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HUPMOBILE

Aalto University

Benchmarking of Transport Solutions in Baltic Sea Cities

Selection of best practices in sustainable mobility solutions connected to ports

HUPMOBILE – Holistic Urban and Peri-urban Mobility
Aalto University, 2020

Imprint

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Project note

The EU co-funded project **HUPMOBILE – Holistic Urban and Peri-urban Mobility** (2019–2021) brings together municipalities, universities and other expert organizations in their efforts to develop a holistic approach to the planning, implementation, optimization and management of integrated, sustainable mobility solutions in the Baltic Sea port cities.

The carried out activities enable major urban mobility stakeholders such as city authorities, as well as infrastructure providers and transport providers to assess and integrate innovative mobility options into their mobility management plans and policies. The developed HUPMOBILE framework allows the planning and implementation of well-functioning interfaces and links in urban- and peri-urban transport, considering the different transportation flows in the local context.

Within HUPMOBILE, partner cities plan, test and implement innovative sustainable urban mobility for both people and goods (i.e. freight, cargo logistics and delivery), which are easily adaptable for follower cities. These include greener urban logistics and combinations of goods- and passenger traffic, intelligent traffic systems-based services, tools for stakeholder participation, and new tools for transportation mobility management and Mobility-as-a-Service (MaaS).

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1. The aim and structure of this report

This benchmarking activity aims to build the capabilities of transportation planners and authorities to identify new approaches in organizing sustainable transport connected to port areas, bring new ideas into collaboration with stakeholders, and assess the most efficient approach in their local context.

This report is based on the desktop research part of this activity. During the project, we will supplement this research with a series of collaboration workshops and site visits in our partner cities and thus keep this document alive. We are not aiming to compare cities to each other, but we hope to increase the knowledge among participating Baltic ports and port cities about best practices in the leading Baltic cities and ports in each theme.

We chose the themes of this activity so that they support the pilot activities in partner cities:

- Rail transport solutions (in connection to ports) in leading Baltic cities (Turku)
- Different approaches in organizing Mobility-as-a-Service, (Riga, Hamburg, Turku)
- Electrification of transportation in BSR region (Riga)
- Existing logistics solutions (in connection to ports) in Baltic cities (Turku)

Following the rest of the work in this work package, we focus on the mobility solutions – different services, technical solutions, or policies – in the chosen themes.

Thus, for example, pure city planning (zoning) approaches to the same aims are not included as this work is intended to benefit both new and existing neighbourhoods with the problem created by increased traffic from ports.

We start this report by describing the unique aspects of each of our case areas – chosen by our partner cities. We proceed then with the abovementioned themes and identified best practices. As our partner cities and the Baltic Sea Region (BSR) cities, in general, have such a different operating environment for these mobility solutions, we don't offer any conclusions or guidelines in this report.

2. Case areas

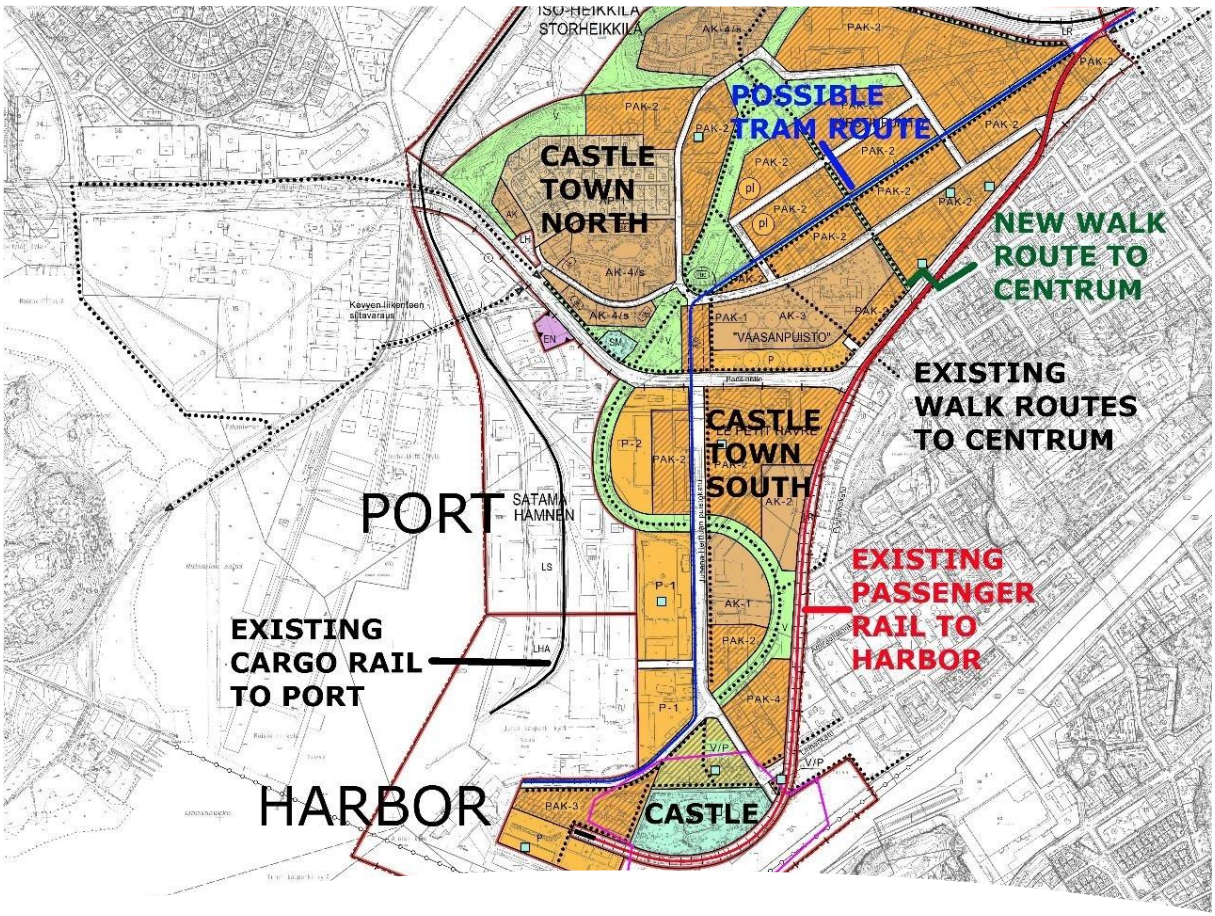
2.1. The city of Turku – Castle town

TURKU	
Area (2018-01-01)	
• City	306.4 km^2
• Land	245.7 km^2
• Water	60.7 km^2
• Urban	252.7 km^2
Population (2019-01-31)	
• City	191 603
• Density	779.92/km^2
• Urban	252 468
• Urban density	999.3/km^2

Turku, located in the region of Southwest Finland, is one of Finland's biggest cities, but small enough that you can go almost everywhere by foot or bike. Turku has a popular public transport network of bus routes, which is managed and supervised by the Region's Public Transport Committee (FÖLI) and is operated mainly by private companies. There is no local rail traffic at the moment, as the city's popular tram services were discontinued in 1972, and the various local railway lines to neighbouring municipalities were all abolished during the late 20th century. However, there are plans for **a light rail system** in the region and **a new trunk line network**, which is based on traffic-heavy bus lines that allow passengers to go to the stop even without checking the timetable.

The Turku Bus Station and the Turku Central railway station are currently located in different places. The City of Turku is planning to combine these two in a new, more significant station complex. There are daily ferry connections from the Port of Turku to Sweden and the Åland Islands. Weekly ferry destinations include Travemünde, Hamburg, Lübeck, Antwerp, Harwich, and Paldiski. In 2019, over 3 million passengers travelled through the Port of Turku, and nearly 2000 cargo vessels visited the port. The main part of the cargo is transported with trucks and trailers, with 106 000 of them arriving or leaving the port yearly.

The areas near the Port of Turku in Finland are going through a large-scale regeneration process, with also plans for a new efficient ferry terminal and rerouting the existing rail connection for the passenger transport originating outside Turku. Maintaining this railway access is one of the critical factors in the attractiveness of Turku as one of the national passenger transport nodes, and the best option is to upgrade the existing cargo rail for the needs of passenger transport. These traffic development efforts enable more efficient land-use and improve the safety and attractiveness of the new residential areas next to the port area. The on-going idea competition, organized by the city, is investigating the opportunities for the use of land areas freed during these development efforts. The removal of the old passenger rail also supports the city's aim of making the new residential areas as environmentally friendly and carbon neutral as possible, since it enhances the ability to use of active modes in everyday mobility before the planned tram line.



The area under development, consisting of the land areas of Castle Town North, Castle Town South, Harbor area, and the historical area around the castle of Turku (Figure above), is a joint development effort between the city, landowners, and the Port of Turku. The district will eventually have housing for 10 000 new residents, and the transport planning and construction for the new ferry terminal are expected to be ready in 2025. For this **transport planning** in Turku and other BSR port cities, HUP-MOBILE aims to give a holistic starting point.

2.2. The city of Riga – connections to the Freeport of Riga

RIGA	
Area (2002)	
• City	324.0 km^2
• Land	275.5 km^2
• Water	48.6 km^2
Population (2018)	
• City	615 369
• Density	1 900/km^2
• Urban	939 325

Riga is the capital of Latvia and home to a third of Latvia's population. The city lies on the Gulf of Riga at the mouth of the Daugava river, where it meets the Baltic Sea. As a city situated by a river, Riga has several bridges. One of them, the Southern Bridge, was the biggest construction project in the Baltic states in 20 years, and its purpose was to reduce traffic congestion in the city centre. Public transportation in the city is provided by Rīgas Satiksme, which operates a large number of trams, buses, and trolleybuses on an extensive network of routes across the city. Also, up until 2012, many private owners operated minibus services, after which the City Council established the unified transport company Rīgas mikroautobusu satiksme, creating a monopoly over the service.

The Freeport of Riga lies on both banks of the River Daugava, covering 15 kilometres in length and facilitates cargo and passenger traffic by sea. Ferry connection from Riga to Stockholm is carrying 868 700 passengers yearly. The number of vessels accommodated in 2019 amounted to 3489, and total cargo handled was 32.8 million tons, of which 2/3 was bulk cargo.

