

PROMOTING INLAND WATERWAY TRANSPORT IN THE PEOPLE'S REPUBLIC OF CHINA

PROMOTING INLAND WATERWAY TRANSPORT IN THE PEOPLE'S REPUBLIC OF CHINA



Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO)

© 2016 Asian Development Bank
6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines
Tel +63 2 632 4444; Fax +63 2 636 2444
www.adb.org

Some rights reserved. Published in 2016.
Printed in the Philippines.

ISBN 978-92-9257-521-2 (Print), 978-92-9257-522-9 (e-ISBN)
Publication Stock No. RPT168324

Cataloging-In-Publication Data

Asian Development Bank.
Promoting inland waterway transport in the People's Republic of China.
Mandaluyong City, Philippines: Asian Development Bank, 2016.

1. Inland waterway transport. 2. Rivers. 3. Transport. I. Asian Development Bank.

The views expressed in this publication are those of the authors and do not necessarily reflect the views and policies of the Asian Development Bank (ADB) or its Board of Governors or the governments they represent.

ADB does not guarantee the accuracy of the data included in this publication and accepts no responsibility for any consequence of their use. The mention of specific companies or products of manufacturers does not imply that they are endorsed or recommended by ADB in preference to others of a similar nature that are not mentioned.

By making any designation of or reference to a particular territory or geographic area, or by using the term “country” in this document, ADB does not intend to make any judgments as to the legal or other status of any territory or area.

This work is available under the Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO)
<https://creativecommons.org/licenses/by/3.0/igo/>. By using the content of this publication, you agree to be bound by the terms of this license.

This CC license does not apply to non-ADB copyright materials in this publication. If the material is attributed to another source, please contact the copyright owner or publisher of that source for permission to reproduce it. ADB cannot be held liable for any claims that arise as a result of your use of the material.

Attribution—In acknowledging ADB as the source, please be sure to include all of the following information:

Author. Year of publication. Title of the material. © Asian Development Bank [and/or Publisher].
URL. Available under a CC BY 3.0 IGO license.

Translations—Any translations you create should carry the following disclaimer:

Originally published by the Asian Development Bank in English under the title [title] © [Year of publication]
Asian Development Bank. All rights reserved. The quality of this translation and its coherence with the original text is the sole responsibility of the [translator]. The English original of this work is the only official version.

Adaptations—Any adaptations you create should carry the following disclaimer:

This is an adaptation of an original Work © Asian Development Bank [Year]. The views expressed here are those of the authors and do not necessarily reflect the views and policies of ADB or its Board of Governors or the governments they represent. ADB does not endorse this work or guarantee the accuracy of the data included in this publication and accepts no responsibility for any consequence of their use.

Please contact pubsmarketing@adb.org if you have questions or comments with respect to content, or if you wish to obtain copyright permission for your intended use that does not fall within these terms, or for permission to use the ADB logo.

Notes:

In this publication, “\$” refers to US dollars.

ADB recognizes “China” as the People's Republic of China.

Corrigenda to ADB publications may be found at <http://www.adb.org/publications/corrigenda>

Contents

Tables and Figures	v
Foreword	vii
Acknowledgments	viii
Abbreviations	ix
Executive Summary	x
1 Overview of the Inland Waterway System in the People's Republic of China	1
The Network	1
Market Share	3
Investment	5
Inland Waterway Transport Management Structure in the People's Republic of China	5
Inland Waterway Transport Development Policy Directions	6
Conclusion	9
2 Constraints in Promoting Inland Waterway Transport in the People's Republic of China: Insights from Hunan Province	10
Market Constraints	11
Funding Constraints for Inland Waterway Transport	14
Constraints in Ports and Logistics System	17
Information Constraints	20
Technical Constraints	20
Regulatory Constraints	21
Conclusion	29



3	Promoting Inland Waterway Transport: Europe's Experience	30
	Introduction	30
	European Union Marco Polo Program	30
	European Union Funding Program Trans-European Network for Transport	34
	The European Union Funding Program INTERREG IV-A Upper Rhine	36
	The European Union Funding Program NAIADES	37
	The European Union Funding Projects PLATINA and PLATINA 2	38
	Conclusion	41
4	Inland Waterway Transport Management: International Practice	42
	Introduction	42
	Waterway Infrastructure Management Companies in Belgium	42
	Rijkswaterstaat in the Netherlands	44
	Inland Waterway Transport Management in Germany	45
	Waterway Management System in Austria	51
	Institutional Inland Port Reform in Canada	56
	Conclusion	59
5	Recommendations	60
	Introduction	60
	Reducing Economic Disparity Within Provinces and Coordinating Planning and Development of Transport and Land Use	60
	Promoting Integrated Transport Planning and Inter-Modality	61
	Developing Inland Ports	61
	Improving Customer Service	62
	Directing Inland Waterway Transport Incentive Programs toward Market Players	63
	Managing Relationship between Government Offices and State-Owned Enterprises	64
	Enhancing Stakeholder Participation	64
	Conclusion	65
	Appendix: Multicriteria Analysis	66
	References	69

Tables and Figures

Figures

1	River System in the People's Republic of China	2
2	Freight Turnover in the People's Republic of China	3
3	Waterway Transport Freight Turnover	4
4	Cargo in River Ports, People's Republic of China	4
5	Investment in Different Modes of Transport, People's Republic of China	5
6	Hunan River System	11
7	Location of Large Enterprises in Hunan	12
8	Economic Potential in Hunan Province: Findings from Multicriteria Analysis	13
9	Market Share versus Resource Allocation, 2013	16
10	Highways, Railways, and Waterways in Hunan	19
11	Hunan Water Transport Administration Bureau Structure	22
12	Marco Polo Facts and Figures	33
13	Granulometric Riverbed Stabilization	55
14	Fairway Installations in Austria	55

Tables

1	Major Rivers in the People's Republic of China	1
2	Hunan Provincial Department of Transport's Funding Allocation in 2013	14
3	Freight Transport Volume and Growth in Hunan	15
4	Freight Transport Turnover Volume and Growth in Hunan	15
5	Development of Railways, Highways, and Waterways	16
6	Freight Turnover	17

Foreword

The Hunan Xiangjiang Inland Waterway Transport Development Project has been underway since 2012. This is the first inland waterway transport project supported by the Asian Development Bank (ADB) in the People's Republic of China (PRC), through a loan of \$150 million, in line with ADB's Sustainable Transport Initiatives. The project aims to improve the transport conditions of Xiangjiang, the largest river in the PRC's Hunan province, and promote the inland waterway transport (IWT) as a whole in Hunan. It includes both infrastructure provision and policy study.

IWT is a low-cost, low-pollution, and low-carbon mass transport mode and has good potential to reduce logistics costs, fuel consumption, air emission, traffic congestion, noise, and road accidents. The PRC has the world's largest IWT system in terms of length and freight volume. However, IWT has been less developed than highways and railways due to a combination of factors such as infrastructure deficiencies, investment, and institutional weaknesses including coordination challenges across the organizations at the local, regional, and national levels.

This publication presents an overview of the PRC's IWT sector, provides insights into constraints in developing IWT based on a study on Hunan province, introduces international good practice in encouraging IWT development and IWT management, and makes recommendations that will be useful to the PRC as well as other developing countries.



Ayumi Konishi
Director General
East Asia Department

Acknowledgments

This publication was developed based on the study report prepared by the consortium of UNICONCONSULT, Hamburg Port Training Institute, and Wang Jing & Co., the consultant engaged under the Loan 2962-PRC Hunan Xiangjiang Inland Waterway Transport Project. Tyrrell Duncan, technical advisor (Transport); and Robert Guild, director, Transport and Communications Division, East Asia Department provided oversight to complete the publication. Xiaohong Yang, director, Transport and Communications Division, Central and West Asia Department, originated the terms of reference for the study. Li Cai, unit head, project administration, Transport and Communications Division, East Asia Department, directed the study and compiled materials for the publication.

Special thanks go to the Hunan Provincial Department of Transport, Hunan Water Transport Administration Bureau, and Hunan Water Transportation Construction & Investment Group for their contributions to the study.

Weijun Fei, vice-president, China Waterborne Transport Research Institute; Kaoru Kasahara, regional cooperation specialist, Southeast Asia Department; Gloria Gerilla-Teknomo, senior transport sector officer, East Asia Department, and Richard van Liere, project manager, STC B.V. Netherlands, reviewed the work.

Abbreviations

ADB	Asian Development Bank
CRM	customer relationship management
DG MOVE	Directorate-General for Mobility and Transport
EU	European Union
GDP	gross domestic product
HPDOT	Hunan Provincial Department of Transport
HPG	Hunan Provincial Government
HWTAB	Hunan Water Transport Administration Bureau
HWTCIG	Hunan Provincial Water Transportation, Construction & Investment Group
INEA	Innovation and Networks Executive Agency
IWT	inland waterway transport
IWW	inland waterway
MOT	Ministry of Transport
RIS	river information system
RMD	Rhein-Main-Danube
RWS	Rijkswaterstaat
R&D	research and development
SOE	state-owned enterprise
TEN-T	Trans-European Network for Transport
WSV	Wasser Und Schifffahrtsverwaltung des Bundes (Federal Waterways and Shipping Administration)
Z&W	Waterwegen en Zeekanaal

Weights and Measures

CNY	yuan
dwt	dead weight ton
km	kilometer
m	meter

Currency Exchange

As of 15 January 2016

\$1.00 = CNY6.59

CNY1.00 = \$0.15

Executive Summary

Sustained economic growth at an annual average of 9% over the past 30 years has led to rapid increases in vehicle ownership and traffic flows within and across cities and provinces of the People's Republic of China (PRC). By 2014, the number of private vehicles had reached 146 million; passenger turnover, 3,009 billion passenger-kilometers (km); and freight turnover, 18,583 billion ton-km.

Since the 1990s, the PRC has made significant investments in developing its transport infrastructure, particularly roads, railways, and airports. By 2014, the total road length had reached 4.46 million km; the length of railways in operation, 111,800 km; and the airports with scheduled flights, 200.

Despite the large supply of transport infrastructure, logistics costs remain high, and traffic congestion has become a frequent phenomenon in the PRC. Other emerging issues are road accidents, air pollution, climate change, and high dependence on oil imports.

Waterway transport is a low-cost, low-pollution, and low-carbon mass transport mode. The PRC has a coastline of 18,000 km and the world's longest and most extensive inland waterway system with a total of 126,300 km of navigable waterways. The waterway freight turnover—including river, coastal, and ocean shipment—accounts for about half of the PRC's total. Despite the system's potential and the government's policies encouraging its development, waterway transport—particularly the inland waterway transport (IWT) which accounted for 14% of the waterway freight turnover in 2014—has not been developed as much as other transport modes and has not achieved its full potential.

This publication examines the constraints in developing IWT based on a study in the PRC's Hunan Province. While the PRC's general policy directions are to promote waterway transport, and national and provincial governments have increased investment in IWT significantly in the past 10 years, investment in IWT remains disproportionately small to its contribution to freight traffic. From 2011 to 2014, investment in roads was 62%, and investment in railways was 32% of the PRC's total investment in the transport sector, while the figure for waterways, including the coastline, was only 6%. The same pattern was also evident in Hunan Province. Only 3.4% of the budget of the Hunan Provincial Department of Transport was allocated to IWT in 2013, compared with 96.6% for roads, despite IWT carrying 10.1% of freight volume (in ton) and 17.9% of freight turnover (in ton-km).



Besides investment, there are five other major challenges threatening the viability of IWT and its integration into the whole logistics chain:

- (i) **Market constraints.** To run a profitable IWT service, a balanced traffic flow (both incoming and outgoing) is required to enable shipping lines to calculate a competitive freight rate for different customers. The disparity in economic development between the PRC's coast and inland provinces and between the different reaches of the rivers leads to unbalanced cargo flows which make it difficult for IWT liners to run a profitable IWT service.
- (ii) **Inadequate inland ports and logistics system.** The inherent disadvantage of IWT is the need for double handling. Inland ports play an important role in facilitating supply chain flows through efficient logistics. Interfaces with other transport modes, such as roads and railways, are crucial to overcome the disadvantage of double handling. There is evidence that the PRC's inland ports are not rationally developed and that port administration is cumbersome. The transportation system is organized by transport mode, and no single mode is focused on creating multimodal chains and seamless transfers at nodes that are needed to lower transport costs.
- (iii) **Information constraints.** Communication channels among shipping lines, forwarders, and government are few. There is no institutionalized communication among these IWT stakeholders. Many shippers are not aware of the ability and opportunities coming out of the IWT system.
- (iv) **Technical constraints.** Limited river water depth, long waiting times at locks, and the lack of port facilities hinder shippers in using IWT.
- (v) **Regulatory constraints.** Many government offices are involved in IWT management, but integrated transport planning to minimize logistics costs and law enforcement capability is weak. The many policy directives to encourage IWT development focus on promotion of infrastructure hardware and give little consideration to market players such as shippers or forwarders, policy instruments, implementation arrangements, and financial support.

The European Union (EU) has implemented several successful programs to promote IWT and intermodal transport, and to take freight off roads since 2003. The Marco Polo program gives grants in the crucial start-up phase of direct modal-shift or traffic avoidance projects or projects providing supporting services that enable freight to switch from road to rail and waterborne systems efficiently and profitably. Other programs include (i) the Trans-European Network for Transport (TEN-T) that aims to help connect industrial regions and urban areas; link them to ports; and help establish an interoperable, intelligent traffic and transport system; (ii) INTERREG IV-A Upper Rhine that intends to support development of the Upper Rhine into an internationally competitive cross-border knowledge and innovation region; (iii) NAIADES that promotes inland waterway transport, focusing on five strategic areas for a comprehensive inland waterway transport policy: market, fleet, jobs and skills, image and infrastructure; and (iv) PLATINA that was designed to support implementation of the NAIADES European inland navigation program.

In the PRC, IWT is under the jurisdiction of the Ministry of Transport (MOT) and provincial departments of transport. The MOT has overall responsibility for policy and administration



of inland waterways and is responsible for planning channels of national importance. Provincial departments of transport are responsible for most other waterways, and indeed for most of the total network. Provinces such as Hunan and Guangxi set up state-owned enterprises (SOEs) to develop the IWT sector. European countries such as Austria, Belgium, Netherlands, and Germany also organize the role of infrastructure and manage IWT either through government offices or SOEs. What can be learned from the European experiences is that performance targets or service levels need to be specified clearly, and the relationship between government and SOEs should be regulated transparently by contract or agreement that spell out rights and obligations.

In the past 30 years, the PRC's transport sector has made tremendous strides in technological advances, infrastructure provision, and market development, but institutional bottlenecks remain, hampering the healthy development of the sector and affecting its role in underpinning the economy.

In 2013, the Government of the People's Republic of China took a significant step to rationalize the institutional set-up for the transport sector by dissolving the Ministry of Railway and merging its functions of planning and policy making with the MOT. But much remains to be done.

The analysis and case study in this report lead to recommendations that are relevant not just to Hunan Province, but also to the rest of the PRC and other developing countries. Based on the experiences of Hunan Province, the PRC, and the EU, there are seven broad recommendations for development of IWT in the PRC.

- (i) **Reducing economic disparity within provinces, and coordinating planning and development of transport and land use.** Economic disparity across different rivers or reaches of rivers causes difficulties for IWT services because of insufficient traffic volume or unbalanced traffic flow. Economic development requires improvement of transport conditions, but improved transport alone may be insufficient to stimulate economic development. To maximize the rate of return on transport investment and minimize waste of resources, it is important to study carefully the economic potentials in different parts of provinces, plan the land use properly, and develop transport accordingly.
- (ii) **Promoting integrated transport planning and intermodality.** To lower transport and logistics costs, it is necessary for all modes of transport to be integrated with seamless transfers at nodes. Developing, managing, and regulating different transport modes in isolation will limit the growth of IWT. Setting up a task force to knock down the walls among government offices, the public and business sectors, and involve a wide range of stakeholders in integrated planning may be a good way forward.
- (iii) **Developing inland ports.** Inland ports are critical links in the supply chain, and efficient port services are a prerequisite for IWT's competitiveness. Inland ports should be connected to hinterlands via a variety of modes of transport, and be planned as comprehensive transportation junctions that link production, supply, consolidation, transport, and distribution to improve overall utilization rates and reduce logistical costs. The scale and level of inland ports should be appropriate to the economic development and trade volume of their hinterlands, and ports



ought to be developed to be large-scale, standardized, and ecofriendly with a rationalized layout. Also, different ports should enhance integration to form a relatively complete inland transportation system and coordinate their operations to form an operational unity.

- (iv) **Improving customer service.** Customers are relevant to the success of any economic sector. To promote IWT, it is important to address customers' needs. This can be achieved by marketing activities of the relevant government offices and/or SOEs including an active customer relationship management (CRM). CRM institutionalized in different stakeholder organizations can improve communication channels.
- (v) **Directing inland waterway transport incentive programs toward market players.** Many national and provincial policies, regulations, and plans are already in place in the PRC to develop IWT infrastructure and reduce terminal handling costs. It is advisable to design incentive programs that focus on the market players who make decisions on choice of transport mode, who concentrate on operational costs of transport contracts, and who consider the complete intermodal transport chain.
- (vi) **Managing the relationship between government and state-owned enterprises.** IWT provides public services and is an area where SOEs can play a useful role. The relationship between the government and SOEs should be regulated by a legal framework that prevents excessive interference by government offices in the operations of the SOEs, while ensuring delivery of SOEs' performance.
- (vii) **Enhancing stakeholder participation.** There is a wide range of stakeholders in the IWT sector besides government offices and academic institutes. It is important to involve stakeholders in major policy studies and formulation to ensure appropriateness of the policies, maximizing positive while minimizing negative impact on the stakeholders; gain popular support; and facilitate implementation.

The publication is organized as follows: Chapter 1 provides an overview of the PRC's inland waterway transport; including the government's policy directions for IWT. Chapter 2 presents a case study on Hunan to illustrate the challenges of promoting IWT in the PRC. The European experience in promoting IWT and international experience in managing IWT are described in Chapter 3 and 4. We make recommendations in Chapter 5.

1 Overview of the Inland Waterway System in the People's Republic of China

This chapter presents the role and status of inland waterway transport (IWT) in the People's Republic of China (PRC), the IWT management structure, and its future development directions.

The Network

The PRC was one of the first countries in the world to develop waterway transport. It had waterway transport as early as 2,500 BC. In 214 BC, a 30-kilometer (km) canal was built connecting the Yangtze and Zhujiang river systems. The 1,794-km world-famous Grand Canal connecting five river systems including the Qiantang, Yangtze, Huai, Yellow, and Hai river systems commenced construction in 486 BC.

The PRC has 50,000 natural rivers with a catchment area of more than 100 square kilometers and about 900 lakes. Table 1 presents the major rivers in the PRC, and Figure 1, the river system. The three longest rivers in the PRC are the Yangtze (6,300 km), Yellow (5,464 km), and Lancang (4,350 km) rivers. The rivers provide huge support for the economic development along their areas. The total gross domestic product (GDP) of the seven provinces and two cities the Yangtze River corridor covers 40% of the PRC's total GDP.

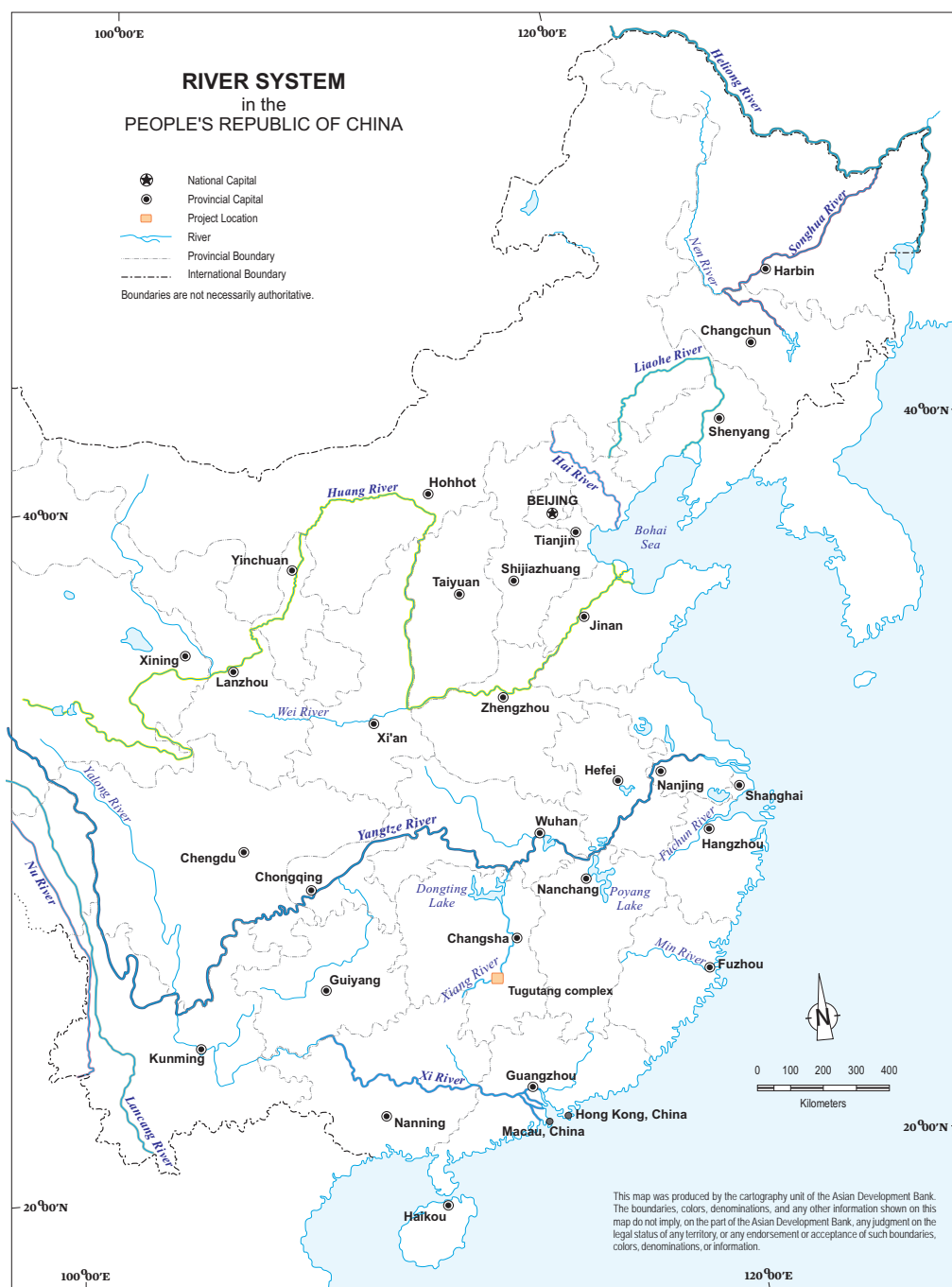
Table 1: Major Rivers in the People's Republic of China

River	Length (km)	Catchment Area (km ²)	Provinces in the Drainage Basin
Yangtze River	6,300	1,808,500	Anhui, Chongqing, Hubei, Hunan, Jiangsu, Jiangxi, Shanghai, Sichuan, and Tibet
Yellow River	5,464	752,000	Gansu, Henan, Inner Mongolia, Ningxia, Qinghai, Shanxi, Shaanxi, Shandong, and Sichuan
Heilong River	3,420	900,000	Heilongjiang
Songhua River	2,308	557,180	Heilongjiang and Jilin
Liao River	1,390	228,960	Hebei, Inner Mongolia, Jilin, and Liaoning
Pearl River	2,214	453,690	Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, and Yunnan,
Hai River	1,329	318,200	Beijing, Hebei, Henan, Inner Mongolia, Shandong, Shanxi, and Tianjin
Yarlung River	2,840	912,000	Tibet
Lancang River	4,350	795,000	Qinghai, Tibet, and Yunnan
Nujiang River	2,816	324,000	Tibet and Yunnan

Source: Ministry of Transport, People's Republic of China.



Figure 1: River System in the People's Republic of China



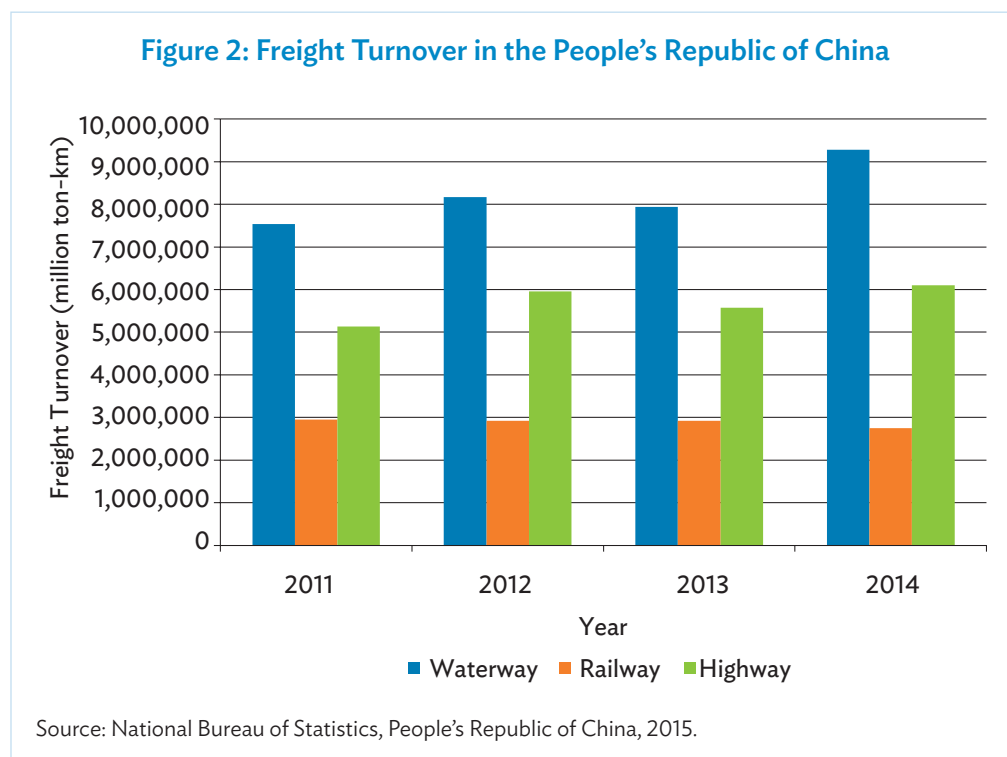
Source: Asian Development Bank.

