SUSTAINABLE URBAN MOBILITY AND COMMUNTING IN BALTIC CITIES

APPLYING TOOLS FOR LOCAL TRANSPORT PLANNING

REPORT ON THE PROCESS AND MAIN OUTCOMES

SUMBA

Interreg
Baltic Sea Region

EUROPEAN UNION

EUROPEAN REGIONAL DEVELOPMENT FUND

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

IMPRINT

Editor: Daniel Krajzewicz.
German Aerospace Center (DLR)
Institute of Transport Research, Rudower Chaussee 7
12489 Berlin, Germany

Authors: Evelīna Budiloviča, Giedre Chrapac, Johanna Fink, Colin Hale, Daina Indriksone, Aksel Part, Jaanus Tamm.

Layout: Matthias Grätz & Elionor Ferrer, Baltic Environmental Forum Germany
Cover picture: Maixent Viau, unsplash.com
This report was developed in the SUMBA project (#R074), with financial support of the INTERREG Baltic Sea Region programme of the European Union. The contents of this brochure solely reflect the views of the authors and do by no means represent the view of the INTERREG programme or European Commission.

TABLE OF CONTENTS

1. INTRODUCTION

This output describes the outcomes of the Group of Actions (GoA) 3.1 “Applying tools for local transport planning”. The report serves as a lessons learnt document of the GoA 3.1 and gives an overview on the activities carried out in the partner municipalities. In this activity participating municipalities/counties selected and implemented a transport model or used a planning tool for supporting the decision-making with options that help them meet their goals. This report thus supplements the GoA 2.3 output with practical implementation examples and is therefore also aimed at providing advices for other municipalities that are not part of the consortium.

One part of this activity was the collection of data needed for representing the situation within the municipality’s/county’s transport network. As well, the municipalities/counties needed to choose the planning or modelling tool, based on their modelling needs for concrete problems they would like to target as well as taking into account already available models. The chosen model and method had as well to be compatible with SWOT analysis undertaken in WP2.

Furthermore, terms of reference (ToR) had to be developed, as most models or planning tools need to be bought, carried out or adapted by specialists in the private transport planning sector.

The document is structured as follows. First, the development of the transport models is given, divided into collection of the needed data and the development of a representation of the transport network state, if applicable for a city. Then, an overview on the generated results is given. The following chapter 4 gives the recommendations for developing transport models. Finally, an overview of the preparation of the terms of reference is given.

2. MODELS AND TOOLS DEVELOPED BY PARTNER MUNICIPALITIES

The implementation of a transport planning tool (see SUMBA GoA 2.3) requires some steps. The first and major one is to determine the municipalities current and foreseen requirements towards such a software and to put them against the available budget as well as the data that is already available or can be collected. Then, the decision must be taken whether the model shall be built in-house or whether an external consultancy shall be involved. Only knowing and deciding about these prerequisites, a proper, matching tool can be selected.

Within the scope of the SUMBA project, different partner municipalities have implemented models of their transport network and followed different steps to achieve this goal. The involvement of stakeholders and experts was mainly part of prior groups of actions, mainly the definition of the analysis of strengths, weaknesses, opportunities, and threads (SWOT analysis) and of a commuting master plan (CMP), performed in GoA 2.2 and GoA 3.2, respectively. Thereby, this part of the process will not be repeatedly reported herein.

In the following, the collection of data needed to interpret and model the transport in the respective areas will be described first. Then, an overview of the implemented models and tools that help the municipalities to understand the situation in their transport network is given.

2.1 Surveys and Data Collection

In the following, the data collection performed by the cities involved in the project are described. Cities that did not collect data, are not listed.

2.1.1 Hamburg

Hamburg has conducted a commuter survey in Pinneberg. The invitation to the survey was distributed via social media and press.

2.1.2 Olsztyn

Olsztyn performed a "Survey of journeys and transport behaviour of the inhabitants of Olsztyn FUA" among 750 households in October and November 2018. The output is a data set of journeys in Olsztyn and its FUA as well as a final report including the summary of the transport behaviours of the inhabitants in this area. It was the first complex journey survey conducted in the city and its FUA.

The aim was to gather data on travels on weekdays, Saturdays and Sundays – information regarding places visited by the respondent were: addresses, motivation, journey start and end times, means of transport (also the number of people in a car if it was used) and the time of walking to and from the stops and the reasons for choosing a car or the PT.

Overall, the survey helped the city administration to:

- acquire knowledge of the transport behaviour of the inhabitants,
- identify the inhabitants' transport-related needs for the purpose of studies, plans and designs concerning the development of the transport system,
- facilitate the planning of changes in PT routes in relation to the expansion of the tram and bus network, P&R and B&R car park network and the planning of intermodal hubs,
- facilitate the current efforts regarding the organisation of the PT.

As such, the survey results were used for planning purposes directly for a large variety of application, e.g. planning investments, managing the PT etc. Different stakeholders use the results (i.e. journey data base) in their everyday work. The main users of the survey are the Road, Greenery and Transportation Board in Olsztyn and the City Traffic Engineer. The survey and gathered data will be used as a model for the next survey, which is hoped to be performed regularly.

2.1.3 Riga

During the SUMBA project, Riga municipality has conducted a household survey and performed traffic counts. The data collection was performed for redeveloping Riga's transport simulation model. Before the SUMBA project, the model covered the Riga municipality territory only.

Both, the household survey and the traffic counts help to improve the decision-making tool for analysing the transport system in a sustainable way in the whole Riga metropolitan region.

2.1.4 Šiauliai

The city of Šiauliai conducted a domestic survey, including an analysis of primary and secondary sources, a statistical data analysis, a survey of passengers and residents, interviews with public transport organizers, as well as with operators and service users. The major goals were to analyse the flows of Šiauliai region residents, commuting to Šiauliai to work/ learn, as well as their motives for choosing a mode of travel and to identify the motivation of Šiauliai city and region residents to use public transport services, determining factors, and prepare suggestions, based on the results of the study carried out.

