Plan and Implementation Support for Commercialization of NW-1

Summary of 1st Pilot Movement

Haldia to Patna / DALMIA

HPC

Uniconsult
Universal Transport Consulting GmbH

26th April 2017 (revised 07th July 2017)

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Table of Contents

List of Figures

Page

List of Tables

Page

1 Introduction

Effective and reliable transportation systems are among the main drivers of growth and of foremost importance for the economic development of any nation. In Europe and Northern America, inland waterway transport (IWT) has thereby a long tradition as an economically efficient and also environmentally friendly mode for the transport of various kinds of cargoes and goods. More recently, also several Asian countries including China and Vietnam have refocused on the development of IWT as part of their national transportation systems.

In India with its large network of rivers, canals and backwaters, the National Government also intends to increase the use of IWT and to exploit the potential that this mode of transport offers for the country's growing economy. During recent years, the Indian Government and the Inland Waterways Authority of India (IWAI) as the statutory authority in charge of inland waterways have therefore undertaken major efforts to enhance the navigability and boost freight movements on India's inland waterways.

While the country's modal share of IWT is still rather low when compared to some other countries, interim endeavors start to show first results with freight volumes on India's National Waterways increasing continuously. In order to foster both, a sustainable and commercially viable future development of the sector, the competent authorities have invited external expertise for a project on *Plan and Implementation Support for the Commercialization of National Waterway-1* (NW-1). Within the scope of the project, the Consultants' team of experts engages in direct talks with potential shippers and vessel operators. Moreover and in order to prove operational viability of IWT on NW-1, pilot movements are arranged and conducted.

In order to provide a sound basis for further project work, the given report presents a summary of operational and planning procedures regarding the first pilot movement of 370 metric tons of cement from Haldia, West Bengal to Patna, Bihar. Due to insufficient water depth on the final stretch of the transport, 110 metric tons of bagged cement had to be unloaded in Bhagalpur, Bihar. Thus, the barge continued with 260 metric tons upstream from Bhagalpur, Bihar to final port of call at Patna, Bihar.

Due to the itinerary of the movement covering approximately two thirds of NW-1 as well as the exemplary character of the commodity type, the first pilot movement provides a well-suited case study for detecting still existing infrastructural and/or organizational barriers that have to be addressed in developing viable O-D pairs. Considering these practical experiences and also building upon the interim findings of the current project's ongoing field work as well as the Consultant's profound knowledge of the Indian IWT market, the report provides implementation-oriented recommendations for creating the necessary conditions for a sustainable development of IWT transports on NW-1.

In the following, Chapter 2 gives a short review of the general background of this first pilot movement. Chapter 3 presents the main financial issues while Chapter 4 highlights operational aspects. Based on these findings, crucial success factors and relevant requirements for commercially viable transport flows and their technical feasibility are discussed and recommendations on urgent need for action are derived.

2 Preparation of Pilot Movement

Dalmia Cement Limited, a subsidiary of Dalmia Bharat Limited, is one of India's leading cement producers. With the group's corporate headquarters being located in New Delhi, the company operates cement production facilities at different locations, inter alia in the southern Indian states of Tamil Nadu and Andhra Pradesh.

In addition to its own cement manufacturing plants the company also owns a major 74.6% stake in Orissa Cement (India) Limited (OCL), which operates cement production facilities at three locations in the states of Odisha and West Bengal. With the acquisition of the brands Adhunik Cement and Calcom Cement, the Dalmia Bharat Group moreover strengthened its market position in North Eastern India. Beside its cement business the Dalmia Bharat Group is also active in a number of other industries, including the sugar and energy sectors. It has been stated in previous discussions that also for these industry branches IWT might be of interest.

In line with the overall development of the Indian economy, the country's cement industry has recently experienced significant growth. Despite per capita consumption of cement still being rather low compared to the world average, increasing investments in the national infrastructure contributed to a sustained growth of the cement sector of approximately 7% over the 2010-2015 period with the Indian cement market now ranking No. 2 in the world.[1]

With cement manufacturing plants frequently located in the vicinity of the raw materials' places of origin, transport solutions at the input stage of the production chain are often rather lean and corresponding freight costs comparatively low. However since the demand for cement products in India is mainly catered by the retail segment, efficient distribution solutions for the cement produced are among the key success factors in the industry.