By 2014, the navigable length of rivers totaled 126,300 km. Changjiang or Yangtze River, which runs from the PRC's west to east, connecting the coast and vast inland, is the PRC's golden waterway transport route. Its freight throughput ranks number 1 among all inland waterways in the world.



Market Share

Passenger transport by waterways is negligible compared to modal passenger share for railways (48.8%) and highways (50.8%). In terms of freight, waterway transport including river, coastal, and ocean shipment accounted for 51% of the total freight turnover in 2014 (14% for IWT), while highways was 34%, and railways, 15%. Figure 2 presents the freight turnover by the three transport modes for the period of 2011 to 2014.

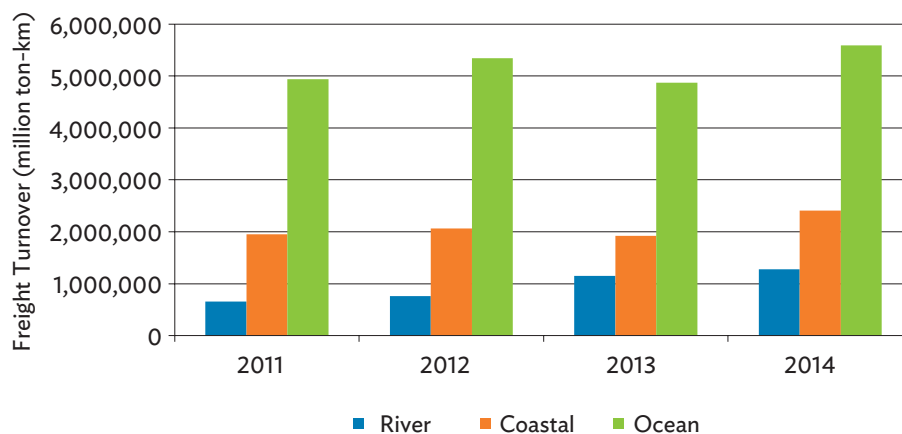


Of the waterway transport freight turnover, ocean shipping constitutes 60%; coastal shipping, 26%; and inland waterway, 14% of the total freight turnover in 2014 (Figure 3).

In 2014, river ports handled 3.5 billion tons of cargo. Figure 4 shows the types of cargo that passed through the river ports in the PRC. About 51% of all cargo through the river ports are mineral building materials (31%) and coal and coal products (20%). Container shipping is also slowly gaining importance.

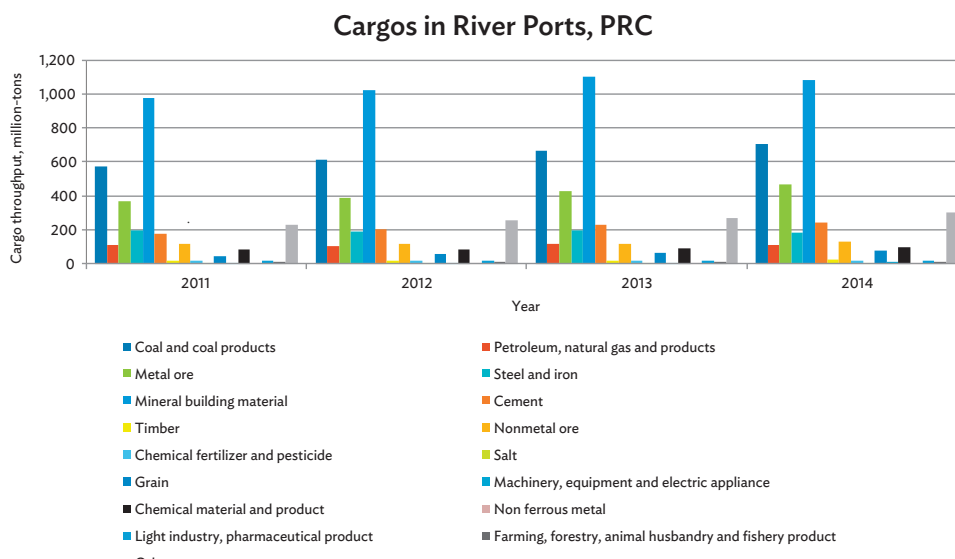


Figure 3: Waterway Transport Freight Turnover



Source: National Bureau of Statistics, People's Republic of China, 2015.

Figure 4: Cargo in River Ports, People's Republic of China



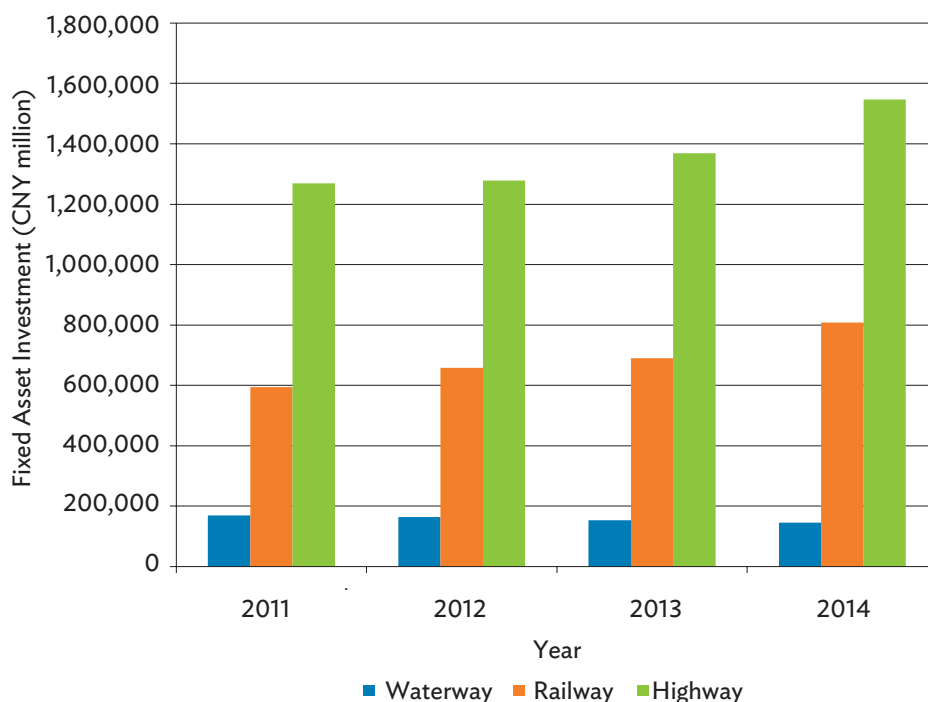
Source: National Bureau of Statistics, People's Republic of China, 2015.



Investment

Investment in transport by the PRC has been highly tilted toward roads and railways, and investment in waterway transport has not been commensurate with its contribution to the freight transport. Figure 5 shows that roads accounted for 62% of the investment; railways, 32%; and waterways, only 6%.

Figure 5: Investment in Different Modes of Transport, People's Republic of China



Source: National Bureau of Statistics, People's Republic of China, 2015.

Inland Waterway Transport Management Structure in the People's Republic of China

The Ministry of Transport (MOT) has the overall responsibility for policy and administration of inland waterways in the PRC. The Regulation on Administration of Waterways stipulates that the MOT is responsible for planning channels of national importance, which include Class IV and higher channels (suitable for vessels of 500 tons-plus) that are part of the national network, plus Class V and higher channels (suitable for vessels of 300 tons-plus) that have important transprovincial traffic functions. The MOT's Bureau of Water Transport Administration is devoted to carry out its responsibilities. The MOT has decentralized responsibility for day-to-day administration and management of the main waterways of



national importance to the Changjiang River Administration of Navigational Affairs and Pearl River Administration of Navigational Affairs. These authorities function as the MOT's agencies.

Provincial governments are responsible for most other waterways, and indeed for most of the total network, which they administer through provincial departments of transport. Provincial water transport administration bureaus are usually established under provincial departments of transport. The provincial authorities are required to submit annual reports to the MOT.

Another major authority relevant to the water transport sector management is the Ministry of Water Resources. The water law entrusts this ministry with the overall management and coordination of water resources in the PRC. Specialized plans for inland waterway infrastructure and ports must be coordinated through the Ministry of Water Resources. The port law requires that the design of ports must be in accordance with national, provincial, or municipal plans; and be compatible with other plans, such as those for land utilization, cities, river management, flood prevention, oceanic regions, and other transport modes.

Inland Waterway Transport Development Policy Directions

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

The plan acknowledged the importance of supporting policies which

- (i) seek to secure a stable long-term financing model;
- (ii) seek external sources of finance;
- (iii) enhance cooperation with other relevant departments in the areas of shipping services, power supply, flood control, irrigation, and water supply;
- (iv) enhance the planning of ports;
- (v) strengthen measures to standardize and modernize the vessel fleet;
- (vi) increase and improve the application of information technology to IWT management;
- (vii) ensure safety and environmental performance; and
- (viii) attain a sustainable development of the system.



In January 2011, the State Council issued “Opinions on Accelerating the Development of Water Transport on the Yangtze River.” The opinions requested that governments at all levels shall devote the attention to integrate water transport with other modes of transportation involving highways, railways, aviation, and pipelines; to develop multimodal transport; and to exert the comparative advantages and combination efficiency of various transportation means; thus, helping optimize the transportation structure, reduce comprehensive logistics costs of society, and transform the mode of transport development.

The opinions acknowledged that the fast economic and social development, resource and environment constraints are becoming increasingly stringent and that the contradiction between transport development, energy conservation, and environment protection has become increasingly acute. Inland water transport has unique advantages in transportation of energy, raw materials and other bulk materials, as well as containers and major equipment. Speeding up development of inland water transport on rivers such as the Yangtze River is conducive to development of the electric power, steel, automobile, and other sectors in regions along rivers; helps adjust and optimize the layout of industries in areas along rivers; and helps cut down the energy consumption, build a low-carbon economy, and reduce emissions. This is in line with the overall requirements of building a resource-saving and environmentally friendly society, and is of great practical significance to speed up the transformation of the pattern of economic development.

The opinions required that governments at all levels shall follow scientific approaches, further emancipate minds, rationally utilize and effectively preserve water resources, pursue scientific and technological innovations, strengthen the research and development (R&D) work on advanced suitable technology and equipment, and prioritize inland waterway transport as a key task in building a comprehensive transport system.

In March 2011, MOT issued the “Opinions on Implementation of Opinions of the State Council on Accelerating the Development of Water Transport on the Yangtze River and Other Inland Waters.” Governments at all levels were requested to strengthen connectivity between railways, highways, and major inland rivers ports; develop major river ports into cargo distribution and trading centers and eventually comprehensive freight hubs; enforce plan implementation; tighten screening and approval procedures for the use of coastlines; encourage development of public piers; and improve the utilization efficiency of coastline, land, and other resources. Provincial transport authorities shall (i) vigorously develop modern shipping sector involving trade, consulting services, information, finance, insurance and other services; (ii) promote corporate operation of inland waterway transport; (iii) guide small- and medium-sized shipping companies toward scale operations; (iv) step up management of dangerous goods transport; (v) encourage transport and port service enterprises to extend the industry chain and expand ranges of services such as warehousing, distribution, and logistics and eventually become logistics operators; (vi) strengthen control of ship-induced pollution, equip newly built inland transport vessels with bilge disposal (or storage) and sewage or garbage collection facilities, renovate existing passenger ships (including truck roll-on-roll-off [ro-ro] vessels) in key water areas by equipping them with related facilities, and build a monitoring and testing system for ship-induced pollution; and (vii) establish emergency response systems for pollution accidents in inland waterway transport, equip vessels with pollution treatment facilities, build onshore



facilities at waterway service areas and ports for collecting and treating garbage, bilge, and sewage of vessels.

In August 2013, MOT issued the “Notice on Issuing the Action Programs (Year 2013–2020) on Accelerating the Development of Water Transport on the Yangtze River and Other Inland Waters.” Governments were required to strengthen planning and construction of inland waterways which connect with coastal ports. Furthermore, governments at all levels shall make efforts to (i) speed up development of large-scale port areas for special purpose at major ports and part of the key ports along inland rivers, especially terminals for handling containers, automobile ro-ro handling, and bulk commodities; and (ii) develop multimodal transport and port logistics.

In February 2006, the MOT published the “National Outline for the Development of Ship-Class Standardization on Inland Waterways.” The Outline requires that provincial transport authorities develop the navigation industry by relying on technological innovations and progress.

In May 2013, the Ministry of Transport issued the “Guiding Opinions on Promoting the Development of Green, Recycling-Oriented, and Low-Carbon Transportation,” that mandated provincial transport authorities to (i) strengthen technological research and development on green, recycling-oriented, and low-carbon transportation; (ii) promote scientific and technological breakthroughs including R&D and application of key technology for intelligent transportation, and the research and demonstration of the key technology for emergency response to transportation pollution and pollution control; (iii) proactively promote key technology, advanced applicable technology, and product R&D in the fields of energy saving, ecological environment protection, and utilization of new energy for the transportation energy sector; (iv) promote technology and products of green, recycling-oriented, and low-carbon transportation; step up research and formulation of policies for the technology of green, recycling-oriented, and low-carbon transportation; make public the achievements directory of the technology, product, and technique of the green, recycling-oriented, and low-carbon transportation in a timely manner, and actively promote the market-integration and industrialization of technological achievements; and (v) vigorously promote establishment of systems of criteria, measurement and inspection, and verification for the technology, products, and techniques of the green, recycling-oriented, and low-carbon transportation.

In April 2014, the Ministry of Finance and the MOT promulgated the “Management Measures for Subsidy on Ship-Class Standardization on Inland Waters.” The policy encourages cargo vessel replacement by providing subsidies: CNY30,000 for vessels with a gross tonnage under 1,000 tons, CNY40,000 for vessels above 1,000 tons but under 2,000 tons, and CNY50,000 for vessels over 2,000 tons. It also provides subsidies for vessels to install sewage cabin: CNY15,000 for vessels under 1,000 tons, CNY20,000 for vessels between 1,000 tons and 2,000 tons, and CNY25,000 for vessels above 2,000 tons.



Conclusion

The promulgation of these policy directives indicates that the state has elevated inland waterway development as a strategic focus in building a comprehensive transport system, and that technological innovations are central to achieving the policy objectives. These are of profound significance to further giving play to comparative advantages of inland waterway transport, building a modern integrated transport system, and promoting a low-carbon economy.

Although the PRC's general policy direction is to scale up development of the IWT sector, moving from policy to reality has a long way to go, and constraints are considerable. Chapter 2 presents the Hunan Xiangjiang waterway transport study that gives some glimpses into the difficulties in promoting the IWT sector.

2 Constraints in Promoting Inland Waterway Transport in the People's Republic of China: Insights from Hunan Province

Hunan is a landlocked province in the central PRC, and one of six central provinces supported by the government's Central Region Development Strategy. It has a population of 68.4 million and is rich in minerals. Hunan's mineral resources are of both high quality and quantity. Of the 160 minerals discovered in the world, Hunan has 141, including 91 kinds of mineral reserves that were proven to exist, and the reserves of 105 mineral deposits that have been explored. Another natural resource is the forest. More than half of Hunan is covered by 314 million cubic meters of forest trees. Hunan has four large rivers (Lishui, Xiangjiang, Yuanshui, and Zijiang), and several tributaries flow through the province to converge on Dongting Lake and into the Yangtze River (Figure 6). It has the third longest provincial IWT network in the PRC, with over 11,495 km of waterways, 107 ports, and 1,880 berths.

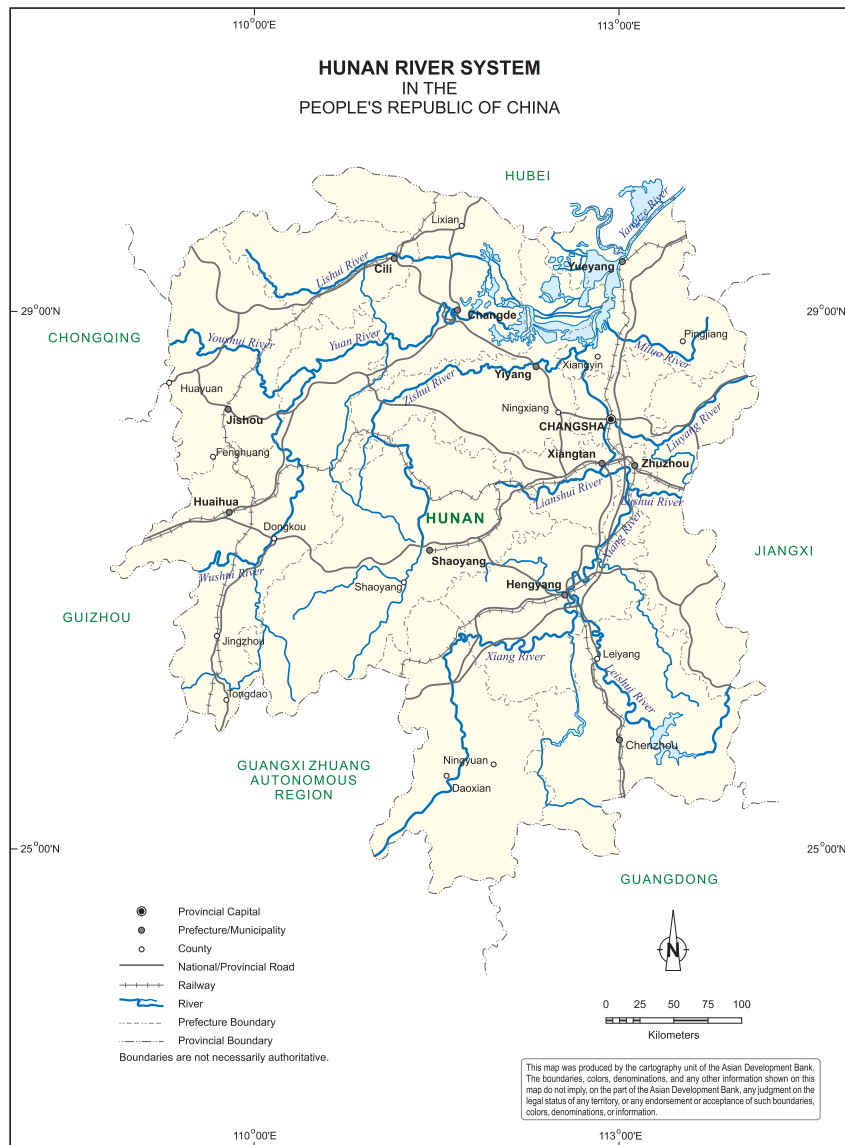
Xiangjiang is one of the largest tributaries of the Yangtze River and the largest river in Hunan. Originating in the Guangxi Zhuang Autonomous Region, it is 969 km long, with 773 km in Hunan before it flows into the Yangtze River. The Xiang River runs from south to north, connecting, via the Yangtze River, six of Hunan's major cities and a large proportion of population with the PRC's east coast seaports. About 70% of the large and medium-sized enterprises of the province are located along the river.

In history, IWT was one of the most important transport modes in Hunan. However, by 2014, the IWT freight volume only accounted for 12.7% of the total freight volume of all modes. Only 5% of the waterways and berths can accommodate vessels of up to 1,000 tons carrying capacity.

The study has looked into IWT-related government policies, management, and development along Xiangjiang and in Hunan to identify appropriate programs to promote the IWT sector. The constraints in developing IWT identified, however, may not be unique to Hunan and Xiangjiang, but are in common with the PRC's other provinces and rivers as well.



Figure 6: Hunan River System



Source: Asian Development Bank.

Market Constraints

Unbalanced cargo flows. When setting up a new IWT liner connection or even sustainably running an IWT connection, a balanced traffic flow, incoming and outgoing, is required to enable the shipping line to calculate a competitive freight rate for the different customers. Shipping lines cannot have a profitable operation on unbalanced transport flows. A major shipping line market player gave this example on the impact of balanced cargo flows. While the traffic flow in the container transport from Changsha to Shanghai is running well since it is balanced (47% import, 53% export), there is no IWT container liner services from

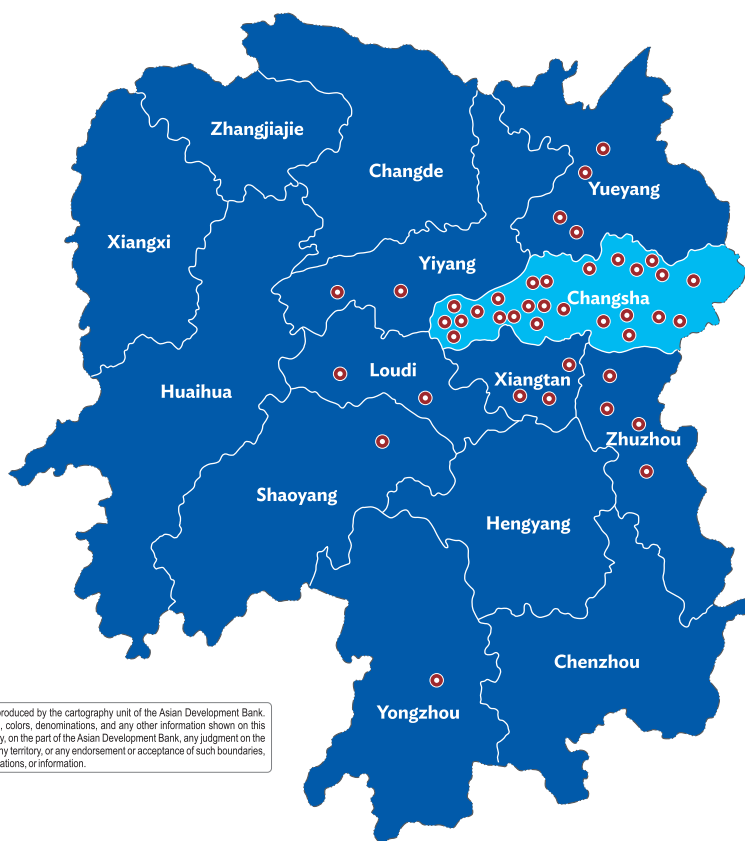


Hengyang downstream to the IWT container hub port, Yueyang. The main commercial reason (aside from low water during certain times of the year) for the lack of regular IWT services is the unbalanced traffic flow to and from Hengyang (much more export than import cargo volumes because of the regional consumption and production balance).

In 2011, IWT captured 9.5% of the total freight tonnage of Hunan. In the short term, the growth in demand is driven by an increase in existing commodities. In the medium and long term, however, the growth would be driven by new generated markets—the development of new industries on the waterway itself. So far, 127 of the world's top 500 enterprises have established operations in Hunan, but none of them in the middle and upper stream of Xiangjiang during the recent past. As Figure 7 shows, their locations are concentrated in and around Changsha City. Over 80% of provincial economic growth was contributed by the Changsha–Zhuzhou–Xiangtan city cluster.

To analyze the IWT market potential in Hunan, a multicriteria analysis of the province's economic potential was conducted. Ten criteria were selected to best reflect the demand parameters for inland–waterway shipping (see Appendix 1). The general potential impact of these criteria on economic growth was rated according to their significance of impact. The values were then set in proportion to the different sizes or population numbers of Hunan's

Figure 7: Location of Large Enterprises in Hunan



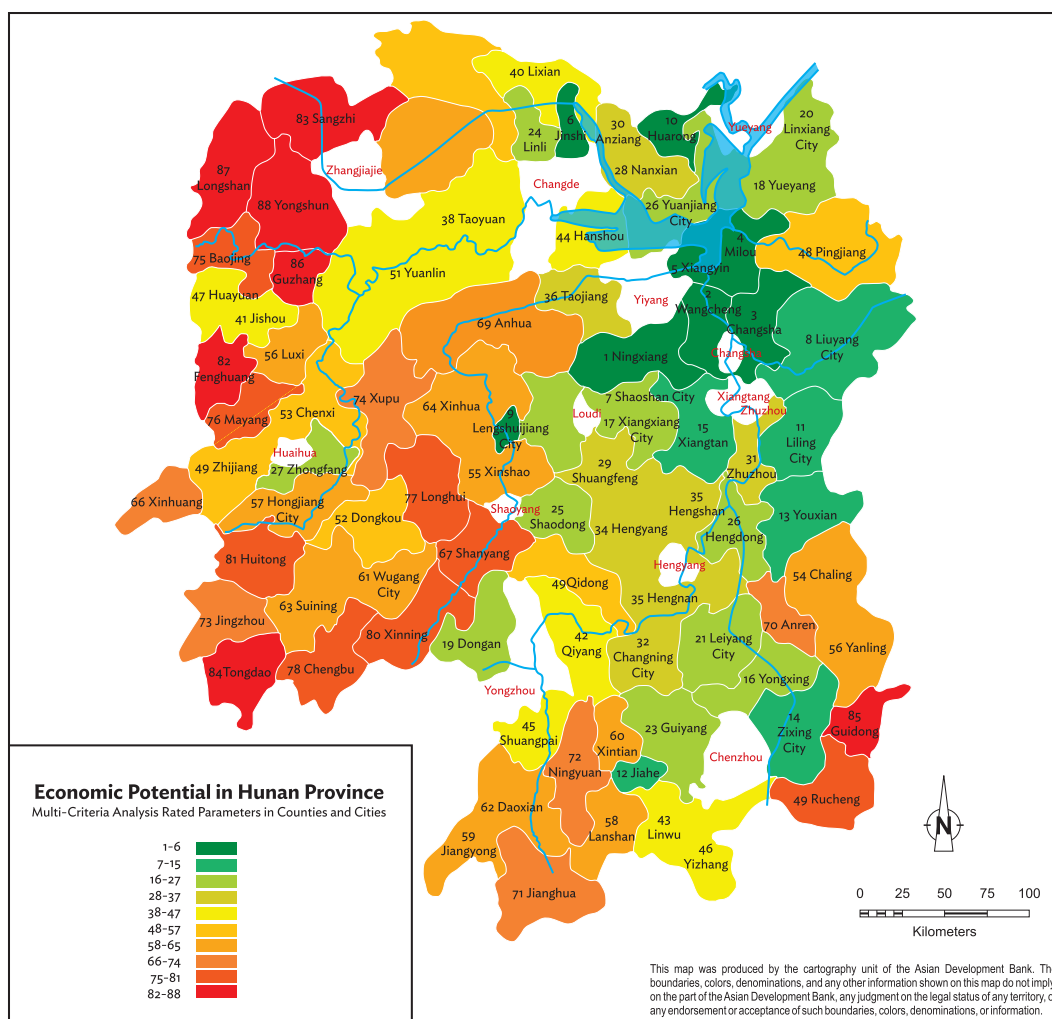
Sources: Asian Development Bank.



counties and cities. Subsequently, the individual values were substituted through ranks for each criteria group. Finally, each rank was multiplied by the rating figure of each criteria group, and the sums of all rated ranking figures for each of Hunan's counties and cities were ranked. These ranked rates were assigned colors ranging between green (high economic potential) and red (low economic potential) to make it visually easier to compare economic potential.