Additionally, traffic was counted in different regions of the city. This included the determination of the daily traffic intensity (DTI) in May, June 2020 and September 2020. For this purpose, mobile traffic intensity meters „SDR Traffic“ were installed on the poles of road signs, which recorded the data of traffic flows, distinguishing between cars and freight transport (data was collected on Monday-Thursday). In order to assess the distribution of traffic flows on the routes in the study area, traffic flow surveys were performed additionally with ARH SpeedCAM number recognition cameras on the identified routes. The surveys were carried out during the morning peak from 07:00 to 10:00 and during the evening peak from 16:00 to 19:00. After conducting the research of the distribution of traffic flows in the analysed area, a matrix of the distribution of daily traffic flows was formed, as well as during the morning peak (07:00 - 10:00) and during the evening peak (16:00 - 19:00). Furthermore, a study of traffic flow routing was performed, during which traffic movement in Šiauliai city was evaluated. Route identification surveys were conducted in May and June 2020.

Here, the goals were:

1. To identify transport flows coming and leaving Šiauliai city during morning and evening peak hours.
2. To define flows of transportation staying in the city during the working day.
3. To identify the modal distribution of transport.
4. To identify the main dominant travel itineraries throughout the network, to prepare the traffic flow communication matrix in the network.
5. To determine the connections of traffic flows, trips between different places in the city and the region.

The survey covered city 22 entrance/leaving points, the places where PTI cameras have been used are shown in Figure 1.

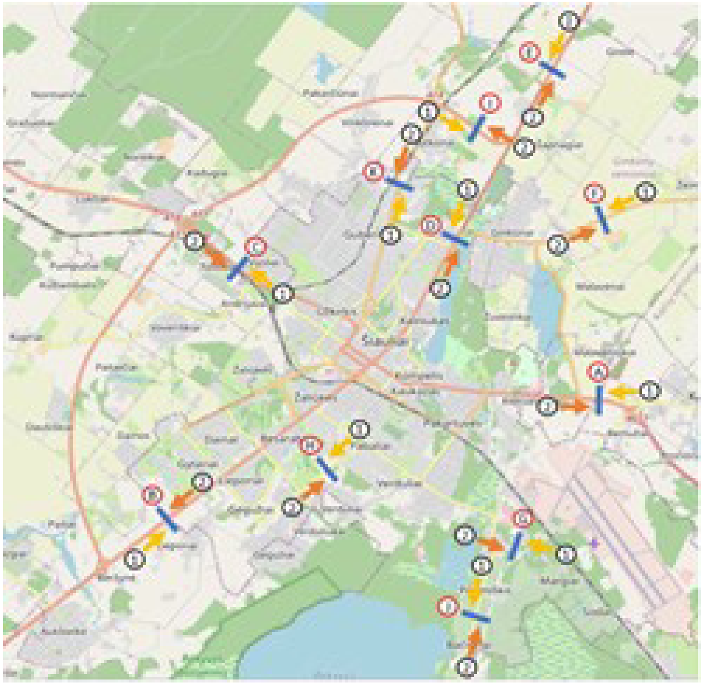

Figure 1. Entrance/leaving points select as traffic count spots in the city of Šiauliai.

The major problem faced was the Covid-19 crisis and the related national quarantine, which forced work and studies from homes therefore the transportation flows were very much affected and the survey itself was postponed to May-June instead of the planned March. Nevertheless, the survey was conducted at the end of the quarantine and repeatedly – at the beginning of the new school year, therefore the data gathered is valid and represents real situation. Among other results, the impact of the quarantine period on car flows could be assessed for the same time periods in June 2019 and June 2020. The observed change in traffic flows is practically the same and varies from -2.85% to 1.15%.

2.1.5 Tallinn

Tallinn performed a regional tramway network feasibility study and a cost-benefits analysis within the project. The main output was a final report that assesses the socioeconomic cost-benefits of each part of the proposed network. Cost-benefit calculations were based on a traffic model.

In addition, a study on public transport stops' quality standards was performed. The main output was a final report that outlined the recommended quality standards for public transport stops and proposed a methodology for assigning quality standard levels to the stops in the region.

Furthermore, accessibility measures were computed for the city of Tallinn within the project. Computing accessibility measures was deemed necessary as they are considered a good indicator for assessing the conditions of using various transport modes. Accessibility measures had not been computed for the Tallinn region before. The analysis included the city of Tallinn and Harju county. They compared the accessibility of different modes of transport, namely walking, cycling, using the public transport and using a private car.

2.1.6 Tartu

Tartu performed a wide set of data collection methods within the project's lifespan, including:

1. Data collection from traffic counters for modelling. The aim of the activity was to model future traffic flows and estimate future modal split.

2. Conduction of a survey on mobility in the city of Tartu and adjacent areas. The aim of the study was to find out the distribution of modes of movement in the city and urban area of Tartu and to find out the preferences of the residents in the choice of modes of movement in the future.

3. Analysis on Tartu's private transport emission scenarios in 2010–2018 along with an estimation for 2030. The aim of the analysis was to find out the environmental impact of private transport in the last decade and possible trends in the future. The study was the basis for scenario development and activity planning.

4. Analysis of traffic accidents.

5. Analysis of population and migration. The aim of the analysis was to identify population migration in the Tartu region in order to model future mobility trends.

The analyses revealed that the use of private transport is steadily increasing in the region and that this increase is mainly compensated by a decreasing share of walking. The main reasons were the changes in mobility associated with suburbanisation and the preference for amenities due to the rising living standards.

During the project, traffic counters were rented to generate the traffic data needed for modelling. As the created system worked well, the system was further developed during the project and by the end of the project the city has already covered the city's perimeter with the census equipment and the most important strategic points within the city (bridges, railway crossings km). The generated data have been used in research at the University of Tartu and other research institutions. The datasets have also been used, for example, to assess the effects of COVID and in other cases. Today, the city has 20 important points covered by census equipment.

2.1.7 Växjö

The city of Växjö performed two studies within the project. The first one was a resident survey on traffic safety which comprised of two parts: 1) a survey via Microsoft Forms with scenarios of traffic design in four different city areas (housing, shopping, city centre, school), 2) involvement of a mapping tool using ArcGIS where residents could identify problem areas related to traffic safety. The survey was open for two months during April-June 2019. The results are available at: https://www.vaxjo.se/sidor/trafik-och-stadsplanering/trafikutveckling/transportplan-2025/medborgarundersokning.html.

The second study dealt with school routes. Here, a mapping tool that used Cautionaries was used, where children in fourth grade could write their route to school and identify problem points on the map related to traffic safety. The survey included questions about the taken and the desired mode of transport as well as about the motivation for choosing them.

2.2 Modelling Traffic

Again, traffic modelling tasks performed within the project are given in the following individually for each city. The involvement of analysis tools is only outlined. Thereby, this section includes a summarizing comparison subsection at the end.