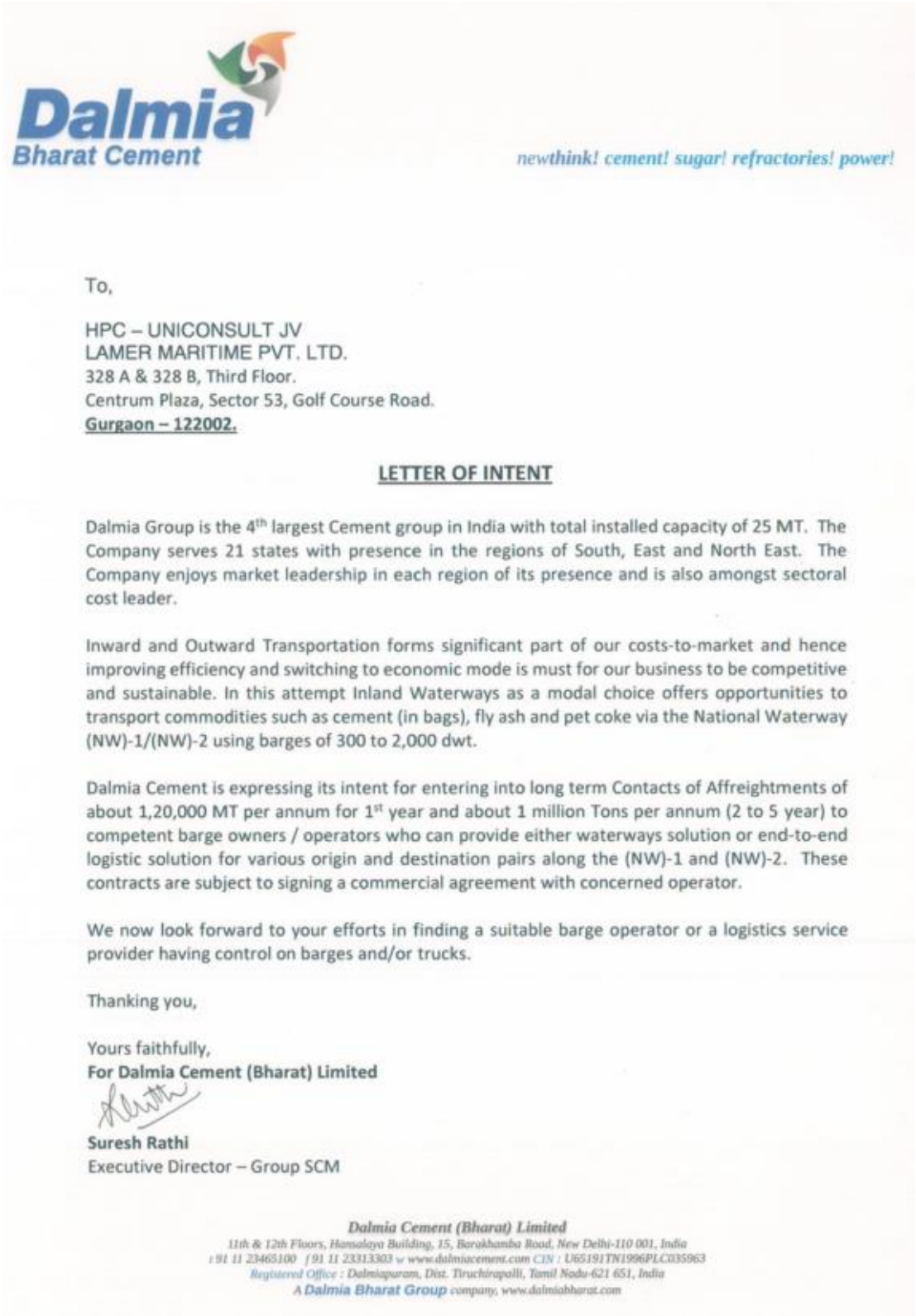
Given the specifics of the commodity and the nature of the company's current cargo movement pattern, Dalmia Cement believes that IWT meets the requirements to become both, an efficient and reliable mode of transport for the distribution of its cement products, offering substantial advantages in cost effectiveness compared to road and rail transport. The company therefore shows an interest to make use of inland waterway shipping and the National Waterways for an economical and sustainable freight transport.

Being aware of the potential advantages of IWT and following some days of discussion, Dalmia Cement agreed to participate in an initial pilot movement on the transport of 370 tons of cement from Haldia, West Bengal to Patna, Bihar. Normally these transports are thereby inter alia performed by train with first and last mile transport by truck and total transport duration of approximately one week.

Moreover, and in addition to agreeing on the first pilot movement, the company also expressed its intention to do three back to back cargo movements from Kolaghat, West Bengal to Bhagalpur, Bihar and has provided a Letter of Intent on entering into a long term contract with competent vessel operators who can provide reliable waterway transport or end to end logistics solutions for O-D pairs on NW-1.

