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CIVITAS PORTIS TRANSFERABILITY

INSIGHTS INTO THE IMPLEMENTATION OF SMART MOBILITY MEASURES

CONSTANTA MOBILITY MEASURE DEVELOPMENT OF A DECISION SUPPORT SYSTEM



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MOBILITY MEASURE

DEVELOPMENT OF A DECISION SUPPORT SYSTEM

WHAT IS IT ABOUT?

Develop a data platform and simulation model of the traffic flows connecting the TEN-T network and the city of Constanta, in order to:

- analyse alternative mobility solutions in the Mobility Forum, Constanta's 'think-tank' on integrated solutions involving stakeholders and decision-makers of both city and port;
- develop contingency plans to solve generic traffic congestion cases and promote seamless mobility through TEN-T network nodes to and from the port and Constanta's road network in order to contribute to the reduction of pollutant emissions;
- act as a useful source of information for transport specialists conducting traffic analyses & optimization;
- allow public transport operators to better organise their routes & for the public transport passengers to be informed on accurate transport times, routes, and environmental impact of their modal choice;
- reorganise transport flows more efficiently.

KEY ELEMENTS

- Mapping traffic data sources on traffic associated with the different modes of transportation connected to the TEN-T nodes of the Constanta Port and the Constanta Growth Pole.
- Facilitate the access to the available data sets and ensure their interoperability.
- Improve the quality of the decision-making process, planning and allocation of resources using alternative contingency plans for a number of generic situations with heavy congestion.
- Establish a system and procedures for the monitoring, evaluation, early warning and reporting of pollutant emissions from traffic in the City, Port and Growth Pole areas.



CONTEXT & CHALLENGES

Constanta and the Port of Constanta, the largest port on the Black Sea, are connected to the Rhine – Danube TEN-T Corridor. Taking into account the importance of the Constanta hub on the corridor, there are several systems which are monitoring the relevant traffic flows through the inbound and the outbound transport infrastructures associated to different modes of transport, such as maritime, inland navigation, road transport, railway transport, pipelines, and air transport.

Fragmentation of data sources

The IT platforms associated with the monitoring of different types of traffic management are operated by different institutions, such as the Naval Authority, private operators of specialised terminals, the company that is providing the service of monitoring the port gates' access, the Railway Authority, the Black Sea Danube Channel Administration, the Road Transport Authority, the Administration of Intercity Roads, the Road Transport Department of the Municipality, the police, the Inspectorate for Emergency Situation, and other similar institutions. Due to the fragmentation of these data sources, there is a lack of aggregated information on traffic management that influences the decision-making process on developing mobility strategies, plans, and the related implementation measures.

Interoperability of the Decision Support System

This measure aims to assure the interoperability of the Decision Support System (DSS) specialised on sustainable mobility, which has been developed with the data sources associated to the major nodes of the TEN-T corridor. Therefore, the implementation of bike storage facilities was

selected by Klaipeda city as one of the promotional tools to encourage people to change their behaviour in the long term. This fosters the use of private bicycles (including more expensive e-bikes), complementary to the use of a shared bike system, which was initiated by a private company and is typically being used for shorter trips (2-5 km).

Monitoring air pollution

A system for monitoring air pollution in the city of Constanta and the Constanta Growth Pole Area is required by several objectives of the Municipality and the Constanta Metropolitan Area Association which are linked to national and EU strategies, such as strategies on clean air, sustainable urban mobility, quality of life, and promoting the attractiveness of the city. The development of an appropriate system and related procedures for the monitoring, evaluation, early warning and reporting of pollutant emissions from traffic in the City, Port, and Growth Pole area, takes into consideration the requirements for all the above-mentioned objectives.

Contingency plans

In order to improve seamless mobility through the TEN-T network, contingency plans were designed for five generic situations (worst case scenarios) when the traffic flow is heavily congested due to the overlapping of traffic flows from the related TEN-T network nodes. This is often the case in specific circumstances, such as, for instance, major events (concerts, music festivals, etc.), holidays, or cereal cropping seasons. The selection of these generic congestion cases has to be rigorously motivated, and the proposed contingency plans have to be reliable and implementable in order to be agreed on by all decision makers. To this end, data in terms of traffic flows and air pollution have been collected from a significant number of sites.