The Freeport of Riga is the biggest port of Latvia and the second biggest port of the Baltic States by cargo turnover that reached 36,4 million tons (2018). While developing new infrastructure for the future (picture on next page), the Freeport of Riga is also developing – together with the government of Latvia, the City of Riga, and its inhabitants – a sustainability framework to ensure that environmental and social issues are fully integrated with port's activities.

In this process, the Freeport of Riga main interests are to:

- Develop their own urban mobility management plan as part of Riga's emission-free transport strategy
- Initiate studies on management and monitoring of port-related transport flows and the possibilities to develop soft measures for optimizing port-related mobility
- Enhance public participation and co-creation and demonstrating the potential of mobility management and ITS solutions for urban mobility to stakeholders at all levels
- Promote an attractive market for clean and energy-efficient road transport vehicles

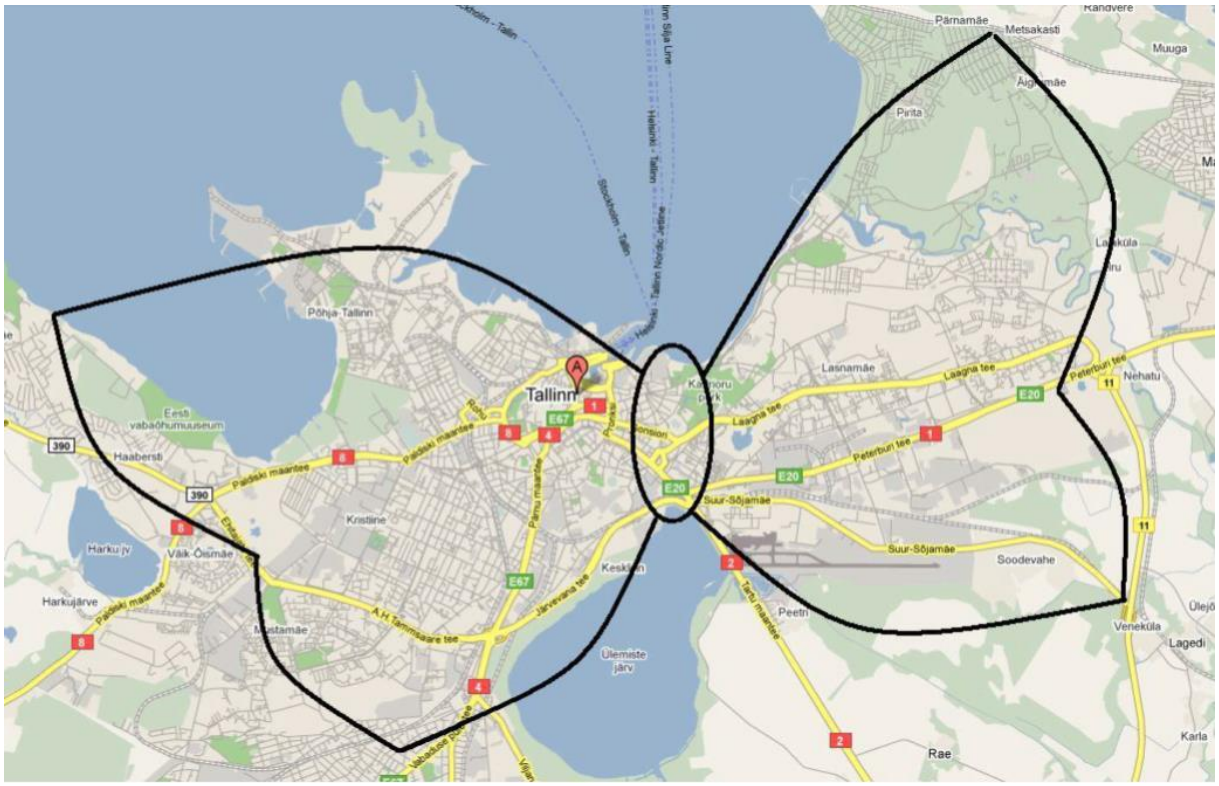
A holistic and integrated approach to sustainable urban mobility management means taking simultaneous consideration of every stakeholder that may affect or be affected by the mobility management measures identified/planned to be implemented or already implemented. That is why assisted by the expertise developed in Riga, stakeholders in HUPMOBILE should be engaged as early as possible, to ensure their **support** in the project execution process.

2.3. The city of Tallinn – the Old City Harbor

TALLINN	
Area	
• City	159.2 km^2
Population (2019)	
• City	434 562
• Density	2 700/km^2

Tallinn is the capital and the most populous city in Estonia. It is located in the northern part of the country, on the shore of the Baltic Sea, 80 kilometres south of Helsinki, Finland, 320 kilometres west of Saint Petersburg, Russia, and 380 kilometres east of Stockholm, Sweden. It has close historical ties with these three cities, and due to its strategic location, it was an essential part of the Hanseatic League. Tallinn's Old Town is one of the best-preserved medieval towns in Europe and is listed as a UNESCO World Heritage Site. Public transport in Tallinn consists of bus, tram, trolleybus, train, and ferry services. The city operates a system of bus (75 lines), tram (4 tracks) and trolleybus (4 lines) routes to all districts. Light rail service in Tallinn has been planned since the 1970s. The project halted when Estonia became independent from the Soviet Union, but in the 2000s, the planning resumed.

The Old City Harbor is one of the five ports within the state-owned company Port of Tallinn. The Old City Harbor is predominantly a passenger harbour serving over 10 million passengers in 2019. The functions of a traditional cargo port have been gradually moved away from the city centre into the other docks, and presently the Old City Harbor processes mainly Ro-Ro cargo carried by passenger ferries.



The amount of passengers travelling between Helsinki and Tallinn (route in the picture) has increased in recent years steadily to 9 million per year. Still, at the same time, the amount of passenger cars has increased seven times in 20 years – reaching nearly 1,4 million in 2017. Also, there are roughly 340 000 lorries, and trailers transferred yearly between Helsinki and Tallinn route alone, increasing the pulsating demand on the already busy road network.

Tallinn has invested in its road traffic control centre, which oversees 249 controllers – of which 50 has public transport prioritization – and for example, variable message traffic signs in the city. Thus, they have a solid starting point to test additional technological solutions in road traffic.

The aim of the city of Tallinn in HUPMOBILE is to investigate how a city with increasing transit flows can benefit from the adaptive traffic lights, by testing them in specific hot spots and estimate the effect on the flow of traffic on the entire city level. This testing will be conducted in open collaboration with market players via a competitive procurement process, thus also looking into various adaptive traffic lights solutions on the market and developing a more holistic approach for **implementing sustainable transport solutions**.

2.4. Free and Hanseatic City of Hamburg – The district of Altona

HAMBURG / ALTONA	
Area	
• Hamburg	755.22 km^2
• Altona	77.5 km^2
Population (2016)	
• Hamburg	1 822 445
• Density	2 400/km^2
• Altona	270 263
• Density	3 500/km^2

The District of Altona is the westernmost urban district of the German Free and Hanseatic City of Hamburg, on the right bank of the Elbe river. Altona was an independent city until 1937. Altona is the location of one of the major railway stations, Hamburg-Altona, acting as intermodal mobility hub with connections to the Hamburg S-Bahn, national railway system, local bus lines, and with a multitude of last-mile solutions available. The A 7 autobahn and the B 4 road traffic connection passes through Altona. The Hamburg Transport Association coordinates the connections with local public transport to other parts of Hamburg. These connections include metro lines, numerous bus lines operated by Verkehrsbetriebe Hamburg-Holstein (VHH), and the Hamburger Hochbahn (HHA) as well as some Elbe ferries from HADAG Maritime Tourism and Ferry Service. Since 2018, diesel vehicles having emissions below Euro 6 been banned on the streets Max-Brauer-Allee and Stresemannstraße in the district.

Although the Port of Hamburg is on the other side of the river Elbe, this is Germany's largest port, and the third-busiest port in Europe (after Rotterdam and Antwerp) with 135 million tons of cargo handled annually. 2/3 of this cargo is containers, and 55% of the containers going to the hinterland is carried with trucks.

The City of Hamburg has gained experience with different models of car-sharing and has a very well accepted and used a bike-sharing system. The city and its public transport providers now look into the interlinks of different transport modes, and in models to solve the last-mile problem, with mobility hubs being installed at public transport interchanges and a platform which grants access to public transport as well as several mobility services (car share, bike share, and rental cars). The currently realized hubs are located in central areas, with two pilot sites running detached from public transport stations, serving as neighbourhood mobility stations.

Much of commuter traffic from peri-urban areas and logistics still run through the city centre, leading to high emissions close to residential areas. With the development of new residential areas along the main routes, alternative transport models become increasingly important. Within logistics, there are already several approaches aiming at more sustainable solutions. A combination of transport hubs with parcel and goods deliveries (usable by all parcel delivery companies and residents) could reduce

delivery traffic and make neighbourhoods more functionally diverse. In the case of commuting, the aim is to investigate how large employers can, through mobility management, influence their employees' mobility behaviour. These aspects are essential when thinking about different holistic approaches in **organizing sustainable mobility** by connecting new and existing solutions to form Mobility-as-a-Service offering to users.

Photo © Borough of Altona

3. Rail transport solutions (in connection to ports)

The different railway solutions were identified by going through different knowledge bases. Publicly available descriptions of the lessons learned and benefits from these development efforts were preferred in the selection of the solutions for this report.

3.1. The situation in some of our partner cities in the topic

3.1.1. City of Tallinn

Tallinn's Old City Harbor does not use the railway for cargo or passengers anymore. Part of the old harbour railway still exits, but there are plans to demolish and take the land area in other use. The Old City Harbor logistics are based on trucks carrying cargo to the ro-ro passenger ships.

Many of the previous harbour activities have moved to Muuga harbour, 17 km east of Tallinn. Around 40% of the transit cargo volume passing through Estonia goes through Muuga. Muuga harbour has a railway connection. A new multimodal cargo terminal will be built there, and it is part of the North-South Transport Corridor with the eastbound railway at the other end of the Rail Baltic. The Muuga harbour area also has an Industrial & Logistics Park for the companies.