[1] Dalmia Bharat Group (2016), Investor Presentation February 2016.

Figure 1: Dalmia's Letter of Intent for Long-Term Contract



Dalmia Bharat Cement

newthink! cement! sugar! refractories! power!

To,

HPC – UNICONSULT JV
LAMER MARITIME PVT. LTD.
328 A & 328 B, Third Floor.
Centrum Plaza, Sector 53, Golf Course Road.
Gurgaon – 122002.

LETTER OF INTENT

Dalmia Group is the 4th largest Cement group in India with total installed capacity of 25 MT. The Company serves 21 states with presence in the regions of South, East and North East. The Company enjoys market leadership in each region of its presence and is also amongst sectoral cost leader.

Inward and Outward Transportation forms significant part of our costs-to-market and hence improving efficiency and switching to economic mode is must for our business to be competitive and sustainable. In this attempt Inland Waterways as a modal choice offers opportunities to transport commodities such as cement (in bags), fly ash and pet coke via the National Waterway (NW)-1/(NW)-2 using barges of 300 to 2,000 dwt.

Dalmia Cement is expressing its intent for entering into long term Contacts of Affreightments of about 1,20,000 MT per annum for 1st year and about 1 million Tons per annum (2 to 5 year) to competent barge owners / operators who can provide either waterways solution or end-to-end logistic solution for various origin and destination pairs along the (NW)-1 and (NW)-2. These contracts are subject to signing a commercial agreement with concerned operator.

We now look forward to your efforts in finding a suitable barge operator or a logistics service provider having control on barges and/or trucks.

Thanking you,

Yours faithfully,
For Dalmia Cement (Bharat) Limited

Suresh Rathi
Executive Director – Group SCM

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Registered Office : Dalmiapuram, Dist. Tiruchirapalli, Tamil Nadu-621 651, India
A Dalmia Bharat Group company, www.dalmiabharat.com

Source: The Consultants/Dalmia 2017

The above mentioned Letter of Intent has been submitted to the JV of HPC-UNICONSULT on 9th February, 2017.

3 Financial Aspects

IWT freight charges for the main leg transport of the cement shipment transported during this initial pilot movement summed up to a total of INR 162,800 (excluding fuel cost), or INR 440 per ton.

In addition to the charges directly associated to the vessel transport, a number of other expenditures occurred for pre- and onward transport, intermediate storage and cargo handling. In total, these costs summed up to approximately INR 1,175 per ton (excl. Service Tax). Table 1 below presents a detailed breakdown of the costs of the first pilot movement.

Table 1: Freight and Transport Charges

Position (Cost Item)	Charges (INR per Ton, excl. Service Tax)
Truck transport from Medinipur to Haldia, West Bengal	INR 620
Unloading from truck at godown	INR 35
Hire of shed godown at Haldia port, West Bengal	INR 20
Loading into trucks for transport from godown to vessel	INR 35
Truck transport from godown to vessel	INR 120
Loading of vessel at Haldia, Bihar	INR 50
Vessel transport freight charges	INR 440
Unloading at Bhagalpur, Bihar	INR 120
Unloading at Patna, Bihar	INR 120
Last mile transportation cost at Patna (day/night shift)	INR 175 / INR 300

