Watertruck and its opportunities for the construction industry

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Samenvatting

WATERTRUCK (WT) is een Europees project in het Interreg IVB NWE programma met partners uit Frankrijk, Nederland en België. WT beoogt het in de markt zetten van een nieuw transportconcept voor de binnenvaart op kleine vaarwegen (van CEMT Klasse I - 300 ton - tot en met CEMT klasse IV - max. 1500 ton). Het vaarconcept is gebaseerd op het inzetten van kleine duwbakken (tot 1500 ton) en kleine innovatieve duwboten. De twee belangrijkste kenmerken en voordelen ten opzichte van de traditionele binnenvaart met gemotoriseerde binnenschepen zijn het verdwijnen van de woonfunctie aan boord van de innovatieve, kleine duwboten enerzijds en anderzijds het loskoppelen van de laad- en losoperaties enerzijds en het varen anderzijds. WT heeft als doel de grootste bedreigingen van de hedendaagse, traditionele binnenvaart aan te pakken. Kleine binnenschepen (tot en met CEMT klasse IV) verdwijnen aan snel tempo uit de aanbodzijde van de transportmarkt. Tevens is er een gebrek aan personeelsinstroom in de binnenvaart op kleine vaarwegen. Het project onderneemt verschillende acties richting gebruikers en aanbieders en doorloopt verschillende stappen om het concept in de markt te introduceren. Zo onderzocht het enerzijds de nieuwe verladersmarkten die door het loskoppelen van de laad- en losoperaties van het varen kunnen worden aangeboord. Anderzijds werd een business model voor het concept opgemaakt.
WT bevordert een optimalere modal split door de binnenvaart een nieuwe boost te geven. Het voor- en natransport over de weg kan optimaal georganiseerd worden doordat de duwbak de nodige tijd (enkele dagen) ter plaatse kan blijven. Deze eigenschap zal zijn voordeel vooral bewijzen in grote stadscentra en zeehavens waar het wegverkeer vaak vast loopt. Zo kan ook het transport van bouwmaterialen over het water worden uitgevoerd, waarbij via een netwerk van watergebonden consolidatie en distributiecentra heel wat vrachtwagens van de weg kunnen worden gehaald.

1. Introduction

The project Watertruck (WT) aims at introducing a new and environmentally friendly transport concept for inland navigation on small waterways (from CEMT Class I - 300tonnes - up and including CEMT Class IV - max 1500 tons). The WT navigation concept is based on the deployment of small barges (up to 1500 tons) and small pushers.

The two most important characteristics and advantages in comparison to the traditional inland navigation with motorized inland vessels are: on the one hand no longer accommodation on board of the innovative, small pusher and, on the other hand, decoupling of loading/unloading from the navigation itself.

The WT concept aims at tackling the biggest threats of the current traditional inland navigation, i.e. the rapidly disappearing small inland vessels from the supply side of the transport market. It appears that small barges (200/300 tons) are virtually inexistent in Belgium and other countries. In general smaller vessels such as Spits and Kempenaar are on the verge of extinction. WT also intends to find a solution for the lack of intake of labour forces for inland navigation on small waterways. Additionally WT aims at improving inland navigation in city centers.

