Urban Environment publications 2019:13

# Helsinki West Harbour Traffic situation overview

## Pilot project implementation

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North Sea Baltic Connector of Regions (NSB CoRe)

**North Sea Baltic Connector of Regions**
Interreg Baltic Sea Region programme 2014–2020

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# 1. Abstract

The Helsinki West Harbour area and its surroundings are an international transport hub and corridor as well as a long-time development site of transport-related R&D and a source of challenges related to mobility. Intensive development of the area and increasing amounts of transport require that transport systems and services can enable smooth and efficient mobility of people and goods. The area is closely related to the NSB CoRe WP3 activities, describing intelligent transport systems and services (ITS) relevant to providing real-time mobility services in the Helsinki area.

Based on previous studies and projects in the area, one of the key challenges is to determine the status of harbour traffic, and in particular the exact amount of traffic generated by harbour activities. This amount of information in itself has an extensive influence on the surrounding traffic system and its functionality. Dozens of trucks and dozens or even hundreds of other vehicles arrive at the transport network several times a day. There is a growing need for synchronisation of traffic management operations, and the information needs of local business, residents and customers are also increasing.

The City of Helsinki, one of the partners in NSB CoRe, launched a pilot project to develop solutions to these challenges.

"Dozens of trucks and dozens or even hundreds of other vehicles arrive at the transport network several times a day."

The goal of the pilot project was to collect information on the current status of the West Harbour traffic situation. Project was open for technical innovations to provide real time information, open data solution and modern technical solution as a service.

Helsinki West Harbour's Traffic situation overview project is part of the North Sea Baltic Connector of Regions project (NSB CoRe), which is financed by the Interreg Baltic Sea Region Programme. The project is being carried out in close collaboration with the FinEst Smart Mobility project. The members of the NSB CoRe steering group are:

- Mikko Lehtonen (Chair), City of Helsinki
- Jonas Kurtto, City of Helsinki
- Jussi Malm, Port of Helsinki
- Esa Salonen, Port of Helsinki

Pilot is implemented by Infotripla Ltd.

# 2. Introduction

## 2.1 Helsinki West Harbour as an international transport hub

The NSB CoRe project, financed by the Interreg Baltic Sea Region Programme, aims to improve the sustainable accessibility of the Eastern Baltic Sea Region to freight and passenger transport. One of the partners in NSB CoRe, the City of Helsinki, decided to boost development of the Jätkäsaari district of Helsinki with smart mobility solutions by launching a pilot project to provide an overview of the current traffic situation in the Helsinki West Harbour. The pilot project is one of the projects being conducted to support development of smart mobility in the area.

As an international transport hub, the Helsinki West Harbour area and its surroundings are also under very intensive development. This development includes construction of a new residential area to accommodate 18,000 reasons, which poses challenges for traffic in the area and will leave less space for truck waiting areas and parking. Although local public transport connections to and from the harbour are good, its location causes difficulties for overall accessibility, both for passengers and for logistics. Over 8 million ferry trips are made between Helsinki and Tallinn every year. The connection between Helsinki West Harbour and Tallinn Old City Harbour is one of the world's busiest.

The area is an essential part of the City of Helsinki's NSB CoRe work package 3 (WP3) activities (see section 2.2 below). Work Package describes intelligent transport systems and services (ITS) that are important to the provision of real-time mobility services.

The pilot project is being carried out in close collaboration with other EU projects, in particular with FinEst Smart Mobility. The FinEst Smart Mobility project is ideal for the piloting of new mobility services and solutions. More impact will be achieved when these projects support each other.

## 2.2 The project framework

Helsinki West Harbour's traffic situation overview project is part of NSB CoRe, which is financed by the Interreg Baltic Sea Region Programme. The project is being carried out in close collaboration with FinEst Smart Mobility project, with the aim of collecting more information on the current traffic situation of the harbour. The need for this situation overview was recognised in pilot projects that were launched in FinEst Smart Mobility in spring 2018. NSB CoRe and FinEst Smart Mobility projects are both aimed at improving freight and passenger transport between Helsinki and Tallinn.

**"Connecting these goals and planning the pilots to support each other creates greater value and impact."**

NSB CoRe is aimed at improving the sustainable accessibility of the Eastern Baltic Sea region to freight and passenger transport. The project contributes to the European Commission's Trans-European Transport Network (TEN-T), which connects the continent between East and West, North and South, by taking its implementation to the regional and local level connecting the TEN-T core network corridor of the North Sea–Baltic corridor to its catchment area and access routes in the Eastern Baltic Sea region. The project activities consist of logistics, long distance commuter services, transnational community building and transport branding.

