Demonstrating the use of urban and inland waterways – for densely populated cities and more sustainable transport

The DenCity project aims to find innovative solutions and services to reduce overcrowding and environmental impact, and increase the quality of life for residents and workers in densely populated city districts. The key is to involve the general public in designing the solutions. DenCity is a collaborative project between industry, academia and society and is financed by the Swedish Innovation agency Vinnova and Västra Götalandsregionen.

Read more at the project website: https://closer.lindholmen.se/en/projects-closer/dencity

The demonstration for the NÖKS II project was a one-time container transport from Gothenburg, at the mouth of Göta älv, to Vänernborg at the estuary of Göta älv. 20 (20”) containers were transported using a barge/pusher combination operated by Sandinge transports. The unloading operation was demonstrated at the Port of Vänernborg. The containers were unloaded from the vessel and loaded onto trucks for delivery to the final destination.

SSPA supported Avatar Logistics with technical preparations for the transport operation (e.g. a specification of the loading plan) and by evaluating the transport efficiency and environmental performance of the demonstration.

NÖKS II is a three-year EU-funded project (2015–2018) that is part of the Interreg Öresund-Kattegat-Skagerrak programme with partners in Sweden, Norway and Denmark.

The project is coordinated by SSPA and aims to increase the use of sea transport solutions within the region and to contribute to a more environmentally friendly and low-carbon transport system. The project is financed by Interreg, Öresund-Kattegat-Skagerrak, the European Regional Development Fund, Västra Götalandsregionen, Fyrtobol and Region Skåne.

Read more at the project website: http://noks2.com

Demonstrating new logistics solutions is shown to be an important step for gaining understanding of system prerequisites for commercialisation, both with regard to technical issues such as vessel design characteristics and cargo-handling equipment, and social matters such as the importance of practitioner involvement and the evaluation of performance criteria. SSPA demonstrated the use of urban and inland waterways as part of two large collaboration projects: DenCity and NÖKS II. This is a promising path for the future, both for managing the trend towards more densely populated cities and for using more sustainable transport solutions.

Transition towards a future and more sustainable transport system

There is a need for significant changes to be made to the transport system in order to meet society’s long-term transport goals. Local and national authorities are facing major challenges related to the freight transport sector, in particular concerning the increasing greenhouse gas emissions from freight transport. This unsustainable trend is largely due to a larger proportion of goods being transported by road instead of other, more energy-efficient modes of transport such as sea transport.

In urban environments, and in addition to the transport sector’s greenhouse gas emissions, road freight distribution has other effects as well: congestion, noise and local emissions. Many urban areas are growing rapidly and local authorities are also facing challenges in relation to lack of available space. Also, many cities are located near and around waterways since historically, sea transportation was the main mode of transport. The proximity to water means that waterways are already an available means of transport. In urban environments, and in addition to the transport sector’s greenhouse gas emissions, road freight distribution has other effects as well: congestion, noise and local emissions. Many urban areas are growing rapidly and local authorities are also facing challenges in relation to lack of available space. Also, many cities are located near and around waterways since historically, sea transportation was the main mode of transport. The proximity to water means that waterways are already an available means of transport. 

Today, there is unexplored potential to be found in increasing sea transport by connecting inland waterways to large export or import ports, e.g. the Port of Gothenburg.

Therefore, one promising path for reducing the increase in road transport and the negative impact from such transport systems is a shift to transport on urban and inland waterways. However, implementing and designing urban and inland waterway systems is a complicated issue involving multiple actors within the transport system with potentially conflicting aims. By demonstrating the use of waterways in both urban and inland environments, important knowledge can be obtained as a first step towards necessary long-term changes to the transport system.

City logistics using urban waterways in Gothenburg

Gothenburg is currently growing rapidly and the city has plans for developing several new districts in close proximity to the river, Göta älv, which cuts through the city. One of these areas is the former port, Frihamnen, which is located close to the city centre and will be developed to accommodate and provide work places for approximately 15,000 people. Local authorities have designated this area a place where innovative and sustainable solutions
An arrangement, including parties such as ports, container terminals, goods owners, vessel operators and authorities. The demonstration was a one-time container transport from Gothenburg, at the mouth of Göta älv, to Vänersborg at the estuary of Göta älv. Twelve (12) containers were transported using a barge/pusher combination operated by Sandinge transports. The unloading operation was demonstrated at the Port of Vänersborg. The containers were unloaded from the vessel and loaded onto trucks for delivery to the final destination. SSPA supported Avatar Logistics with technical preparations of the transport operation (e.g. a specification of the loading plan) and by evaluating the transport efficiency and environmental performance of the demonstration.

Knowledge gained from demonstrating new logistics solutions
SSPA has identified drivers and challenges associated with an increased use of urban and inland waterways. The main drivers of this alternative mode of transport in city logistics are the associated sustainability and large capacity for transporting goods. A properly implemented system has the potential to substantially reduce air emissions, congestion and noise by reducing the number of trucks on highways and in urban areas. Actors also see potential in commercialising waterway logistics solutions as a natural part of future logistics concepts.