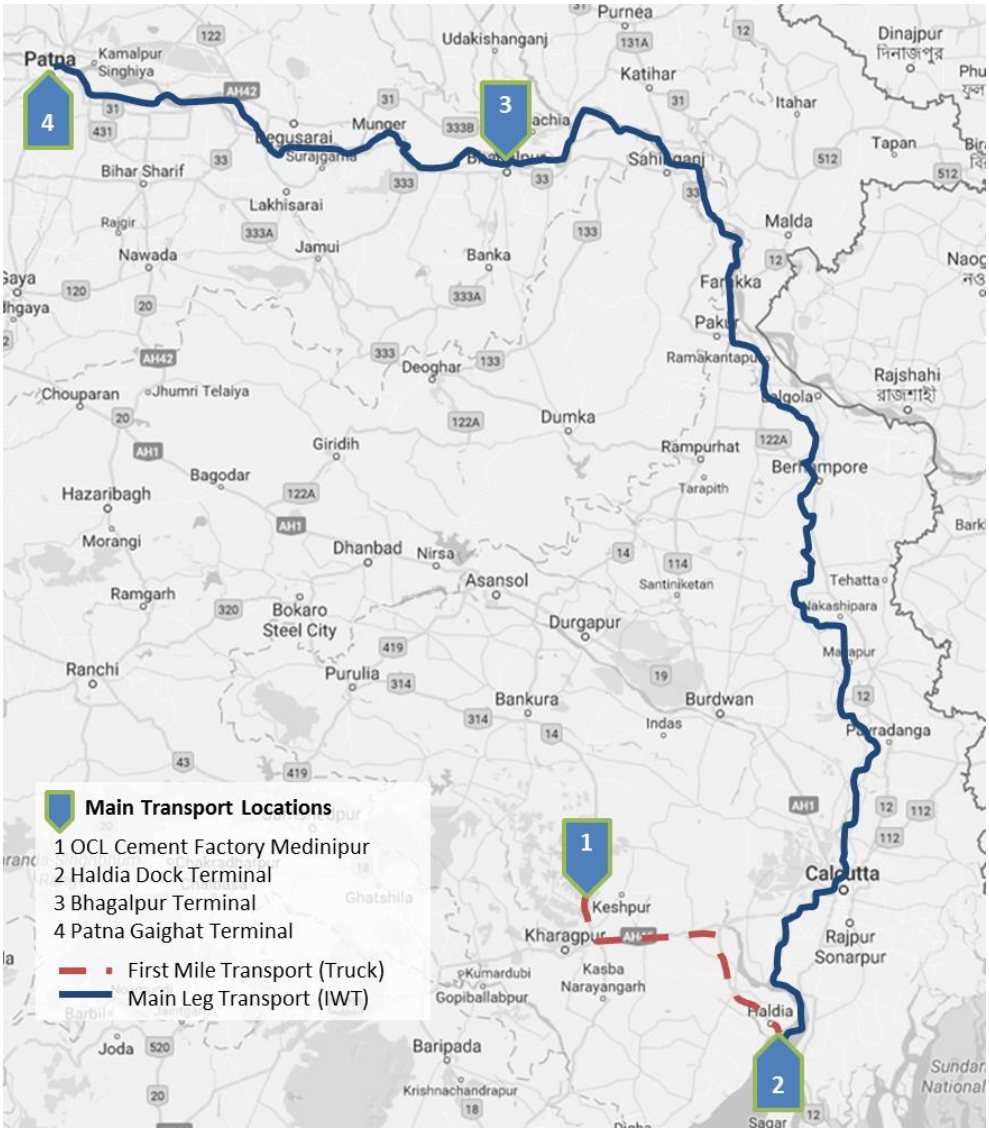
Source: The Consultants 2017

For this pilot movement, vessel transport freight charges mentioned above have been paid by Dalmia to charterer, whereas the rest of cost items have been paid by Dalmia to respective concerned parties.

4 Operational Aspects

As part of the ongoing public efforts to enhance the system of National Waterways and within the scope of the current project on the successful commercialization of NW-1, a first pilot movement of bagged cement was conducted in cooperation with IWAI, Spring Professional Services Pvt. Ltd. and Dalmia Cement (Baharat) Limited on the 920 kilometres stretch between Haldia, West Bengal and Patna, Bihar. With loading procedures starting on 2nd February 2017 and unloading being completed by 27th February 2017, the movement had an overall duration of 25 days. Figure 2 below shows movement plan of the movement.

Figure 2: Movement Plan Pilot Movement 1



Source: The Consultants 2017, based on Google Maps

The shipment of 370 tons of bagged cement originally originated at the cement production facility in Medinipur, West Bengal. The manufacturing plant belongs to Dalmia Cement's subsidiary OCL India Ltd. and has an installed cement capacity in the region of 1.35 million tons.[2]

[2] OCL India Limited (2016), Annual Report 2015-16.

Without direct waterway access at the Medinipur cement production facility, first mile transport to an appropriate waterway access point was required. In the case of the given pilot movement, first mile connectivity over a distance of approximately 130 kilometres to Haldia, West Bengal was realised by truck transport with first mile transport duration of approximately 6 to 8 hours. Following its arrival at Haldia Dock Terminal, the shipment had been stored in a local godown before being transported to the vessel loading site. Table 2 below summarizes operational characteristics of the first pilot movement.

Table 2: First Pilot Movement at a Glance

First Pilot Movement Haldia – Patna	
Shipper	Dalmia Cement Limited
Vessel Operator	IWAI
Charterer	Spring Professional Services Pvt. Limited
Vessel Name	M.V. Zakir Hussain
Commodity	Cement (bagged)
Cargo quantity	370 tons
Start of loading / Departure at Haldia	02|02|2017 / 05|02|2017
Arrival / End of Unloading at Patna	24|02|2017 / 27|02|2017

Source: The Consultants 2017

Transport on NW-1 was carried out by M.V. Zakir Hussain which is a 2009 built roro-inland waterway cargo vessel under possession by IWAI and assigned to the authority's Patna regional office.