MAIN ACTIVITIES

Important activities include the evaluation of the relevant data sources, interoperability, ownership and conditions for the use of datasets related to the traffic associated with the different modes of transportation connected to the TEN-T nodes of the Constanta Port and the Constanta Growth Pole. Next to that, a selection of generic cases of traffic congestion was made, and the promotion of seamless mobility through TEN-T network nodes to and from the port and road network, based on alternative contingency plans. A third important activity was to assure the accessibility of the aggregated traffic data for the targeted groups of users, in order to promote the proposed contingency plans.

A specific methodology has been defined for estimating the pollutant emissions, and validation activities were carried out with experimental measurements according to the associated data for the measurements of the emissions. Using the model, the accumulation of pollutants in the different areas of the city are evaluated, and a study is performed on the impact of different scenarios of traffic flows in connection with the TEN-T node, and, more specifically, their impact on urban mobility. Next to that, an analysis of the factors that are influencing the traffic flows connecting the TEN-T network and the City of Constanta was conducted.

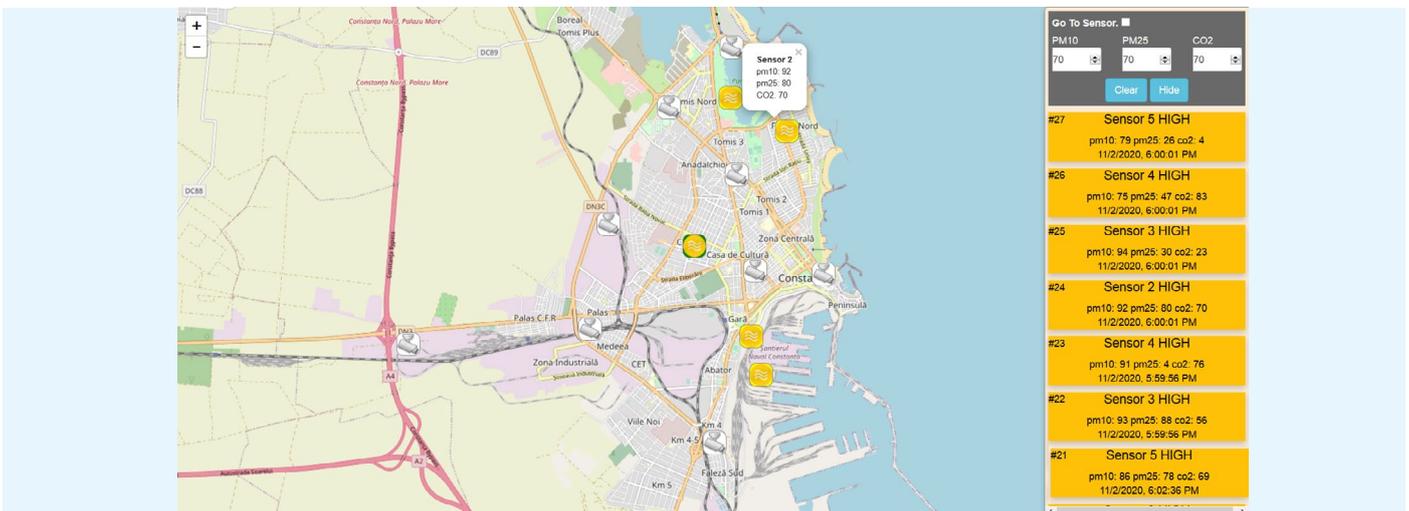
The resulting validated model for the estimation and mapping of emissions associated with traffic flows, and the knowledge on how to take into consideration the specific context of the Constanta City, is used to define scenarios relevant for a number of situations, such as the summer season, agricultural harvesting periods, reference conditions in winter, or other possible extreme weather conditions.

BENEFITS

The Decision Support System is believed to yield the following benefits:

- **Transport:** Improved efficiency of public transport lines.
- **Environment Reduction** of greenhouse gas emissions by 10%.
- **Awareness:** Raised awareness and increased support amongst decision makers and specialists for future decisions on sustainable mobility measures because of better access to information on, for instance, the environmental impact of transport modes and routes. The integration of the Decision Support tool could improve the pathways of initiating and implementing sustainable mobility actions, as it promotes a professional approach and a very high efficiency regarding the implementation of complex projects.

A SPECIFIC METHODOLOGY HAS BEEN DEFINED FOR ESTIMATING THE POLLUTANT EMISSIONS, AND VALIDATION ACTIVITIES WERE CARRIED OUT WITH EXPERIMENTAL MEASUREMENTS ACCORDING TO THE ASSOCIATED DATA FOR THE MEASUREMENTS OF THE EMISSIONS.