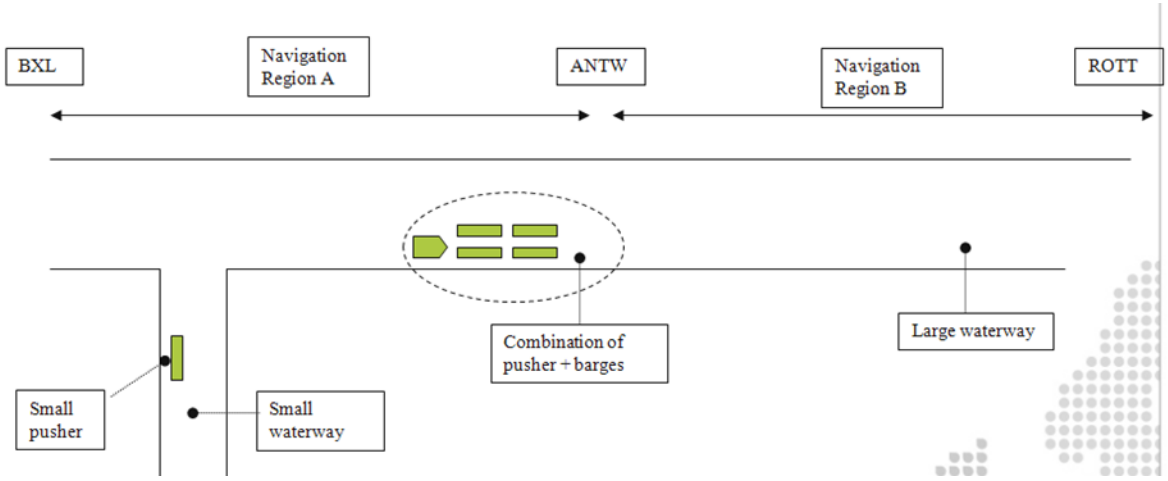

Fig. 1. WT concept

In order to introduce the concept to the market in a structured way, the project is divided in several actions all leading to one goal: the update of the new concept by the market, being the shippers, the transporters and skippers.

2. Applicability in Europe

2.1. WT identified new markets

Old as well as new markets have been thoroughly investigated with respect to their WT potential. Old markets are existing shippers markets that already use the waterway to transport their incoming and outgoing flows of goods. New markets are markets that do not use traditional inland navigation by motor vessels. New markets are today not using the waterway due to operational setbacks of traditional inland navigation vessels such as extreme short load/unload windows, supply shortage, etc.

In Belgium WT identified as direct potential the following markets: recycling materials; biomass and granulates and minerals. The following table gives an overview of the volumes, expressed in tons/year, for these markets in Belgium. Within the next three to five years, the WT-concept has an estimated potential of more than 4 million tons/year in Belgium. The most promising market is the market of recycling materials, with special focus on the sub-market ground works, closely followed by the bio-mass market.

"New" markets (tons/year)		
Total recycling materials	**3.330.000**	
ground works		2.550.000
construction waste		300.000
scrap		480.000
Total biomass market	**597.600**	
wood pellets and chips		597.600
"Old" markets (tons/year)		
Total granulates and minerals	**450.000**	
granulates and minerals		450.000
Grand total (tons/year)		
Grand Total	**4.377.600**	
Total "new" markets		3.927.600
Total "old" markets		450.000

Fig. 2. Grand Total of WT potential (tons/year) in Belgium

In France five main markets were selected and quantified as well as qualified namely recycling materials, sand & gravel, grain and fertilizers, steel industry and energy. The idea of a "Regular Pushing Line" or "River shortline" was considered as a good way to introduce WT, in particular during the time of constructing Seine-Nord Europe Canal, to prepare the sector to use to the fullest this new infrastructure.

Also in the Netherlands there is a market for WT, although the potential differs per segment. Four segments were identified: containers, building materials (sand and gravel), agricultural goods and waste. The advantage of the decoupling of loading/unloading of the vessel and the actual sailing is seen as a major advantage. Combining flows is the key for a potential success.

2.2. WT identified and selected flows

This market study combined desk research with in depth interviews with key players within several segments of the transport market. In investigating the market potential it

became clear that there is a potential for WT when some boundary conditions are fulfilled.

What makes WT so attractive is usually the fact that the barge can be used as a storage area. It appears that big urban communities offer the highest potential. Once you succeed in setting up a flow there will be undeniably opportunities to lower the unit-cost when combining several flows such as salt barge with soil, metal scrap, waste, etc. Outside these urban communities most respondents have doubts about the potential of WT. WT could offer a way to unlock smaller waterways but not in point-to-point flows unless it is possible to define specific hub areas. Between those hubs one could set up transports of multiple barges which are decoupled in the hubs. Of course this means that a significant flow is needed between those hubs in order to reduce the unit-cost.
The quick scan in the Netherlands has led to 7 different companies and flows that were promising for the WT concept. Further assessment of these flows finally led to 6 particular stretches for 4 different companies. Combining the flows of these companies into a round-trip network, using a pusher and 13 barges, the WT concept can be applied cost-effectively, compared to conventional inland navigation.
In France 3 companies gave enough clearance for in-depth business cases, involving 7 different flows. Decision on the part of these companies is yet to come on whether they shall start a WT scheme. There is good hope that a demonstration case may be started by a sand & gravel company, involving a possible 80 000t traffic.