Figure 3: Deployed Cargo Barge MV Zakir Hussain

Source: The Consultants 2017

4.1 Loading Procedures

Loading of the pilot movement at Haldia, West Bengal started on 2nd February 2017. Loading took place at the future Haldia Multi Modal Terminal location just outside Haldia Dock Terminal's main port area. With regard to the loading operation it was possible to take advantage of the vessel's deck mounted loading ramp, allowing trucks to bring the cargo directly on board the vessel were the bagged cement was then loaded off the trucks by local workers. In total a work force of 20 people has thereby been employed to process the pilot movement's loading operation.

Figure 4: Impression of Loading Operations

Source: The Consultants 2017

Altogether the loading procedure at Haldia Terminal took a total of two days. The operational process at Haldia, West Bengal was thereby hampered by tide-related fluctuations in water level that made it necessary for the transport vessel to temporarily cast off during the loading procedure before berthing again. Although loading procedures took longer than expected, the delaying impact has been somewhat reduced as loaded trucks remained on board the barge to be unloaded while the vessel anchored mid-stream during low tide.

4.2 In-transit Procedure

The main leg transport left Haldia Terminal on 5th February 2017. Fully loaded with 370 tons of cement the draught of inland waterway vessel M.V. Zakir Hussain summed up to a total of approximately 1.9-2.1 metres. Current draught limitations on NW-1 during the time of the pilot movement were specified with 2.2 metres on the sector from Haldia, West Bengal to Farakka Lock, 1.8 metres up to Munger, Bihar and 1.5 metres up to Patna, Bihar.

Following an intermediate stop including the unloading of 110 tons of cement at Bhagalpur, Bihar, the vessel's draught was reduced for the final part of the route. Still throughout the course of the transport, low water levels and infrastructural barriers in the sector upstream of Farakka Lock lead to a number of operational problems, including en route groundings.[3]

For the conduct of the pilot movement, the vessel was staffed with an on board crew of eight men. Night shifts were thereby hampered by a lack of labour force as well as broken and/or inadequate navigational aid systems. Fuel consumption of M.V. Zakir Hussain amounted to approximately 60-70 litres per hour, depending inter alia on the river's flow velocity. At the time of the pilot movement river current varied between 2-4 kilometres per hour.

With regard to official provisions and coordination with public authorities, no significant difficulties were encountered during the course of the pilot movement. In particular, this also applies to the issue of state-border crossings. Moreover no problems with cargo-documentation were experienced; however an E-Suvidha form was required for the pilot shipment of cement.

4.3 Unloading Procedure

The final destination of the pilot shipment of bagged cement was with local retailers in northern India, in particular in the state of Bihar. To facilitate last mile transport and in order to meet draught limitation in the upstream sectors of NW-1 up to Patna, Bihar, an en route stop at Bhagalpur, Bihar was included in the movement plan.

Figure 5: Unloading Location at Bhagalpur

Sources: The Consultants 2017

[3] See also Section 5 on Experiences and Findings.

As during the loading process at Haldia, West Bengal, M.V. Zakir Hussain's on board mounted ramp was used for the intermediate unloading of 110 tons of cement at Bhagalpur Terminal with local workers bringing the bagged cement off the vessel and loading it onto trucks parked on land. From the terminal site the cement was then trucked to local retailers or distributors in the Bhagalpur, Bihar region. Total idle time for the intermediate stop was three days (16th to 19th February 2017).

Patna, Bihar as the pilot movement's final destination was reached on 24th February 2017 with unloading taking place at the central Gaighat Terminal next to Mahatma Ghandi Setu. In the absence of an appropriate docking site at the river shore or a suitable jetty infrastructure, unloading was done using an on land mobile crane instead of the vessel's mounted ramp.

Unloading of the pilot movement's remaining shipload of bagged cement at Patna Gaighat Terminal was completed on 27th February 2017 with a total labour force of 18-25 workers being employed for the unloading operation. From the terminal site the cargo was directly transported onwards to local cement retailers in the Patna, Bihar region without intermediary storage in the harbour area. However some operating delays occurred as truck operators had no entry to the terminal site during day time.