FROM CONCEPT TO REALITY

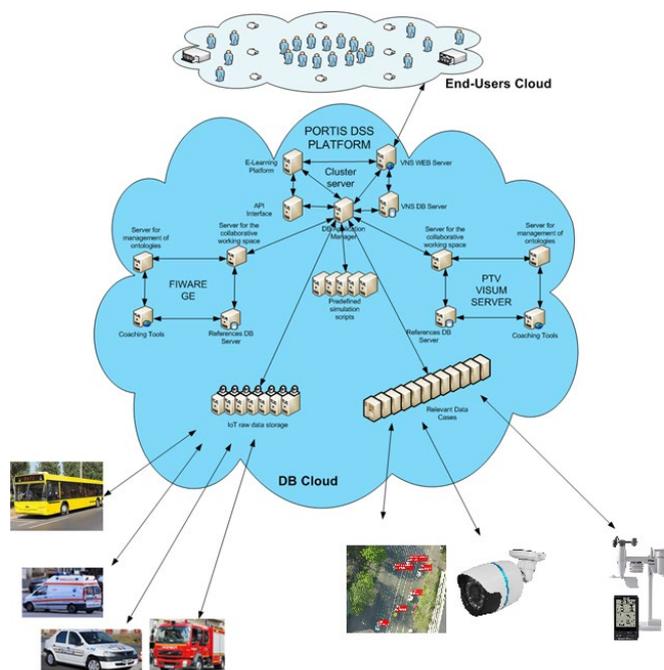
Preparation

Step 1: Evaluation of data & defining the conditions for data use

- Evaluate the relevant data sources related to the interoperability options for the different IT platforms owned by institutions that are responsible for the different segments of transport modes;
- Define the ownership and conditions for the use of datasets on the traffic associated with the different modes of transportation connected to the TEN-T node of the Constanta Port and the Constanta Growth Pole.

Step 2: Aggregating the data

Based on this evaluation, Constanta established the procedures for aggregating the data from different databases. The process of aggregation was developed in two steps: in the first step the Constanta Port Administration coordinated the development of procedures for the aggregation of traffic data connected to the Port activities, and the Municipality of Constanta coordinated the aggregation process of the traffic data associated with the city. In the second step, the Municipality of Constanta aggregated the available traffic data sources for the Constanta Growth Pole. The preparational activities consisted of the evaluation of the relevant data sources, the interoperability options for the different IT Platforms owned by institutions that are responsible for the different segments of transport modes, and the ownership and conditions for the use of datasets on the traffic associated with the different modes of transportation connected to the TEN-T node of the Constanta Port and the Constanta Metropolitan Area. In this respect, various stakeholders were contacted and interviewed, such as: the administrators of IT platforms from the Naval Authority, private operators of specialised terminals, the company that is providing the service of monitoring the access through the gates of the port, the Railway Authority, the Black Sea Danube Channel Administration, the Road Transport Authority, the Administration of Intercity Roads, the Road Transport Department of the Municipality, the police, and the Inspectorate for Emergency Situation. In parallel, the procurement procedures for developing the system for monitoring air pollution in the city of Constanta and the Constanta Growth Pole Area had been initiated.



Barriers

The most important barriers that have been encountered at the preparation stage were the establishment of communication lines with the owners of traffic data and the lack of regulation regarding the exchange of such types of data.

Through the involvement of Constanta Municipality, based on an explicit request for the required information to be used in planning activities, it has been possible to obtain some of the required data for very limited periods of time. In this respect, there are also some applicable provisions in the regulation that is establishing the general framework for urban planning, however there is a lack of specific regulations for traffic data collection and use.

Driver: The Mobility Forum Working groups

There were several data exchanges during the Mobility Forum Working Groups. The Mobility Forum organises the following Working Groups: public transport, parking, Central Area Accessibility, Freight Transport, and Neighbourhood level mobility.

The Working Groups operate through meetings with specific topics regarding mobility, with the participation of experts from different public authorities and institutions, including specific private stakeholders, that fostered the interaction between these stakeholders and the developers of the Decision Support System.

All the above-mentioned Working Groups produced different sets of data that were of importance for the development of the Decision Support System, especially the public transport data, the data regarding the street network, and, naturally, the data collected through the traffic studies conducted by the Municipality.

The lesson learned here is that, in cases where there is a lack of regulation, it is very useful to involve the top decision makers and to follow a top-down approach. As such, an institution such as Constanta's Mobility Forum, involving decision-makers and stakeholders from both city and port, has been an important driver to acquire the necessary data.