2.2.1 Riga

Within the project, Riga updated its transport simulation. The Riga municipality is the owner of Riga transport simulation model (RTSM) that was developed in 1996 on EMME (www.inro.ca).

The last upgraded was performed in 2004. The development of the city and increasing commuting trips was the main reason to participate in the SUMBA project for upgrading the RTSM. One of the key goals of the SUMBA project is to significantly update the existing macroscopic transport model of the Riga City Municipality, considering two sub-models: demand model and supply model, see Figure 2.

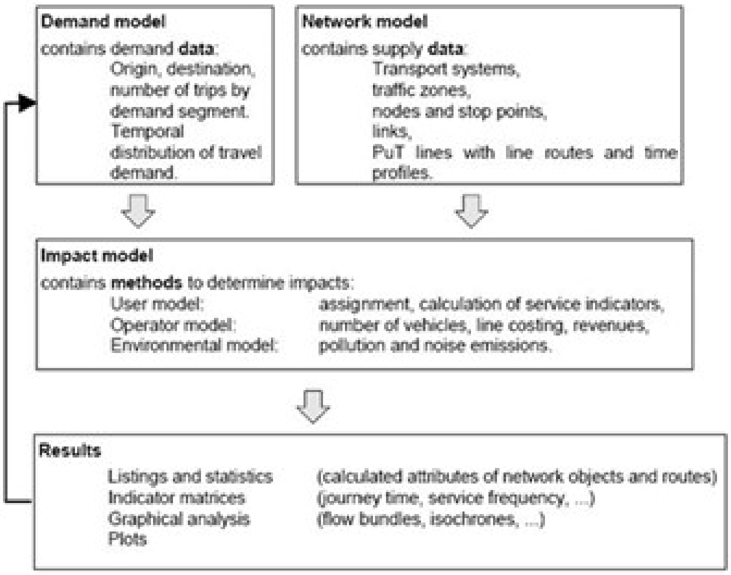

Figure 2: Macroscopic model generic representation (PTV VISION VISUM Official Manual, PTV AG).

The demand models have been updated based on data collected during household mobility survey, traffic counts, analysis of existing data regarding tickets purchased for public transport. The demand model has been significantly updated, mainly by extending the number of transport zones coded in the model, mainly motivated by the wish to include the public transport. The objectives and expected results were to model the transport flow and the influences of the new infrastructure (the city development plan until 2030) on commuting trips.

The reasons to choose the used methodology and the tool were: 1) a transport model already existed and had to be updated, 2) the macro level simulation gave the huge opportunity for traffic analysis, 3) the possibility to get data about passenger car demand plus the fixed additional demand. The modelled area is shown in Figure 3.

Figure 3: The RTSM territory.

Finally, an updated model has been used to evaluate two development scenarios.

The public transport element has been included in the model based on available data about stops, lines, routes, and schedule. Following transport system has been included: trams, busses, trolleybuses, and urban-suburban trains. For trams, busses, and trolleybuses the data available from http://transitfeeds.com/feeds has been used in General Transit Feed Specification format (GTFS). Additionally, the data about urban and suburban trains has been added to the model. As GTFS data is absent for this transport system. So, the stops, lines and routes have been coded manually. The schedule for urban and suburban trains has been adopted from the official webpage of the service provider "Pasažieru Vilciens" (https://www.pv.lv/lv/marsrutu-saraksts).

The traffic flow data on the city border is from official web page of Latvian state road https://data.lvceli.lv/informacija-un-dati/#satiksmes-intensitate. Data about commuting trips is from the household survey. The survey has been completed by Research Centre SKDS. Target groups: Riga and Sub-Riga residents at the age from 8 included. Sampling method: random sampling in the frame of clusters. Research method: personal (face-to-face) interviews at the places of respondents' residence.

Auto counting data on the Riga city was collected manually by trained staff using paper forms developed for the current project. Each counting staff member had the provided form, which is split by types of vehicles and 15minutes time intervals. Form header indicates the traffic counting point number, counting staff id, counting direction and additional technical information.

2.2.2 Tartu

The traffic uses the software Cube for performing the light rail network feasibility study Tallinn-Harju region. The model was initially intended for modelling car traffic only but for this study it was developed further to enable modelling PT as well. Modelling has been performed by a consultancy company.

Additional modelling has been done using the ArcGIS geo-information system. The choice was based on the organization's competencies and available technical capabilities. One important argument for the choice was to ensure the sustainability of the solution. ArcGIS was used to visualise traffic counts via the smart city platform and created the preconditions for the use of traffic counter data for traffic modelling.

2.2.3 Växjö

During the SUMBA project the available VISUM model was updated with current data, including traffic counts, population, workplaces, etc. for the year 2018. The baseline model used data from a travel habit survey and counts from 2012. The modelled region covers the Växjö city boundary and includes cars, heavy vehicles, public transit, and bike traffic. A cycling model was also created, originally external to VISUM but connected to it for handling cycling flows in city's network.

In addition, an ArcGIS commuting study based on OD data from the population and work-place statistics was performed. It covers the entire municipality and was published via ArcGIS Storymaps (https://vaxjo.maps.arcgis.com/apps/MapSeries/index.html?appid=188010451de648af875e7518d198f2d7). It includes the accessibility with bicycle, electric bicycle and public transit in intervals of 15, 30, 45 minutes as well as comparisons to car travel time, and a "heat map" showing the roads used most by vehicles.

2.2.4 Summarizing Overview

While only few complete models of the respective areas were built, several partner cities used analysis tools such as the accessibility computation tool UrMoAC developed by DLR or ArcGIS for visualising surveyed data. Table 1 gives an overview about the used tools.

Table 1: Overview on GIS and transport model implementation.

Cities	Analysis-Tools*	Transport Modelling
Hamburg	(x) (GIS)	
Olsztyn		
Siauliai		
Riga	x	x
Tallinn		(x)
Tartu	x	
Växjö	x	x

**ArcGIS, UrMoAC, etc.*

3. OVERVIEW ON RESULTS

This chapter reports about distinct results obtained by the work performed within individual cities.

3.1 Hamburg

The commuter survey performed in Pinneberg delivered insights about the inter-dependency of the available offer and the behaviour. It includes information about the commuters from Pinneberg that cross the border to Altona / Hamburg and about the transport modes, the reasons for choosing them, and an explanation why public transport was not used. The sample was self-selected and gives an impression only, but is not statistically representative. Overall, 1600 probands reported about their behaviour. One of the main findings was the information about the duration of commuting to Hamburg.