As a result of operations partly shifting to Muuga, the old city harbour and land area can be utilized for residential buildings and offices. However, this new area also needs good transport connections. As a result, the City of Tallinn has a new ambitious vision for the harbour area. It prefers active modes of transport (walking and cycling) instead of private vehicles both for the residents and cruise passengers. Part of this plan may also be a new tram line (or lines) that would better connect the harbour also to other modes of transport in Tallinn, thus supporting better multimodality.

3.1.2. City of Turku

The city of Turku currently has a railway connection to the harbour. The line is used both for cargo passengers. However, the current line supporting passenger traffic is not optimal concerning the land use of the new city district Castle Town. In cooperation with other stakeholders (e.g., Finnish national railroad company VR and VR Tracks), Turku has decided to partly re-locate the current rail line to enable better land use in the Castle Town, and to enhance safety and active modes of transport in the area. The new line will also improve the accessibility of the new passenger terminal (to be finished in ~2025).

There is also a plan for supporting the new Linnakaupunki area with a new tram line that would benefit both the residents and cruise passengers, but the final investment decision is not yet made.

3.2. Aarhus light rail

The Århus Letbane (Aarhus light rail) is a light rail system in the city of Aarhus, Denmark. Regional transport company Midttrafik operates it. The first light rail line opened in December 2017, but the system is under continuous development and expansion.

The recent (April 2019) completion of the connection in Aarhus will operate partly on the converted heavy rail section and partly on the extension of the existing double-track line. Two types of rolling stock have been operated over the first line: conventional trams which are slower and restricted to only running along some parts of the route and hybrid tram-trains that can be operated on the traditional heavy rail network. The latter is used for long-distance services.

The planning of the second stage of the project is in progress. The second phase includes an extension to the newly-developed eastern harbour in Aarhus and the suburb of Brabrand via the city centre. Part of the route will once again use the alignment of an abandoned heavy rail line. Light rail systems are also planned or under construction in both Odense and Greater Copenhagen. Financing for the 2km harbour section is in place thanks to income from property sales.

Photo: **L1105** by Lav Ulv / **CC BY**

Lessons learned

- Using knowledge and experiences in the early project phases from several other European Rail Networks proved to be very useful.
- Finding a joint agreement on possible solutions for the conversion of existing platforms was more complicated than anticipated in terms of ownership, safety, development of new norms, stakeholder involvement, etc. The technical studies conducted helped to create an overview and a common understanding.
- There were no operational safety rules for an LRT system in Denmark in place, and creating the first one has required a joint effort of many stakeholders to ensure that deliverables were produced in the right order. This ruleset was generated in parallel with the design and

construction of both infrastructure and rolling stock. A highly competent project manager would have been beneficial to facilitate the involvement of the stakeholders and ensure that deadlines are met, and project deliverables are produced.

- The mobility model created during the project will be used in the future planning of light rail expansion, optimization of operation plans, and increased focus on improving access from passenger catchment areas to the light rail.
- Subcontracted portions of the project created fewer lessons learned for the transport authority.

More information: **https://www.letbanen.dk/media/316858/aarhus_lrt_final_report_150816_ver_11.pdf**

3.3. Helsinki harbours: railways for cargo, trams for passengers and citizens, old rails to a high-quality bicycle lane

Helsinki moved the cargo harbour and ships to the east side of the city to Vuosaari harbour from Jätkäsaari in 2008. Only the terminals for passenger ro-ro ships (ships both for cargo and passengers) and for visiting cruise ships were left in the city centre. All the cargo to these passenger ro-ro ships is transported with trucks. Each of these city terminals is connected to the city centre by a tram line, while the Vuosaari cargo harbour also has a train connection.

Helsinki demolished the rails leading to the city terminals. The cargo trains arriving at harbour used to stop all other traffic, thus causing delays. The former railway line to Jätkäsaari harbour was converted into a wide, high-quality bicycle route called “Baana.” This route connects the western part of Southern Helsinki to the city centre.

Helsinki built a new city district to the former harbour area in Jätkäsaari, and as part of that plan, also created new tram line connections. These lines serve both residents and passengers. The advantage of these tram lines is that they require less land area and have a much smaller turning radius than a train.

To further reduce unnecessary vehicle traffic in city centre port areas on both sides for the Baltic Sea, two ferry connections for passengers with a car were opened in 2019 between Vuosaari and Muuga (Tallinn) harbours. Many passengers with vehicles also prefer this alternative as they don’t have to drive in city-centre traffic anymore.

4. Different approaches in organizing Mobility-as-a-Service

The different Mobility-as-a-Service (MaaS) solutions or essential aspects in organizing MaaS, such as last-mile solutions, were identified by going through different knowledge bases. Publicly available descriptions of the lessons learned and benefits from these development efforts were preferred in the selection of the solutions for this report.

4.1. The situation in our partner cities in the topic

4.1.1. Free and Hanseatic City of Hamburg

In Hamburg, an integrated mobility platform called SwitcHH is developed by the Hochbahn, which operates the underground system and large parts of the bus system in Hamburg. The approach in Hamburg is that the provision of the digital infrastructure is a global task of general interest that should be developed and operated by public authorities. The digital infrastructure is built by Upstream next level mobility, a subsidiary of Wiener Linien and Wiener Stadtwerke. At the same time with the digital infrastructure, Hochbahn is creating intermodal mobility hubs, SwitcHH points, around the city also to ensure physical integration between the different transport modes. In 2018, 17 SwitcHH points with metro connection and 28 decentralized neighbourhood mobile hubs were available (source: UITP, 2019, Mobility as a Service report)

4.1.2. The city of Riga

In several parts of Riga, there is an overlap between the network for train, bus, trolleybus, tram, and minibus. Some of these networks are developed and operated separately from each other. An integrated ticketing system has been deployed for local traffic by bus, trolleybus, or tram. However, the opportunities to change between different networks are not yet encouraged because of differing fare systems and lack of synchronization in timetables (source: Uhlmann J. (2019) Possible Consequences of the Implementation of Transport Integration in the Riga Planning Region. RelStat 2018. Lecture Notes in Networks and Systems, vol 68. Springer, Cham).

4.1.3. The city of Tallinn

The city of Tallinn, with approximately 420,000 residents, is the largest city in the world so far offering free-fare public transport as a service to all of its residents. The City of Tallinn introduced this policy as part of its overarching plan to promote sustainable transport solutions in 2013. As a part of the plan, tram, trolleybus, and bus services that used to be divided between different operators were merged under one company. Public transport in Tallinn before this policy had a substantial market share, with 40 % of all trips in the city performed by the public transport system (and 30 % by foot). Also, the percentage of users exempted from fares amounted to 36 %, with an additional 24 % of the users having special fares. This policy can, therefore, be conceived as the final stage in a sequence of steps aimed to make public transport in Tallinn more attractive and affordable. However, the slight

modal shift from car to public transport (5%) was also accompanied by an undesired change from walking to public transport, and an increase in the distance travelled by car. (source: Cats, O., Susilo, Y.O. & Reimal, T. Transportation (2017) 44: 1083.)

4.1.4. The city of Turku

The Public Transportation authority of the city of Turku has made agreements with several MaaS operators to enable them to sell Public Transportation tickets and to create travel chains by combining transportation services. Currently, the city of Turku is also updating the city's parking policy, which allows new mobility needs to be taken into account – such as shared mobility services. The goal is to enable genuinely easy and affordable options for car ownership (source: **CIVITAS ECCENTRIC project**).

4.2. Integrated mobility management services in the harbour of Odense

Photo: **Odense-Byens Bro-towards south** by Kåre Thor Olsen / **CC BY-SA**

Odense Harbour is a former industrial area that has been converted into mixed-use. New apartments are being built along the harbour front and many new light businesses have settled down in the district, which over the coming years will be integrated into the city centre area. To serve this vision, Odense needs integrated mobility management which includes all modes of transport and a planning strategy where architecture and traffic planning is fully integrated – potentially affecting the overall impression of the area.

Before, Odense Harbour was separated as an isolated area without any connection to the city centre. The former traffic plan from 1999 didn't include the harbour area and cars and trucks dominated the roads. The new traffic and mobility plan take a holistic approach to the challenge of how to convert former industrial areas into attractive places to live and to work. The reconnection of the new residential area across the main barriers of through going trains and massive car traffic has been overcome by building a new landmark – a dedicated bridge for cyclists and pedestrians (picture). The bridge is intended to benefit soft road users in shortening distances, and it highlights the priority of these groups within the newly designed city centre area.

Just before the traffic and mobility plan was started, the urban planning department published a local plan for selected areas in the city centre. This very much linked up to the plan for traffic and mobility in the harbour area and positively affected public opinion.

The working group published a report on different possible measures to be used. The measures included new mobility initiatives like introducing student bicycles, tram line, closing streets to benefit cyclists and pedestrians, and new services for commuters. This helped to give stakeholders and residents an overview of the actual possibilities and the expected outcomes. The planning work also included a sophisticated traffic model, integrating car traffic, public transport and cycle traffic. For constructing this model, a particular web site was set up to collect data about route preferences of cyclists and 3,000 cycle trips were drawn by cyclists on this site for the model. However, Due to a massive amount of work in the model, the whole project was massively delayed.

Recommendations

- The citizens and the stakeholders should be able to see how things are developing through the planning process. Early involvement can be crucial for a successful outcome and therefore, is also recommended.
- New developments efforts like the traffic model always take much longer time than planned – they need to be initiated from the very beginning of the project and the time schedule should take unexpected delays into account.

More information: **https://civitas.eu/content/1112o-mobility- management-services-odense-harbour**

4.3. Sustainable delivery traffic solution KoMoDo

Micro-depots as the starting point for delivery with cargo bikes are a transferable mobility solution for local authorities to help make delivery traffic more environmentally friendly. The twelve-month test phase of the KoMoDo pilot project in Berlin confirmed that the use of cargo bikes for the delivery of parcels and the shared use of a micro-depot site by several parcel services could work if particular prerequisites are satisfied.

The use of cargo bikes for the last mile of parcels is environmentally friendly, as bikes can replace trips made by conventional delivery vehicles. During the pilot, around 160,000 packages were deliv-

ered by cargo bike in the vicinity of the micro-depots by Germany's five largest parcel delivery services and they continuously increased the volume of parcels delivered. Since all deliveries were emission-free, around eleven tons of CO2 were saved compared with conventional delivery vehicles. Up to eleven cargo bikes were in use daily and they covered, in total, more than 38,000 km.