The map in Figure 8 constitutes the result of calculating the economic potential of Hunan's individual counties and cities. The map's color distinctions (red color indicating a low economic potential in the west, and green a high potential in the east) give an immediate impression of the economic disparities in Hunan. Most economic potential is concentrated in a corridor along the lower Xiangjiang (with Changsha City as the growth center) and the Leishui River (with Zixing City as the second growth center). The middle and upper reaches of the Xiangjiang are ranked at positions 27 and 35 (out of 88 counties and cities).

Figure 8: Economic Potential in Hunan Province: Findings from Multicriteria Analysis



Sources: *Hunan Province Statistical Yearbook 2012*; Consultants' calculations and design.



The disparity in economic development potential in Hunan leads to unbalanced cargo flows that make it difficult for IWT liners to extend the shipping services to the middle and upper reaches of the river. To run a profitable IWT service, a balanced traffic flow, incoming and outgoing, is required to enable the shipping line to calculate competitive freight rates for different customers.

Limited market penetration because of geographical and topographical situation.

The modal share of IWT in the export cargo transportation from Hunan to Shanghai via the Xiang River is about 65%. Barge transport from Changsha to Shanghai takes about 86–92 hours, truck transport about 38–40 hours, whereas truck transport is about three times more expensive. This costs/time ratio benefits the IWT on this route and leads to a large share of cargo transported on the river system. When it comes to the potential of IWT market penetration south of Changsha toward Hengyang, the transport duration and costs by truck and railway to the seaport of Guangzhou or Shenzhen is quite competitive against the IWT transport to Shanghai. In other words, it will be challenging to shift additional cargo from the truck to IWT in the south of Changsha by whatever attractive incentive measures.

Sophisticated and expensive organization of intermodal inland waterway transport.

The shippers have mentioned this constraint several times, and it is actually well-known in other countries engaged in IWT logistics. IWT has a limited networking capability, which mostly requires expensive and time-consuming pre- and on-carriage by truck. This intermodal approach requires a comprehensive logistics management system such as a “logistic information public-sharing platform” that the central government arranges. This system is high-tech, highly professional, and requires a high standard of coordination between departments at different levels.

Funding Constraints for Inland Waterway Transport

Disproportionate public financing of IWT. In Hunan, the budget allocation for the IWT industry does not correlate with the relevance and the big role the IWT industry plays in the province. Table 2 provides the funding allocation of the Hunan Provincial Department of Transport (HPDOT) for the road subsector and IWT in 2013. IWT’s market share in terms of freight transport volume is presented in Table 3, and for freight turnover volume is in Table 4.

Table 2: Hunan Provincial Department of Transport’s Funding Allocation in 2013

Allocation of Central Government Funds for the Transport Modes Road and IWT	Amount of Money (CNY million)
Expressway	5,678
Arterial highway	3,035
Rural highway	3,366
Waterway	485

continued on next page



Table 2 continued

Allocation of Central Government Funds for the Transport Modes Road and IWT	Amount of Money (CNY million)
Station yard	184
Rebuilding arterial highway after disaster	585
Transforming dangerous bridges, security and crossing bridges	68
Information construction and others	162
Financial support in total for road and waterway transport modes	14,175

Source: Hunan Provincial Department of Transport, November 2014.

Table 3: Freight Transport Volume and Growth in Hunan
(tons, million)

	Road Transport	IWT	Market Share of IWT on Road and IWT Cargo Volume	Increase of Road Cargo Volume	Increase of IWT Cargo Volume
2009	1,113.5	118.3	9.6%		
2010	1,276.4	158.1	11.0%	12.8%	25.2%
2011	1,442.4	179.5	11.1%	11.5%	11.9%
2012	1,666.7	187.1	10.1%	13.5%	4.0%
2013	1,850.7	206.9	10.1%	9.9%	9.6%

Source: Hunan Provincial Department of Transport, November 2014.

Table 4: Freight Transport Turnover Volume and Growth in Hunan
(ton-km, million)

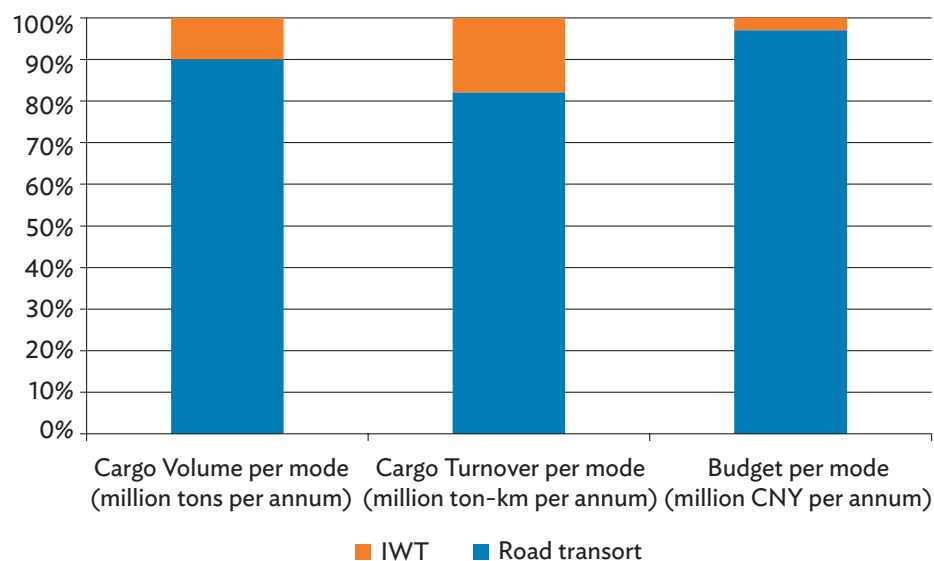
	Road Transport	IWT	Market Share of IWT on Road and IWT Cargo Volume	Increase of Road Cargo Volume	Increase of IWT Cargo Volume
2009	126,000.0	25,500.0	16.8%		
2010	153,900.0	34,200.0	18.2%	18.1%	25.4%
2011	187,900.0	42,026.0	18.3%	18.1%	18.6%
2012	239,200.0	56,226.0	19.0%	21.4%	25.3%
2013	271,300.0	58,974.0	17.9%	11.8%	4.7%

Source: Hunan Provincial Department of Transport, November 2014.

According to the information in the tables above, the share of IWT of freight transport by road and by IWT in Hunan represents about 10.1% of the overall freight volume, and 17.9% of freight turnover in 2013, while the HPDOT budget allocation to IWT was only about 4.3%. Figure 9 illustrates this unbalanced relation between market share and government's resources allocation.



Figure 9: Market Share versus Resource Allocation, 2013



While IWT provides important transport capacity, its growth is increasingly limited as the road transport's share is increasing in step with the development of the road and bridge network and the extension of competitive road-transport services into areas previously served only by the rivers. Between the years 2006 and 2013, freight transport in terms of turnover by road had increased 358%, whereas freight turnover by IWT increased by only half that proportion. Table 5 shows the development of railways, highways, and navigable inland waterways between 2006 and 2013; and Table 6 presents the freight turnover by the three transport modes during the same period.

Table 5: Development of Railways, Highways, and Waterways (km)

Year	Length of Railways in Operation	Of Which: Double-Tracking	Length of Highways	Of Which: Expressways	Length of Navigable Inland Waterways
2006	2,806	1,246	171,848	1,403	11,968
2007	2,799	1,250	175,415	1,764	11,398
2008	2,795	1,246	184,568	2,001	11,398
2009	3,693	1,852	191,405	2,226	11,968
2010	3,695	1,847	227,998	2,386	11,968
2011	3,693	1,852	232,190	2,649	11,968
2012	3,825	1,987	234,051	3,968	11,968

Source: Hunan Provincial Statistical Yearbook, 2013.

**Table 6: Freight Turnover (ton-km, billion)**

Year	Total	Railways	Highways	Waterways
2006	178.07	95.17	59.24	23.67
2007	198.12	103.84	68.27	26.01
2008	233.96	97.15	108.51	28.31
2009	250.47	99.00	125.97	25.50
2010	290.42	102.27	153.94	34.21
2011	334.50	104.62	187.86	42.03
2012	395.29	99.81	239.25	56.23
2013			271.30	58.97

Source: Hunan Provincial Statistical Yearbook, 2013.

Restricted access to commercial bank loans. Due to bank regulations (risk management), commercial banks do not accept purchased inland waterway vessels as security for loans. This regulation makes it difficult for shipping lines to obtain the financial sources to procure new IWT vessels.

Constraints in Ports and Logistics System

A supply chain is defined as the flow of resources and data to fulfil end-customer demand, starting from raw materials sourcing through the various stages of value-adding, handling, storage, and transport. Within the management of supply chains, logistics activities are concerned with transport, storage, and handling of goods at all chain levels. Inland ports play an important role in facilitating the supply chain flows through efficient logistics. Their presence is an attractive factor for (primarily manufacturing) facility location decisions. Inland ports can have three functions:

- (i) as a hub of transport chains (freight transfer point);
- (ii) as a location for industry, services, and as a vital part of industry clusters; and
- (iii) as a link in regional production networks.

While all ports form nodes in the supply chain or production network, they do not always play the role of freight transfer points or industry centers. Some ports serve two functions and only a few serve all three.

Of the 99 cities and counties in Hunan, 63 possess one port of varying size and equipment. Almost all of the 36 cities and counties without a port are located in the northeast, southwest, and far south of Hunan. Of these 36 cities and counties, half are not located close to a navigable river. Comparing the cities and counties' average endowment with port infrastructure against the average cargo throughput across their navigable waterways indicates under or oversupply of ports not correlated with existing or anticipated demand.



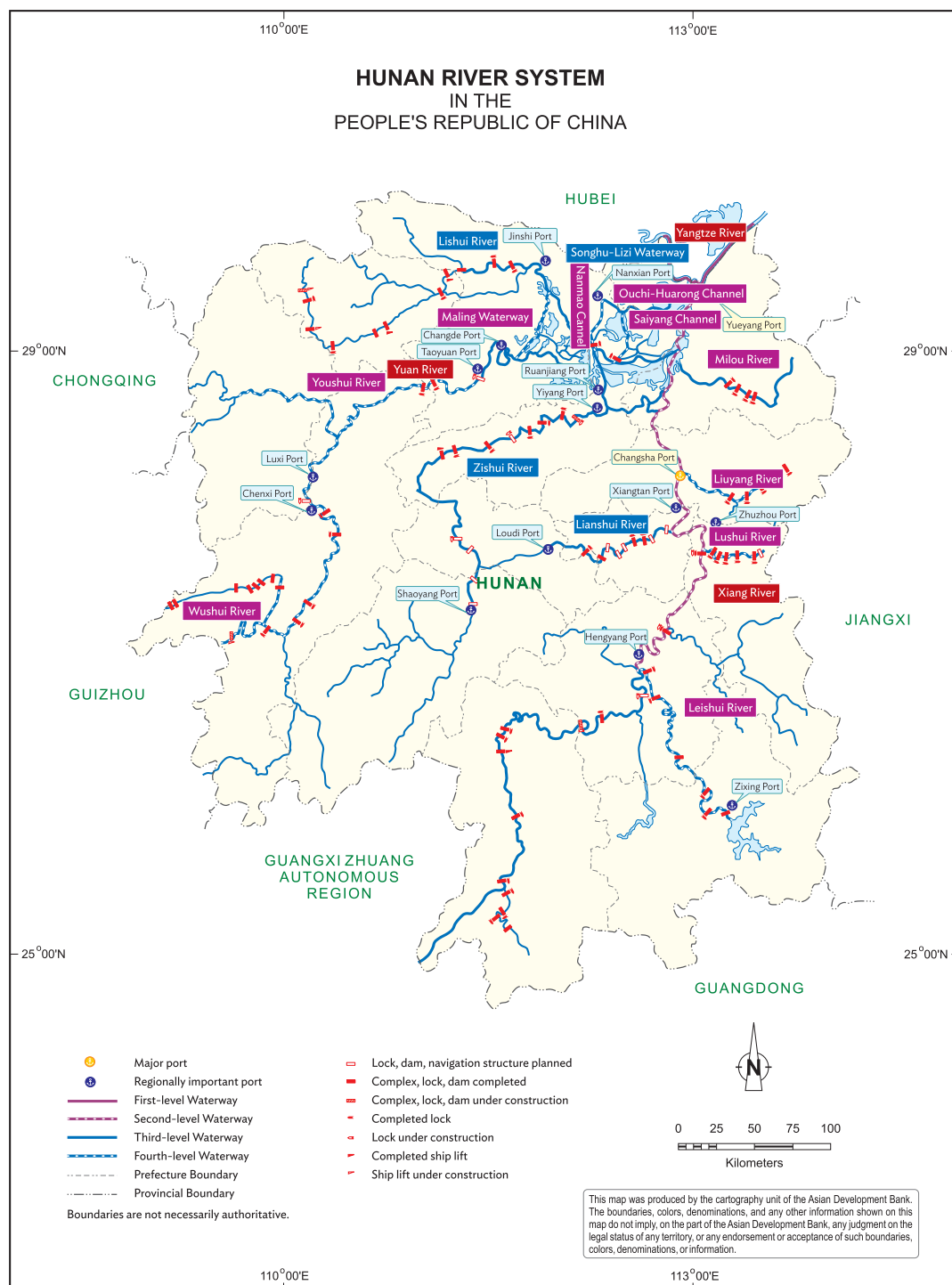
Efficient handling at ports is a prerequisite for successful competition with other transport modes. After decades of effort in the legislative process of port management, the documents required and procedures of port endorsement were promulgated as set forth by the Law of the People's Republic of China on Ports, Regulations of the People's Republic of China on Administration of Traffic Safety in Inland Waters, and Rules of the People's Republic of China on the Administration of Vessel Endorsement. In addition, the Hunan Provincial Government (HPG) also issued implementing measures on provincial waterway management. However, according to some shipping companies, the procedure to obtain a vessel endorsement is still time-consuming and costly. It becomes even worse if the ships have to call at ports located in different provinces. The reasons for the continuing red tape are, firstly, a unified vessel endorsement and port management system where law enforcement departments can share their information and coordinate their actions is still under construction. It means captains of vessels need to be familiar with unique systems in every port to meet the requirements of formality and submit the same documents repeatedly. Secondly, the understanding of these legislations and regulations are distinctive in different ports. It leads to different implementing policies in different ports that confuse the captains. Decisions of administrative penalty are even more troublesome considering that port authorities fine vessels with a broad range of discretion on the basis of their interpretations of the general Administrative Penalties Law.

According to port users, only two existing container lines operate in Xiangjiang, from Changsha to Yueyang and from Changde to Yueyang. Container port operations are not always efficient and satisfactory for the customers. The state port operator addresses any problems. However, the existence of a port monopoly and state administrative procedures restrict major changes and improvements. Obviously, any obstacles or constraints on efficiency of port operations affect the competitiveness of IWT against other transport modes, particularly the road system.

The inherent disadvantage of IWT is the need for double handling. This can be countered by better interface with other transport modes, particularly trucking. Hunan has a relatively complete network of railways, roads, and waterways (Figure 10), yet it has no multimodal transport corridor. Its transportation system is organized by transportation mode, and no single mode is focused on creating multimodal chains and seamless transfers at nodes that are needed to lower transportation costs. In fact, all stretches of its navigable rivers are paralleled by highways, posing significant disadvantages to IWT.



Figure 10: Highways, Railways, and Waterways in Hunan



Source: Hunan Waterway Transport Construction and Investment Group. 2013.



Information Constraints

Limited representation of shipper's and/or shipping line's interest in public bodies. The communication channels between shipping lines and forwarders, and government seem to be weak. There is no institutionalized communication between forwarders and the government. Usually, the government investigates the current IWT situation on its own or through the ports. Associations exist, but cannot do proper lobbying. Associations such as shipping line association and forwarders association are part of the Hunan Water Transportation Administration Bureau. Due to this organizational setup, independent lobbying of the shipping line's or forwarder's interests might be difficult, as the interest of those parties might not always be in line with government's policies and strategies. Some of the relevant information on new regulations or incentive measures is from television or the internet, but only moderate institutionalized information flows to shipping lines via the associations.

Limited awareness of inland waterway transport advantages. Many shippers in the PRC are not aware of the capabilities and opportunities from the IWT system. Apart from the well-known supporting advantages on environment and safety, IWT can be commercially viable. However, because of the limited networking capacity, IWT often requires a time- and cost-intensive pre- and on-carriage on the road to cover the complete transport distance from the shipper's factory to the consignees' storage facilities. This kind of combined transport makes the necessary organization and communication accompanying the transport much more comprehensive, and requires a skilled and experienced logistics system and service provider. This is the main reason why many shippers and other decision makers in the logistics industry decide to go for truck transport instead of IWT. There is a misconception in the Hunan logistics market that IWT might not be the right solution and many shippers just decide to go for truck transport without checking IWT.

Technical Constraints

Limited water depth in the dry season. The required navigable water depth is 4.5 meters (m) for 1,000-ton capacity barges. The water depth in Xiangjiang is sometimes too shallow. From September to March, the water depth is about 2–3 m only. During the low water season, only vessels with a capacity of below 1,000 tons can navigate on Xiangjiang to Changsha, while they can carry just 50% of their capacity. The situation worsened with the construction of the Three Gorges Dam at the Yangtze River. The situation is well known to the government and plans are underway to solve this problem. Nine dams are built or are under construction along Xiangjiang.

Long waiting time at locks. Xingjiang has seven navigation complexes including the Tugutang navigation complex. Several shipping lines have reported that waiting times at locks on Xiangjiang are too long, which has a negative impact on IWT vessel travel time and the competitiveness of IWT. The company TBEA Hengyang Transformer, in Hengyang said in an interview that it needed 2 days to transport a transformer by an IWT vessel to pass the two locks downstream from Hengyang to Changsha. The waiting time at the Zhuzhou lock was sometimes up to 3 days. On the other hand, it was reported that, at the end of October 2014, there was a dramatic change in the operation of the locks, leading to a 50% reduction of the overall travel time to Changsha.



Regulatory Constraints

Extensive inland waterway transport management structure, but weak planning and law enforcement capability. Eleven government offices in Hunan are relevant to IWT, eight of them government offices at the national level. They are listed below:

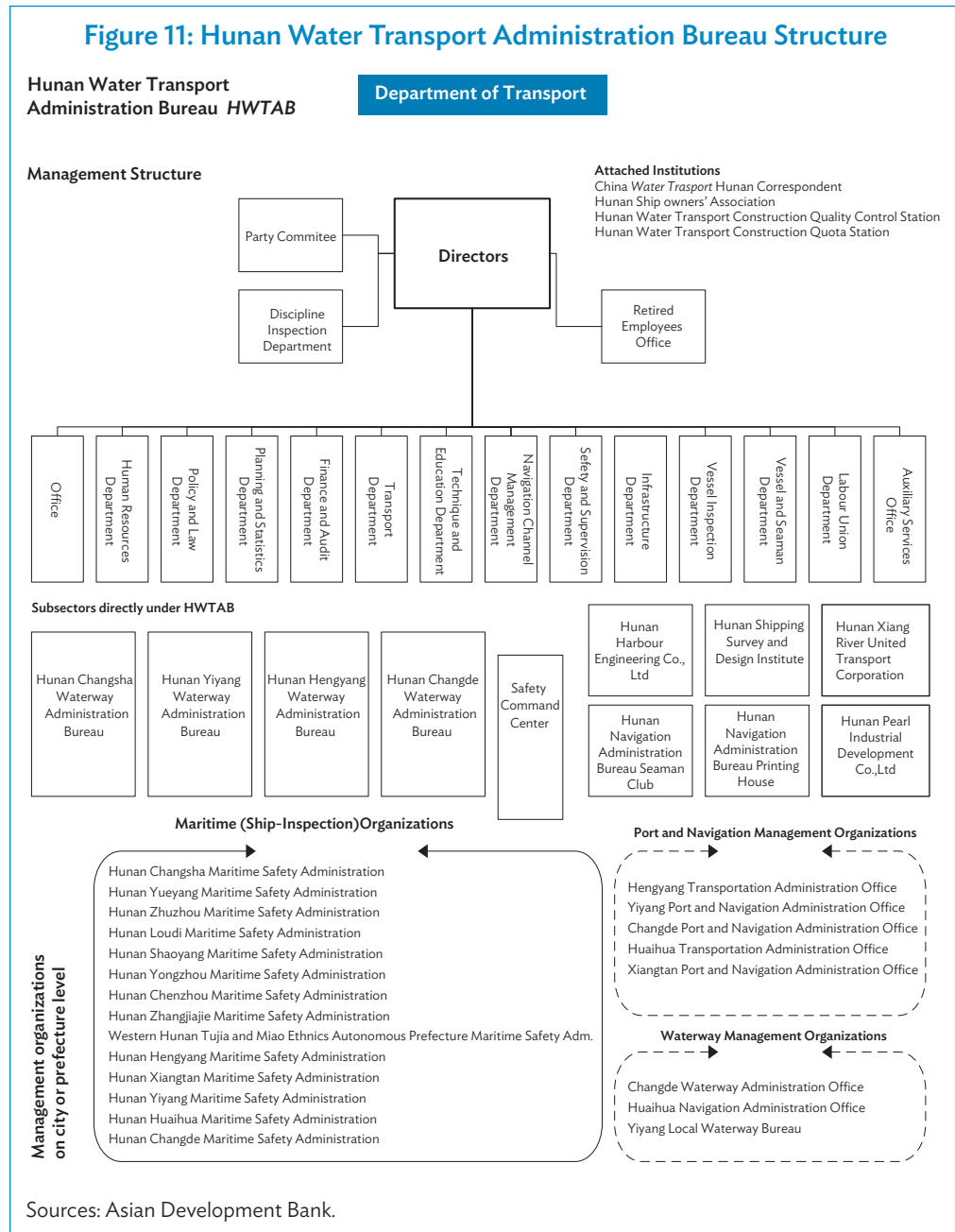
- (i) Hunan Provincial Development and Reform Commission
- (ii) Hunan Provincial Department of Finance
- (iii) Hunan Provincial Department of Transport (HPDOT)
- (iv) Hunan Provincial Water Transport Administration Bureau (HWTAB)
- (v) Hunan Provincial Department of Water Resources
- (vi) Hunan Provincial Department of Environmental Protection
- (vii) Hunan Provincial Department of Land and Resources
- (viii) Hunan Provincial Department of Housing and Urban-Rural Development
- (ix) Hunan Provincial Department of Agriculture
- (x) Fishery Department of Hunan Provincial Bureau of Animal Husbandry and Aquaculture, and
- (xi) Hunan Provincial Administration of Quality Supervision over Transport Construction

HPDOT and HWTAB are most directly relevant to the IWT in Hunan. HPDOT's general mandates are the following:

- (i) To formulate strategies, policies, laws, and regulations on the development of highway and waterway transport of the province; to take charge of inspection and supervision on traffic law enforcement;
- (ii) To work out industrial development programs, midterm and long-term development programs, and annual development plans for highway and waterway transport of the province, and supervise the implementation of the programs and plans;
- (iii) To organize the implementation of supervision and administration on the cost control and quality control of the state or the provincial key highway and waterway construction projects of large and medium scale; to take charge of fund-raising for important transport construction, and allocating and supervising transport funds; to take charge of industrial administration on highways, bridges, ferries, and tunnels that charge tolls from passing vehicles or vessels; to be responsible for port planning in the entire province; to create the charging standards together with competent pricing authorities of the provincial people's government for the port service which are subject to government-guided price or government-set price;
- (iv) To supervise and administer the transportation and construction markets of highway and waterway transport; to maintain the fair competition order of highway and waterway transport sector; to provide guidance on structural optimization of the transport sectors and coordinated development of the transport sectors; and
- (v) To organize the construction, maintenance, and fee collection of water transport infrastructure; to take charge of waterway navigation channel; to take charge of administration on waterway transport, transport services, ports, ship inspection, marine antipollution, forwarding, waterway dredging, use of the shoreline and riverside.