3.2 Olsztyn

The results of the survey of journeys and transport behaviour of the inhabitants of Olsztyn FUA show that ca. 439 500 journeys are made in the Olsztyn FUA every working day, 169 500 every Saturday and 91 700 on Sunday. Working day travellers are mainly employed people and school students while on Sunday people with an age above 60 travel the most frequently.

A car is the most popular transport mode – used in 40% of journeys on a working day, 55% on Saturday and 33% on Sunday. Men use them more often than women.

One in four journeys on a working day and one in five on a Saturday are made by foot. The percentage share of journeys made by foot on Sunday reaches 50%. These results were a bit surprising – the popularity of walking was a bit unexpected. The potential of walking as a transport mode (esp. in the city area) could be promoted in the future. The main travellers are people who commute regularly (employed people and students) what means that they should be addressed at the first place during the implementation of the measures supporting intermodality and multimodality in the Olsztyn FUA. However, elderly citizens are the main Sunday travellers what is an important information for the people responsible for the PT timetables in the Olsztyn FUA (i.e. Road, Greenery and Transportation Board in Olsztyn and relevant bodies in the FUA municipalities providing their own PT services).

30% of journeys on working days are made by the public transport (PT). Much less on Saturday: 20% and Sunday: 15%. Women are more likely to use the PT what is not very unusual in general.

The average travel times for journeys in the Olsztyn FUA depend on the transport mode. Journeys by the PT are the longest while these on foot are the shortest. What is interesting, the travel times do not depend on the day on which the journey is made.

3.3 Riga

The resulting dataset includes daily trip data from more than 5300 households (appr. 60 000 trips). The household survey gave the opportunity to increase the amount of transport analysis zones from 180 to 520 and to extend the area of study from the Riga municipality territory to the region of Riga. Every day more than 300 000 commuting trips are performed in both directions (from/to Riga region from/to Riga city).

Traffic counts have been performed at the 50 most congested sites, including intersections, bridges, and viaducts. Respecting the technical specification of this project, the following types of vehicles were considered: Passenger vehicles, Light cargo vehicles, Mid cargo vehicles, Cargo vehicles, Cargo vehicles with trailer, Motorbikes, Buses. The data is mainly used to calibrate origin/destination (OD) matrices obtained from the traffic model.

The following actions have been performed within the SUMBA project's lifetime:

- collected data (household survey, traffic counting),
- changed and edited the network (new zone system (TAZ), nodes, centroids, links, transport modes,
- changed the prohibitions or using the links for some transport modes (e.g., prohibition for the truck in the AM to cross the bridge),
- prepared the matrix about employment and the residents,
- created the matrix of OD for AM, IP, PM time periods for private cars, trucks and medium cargo vehicles,
- created the matrix of OD for AM, IP, PM time periods for public transport modes (tram, bus, trolleybus, mini bus),
- created the railway network (nodes, links, stations),
- The auto traffic and public transport assignments were done. Scenarios for current situation and new development plan were compared.

RTSM will be used for mobility point location definition and analysis, new railway development (Rail Baltic project), current transport infrastructure scheme analysis and redeveloping.

3.4 Šiauliai

The domestic survey revealed a large variety of insights. First, when assessing responses of potential passengers traveling by car rather than public transport, it was found that the main reasons for not traveling by public transport is a lack of routes and inconvenience of times – almost a third of all responses (28.7%). Travel time, which is too long (21.9%) and long distances to a station or stops (13%), also have a significant impact. In order to find out the reasons that would encourage respondents to use public transport and give up a polluting car, 24.6% or respondents indicated that public transport would take over if there were more frequent routes, 12.9% respondents would be motivated by shorter travel times. It is also important to mention that better timetable compatibility (10.6%), a single ticket system (10%), lower ticket prices (8.7%) and more convenient locations of public transport stops (7.8%) would possibly influence the transition from cars to public transport.

Second, upon assessing the peculiarities of the respondents' behaviour, the main attention was paid to determining the purpose of the residents' trip to Šiauliai. As much as 31.5% of the respondents indicated that they travel to Šiauliai for work, shopping (21.8%), to perform leisure activities (19.6%) and for medical purposes (16.7%). Less popular reasons are to approach a school (4.1%) or a higher education facility (3.5%). Regardless of the purpose of the trip, the frequency of travel is also assessed to determine population flows and major points of attraction. For work purposes, as many as 45% go to Šiauliai. Respondents travel on working days (45%), although a significant number of respondents travel to the city for work every day or almost every day (34%). Respondents traveling for shopping (40% of all those traveling for shopping) and those traveling for entertainment (39%) are more likely to choose working days for travel. Those who travel to Šiauliai for medical purposes, for studies at school or higher education more often travel every or almost every day. It can be noticed that Šiauliai city as a centre of attraction performs different functions – it provides employment opportunities for the residents of the district, as well as education, health care, leisure and entertainment services.

Third, the assessment of the satisfaction for public transport services has shown that the services provided are rated relatively well. Assessing different aspects in the 4-point system, the condition of public transport stops was assessed best – 3.4 points. The existing network of public transport stops (3.26 points) and the cleanliness of public transport (3.1 points) were also graded quite well. Compatibility of schedules (3 points) and punctuality (2.9 points) were rated lower. In summary, there are areas that should be improved, but the aspects that depend on the cooperation of Šiauliai City and Šiauliai District Municipalities are assessed worst. When considering a unified model for the organisation of public transport, the issues of compatibility and punctuality of timetables should be addressed and therefore the evaluation should be better in the future.

In order to identify the real and potential needs of passengers for public transport, the most discussed directions have been identified, which have been expressed in both quantitative and qualitative research. One of the main and most acute problems is the lack of public transport routes, as more remote settlements have poor or no access to larger cities. A number of observations have also been made about public transport stops, as many of them do not have roofs, which causes a lot of inconvenience to passengers, they are not safe, and in other places there are no stops or in inconvenient places, making it difficult for passengers to reach their final destination. Emphasis is also placed on the modernization of vehicles so that buses are adapted for the disabled, have heating and cooling systems, free internet, and are environmentally friendly and economical.