All cases investigated in Belgium held in common that they deal with bulk deliveries (soil, salt, biomass, metal scrap, agricultural goods, building materials etc.). Apparently there doesn't seem to be a WT potential to transport pallets using barges. The problem seems to be the loading or unloading pallets from barges. First of all there doesn't seem to be nowadays an efficient way to handle pallets. Secondly security might also be an issue besides the fact that when loading or unloading pallet damage percentages can be very high. It is also clear that WT unit-cost is not always lower than road cost. Even in situations in which you would normally assume a high potential for WT.

For some companies an adequate implementation plan has been prepared by working out concrete and practical based business cases with an eye on economic and social impact. WT thus already identified three positive business cases: the intercompany transport of 2 different companies for which the WT solution has been considered as a valuable alternative for truck. Also a business case for a specific intermodal container route which may be implemented in the future has been elaborated. In this case, the WT business case has been compared with a business case based on traditional inland navigation integration. Also in this case advantages of the WT solutions were identified. Therefore, an implementation plan for the 3 business cases has been elaborated. An industrial pilot needs to be installed to test the presumed economic and practical feasibility.

2.3. WT Business model

WT investigated into developing a feasible sectorial business model, which allows making the difficult leap from an innovative transport and logistics concept towards a real business affair. WT used the Business Model Canvas (BMC) consisting of nine "building blocks", all containing a crucial aspect of the business model.

The value propositions of WT are: a reliable transport and logistics service provider and enabler of minimal logistical shipping costs. To assure this added value, 'how' (supply) and 'who' (demand) questions are deeply analyzed and answers were proposed. Studying the BMC, we must highlight that sustainable cash flows is one of the keys to the WT success. That is why cost price transparency is a must. Price setting will be based on value creation. Value creation can only be met if long term contracts are concluded and the WT operator can earn back his investments.

The study revealed the recommendation that WT must be set up as by the lean start-up methodology, for which it is crucial that the theoretical assumptions are tested in practice. Minimal Viable Services (MVS's), i.e. point-to-point connections, are almost immediately installed as real life business cases to make sure the expectations concerning value propositions and the growth model are redeemed: does WT offer real value to the shipper and is he prepared to pay for it? Can the service be multiplied?