IWT in Hunan is under the regulatory regime of HWTAB. Figure 11 gives the organizational structure of HWTAB.



HWTAB's general mandates are as follows:

- (i) To deploy the drafting and implementation of local laws, rules, regulations and technical specifications on waterway transport according to the laws and regulations as well as instructions of the provincial department of transportation; to take charge of administrative law enforcement, supervision, and inspection on waterway traffic safety of the entire province;



- (ii) To plan for waterway transport development of the province; to draft and report annual plans of construction and renovation (maintenance) projects in relation to maritime surveillance, ship inspection, fairway management, port navigation administration, and to deploy the implementation of plans;
- (iii) To take charge of drafting administrative measures on construction and maintenance of waterway transport facilities of the province, and organize the implementation of the measures as approved; to take charge of collection, appropriation, and supervision on use of funds for construction and maintenance of waterway transport facilities under its governance;
- (iv) To be responsible for water traffic safety surveillance and prevention of pollution by vessels in waters; to supervise and administer the safe working conditions of ship owners and the safety management system of shipping enterprises; to regulate the water traffic navigation order and the navigation environment, and to designate and administer the navigation routes, navigation prohibition areas, traffic control areas, anchorages outside of harbor area, and safe operating areas, etc.; to examine, supervise, and inspect overwater and underwater construction work (including the use of shoreline) for any navigation hindrance; to deploy and direct water search and rescue; to administer salvage of sunken ships and sunken articles; to administer and release sailing warnings (notices); to administer accreditation of the crew, pilots, and their training institutions; to take charge of registration and visa application of ships of the province; to investigate and handle water transport accidents and vessel-induced pollution accidents;
- (v) To be responsible for inspection on vessels and water facilities and for ship seaworthiness management; to be responsible for statutory inspection on vessels and water facilities; to take charge of approval and inspection on marine products in accordance with the limits of authorization; to review ship design drawings in accordance with the limits of authorization;
- (vi) To participate in the organization and implementation of state and/or provincial key highway and waterway construction of large- and medium-scale projects, and to implement centralized administration on medium and small construction projects of waterway transport infrastructure;
- (vii) To implement industrial administration on provincial markets of water transportation, transport service, port handling, and ship building; to take charge of waterway transport administration and port administration; to organize and coordinate waterway transport for military combat readiness; and
- (viii) To take charge of the administration of inland waterway navigation channel of the province; to take charge of the review of navigation technology standards; to participate in the coordination of comprehensive utilization of water resources.

HWTAB is also known as Provincial Maritime Safety Administration and Provincial Vessel Inspection Administration. HWTAB is responsible for inland navigation transport, river channel harbor administration while Maritime Safety Administration is mainly responsible for navigation safety, Vessel Inspection Administration is responsible for inspection of vessels and administration of crew members. Included in HWTAB's responsibilities are



giving permission to the following operations or activities in navigable inland waters or along the banks which might affect safe navigation in inland waters:

- (i) Exploration, exploitation or explosion;
- (ii) Construction, installation, repair, or dismantling of structures or facilities at surface or underwater;
- (iii) Establishment of bridges or cable linkages;
- (iv) Laying, servicing, or removal of cables or pipelines at surface and underwater;
- (v) Installation of facilities such as mooring buoys, pontoons, or bollards, etc.;
- (vi) Construction of fairways, dredging at fairway or wharf front; and
- (vii) Holding large mass activities or sports events.

Any party who is to carry out the above-mentioned operations and activities is required to submit a report in advance to HWTAB for approval.

Hunan Provincial Water Transportation, Construction & Investment Group (HPWTCIG), a state-owned company, is another major stakeholder in Hunan's IWT sector. On 8 November 1997, HPDOT issued the Notice on Incorporation of Hunan Xiangjiang Navigation Construction Development, and established a wholly state-owned limited liability company responsible for initiation, construction, operation, and development of as well as financing and loan repayment for projects involving Xiangjiang transport construction and development. In January 2013, the HPG announced its decision to restructure Xiangjiang Navigation Construction Development to be HPWTCIG. On 30 October 2013, HPWTCIG obtained the business license with the registered capital of CNY3 billion and paid-in capital of CNY1.7 billion. Its business scope includes (i) investment in, and construction, operation, and maintenance of, navigation hydro-junctions, navigation locks, ports, waterways, and other major water transport infrastructure in Hunan as guided by the provincial people's government; (ii) investment in construction projects involving the state and province's planned trunk waterway network; (iii) foreign investment according to the laws and regulations of the PRC; (iv) engaging in riverside industrial investment, logistics services (excluding transport), material trading, and operation and management of land and costal resources, as relevant to Hunan waterway transport; and (v) design, production, distribution, and acting as an agent for all kinds of domestic advertising.

The relationship between HPDOT and HPWTCIG is complicated. On the one hand, HPDOT, as a representative of HPG, is the investor and shareholder of HPWTCIG. On the other hand, HPDOT gives projects to HPWTCIG. There is no formal agreement between HPDOT and HPWTCIG.

Although a wide range of government offices manages the IWT sector, intermodal transport planning capability to minimize logistic costs is lacking. More emphasis was given to water resources under a number of hydroelectric projects, neglecting the needs of inland shipping. Awareness of waterway laws is low, and law enforcement is weak. Those responsible for carrying out administrative penalties for waterway violations are not in the position to enforce laws. The human resources for managing waterways is inadequate in both quality and quantity.



Encouraging inland waterway transport Regulations in Hunan but limited operationalization. Hunan has issued extensive regulations on IWT, as follows:

(i) Regulations on IWT Development in Hunan

Several Opinions of the People's Government of Hunan Province on Encouraging, Supporting, and Guiding the Development of Individual and Private Economy and Other Non-Public Sectors of the Economy. These were promulgated by the people's government of Hunan province in 2005. According to the opinions, the HPG shall (i) encourage private capital to invest in public utilities and infrastructure in various forms such as sole proprietorship, joint venture, cooperation, etc. in line with the law for construction of profit-making municipal public utilities in relation to sewage treatment, garbage disposal, and so on, diversifying investment structure; (ii) allow transregional and cross-industry participation in business operation of municipal public utilities in relation to public traffic, sewage treatment, garbage disposal, and other undertakings; (iii) encourage private capital investment in waterway transport and traffic infrastructure construction; and (iv) support active engagement of private capital in construction and renovation of inland waterways and construction and operation of ports, wharfs, and other infrastructure.

Local governments at all levels shall support the establishment of business initiation service agencies, and set up and enhance the database of business initiation projects, to provide start-up enterprises with services relating to information consultation, market expansion, and technical support. Small start-up enterprises may, according to their industrial characteristics, be allowed to reduce their registered capital, to contribute registered capital in installments and cut down their business registration fees. Local governments shall encourage self-employment by implementing measures on business training, loan guarantees, and interest subsidies, support for business premises, and information provision.

Regulations of Hunan Province for Administration of Waterway Transportation. The regulations was issued by the Standing Committee of People's Congress of Hunan Province in 2009. The HPG is required to encourage domestic and foreign investors to establish waterway transport undertakings including waterway transport enterprises, and implement the principle of "those who invest shall benefit."

(ii) Regulation on Protecting Xiangjiang in Hunan

Measures of Hunan Province on Implementation of the Water Law of the People's Republic of China. This was issued by the Standing Committee of National People's Congress of Hunan Province on 31 March 2012. It emphasizes that after delimiting the water functional regions, water administration departments of the people's government above the county level shall, according to legal provisions of the State, set up water quality monitoring sections in important river waterways and drinking water resource conservation districts to monitor the water quality status. Where they find that the total discharge of major pollutants exceeds the limitation or the water quality of the water functional regions fails to meet the requirements of the functions of the water areas, they shall promptly report to the relevant people's governments and notify the environmental protection departments.



Implementation Plan for Pollution Prevention and Control in Zhuzhou Section of Xiangjiang Changsha Comprehensive Junction Reservoir Area. This was issued on 19 October 2012 by the people's government of Hunan Province. The plan requires measures on pollution prevention and control on transport vessel and port terminals. Strict restraints shall be placed on transport of dangerous chemicals, and it is forbidden to flush vessels clean or directly discharge domestic garbage or bilge of vessels into the reservoir area. Temporary piers in the reservoir area shall be removed, the berths at retained piers shall be rationally allocated, and the reservoir shall be delimited into various areas. To clear out unnecessary floating oil jetties, floating filling stations (points), and refueling stations, illegal floating gas stations (points) will be clamped down on, and vessels are prohibited from dumping wastes or oily water into the reservoir area.

Regulations of Hunan Province on Protection of Xiangjiang. This was issued by the Water Resource Department of Hunan Province on 1 May 2013. According to this regulation, ship navigating in navigable waters of the Xiangjiang shall have legal and valid certificates of water pollution prevention, and shall be equipped with facilities for collection of pollutants such as sewage, waste oil, and garbage. It is forbidden to discharge or dump pollutants and ship wastes. In addition, the people's government at the county level shall organize relevant units to get floaters and harmful algae out from the trunk streams and major tributary streams of the Xiangjiang under its governance, and dispose them in a bio-safe manner.

Notice on Strengthening Prevention and Control of Ship-Induced Pollution in Xiangjiang Changsha Junction Reservoir Area. This was issued by the Administration of Water Transportation of Hunan Province. It requires that ships navigating in the Xiangjiang Changsha junction reservoir area shall be equipped with bilge tanks and sewage tanks, and are prohibited from discharging sewage and bilge into the reservoir area; garbage containers or bags shall be prepared for storing ship garbage in the process of transport; and ships entering the reservoir area shall timely notify garbage collecting units for removing ship garbage and sewage. For every single voyage passing Xiangjiang, ships shall make delivery of garbage to the collecting units each time; ships navigating within Hunan Province shall deliver garbage not less than twice a month; ships navigating within the reservoir area shall deliver bilge and sewage not less than once a month. Since 1 January 2014, ships not equipped with bilge tanks or sewage tank or garbage cans have been prohibited from entering the Xiangjiang comprehensive junction reservoir area.

Notice on Promoting the Implementation of Ship-Class Standardization on Inland Water in Hunan Province. It is provided that, after 1 January 2016, inland water vessels which sewage collection fails to meet the current standards, chemical cargo vessels, and single-deck tankers (>600 ton) will be forbidden from sailing on certain waters of Xiangjiang, Yuanjiang, and Dongting Lake. From 1 October 2013 to 31 December 2015, the installation of sewage treatment or collection facilities on vessels that meet the conversion requirements may get subsidy from the government.

Pilot Measures for Regulation on Issuance of License for Sand Mining in River Course of Hunan Province. According to the measures, the Water Resource Department at each level of the people's governments shall be responsible for the issuance, supervision, and administration of the sand mining license in the river course, and shall work with



other competent departments including the land resource department and transport department at the same level. During the process that the right of sand mining is granted with consideration, the Water Resource Department shall solicit opinions from other departments such as the Land Resource Department and Transport Department at the same level. After issuance of the license, the Water Resource Department shall inform of the issuance, in a timely manner, other departments such as the Land Resource Department and Transport Department at the same level.

(iii) Regulations on technological innovation of inland water vessels in Hunan

Implementation Opinion of Hunan Provincial People's Government on Encouraging, Supporting and Guiding the Development of the Non-Public Sector Economy including the Individual Sector and Private Sector.

Issued by the Hunan provincial people's government on 22 July 2005, the opinion states that the HPG will be committed to improving services for technological innovation; to give full support to the technological innovation and to the application, approval, finance arrangements, and project management of all kinds of technical programs. Nonpublic enterprises enjoy treatment equal to that of public enterprises. The verified nonpublic high-tech enterprises enjoy favorable treatment equal to that of public high-tech enterprises.

Besides, the local government organizations at all levels should (i) provide funds to establish platforms of generic technology and public service such as R&D centers, test centers and information centers in key industrial clusters and industrial parks, to encourage nonpublic capitals to establish incubators for all kinds of technology enterprises; (ii) encourage nonpublic technology enterprises to cooperate with universities and colleges, and scientific research institutes to set up technology development institutions of all kinds that can pool resources and wisdom of industry, education institutes, and research institutes to solve problems; and (iii) encourage and support nonpublic enterprises to form high-tech R&D centers and engineering technology centers, and to set up postdoctoral work stations and experimental bases.

The local government organizations at all levels are required to (i) vigorously foster the technology market, support key cities well-positioned to set up technology exchanges, with a view to promoting the transformation of technological achievements and transfer of technology; (ii) encourage intermediary technology service agencies to provide technology information, technology consultation, and technology promotion, and other professional services; (iii) encourage state-owned research institutions to open laboratories to nonpublic enterprises; (iv) effectively protect the intellectual property rights of entities and individuals, and (v) provide funds for the application and protection of the invention patent of nonpublic enterprises.

Regulations of Hunan Province for Administration of Waterway Transportation. It provides that the transport administrative department under the people's government at or above the county level shall, as per the national industrial policies and the social traffic capacity and transport capacity and actual situation of the vessel structure, guide the development of high quality and energy-saving vessels to go into operation.



Notice on Promoting the Implementation of Ship-Class Standardization on Inland Water in Hunan Province. Local government transportation departments are required to encourage construction of advanced, efficient, energy-saving, and clean demonstration vessels that meet the state's guide directions, promote technological advancement of inland water vessels to promote modernization of vessels.

(iv) Regulations on traffic control of IWT in Hunan

Implementation Measures on Regulation of the People's Republic of China on the Administration of Navigable Waterways in Hunan Province. It is required that the operators of water gates and ship locks shall strengthen the management of water gates and ship locks to ensure their good function. Vessels that pass the water gate or ship lock shall obey operators' command.

Implementation Measures on Water Law of the People's Republic of China in Hunan Province. It is required that construction of projects shall not affect the steady flow of river, or block the discharge of flood, and threaten the safety of project facilities such as structures that protect the slope, shore, and dikes, and that pilot and assist navigation, and hydrology monitoring shall not silt up any rivers, lakes, reservoirs, and man-made channels. For those inevitable situations, the construction entity shall take remedial measures. In case losses are incurred, the construction entities shall make compensation according to the laws. Additionally, before the settlement of disputes on waters, without agreement between the parties concerned or approval of the same higher level of people's government, no party may unilaterally change the current water situation by building structures that drain, block, collect or detain (store) the water within 5 km of the location of water dispute which happens at the borderline of administrative regions at or above county level, or within 3 km of the location of water dispute which happens at the borderline of administrative regions at or above township level.

Regulations on Protecting Xiangjiang of Hunan Province. The transport authorities under the people's government at or above county level shall strengthen the maintenance of Xiangjiang waterways to guarantee clear channels. No entity or individual may occupy or damage the navigable channel or navigation facilities. When Xiangjiang waterways are blocked, the waterway administration body shall take measures to repair the waterway in a timely manner. The entity that constructs or operates within the navigable waters of Xiangjiang, upon the completion of construction or operation, shall clear the residue in a timely manner, and shall be subject to the waterway administration body for check and acceptance. The operators of ship locks on the high-class section of Xiang River waterways shall, in accordance with the state standard or the industry standard of transportation, maintain the normal function of ship locks to guarantee safety and efficiency of passage through ship locks. A joint scheduling mechanism for ship locks in complexes shall be established on Xiangjiang. Such mechanism shall comply with the unified scheduling of flood prevention and drought relief on Xiangjiang.



(v) Implementation Measures on Law of the People's Republic of China on Ports in Hunan Province

The HPG shall develop port planning for the province in accordance with national port planning. The transport authorities at different government levels shall be responsible for the specific work. Overall planning for both major ports and important ports shall be approved by the people's government at the same level before it is reported to the provincial transport authority for examination and approval. The port operation shall comply with the principles of impartiality, fairness, and honesty. Port operators shall not elbow out the rivals by illegal means and shall not force others to accept the port services.

When the business operational fees of a port are subject to government-guided price or government-set price in accordance with the law, the provincial pricing and transport authorities shall set the charging standards. A business operator of the port shall announce at its place of business the items and rates of the fees for its services.

The direction and principles of encouraging IWT development are clear, but policy instruments, implementation arrangements, and financial support provisions are not specified. They focus heavily on promotion of infrastructure hardware and give little consideration to market players such as shippers or forwarders. Some regulations such as waste collection make IWT more expensive and time-consuming. As a result, they may not be operationalized and have limited feasibility. For example, some ship owners in Hunan do not consider that the financial subsidy for vessel standardization takes into account the local costs and actual conditions. Standard barges eligible for subsidy are too large for the Xiangjiang. They would rather bear the risk of running low-cost unqualified vessels rather than build a modern demonstration vessel with limited cofinancing and payback. For the installation of sewage treatment facilities, the regulation does not mention much on the supervision of land disposal of stored sewage. If riverside and landside do not coordinate well on law enforcement, the objectives of the regulations will not be achieved.

Conclusion

Obviously, the constraints in developing the IWT sector in Hunan, and the PRC in general are considerable and not easy to overcome. Nevertheless, understanding the problem is the first step in finding solutions that are less straightforward. The next two chapters present Europe's experience in promoting IWT and the international experience of managing IWT which provide examples on how the PRC may promote its IWT sector.

3 Promoting Inland Waterway Transport: Europe's Experience

Introduction

European Union (EU) member states have transport policy objectives that are very similar to those in the PRC. Their common objective is to develop a transport system that can facilitate good quality services; and is efficient, safe, secure, and environmentally friendly. The EU transport system must create the conditions for a competitive industry generating growth and jobs. The promotion of IWT, rail, and multimodal transport are means to achieve that because these modes outperform road transport on all these characteristics.

Europe and its member states are market economies, meaning that private sector companies (and only few public-owned) operate in competitive markets and the role of governments is to regulate those markets and take care of sufficient quality of transport infrastructure. A big difference between the IWT infrastructure in PRC and Europe is that Europe's network can be considered as very mature and will only need minimal investments to upgrade. The challenge in European countries is to maintain IWT infrastructure in good physical condition, to promote its use, and to further expand the competitive position of the transport mode versus other cargo segments. In the PRC, the IWT infrastructure and ports will be expanded and upgraded.

A brief summary of the context of IWT and the transport policies for promotion of IWT in Europe is provided next. The focus will be on the Marco Polo Program.

European Union Marco Polo Program

The program. The program aimed to ease road congestion and its attendant pollution by promoting a switch to greener transport modes for European freight traffic. Railways, sea routes, and inland waterways have spare capacity. Companies with viable projects to shift freight from roads to greener modes turned to Marco Polo for financial support. More than 500 companies have done so successfully since the program was launched in 2003.

Responsibility. The program is run by the European Commission's Directorate-General for Mobility and Transport (DG MOVE) and the EU's Innovation and Networks Executive Agency (INEA). INEA is responsible for the operational side of the program—putting it into action on the ground and liaising with participants.

Objectives and funding areas. Marco Polo cofunded direct modal-shift or traffic avoidance projects, and projects providing supporting services that enable freight to switch



from road to other modes efficiently and profitably. Funding is in the form of an outright grant; it is not a loan to be repaid later. Applicants must meet a series of conditions to obtain a grant. Grants covered a share of costs associated with the launch and operation of a new modal-shift project, but must be supported by results.

A grant gives financial support in the crucial start-up phase of a project before it pays its way to viability. Grants last from 2 to 5 years. Projects should be commercially viable by the time the funding stops. Successful participation in a Marco Polo project enhances a company's green credentials.

The program is user-driven. If a company has a project to transfer traffic from road to other modes or to avoid road transport, it may qualify for a grant. The project has to involve a cross-border route. It has to make economic as well as ecological sense. The selection criteria are set out in the grant application documents. Commercial undertakings, whether privately or publicly owned, can apply for funding.

In total there are five funding areas:

- (i) Modal shifts from road to rail and waterborne systems. Most applications are for direct modal-shift projects. You do not have to shift all your traffic off the road to obtain a grant. Intermodal projects, combining the different transport modes—road, rail, and waterborne transport—are eligible.
- (ii) Catalyst actions that promote modal shift. These must be breakthrough technology-driven projects, providing supporting services for modal shift like management systems, integrated cargo control via global positioning system or common information technology platforms for interoperability between modes.
- (iii) Motorways of the sea between major ports. Motorways of the sea actions offer an effective way of getting big volumes of freight off the roads and onto ships. They must be innovative and intermodal, and operate between category A European ports fully equipped to handle this traffic. Category A ports are defined in an official EU decision.
- (iv) Traffic avoidance. The cleanest journey is the one that does not take place. The program therefore promotes traffic avoidance by funding projects that introduce new ways of avoiding or reducing road traffic, such as avoiding empty runs or improving supply chain logistics.
- (v) Common learning actions. Projects related to enhanced knowledge and cooperation in intermodal transport and logistics are a regular feature among funded projects. Different award conditions apply for this category.

Budget. The overall Marco Polo budget for the period 2007–2013 was €450 million (about CNY3.6 billion). Applications for grants hit a record level in 2009 and 2010. Competition for funds is therefore keen. To put all applicants on an equal footing, requirements are kept simple and procedures are as transparent as possible.



The Marco Polo program publishes a call for proposals from potential grant applicants at the beginning of each year on its website. The decision to give funding to a project is based on the following basic principles, with variations for each funding area:

- (i) The amount of freight shifted from road to greener modes (or the amount of road transport avoided): minimum threshold of 60 million tons/km for modal shifts (13 million tons/km in the case of pure inland waterway projects), 30 million tons/km for catalyst actions, 200 million tons/km for motorways of the sea, and 80 million tons/km for traffic avoidance.
- (ii) A fixed rate of subsidy: where a minimum subsidy threshold of €250,000 applies. The subsidy rate for all types of projects is €2 per 500 tons/km. Traffic avoidance projects can also use a rate of €2 per 25 vehicle/km.
- (iii) A maximum duration: grant duration is 2 years in the case of common learning actions; a maximum of 3 years for modal shifts; and 3–5 years for catalyst actions, motorways of the sea, and traffic avoidance.
- (iv) A ceiling on the costs covered: the upper limit of eligible costs is 35% for all categories, except for common learning actions where it is 50%. Eligible costs are those necessary to implement the project. They do not include return on capital, debt, and debt service charges, or value-added tax, or costs incurred in nonparticipating countries.”

Applications must show the need for the subsidy by being loss-making during the subsidy period. But equally, they must show how their project will return to a sustainable profit from the time the subsidy ends.

Implementation and results. The contract document for each successful project is the Marco Polo grant agreement. It is negotiated and signed by the beneficiary or beneficiaries on the one side, and the INEA on behalf of the European Commission on the other. The agreement is based on the applicant’s proposal and takes account of the evaluation committee’s comments.

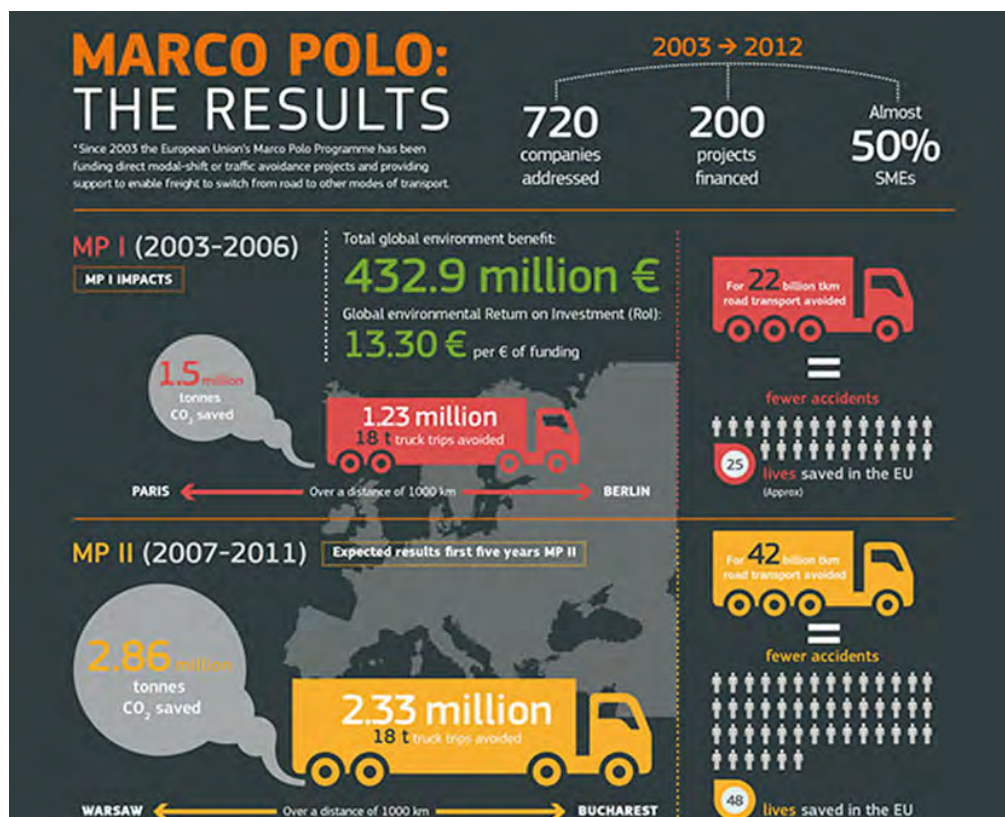
Over the period 2003–2009, 125 projects involving more than 500 companies received funding from the Marco Polo program. Most projects benefiting from the program are modal shift actions. These accounted for 79% of the funding. These are projects that can viably shift freight from the road to other forms of transport in current market conditions, and where operational losses incurred during the start-up period can be covered by a Marco Polo grant. Common learning actions accounted for 9% of the funding and catalyst actions accounted for 8%. Traffic avoidance projects and motorways of the sea projects each accounted for 2% of the funding, but these categories have only existed since 2007.