Summarizing the material of the interviews with the stakeholders, the direction of change is clearly visible - the integration of different municipal public transport systems. It is proposed that Šiauliai City and Šiauliai District Municipalities move to a unified public transport system, where decisions would be made by qualified specialists in this field, moving away from the geographical boundaries of municipalities and giving priority to population mobility and social service rather than saving and reducing. With a unified system, solutions for a single ticket and billing system could be implemented, and timetables would be coordinated with each other, ensuring convenient travel within and outside the city. It is proposed to create a network of simple and fast direct routes that would ensure connections between different settlements and connect the main attraction centres by high-speed routes. The new model is also expected to improve transport capacity, regulate traffic properly, upgrade the traffic management system and the street network, and create priority lanes for public transport.

Regarding the performed traffic counts, the distribution of traffic flows at the measuring station under study by direction is distinguished. Morning peak, evening peak, daily and freight traffic intensity are presented. Information on the distribution of traffic flows to other measurement stations per day (at hourly intervals) is also provided.

The most successful solution has been the systematic real-time collection of traffic census data initiated within the project. The system has been further developed and in the future, it is planned to equip about 40 important strategic points in the city with counting equipment. Thanks to the collection of traffic data, the organization has become more interested in data than before, and specifically traffic census data has been used by planners. In addition, a boost has been given to several new developments: for example, the development of data visualization solutions, the creation of a data disclosure solution, etc.

3.5 Tallinn

Regarding the tramway network feasibility study, the expectation was that tram lines on the busier transport corridors would be beneficial, some of the less bust lines would not. Yet, the study found that all parts of the network would be feasible and socioeconomically very beneficial, even the less busy ones. The detailed placement of tramlines needs to be agreed upon next. It was a very influential study in the region that got a lot of reactions (positive and negative) and definitely got the conversation started on building the network. It also proved that the investments that would go into developing the network would be worth it. The broad involvement of stakeholders was very beneficial as well as picking a good team of specialists to carry out the analysis.

When looking at the study on public transport stops' quality standards, the expectation was that the main proposed additions to current stops would be of pragmatic type, but the study shows that PT stops need to be approached much more holistically than assumed – in addition to the pragmatic qualities, the aesthetic qualities of the stops should not be neglected.

The standards compiled with this study are assumed to be quite influential in future PT stop design in the region. This helps increase the modal share of PT. Again, a well-rounded team of specialists, including urban designers, was essential for performing and assessing the study an its results.

The accessibility study delivered an overview about the conditions for using each of the regarded modes of transport in various areas within the study region; it was not possible to compare private car to other modes of transport due to lack of relevant data. Contrary to expectations, the accessibility scores for public transport were worse than for cycling. The main challenge that occurred was the lack of data. More specifically, there was no information available about the real travel times on the roads. This challenge was overcome by using information about speed restrictions for the mode private car. However, the solution was not perfect as it resulted in significantly over-estimating the accessibility of the mode private car. In the future comparable accessibility scores for private car need to be calculated as well as more detailed scores for walking and cycling to the nearest public transport stop that would take into account the varying service levels of bus stops.

3.6 Växjö

Given the work performed within the project, the city of Växjö obtained the following results:

- Model: Identification of problem areas where car traffic is expected to exceed capacity. The model is used again in SUMBA+ to test measures such as circulation plan and mobility hubs.
- Commuting: The potential for commuting with bike and public transit in the municipality was determined and important cycling routes and school routes were identified. This is communicated by a public website that is accessible to residents, politicians and other actors.
- Safety survey: The survey gives a better understanding the residents' experiences in traffic in the municipality and to identifies problem areas that help to prioritise measures.
- School study: The study has identified important school routes (compared against theoretical routes in commuting study) and problem points. This allows to prioritise measures during new budget allocation every year. Depending on how well the process and mapping tool work, the study may be integrated into the bi-annual travel habit survey conducted with schools.

4. RECOMMENDATIONS

As most of the cities did not use any transport models before, most of the collected recommendations target at the overall process, not on building the transport model(s) as such. Thereby, in the following, a short summary about recommended practices for setting up the modes are given first, followed by general recommendations as supported by the cities.

4.1 Recommendations for Setting Up Transportation Models

When starting to build up a representation of the own transport network from scratch, one recommendation is to use simple and easily available tools at first. This mainly includes geo-information (GIS) systems like ArcGIS or its open source counterparts like QGIS. Often, the expertise to use these tools is already available in-house and if not, these tools are easy to learn. They allow to visualise the road network, to annotate areas of special interest and to show performed measures at the location they were collected. In addition, given proper extensions, these tools are sometimes capable to perform simple accessibility analyses or simple traffic flow computations.

Data collection is a second crucial step in getting insights about traffic. When collecting traffic data, major roads or most congested intersections should be investigated and different modes of transport should be regarded. When performing surveys, one should take care about their length so that the probands are capable to complete them in full. Often, it makes sense to involve partners with expertise in performing the respective task. As well, the time of the traffic data collection or survey should be chosen well. As the data should represent usual behaviours and situations, a weekday in spring or summer should be selected, yet not during or around holidays. Again, GIS allows to visualise and inspect the collected measures.

Some involved cities reported that their size is too small to build up a complete transport model. In such cases, an inspection of the major traffic flows and the major needs in terms of accessibilities may be sufficient. When building a new model for a larger city, it seems to make sense to start with a macroscopic one, because of the lesser data needs and a faster and thereby lesser costs for setting it up in comparison to a microscopic model.

4.2 Further Recommendations and Lessons Learned

4.2.1 Hamburg

Workshop formats, regular meetings with a similar group of people and generating a sense of being part of a closed group (SUMBA expert group) worked well and the attendance in SUMBA meetings was generally very high.

The advice is to get the relevant institutions to officially be part of the project to get their commitment and to be more daring in communicating what you do, even if it might reach beyond your scope of responsibility/influence.

4.2.2 Olsztyn

The survey was widely promoted in Olsztyn and its FUA to make people more conscious about that activity. The part of the promotion was an official letter from the City Mayor introducing the survey to the inhabitants and encouraging them to participate. The interviewers presented the letter to the people they wanted to ask to take part in the survey what made them more trustworthy. It is a good idea to use such an intermediate communication.

The survey was conducted by a company dealing with public opinion polls and surveys. It was a good idea to rely on their professional experience when it came to questionnaire construction, dividing the area into the transport sectors, choosing a survey method or drawing an address sample of dwellings. Yet, the survey was conducted in October and November, in late autumn.