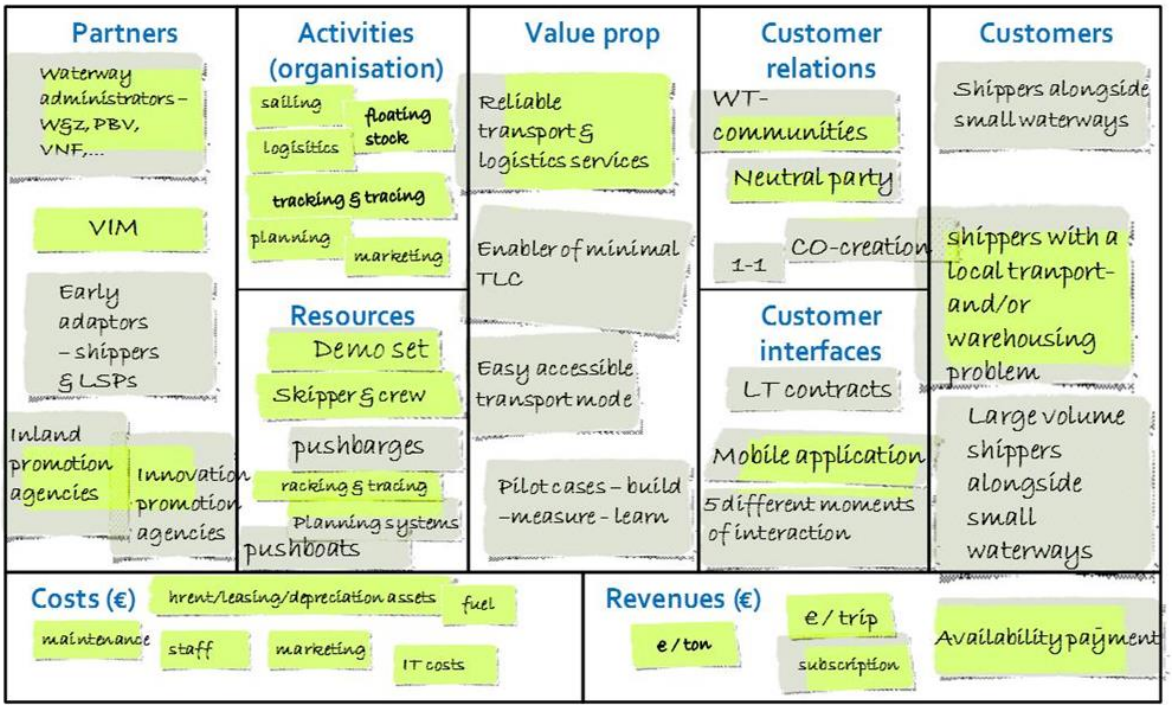

Fig. 3. WT business model

3. Operational procedures

3.1 Learnings V+

Based on an in-depth survey of existing push boat & push barge (PBPB) operations on large waterways (CEMT Class V and up) in Europe and abroad, a series of interesting and useful findings has been researched in order to support the implementation of WT concepts in the coming years. The research was carried out mainly by extensively interviewing major operators in France, the Netherlands and Belgium complemented by desk research resulting in a good understanding of PBPB operations in and outside Europe. It revealed that operational schemes and exploitation patterns as carried out by PBPB operators generate interesting downsizing opportunities for WT-patterns. The way assets and crew are organized is worthwhile to be looked at while defining feasible WT-patterns. Without any doubt planning and organizing will play an important role while implementing WT-patterns. This planning function is to be regarded as 'new' in the inland navigation environment on small waterways since operators today are mainly and exclusively focusing on their individual motorized small vessel under control of the exploiting family. The importance of setting up an adequate planning function coordinating small push boats and small push barges cannot be stressed enough while implementing WT-patterns.

The most important factor is without any doubt the usage of barges all having the same dimensions. WT-barges should belong to maximum 2 standard types, as it is the case for PBPB operations in Europe and USA where PBPB is very popular. WT started looking into the capacities first, with the aim to later define the dimensions.

3.2 WT investigated into the optimal set of WT-push barge capacities

In order to calculate the ideal barge capacities for future WT push barge, historic data on tracks from all inland shipment movements for 2011 was used. Data sets have been gathered from the 3 participating countries in the WT project: France, the Netherlands and Belgium. A model was created and after numerous iterations and calculations, the ideal set of two capacities came out: 300 and 700 tons. Discussions with some experts in the field revealed that homogeneous sizes for Europe are a key factor for successful implementation of the WT project.

3.3. How to cope with the lack of investments?

All shippers would like to see major investments to be made in order to provide push barge and push boat capacity into the market. Shippers indicate that delaying equipment investments could harm the market share of waterway transport. Transport companies and skippers are not denying investment needs, but indicate repeatedly that single actors have not enough investment capacities. Companies willing to offer WT solutions indicate that co-operation structures are needed. In this co-operation structures, ideally, public actors and private actor should work out solutions to lower investment thresholds. Another issue that refrains investments is the dilemma imposed by regulation and legislation. Inland navigation rules as applied today originated from traditional inland navigation environment not from WT patterns.

3.4. Flexibility is key

In most identified cases, flexibility is a critical success factor. The fact that navigation is decoupled from loading/unloading processes, creates a wide variety of operational

opportunities. Shippers that are considering implementation of WT patterns want to strengthen flow control possibilities. If the shipper is able to decide on where and when and how push barges are put in place, transport flows can be in a higher degree integrated into production systems and inventory optimization processes.