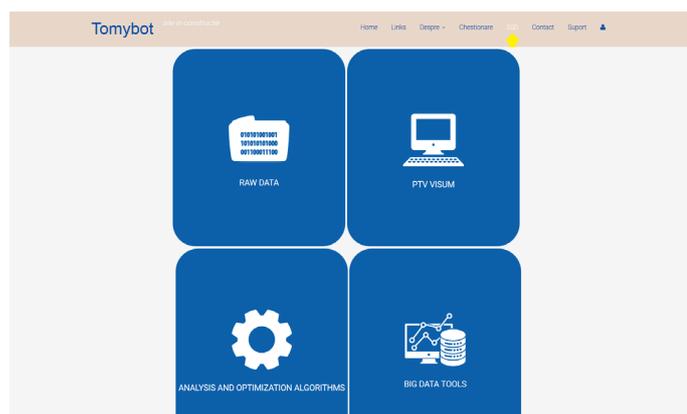
Implementation

The implementation of this measure started with the development of the procedures for the estimation of pollutant emissions using a specialized IT platform, i.e. PTV VISUM. Next to that, the experts involved conducted some analyses of the factors that are influencing the traffic flows connecting the TEN-T network and the City of Constanta.

In parallel, a number of extensive measurements were developed, using the mobile pollution data lab in several spots, that correlated with the VISUM model.

The following steps were followed to enable the monitoring and integration of pollution data:

1. In order to identify the necessary monitoring locations for the deployment of the mobile laboratory, a continuous analysis of the city network and conditions was performed, paying particular attention to traffic peaks, holiday traffic, and special events which are usually gathering large numbers of private or freight vehicles.



2. For the identified sites, activities for pollution data collection were conducted, by monitoring each site for a certain period of time; ranging between one and two weeks. After the completion of the data gathering for all sites, the data gathering was conducted again for the same sites, but in different periods of the year. In order to check the compliance with existing emissions regulations, the standards for Romania were identified and the limits were cross-referenced with the measured data from the mobile laboratory.
3. In order to develop a method for the continuous estimation of emissions at city and metropolitan area level, the PTV Visum model for the analysis of the traffic associated emissions was developed, having as reference the approved city and metropolitan area model from 2015, as well as the estimated traffic for the next five and fifteen years. The emission analysis is based on the HBEFA module with the existing emission standards from Germany. In parallel, a new PTV Visum model for the central area of the city was developed, based on the latest traffic studies from 2018 and 2019 for this area, and the questionnaires for Origin Destination matrices.
4. In order to bridge the gap between the results from the onsite measurements generated by the mobile lab on the one hand, and the VISUM modelling on the other hand, it was necessary to create a dispersion model, which required a 3D model of the city. For this purpose, some dedicated software packages such as ADMS and COPERT were purchased, and some modelling activities were carried out for a reference street canyon on the Ferdinand Boulevard in the city centre.

Barriers

The main barriers that have been encountered in the implementation phase was the lack of experience in developing such a system of data collection, and to assure the compatibility of traffic and pollution data.

Lessons learned

The lesson that was learned is that you should not try to re-invent the wheel and study the solutions that were developed by other municipalities. Very valuable inputs have been received through a number of exchanges with other PORTIS cities, for instance with the Municipality of Antwerp on the development of digital applications, as well as from the Municipality of Aberdeen on integrated planning.

The experience of the Municipality of Antwerp was found to be very impressive, and inspired Constanta to integrate some elements of Antwerp's approach in the development of its Decision Support System:

Engage an external partner for the development

- Based on the exchange with Antwerp, Constanta engaged an external partner for the development of its Decision Support Platform, and signed a Memorandum of Understanding for long-term collaboration between the municipality and the MEDGreen Cluster for continuous updating and maintenance activities;

Ensure the user-friendliness of the system

- The digital platforms of the municipality of Antwerp are very user-friendly and easy to be used by the general public. Inspired by this example, Constanta developed some additional features for its Decision Support System, the tomy.ro platform, such as a route planner for sustainable mobility in the city, the guidance towards sustainable mobility options such as bicycles and public transport, and the application orientating travellers towards Points of Interest.

Ensure the involvement of the municipality throughout the implementation process

- In the case of the Municipality of Antwerp, the experts from the municipality are involved during the entire cycle of developing and improving digital applications. During the implementation of the Decision Support System, the experts from the Municipality of Constanta and the related agencies have also been involved in all tasks, providing their opinions and suggestions for improvement all along the implementation process.