It was not easy to encourage some people to let an interviewer in when it was dark outside. That is why the interviewers had to visit much more households that it had been planned at the beginning. Thereby, it would be better to plan the survey for late spring, for two reasons:

- people would be probably more eager to let the interviewers in when it was still quite light outside,
- results for the journeys by bike or walking would be a bit closer to the average rate as in October and November the weather makes people use rather cars and the PT.

The other problem was to obtain a proper size of the survey sample. After the survey had been ended we analysed and consulted with some experts both the methods and the results. We concluded that a bigger sample (not 500 and even 750 households but rather 1500) would give a bit more reliable effect.

A further recommendation is to involve the transport organisers from the whole FUA to take part in the survey preparation, esp. to consult the transport sectors division. It is also useful to discuss with them the sample division, for example how to divide the sample by the municipalities. It will make stakeholders sure that their needs are well addressed.

4.2.3 Riga

Positive was a wide stakeholder involvement, comprehensive working groups, relatively high interest of the state and other public institutions e.g., Road Transport Administration, Ministry of Transport, Riga municipal limited liability company “Rīgas Satiksme” (public transport service company in Riga) in the project. Since the very beginning, SUMBA stakeholder events started with active stakeholder involvement – representatives from Riga city, Pierīga municipalities, national institutions as Ministry of Transport, Ministry of Environmental Protection and Regional development, as well as transport development planners and scientists. During the project, a close cooperation was established with the associated partner of SUMBA project - Riga Planning Region. So far, this cooperation has resulted in two co-creation seminars with other projects of Interreg program: SUMBA & NSB Core seminar and SUMBA & Baltic Loop seminar. Cross-border and cross-sector communication helped to identify challenges in different levels – national, regional and very local – and seek for solutions from state (national level) and municipality (local level) perspective. We see that with the SUMBA initiative, cross-border communication was improved and will continue in other mobility-related activities e.g., development of mobility hubs.

One of the major issues was the fragmented responsibility management (acknowledging that transport-related data is collected at various institutions) in the transport sector, external political conditions and the change of political settings in Riga. A new and still ongoing national administrative reform had an impact on the administrative division and the related responsibilities of municipalities in the country giving uncertainty to further development processes at local level in the mobility field due to uncertainty in responsibilities. The issue of property rights (e.g., on plots suitable for designation of mobility hubs), along with a lack of a regulatory framework to oblige for co-decision at the local level, can slow down the practical implementation of mobility hubs in the project area. Thereby, there is the need for a clearer separation of responsibilities when there are several project partners in the same country. This includes sending guidelines about the CMP (or equivalent document) to partners earlier (if possible) so that the implementation of activities can be better aligned.

Starting to address stakeholders as early as possible is recommended, as well as identifying the needs and issues to be addressed in the specific area. The initial step to apply a participatory process was taken already at first stakeholders’ event at the beginning of 2018 when the borders of SUMBA project area were discussed and mobility-related challenges identified.

Further recommendations include:

1. The authority needed educated staff which could work with the model and write the restriction. Also needed specialist in data collecting and result analysis.

2. The model upgrade and data collection need to be organised in the regular way (not from project to project).

3. It is needed to have a clear view of what the authority would like and need to do with the model. This could help to choose the software and model type.

4. Transport simulation and data collecting are very expensive activities, that why necessary to have the regular budget for this.

In addition, it is pointed out that the main bonus is to hold the ownership of the transport simulation model.

4.2.4 Šiauliai

The city of Šiauliai emphasizes that It is really important to ensure that the service is provided by qualified experts in the field, therefore the technical specification and the qualification requirements should be in-line with the expected result.

4.2.5 Tallinn

Tallinn's recommendation is to dig deeper into the mechanisms of the models proposed to determine whether they reflect reality to a sufficiently high degree if modelling is used for tasks that usually do not involve modelling within the country, e.g. planning for active modes.

4.2.6 Tartu

In Tartu's opinion, the biggest issue is to know how to estimate the amount of work involved in data management and modelling and to consider the needs to develop necessary skills. There is no long-term view and no thinking on the sustainability of solutions. It is definitely necessary to develop the competencies of the organization and also to plan additional resources (workforce, financial resources).

4.2.7 Växjö

The communication of model results is one of the major issues seen by Växjö. It includes raising an understanding about the results to politicians or others that are not accustomed to using transport models as they may appear very technical and hard to understand.

Additionally, the municipality should hold the ownership of the software, because otherwise the possibility to apply the model for extracting specific details, like flow diagrams for particular streets for example, is not given. Otherwise, such questions need the involvement of the consultant owning the model what can get quickly get quite expensive.

A further recommendation is to use GIS-systems at the begin of the investigations, both for analysis as well as for communicating the results. The used ArcGIS tool used for this purpose was named to be capable to even perform some basic traffic flow simulations with help of relevant extensions (ex. ArcGIS network analyst). An added benefit is the lower cost for use, as, in this case, a license was available at the municipality as well as staff with experience with the tool. In addition, extensions like story maps (ArcGIS) are named to make it easier to communicate results.

When gathering data from residents using for example mapping tools, some problems with different operating systems and different devices were observed. The mapping tool used by Växjö for schools crashed with older operating systems on iPads because of the large size of the map and compatibility issues. It is thereby recommended to perform intensive tests with different devices prior to a release.

In addition, one comment is that people, including politicians, are influenced heavily by opinions, senses, limited experiences, fake news, biases and other factors. Data and analysis results, while important, need to be communicated in a way that overcomes these and other factors. Otherwise this really expensive and time-consuming work does not achieve any meaningful results.

5. PREPARING THE TERMS OF REFERENCES

5.1 Riga

For upgrading the Riga transport simulation model (RTSM), a procurement tender was provided which consists of three main parts:

1. methodology of household survey development;
2. household survey and auto counting organisation and preparation;
3. the model upgrades.

The tender requirements were written by the department specialists. All surveys were set up including an individual's protection terms as following:

The activities described below and the methodology developed is required to be coordinated with the City Development Department of Riga City Council (hereinafter referred to as the Department) upon receiving the positive opinion of the Department and complying with Regulation 2016/679 of the European Parliament and of the Council on the protection of individuals with regard to the processing of personal data and the free movement of such data, which will come into force on May 25, 2018.

In addition, the intellectual property rights were fixed:

Within the project, the updated RTSM is the Department's intellectual property, as well as all the data collected in the framework of vehicle counting and household survey. Additional rules on the use of data may be subject to separate agreement.