Seventy projects were selected for grants in the period 2007–2009, i.e., the first 3 years of the Marco Polo II program. The maximum subsidy amount per project ranged from €0.37 million to €7.5 million. These projects aim to take a total of 54 billion ton-km of freight off the roads each year. The total benefit to society as a result of avoiding the environmental and social costs of road freight traffic is estimated to be worth €1.4 billion.



Under the 2010 call for proposals, 32 projects were successful, from 101 bidders for the budget of €63.54 million. Of the 32 projects, 26 were modal shift actions, i.e., robust, but not necessarily innovative projects that take freight off the roads. Four were common learning actions, i.e., these innovate in ways of dealing efficiently and sustainably with increasingly complex transport and logistics solutions. There was one traffic avoidance action, transport and production, and one motorway of the sea action, i.e., an action offering a door-to-door service by combining short-sea shipping services with other modes of transport. No catalyst actions were selected in 2010. Figure 12 indicates the results of Marco Polo between 2003 and 2012.

Figure 12: Marco Polo Facts and Figures



CO₂ = carbon dioxide, EU = European Union.

Source: Innovation and Networks Executive Agency. <http://inea.ec.europa.eu/>



European Union Funding Program Trans-European Network for Transport

The Trans-European Network for Transport (TEN-T) Program was established by the European Commission to support the construction and upgrade of transport infrastructure across the EU.

The TEN-T Program dedicated financial support toward the realization of important transport infrastructure projects—in line with the overarching goal of European competitiveness, job creation and cohesion.

The TEN-T Executive Agency, created by the European Commission in 2006, managed the program on behalf of the European Commission for all projects established under the 2000–2006 and 2007–2013 funding schemes. The projects represent all transport modes—air, rail, road, and maritime/inland waterway—plus logistics and intelligent transport systems, and involve all EU member states. On 1 January 2013, the the TEN-T Executive Agency became the INEA, but management of all open TEN-T projects continues unaffected.

The EU contributed €8 billion to the TEN-T program for 2007–2013, to support studies or works that contribute to the TEN-T program objectives. To allow this funding to ultimately improve the European transport network and increase mobility, there is a specific sequence of activities that needs to take place to award it.

TEN-T funding opportunities are open to all EU member states or, with the agreement of the member states concerned, international organizations, joint undertakings, or public–private undertakings or bodies. Funding in TEN-T grants can support studies or works that contribute to TEN-T program objectives.

This €8 billion budget over the 2007–2013 funding period was primarily allocated to projects selected via calls for proposals launched each year by DG MOVE, and, as of 2009, by the former TEN-T Executive Agency on its behalf. The norm was that, each year, a multi-annual call and an annual call were launched. The funding quotes differ from 10% to 20% for infrastructure projects up to 50% for prefeasibility studies.

Overall, the multi-annual calls aimed to give an important impetus to the implementation of the TEN-T priority projects—as defined in the TEN Guidelines—and to address some horizontal priorities.

The commission (DG MOVE), with the assistance of the agency, carries out the evaluation and selection of submitted proposals. The process is supported by independent external experts whose role is to ensure that only the most high-quality proposals that best meet the award criteria as described in the relevant work program and call text are selected for funding.

Proposals, that meet the eligibility criteria specified for a call, are evaluated on the basis of the criteria defined in the relevant work program and call texts. Essentially, these relate to:



- (i) relevance to the TEN-T priorities and policy objectives,
- (ii) maturity,
- (iii) impact—particularly on the environment, and
- (iv) quality (completeness, clarity, soundness, and coherence).

A list of proposals recommended for funding is then prepared by the DG MOVE, with the support of the agency, taking into account the external experts' opinions.

Successful applicants are then invited by the agency to enter into negotiations on the basis of which, if agreement is reached, individual commission decisions are established to support individual projects.

Inland waterways are part of the TEN-T corridors. TEN-T Regulation (EU) No. 1315/2013 requires:

- (i) Member states shall ensure that inland ports are connected with the road or rail infrastructure.
- (ii) Inland ports shall offer at least one freight terminal open to all operators in a nondiscriminatory way and shall apply transparent charges.
- (iii) Member states shall ensure that (a) rivers, canals, and lakes comply with the minimum requirements for class IV waterways as laid down in the new classification of inland waterways established by the European Conference of Ministers of Transport and that there is continuous bridge clearance, without prejudice to Articles 35 and 36 of this Regulation. At the request of a member state, in duly justified cases, exemptions shall be granted by the commission from the minimum requirements on draught (less than 2.50 m) and on minimum height bridges (less than 5.25 m); (b) rivers, canals and lakes are maintained to preserve good navigation status, while respecting the applicable environmental law; and (c) rivers, canals, and lakes are equipped with river information system.
- (iv) Inland waterway and maritime transport infrastructure of the core network shall avail of alternative clean fuels.

TEN-T projects involving waterways can be grouped into the following:

- (i) Inland waterways are made up of rivers, canals, and the various branches and links that connect them. The TEN-T inland waterway projects aim to help connect industrial regions and urban areas and link them to ports. Inland ports form part of the network, in particular as points of interconnection between the waterways and other modes of transport.
- (ii) River information systems (RIS) and its related projects involve traffic management infrastructure on the inland waterway network. Specifically, this includes the establishment of an interoperable, intelligent traffic and transport system to optimize the existing capacity and safety and improve interoperability with other transport modes.
- (iii) TEN-T projects dealing with seaports aim to permit the development of sea transport. They include support for shipping links for islands and the points of interconnection between sea transport and other modes of transport. Their



infrastructure aims to provide a range of services for passenger and goods transport, including ferry services and short and long-distance shipping services, coastal shipping, linking EU member states with third countries.

The trans-European network of Motorways of the Sea intends to recreate the road and rail network on the water, by concentrating flows of freight in viable, regular sea routes. These projects strive to improve port facilities and infrastructure, as well as electronic logistics management systems, safety, and security and administrative and customs procedures, as well as access routes for year-round navigability. Projects usually are proposed by at least two member states. The Motorways of the Sea One Stop Help Desk may be visited for more information about these projects and their funding opportunities.

The European Union Funding Program INTERREG IV-A Upper Rhine

The INTERREG community initiative was launched in the 1980s by the European Commission, under the responsibility of the Regional Policy Directorate General. Regional Policy enjoys the second biggest budget in the European Union, after the Common Agricultural Policy.

Following a pilot phase (1989–1990), the program was extended to cover the whole of the European Union, with INTERREG I (1990–1993), followed by INTERREG II (1994–1999) and INTERREG III (2000–2006). Allocated funds have increased regularly and European Regional Development Fund gave the latest programming phase €4.9 billion. The visible success of the initiative is the main reason why it has been so willingly pursued.

The Upper Rhine area, where France, Germany, and Switzerland share common borders, is of central importance to Europe in terms of history, culture, and economy. Cross-border cooperation, involving over 5 million inhabitants, began in the 1960s and accelerated under the INTERREG initiative.

Over the last 15 years, the rising number of projects and players involved in cross-border cooperation has demonstrated the immediate and very real impact of the INTERREG initiative in the Upper Rhine. Within the two programming areas, PAMINA (PA=partial territories of South Palatinate, MI = Mittlerer Oberrhein [Middle Upper Rhine], NA= the North Alsace) and Upper Rhine Center-South, INTERREG has provided the backing for some 300 projects to develop within a genuine spirit of partnership.

The INTERREG IV A Upper Rhine program intends to sustain cross-border cooperation in the Upper Rhine Valley. Implemented in the Upper Rhine region, the program is part of the objective for “European territorial cooperation.” This objective itself is a part of the Regional Policy of the EU. The program is also, for the Swiss portion (Switzerland is not member state of the EU), part of the Swiss New Regional Policy. The program covers a period of 9 years between 2007 and 2015. The implementation is founded on a base document, the operational program.



The operational program was drawn up by the actors of the cross-border cooperation in the Upper Rhine region and was adopted by the European Commission on 24 October 2007. The objectives of the program are as follows:

- (i) To support the development of the Upper Rhine into an internationally competitive cross-border knowledge and innovation region through promotion of projects with the aim of cross-border research capacity to strengthen cross-border participation of companies, and to increase the development of applications and innovation through cross-border consortia;
- (ii) To promote cross-border dimensions of sustainable development of the area, the economy, and the mobility of the Upper Rhine through projects with the aim of improving the protection of species, the quality of the ecosystem services that reduce environmental burdens and resource use in the context of urban development, the economy of the Upper Rhine, and the increase in the share of transport with lower load carrier;
- (iii) To promote employment in the Upper Rhine cross-border through projects with the objective of cross-border development of small and medium enterprises, increasing the supply of jobs and cross-border employment; and
- (iv) To promote cross-border cooperation between administrations and citizens in the Upper Rhine through projects with the aim of improving cross-border service offerings of administrations, and increasing citizens' identification with the Upper Rhine as a cross-border region.

The European Union Funding Program NAIADES

In 2006, the European Commission adopted a Communication on the promotion of inland waterway transport. The NAIADES action program was intended for the period 2006–2013 and focused on five strategic areas for a comprehensive IWT policy: market, fleet, jobs and skills, image, and infrastructure. These measures are rounded off by reflections on an appropriate organizational structure.

Issues addressed under NAIADES include working time arrangements; professional qualification requirements; the examination of administrative and regulatory barriers; the adoption of innovative technologies; such as the RIS; and infrastructure improvements.

By creating favorable conditions for the further development of the sector, the commission hopes to encourage more companies to use this mode of transport. The policy to promote IW in Europe is in the NAIADES action program.

A first action program covered the period 2006–2013. A second action program, NAIADES II, covers the period 2014–2020.

Carriage of goods by inland waterways is a climate-friendly and energy-efficient mode of transport that can contribute significantly to sustainable mobility in Europe. The European Commission believes its great potential must be better used to relieve heavily congested transport corridors.



The NAIADES action program comprises many actions and measures to boost transport on inland waterways. The program runs until 2020 and is to be implemented by the European Commission, the member states, and the industry itself.

The revision of the NAIADES action program (2014–2020) is expected to lead to the adoption of the NAIADES II Communication foreseen in 2013. In its staff working paper, the Commission Services presented concrete actions under preparation:

- (i) Infrastructure. Planned actions for inland navigation under the existing programs and under the forthcoming instruments of the next multi-annual financial framework for the period 2014–2020 (financial and technical assistance);
- (ii) Market. Assistance for integrating inland waterways into the multimodal logistic chains; financial incentives for inland navigation;
- (iii) Fleet. Measures to reduce emissions (for example, standards);
- (iv) Jobs and skills. Actions aimed to increase harmonization of standards for professional training and certification; and
- (v) Information exchange and sharing. Review of the RIS policy.

The NAIADES II Communication aims to create conditions for inland navigation transport to become a quality mode of transport. It sets out the program for policy action in the field of IWT for the period 2014–2020. Actions are taken in the following key areas of intervention:

- (i) Quality infrastructure,
- (ii) Quality through innovation,
- (iii) Smooth functioning of the market,
- (iv) Environmental quality through low emissions,
- (v) Skilled workforce and quality jobs, and
- (vi) Integration of inland navigation into the multimodal logistics chain.

The other elements of the package represent the first steps toward implementation of the NAIADES II program. The staff working document is a contribution to the impact assessment of future initiatives in relation to the greening of the inland waterway fleet, the proposal for a directive laying down technical requirements for inland waterway vessels prepares for the implementation of a new approach to governance in inland navigation and the proposal for a regulation amending Council Regulation (EC) No. 718/1999 intends to allow a broader range of actions of the Reserve Funds available to support inland navigation. Moreover, in the context of the RIS, the European Commission adopted an implementing regulation introducing a harmonized electronic chart display information system.

The European Union Funding Projects, PLATINA and PLATINA 2

The PLATINA project is a major trans-European project for the promotion of IWT. Launched by the European Commission in 2008, PLATINA was designed as a platform to provide support for implementation of the NAIADES European inland navigation program. It brings together 22 partners from 9 European countries, and has received commission funding of €8.5 million.



The PLATINA project, adopted under the 7th Framework Program for Research and Technological Development, covers a broad set of actions in five strategic fields of NAIADES:

- (i) Improve market conditions,
- (ii) Modernize the fleet,
- (iii) Develop human capital,
- (iv) Strengthen the image of inland navigation, and
- (v) Improve infrastructure.

PLATINA provides technical and organizational assistance by ensuring active participation of key industrial stakeholders, associations, and member states' administrations. Furthermore, PLATINA organizes expert meetings and working groups, and carries out studies on how to better implement selected actions. Other actions include setting up a single portal for online inland navigation information services and an inland navigation education network, as well as the provision of technical support for the further development of RIS.

The project PLATINA 2 implements the European action program for the promotion of IWT (NAIADES 2). PLATINA 2 is effected by a consortium of 12 organizations from seven different countries. The consortium includes relevant stakeholder groups from the IWT sector.

To accomplish the objectives and intentions of the NAIADES 2 action program, the PLATINA 2 consortium includes the active participation of:

- (i) waterway operators and administrations,
- (ii) representatives of the IWT industry and fleet operators,
- (iii) promotion and development organizations,
- (iv) inland navigation educational and training institutions, and
- (v) experienced consultants and research institutes.

PLATINA 2 comprises several bodies related to project management as well as internal and external communication and content-related steering:

- (i) **Advisory Committee.** Responsible for strategic guidance of the project's technical actions and recommendations. It consists of high-level representatives of member states, third countries, river commissions, the IWT sector, and the European Commission. Their acceptance of PLATINA 2's results is vital to the success of the NAIADES action program. The advisory committee usually meets in combination with the EC NAIADES implementation group. Furthermore, it reviews the road map reports proposed by the management committee or discusses topical issues in the course of NAIADES dialogue.
- (ii) **Management Committee.** Consists of senior representatives of the work package leader organizations which are responsible for tactical planning and internal agreement on road map reports for the platform and its work packages.
- (iii) **Executive Board.** Made up of representatives of the European Commission and the management committee. It is in charge of strategic planning, resolving



contractual and financial issues, and monitoring support activities. The ExBoard meets at appropriate milestones. Occasionally, selected member state representatives are invited.

- (iv) Technical Secretariat. Responsible for the day-to-day administrative and technical management of PLATINA 2 and consists of the work package leaders. It carries out the actions delegated to it by the management committee and the executive board. The technical secretariat is also the focal point for organizing project-related networks, and dissemination and exploitation of project results. This includes technical coordination and responsibility, coordination and liaison with the European Commission, financial administration, a communication desk, as well as a project back office.
- (v) Project partners. Experts who provide technical expertise and inputs to the various work packages and activities. These experts are chosen from among IWT industry representatives, consultants, promotion agencies, and administrations. Project partners only meet as necessary to complete their specified tasks. A full consortium meeting together with the EC-project officer normally takes place once a year.
- (vi) Involvement of external experts, stakeholders, and subcontractors. In addition to the targeted one-directional information transmission under the PLATINA 2 umbrella, interactive involvement of stakeholders from within and beyond the sector takes place. This is carried out by various means, the most important being the NAIADES dialogue and the thematic expert groups, which are adapted to the particular issue. The gathered viewpoints and expert knowledge are integrated in the project work. Synergies with existing initiatives and structures are exploited.

Project structure and objectives. PLATINA 2 provides technical and organizational support to the European Commission, member states, third countries, river commissions, and industry in the development and deployment of targeted policy actions implementing the NAIADES II action program. Consequently, PLATINA 2 aims at fostering the development of IWT into a quality mode of transport. The project builds on close cooperation with administrative stakeholders on all levels, river commissions, branch organizations, as well as (potential) end users, freight forwarders, fleet and terminal operators, shippers, and further relevant stakeholders, initiatives, and projects. Their involvement is ensured by dedicated working groups, the advisory committee, or NAIADES dialogue.

Organized along the priority topics of NAIADES II, PLATINA II comprises four work packages (“action fields”) dealing with specific policy areas:

- (i) Markets and awareness,
- (ii) Innovation and fleet,
- (iii) Jobs and skills, and
- (iv) Infrastructure.



Conclusion

Unlike the PRC top-down approach using administrative orders, focusing on the government offices and state-owned enterprises, and aiming at infrastructure; Europe's IWT promotion efforts provide business incentives, target business entities, and aim to improve market conditions, develop human capital, strengthen the image of IWT, and integrate IWT into the multimodal logistics chain. Another distinctive feature is the active and wide participation of key industrial stakeholders, associations, and member state administrations. The alliances between the policy directions and funding support, across European countries, and between the public and business sector mobilized wisdom from a wide range of stakeholders, increased awareness of IWT, stimulated innovations, and ensured efficient and cost-effective solutions to the problems facing IWT.

4 Inland Water Transport Management: International Practice

Introduction

Across the EU, IWT is governed at four levels:

- (i) Multinational River Commissions established by international conventions. The two most important are for the Rhine River and its tributaries (1868), and the Danube River and its tributaries (1948);
- (ii) The EU through the European Commission;
- (iii) Individual European national governments; and
- (iv) United Nations Economic Commission for Europe, which is not an administrative body and has no power of implementation, but seeks harmonization of IWT navigation and environmental standards across the whole Europe.

This chapter presents the inland waterway management in selected European countries and Canada.

European countries have different ways of organizing the role of infrastructure development and management and of assigning tasks to them and supporting them. The examples in this chapter are chosen to illustrate complexities of the management issues and exemplify some best practices. Canada was chosen since the country has undertaken various phases of institutional reform for port management. This experience offers some lessons on the challenges of reforming government-operated ports. The reforms also show that there are a range of institutional models that can be adopted.

Waterway Infrastructure Management Companies in Belgium

The Belgian Transport Ministry has its representation of three only at its subfederal level: Wallonia, Flanders, and Brussels region. The Government of Flanders has entrusted management of its waterways to two companies: Waterwegen en Zeekanaal (Waterways and Sea Channel) and NV de Scheepvaart (NV Waterway Transport), both public-owned joint stock companies. The waterway network in Flanders has been divided between these two companies.



As an example, Waterwegen en Zeekanaal (Z&W) manages a network of about 1,000 km of navigable waterways. The objectives of the company, as defined in its constitution are:

- (i) Management and exploitation of the navigable waterways entrusted to the NV;
- (ii) Organization of management, exploitation, and commercialization of those territories adjacent to navigable waterways that are entrusted by means of ownership or of concession to the NV; and
- (iii) Composition of regional advisory committees and the organization of dialogue with all relevant local authorities and stakeholders related to the abovementioned tasks.

These objectives comprise the following tasks:

- (i) Procurement of territory needed for the infrastructure, its operations, and for water management as well as sale of redundant territory;
- (ii) Leasing or managing concessions of territory;
- (iii) Preparing grounds for construction purposes or for other use;
- (iv) Trade and/or structural cooperation with public entities related to these territories;
- (v) Carrying out a policy specifically aimed at promoting waterway-based industries and waterborne transshipment; and
- (vi) Creating new waterborne industrial or logistic zones.

The objectives and tasks should be understood with the mission of the company that it must operate for social benefit. It must promote the multifunctional use of all its infrastructure assets, of which promoting waterborne transport is an important one, must ensure safety and meanwhile must respect all social relevant aspects and interests of all players in the field.

Conditions and means for Z&W's operations are laid down in a management agreement between Z&W and the relevant government entity (in this case, the Government of Flanders).

Z&W should be financially sustainable. The organization is not for maximizing profit, however, ideally will have profits for investing to pursue its mission. The destination of the profits is decided by the general assembly of the shareholders. These are, as defined by Z&W's constitution, the Government of Flanders owning at least 75%, municipalities adjacent and relevant to the waterway, and relevant public-owned regional development entities.

In manpower and resources, Z&W's main activities are in the departments for waterway maintenance and civil engineering.



Also important to Z&W is the department of commercial management entrusted with the commercial target of the company by

- (i) realizing its own commercial revenues (mainly from ground leases),
- (ii) attracting cargo traffic which is currently on the road to IWT (modal shift), and
- (iii) enhancing the efficiency of using infrastructure and of the multifunctional use of the waterways.

Its tasks are wide-ranging. These include sales and contracting of new clients, improving logistics and the use of innovative transshipment technologies, identifying opportunities that emerge from Z&W's traditional waterway management activities, and managing all real estate and other property.

Z&W is free to apply policy instruments, which are commonly defined as long as they are compliant with regulations. One instrument that has been applied successfully since 1998 is that Z&W enters into public-private cooperation with companies for investing in equipment for transshipment between shore and barge, claiming to have avoided about 1 million truck movements in Flanders in 2013. Other instruments were support measures for smaller waterways and small barges, and studies and an agreement for a pilot project for moving pallets on barges.

Rijkswaterstaat in the Netherlands

The Dutch waterway network is the densest in Europe. About 6,000 km of rivers and canals form a complex system serving all parts of the country. Many serve as drainage as well as navigation. The network of the main commercial waterways of European Class IV and higher, with a total length of 2,200 km, is state-owned and operated by Rijkswaterstaat (RWS). They account for about 40% of international freight movements in the Netherlands and 20% of domestic freight. Many different provincial authorities or drainage boards manage the smaller waterways.

RWS is the executive agency of the Ministry of Infrastructure and Environment. Its mission is to manage and develop the national highway network, the waterway network, and other waters as a sustainable living environment. Tasks include flood protection; assuring sufficient and clean water; and providing transport infrastructure network that is in good technical condition, is user-friendly, and enables smooth and safe traffic. As such, RWS is also responsible for providing reliable and useful information to users.

The institutional solution involves a certain distance between the Ministry and an independent RWS which, however, is still the direct political responsibility of the Minister. RWS's activities are mainly steered by the following two arrangements between the Ministry and RWS:

- (i) Project steering for construction and for very large maintenance works (value above €30 million). The instrument for project steering is the Multi-Annual Program for Infrastructure, Land Use Planning, and Transport (in Dutch: MIRT), which is a high-level project programming instrument for short and medium



terms that is updated annually. In the MIRT project cycle, RWS has an advisory role in the prefeasibility (or exploratory) phase in which few alternatives are preliminary assessed, and in the feasibility phase in which one or two variants are assessed profoundly. RWS has this advisory role because of its expertise in technical aspects of construction and their impacts and costs. RWS is responsible for supervising and contracting in the project realization phase.

- (ii) Service Level Agreements (SLAs) for infrastructure network management, including regular maintenance. They use performance indicators for steering. One category of PI is technical norms such as the dimensions that determine navigability and strength parameters of keys. Another category concerns service levels, such as the availability of infrastructure for navigation (x% of the year) and average lock passage times. A third type refers to policy targets, such as for traffic safety. Every year, the SLA and budgets needed for realization are renegotiated. The ministry and RWS must agree on the performance indicators measurement system that goes with the SLA.

RWS has no other revenues than those provided by the government. The budgets of RWS for project development and for maintaining services levels are renegotiated every year.

Overall the system has been working well in managing annual budgets and investments. A weakness of the system is that it requires a profound understanding of needs and related costs. For budget negotiations for improved service levels, it is complicated to link investment sums and enhanced performance, and in practice, RWS cannot present the ministry with different budget allocation options. It is also complex to define what is needed for a continuous provision of, for example, a base-quality network.

Ideally, an asset management system would provide good insights. Such system, however, is too complex to develop and maintain even in highly experienced and advanced countries.

Inland Water Transport Management in Germany

Waterways and Shipping Administration of the Federal Government

In Germany, the federal government is the owner of the federal waterways, including 23,000 square kilometers of maritime and 7,350 km of inland waterways. On these waterways, over 250 million tons of goods are transported each year. The Federal Waterways and Shipping Administration (WSV) is responsible for administration of federal waterways and regulation of shipping. WSV is subdivided into seven waterways and shipping directorates, 39 waterways and shipping offices and seven offices for new construction. It employs about 12,500 persons. The annual budget for construction and operation is about €1.2 billion (about CNY10 billion).

WSV has the following tasks:

- (i) To ensure, as the river police and building control authority, that the condition of the waterways is in line with the requirements of shipping and that the government-owned shipping facilities and the waterways comply with all requirements as to safety and order;



- (ii) To ensure, as the shipping police authority, that no risks for people and the environment emanate from navigation or other uses of the waterways;
- (iii) To be responsible for the maintenance, modernization, and new construction of federal waterways including the official approval procedures (plan establishment and/or plan approval);
- (iv) To maintain and operate about 450 lock chambers, 290 weirs, 4 ship-lifts, 15 canal bridges, and 2 barrages;
- (v) To maintain and operate, for the purpose of channel marking, at and in the maritime waterways approximately 1,600 fixed shipping signs (such as lighthouses and beacons) as well as approximately 4,000 floating shipping signs (so-called buoys). In addition, there are approximately 10,000 other shipping signs (e.g., bushes), as well as the relevant shipping signs (buoys and sign boards) in inland navigation;
- (vi) To maintain and operate the vessel traffic service centers at the maritime waterways and the traffic control centers at the inland waterways which, on a 24-hour basis and operated by skilled personnel, survey, monitor and, if necessary, control traffic, support shipping by providing information and advice, check and activate the shipping signs, and, in their function as shipping police, assume the task of intervention and coordination in cases of accidents or environmental pollution; and
- (vii) To maintain and operate the globally most technically advanced and efficient fleet of oil spill recovery ships (combating oil spills and chemical accidents, emergency towing, fire-fighting on board ships) which are mainly deployed in the German jurisdiction in cases of major accidents, but may also be used at international level on the basis of bilateral agreements.

Two waterway management branches (Waterways and Shipping Branch North in Kiel and Waterways and Shipping Branch Northwest in Aurich) are mostly responsible for maritime waterways. The other five waterways and shipping branches are exclusively responsible for inland waterways. On average, each of the five mentioned branches is responsible for around 1,400 km of waterways; each substation is on average responsible for around 260 km of waterways.