WT patterns often contain two distinctive components: a transport function is often combined with a flexible, integrated logistic component. The transport function focuses on massification where push barges (and related flows) are combined to achieve lower transport prices/ton while the flexible management of push barges nearby facilities is focusing on creating added value.

Clearly planning becomes another key-function in organizing WT patterns composed out of two distinctive functions transport and dedicated logistics. The planning service is to be regarded as 'new' in the small inland navigation world and can be filled in by a separate party similar to the 4PL – philosophy commonly used in road inspired supply chain solutions.

3.5. Broader chances for inland navigation crew

Interviewees see broader and better chances for attracting crew to operate WT patterns. The omission of the obligation to live and work aboard 24/24 and 7/7 creates good perspectives to find motivated crew. However skippers keep on stressing the important link between crew and equipment. WT calls for a young generation of crewmembers that prefer a 'normal quay side type of social live' above the traditional image of the fully independent skipper on the spot market.

3.6. Pilots executed by industry

WT continues to look for parties or companies such as shippers, transport companies, logistic and other service providers that are willing and able to organize, together with WT partners, industrial WT-pilots that clearly show and demonstrate the added value of the WT-concept to a wide public in a 'close to real-live' working environment. The pilot is to take place in the North West European area, locally (in France, Belgium or The Netherlands or transnationally before June 2014. The selected parties or companies are required to modify their own transportation and handling procedures so as to implement (temporarily) the WT-concept in their own organization. In return for the materialization and organization of such industrial pilots, the selected parties or companies will be awarded a grant.

With the support of WT, so far two real live pilots have been executed, one in Brussels and one from Oss (The Netherlands) to Gistel (Belgium). The Brussels pilot clearly illustrated the warehouse on water WT characteristic as the barge as waiting to be filled with sludge, transported to the quay over several days by several trucks. The second pilot illustrated the WT characteristic of combining several flows. Salt was first transported in convoy to Gistel. At Passendaele the barges were decoupled to be able to sail the last part of the trajectory on the small river. The return freight was scrap, the barges again assembled in Passendaele to be further transported to Kallo (Belgium). All shippers involved testified of positive learnings and have the intention to continue the transport of their goods by the WT concept.

3.7. Solution to current bottlenecks

At this moment it is not yet possible to deploy the WT concept widely. There are not enough barges available. Moreover those available are extensively used for other purposes and are often not suited for the transport of the freight identified. WT has therefore launched new research into cheap and quick production of barges.

On an operational level, further efficiency can be achieved by reducing the staff required to man the pusher. Legislation in the Netherlands e.g. requires a staff of three in push convoys of more than 86 m length. Manning rules should be regulated on a European level, the EU is already looking into them.

The initial investment costs will be high. An exploitation model needs to be developed in co-operation with one or more large inland shipping operators and/or logistics service providers. This will require a long-term commitment and stable flows on the network and the cooperation and participation of inland navigation managers and government.

Also when deploying WT it will be important that the installation of the Minimal Viable Services (MVS) will be evaluated. WT communities will be valuable for this evaluation. WT communities are platforms where customers – under the guidance of a neutral partner - are brought together and discuss (inter alia) the MVS. When several MVS have proved their added value and viability, loops can be created and the growth-model can be put in action.

WT will look into communities on a wider level and will prove the viability of the concept for certain regions. Industry and government (waterway managers) will be involved in this exercise. The outcome will be available by mid-2014.

3.8. WT can tackle many problems of the traditional small inland navigation market

WT is seen by most of the interviewees as a well-considered concept that can offer both transport and logistics solutions for small inland waterways. One of the most important reasons is that WT gives shippers the possibility to regain control of the supply chain and offer optimal planning possibilities thanks to the decoupling possibilities with respect to the sailing and the (un)loading process, the floating stock feature, the fact that skippers do not have to live on board anymore, etc.

WT is consequently well suited to fight the current lack of control and fragmentation of the traditional inland navigation services from a shipper’s perspective.