Figure 6: Unloading Procedure at Patna

Sources: The Consultants 2017

5 Experiences and Findings

En route from Haldia, West Bengal to Patna, Bihar the pilot movement suffered a number of delays due to infrastructural bottlenecks on NW-1. Apart from the tide generated problems and yet to be improved IWT loading facilities at Haldia Dock Terminal, the predominant number of these obstacles were to be found on the National Waterway's northern stretches, upstream from Farakka Lock.

Throughout the course of the pilot movement, the cement shipment got repeatedly delayed due to missing or inadequate terminal facilities or loading/unloading sites. As described above, corresponding problems in the southern sector of NW-1 foremost included the heavily tide-depending and partly improvised loading operations at Haldia Dock Terminal.

On the National Waterway's upstream sector, operational delays in the unloading and onward transport of the cargo were inter alia caused due to existing restrictions in the truck operators' access to terminal sites during day time (e.g. at Patna Gaighat Terminal) and the availability of local workforce (at Bhagalpur, Bihar).

En route from Haldia, West Bengal to Patna, Bihar, Farakka Lock constitutes the junction between the Hooghly River System and the Ganges River. With the construction of a new lock underway and an extensive modernization of the existing lock in the planning, the current infrastructure constitutes a systematic bottleneck on NW-1. Besides the time needed for the actual locking event, operational hours are yet another limiting factor for smooth IWT transport. In the case of the given pilot movement, waiting time at Farakka Lock amounted to approximately 13 hours.

On the NW-1 stretch between Bhagalpur, Bihar and Patna, Bihar, floating pontoon bridges crossing the Ganges River at two locations near Goiaspur, Bihar and Fatuha, Bihar pose physical obstacles to smooth IWT operations. With currently existing procedures for opening of these bridges being slow, passing causes an average voyage delay of 4-6 hours. Moreover in the course of the pilot movement, public intervention was needed during passage of the pontoon bridges. This was due to the fact that local population opposed the opening as it causes interruptions to their daily working routine.