The City of Helsinki is responsible for two of the NSB CoRe work packages: WP3 and WP4. Helsinki West Harbour's Traffic Situation overview project is part of the WP3.


## Project facts

**Priority area:** Transport
**Specific objective:** Interoperability
**Duration:** 2016–2019
**Lead Partner:** Helsinki-Uusimaa Regional Council, Finland
**Project budget:** 3,3 M EUR
**Financing source:** Interreg Baltic Sea Region Programme

## More information

http://www.uudenmaanliitto.fi/nsbcore

# 3. Pilot project

## 3.1 Goals of the pilot project

The NSB CoRe Smart Mobility pilot project, the aim of which is to gather information to provide an overview of the Helsinki West Harbour traffic situation, was launched in Autumn 2018. The City of Helsinki invited tenders for implementation and testing of the solution, and the tender submitted by Infotripla was chosen.

The pilot project has three main aims:

- To build a system that provides more information about the internal traffic situation at the harbour
- To provide more information about the traffic flow to the surrounding traffic network generated by the harbour
- To make traffic situation data and other information freely available through an open data interface

The technology to be used and the means of providing the data were not specified in the invitation to tender, as the aim was to encourage tenders that were based on new innovative solutions.

One of the additional goals set for the project was cooperation with the FinEst Smart Mobility project (http://www.finestlink.fi/en/finest-smart-mobility/), which was a piloting project being conducted in the West Harbour area at the same time. The results of the NSB CoRe pilot project are available to be used in other projectsin the future use, for example in the Jätkäsaari Smart Mobility Lab (https://forumvirium.fi/en/jatkasaari-smart-mobility-a-test-area-for-smart-mobility-and-accelerator-for-commercialisation/). This lab will boost smart mobility solution use in the area.

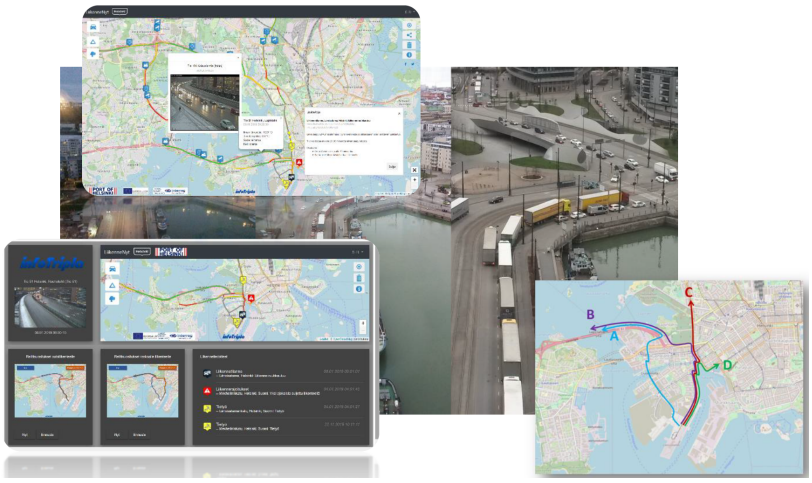


*Figure 1. Increasing traffic situation awareness in Helsinki West Harbour (source: FinEst Smart Mobility project)*

## 3.2 Technical overview of NSB CoRe

The technical set-up of the system consists of four layers: the sensor system, data communication, logic, and data delivery. The set-up is described below and illustrated in Figure 2.