For the participating parcel delivery services, this project offered the chance to test out parcel delivery using cargo bikes from micro-depots. Even public funding discontinued (1st July 2019), the parcel delivery services involved will continue to use the current site and the Berlin-Pankow district office has already approved the use of this area for an extended period. Based on these project results, the Senate has committed to identifying further suitable sites for micro-depots in Berlin together with the local districts and local port operator.

Lessons learned

- The local port operator BEHALA functions as the neutral operator of the handling area.
- Micro-depots and cargo bikes represent an efficient alternative, especially in areas with a high density of recipients and a dispatch structure which is suited to cargo bikes (parcel numbers, volumes and weights).
- The delivery personnel used the essentially electrically-assisted cargo bikes in a radius of up to three kilometres around the micro-depot.

More information: **https://www.behala.de/en/the-future-of-urban-logistics/**

4.4. Transferium Maasvlakte

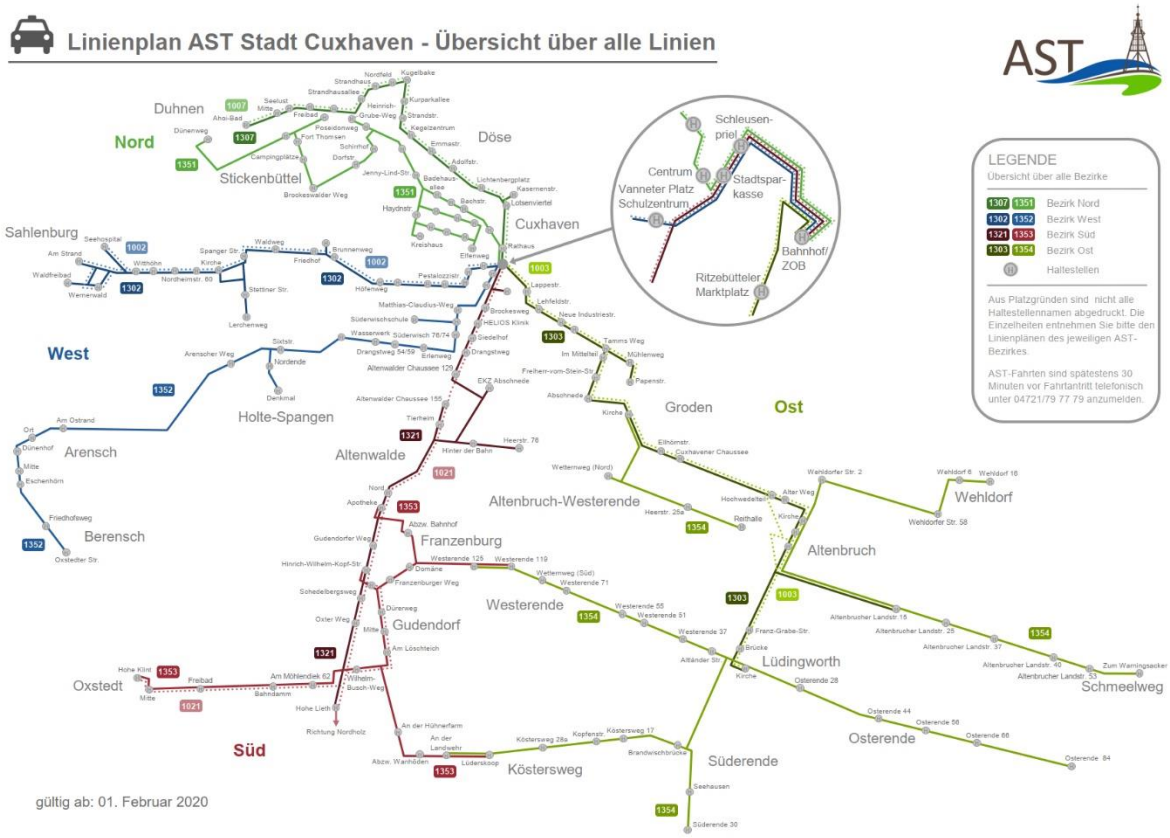
This public transfer hub made as a collaborative effort merges various transport streams, such as bus, ferry, bicycle routes, and ferry, increasing the accessibility of Maasvlakte port area and reducing congestion on the main road to the area. The main target group is the 7,000 people working in the western section of the port.

Stops and services for buses include both company and public buses. For example, the Vipre Maasvlakte Office Shuttle will carry employees from various locations in the wider surrounding area to the Transferium. Currently, the Transferium is also accessible using standard public transport buses. The facility is fitted with electric bicycles for the last leg of commute to the far-reaching workplaces.

The transfer hub and the Fast Ferry connection is also serving visitors of the nearby nature destinations. Futureland, the beach on the second Maasvlakte is popular among bikers, and the nature reserve of Landtong peninsula is also accessible. Along the Fast Ferry route is beak island, which was created a few years ago during the construction of the Nijlhaven. Visitors can often see seals lying there, which is an excellent proof that nature and industry can coexist well. These seals know that they have nothing to fear from the big tankers and that they are left alone. Often the captain of the ferry wants to make an extra turn to take a closer look at the seals.

More information: **https://www.portofrotterdam.com/en/our-port/our-themes/an-accessible-port/an-accessible-port/transferium-maasvlakte**

4.5. Anrufsammeltaxi



Picture: [The line map of the AST service](#) by Verkehrsgemeinschaft Nordost-Niedersachsen GbR

The shared call taxi (Anruf-Sammel-Taxi - AST) is a common mobility concept in German-speaking countries as an additional service to the regional bus. The prizing and operating times vary with the areas. For example, more rural areas have regular service during the workday hours, compared to the urban areas where the service is in operation more likely during late night. AST runs according to the timetable and on fixed routes, but only if someone has registered a trip beforehand. Depending on the service area, the travel request needs to be sent 30 to 60 minutes before the departure time specified in the timetable. Our example is from the rural district of Cuxhaven and in the city of Cuxhaven in Germany, where the service has been operational since 2010. The fare varies between the regions but is always less than a regular taxi ride on this route and there is reduced prizing for the vulnerable groups in the more rural parts of the district. Recently, in the city of Cuxhaven, the fare and the ticket has been set as the same as in regular public transportation. The administration of the service is done by Verkehrsgemeinschaft Nordost-Niedersachen GbR (VNN), an association of a large number of transport companies in eight districts and the operation is done by local taxi- or transport companies. Financing is shared by county and municipalities (50 % / 50 %).

Lessons learned

Although not surveyed extensively, the percentage of residents having used the service varies between 5% to 17%, and mainly they have used it only 1 to 3 times per month or less frequently. In the new transportation plan of the region, this service is planned to be enlarged.

More information: https://www.vnn.de/fahrplaene/landkreis-cuxhaven/anruf-sammel-taxi-ast

4.6. Brf Viva – Smart housing including shared mobility solutions

Brf Viva in Gothenburg, Sweden, is a new kind of smart housing concept that suits well for people who want to live sustainably. The apartments (132 in total) use solar power with used e-car batteries for electricity storage, heat recovery from ventilation, have excellent energy efficiency, and the buildings are made of climate-smart concrete. Brf Viva acts as a testbed for new housing concepts in terms of social, economic and environmental sustainability. Citizens' were involved in the process during the planning of the housing concept. The apartments won the Environmental Building of the Year in Sweden Green Building Awards in 2019.

New mobility solutions are also part of the concept:

- The apartments are situated close to the city centre with good public transport connections.
- There are no private parking lots for apartments.
- Instead, the residents have in their use shared (e-)cargo bikes, (e-)bikes and shared cars.
- The residents also have in their use a Mobility-as-a-Service application that combines different modes of transport, including bicycles, carpool and public transport.

So far, the residents have been happy with their housing choice. As such, this housing concept could fit well in similar places where owning and using a private car is not needed, and there is a need to avoid an increase in vehicle traffic. It also shows the potential of citizens involvement and interaction together between city planning, transport planning and construction companies during the planning. Also, Housing solutions and apartments should be considered to be part of the MaaS organizing solutions.

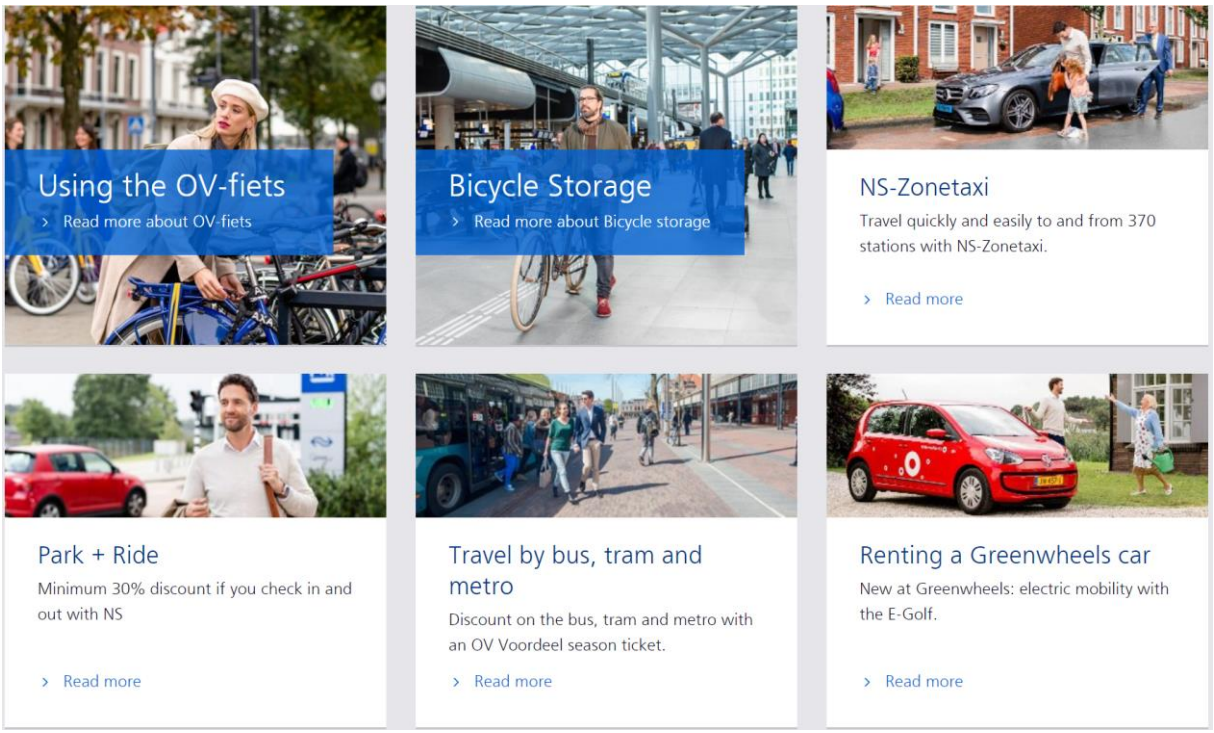
More information: https://www.greengothenburg.se/reference-objects/353