Riga's tender requirements for the household survey are given in Annex 1a, the ones for the organisation of the Household survey and vehicle counting in Annex 1b, the ones for updating the RTSM in Annex 1c.

The vehicle counting occurred problems, because during the time the observation should take place, a huge reconstruction of the streets started, changing all traffic flows. The household survey was problematic as well. The pilot survey was prepared using a paper questionnaire and results were not sufficient, because the survey included many questions and took thereby a long time. To address this problem, a smartphone app was developed.

Regarding the update of the RTSM, the main problem was the time. The second problem was the used software itself: the Riga municipality used the model EMME and the consultant VISUM. Before the tender was signed in, we had the consultation with PTV group (VISUM provider) and they said that where is not the problem to migrate the data from one software to another. But in reality VISUM could not provide these activities. Thereby, even though EMME provides the import of data from VISUM, a huge manual work for importing data was needed.

5.2 Šiauliai

The following qualification requirements was given in the tender conditions to the service provider:

During the last 3 years or during the period from the date of registration of the supplier (if the supplier has been operating for less than 3 years), the supplier must have performed at least one contract for traffic flow research services with a value of at least EUR 8000 (VAT excl.).

The scheme for developing the transport flow matrix was added to the tender documents. The main service requirements were detailed in the Technical Specification.

5.3 Tallinn

Tallinn did not formulate specific requirements in the tender. Yet, when evaluating contractors' offers, their overall approach was assessed and high-quality modelling was considered a necessary part of a good offer.

5.4 Tartu

As the solutions were developed in-house and using own resources and the existing software solutions, no requirements were necessary. The implicit requirement was to use the software and the knowledge for using the software that is already available in-house.

5.5 Växjö

Växjö's model was updated with the help of a consultant that already had a frame contract. Thereby, this work was not procured during the project but rather by establishing an agreement through dialogue with the consultant to decide what is feasible in the scope of the project and the given budget. The consultant submitted a suggestion including the time schedule, the tasks, the outputs and the budget that acted as reference for agreement. These documents can be provided upon request (Swedish). The reference included mainly the following items:

- Responsibility for providing data, statistics, awareness of data availability early on is important;
- Schedule and deliverables (need to be clear);
- Budget (according to project budget, sometimes increased with help of the municipality if needed – i.e. VISUM);
- The software was typically decided ahead of time (VISUM model already existed; ArcGIS obvious choice, Maptionnaire based on limited alternatives and prior experience of consultant);
- Depth of analysis and features included are often determined by the budget;
- Forecast scenarios in model according to development master plan, known detailed plans and planned infrastructure investments (road/highway).

6. ANNEX 1

The annex includes the tender requirements formulated by the city of Riga.

6.1 Annex 1a: Riga: Tender requirement Household survey methodology

4.1. Develop methodology for household surveys and counting of vehicles. The following activities should be included:

4.1.1. To divide the study territory into three parts (see Annex 11):

4.1.1.1. Riga - administrative boundaries of Riga;

4.1.1.2. Pieriga – territories bordered with Riga and municipalities located close to them;

4.1.1.3. The territory affecting Riga and Pieriga (hereinafter referred to as the Affected Territory) - the municipalities bordered with Riga.

4.1.2. To evaluate the division of Riga 429 statistical zones and, if necessary, to change it, taking into account the planned development of territories and transport infrastructure trend developments.

4.1.3. To evaluate and determine the number of Pieriga statistical zones, taking into account the mutual traffic flow between Riga and Pieriga and the distribution of the population density of Pieriga, providing appropriate substantiation for this distribution.

4.1.4. To evaluate and determine the number of statistical zones of the Affected Territory. When determining the number of zones, it is necessary to take into account the distribution of mutual traffic flows between the Affected Territory, Riga and Pieriga.

4.1.5. To develop a questionnaire. The questionnaire should include: socioeconomic issues for households and questions about mobility data, including respondents' gender, age, income, employment, number of vehicles owned or used, and history of travel routes. The questions shall be prepared in Latvian and Russian. Samples of the questionnaire must be agreed with the Department.

4.1.6. To calculate the sample size based on the demographic data of each transport area, taking into account population density. The target number must be at least 4% of the number of households in each transport area.

4.1.7. In the methodology, to describe sampling, respondent indices, address selection, respondent's principle of choice, how the respondents' commuting data obtained during the survey will be related to zoning, as well as technical information on the progress of the field research field works;

4.1.8. To evaluate and determine vehicles counting points in Riga and Pieriga. Traffic counting should be carried out by not less than 100 counting points throughout the city of Riga. The location of the counting points should be determined on the basis of transport infrastructure and current intensity analysis, as well as best European practice. This point shall be executed based on the methodology developed by the LTAIA in 2016 "Study on the Methodology of Transport Flow Analysis".

Upon receipt of the positive opinion of the Department, the activities set in paragraph 4.2 and 4.3 shall be executed.

4.1. Organize and carry out the Household Survey

4.1.1. The survey provides the following activities: organization, choice of residents, questionnaire construction, drawing up of instructions, pilot survey, pilot-result processing, correction, coding, cleaning, formatting, reporting, control of surveys and counting. Conducting a survey, follow the random sampling principle.

4.1.2. Household Survey Results:

4.2.1.1.To submit processed questionnaires in the format of data tables;

4.2.1.2.To prepare an analytical report in the form of paper volume in Latvian with a summary in the form of a text and the presentation of the main results in the graphs;

4.2.1.3.A detailed representation of the results in the format of data tables according to all the socio-demographic parameters included in the survey (including respondents' gender, nationality, age, place of residence and other parameters of interest to clients);

4.2.1.4.Creation of infographics, which include information on the main results of the survey;

4.2.1.5.The materials of a survey (questionnaires, logs), results and report shall be submitted on a digital data medium;

4.2. Organize and execute vehicle counting

Within the framework of this activity, it is necessary to organize and conduct traffic counting in Riga and Pieriga: for automobiles; truck transport (divided in at least two ways); public transport; cycling transport; for pedestrians.

4.2.1. Results of vehicle counting

4.3.1.1. The traffic flow counting data must be summarized by all means and submitted in (*.xlsx) or in another database format;

4.3.1.2. The traffic flow counting data must be presented graphically and submitted in (*.pdf) format.

The activities mentioned in p. 4.2 and 4.3 shall be carried out in parallel in spring or autumn.

The information mentioned in p. 4.2.2 and 4.3.1 shall be submitted on a digital data medium.