Challenges that must be overcome relate to the difficulties in competing with existing road transport solutions. Road transport solutions are often cheaper and more flexible compared to a waterway option, for example, with regards to pick up and delivery place and time. The difficulties in competing with road transportation due to cost issues are particularly evident for inland waterways, where tariffs related to fare changes, requirements for plants and handling costs in ports increase transport costs. Furthermore, waterway logistics solutions often involve several handling steps compared to current road transport solutions, which increases transport time. This was particularly evident in an environment where several handling steps in the logistics concept influenced the total transport time and costs to a great extent. However, development of new areas such as Frihamnen enables the incorporation of urban waterways and gives possibili- ties to develop systems that will reduce the number of handling steps. The best technology available was used in the demonstrations. Based on the results of the demonstrations, it is possible to discuss and suggest possible improvements for a concept optimised for urban and inland waterways respectively. There are a number of different vessel concepts that are viable from either a financial, technical or an environmental perspective. Urban waterway vessels are believed to be good candidates for alternative fuels such as bio-gas, bio-methanol or batteries since air emissions, noise and energy-efficiency are important parameters when operating in populated environments. Urban waterways also set restrictions with regards to narrow passes, low bridges and shallow waters. The vessel which need to be taken into account.

As in urban contexts, alternative fuels are of interest since Göta älv, like most inland waterways, passes through several cities and populated areas. Minimising emissions from the vessel is essential when competing with other modes of transport since environmental performance is becoming increasingly important. To utilise the advantages of waterway logis- tics, it is important to design transport systems that benefit from scale, both economically and environmentally. This requires increased coordi- nation among the actors involved to consolidate cargo and optimise the transportation. The two real-life tests of new logistics concepts were powerful tools and important steps in visualising the potential of using Göta älv for city logistics in Gothenburg and container transport upstream and downstream. Relevant actors were involved in the demon- strations and showed great interest in a future development towards commercialised logis- tics concepts. Goods owners are willing to ship their containers on Göta älv when such a logistics solution is in place, and urban logis- tics actors consider the waterways a valuable alternative for reducing the amount of trucks in Gothenburg. The demonstration has there- fore provided unique experiences and set up a network of value for commercial players, as a first step towards new logistics concepts. The two projects DenCity and NÖKS II have provided SSPA with valuable experiences in relation to the actual design, planning, execution and evaluation of demonstration activities, taking into account all actors’ views and requirements. This in combination with a wide knowledge of shipping, logistics and naval architecture contributes to great experi- ences and possibilities for SSPA to further support actors in the process of utilising urban and inland waterways to a greater extent.

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The barges “Helena” and towing vessel “Dragaren 6” transporting waste and goods on the urban waterways in Gothenburg. Photo: Christian Finnsgård

Within urban planning and mobility will be developed and tested. One such project is the large government-funded project DenCity, which aims to find sustainable mobility solu- tions in order to eliminate the need for heavy trucks. SSPA is involved in the project and is responsible for exploring solutions and identi- fying drivers and barriers for an increased use of urban waterways to meet Frihammen’s need for sustainable city logistics.

To demonstrate the environmental, technical and economic feasibility of transporting goods and waste on urban waterways, possibly using the same vessel, an actual waterborne transport system was designed and tested in Gothenburg. As the new area in Frihammen is not yet built, the demonstration took place in other parts of the city with goods and waste transportation for two weeks using urban waterways.

Gothenburg’s waterways pose several challenges when it comes to choice of vessel. For example, there are many low bridges, narrow passages and shallow waters to be considered while also finding ways of maxi- mismising cargo capacity. The vessel used was a small, barge, well-suited for the desired route, with an accompanying tugboat. The waste was loaded using the truck’s container lifting devices and goods were rolled onto the barge using small ramps. This means that no addi- tional landbased cargo handling equipment was needed. During the demonstration, the barge collected package freight every day from the DHL terminal a couple of Kilometres upstream from Gothenburg city centre, which was then un- loaded in the city centre for further distribution on cargo bikes and in electric vehicles. Waste was then loaded for transport to Vänersborg from Lindholmen to the waste-to-energy incinerator plant in Silvén for production of electricity and heat. The entire operation was planned, coordinated and carefully monitored by SSPA and all collected data, such as time for transportation and cargo operations, deviations from the expected time, fuel consumption, noise and costs were analysed and evaluated.

Container transportation on Göta älv
The Port of Gothenburg is the largest port in Scandinavia and handles about 30 per cent of Swedish exports. Göta älv is an important link to the Port of Gothenburg from Sweden’s largest lake, Vänern. Existing shipping lines transport mainly bulk goods to and from ports in the Vänern region to and from other Euro- pean ports, and there is no current waterway transport solution for containers to the Port of Gothenburg. Instead, businesses in the Vänern-Göta älv region use other transport options such as road or rail to transport containers to the Port of Gothenburg.

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In March 2017, a logistics concept for container transport on Göta älv was demon- strated in cooperation with Avatar Logistics. Demonstrating this new logistics concept involved handling a number of issues such as what goods to transport, what vessel to use, what documentation would be needed to comply with existing laws and regulations, and how to gain access to ports and required equipment for unloading/loading. Consequently, several actors needed to be involved for such