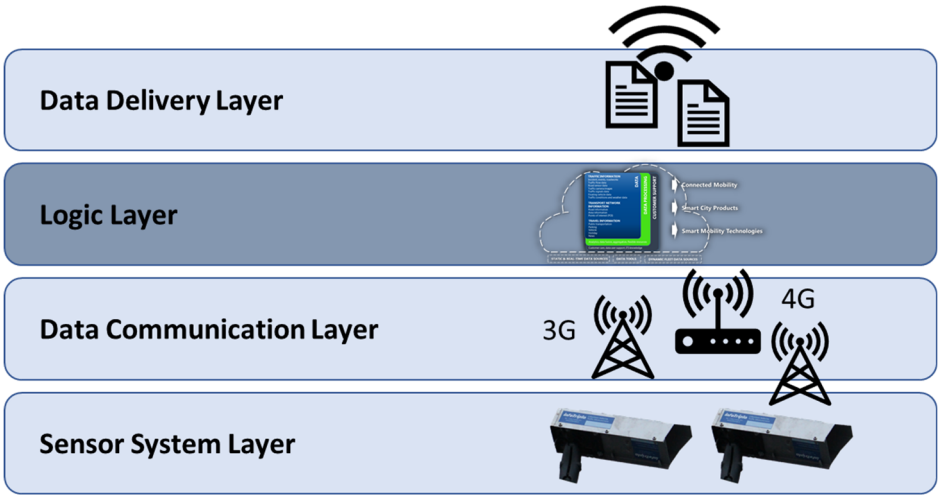


*Figure 2. Technical set-up of NSB CoRe*

**Sensor system layer**
The traffic measuring sensor system was installed to provide raw measuring data from harbour traffic. The sensor system was installed to provide traffic counts and traffic flow information at the exit ports of the harbour. The system can be used to provide several other data types in addition to the ones selected for this pilot. The system uses modern laser detection and commercial communications technology. All the data and information used in the system are anonymised.

**Data communication layer**
Data communication is accomplished by real-time, secured communication solution over the currently available commercial mobile data networks (3G and 4G). The communication layer delivers data from the sensor system to the backend system. It also gives an opportunity to make configurations wirelessly.

**Logic layer**
The logic for the pilot information is based on Infotripla's Traffic Data Analytics Cloud system (TDAC). Collected data is analysed, aggregated and saved in TDAC and TDAC enables logical information delivery.

**Data delivery layer**
Data and traffic information generated by the pilot is implemented to be available via technical interface. This enables the traffic information provided in the pilot project to be made available to any other data users (e.g. projects such as FinEst Smart Mobility or Jätkäsaari Smart Mobility Hub). The data delivery layer connects the pilot to broader smart mobility ecosystems. In addition to a technical interface, a user interface was also used for system testing and data validation during the pilot project.

The information available from the data delivery interface is the number of vehicles passing through in intervals of 1 and 5 minutes. Speed measurements area also available. The interface format is REST/JSON API. The technical specification of the interface are available in the open-source software website Swagger: https://it102.infotripla.fi/ItSensorServiceApi/swagger/#/ (continued availability of interfaces and data is dependent on continuation of the pilot project).


*Figure 2. Pilot elements and implementation in Helsinki West Harbour*

## 3.3 Pilot project development

*Figure 3. Pilot projects elements and implementation.*

## 3.2 Pilot project development

The pilot project was developed and implemented in three steps

1. **Technical development**
   The pilot was based on the plan already introduced in the project proposal phase. The pilot technology solution was based on a combination of traffic measuring sensors, data analytics and logic and communications. The first phase of the project was to assemble and combine selected technology and communications elements. The technical development contained detailed technical planning and architecture work, factory tests for technical feasibility of the system, and technical installation of the solution.

   Technical development of the pilot was carried out between November 2018 and January 2019.

2. **Technical testing and validation**
   Technical testing and validation were conducted to ensure that the system was technically ready for use in the actual piloting environment in Helsinki West Harbour. The technical testing consisted of field tests for the system, feasibility tests, system validation, and finetuning of the algorithm. Most of the technical testing and validation were carried out in January 2019.

3. **Piloting**
   Piloting of the system was carried out in the actual harbour environment in order to compare the system to actual traffic conditions. The aim was to determine the technical performance of the system and to evaluate the results. Piloting, acceptance testing and evaluation of the results were carried out between January and March 2019.

## 3.4 Pilot evaluation

Evaluation was carried out to ensure that the system worked well and that the results met the criteria for the pilot project. These procedures were carried out during the technical implementation phase and the piloting phase in actual operating conditions. The main method of evaluation was comparison of system data with actual harbour conditions.

**In the technical implementation phase**, some problems occurred in the communication layer due to problems in the communication system set-up for ensuring data-secure communication between the sensor system and backend system. Such setbacks are to be expected when developing a new prototype system. They were resolved without any major impact on the piloting schedule or implementation plans.