6.2 Annex 1b: Riga: Tender requirement Organisation of the household survey and vehicle counting

4.1. Organize and carry out the Household Survey

4.1.1. The survey provides the following activities: organization, choice of residents, questionnaire construction, drawing up of instructions, pilot survey, pilot-result processing, correction, coding, cleaning, formatting, reporting, control of surveys and counting. Conducting a survey, follow the random sampling principle.

4.1.2. Household Survey Results:

4.2.1.1.To submit processed questionnaires in the format of data tables;

4.2.1.2.To prepare an analytical report in the form of paper volume in Latvian with a summary in the form of a text and the presentation of the main results in the graphs;

4.2.1.3.A detailed representation of the results in the format of data tables according to all the socio-demographic parameters included in the survey (including respondents' gender, nationality, age, place of residence and other parameters of interest to clients);

4.2.1.4.Creation of infographics, which include information on the main results of the survey;

4.2.1.5.The materials of a survey (questionnaires, logs), results and report shall be submitted on a digital data medium;

4.2. Organize and execute vehicle counting

Within the framework of this activity, it is necessary to organize and conduct traffic counting in Riga and Pieriga: for automobiles; truck transport (divided in at least two ways); public transport; cycling transport; for pedestrians.

4.2.1. Results of vehicle counting

4.3.1.1. The traffic flow counting data must be summarized by all means and submitted in (*.xlsx) or in another database format;

4.3.1.2. The traffic flow counting data must be presented graphically and submitted in (*.pdf) format.

The activities mentioned in p. 4.2 and 4.3 shall be carried out in parallel in spring or autumn.

The information mentioned in p. 4.2.2 and 4.3.1 shall be submitted on a digital data medium.

6.3 Annex 1c: Riga: Tender requirement Household survey and auto counting organisation

4.3. Updating of RTSM:

The activity is focused on the demand model assessment. It is proposed to use the classic 4-step model (trip generation, trip division, division by means of transport, redirection of traffic flows in the street network).

It is necessary to carry out the following activities:

4.3.1.1.the expansion of the model by adding the territory of Pieriga: the division of Riga into 429 zones and the territories of Pieriga, which include the establishment of new zones (road sections, street networks, connections (connectors));

4.3.1.2.obtaining of output data for supplementing the model with the public transport component:

- passenger transportation by rail (routes, traffic list, frequency, speed of traffic, passenger capacity);
- regional buses (routes, frequency, speed of traffic, passenger capacity);
- public transport (tram, bus, trolleybus, minibuses) in Riga and Pieriga (routes, traffic list, frequency, speed of traffic, passenger capacity);
- to obtain, process and analyse data on public transport demand.

4.3.1.3.obtaining and analysing data on truck transport routes;

4.3.1.4.obtaining data for supplementing the model with pedestrian and bicycle flow data;

4.3.1.5.data coding: distribution of residents by zones, distribution of employees by zones, traffic flow (street network, speed, size of flows, distribution by means of transport, routes); processing and inputting survey and counting results into a database;

4.3.1.6.structuring of the model: assessment of the parameters of the travel-generation model for each category of travel (from home to work, from a shop to home, etc.), assessment of the model parameters of the travel purpose distribution and the choice of types for each category of travel;

4.3.1.7.model calibration;

4.3.1.8.preparation of work descriptions, creation of user manual;

4.3.1.9.training of the Department specialists;

4.3.1.10. to develop and agree with the Department (at least two) transport modelling scenarios and set the time limits for them:

- to develop a scenario for the current situation;
- to develop a scenario for the maximum development of the future transport infrastructure with the implementation of all planned stages of B and C category road transport infrastructure in accordance with the development trends of territories and transport infrastructure determined by RTP 2030. The year of the maximum development future scenario is substantiated and determined by the Contractor. If necessary, to develop additional development scenarios, which do not provide for maximum development.

4.3.2. The results of RTSM:

The updated RTSM consists of:

4.3.2.1.integrated model data;

4.3.2.2.updated street network data (system of streets, street length, driving speed, journey time, etc.) in accordance with developed transport infrastructure development scenarios;

4.3.2.3.for new commuting matrices of automobiles;

4.3.2.4.for new commuting matrices of truck transport;

4.3.2.5.for the demand matrices (hereinafter referred to as PA) of automobiles;

4.3.2.6.for public transport matrices;

4.3.2.7.for matrices of passenger transportation by rail;

4.3.2.8.data matrices on the option of choosing between means of transport (for example, automobiles or public transport).

4.3.2.9.Updated RTSM data (matrices, street sections, nodes, attributes, scenarios, databases) to be submitted in the format of the EMME 4.x.x software or universal digital file format (*.shp; *.xls; *.dbs);

4.3.2.10. To draw up a report on the works done and submit in the format of (*.doc) or (*.docx);

4.3.2.11. To develop an updated RTSM user manual with a chapter on future development and maintenance of RTSM and submit it on a digital data medium in the format of (* .doc) or (* .docx);

4.3.3. The structure and composition of the mentioned documents should be agreed with the Department and submitted on a digital data medium.

ABOUT SUMBA

WHY DO WE NEED SUMBA?

More and more people chose to live in suburbs while they continue to work in cities, resulting in high number of daily commuters. Commuter traffic is still dominated by private cars, resulting in problems such as

- congestion
- air pollution
- high demand of parking spaces
- higher costs of public transport.

SUMBA will address commuter transport and help to mitigate these problems!

OUR ACTIVITIES

The urban transport system can be reshaped to an intermodal network that off ers a combination of various transport modes, including bike and car-sharing. This helps cities to achieve a more attractive and environmentally friendly commuting system. SUMBA will develop and test tools that help urban and transport planners to assess, plan, and integrate intermodal mobility solutions into transport plans and policies of their cities and municipalities.

OUR PARTNERS CITIES

Hamburg (Germany)
Tallinn city, Union of Harju municipalities (Estonia)
Tartu (Estonia)
Riga (Latvia)
Växjö (Sweden)
Šiauliai (Lithuania)
Olsztyn (Poland)
Associated cites Gdynia, Warsaw suburban region, Słupsk municipality (Poland), and Helsinki (Finland)

EXPERT PARTNERS

German Aerospace Center, Institute of Transport Research
Baltic Environmental Forum Latvia, Estonia and Germany
Earth and People Foundation

SUPPORT

The SUMBA project is part-financed by the INTERREG Baltic Sea Region programme and runs from October 2017 until September 2020.

WWW.SUMBA.EU