WSV's duties are regulated in Article 89 of the Basic Law for the Federal Republic of Germany:

Article 89

[Federal waterways—Administration of waterways]

(1) *The Federation shall be the owner of the former Reich waterways.*

(2) *The Federation shall administer the federal waterways through its own authorities. It shall exercise those state functions relating to inland shipping which extend beyond the territory of a single Land, and those functions relating to maritime shipping, which are conferred on it by a law. Insofar as federal waterways lie within the territory of a single Land, the Federation on its application may delegate their administration to that Land on federal commission. If a waterway touches the territory of several Länder, the Federation may commission that Land which is designated by the affected Länder.*



(3) In the administration, development and new construction of waterways, the requirements of land improvement and of water management shall be assured in agreement with the Länder.¹

The basic law is the constitutional law of Germany. It can only be changed by two-thirds majority in the Federal Parliament. Due to the German political system, such changes of the basic law are very uncommon.

Therefore, at the moment, all units are fully state-owned. There are neither equitization projects nor any joint stock companies. The reason for this “state-owned policy” is that the management of waterways is recognized as a classic service for the public and, thus, the responsibility of public administration.

However, in these days of restructuring, there are also rumors on political decision making to reorganize WSV within the abovementioned legal framework from an “administration of implementation” to an “administration of warranty” to focus on the core area which is established by the basic law. Such reorganization could cause privatization of some minor of the abovementioned tasks; examples follow:

- (i) infrastructure operation and marketing for waterway tourism and leisure purposes,
- (ii) infrastructure operation and marketing for water sports,
- (iii) operation of sluices, and
- (iv) maintenance of ships.

But these ideas are controversial, on one hand, you cannot gain significant profit in waterway management (if not owner of, e.g., the Suez Canal), on the other hand, it is very important to keep the waterways barrier-free. Any development of commercialization could cause barriers. Any risk of a development of “dedicated waterways” for individual companies (e.g., shippers, shipping companies, logistics companies) would cause distortions of competition.

Furthermore, it is very difficult to differentiate between infrastructure for logistics and transport, and infrastructure for tourism and leisure as these are mostly the same infrastructure.

Inland Ports

Inland ports in Germany are predominantly public ports. Only a few ports are private or owned by companies (e.g., ports for the chemical industry or for coal-fired power plants).

The public ports generally belong to a (i) community (municipality port), (ii) union of several smaller communities (society, united to that end), or (iii) province (state, e.g., Bavaria or Saxony). German inland ports not only serve as hubs for transshipment of goods and commodities, they also serve a significant function as nodal points of logistics by being the interface between the different modes of transport: barge, truck, and rail.

¹ Federal states of Germany



The port area is used by port-related companies of various kinds; for example, freight forwarders; shipping lines; warehouses; works to produce food and animal food; working up scrap or used glass; storage places for iron ore, coal, sand, gravel, construction materials, steel plates; export or import goods like stones, tropical wood, rubber; commodities to be commissioned; new cars; containers; machinery; and chemical goods or liquid goods like petrol products (fuel, liquefied petroleum gas, liquefied natural gas). These companies have in common the use of multiple (at least two) transportation modes to receive or to dispatch goods after storage, sometimes after having them processed into goods of higher quality and value. Animal feed producing companies, for instance, receive raw materials per inland vessel in big quantities. After processing them into different products, they distribute them to their customers in smaller quantities by truck. In contrast, car distributing companies, for example, usually do not carry out further processing. Their task is limited to the handling of cargo from special inland roll-on and roll-off (ro-ro) ships to rail lorries, including its interim storage.

The port administration performs a number of tasks to enable a smooth operation in general:

- (i) Beginning with the planning of the port's layout, it has to be considered land traffic planning, above all between port railway and roads, as well as an optimum road and railway connection of the areas for future settlement of companies. Of utmost importance is flood protection of the port area, either by choosing a sufficient altitude (safe against a flood of at least 100 years return) or the flood protection by walls and dikes.
- (ii) The connection of the port entrance to the waterway has to be planned very carefully. Support of a hydraulic institute for water construction may be considered, especially when the port is situated at a flowing river, to avoid local sedimentation that will lead to a need for dredging, aside from nautical requirements for the entrance of vessels into and the exit of vessels out of the port (sight, current, space, vertical clearance under bridges, etc.).
- (iii) Very important is the availability of appropriate plots of land to offer settlement opportunities for companies in the port area: Size, shape, situation (noise), neighborhood to adjacent companies (dust), as well as water supply, power supply, waste water disposal, dimension of sewer (heavy rainfall)—all these can either foster or hamper, if not sufficient—the growth and efficiency of the port. To find suitable companies for settlement at the port area, good publicity is recommended, and to convince them, contracts with fair conditions have to be offered.
- (iv) In addition to the construction of a quay wall with its mooring equipment, stairs, ladders, safety belts, illumination, disposition of the cranes, their power supply, their lifting capacity and reach, the railway along the quay, the environmental points of view, the drainage of the surface, the handling space—all solid construction details, planned by the port administration—the management of the river port is also significant to create an efficient port.
- (v) Depending on the specific contract, the port authority is usually responsible for the operation and availability of dockside cranes (with the required lifting equipment like gripper, spreader, hook, etc.) and the crane operators. The crane operators are, in turn, responsible for the safe condition of the dockside cranes (and their power supply, also in case of emergency). If the port authority runs the port railway, another responsibility is the efficient and in-time dispatch of the right railway wagons (number and kind).



- (vi) The transshipment companies or freight forwarders at the port area are responsible for the dispatch of the trucks and the corresponding handling equipment (reach stackers, forklifts, yard organization).

The shipping lines are responsible for the arrival of the right vessels in time.

If all (at least three) of the partners mentioned above in this transshipping business are well prepared with the right equipment and staff, if they understand each other in process cooperation, and if the abovementioned disposition of buildings and transport infrastructure is available, then you can have an efficiently working port.

As owner of the port area, the port authority is usually responsible for the maintenance of the infrastructure (quay basins, quay walls, roads, railway lines, water and power supply, and supply of waste water disposal), as well as equipment such as transshipment dockside cranes.

In the past, the port authority usually executed the complete maintenance work, except for dredging work in the basins and at the port entrance. This procedure was very labor-intensive; therefore, many workers had to be employed at all times.

These days, port authorities have changed the procedures of maintenance work. Tasks for which no special port knowledge is required are usually done by private companies specialized for the task they are hired for. These tasks include road work, railway track maintenance, riverbank maintenance, weed removal, mowing grass, etc. Bigger tasks, depending on the amount of costs incurred, may be awarded to contractors after an offering for public tender.

All tasks for which special port knowledge is required, for instance, maintenance of quay stairs, ladders, lifting equipment, special electric devices, etc., will still be done by the port authority's staff. There is a great variety of these from port to port.

Finances and Tariffs

Channel fees are charged from the inland waterway (IWW) shipping companies based on the use of the waterways, and are usually collected at key points of the waterway. In Germany, channel dues are levied, based on the weight and type of cargo (six categories of cargo [plus containers and passengers] exist); different charges apply for different sections of the IWW system. A typical channel due is €0.8 per ton km.

Inland ports are commercial enterprises that serve the country's economy as points of intersection in the goods traffic. Their main corporate goal is offering their services as multimodal hubs, and not maximizing profit; but they have to survive economically, including recovering investments. The revenue of an inland port is created by

- (i) rental of the plots of land (rented by the companies at the port area),
- (ii) port fees of the vessels (paid by the shipping companies),
- (iii) transshipment fees (paid by the owner of the cargo),
- (iv) railway fees in the port,
- (v) rental of the port-owned dockside cranes, and
- (vi) fees for special services (e.g., planning and engineering services for other ports, supply of water and electric power, snow plough services during winter time, etc.).



The port authority's fees and tariffs can usually be seen as a compromise between the needs of the port on the one hand, and the market and the possibilities of the client on the other hand. The port fees and transshipment fees are used for maintenance of water construction (dredging, repair of mooring installation, stairs, etc.), whereas the railway fees and the rental of the port-owned dockside cranes are purpose-related fees.

The rental of the plots of land is the port's basic revenue. It is necessary to prepare the area to create a rentable condition for the plots. This includes removing inappropriate soil, measures of flood protection, creating connections for water and power supply, etc. Rental of plots is the only option, as a sale of land is unusual in this case. The reason for not selling plots to any company for settlement is to ensure port development in accordance with port authorities and to ensure that only port-related companies are located in the port area. The typical duration of rental contracts is 20 to 25 years. Because of their rather long-term effects, the leases usually contain a provision for inflation.

The port area itself is laid down by decree, where the rights and obligations are fixed and a precise description of the boundaries of the port area is given. The port authority regularly examines the plots of land the companies rent for the timely discovery of contamination of the soil, if any.

Rhein–Main–Donau: An Example of a Private Concession

The enterprise Rhein–Main–Danube (RMD) started in 1921 under the shared ownership of the Government of Germany and the State Government of Bavaria. The purpose of the company is to invest the revenues collected from the exploitation of a range of power plants (currently 59 of them) in and near the connecting channel between the river Main (tributary to Rhine) and Danube in the construction of all works for the high-class waterway link. In 1995, RMD was privatized and ownership and remaining obligations were transferred to three energy companies. The core business of RMD is energy provision, not navigation, even though the obligation for providing the navigation channel remains. The concession runs until 2050.

RMD's obligation includes all activities relevant to the construction of a high-quality waterway, including provision of sufficient port and lock capacity. It is, therefore, bound to the same principles of responsible design and construction as those used for other major infrastructure works laid down in national legislation. For example, the waterway design must

- (i) provide reliable navigation conditions during all seasons of the year;
- (ii) have good consideration for safety of navigation;
- (iii) prefer using low-impact river training measures, like dredging or low-impact design of embankment protection above high-impact works, where possible;
- (iv) include locks with sufficient capacity for swift lock passages;
- (v) provide an infrastructure of ports, and, therefore, include the planning of the port locations, their capacities, connection to railway and road networks;
- (vi) provide offshore constructions which are resistant to most extreme waves;
- (vii) contain measures that prevent negative impacts on groundwater levels and soil conditions in the adjacent terrains;



- (viii) provide flood protection to surrounding areas;
- (ix) consider all types of environmental impacts of the waterway in operation and during construction, including impacts on flora, fauna, and landscape quality; and
- (x) include mitigating and compensating measures for environmental damage.

The Federal German and Bavarian Government recently decided on upgrading the stretch, and works are expected to start in 2015. They will include works for containing damage of flood risks.

Observations of the German Experience

The following features of the German IWW system are summarized below:

- (i) In Germany, there is generally no differentiation between construction, maintenance, and management of IWT. All are under one state-owned body. Major new construction is coordinated by establishing special dedicated “new construction” administration offices. The reason for this “state-owned policy” is that the management of waterways is considered a classic service for the public and the responsibility of public administration.
- (ii) There is only one example of a private concession: Rhein–Main–Donau is noteworthy as it shows that the responsibility for infrastructure does not have to be handled by public authorities or SOEs. However, any further discussion of IWT privatization in Germany focuses on questions of tourism and leisure.
- (iii) The German river management stations are “customer-minded”—their focus is to guarantee efficient and safe inland shipping.
- (iv) Accordingly, updated information is available to shippers by river management information services maintained by waterway administration (www.elwis.de).
- (v) Inland port operations and inland port administration are separated. Any kind of port affairs is the state’s (provincial) domain, whereas waterway management and fostering of multimodal networks is a federal task.

In Europe, there is a common understanding that specific provisions governments consider necessary in view of local conditions should not be at variance with the provisions of a European Code for Inland Waterways and the Regulations on International Carriage of Dangerous Goods by Inland Waterway to allow effective transboundary transport by inland shipping (see www.yosc.org.uk/cevni.pdf).

Waterway Management System in Austria

In Austria, the waterway infrastructure is managed by a company named viadonau that is particularly committed to continuously improving its performance to ensure a well-maintained waterway infrastructure. Viadonau is responsible for management of the waterway infrastructure of the Austrian part of the Danube. The Austrian stretch of the Danube has an entire length of about 351 km. In its function as waterway management authority, viadonau also carries out responsibilities for waterway administration.



Establishment of the Company

The Austrian Federal Waterways Act (Federal Law Gazette I No. 177/2004) governs the tasks and services viadonau supplies. It forms the legal basis of all the company's activities. The responsibilities of the federal waterway management include

- (i) regulation, maintenance, and construction of inland waters;
- (ii) flood protection, including preparation and implementation of precautionary and preventive measures;
- (iii) monitoring of water status and participation in measures against water pollution;
- (iv) river embankment design, including the improvement of the living conditions of animals and plants on the banks and riparian areas;
- (v) planning, construction, and maintenance of towpaths;
- (vi) construction and maintenance of federal ports and intermodal installations; and
- (vii) hydrography and measures to create favorable flow conditions (including the measurement, collection, verification, and processing of data).

To meet the waterway's specific tasks, in particular, the Federal Waterways administration, maintenance, and development of the Danube waterway, viadonau was founded as a limited liability company with the company name Via Danube – Austrian Waterways Society headquartered in Vienna due to the merger of the Austrian Danube Shareholding Company, the Austrian Danube-Technology, and the Via Danube – Development Company for Telematics.

The merger took effect on 31 December 2004. The share capital of the new company was set at a nominal €2 million and was met entirely through contributions in kind from the assets of the merging companies. The federal government dispensed with respect to the former Austrian Danube Shareholding Company on 50% of its trade receivables not yet paid. The shares of the company are fully with the Austrian government represented by the Austrian Federal Ministry for Transport, Innovation and Technology.

General Tasks

As laid down in the Federal Waterways Act, viadonau fulfils all tasks of the federal authorities for planning, and monitoring river-engineering projects. The regulation, preservation, and development of waters as well as flood control facilities are of particular importance in the viadonau service portfolio.

The strategic planning, controlling, and monitoring of the administration of federal waterways continues to rest with the Federal Ministry for Transport, Innovation and Technology. For all issues regarding navigation on the Danube, the Austrian Supreme Navigation Authority is responsible.

Infrastructure management. Viadonau ensures the availability of an efficient and reliable waterway infrastructure. This includes the creation and preservation of fairway parameters, the maintenance and repair of the river banks, and the ongoing provision of hydrographical and hydrological data.



However, viadonau is also responsible for many ecological river-engineering and renaturalization projects. These projects restore the river to its natural course and create new habitats for animals and plants.

All measures relating to bodies of water are to be nature-oriented and should be done so that the environment is protected to the largest possible extent. Waterways are to be planned, constructed, and maintained so that they can be safely used by all users in accordance and compliance with the shipping law.

The largest project, which takes into account equally the interests of navigation and ecology, is an Integrated River Engineering Project on the Danube to the East of Vienna.

Traffic management on the Austrian Danube. With the Danube River Information Services (DoRIS), viadonau operates an information and management system for navigation on the Austrian part of the Danube. The company also plays a crucial role in the development of the related EU standards and supports the implementation of RIS in the whole Danube region.

Transport management also includes the operation of the Danube locks. Viadonau has also been designated as the competent authority for this task. Thereby, viadonau performs sovereign functions in the areas of lock supervision, weir supervision, and water supervision.

In the development of IWT, particular focus is placed on increasing the volumes of cargo transport and intermodal transport as well as on developing and implementing new technology and systems for inland waterways (RIS in particular).

Development of inland waterway transport. An increase in the volume of goods transported on the environmentally friendly and cost-efficient Danube waterway requires a comprehensive improvement of basic conditions in terms of both Danube navigation infrastructure and services. In cooperation with national and international partners from all over Europe, viadonau develops projects for modernizing and enhancing the attractiveness of Danube navigation.

Flood control. Viadonau constructs and operates flood control dikes and facilities to protect the residents of the areas concerned. In doing so, the company is committed to ensuring the greatest possible protection of the environment by taking extensive ecological measures to accompany the projects. It measures, collects, and processes hydrographical data, thereby creating key water management data required by federal authorities.

Main activities for waterway maintenance. The major part of the measuring systems along the Danube River in Austria is equipped with automatic data loggers. This data is public and transmitted to the hydrology department of viadonau which is the owner of the monitoring stations and the collected data. The water levels of seven monitoring stations are published hourly on the website of viadonau (<http://www.doris.bmvit.gv.at/>).

The focus of measurements is on the survey of water levels which is the basis for planning flood prevention programs and for calculating recent and reference water levels (LNWL = low navigable water level, AWL = average water level, HNWL = highest navigable water level, HWL = highest water level).



General riverbed measurements take place by the so-called Naufahrt (nautical cruise) which is done monthly by viadonau. Within longitudinal movements, it tries to gauge if there are shallow sections in the navigation fairway. (At the Austrian part of the Danube, two major categories of shallow sections can be distinguished: shallow sections in free-flowing sections and shallow sections in backwaters of the hydropower stations.) If that is the case, cross-sectional profiles for the relevant section are created to discover the dimensions of the shallow section. These are later transmitted immediately to the Team on DoRIS for publication.

At the same time, the team responsible for hydrography from viadonau is instructed to do a record of the river basin. This record is the base for dredging projects and is needed to start dredging the shallow section. Furthermore, the received data should be integrated into the electronic chart display and information system electronic chart display and information system (ECDIS).

The Austrian Ministry of Transport and viadonau initiated the Integrated River Engineering Project on the Danube to the East of Vienna to improve fairway conditions and ecological deficits in this section of the Danube.

It is planned to implement a combination of different river engineering and ecological hydro-engineering measures in this section of the Danube:

- (i) Granulometric river bed stabilization,
- (ii) Low water regulation,
- (iii) Riverbank renaturalization, and
- (iv) Waterway linkage.

Besides the lower water regulation, one major goal of the project is the stabilization of the riverbed which constitutes a substantial weak point in inland waterway navigation and is characterized by a continued bed erosion rate of 2 to 3.5 centimeter per year in some sections. The increasing bed erosion of the last few decades shall be reduced by granulometric river bed stabilization (Figure 13). It is planned to add coarse gravel with a

Figure 13: Granulometric Riverbed Stabilization



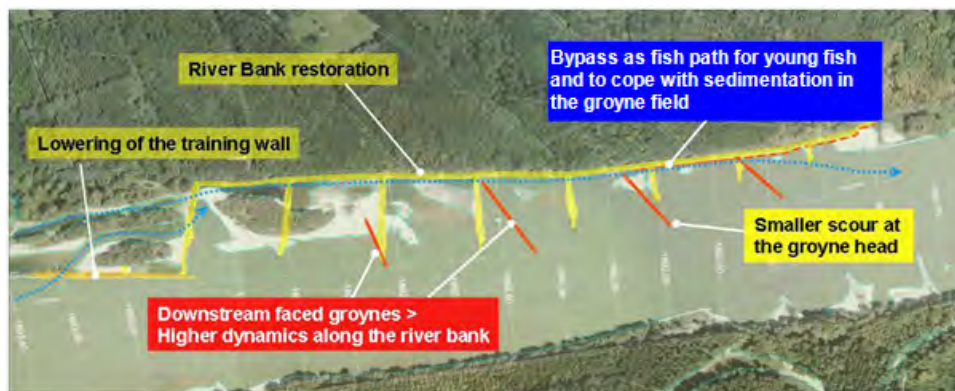
Sources: Asian Development Bank.



grain diameter of approximately 40 to 70 millimeter, which is coarser than the major part of the Danube's natural bed load in the project area, but finer than the maximum natural grain size. The thickness of the gravel layer and the exact grain size (grading curve) are the results of an optimization task, whereby nautical and ecological requirements are taken into account. The grain size distribution of the material to be added is determined so that, with an appropriate safety distance, damage to ship propellers can be avoided and the ecological exchange capacity of the riverbed of the Danube is preserved.

The major goal of inland navigation is to secure adequate fairway conditions at low water levels. This is accomplished by low-water regulation measures (groynes and training walls). The distance between groynes, their heights, and shapes were optimized from an ecological, nautical, and material-efficient point-of-view to minimize the deposition of sediment in the groyne fields and the formation of scours near the groyne heads (see Figure 14).

Figure 14: Fairway Installations in Austria



Sources: Asian Development Bank.

The major ecological goal of the project is to give the river greater freedom to move and, thus, to enhance the region's ecological functioning. The landscape-forming power of the river is to be reinforced—primarily by riverbank renaturalization. Protection structures on slip-off slopes are removed and undercut slopes are preserved. Furthermore, the waterway linkage is to increase the exchange of water between the Danube and the floodplains and will bring flowing water into the floodplains. Side arms will be linked to the main river at low-water level.



There are three different ways how skippers are informed about the suspension of navigation in the flood period:

- (i) The service “notices to skippers” from the Supreme Navigation Authority (if requested additionally sent by e-mail);
- (ii) Information from the information system DoRIS; and
- (iii) Radio communication with the lock staff via very high frequency radio.

The Danube Commission standardizes signalization on the whole course of the Danube. The corresponding regulations in Austrian law are found in the Inland Waterway Regulation and the Austrian Navigation Act. Among others, there are regulations about vessel designation, nighttime markings, daytime markings, sound signals, and waterway signs (e.g., buoys). Navigation surveillance constantly maintains waterway signs at the Austrian Danube. The buoys are produced of iron sheet and the anchors are made of iron.

Observations of the Austrian Management System

The following features of the Austrian IWW system are summarized below:

- (i) The strategic planning, controlling, and monitoring of the administration of federal waterways rest with the Austrian Federal Ministry for Transport, Innovation and Technology. All issues regarding navigation on the Danube are responsibilities of another entity—the Austrian Supreme Navigation Authority.
- (ii) Viadonau in Austria is a state-owned enterprise (SOE) dedicated to IWT development. This body combines construction and maintenance on the Danube River.
- (iii) Viadonau performs sovereign functions in the areas of lock supervision, weir supervision, and water supervision.
- (iv) There are good maintenance systems in place, trying to combine shipping interests and ecology.
- (v) With DoRIS, viadonau operates an efficient information and management system for navigation on the Austrian part of the Danube.
- (vi) Introduction of the Automatic Identification System is done in a sequenced approach. In the beginning, all inland vessels could borrow a device for a nominal charge to familiarize them with the system. Since 2014, all vessels are required to have system responders on board, financed by their owners.

Institutional Inland Port Reform in Canada

Canada has a freshwater area of almost 800,000 square kilometers within its boundaries. This area consists of lakes interconnected by river systems. The Mackenzie River is the seventh largest river system in the world, while the St. Lawrence River–Great Lakes Waterway is the longest inland waterway in the world. It services 15 major international ports and 50 regional ports in both Canada and the United States. The Canadian portion of the seaway is managed by the St. Lawrence Seaway Management Corporation. In 2006, the corporation handled 47.1 million tons of freight. Primary commodities shipped were grain (11.5 million tons), iron ore (11 million tons), and coal (3.7 million tons).



Maritime and Inland Waterway Ports

Overall, Canada has approximately 590 major ports, 700 small craft harbors, 1,800 fixed light stations in the inland waterway system that includes the seaway and its locks. Ports are classified into three categories: Canada Port Authorities (major ports), regional or local ports, and remote ports. The 700 small craft harbors are managed by Fisheries and Oceans Canada (a government ministry).

Canada has undergone several phases of port reform. The first round of reform was introduced by the adoption of the Canada Ports Corporation Act in 1983. This act established the major ports as “Crown corporations” or state-owned companies. To introduce this reform, the Canadian government cancelled Can\$727 million worth of debt and unpaid interest that the ports accumulated to enable the newly established companies to operate without the burden of past debts. The aim of this reform was to enable the ports to operate in a more commercial fashion. However, over time, it became apparent that the reforms had not gone far enough. Ports were still constrained from operating as true commercial entities. For example, approvals for financing port development and concluding land transactions took too long. Ports also had to obtain approval from the government to spend their own retained earnings. Approval could take anything between 4 and 26 months.

In 1994, the government initiated another review of the marine sector that included several public hearings. The hearings provided the opportunity for diverse stakeholders to present their views on the future direction of port reform to government. During these hearings, many managers of the state-owned ports said that ports did not require more commercial freedom. In contrast, commercial stakeholders (e.g., shippers), preferred more autonomous port management, including a view that the majority of port directors should be appointed from the private sector.

The result of the port reform process was that the major ports in Canada were incorporated as not-for-profit businesses known as Canadian Port Authorities. The Canadian Port Authorities receive no subsidy, and must operate in a financially self-sufficient manner. Hence, they are expected to raise capital funds from commercial banks and cannot transfer any liabilities to the government. Dividends must be paid to both the federal government (an annual payment based on gross revenues) and local governments (as payments in place of property taxes). This also implies that port tariffs are not uniform, but are set by each port individually. The boards of directors of each port are appointed by the minister, but the majority of members represent users who are nominated by stakeholders (although such nominees may not be employees or officers of any user).

Since the implementation of port reform, there has been criticism that it has not gone far enough in achieving the goal of commercialization of the port sector. Specific concerns are as follows:

- (i) Government continues to dominate appointments to the ports’ boards of directors. Though user groups nominate the majority of members, it is perceived that the ports are not truly independent. There is a concern that directors without sufficient knowledge of the port sector may be appointed. The end-result may be that the role of port users in the management of ports will be diminished.
- (ii) Ports are restricted to activities directly related to shipping, navigation, and passenger and goods transport and handling. They may not undertake other



commercial activities that could yield additional revenues such as recreational, industrial, and residential land development because this reduces their revenue-generating potential.

- (iii) Ports may only pledge the revenue generated by port activities as collateral for loans. The physical assets (e.g., land, buildings) are still owned by government and may not be offered as collateral. This restricts the ports' borrowing capacity.²
- (iv) There is a concern that the burden of financing smaller nonprofitable ports is being transferred to local governments, while the federal government retains the benefit of revenues earned by the bigger profitable ports.
- (v) The "not-for-profit" status of the ports may create confusion about their commercial orientation in the minds of port managers. It has been suggested that it would have been better to corporatize the ports so that the port's mandate to maximize profit for the shareholder is clear (whether the shareholder is the government or the private sector).