4.7. Cooperation between e-scooter operators and the City of Lisbon

E-scooter services have become very popular in many congested European cities. While the scooters are currently used mostly for fun, they are also considered to be a viable last-mile alternative. There has also been lots of debate about their problems: speeding, driving on wrong places, parking issues, abandoned vehicles and accidents. Every country has its own legislation concerning e-scooters and scooters: sometimes they are compared to bicycles, but it may also be legal to use them on pavements if the vehicle does not exceed the specific speed limit. However, the legislation does not yet guarantee that users or even service providers would follow them (legally, the driver is usually responsible if something happens). Also if there is foul play, service providers hardly ever penalize users or police would fine a misbehaving driver (or service provider) of foul play. The latter is often true also concerning cyclists and those riding with their scooters.

The city of Lisbon has taken an alternative approach for solving possible issues with electric scooter service providers. It arranges approximately once a month an unofficial "coffee meeting" with all service providers to discuss and find solutions to recognized challenges. All the operators (including, e.g. Lime and VOI) are there simultaneously because the challenges are typically very similar regardless of the operator. Instead of setting strict rules to the companies, city wants the service providers to find best solutions and practices: the same outcome can be achieved by technically limiting the device, or by educating the users in advance[1]. Another example related to parking is that the service providers may use stands for their scooters, or virtually zone certain areas for parking (in cooperation with the city people defining the proper places and ways). At the same time, the city expects that the drivers become gradually more (behaviorally) skilled drivers, and those service providers would find ways to educate users and enforce their good behaviour in traffic.

4.8. Bike-Train-Bike system as a backbone of MaaS



Picture: **Different door-to-door services** offered by Nederlandse Spoorwegen, the Dutch railway company

The most important measures within this approach are the provision of enough bike parking at railway stations and offer (shared) bikes, especially for the last mile. The Ministry of Transport in 1999 introduced an investment plan to enlarge and renew all cycling facilities at railway stations. Co-financing from the national government meant that local governments, Infra Manager ProRail and

[1] Gössling (2020) has a good review of different methods and policies that have been applied in different cities and countries related to e-scooters. Integrating e-scooters in urban transportation: problems, policies, and the prospect of system change. Transportation Research Part D 79.

Dutch Railways (NS) were willing to co-operate and invest in bike parking. The investment plan made a huge impact. According to a survey, the stations with new and enlarged bike facilities saw 20% more train passengers and 11% more bike use in 2002 due to the new/extra racks. In 2003, a shared bike system (called: OV-fiets) has been introduced in the Netherlands following a small-scale pilot in 2000 started by Dutch ProRail and supported by Dutch Ministry of Transport and the cyclist organization 'Fietsersbond'. OV-fiets is a typical 'back-to-one' (B21) system. You bring the bike back to the same location where you rented it, but for an additional fee, you can bring the bike to another site.

But this approach is not just about the hardware; it also includes marketing, promotion, integrated tariffs, and the organization of bike-train solutions. People have to be convinced and enticed to use bikes and the offer has to be truly seamless. For this reason, NS offers other last-mile options today as well (picture), but the backbone is the Bike-Train-Bike approach. It must be stated that the Dutch example cannot directly be copied to other countries. Experiences in the UK and Belgium show that cultural, legal and geographical differences oblige companies to adapt the Dutch example.

Lessons learned

- Location is the absolute priority. Racks and guarded bike parking at the wrong place will not be used. They near the access routes, near the departure platforms (optimally within 50 meters), and within the viewpoint of residents (to feel safer)
- Provide enough racks at each station currently and in the future. Enough means that even during peak hours there have to be at least 20% more racks than bikes to avoid overcrowded bike parking
- If possible and especially in countries with high chances of snow or rain: provide roofed or covered racks
- Provide a fastening feature for separate locks: to reduce the risk of theft
- At one station (the City of Groningen) the Municipality chose to offer free parking in the guarded parking during the weekend due to the many students and a lack of capacity in the free-to-use racks during the weekend
- The guarded bike parking at Utrecht Jaarbeursplein (open 24 hours per day) was the first parking to introduce a new tariff system ((first 24 hours are free, after that, you pay €1,25 per day) as a pilot project. Experiences have been very positive and in 2016, 20 parking places have adopted the new system and, considering the success of the system, more are being included shortly
- Maintain and regulate bike parking. Otherwise, parking will quickly start looking messy, and lots of non-used bikes will remain in the parking, which results in parking places being overcrowded for no reason. At some Dutch railway stations, 20-40% of the racks were used by non-used ('orphan') bikes
- From 1st of January 2017, NS has changed the tariff structure and abolished the subscription fee for users. NS states that a subscription often is a barrier for people to use the shared bike system. The price per rental (max 3*24 hours) roughly equals a round-trip by bus

- Clients are the best ambassadors for the public bike system and an ability to quickly pay for two bikes is an advantage when you are travelling together. Generally speaking, the promotion of bike parking is more crucial than the promotion of shared bikes, because the number of people that will/can use bike parking is higher
- When the shared bike system became a part of the railway company in 2008, the organization could use the marketing expertise and the client database of NS. Since then, the number of subscribers tripled to 160,000 people. NS doing all the marketing and the main communication of the system has kept the costs down
- For a seamless bike-train-bike trip, limiting the number of transportation cards is another crucial element to success. Therefore, all passengers can use the same card to safely park their bike, which they used to reach the station and to rent a public bike for the last mile of the trip
- Find a proper balance between safety and directness by attending to the real needs of cyclists when designing/implementing specific infrastructure. In descending order, these should be improved first: Safety -- Directness -- Attractiveness – Comfort

More information: http://www.bitibi.eu/dox/D2_5_Guidelines_BiTiBi_May_2017n.pdf

4.9. Solutions under and over a river

Photo: De Fiets Bus, © Port of Antwerp

Due to its geographical position situated on two riverbanks of the river Scheldt and the presence of several large docks, some parts of the Antwerp port area are not easily accessible by bike – making

more than 80% of the workers use their own car daily for the commute. Furthermore, the traffic inside the port area is intense and largely comprises lorry traffic and large transports, making safety a key issue for port companies and their employees. However, with 68 % of the 60 000 port employees living in the immediate surroundings of the port, cycling to and from the port has a lot of potential.

From the multimodal point of view the most important implemented solution were: Bike bus allowing people to take their bicycle to the bus line running through a cars-only tunnel under the river Scheldt, and the expansion of the water bus line to the north, allowing port workers to take their bike on the water bus when crossing the river Scheldt. These implementations decreased the journey for cyclists by an average 15 km and 50 min. Both the bike bus and the water bus were very popular from the start. An average monthly use in bike bus was 10 122 passengers in 2020 and the water bus tripled its use especially in the summer with 76 745 users in July 2019.

Lessons learned:

- As there were no existing examples or best practices from other cities to develop a bike bus, so the concept had to be developed from scratch. First idea was to adapt the concept of a ski bus, with the equipment stored at a trailer attached to the bus, however this was abandoned as this proved to be too time consuming. Instead, an existing second-hand passenger bus was remodelled with as many seats as possible removed to fit more bikes. As a result, the bus had a built-in bicycle storage to accommodate for 25 to 30 bicycles per bus. However, as the bike bus was a second-hand bus remodelled into a new type of bus, the bus had to get authorization after remodelling, which took some time.
- At the start of the operation, the waiting times were longer than expected due to congestion. Even though a separate bus lane was implemented, also the operational scheme had to be changed to more flexible: instead of a fixed time schedule for each stop on the route, only the first stop is fixed, which provides more flexibility along the route.
- The bike bus started as a pilot with five companies and the employees of these companies became also involved in marketing and communication. This practice of ambassadorship has created very strong supporters amongst the port employees, which helped promoting the bike bus to the other companies of the port.
- At the launch of the water bus service, it was quite overwhelmed by interest from certain port companies who regarded the water bus as an alternative to their own collective public transport. In future projects, different stakeholders will be involved at an earlier stage to avoid such misunderstandings. Eventually, extra vessels were taken into service and the Flemish government took over the funding of the Scheldt route.

More information: **https://civitas.eu/sites/default/files/portis_transferability_sheet_2ant1_2_antwerp_final.pdf**

5. Electrification of transportation in BSR region

The different railway solutions were identified by going through different knowledge bases. Publicly available descriptions of the lessons learned and benefits from these development efforts were preferred in the selection of the solutions for this report.

5.1. The situation in our partner cities in the topic

5.1.1. Free and Hanseatic City of Hamburg

Verkehrsbetriebe Hamburg-Holstein GmbH (VHH) currently has two e-buses, but has completed the procurement process for a further 16 and has open tenders for another 34 to be supplied in 2020. The first milestone was achieved in summer 2018 when one of the first e-bus depots in northern Germany went into operation in Hamburg-Bergedorf. VHH invested around €10 million in the modern bus depot facility, which is specifically set up for the maintenance and repair of e-buses. It serves as a template for the 11 remaining VHH depots, which will also be upgraded over time. VHH has simultaneously been installing the necessary charging infrastructure for 137 buses to be electric by 2030. VHH is also examining how electricity generated by wind turbines can be used to charge e-buses overnight. Wind energy will enable buses to be charged at precisely the times when there is excess (wind) energy being generated and is readily available for use (source: **https://www.in-itse.com/ende/hamburg-goes-electric.html**).