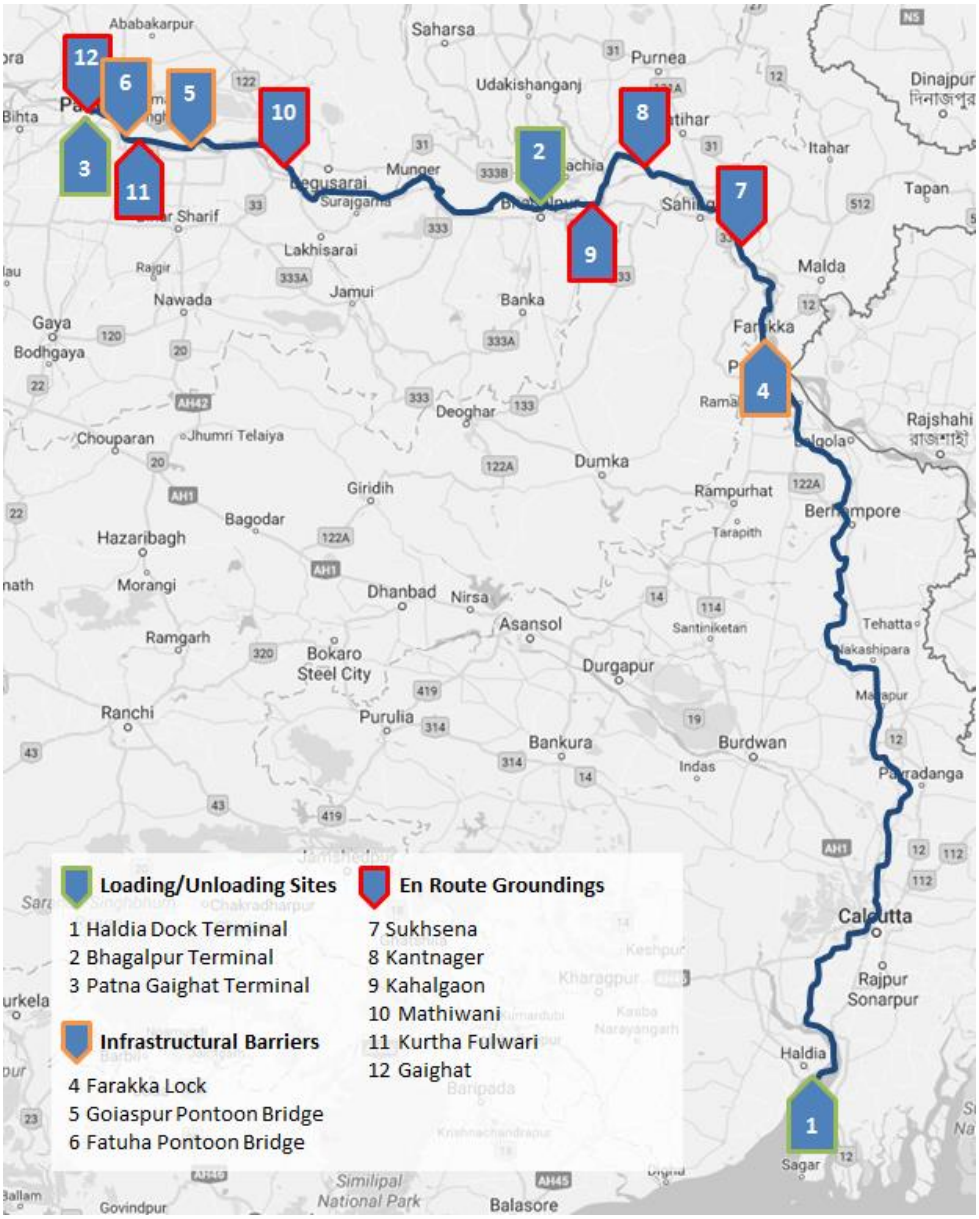
Figure 7: Impressions of Pontoon Bridge

Source: The Consultants 2017

On a number of stretches along NW-1, fixed navigational aid light infrastructure is generally available in order to facilitate night time navigation. In the event of the given pilot movement it was experienced that both sides' lights were not working properly at several locations, mostly on the sector upstream from Farakka, West Bengal. With these navigational aid systems being out of order, the movement experienced some navigational difficulties due to a lack of visibility during dawn light and night time hours.

With proper IWT terminal facilities still under construction or in the planning at a number of locations, adequate bunker fuelling stations are currently still unavailable at most places along NW-1. As for the current pilot movement the existence of such bottlenecks in the local fuel supply infrastructure made it necessary to perform a detailed and thorough pre-planning of on board fuel management, thus causing some limitations to smooth and flexible vessel operation.

Figure 8: Main Leg Transport by Inland Vessel



Source: The Consultants 2017, based on Google Maps

With water levels on NW-1 varying heavily by season, dredging and the maintenance of an adequate available draught is of major importance for an unhampered and smooth IWT operation. As stated above, specified draught limitations for the time of the pilot movement varied between 2.2 metres for the sector from Haldia, West Bengal to Farakka, West Bengal and 1.5 metres between Munger, Bihar and Patna, Bihar.

Yet, and despite a reduced vessel draught due to fuel bunker management and the unloading of 110 tons of cement at Bhagalpur, Bihar, the pilot movement experienced several en route groundings throughout the passage on the NW-1 sector upstream from Farakka, West Bengal. Namely groundings took place at six locations at Sukhsena (near Rajmahal, Jharkhand), Kantnangar, Kahalgaon, Mathiwani, Kurtha Fulwari (near Fathua, Bihar) and at Gaighat (near Patna, Bihar).

As described above, the pilot movement experienced several delays due to infrastructural bottlenecks that were mainly concentrated on the northern part of NW-1 upstream from Farakka Lock. However, and except for the tide dependency and the yet to be improved IWT terminal facilities at the loading site in the port of Haldia, West Bengal, it can be stressed that overall navigational conditions on the southern part of the National Waterway, in particular on the Hooghly River System downstream from Farakka Lock, were generally good, thus allowing a smooth and efficient transport by inland waterway vessel on this section of NW-1.

In India, institutional proceedings at state border crossings can often constitute a major obstacle when transporting cargo by truck. Corresponding interruptions in the transport process in addition to heavy road congestion thereby frequently cause major operational problems in road transport and can lead to delayed deliveries of goods. However, with regard to the lessons learned from the first IWT pilot movement it can be highlighted that no such issues or disruptions at state border crossings were experienced.

Compared to the costs directly associated to transport by inland vessel, first and last mile transport as well as handling charges often amount to a significant proportion of the overall transport costs in IWT based logistics solutions. With several terminals along NW-1 yet to be under construction or in the planning, terminal availability still constitutes some limitations to currently viable movement relations. Yet and despite the problems experienced, the first pilot movement demonstrated both, the general interest of potential private sector shippers in IWT based logistics concepts as well as the overall feasibility to conduct such transports on NW-1.

Subject to the readiness of appropriate loading infrastructures as well as the availability of transport vessels, further pilot movements are expected to take place in the near future. As they are planned to cover both, varying O-D pairs and different types of commodities, the upcoming trial transports may provide further insights and findings on existing infrastructural and/or organizational bottlenecks as well as on potential shippers' expectations with regard to IWT operations. Moreover further pilot movements may offer the chance to evaluate the effectiveness of public infrastructure and/or market development measures taken based on the interim findings of the ongoing project on commercialization of NW-1.