4. Applicability of the WT concept for the construction industry

4.1 Historical character

The construction industry, spearheaded by the manufacturers of building materials, are historically located next to the inland waterways. Brick manufacturers were amongst the first users of the canal system in The Netherlands and Belgium, having a need to transport large volumes of their end products to the end users. Those production sites continue to exist until today but the use of the waterways has in many cases been replaced by road transport. This substitution was brought on by the significant public investments in road infrastructure in the fifties and sixties combined with the increase in vessel size in inland shipping. The use of smaller waterways saw a steep decline which has continued until today.

The production sites along the smaller inland waterways frequently have little expansion possibilities, inducing a need to optimize the use of space. Inventory levels are kept well under control which implies a need for regular downstream transportation. Production companies have invested in their own fleets to facilitate this.

4.2 Current challenges

Two evolutions has put the current way of operating under pressure. Firstly, the continuing increase of traffic on the existing infrastructure has resulted in an exponential increase in congestion. This leads to hidden losses in the form of lost hours and lost optimization opportunities. Deliveries which are stuck in traffic cause delays on construction sites and damage relationships with constructors.
The second evolution is an increase in produced volumes over the past decades, putting more and more strain on the site's storage capacity and driving the manufacturers to explore alternative solutions. One alternative solution would be to build up a buffer inventory in a remote location, servicing the surrounding area with shorter and more reliable lead times. However, the additional cost of truck transport between the production site and the remote stock location, in addition to the costs of the remote location itself proves to be prohibitive. Organizing the mass transport by inland waterways is only a possibility if the capacity of the inland waterway on which the production site and remote location are located is sufficient to allow the use of contemporary ships.

4.3 Water bound distribution and consolidation centres

The manufacturers of building materials realize that the supply chain in the construction industry is due to change in the years to come. Cooperation and transparency will be required to overcome the growing road congestion and pressure on space.
One concept is the implementation and use of shared facilities for the distribution and consolidation of building materials. Such a center could host buffer inventories for a number of producers. Large volumes of primarily fast-running SKU[1]'s could be shipped from production sites to the distribution center where the material could be picked up by building material dealers for just-in-time delivery to construction sites. Especially in

[1] Stock keeping unit: is a distinct item, such as a product or service, as it is offered for sale that embodies all attributes associated with the item and that distinguish it from all other items.

urban areas such approach yield benefits as construction sites often face the same space constraint as production sites.
The added value of such a distribution center could be enhanced by adding a number of other functions. For construction sites which are located in CBD[2]s or in areas with difficult access, they could function as a consolidation center where part loads would be held and combined into full truck load deliveries to the construction site, using sustainable transport modes for the last mile delivery and as such reducing the number of vehicle movements in the city.
Another function could be the offering of value-added services such as kitting or assembly of components, which reduce the on-site workload for highly skilled and expensive construction workers.
A fourth function could be the collection and recycling of waste. Here, the scope is not limited to packaging materials (wood, plastic, pallets,), but also metals or excess materials. Soil or rubble can also be evacuated via such a center.

4.4 Watertruck opportunities
As stated, manufacturers of building materials are historically located along the smaller inland waterways. The main target area for water bound distribution and consolidation centers are urban areas, also frequently located along smaller inland waterways. WaterTruck offers a viable alternative to road transport between production site and distribution center in such a case.
Palletized materials can be loaded in push barges with one push barge replacing up to ten truck loads. The push barges are also useful for the evacuation of soil or rubble from the distribution center.
A third use is the delivery of consolidated shipments to waterside construction sites, relieving the inner cities from the much-maligned traffic of heavy trucks.

WT receives 50% funding from the Interreg IVB North West Europe program and has partners from Belgium, The Netherlands and France: VIM (Flanders Institute for Mobility), Voies Navigables de France, Haven van Brussel, Waterwegen & Zeekanaal, De Scheepvaart, Expertise en Innovatie Centrum Binnenvaart, Provincie Zeeland, Provincie Limburg (N), Provinciale Ontwikkelingsmaatschappij West-Vlaanderen, Provincie Noord-Brabant. More info can be found at www.watertruck.eu.

[2] Central business district: the commercial and often geographic heart of a city