Observations from Canada's Experience

The following features of Canada's experience are worth noting:

- (i) The goals of port reform must be clearly understood. Government must avoid sending confusing signals. In Canada, the Canadian Port Authorities are required to make revenue payments to the government, but are also established as "not-for-profit" entities. These two goals potentially conflict with each other. Port managers may be confused whether their goal is to maximize earnings for the shareholder (government) or to operate to merely covers costs. In the former case, care has to be exercised that ports do not charge tariffs that are too high. This can easily occur if a port is a monopoly.
- (ii) One way of achieving a more commercial orientation is to place the port under the management of independent directors. In Canada, the majority of these directors are nominated by port users, but the government still selects the appointees. This has given rise to fears that there will be undue political interference in port appointments. Another fear is that persons lacking essential skills will be appointed.
- (iii) If the policy goal is to commercialize the ports, the reform must be designed to enable port managers to operate autonomously in managing their affairs. Their activities should only be restricted for good reason. Mechanisms must be put in place so that such restrictions do not interfere unnecessarily with day-to-day management. In particular, it is important that government understands that in a commercial environment, decisions need to be made quickly. If government approvals are required (which should be limited to essential cases), these must be given speedily. Otherwise, cumbersome bureaucratic processes will undermine the goal of commercial efficiency.
- (iv) Not all ports can be operated on a commercial basis. Many ports will continue to be loss-making, especially if these provide essential public services.

² For example, in 2000 it constrained the ability of the Port of Halifax to attract Maersk as a terminal operator as the port could only borrow \$25 million, against the \$250–450 million it needed to construct a new terminal.



- (v) It should be anticipated that port managers working in government-controlled entities may oppose reforms. Therefore, government must also pay attention to ways to include managers in the reform process and to make them supporters of the process.

Conclusion

Different countries have different landscapes and different management structures. Each structure has its respective strengths and weaknesses. No perfect system exists in an evolving global environment. On the other hand, the following may merit the PRC's consideration:

- (i) IWT is widely recognized as a public service. Commercial interest may be mobilized to provide better services, but should not override the public interest.
- (ii) IWT can be managed by the government and by SOEs, but service level needs to be clearly specified, and the relationship between government and SOEs should be regulated by contract or agreement spelling out rights and obligations.
- (iii) IWT management should be customer-oriented and make river information accessible.
- (iv) Ports are nodal points of logistics. Efficient ports require well-designed port infrastructure, integration of different transport modes, and process cooperation of port partners such as freight forwarders, shipping lines, port authorities.
- (v) Environmental and ecological concerns should be mainstreamed in all phases of developing IWT.

5 Recommendations

Introduction

During the past 30 years, the PRC made tremendous strides in technological advances, infrastructure provision, and market development in the transport sector, but institutional bottlenecks remain, hampering the healthy development of the sector and affecting its role in underpinning the economy.

In 2013, the Government of the People's Republic of China dissolved the Ministry of Railway, merged Ministry of Railway's functions of planning and policy making with the MOT, established the State Railway Administration under MOT, and established the China Railway Corporation. This is a significant step taken by the government to rationalize the institutional set-up for the transport sector and facilitate integrated transport planning and coordinated development among different transport modes. But much remains to be done.

The following recommendations are from the institutional point-of-view and are based on the study of the experiences of Hunan province, the PRC, and EU. They may look obvious, but achieving any of them will require fundamental change in the approach and philosophy of the stakeholders in the PRC's transport sector.

Reducing Economic Disparity Within Provinces and Coordinating Planning and Development of Transport and Land Use

Economic disparity exists between the PRC's east coast and west inland, thus, the PRC has launched the western development strategy to bridge the gap. This has led to significant growth of cargo flow including on the Yangtze River which now ranks as the first in the world.

Economic disparity also exists in provinces. In Hunan, economic growth centers around the Changsha–Zhuzhou–Xingtian city cluster which contributes 80%. This has enabled profitable IWT shipping and 65% of the market share of IWT for the export cargo from Changsha to Shanghai. But south to Changsha along the middle or upper reaches of the Xiangjiang River and other rivers such as Lishui, Yuanjiang, and Zishui where economic development is much less, offering IWT cargo services will be difficult, because of insufficient cargo volume or unbalanced cargo flow which render IWT services unprofitable.



Economic development requires improvement of transport conditions, but improved transport alone may be insufficient to stimulate economic development. To maximize the rate of return on transport investment and minimize the waste of resources, it is important to study carefully the economic potentials in different parts of provinces, plan land use properly, and develop transport accordingly. Some rivers may have more potential for ecotourism than freight transport. Blindly building navigation-cum-hydropower generation complexes to facilitate freight transport may be self-defeating and result in a waste of investment.

Promoting Integrated Transport Planning and Intermodality

IWT has lower operating costs per ton-km than both road and rail. Despite average lower speeds, this makes IWT potentially attractive for certain markets. In particular, IWT is potentially very competitive for the export market (including containers). When potentially lengthy sea shipping times are factored into the overall journey duration, time savings on the PRC inland leg of the trip are relatively insensitive if significant cost savings can be achieved.

IWT does not experience road congestion or suffer from the capacity issues of the PRC's rail freight system, and can be considered a reliable mode of transport with fairly reliable journey times. It is also considered relatively safe and secure for the shipment of goods.

IWT provides important transport capacity in the PRC, but its growth is increasingly limited as the road network is being rapidly developed, and competitive road transport services is extending into areas previously served only by rivers.

While the government's general policy directions are to promote water and intermodal transport, these have not translated into reality in terms of transport planning and funding allocation. Each transport mode still tends to be developed, managed, and regulated in isolation without focusing on creating multimodal chains and seamless transfers at nodes that are needed to lower transport costs.

In connection with the government's regional cluster development initiatives such as the Beijing–Tianjin–Hebei and Yangtze river economic corridor, it is desirable to set up a task force for each initiative comprising experts from the government offices at both national and provincial levels, research institutes, and businesses, to focus on integrated transport planning. The task force is persuaded to knock down walls between government offices and between the public and business sectors.

Developing Inland Ports

Inland ports are critical links in the supply chain, and efficient services at port are a prerequisite to IWT's successful competition with other transport modes. The Hunan case study indicates there are many port facilities, including illegal ones and ones which are rudimentary and do not meet safety measures, but both under and over port capacity



coexists. The scale and level of inland ports should be appropriate to the economic development and trade volume of their hinterland, and ports ought to be developed to be large-scale, standardized, and ecofriendly with a rationalized layout.

To strengthen IWT's competitiveness, inland ports should be connected to hinterland areas via a variety of modes of transport, and be planned to have the functions of a comprehensive transportation junction, linking production, supply, consolidation, transport, and distribution to improve the overall utilization rate and reduce logistical costs. Construction, extension, and renovation of inland ports should be conducted under the centralized planning and guidance of the government to achieve development harmonious with regional economic development, and channel treatment and regulation. Also, different ports should enhance integration to form a relatively complete inland transportation system and coordinate their operations to form an operational unity.

Improving Customer Service

Customers are relevant to the success of any economic sector. Customer satisfaction is crucial to any institutional structure. In the past, it was difficult for public administrations worldwide to understand ordinary citizens as their customers. This attitude has changed as government services are more and more reviewed under cost-benefit considerations.

The Hunan case study indicates there are many reasons for customer dissatisfaction about IWT, including long waiting times at locks, different port requirements, lack of river information, etc. If customers feel poorly treated, customer defection takes place. In the long run, that could mean fewer customers, gradual under-use of waterways, and fewer jobs.

To promote IWT, it is important to address customers' needs. This can be achieved by marketing activities of the relevant government offices and state-owned enterprises including active customer relationship management (CRM). CRM is a widely implemented strategy for managing an institution's interactions with customers, clients, and stakeholders. It involves using technology to organize, automate, and synchronize business processes such as marketing, customer service, and technical support. The overall goals are to find, attract, and win new clients; nurture and retain those already attracted; entice former clients back into the fold; and reduce the costs of marketing and customer service by streamlining the processes. CRM describes an institution-wide business strategy including customer-interface stations.

CRM systems for marketing help the institution to identify and target potential clients and public relations alliance partners. A key marketing capability is tracking and measuring multichannel campaigns, including e-mail, search, social media, telephone, and direct mail. Recognizing that service is an important factor in attracting and retaining customers, organizations are increasingly turning to technology to help them improve their clients' experience while aiming to increase efficiency and minimize costs. Relevant analytics capabilities are often interwoven into applications for marketing and customer service. These features can be complemented and augmented with links to separate, purpose-



built applications for analytics and business intelligence to monitor and understand client actions and preferences, through traffic forecasting and data quality.

Customer relationships are becoming a more important factor for differentiating within one sector. The importance of a skilled workforce cannot be overstated. Customer service skills can be learned. For the IWT sector, such set of skills could mean, for example:

- (i) Expertise and service orientation;
- (ii) Information policy;
- (iii) General conditions in waterways, ports, and landing stations;
- (iv) Safety on waterways and landing stages (berthing system, risk of theft, etc.);
- (v) Dredging and maintenance quality;
- (vi) Navigational aids provision;
- (vii) Warning systems about obstructions in fairways (silted banks, bad currents, high or low water level for travelling and landing stations, etc.);
- (viii) General driving discipline on the waterways; and
- (ix) Communication in inland navigation.

Directing Inland Water Transport Incentive Programs toward Market Players

In general terms, the transport of goods from the producer location (or “selling party”) to the consumer location (or “buying party”) is a necessity and prerequisite for international trade. One of the parties decides choice of transport mode, considering transport costs, time and quality (e.g., punctuality, reliability) for the overall transport from the producer to the consumer. A main decision criterion is the transport cost. Given the often required pre- and on-carriage of cargo to and from an inland waterway port, the prices for IWT are sometimes not competitive against the direct truck transport. Reducing the IWT transport costs by consideration of the whole transport chain as well as the additional costs for pre- and on-carriage by financial support or cofinancing will help to increase the competitiveness of the IWT transport mode.

Many national and provincial policies, regulations, and plans are already in place in the PRC to develop IWT infrastructure and reduce terminal handling costs. It is advisable for the PRC to design incentive programs that focus on the market players or the shippers who make decisions on choice of transport mode, that concentrate on the operational costs of the transport contracts, and that consider the complete intermodal transport chain, including loading and uploading as well as pre- and on-carriage by other transport modes, which is very often a fundamental precondition to offer competitive transport solutions of IWT to market.



Managing Relationship between Government Offices and State-Owned Enterprises

Similar to Hunan, some other provinces of the PRC have also set up SOEs to develop the IWT sector. As stated earlier, IWT provides public services and is an area where SOEs can play a useful role. In Europe, IWT is also managed either by government offices or SOEs. The difference between the provincial systems of the PRC and European system lies in the relationship between the government offices and SOEs. The European system is rule-based. For example, there is a management agreement between Z&W and the Government of Flanders where Belgium lays down the conditions and means for Z&W's operation. Between RWS and the Ministry of Infrastructure and Environment of the Netherlands, there are Service Level Agreements for infrastructure network management with performance indicators. The operations of the waterways and shipping directorates are regulated by Article 89 of the Basic Law for the Federal Republic of Germany. The tasks and services to be supplied by viadonau are governed by the Austrian Federal Waterways Act. But in Hunan, there is no formal agreement or any other legal framework regulating the relationship between HPDOT and HPWTCIG. The situation is similar in other provinces. This opens the door to the government offices' excessive interference in the operations of the SOEs, and performance of the SOEs is not commensurate to the resources the SOEs obtain from the public sector. Therefore, it is recommended that a legal framework be established to regulate the operations of both the government offices and their SOEs.

Enhancing Stakeholder Participation

The wide range of stakeholders in the IWT sector besides the government offices and academic research institutes includes ship owners, businesses with large transport needs, shipping companies, navigation-cum-hydropower owners, port users, shippers, and forwarders' associations. For major policy studies and formulation for the IWT sector and overall transport planning, it is important to have extensive stakeholder participation for the following reasons:

- (i) Different segments of the IWT sector have different information and experiences that may contribute to sound policy development and planning;
- (ii) the stakeholders may have better solutions than those from government officials and academic thinkers;
- (iii) any policy and planning will impact the stakeholders and, therefore, their views should be solicited to gauge impact and minimize mistakes; and
- (iv) extensive stakeholder participation will help gain popular support and facilitate policy implementation.

In today's logistics and business world, timely, qualified, and reliable information helps the relevant decision makers in the IWT industry make sensible transport mode choices. Besides media, enhancing the role of shippers and forwarders' associations in the two-way communication between the government and business sector may be efficient and cost-effective.



Conclusion

The efficient flow of people and goods is indispensable for a competitive economy. It is important for the transport sector to work horizontally, knocking down the walls between the different transport modes and the other planners for economic policies, land, and water resources. The private sector offers practical solutions to its transport needs and is a useful source of knowledge for the public sector's decision making. A public-private partnership on studies, planning, and policy formulation will contribute better results. As for SOEs, if government offices cannot be impartial and regulate within the law, SOEs may become fertile ground for corruption and low-standard performance.

Appendix: Multicriteria Analysis

Parameters, Ratings and Data

Parameter	Population Density (heads/km ²)	Household Density (CNY'000/head)	Urban Population (%)	Gross Input (CNY'000/head)	Fixed Assets Investment (CNY'000/head)	Primary Sector GDP (CNY'000/head)	Cut Wood (m ³ /km ²)	Secondary Sector GDP (CNY'000/head)	Industrial Total Assets (CNY'000/km ²)	Industrial Employment (m/head)
agreed Rating	10	1	3	9	4	8	2	8	6	6
Anhua County	182.9	58.1	25.3	14.6	8.6	3.5	19.0	6.1	24.3	0.65
Anren County	264.0	71.6	35.9	12.8	17.7	3.7	22.3	4.5	21.2	0.38
Anxiang County	484.4	135.8	32.6	23.7	12.1	5.6	24.1	6.1	95.7	0.47
Baojing County	160.4	40.0	32.6	14.6	52.2	2.4	2.3	7.5	21.8	0.67
Chaling County	229.6	58.9	47.8	20.1	25.6	4.5	15.7	8.3	50.3	0.30
Changning City	396.0	99.6	44.6	24.5	8.0	4.8	10.0	11.2	166.2	0.82
Changsha County	494.1	148.6	51.9	89.2	8.0	6.0	2.7	64.6	190.8	3.43
Chengbu County	95.6	30.6	26.1	10.3	194.9	3.7	59.7	3.6	8.8	0.64
Chenxi County	229.8	69.2	30.7	17.1	12.8	2.7	29.0	7.8	67.3	1.68
Cili County	173.9	60.7	34.1	18.8	7.4	3.3	11.2	6.6	34.8	1.70
Daoxian County	249.2	64.5	32.7	18.1	5.9	5.1	18.5	5.2	48.3	0.30
Dongren County	248.2	75.0	33.0	58.5	26.0	6.0	8.3	34.3	57.0	0.59
Dongkou County	353.9	120.2	29.8	13.3	11.3	5.3	67.6	4.4	59.5	0.32
Fenghuang County	198.9	50.9	26.0	13.4	7.3	2.1	4.2	2.3	12.0	0.06
Guidong County	157.3	44.5	31.3	8.6	11.0	1.6	56.8	2.7	10.3	0.18
Guizhang District	236.1	77.7	37.7	33.0	22.5	4.8	3.5	17.5	72.4	2.62
Guzhang County	99.8	27.3	32.2	11.6	8.0	2.5	16.4	3.2	7.0	0.24
Hanshou County	384.2	113.9	28.6	19.7	12.5	4.6	16.4	6.8	91.4	0.56
Hengdong County	328.0	85.4	31.1	27.6	10.5	5.3	53.1	11.5	91.9	0.71
Hengnan County	365.2	97.2	39.2	22.0	10.0	5.5	2.4	10.9	77.1	0.51
Hengshan County	248.5	65.8	32.2	25.2	12.6	5.9	2.3	8.8	101.9	0.61
Henyan County	442.2	118.5	32.6	19.4	10.1	5.0	13.0	8.1	140.7	0.51
Hongjiang City	181.5	58.6	36.0	17.8	15.8	3.6	46.3	6.7	73.3	1.29
Huarong County	441.1	119.8	38.4	30.5	7.5	6.7	41.1	15.3	246.6	1.42
Huayuan County	260.8	64.9	34.6	20.4	7.6	1.8	0.0	13.5	131.4	2.27
Huitong County	142.2	42.3	26.0	14.4	8.2	3.1	112.4	3.7	14.7	0.26
Jiahe County	427.3	140.4	38.3	32.3	16.4	4.5	14.8	16.8	214.1	1.44
Jianghua County	128.4	33.9	24.1	15.9	11.2	4.6	70.2	4.6	13.1	0.40
Jiangyong County	142.7	41.6	26.2	17.2	16.9	6.9	40.4	5.1	24.5	0.34
Jingshi City	450.9	146.6	61.6	34.6	19.0	6.3	4.1	16.7	317.2	2.31
Jingzhou County	111.0	30.7	41.5	20.4	8.3	4.4	115.6	7.7	25.8	0.38
Jishou City	286.4	91.0	71.0	31.7	17.2	1.7	0.8	10.9	86.6	2.29
Lanshan County	182.0	45.8	39.3	20.1	8.8	2.8	26.9	8.2	96.3	0.49
Leyang City	435.9	125.0	45.2	26.2	16.2	4.4	9.2	11.4	212.5	1.15
Lengshuijiang City	753.7	302.1	75.8	64.6	29.7	2.4	8.0	45.8	990.8	6.60
Lianyuan City	437.1	138.1	33.5	22.1	11.2	4.6	21.4	10.8	172.6	1.24
Liling City	439.8	114.6	48.5	41.7	20.2	4.0	1.5	27.3	722.3	2.33
Luli County	334.4	102.6	38.5	25.8	21.6	5.4	2.6	10.1	145.5	1.19
Linwu County	247.4	71.3	31.5	24.1	16.9	3.0	6.9	12.0	104.0	0.80
Linxian City	291.1	77.7	41.9	32.0	21.3	4.6	7.2	18.1	136.5	1.27
Liyuan City	256.5	74.7	46.9	63.1	33.9	5.6	33.3	44.8	273.4	2.36
Lixian County	480.8	164.7	26.9	20.4	3.5	4.7	4.6	8.1	80.5	0.57
Longhui County	382.4	119.7	22.5	9.6	7.9	2.8	25.4	2.8	37.3	0.17
Longshan County	161.0	46.9	30.3	9.8	5.6	2.7	0.0	2.3	11.5	0.23
Luxi County	177.2	52.1	36.0	17.5	6.4	2.2	0.9	10.7	74.6	0.84
Maying County	220.3	56.8	28.1	13.8	7.9	3.5	24.0	5.0	25.6	0.39
Miluo City	415.3	119.9	48.4	42.6	23.2	5.6	9.3	26.5	325.1	2.80
Nanxian County	551.1	194.3	37.1	21.4	4.6	6.9	15.0	6.9	127.2	0.70
Ningxiang County	402.1	132.8	44.3	62.7	42.1	7.3	15.5	42.9	297.0	2.58
Ningyuan County	281.1	73.2	34.1	12.7	10.9	3.4	15.7	4.6	45.9	0.44
Pingjiang County	230.4	62.8	33.6	17.3	15.1	3.6	34.3	8.2	75.0	1.03
Qidong County	524.9	151.1	35.4	18.0	7.0	5.0	6.3	7.1	110.6	0.62
Qiyang County	339.5	95.4	39.1	20.7	14.1	4.3	34.5	8.0	91.3	0.76
Rucheng County	137.1	45.9	28.0	11.3	11.5	2.6	45.8	4.4	26.8	0.66
Sanzhi County	110.4	37.7	32.7	14.7	8.1	2.0	13.3	3.5	12.7	0.39
Shaodong County	507.9	205.1	40.2	25.4	13.5	4.5	0.6	12.5	171.2	0.41
Shaoshan City	409.5	127.6	35.4	57.6	52.3	5.0	1.4	33.8	409.5	1.54
Shaoyang County	465.1	131.8	27.5	9.7	7.8	2.8	2.4	3.6	66.1	0.29
Shimen County	151.2	47.8	32.1	22.6	11.8	1.9	12.1	15.4	48.1	1.81
Shuangfeng County	499.5	165.6	23.0	17.8	9.2	5.9	11.1	7.3	131.3	0.63
Shuangpai County	95.2	31.5	35.3	22.5	55.3	6.7	43.6	10.2	38.5	1.22
Shupu County	215.9	64.5	29.8	13.9	8.2	3.2	25.1	5.2	41.6	0.55
Suining County	121.1	37.2	22.5	16.1	10.3	4.2	55.3	7.6	44.8	0.67
Taojiang County	374.6	125.0	34.1	19.6	11.3	3.9	154.4	9.4	108.8	0.90
Taoyuan County	192.1	61.6	28.4	23.9	10.1	6.6	8.4	18.9	215.0	1.63
Tongdao County	93.1	25.5	25.0	12.8	7.4	0.4	116.3	4.7	14.8	0.19
Wangcheng District	387.7	117.3	47.6	71.3	64.0	5.7	7.3	52.7	1064.7	25.82
Wugang City	484.0	157.0	31.6	12.2	8.1	4.9	0.0	2.6	60.1	0.28
Xiangtan County	332.1	108.5	30.5	27.2	12.1	5.7	4.8	13.8	157.6	1.01
Xiangxiang City	394.8	120.4	28.0	29.3	12.4	5.4	6.5	15.3	175.2	0.54
Xiangyin County	444.4	120.8	38.5	34.1	22.1	5.9	11.1	18.9	215.0	1.63
Xinhua County	206.3	87.6	24.8	13.4	6.0	3.9	13.5	4.5	86.4	0.35
Xinhuang County	162.0	46.7	26.5	15.4	8.5	2.2	85.3	8.1	45.7	0.72
Xinning County	204.9	64.5	31.0	10.8	14.1	3.4	9.3	2.9	25.1	0.23
Xinshao County	421.6	131.6	26.4	11.6	11.2	3.2	17.0	4.5	81.1	0.63
Xintian County	328.8	92.8	28.9	14.5	10.3	4.3	21.8	4.1	70.7	0.36
Yanling County	99.6	25.7	38.5	21.0	28.9	3.2	57.9	10.9	53.7	0.95
Yishang County	280.3	75.9	37.1	17.9	7.7	2.8	5.8	10.5	136.6	1.56
Yongshun County	113.0	33.3	30.8	9.6	5.7	2.8	0.0	2.5	5.3	0.16
Yongxing County	289.6	88.1	38.1	37.3	23.5	3.6	28.3	24.0	121.3	2.28
Youxian County	261.6	70.3	48.1	36.3	22.5	5.6	21.1	20.0	137.7	1.55
Yuanjiang City	312.8	120.7	44.0	26.3	15.7	6.4	98.3	11.0	105.8	1.33
Yuanlin County	100.2	28.1	31.2	24.3	9.4	2.6	39.3	16.3	27.8	1.87
Yueyang County	247.1	62.9	38.3	26.4	7.7	5.5	4.3	13.3	99.5	1.61
Zhilang County	162.2	47.7	26.6	20.6	8.2	4.8	34.1	9.2	29.1	0.67
Zhongfang County	161.6	47.6	24.1	30.9	32.0	4.0	59.6	18.7	50.4	4.75
Zhuzhou County	208.3	66.2	24.3	27.7	16.6	5.4	9.8	14.5	57.2	0.88
Zixing City	124.2	42.2	57.1	66.0	44.1	5.2	79.7	46.3	145.8	5.01

Sources: Hunan Province Statistical Yearbook 2012; Consultants' calculations.