5.1.2. The city of Riga

Urban public transportation in Riga is mostly provided with electric power-driven vehicles (trams, trolleybuses, part of city public buses, train). The plan is to replace all public bus fleet by sustainable vehicles driven by electricity, hydrogen and other alternative low or zero-emission fuels by 2030 (source: Interreg **cities.multimodal project**).

5.1.3. The city of Tallinn

In 2011, Estonia launched a program for electromobility called ELMO to support the introduction of energy-efficient and environmentally-friendly electric cars and plug-in hybrids. An electric vehicle fast-charging network, consisting of 165 fast chargers around Estonia, was built. Since establishing the programme, there are 28 fast-charging stations in Tallinn. Tallinn municipality uses 29 electric cars. In 2018 there were 252 electric vehicles in Tallinn, 85 of them belong to the public sector, 125 to legal entities and 42 to individuals. In public transportation, the city plans to switch to 100% use of electric city buses from 2035. Tallinn city has signed an agreement with the local power company Eesti Energia AS to provide the best places for electrical charging network for buses. Unlike typical solutions, charging times align with fluctuating prices of electricity to minimize the costs of electricity. At the same time, buses could support the grid based on power in their accumulators, which supports the balancing of power load in all electrical network. There will be two electrical buses in test in Tallinn from the year 2020 (source BSR Electric and Roadmaps for Energy projects).

5.1.4. The city of Turku

Currently, there is one trunk route, which is mainly operated with six electric buses – only when the ferries arrive in the harbour, additional diesel buses are used in the line. These electric buses have been operated by a city-owned company so far, to ease knowledge sharing and procurement – and this procurement ended with 12 new electric busses taken into service in 2021. By May 2019, over 1 000 000 km have been driven in total with the electric buses, but there have been problems with the reliability, especially during the wintertime. The buses are charged at the end stations and overnight at the depot. In addition to charging electric buses, the local utility company has also been active in developing a charging network for electric cars. Currently, there are 20 charging station and plans for 200. The city itself is preferring electric cars in their procurement and testing light electric vehicles in work-related trips during the office hours. (source: Riekki, S. (2019). Expanding the electrical bus network in the Turku area. Master thesis in Finnish and **CIVITAS ECCENTRIC project**).

5.2. Geofencing

Photo: **Västtrafik 7118** by **Bahnfrend** / **CC BY-SA**

Geofencing applications are starting to appear on city streets, with for example, the electric mode of hybrid vehicles being turned on in cities according to predefined areas of the city. In the city of Gothenburg, the first available results are encouraging, highlighting geofencing's potential to enable safer and more environmentally friendly urban mobility.

Geofencing uses a virtual perimeter for an actual geographic area inside which mobility management can be applied. The technology enables for vehicle manufacturers and/or the vehicle owners an opportunity to let the vehicle respond even autonomously to the digital regulations. Geofencing enables a vehicle to adapt to the city environment based on its position, which is identified using a Global Positioning System (GPS). This means that, for instance, the vehicle's speed or drive mode can be limited and/or adjusted to different times of the day. The technique is also versatile enough to be deployed on motorways, major arterial roads, densely populated areas and in city centres.

Cities can create green zones, allow for better traffic flows, lower traffic noise and air pollution, and make public spaces safer to use with this technology. These were the objectives of a project concerning bus routes 55 and 16 in Gothenburg and for the past 5 years, the city has used geofencing techniques on 10 vehicles, with very encouraging results. The buses operating on routes 55 and 16 are either electric or hybrid vehicles. Geofencing is being used on both routes, limiting the speed of the vehicles, and forcing hybrid vehicles to automatically switch to the electric engine on certain digitally limited stretches of the routes (i.e. zones with many pedestrians and cyclists). Data is an essential element for the operationalisation of this technique. Currently the data used by the buses for geofencing is programmed into the vehicles, but in the future, the aim is for the data to be stored elsewhere and downloaded into the vehicles as they enter a specific area.

The results, particularly on the reliability of the system, are encouraging. Bus drivers feel that the system in place assists them in focusing solely on the driving aspect, thus reducing the risk of accidents. The system is also reliable to the extent that the speed limits that have been enforced have not been exceeded and emissions have decreased. In addition, fleet owners report that vehicles have been damaged less. One of the most unexpected outcomes is that nearly all stakeholders involved (drivers, fleet owners and vehicle manufacturer) are happy to have their operations controlled by geofencing.

Gothenburg's case focuses on creating the right conditions for geofencing, bearing in mind that introducing this on a larger scale is complex and not without challenges. The goal is that, by 2022, the Swedish Government will have developed procedures enabling cities to implement geofencing in the cities, while providing incentives for connected vehicles and infrastructure. This could be done by creating increased access to certain city areas in the rush hour or during the evening. The ambition is also for geofencing to be used in an entire city zone, with rules set by the corresponding managing authorities, in line with the expectations of residents. This would result in the creation of dynamic smart zones with rules and requirements, for which vehicle adaptation would be needed.

Lessons learned:

- For the successful implementation of geofencing, there is a pressing need for full collaboration between all stakeholders (public transport entities, fleet owners and technology providers). Otherwise, the potential for creating attractive and tailor-made solutions is curtailed.

- Making city data available for all stakeholders involved is an important pre-requisite.
- Thus, the main challenges to be addressed to achieve the widespread deployment of large-scale geofencing – the need for a functioning digital infrastructure and an appropriate regulatory framework.
- As an additional benefit, the connectivity of vehicles needed for full geofencing also improve safety on roads, since the communication between vehicles will allow, for instance, a bus to inform another bus about a slippery road in the vicinity.
- Other challenges affecting the success of this technology are: the mix of new and old vehicles on the road; the mix of voluntary and mandatory services, and the level of penetration of these depending on the categories; the need for up-to-date information and high-quality data; the accuracy of GPS and the need for storage (to handle all of the information); the acceptance by users and the public, negative perceptions and emotional aspects of the desire to control (particularly for private car drivers); changes in institutional arrangements within and between road operators.

More information: https://www.eltis.org/resources/case-studies/geofencing-new-tool-make-urban-transport-safer-and-more-sustainable

5.3. Privileges for operators of electric freight vehicles

Photo: [Electric freight vehicle in the city of Amsterdam](), © Frevue -project

As a partner in the FP7 FREVUE project, the City of Amsterdam has been actively supporting the uptake of electric freight vehicles (EFVs), using different incentives, from purchase subsidies to encouraging zero emission deliveries in the procurement of its own office supplies. Among the most effective incentives were traffic regulation exemptions in the city centre to seven logistics operators using EFVs as their delivery vans and trucks. These exemptions allowed electric freight vehicles to (un)load directly in the pavement, to operate outside the time access windows and to enter certain pedestrian zones. The areas were defined based on operators' preference (logistics operators could ask for exemptions specific to their business) and traffic situation.

There were several perceived benefits for the operators, workers, and the city. Five out of seven operators reported time savings in logistics operations (less time in driving, walking, and (un)loading). As normally the drivers pay the fines for parking illegally themselves and thus hurry in making the deliveries when no legal parking is available, they were able to deliver a better service to the receiving clients and with fewer mistakes when there were no anxiety of receiving parking fines. The city of Amsterdam did not found any negative effects from the pilot, and interviews with local businesses even suggested that the exemptions brought a positive perception of the effects of electric vehicles on air quality and noise levels in the areas affected by the pilot. As a result, the city of Amsterdam is broadening the pilot to the whole city, and at the same time ensuring a stricter enforcement to prevent conventional vehicles parking at the exempted locations.

Lessons learned:

- The current delivery time windows in Amsterdam, based on regulations and shop opening hours, are rather short, reducing the operating time to as little as one hour. As a result, operators employ several vehicles to carry out all the deliveries, with more than one man per vehicle. A wider time window would reduce the vehicles on the streets as well as staff costs.
- Another potential exemption could be the use of tram lanes during delivery windows, as there are usually traffic jams on car lanes.
- Stricter enforcement is needed to prevent conventional vehicles to park at the exempted locations, as well as stop passenger cars to stop at (un)loading bays.
- All parties agreed that the privileges should be made last longer, not only for the positive results observed, but also because it would lead to long-term agreements with the receivers, making the deliveries even more efficient.

More information: **https://www.eltis.org/discover/case-studies/frevue-testing-electric-vehicles-real-world-urban-logistics-operations**

5.4. Charging Master Plan

Picture: The map of suitable and prepared places for chargers in the city center of Stockholm.

Private citizens driving electric vehicles (EVs) mainly charge their vehicles overnight at or near their homes. However, craftsmen, urban logistics and taxi business, as well as visitors to the city also need access to daytime charging facilities and not all citizens can charge at home. In addition, even in markets with high electric vehicle growth, bureaucratic processes and delays related to site selection, permits, and grid connection can discourage investments. For these reasons, the city of Stockholm developed a charging Master Plan to oversee and complement the infrastructural development for EV charging to ensure that it is effectively meeting user needs rather than just covering popular hotspots. The aim is to deliver 4,000 public charge points by 2022 and making the installation of the charging stations as easy as possible for companies, while also ensuring high utilization of each station with good site selection.

As part of the plan, the city has mapped priority areas for public charging investment through consultation with the grid operator Ellevio, the municipal planning department, and local businesses. These sites are pre-approved for the installation and the plan includes a publicly accessible dynamic map which shows existing as well as planned charging sites (picture).