**In the piloting phase**, the results were promising from the very beginning of the tests. Laboratory tests were carried out before implementation in the actual piloting environment. During the first weeks of the piloting process, very poor weather conditions were experienced, and resulted in minor reinstallation of sensors. Also, as always in pilots, lots of backend software and configuration finetuning was made to improve the traffic situation overview information logic and its quality. Finally, evaluation and validation tests were made as field tests (visual comparison in harbour) and by data-analyse using data available from the Port of Helsinki.

**The final evaluation** to compare the system to real traffic situation was made in March 2019 for some ferry arrivals. The objective was to find out the pilot technical acceptance and to evaluate the results of the pilot. Based on the final evaluation, following evaluation results were summarised:

- In general, the pilot was given reliable result of traffic in harbour
- Some challenges were faced because of drivers were not following the line marks in outbound traffic ports (also some weakness in line mark visibility)
- In continuous data, reliability of counts is always more than 80 %, normally more than 90 %
- Within the test sample ferry arriving 20th March,
    - the reliability of the measures for heavy trucks was 96 %
    - the reliability of the measures for other vehicles was 90 % (clearly influenced by the lack of compliance with line marks)

**The results of the pilot** were good. The following three improvements were provisionally planned in the steering group:

1. The location of the sensors could be improved; in the pilot, the sensors were placed in a location that was convenient for electricity supply and mounting.
2. If the need is for only a number of vehicles (as in this case), the sensor's basic traffic count mode could be used instead of any higher-capacity measurement modes.
3. Line markings should be renewed to instruct drivers to use the correct lanes.

More detailed evaluation results were presented and examined in the steering group, and are available on request.

# 4. Pilot feasibility

## 4.1 Pilot and its feasibility

In general, the pilot met the goals and requirements set for it. For this reason, the steering group found it possible that the pilot project could continue, but naturally that depends on various future decisions and processes. The use of this kind of system is recommended if the data and information provided can be used in other services in the information ecosystem.

**The technical readiness to continuation** of the pilot concept in production phase in Helsinki West Harbour is good. The readiness was examined by Infotripla at the end of the piloting process, and as a result the pilot installation and service concept could be taken into production use as it is. Only some physical installation improvements might be needed in to improve mounting and electricity supply, for example.

"In general, the pilot met the goals and requirements set for it."

## 4.2 Future goals

Given the positive outcome of the pilot project, its continuation is recommended.

If the pilot will be available in the future to provide real-time information on traffic in Helsinki West Harbour, the following goals could be set to gain the maximum benefit from it:

- The pilot and its data could be linked to supplement the functionalities of the FinEst Smart Mobility project by aiming at more predictable traffic conditions in Helsinki West Harbour and its surroundings. This would provide added value in the form of making traffic predictions and timing information of FinEst Smart Mobility service concepts more accurate for traffic management operations.
- The pilot data, if made freely available and maintained as open data for other stakeholders, could be used as one additional data source for new smart mobility service developments (e.g. in the Jätkäsaari Smart Mobility Hub).
- Due to its flexibility and scalability, the technical solution developed in the pilot could also be used in other harbours and terminals and for other similar purposes. This opportunity will be examined in detail through replication to determine its business potential.
- The pilot concept, as a combination of a sensor system, cost-effective communication and backend logic, can be replicated to meet other needs for traffic network sensor systems.

# 5. Conclusions

The results of a pilot project to develop and test an innovative solution for real-time traffic information in an actual demonstration environment in Helsinki West Harbour were encouraging, and it is feasible that the pilot project could be continued. Despite being a prototype, the technical solution has proven to be ready for use as it is directly in the production phase. Of course, some issues (e.g. sensor system device mounting) might need adjustment during the first production period.

"Despite being a prototype, the technical solution has proven to be ready for use as it is directly in the production phase."

The piloted solution has also approved to be promising for use in any harbour or terminal, or for use as part of a larger traffic information or management system, including in other countries.

At least two steps can be recommended for making further use of the piloted system:

1. Other Jätkäsaari Smart Mobility Lab stakeholders and developers should be informed about the free availability of the pilot project data for use in their own innovative service development
2. Data provided by the pilot system should be used in traffic management operations to support operators in traffic control (e.g. the FinEst Smart Mobility project)

These recommended steps do of course depend on whether this piloted system will continue to the production phase.

Finally, the pilot met the targets set by the City of Helsinki and the Port of Helsinki, and it supports the goals of the NSB CoRe work package 3 for providing real-time mobility services.

# Documentation page


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Summary:

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Key words: real-time, mobility, service, harbour, traffic, situation, open, data