6 Recommendations

As illustrated by the statement of costs associated with the first pilot movement, first and last mile transport as well as rent and handling charges for storage, loading and unloading account for a major part of the overall costs of transport by IWT. In order to improve operational processes during loading and unloading of goods it is of foremost importance to enhance waterside as well as landside access to the terminals and improve local infrastructural facilities.

In order to lay the foundations for the development of commercially viable O-D transports it must be ensured that loading and unloading operations at NW-1's main terminals can be processed independent of tide implications or other external influences. Given the characteristics of the various kinds of commodities as well as the individual specifics of different types of vessels one may also consider to develop infrastructural facilities for both, loading by crane as well as by roro-ramp at the National Waterway's main IWT terminals.

Concerning landside pre- and onward connectivity of goods, 24/7 access for trucks should be ensured at all IWT terminals. Moreover the provision of additional shed storage room in the immediate vicinity of the main loading sites appears to be recommendable in order to reduce the need for extra transport from the godown to the vessel.

Whereas the necessary preconditions for an efficient and smooth IWT operation appear to be already largely in place on the Hooghly River Section of NW-1, the several en route groundings during the pilot movement demonstrated that further efforts have to be taken to ensure a sufficiently high degree of operational reliability on the Ganges River, upstream from Farakka Lock. This includes in particular the provision and maintenance of year-round reliable minimum water levels (e.g. through increased dredging), thus guaranteeing a sufficient draught as an inevitable requirement for an operationally reliable and cost efficient transport also by inland vessels carrying heavier loads.

In order to reduce transport durations and minimize en route idle times it is moreover recommended to extend the operational hours at Farakka Lock and implement enhanced procedures for opening of existing pontoon bridges. A timely repair of broken fixed navigational aid lights along the shores of NW-1 is needed to allow a smooth IWT operation also during dawn light and night hours.

Following the implementation of these most urgent and indispensable needs for action with regard to the infrastructural circumstances it is inter alia recommended for relevant authorities to lay the institutional grounds to engage in a direct and long term exchange with potential shippers in order to promote the use of IWT beyond the duration of this current project on the commercialization of NW-1. A market oriented IWT promotion unit can thereby also help the authorities to better understand the potential shipper's needs with regard to the transport of their goods and play an active part in the development of individual logistics solutions for specific O-D pairs.[4]

[4] Detailed recommendations on an IWT Promotion Centre India as part of a comprehensive IWT development strategy were inter alia provided in the Part C-Report of the recent IWT Sector Development Strategy and Business Development Study for Capacity Augmentation on NW-1.

7 Conclusion

The first pilot movement of 370 tons of cement from Haldia, West Bengal to Patna, Bihar demonstrated that IWT on NW-1 can be both environmental sustainable and operational efficient. Even though still existing infrastructural bottlenecks caused some delays and several operational challenges, the first pilot movement can nonetheless be considered a successful first step in the course of a successful and sustainable development of viable O-D pairs on NW-1.

By describing the challenges encountered throughout the course of this first pilot movement and by studying the corresponding lessons learned, the given short report aims to derive important starting-points and presents initial recommendations for improving the operational conditions on NW-1, thus providing the grounds for the development of a reliable and commercially viable transport by inland waterway vessel.

Among the most urgent needs identified are the year-round warranty of sufficient water-levels for unhindered navigation on the Ganges River upstream from Farakka, West Bengal as well as the improvement of terminal facilities and loading/unloading sites along the course of NW-1. Moreover extended operating hours at Farakka Lock and improved procedures for the opening of pontoon bridges as well as a timely repair and/or improvement of navigational aid light systems can help to reduce transport times and increase the operational reliability of IWT services.[5]

In order to attract further shippers to inland waterway vessel transport on NW-1 and to proof the transport mode's specific operational advantages, further pilot movements are planned to take place in the near future. In order to offset extra operational costs caused by still existing infrastructural shortcomings, gap funding has yet to be provided by public authorities if necessary. However, and in addition to promoting the use of IWT as an environmentally friendly and cost effective mode of transport, the upcoming pilot movements will also contribute to improve operational efficiency of IWT and develop the foundations for commercially sustainable and viable O-D pairs on NW-1.

[5] For further information on terminal sites and catchment areas, please see also the Part A-Report of the recent IWT Sector Development Strategy and Business Development Study for Capacity Augmentation on NW-1.