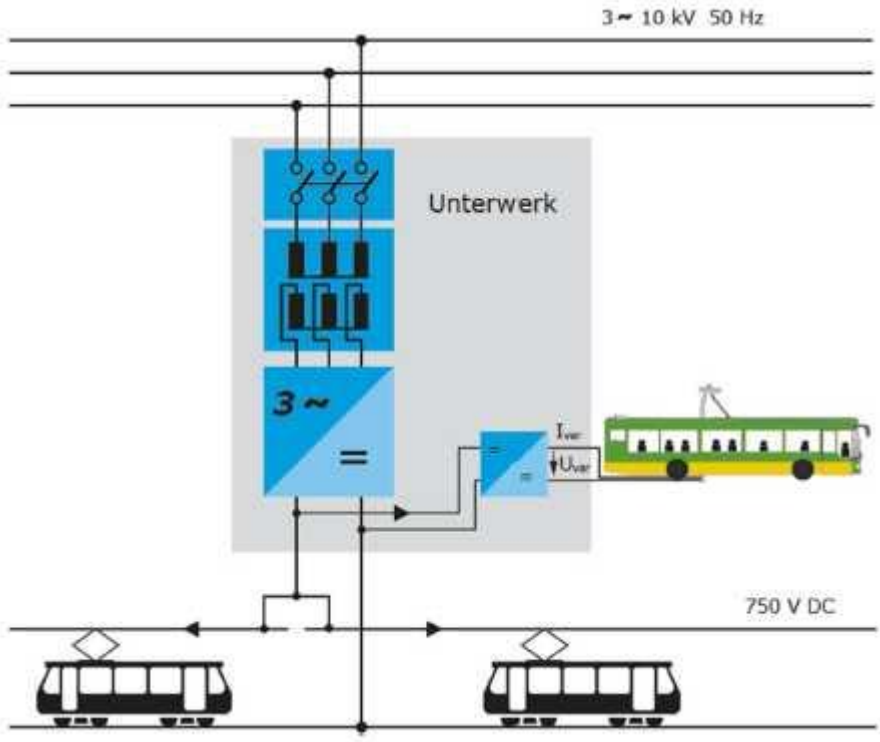
Private operators can submit statements of interest for specific sites and private utility companies have already shown interest in providing on-street fast charging infrastructure. To increase competition, each operator can only apply for up to 30 sites per round. Once formally approved, the operator is connected with the grid operator with established procedures for the speedy installation. As a result, Stockholm has been able to accelerate the growth of a public charging network without direct subsidies with a little over 100 charging points being installed in 15 streets in the year 2017 alone.

Lesson learned:

- The transition to EVs necessitates continuous collaboration with all the stakeholders on the deployment of charging infrastructure and setting long-term targets together with them.
- Cooperation and sharing experiences with other municipalities is also highly important.
- Solving associated administrative and legal issues is time consuming. Issues such as traffic signs and access right agreements proved more complicated than expected, and existing legislation in Sweden does not seem well suited to new EV technology.

More information: https://www.eltis.org/discover/case-studies/stockholm-implementing-public-electric-vehicle-charging-network-sweden

5.5. Electrifying bus transportation using existing tram infrastructure for re-charging



Picture: The charging of e-buses from the tram sub-station at Neumarkt station.

In cities like Oberhausen - which is a medium-sized city within the so-called Ruhr Metropolis in the west of Germany - diesel vehicles were mostly used in urban transportation. To reduce the dependency on fossil fuels and to reduce NOx and particulate matter emissions and noise pollution in urban areas, STOAG is trying to introduce buses using alternative energy sources into the urban transportation system. The public transport operator in the city of Oberhausen (Stadtwerke Oberhausen GmbH (STOAG)) took part in the H2020 project ELIPTIC (Electrification of public transport in cities) with the aim of showing how costs and energy can be saved by electrifying public transport and optimizing the use of existing infrastructure and rolling stock.

STOAG is using the existing DC tram infrastructure for charging the new e-buses in operation. The required energy was taken from the tram catenary by a pantograph installed on the roof of the bus or from the tram sub-station. Each charging operation takes up to 10 minutes and can be done during the turning times at the terminus station. Especially, the charging from the sub-station at Neumarkt station (picture) was proven successful. This solution not only has the advantage of sharing the existing medium-voltage switchgear, the converter, and the rectifier of the sub-station, but also allows the weatherproofing of the charger in the sub-station. Hence, there is no additional space required, except for the mast and integrated charging device. The operation of these e-bus lines continued to be successful with only small disruptions in the operating during the introduction of the solution. There are also plans to electrify another line together with the neighbouring public transport operator.

Lessons learned:

- The parking with the ‘pantograph up’ charging system proved to be difficult for the drivers. Also, the pantograph didn’t work well with lower temperatures.
- It also became obvious that the security and safety aspects in the interaction with the charging infrastructure needs to be investigated.

More information: **https://www.eltis.org/discover/case-studies/using-tram-infrastrucure-recharge-e-buses-oberhausen-germany**

6. Existing logistics solutions (in connection to ports)

The different railway solutions were identified by going through different knowledge bases. Publicly available descriptions of the lessons learned and benefits from these development efforts were preferred in the selection of the solutions for this report.

6.1. The situation in our partner cities in the topic

6.1.1. Free and Hanseatic City of Hamburg

The Port of Hamburg has backed rail ever since the dawn of the railway age. Today it offers access to all terminals and industrial firms in the port via the Port Railway, founded in 1866. More than 100 registered rail operating companies use the Port Railway network, and around 200 freight trains reach or leave the port on every working day. To ensure smooth rail traffic, all the port's container, multi-purpose and bulk cargo terminals possess high performance, state-of-the-art rail facilities. Container block trains, for example, can run directly into container terminals without any preliminary shunting. The port authority is trying to construct new bridges with the deliberate aim of separation of transport modes and traffic flows to enable rail and road traffic in the port to flow even more smoothly. Also, loading centres and rail operators are required to use the Port Railway's traffic management system. For controlling and optimizing truck traffic, a slot booking procedure for the delivery and collection of containers by truck was introduced in 2017 at all four container terminals in Hamburg (source: **Port of Hamburg web pages**).

6.1.2. The city of Riga

The railway infrastructure serves approximately 70% of the total cargo turnover of the Freeport of Riga. Conversely, cargo delivery to terminals by road transport is challenging in several districts adjacent to the port due to high traffic intensity and low street throughput. In 2019, with a co-financing from the European Cohesion Funds, all coal handling operations were transferred from the historical centre of Riga to newly constructed state-of-the-art and environmentally friendly bulk handling terminals at Krievu sala. The main development focus is still in the building and modernization of the port's railway network and connections to the national network. Smart Port solutions are under planning in the next ten years (source: **Freeport of Riga development programme 2019-2028**).

6.1.3. City of Tallinn

In 2017, the shipping company Tallink opened a regular cargo route between Helsinki and Muuga. Muuga Harbour is located in a logistically right place, as freight vehicles can drive to and from the harbour without passing through Tallinn city centre. This has diverted up to a quarter of the company's freight traffic away from central Tallinn. For the remaining traffic of different shipping companies, the Port of Tallinn developed an automated traffic management system in the Old City harbour. When a vehicle enters the port area, the front and back number plates are detected, the

height/width/length is measured, and a vehicle is weighed on the road using a weigh-in-motion system. Data received from the number plate detection and measurement systems are automatically transmitted to the port management system, which checks the existence and conformity of the booking and provides further guidance to the driver at the end of the detection area. Driving instructions and information is shown on interactive led displays, which are specially designed for port conditions. Recently, a pilot project for a smart port application is aimed at extending this traffic management by using a real-time waiting line system, halting trucks outside of the city centre and later directing them to the ship in an orderly and timely fashion to avoid congestion (source: **Port of Tallinn web pages** and Interreg FinEst Smart Mobility project).

6.1.4. City of Turku

The Linnanaukko area of the port, closest to the city centre of Turku, serves unit cargo transports as well as lo-lo and bulk transports. There are several truck terminals in the area and railway tracks that lead to the area giving a possibility for the transfer loading of railway carriages. Heavy vehicles are guided to the Turku ring road, from where the trunk routes of goods transport can be accessed, and the heavy vehicles are banned from the whole city centre. Recently the Port of Turku has installed new number plate recognition, a measurement scanner (for length, width and height), weight-in-a-motion scale, and cameras for damage detection to the freight gates of the area to ease the flow of trucks (source: **The Port of Turku Handbook 2018** and NextGen Link project).

6.2. Eskilstuna Intermodal Terminal

Eskilstuna Intermodal Terminal is one of Sweden's leading intermodal terminals. The terminal is used by several rail operators and has daily train connections to ports in Gothenburg, Malmö and Trelleborg. In addition to traditional cargo transhipment services, Eskilstuna also includes facilities for storage and consolidation of goods, maintenance for road or rail cargo carriers and customs clearance services.

This kind of dry port capable of handling international cargo can speed the flow of cargo between ships and major land transportation networks by moving the time-consuming sorting and processing of containers inland. A dry port is also a vested interest of the cities hosting the seaports due to the reduction in land uses, congestion and air-polluting emissions in the city – especially if the connection is based on rail transport. In addition to the environmental factors, the municipalities hosting the inland terminals have also the interest of attracting economic activity and creating jobs to the region – thus not entirely motivated by the profits of the logistics operations.

The terminal in Eskilstuna has invested in automation and electronic communication, further speeding up the flow of cargo. These solutions include cargo gate that photographs and records entry and exit of each vehicle and container/trailer, computerized entry and exit inspection, ADR-S RID-S management and EDI or other electronic reporting.

The inland terminal concept in Sweden started with the seaports being the coordinators of their logistic networks. This network usually consists of short-haul terminals – for example for stuffing and

stripping containers, and terminals over longer distances and good connections to the core transportation networks. The key actors in this network include municipalities in both ends, the dry port terminal, rail operators, goods owners, supplementary service providers, and the National Transport Administration – should the terminal have a capacity to handle international cargo. Recently, the inland terminals in Sweden have become a shared capacity for several seaports and operators. However, close collaboration with the port is still required for the IT integration and excellent flow of information.