Ranked Data

Parameter	Population Density	Gross Input	Secondary Sector GDP	Primary Sector GDP	Industrial Total Assets	Industrial Employment	Fixed Assets Investment	Urban Population	Cut Wood	Household Density
Hunan County or City	(heads/km ²)	(CNY 1000/head)	(CNY 1000/head)	(CNY 1000/head)	(CNY 1000/km ²)	(m/head)	(CNY 1000/head)	(%)	(m ³ /km ²)	(units/km ²)
Fenghuang County	29	17	2	7	6	1	9	80	15	24
Yongshun County	9	3	3	19	1	2	4	60	1	8
Longhui County	62	2	6	18	23	3	17	88	58	64
Guidong County	17	1	5	2	4	4	38	56	74	16
Tongdao County	1	13	21	1	10	5	10	82	85	1
Xinning County	30	7	7	27	15	6	56	59	31	35
Longshan County	19	5	1	15	5	7	3	63	1	20
Guzhang County	5	10	8	12	2	8	18	51	47	3
Huitong County	14	20	12	22	9	9	23	79	83	15
Wugang City	82	11	4	58	37	10	22	54	1	84
Shaoyang County	80	4	11	20	38	11	15	72	9	75
Chailing County	34	41	44	49	31	12	77	10	45	29
Daokuan County	42	36	25	62	30	13	5	46	48	34
Dongkou County	59	15	15	65	36	14	42	65	78	67
Jiangyang County	15	29	23	87	14	15	64	77	67	13
Xinhua County	52	16	18	38	49	16	6	83	40	51
Xintian County	55	21	13	44	40	17	35	66	53	54
Jingzhou County	8	45	36	45	17	18	26	18	84	6
Anren County	46	14	16	34	11	19	67	34	54	43
Sanzhi County	7	24	9	6	7	20	21	47	39	11
Mayang County	33	18	22	29	16	21	16	69	55	26
Jianghua County	12	26	20	50	8	22	41	85	79	9
Shaodong County	86	61	63	48	74	23	54	19	2	88
Ningyuan County	48	12	19	28	28	24	37	40	44	44
Anxiang County	83	56	27	74	54	25	48	49	56	77
Lanshan County	26	42	43	36	48	26	46	25	60	17
Hengyang County	77	38	41	61	68	27	32	48	38	63
Hengnan County	60	50	56	70	45	28	31	44	10	56
Xiangxiang City	65	69	68	66	76	29	49	71	21	68
Shupu County	32	19	24	25	25	30	24	64	57	36
Hanshou County	63	40	30	51	52	31	50	67	46	60
Lixian County	81	43	39	54	46	32	1	73	17	85
Dongxin County	40	83	83	81	34	33	78	45	27	46
Henshan County	41	60	46	78	56	34	52	52	7	38
Qidong County	87	35	32	60	60	35	8	35	20	83
Shuangfeng County	85	33	33	79	63	36	29	87	35	86
Xinshao County	70	9	17	23	47	37	40	76	48	74
Chengbu County	3	6	10	35	3	38	89	78	77	5
Anhua County	27	23	26	30	13	39	28	81	50	27
Rucheng County	13	8	14	13	19	40	44	70	70	18
Suining County	10	27	35	41	26	41	34	89	73	10
Beiding County	18	22	34	11	12	42	85	50	8	12
Zhijiang County	22	46	47	56	21	43	25	74	63	22
Nanxian County	88	49	31	88	62	44	2	31	42	87
Hengdong County	54	67	61	64	53	45	36	58	72	50
Xinhuang County	21	25	40	9	27	46	27	75	81	19
Qiyang County	58	47	38	43	51	47	55	20	65	55
Linwu County	39	57	62	21	57	48	63	55	22	42
Changning City	66	59	59	55	73	49	19	14	33	57
Luxi County	24	31	53	8	43	50	7	32	3	25
Zhuzhou County	31	68	67	68	35	51	62	84	32	39
Taojiang County	61	39	48	37	59	52	43	41	86	71
Yanling County	4	48	55	24	33	53	79	23	75	2
Xiangtan County	56	66	66	76	72	54	47	62	18	59
Pingjiang County	36	30	42	31	44	55	57	42	64	32
Leyang City	72	63	60	46	78	57	60	13	29	72
Linli County	57	62	49	67	70	58	71	21	11	58
Shuangpai County	2	52	50	85	24	59	87	37	69	7
Lianyuan City	73	51	54	53	75	60	39	43	52	78
Linxiang City	51	73	75	52	65	61	70	17	23	48
Hongjiang City	25	32	29	32	42	62	59	33	71	28
Yuanjiang City	53	64	58	83	58	63	58	16	82	69
Huanong County	76	70	69	86	81	64	12	24	68	65
Jiahe County	71	74	73	47	79	65	61	27	41	79
Shaoshan City	68	82	82	59	86	66	86	36	5	73
Youxian County	45	78	78	73	67	67	73	9	51	41
Yizhang County	47	34	52	17	66	68	65	30	19	47
Yueyang County	38	65	64	69	55	69	14	26	16	33
Xiangyin County	78	76	77	77	80	70	72	22	34	70
Chenxi County	35	28	37	16	39	71	53	61	61	40
Cili County	23	37	28	26	22	72	11	39	36	30
Taoyuan County	28	55	45	84	18	73	33	68	28	31
Shimen County	16	53	70	5	29	74	45	53	37	23
Yuanlin County	6	58	71	14	20	75	30	57	66	4
Huayuan County	44	44	65	4	64	76	13	38	1	37
Yanxiang County	50	79	79	33	61	77	76	28	59	52
Jishou City	49	72	57	3	50	78	66	2	4	53
Jingshi City	79	77	72	82	84	79	68	3	14	81
Liling City	74	80	81	40	87	80	69	7	6	61
Liuyang City	43	85	85	71	82	81	82	12	62	45
Ningxiang County	67	84	84	89	83	82	83	15	43	76
Guliyang District	37	75	74	57	41	83	74	29	13	49
Miluo City	69	81	80	72	85	84	75	8	30	66
Changsha County	84	89	89	80	77	85	20	5	12	82
Zhongfang County	20	71	76	39	32	86	81	86	76	21
Zixing City	11	87	87	63	71	87	84	4	80	14
Lengshuijiang City	89	86	86	10	88	88	80	1	26	89
Wangcheng District	64	88	88	75	89	89	88	11	24	62

Sources: Hunan Province Statistical Yearbook 2012; Consultants' calculations.



Rated Data and Prioritized Counties and Cities

Parameter	Population Density	Gross Input	GDP in Secondary Sector	GDP in Primary Sector	Industrial Total Assets	Industrial Employment	Investment in Fixed Assets	Urban Population	Cut Wood	Household Density	Total Points	Priority
Hunan County / City	(heads/km ²)	(CNY '000/ head)	(CNY '000/ head)	(CNY '000/ head)	(CNY '000/ km ²)	(nr./heads)	(CNY '000/ head)	(%)	(m ³ /km ²)	(units/km ²)	(ranking x rating)	(points ranked)
Ningxiang County	670	756	672	712	498	492	332	45	86	76	4,339	1
Wangcheng District	640	792	704	600	534	534	352	33	48	62	4,299	2
Changsha County	840	801	712	640	462	510	80	15	24	82	4,166	3
Miluo City	690	729	640	576	510	504	300	24	60	66	4,099	4
Xiangyin County	780	684	616	616	480	420	288	66	68	70	4,088	5
Jingshi City	790	693	576	656	504	474	272	9	28	81	4,083	6
Shaoshan City	680	738	656	472	516	396	344	108	10	73	3,993	7
Luyang City	430	765	680	568	492	486	328	36	124	45	3,954	8
Lengshuijiang City	890	774	688	80	528	528	320	3	52	89	3,952	9
Huarong County	760	630	552	688	486	384	48	72	136	65	3,821	10
Liling City	740	720	648	320	522	480	276	21	12	61	3,800	11
Jiahe County	710	666	584	376	474	390	244	81	82	79	3,686	12
Youxian County	450	702	624	584	402	402	292	27	102	41	3,626	13
Zixing City	110	783	696	504	426	522	336	12	160	14	3,563	14
Xiangtan County	560	594	528	608	432	324	188	186	36	59	3,515	15
Yongxing County	500	711	632	264	366	462	304	84	118	52	3,493	16
Xiangxiang City	650	621	544	528	456	174	196	213	42	68	3,492	17
Yuanjiang City	530	576	464	664	348	378	232	48	164	69	3,473	18
Dongtan County	400	747	664	648	204	198	312	135	54	46	3,408	19
Lixiang City	510	657	600	416	390	366	280	51	46	48	3,364	20
Leliang City	720	567	480	368	468	342	240	39	58	72	3,354	21
Lianyuan City	730	459	432	424	450	360	156	129	104	78	3,322	22
Guiyang District	370	675	592	456	246	498	296	87	26	49	3,295	23
Linli County	570	558	392	536	420	348	284	63	22	58	3,251	24
Shaodong County	860	549	504	384	444	138	216	57	4	88	3,244	25
Hongdong County	540	603	488	512	318	270	144	174	144	50	3,243	26
Zhongfang County	200	639	608	312	192	516	324	258	152	21	3,222	27
Nanxian County	880	441	248	704	372	264	8	93	84	87	3,181	28
Shuangfeng County	850	297	264	632	378	216	116	261	70	86	3,170	29
Anxiang County	830	504	216	592	324	150	192	147	112	77	3,144	30
Zhuzhou County	310	612	536	544	210	306	248	252	64	39	3,121	31
Changning City	660	531	472	440	438	294	76	42	66	57	3,076	32
Yueyang County	380	585	512	552	330	414	56	78	32	33	3,072	33
Hengyang County	770	342	328	488	408	162	128	144	76	63	2,909	34
Hengshan County	410	540	368	624	336	204	208	156	14	38	2,898	35
Taojiang County	610	351	384	296	354	312	172	123	172	71	2,845	36
Hengnan County	600	450	448	560	270	168	124	132	20	56	2,828	37
Taoyuan County	280	495	360	672	108	438	132	204	56	31	2,776	38
Qidong County	870	315	256	480	360	210	32	105	40	83	2,751	39
Lixian County	810	387	312	432	276	192	4	219	34	85	2,751	40
Jishou City	490	648	456	24	300	468	264	6	8	53	2,717	41
Qiyang County	580	423	304	344	306	282	220	60	130	55	2,704	42
Linwu County	390	513	496	168	342	288	252	165	44	42	2,700	43
Hanshou County	630	360	240	408	312	186	200	201	92	60	2,689	44
Shuangpai County	20	468	400	680	144	354	348	111	138	7	2,670	45
Yizhang County	470	306	416	136	396	408	260	90	38	47	2,567	46
Huayuan County	440	396	520	32	384	456	52	114	2	37	2,433	47
Pingjiang County	360	270	336	248	264	330	228	126	128	32	2,322	48
Zhijiang County	220	414	376	448	126	258	100	222	126	22	2,312	49
Shimen County	160	477	560	40	174	444	180	159	74	23	2,291	50
Yuanlin County	60	522	568	112	120	450	120	171	132	4	2,259	51
Dongkou County	590	135	120	520	216	84	168	195	156	67	2,251	52
Chenxi County	350	252	296	128	234	426	212	183	122	40	2,243	53
Chaling County	340	369	352	392	186	72	308	30	90	29	2,168	54
Xinshao County	700	81	136	184	282	222	160	228	96	74	2,163	55
Yanling County	40	432	440	192	198	318	316	69	150	2	2,157	56
Hongjiang City	250	288	232	256	252	372	236	99	142	28	2,155	57
Lanshan County	260	378	344	288	288	156	184	75	120	17	2,110	58
Jiangyong County	150	261	184	696	84	90	256	231	134	13	2,099	59
Xintian County	550	189	104	352	240	102	140	198	106	54	2,035	60
Wugang City	820	99	32	464	222	60	88	162	2	84	2,033	61
Daoxian County	420	324	200	496	180	78	20	138	98	34	1,988	62
Suining County	100	243	280	328	156	246	136	267	146	10	1,912	63
Xinhua County	520	144	144	304	294	96	24	249	80	51	1,906	64
Gil County	230	333	224	208	132	432	44	117	72	30	1,822	65
Xinhuang County	210	225	320	72	162	276	108	225	162	19	1,779	66
Shaoyang County	800	36	88	160	228	66	60	216	18	75	1,747	67
Luxi County	240	279	424	64	258	300	28	96	6	25	1,720	68
Anhua County	270	207	208	240	78	234	112	243	100	27	1,719	69
Anren County	460	126	128	272	66	114	268	102	108	43	1,687	70
Jianghua County	120	234	160	400	48	132	164	255	158	9	1,680	71
Ningyuan County	480	108	152	224	168	144	148	120	88	44	1,676	72
Jingzhou County	80	405	288	360	102	108	104	54	168	6	1,675	73
Shupu County	320	171	192	200	150	180	96	192	114	36	1,651	74
Baojing County	180	198	272	88	72	252	340	150	16	12	1,580	75
Mayang County	330	162	176	232	96	126	64	207	110	26	1,529	76
Longhui County	620	18	48	144	138	18	68	264	116	64	1,498	77
Chengbu County	30	54	80	280	18	228	356	234	154	5	1,439	78
Rucheng County	130	72	112	104	114	240	176	210	140	18	1,316	79
Xinning County	300	63	56	216	90	36	224	177	62	35	1,259	80
Huitong County	140	180	96	176	54	54	92	237	166	15	1,210	81
Fenghuang County	290	153	16	56	36	6	36	240	30	24	887	82
Sanzhi County	70	216	72	48	42	120	84	141	78	11	882	83
Tongdao County	10	117	168	8	60	30	40	246	170	1	850	84
Guidong County	170	9	40	16	24	24	152	168	148	16	767	85
Guzhang County	50	90	64	96	12	48	72	153	94	3	682	86
Longshan County	190	45	8	120	30	42	12	189	2	20	658	87
Yongshun County	90	27	24	152	6	12	16	180	2	8	517	88

Sources: Hunan Province Statistical Yearbook 2012; Consultants' calculations.

References

- ADB. 2010. *Sustainable Transport Initiative, Operational Plan*. Manila.
- ADB. 2011. *Hunan Xiang River Inland Waterway Project*, Consultant's report. Manila (TA 7339-PRC).
- ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the People's Republic of China for the Hunan Xiangjiang Inland Waterway Transport Project*. Manila.
- E. Andersson. 2010. *Vind een weg of maak er een*. Evaluatie baten-lastendienst Rijkswaterstaat, Utrecht.
- Administration for Industry and Commerce of Hunan Province. 2013. Business License for Enterprise Legal Person [of HWTCIG], Duplicate Copy, Registration No. 30000000024595, (3-2) N, Changsha.
- Changning Transportation Bureau. 2010. *Changning Comprehensive Transport Twelfth Five-Year Plan*. Changning.
- Changning Transportation Bureau. 2010. *Changning Waterways Twelfth Five-Year Plan*. Changning.
- Z. Chuanglong. 2013. China's Small and Medium-Size Inland-River Port Development Countermeasures, *China Academic Journal*. Vol. 24, No. 5, May 2013.
- W. Chunyang. 2014. Empirical Study of the Correlations of Hunan Economic Development and IW, *Journal of Hunan University of Science and Engineering*. Vol. 35, No. 9, September 2014.
- Department and the Economic Commission of Hunan Province. 2010. Interim Measures of Hunan Province on Management of Special Guiding Funds. Accelerating the Process of New Industrialization.
- European Commission. 1998. Proposal for a Council Regulation (EC) on a community fleet capacity policy to promote inland waterway transport. COM (1998) 541 final.
- European Commission. 2011. White Paper "Roadmap to a Single European Transport Area – Toward a competitive and resource efficient transport system." COM (2011) 144 final.



- European Commission. 2013. Greening the fleet: reducing pollutant emissions in inland waterway transport. COM (2013) 623 final. Accompanying text to SWD (2013) 324 final.
- European Commission. 2013. NAIADES II—Toward quality inland waterway transport. COM (2013) 623 final. SWD (2013) 324 final—Communication.
- General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China. 2013. People's Republic of China Organization Code Certificate, Code: 18378999-8.
- Hunan Province Administration for Industry and Commerce (AIC). 1994. Notice for Pre-approval of Enterprise Name ((Xiang) Name Pre-approval [1994] No. 170). Changsha.
- Hunan Province Administration for Industry and Commerce (AIC). 1994. Notice on Incorporation of Hunan Xiangjiang Navigation Construction Development Co., Ltd. (XJRLJZ[1994] No.430). Changsha.
- Hunan Province Administration for Industry and Commerce (AIC). 1997. Capital Credit Certificate issued on 17 November 1997. Changsha.
- Hunan Province Administration for Industry and Commerce (AIC). 2013. Application for Registration of Amendment to Limited Liability Company filed on 18 October 2013. Changsha.
- Hunan Province Administration for Industry and Commerce (AIC). 2013. Articles of Association of Hunan Provincial Water Transportation Construction & Investment Group Co., Ltd. Changsha.
- Hunan Province Administration for Industry and Commerce (AIC). 2013. Report on Name Inquiry Result issued on 28 October 2013. Changsha.
- Hunan Province Administration for Industry and Commerce (AIC). 2014. Enterprise Registration Document of the Administration for Industry and Commerce as collected on 21 August 2014. Changsha.
- Hunan Province Bureau of Statistics. 2003–2012. *Hunan Province Statistical Yearbooks 2003 and 2012*. Changsha.
- Hunan Province Bureau of Statistics, Accounting Office. 2014. Hunan to build comparatively well-off society by doubling the GDP? (湖南全面建成小康社会 GDP 要跑多快?). 10 November 2014. Changsha.
- Hunan Province Department of Communications. 1994. Notice on Establishment of the Board of Directors of Hunan Xiangjiang Navigation Construction Development Co., Ltd. (XJRLJZ [1994] No. 431). Changsha.



- Hunan Provincial Communication Planning Survey and Design Institute, Hunan Hydro Power Design Institute (HHPDI). 2007. Xiang River Main Stream Waterway Development Planning Report. Changsha.
- Hunan Provincial Communication Planning Survey and Design Institute, Hunan Hydro Power Design Institute (HHPDI). 2013. First Assessment Report of External Monitoring on Land Acquisition and Resettlement for Tugutang Navigation and Hydropower Complex, Social Monitoring Report. August 2013. Changsha.
- Hunan Provincial Communication Planning Survey and Design Institute, Hunan Hydro Power Design Institute (HHPDI). 2010. Xiang River Tugutang Navigation–Hydropower Generating Complex Feasibility Study Report, Supplementary Report based on Site Evaluation and Survey by the National Development and Reform Commission. December 2010. Changsha.
- Hunan Provincial Communication Planning Survey and Design Institute, Hunan Hydro Power Design Institute (HHPDI). 2010. Xiang River Tugutang Navigation–Hydropower Generating Complex Feasibility Study Report, Volume I: Introduction (Survey). August 2010. Changsha.
- Hunan Provincial Communication Planning Survey and Design Institute, Hunan Hydro Power Design Institute (HHPDI). 2010. Xiang River Tugutang Navigation–Hydropower Generating Complex Feasibility Study Report, Volume II: Necessity and Feasibility of the Construction. August 2010. Changsha.
- Hunan Provincial Communication Planning Survey and Design Institute, Hunan Hydro Power Design Institute (HHPDI). 2010. Xiang River Tugutang Navigation–Hydropower Generating Complex Feasibility Study Report, Volume IV: Treatment and Supporting Projects for Reservoir Flooding. August 2010. Changsha.
- Hunan Provincial Communication Planning Survey and Design Institute, Hunan Hydro Power Design Institute (HHPDI). 2010. Xiang River Tugutang Navigation–Hydropower Generating Complex Feasibility Study Report, Supplementary Report. January 2010. Changsha.
- Hunan Provincial Department of Transport (HPDOT). 2007. Xiang River Main Stream Waterway Development Planning Report. December 2007. Changsha.
- Hunan Provincial Department of Transport. 2007. Layout of the Development of Xiang River's Main Channel, Changsha.
- Hunan Provincial Department of Transport (HPDOT). 2013. Notice on the Corporate Registration Amendment of Hunan Waterway Transport Construction and Investment Group (HWTCIG). Changsha.
- Hunan Provincial Department of Transport. 2013. Official Reply from Hunan Department of Transport Concerning the Establishment of HWTCIG. Changsha.



- Hunan Provincial Department of Transport (HPDOT) and Hunan Provincial Department of Finance. 2014. Notice of Hunan Provincial Department of Transport and Hunan Provincial Department of Finance on Issuing the Implementation Plan of Hunan Province on Standardized Renovation of Old Rural Ferries/XJA [2014] No. 116. Changsha.
- Hunan Provincial Department of Transport (HPDOT). 2014. Notice on Forwarding the Notice on Issuing the Administration Measures on Subsidies for Ship-Class Standardization of Inland Waterway Ships/TBH [2014] No. 40. Changsha.
- Hunan Provincial Government. 2013. Notice on the Establishment of Hunan Waterway Transport Construction and Investment Group (HWTCIG). Changsha.
- Hunan Provincial Government. 2008. Implementation Measures on Regulation of the People's Republic of China on the Administration of Navigable Waterways in Hunan Province. Changsha.
- Hunan Provincial Government. 2013. Notice on Issuing the Administrative Measures of Hunan Province on Approval for Allocation of Special Fiscal Funds at the Provincial Level (Trial). Changsha.
- Hunan Provincial Government. 2013. Notice on the Establishment of Hunan Waterway Transport Construction and Investment Group (HWTCIG). Changsha.
- Hunan Provincial Government. 2005. Several Opinions of the People's Government of Hunan Province on Encouraging, Supporting and Guiding the Development of Individual and Private Economy and Other Non-Public Sectors of the Economy. Hunan.
- Hunan Provincial Party Committee and Provincial People's Government. 2014. Several Opinions of the Provincial Party Committee and the Provincial People's Government about Accelerating the Process of New Industrialization.
- Hunan Provincial Water Transport Bureau (now: HWTAB). 2010–2013. *Hunan Waterway Transport Statistical Yearbooks*.
- Hunan Tongren Union Accountants Firm. 2013. Capital Verification Report of Hunan Xiangjiang Navigation Construction Development Co., Ltd. (XTRHSYZ [2013] No. 10201).
- Hunan Water Transportation Construction & Investment Group (HWTCIG). 2014. Hunan Province Xiang River Tugutang Complex Project: (Second)-Songbai Port and Yunji Port Construction Budget. July 2014. Changsha.
- Ministry of Finance, Ministry of Transport: Notice on Issuing the Administration Measures on Subsidies for Ship-Class Standardization of Inland Waterway Ships/CJ [2014] No. 61. 2014.



- Ministry of Finance. 2014. Measures on Liquidating and Distinguishing the Stock of Local Government Debt under Supervision of Budget Law. Beijing.
- Ministry of Transport. 2011. Implementation Opinions on Carrying out Proposals of the State Council on Accelerating Development of Waterway Transport on Yangtze River and other Inland Rivers/IJSF [2011] No. 76. Beijing.
- Ministry of Transport. 2001. Management Measures on Subsidy on Ship-Class Standardization on Inland Waters. Beijing.
- Ministry of Transport. 2013. Ministry of Transport's Guiding Opinions on Promoting the Development of Green, Recycling-Oriented, and Low-Carbon Transportation. Beijing.
- Ministry of Transport. 2006. National Outline for the Development of Ship-Class Standardization on Inland Waters. Beijing.
- Ministry of Transport. 2007. National Plan for the Distribution of Inland Waterways and Ports. Beijing.
- Ministry of Transport. 2013. Notice of the Ministry of Transport on Issuing the Action Plan of Accelerating Development of Waterway Transport on Yangtze River and Other Inland Rivers/JSF (2013) No. 536. Beijing.
- R. Narayan, G. Raghuram. 2005. *Viability of Inland Water Transport (IWT) in India*. Bombay Ahmedabad.
- National Development and Reform Commission. 2013. Administrative Measures on Investment Grants and Subsidies on Interest Payment within National Budget. July 2013. Beijing.
- National People's Congress. 2014. Budget Law of the People's Republic of China, 2014.
- People's Bank of China. 1996. Lending General Provisions of People's Bank of China.
- People's Government of Hunan Province. 2012. Implementation Plan for Pollution Prevention and Control in Zhuzhou Section of Xiangjiang Changsha Comprehensive Junction Reservoir Area.
- Regering van Vlaanderen, Besluit van de Vlaamse Regering houdende de omschrijving van de territoriale bevoegdheid van Waterwegen en Zeekanaal. June 2004.
- Regering van Vlaanderen, Besluit van de Vlaamse Regering tot het aannemen van de statuten van het agentschap Waterwegen en Zeekanaal. April 2004.
- Rijkswaterstaat Nederland, Beheerkader Netwerken Rijkswaterstaat. June 2010.



- Standing Committee of Hunan Provincial People's Congress. 2004. Implementation Measures on Water Law of the People's Republic of China in Hunan Province.
- Standing Committee of Hunan Provincial People's Congress. 2010. Regulations of Hunan Province for Administration of Waterway Transportation.
- Standing Committee of Hunan Provincial People's Congress. 2012. Regulations on Xiang River Protection of Hunan Province.
- State Council. 2006. Opinions of the State Council on Accelerating the Development of Water Transport on the Yangtze River.
- State Council. 2011. Accelerating the Development of Inland Water Transport on the Yangtze and other Rivers, Opinion No. 2 of the State Council of the People's Republic of China.
- State Council. 2011. Action Programs (Year 2013–2020) on Accelerating the Development of Water Transport on the Yangtze River and Other Inland Waters.
- State Council. 2014. Opinions of the State Council on Strengthening the Administration of Local Government Debt.
- State Council. 2012. Regulations on the Administration of Domestic Waterway Transport/ Order No. 625 of the State Council of the People's Republic of China.
- The World Bank. 2005. Project Performance Assessment Report, People's Republic of China, Inland Waterways, (Credit 3910-CHA). 5 December 2005.
- UNESCAP. 2004. Manual on Modernization of Inland Water Transport for Integration within a Multimodal Transport System. United Nations. New York.
- Vertrag zwischen Bundesrepublik Deutschland, Freistaat Bayern und Rhein-Main-Donau. 1952. Aktien-gesellschaft über die Bereinigung konzessionsrechtlicher Fragen (Bereinigungsvertrag).
- Water Transport Bureau, Ministry of Transport. 2013. Announcement on issuing the Implementation Plan for Promoting Ship-Class Standardization of Inland Waterway Ships Nationwide during the 12th 5-Year Plan/Announcement [2013] No. 50 of the Ministry of Transport. Beijing.
- Waterwegen en Zeekanaal and NV De Scheepvaart. 2010. Masterplan voor de binnenvaart op de Vlaamse waterwegen. Horizon 2020.
- Waterwegen en Zeekanaal, Jaarboek 2013, Willebroek. May 2014.



- L. Xiaoping. 2013. Management Problems and Countermeasure of the County Ports, *Journal of Transportation Enterprises Management*, No. 1006-8864.
- XPI. 2011. Executive Measures to Further Accelerate Waterway Development of Hunan People's Government, No. 35.
- M. Yu, N. Wenbin. 2012. Construction and Development Model of Inland Port, *Jiangsu Commercial Forum*. pp.57-59. March 2012.

Promoting Inland Waterway Transport in the People's Republic of China

The People's Republic of China (PRC) has the world's longest inland waterway system. Despite the system's potential and the government's policies encouraging its development, inland waterway transport (IWT) has not been developed as much as other transport modes. This publication examines the constraints in developing IWT based on a study in the PRC's Hunan province. Six major challenges threatening the viability of IWT and its integration into the whole logistics chain have been identified. The analyses and case study lead to recommendations that are relevant not just to the PRC but also to other developing countries.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to half of the world's extreme poor. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.



ASIAN DEVELOPMENT BANK

6 ADB Avenue, Mandaluyong City

1550 Metro Manila, Philippines

www.adb.org