Lessons learned

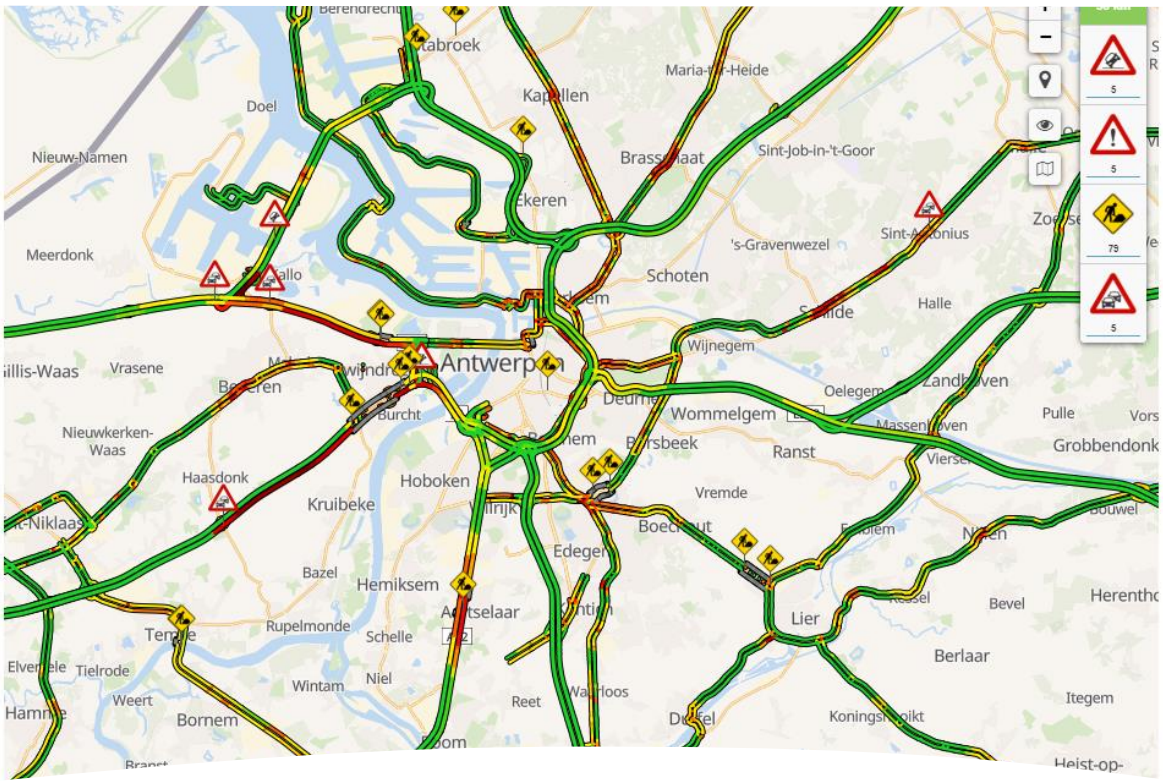
- For the full utilization of the rail connection, coordination with the rail operator(s) is needed when the share of a container and semi-trailer segments change in cargo flows
- Rail solution is not so competitive on short distances, especially as it usually needs infrastructure improvements in the form of on-dock rails and separate rails for passenger transport to increase reliability.
- To support the modal change, the port of Gothenburg offers differentiated tariffs for customers choosing to reduce their emissions.

More information: **https://www.yumpu.com/en/document/read/27192638/hub-and-hinterland-development-in-the-bsr-transbaltic**

6.3. Traffic Flows in Port of Antwerp

In the on-going CIVITAS PORTIS project, the stakeholders in the city of Antwerp are aiming to improve the accessibility of the northern urban area where the port and the city meet and create the right infrastructure for safe transport in and around the city and the port area (e.g. new tramlines, cycling infrastructure, etc.). In addition to linking the city with the port area, their aim is to offer non-car dependent transport options for port employees. This development aim requires significant infrastructural works for the new tram corridor, and the challenge is to guarantee the accessibility of city and port during the construction.

Also, car and truck traffic in and around the city is in focus in order to reduce congestion and improve life quality in the urban area. The map below with current traffic flows and the list of current travel times in the web pages of the port was made as a part of both hard and soft measures to change travellers mindset. In addition to web pages, dynamic traffic signs are being installed on the right and left banks of the river. The purchase and installation costs of these signs amount to 3 million euros. By managing traffic dynamically based on real-time information, the aim is to gently guide outgoing port traffic, thus raising the level of safety and making the flow of traffic smoother. With these different technologies, road users are given information concerning the choice of route, travel times and traffic information such as incidents, tailbacks, road works etc.



Picture: Online map of [current traffic flows](https://www.portofantwerp.com/en/mobility) near the port in the city of Antwerp

More information: https://www.portofantwerp.com/en/mobility

6.4. ITS / Weight-in-motion station

Since Gdynia is a port city, the number of lorries, trucks and other heavyweight vehicles on local streets is very high. The city of Gdynia has been spending a lot of resources for road maintenance since surfaces were being damaged by vehicles going to and from the port area, but never had the means to make exact measurements of the scale of the problem

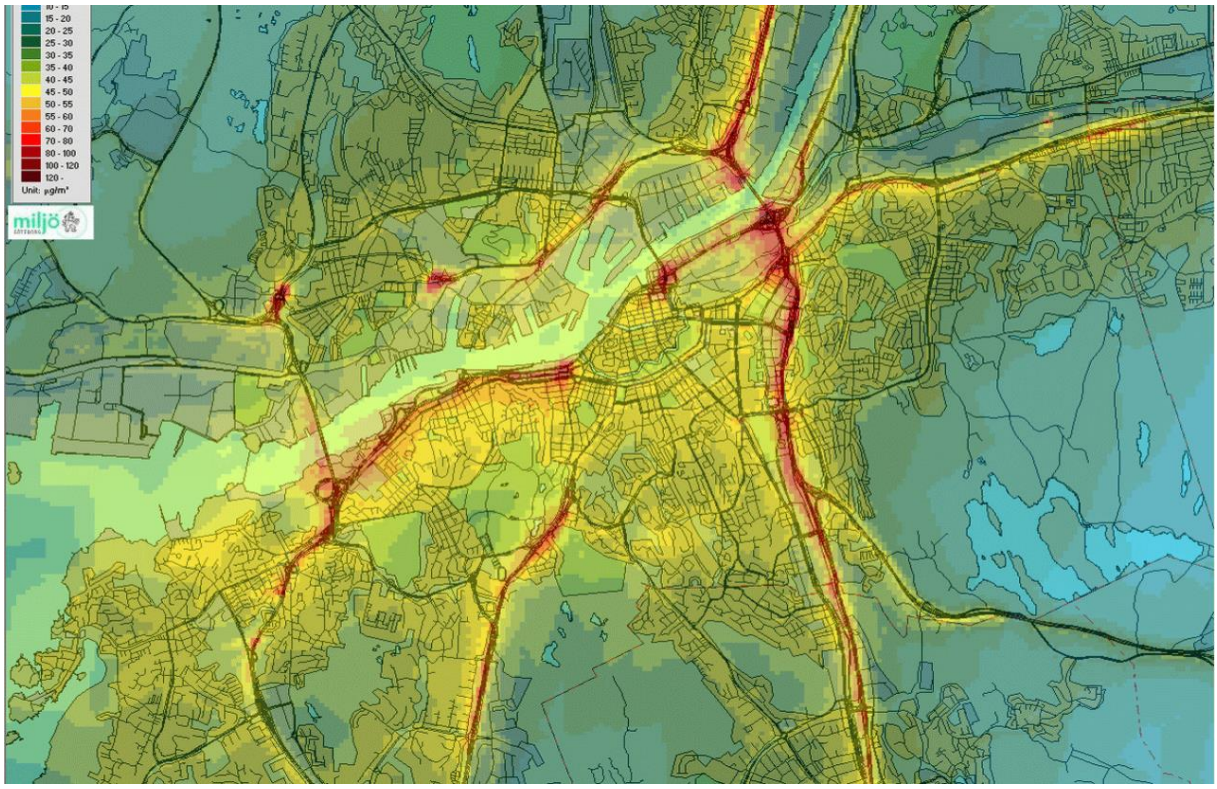
Within the CIVITAS DYN@MO project, the first weigh-in-motion station in the Gdynia region and one of the first in Poland was implemented on one of the main roads leading to the city. This station captures and records the axle weights and gross vehicle weights as vehicles drive over a measurement site without requiring the vehicle to come to a stop. The station in Gdynia was fitted with video cameras, which enabled the immediate transfer of the registration number of the vehicle that exceeded the permissible load to the Traffic Management Centre. This information was also transferred to Road Traffic Inspection and to the port gate for further vehicle inspection.

Results

- Reported reduction of road maintenance cost by 15% and a reduction in the number of overweight trucks by 90%
- Reduction of noise and vibration caused by heavyweight vehicles

More information: https://civitas.eu/measure/weigh-motion-and-enforcement

6.5. Reducing the emissions of logistics



Picture: **NO2 air quality in the city of Gothenburg** measured in CIVITAS TELLUS project in 2005

The north shore of the river in Gothenburg is a former industrial area that is now under intense redevelopment with new companies and residents moving there constantly. The major transit road for heavy traffic to the outer port runs through this area. The heavy traffic causes significant problems for the city and the traffic planners, from both a health and congestion aspects. It is also one of the areas where the European Air Quality Norm for nitrogen oxides (picture) was in danger to be breached.

The objective of the activities in Gothenburg was to decrease emissions of NOx and particles from heavy traffic and distribution by influencing the private transport companies to switch to alternative fuels such as CNG/CBG. This objective was meant to be achieved by giving subsidies to the first ten buyers of trucks and implementing fast fuel systems of alternative fuels for heavy vehicles in the port area. However, during the implementation time (2002-2004), there were not enough interests among the heavy vehicle users and manufacturers. The implementation was still successful, with four TELLUS project partners collaborated to introduce two large and 16 lighter distribution vehicles in the city of Gothenburg. As the lighter city distribution vehicles were also included, the geographical area of the implementation expanded to include the whole of Gothenburg instead of just transits to and from the port. Also, to reflect this change, a CNG fuel station was built in an industrial area with a high transport demand, close to major highways and the city instead of the port area itself.

Lessons learned

- Innovative and holistic thinking that encompasses the complete transport concept and its stakeholders was essential for the success of the implementation.
- Be open for changes. When an implementation like this begin, changes will occur during the process, as many actors and stakeholders are involved. The partners must be able to make changes without applying permission for them at EU as this postpones the process and is frustrating for the members.
- One of the sources for changes is political decisions. The city of Gothenburg also planned to implement in this project an environmentally friendly river shuttle, which stopped by the political decision and the enlargement of an environmental zone with specific restrictions on heavy goods vehicles was postponed by political decision.
- However, with the political support changing on a national level towards more positive for purchasing CNG vehicles, the local waste collecting company was invited to replace the ferry with four heavy CNG powered back-loaders complemented with electric hybrid technology. This implementation ended up complementing the other CNG procurements in the city.

More information:**https://civitas.eu/sites/default/files/tellus_final_evaluation_report_part_ii_-_g_teborg.pdf**