Current & Future steps:

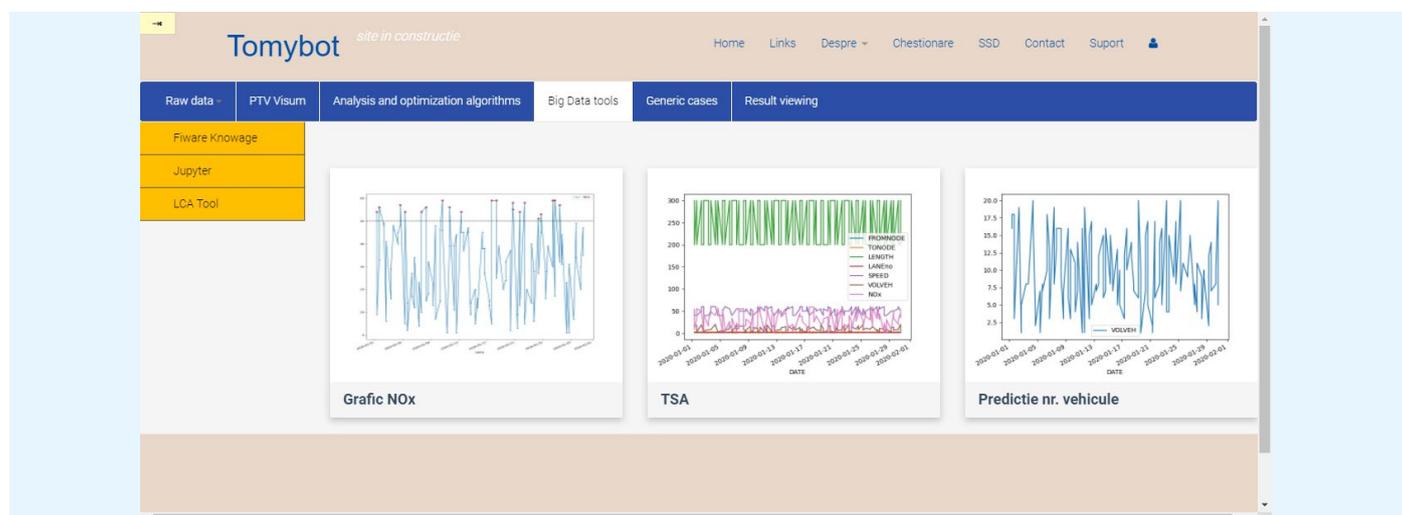
At the end of the Civitas Project lifetime, the Decision Support System has the following features:

- The Decision Support System has been coupled with the PTV Visum application for traffic analysis and optimization, including emission of pollution from road vehicles. The system shall be completed with a tool for air dispersion modeling;
- The database is being populated with existing traffic values, sourced from existing video traffic surveillance systems, traffic studies, direct field measurements, interviews, and questionnaires or other types of inputs.

Future developments will include:

- The Decision Support System shall include big data analysis tools, various transport optimisation algorithms, origin-destination matrix development necessary for the Visum application, an integrated Visum origin-destination import-export tool, automated Visum procedure sequence run and visualisation of Visum results and reports;
- The Decision Support System shall integrate a user manual which shall provide information to the different types of users: visitors, specialists, data input users, data analysis users, etc.

There is also a Memorandum of Understanding between the Municipality and MedGreen Cluster (the Decision Support System developer) for further use of the platform. This MoU establishes the rules on how the Decision Support System will be used after the PORTIS lifetime, and defines the responsibilities of both parties for further use, maintenance and update of the system.



USERS & STAKEHOLDERS

Users

The decision support tool shall be a very powerful tool for decision makers and experts involved in the decision making process, as the system allows for an appropriate analysis of different alternatives, a simulation and sensitivity analysis for motivating and supporting the decision. As such, it is specifically valuable for the following target groups:

- City planners
- Constanta Municipality
- Port Administration
- Public Transport
- Citizens
- Visitors

Key stakeholders

- **Constanta Municipality:** Responsible for planning, operations, management and monitoring of public transport systems in the City and responsible for the implementation of public transport routes and services, and their quality.
- **Cluster Medgreen:** Cluster for Promoting Businesses Specialized in ecotechnologies and Alternative Energy Sources; they are the principal partner involved. They are in charge of the development of the database, the collection, import, and integration of data sets, the design of the interoperability procedures, development of the algorithms, programming, testing and validation of the software tools. They are also in charge of the development of the web-based interface for the real-time tracking of the position of public transport buses.
- **Local Public Companies** in the field of Public service provision (e.g. Public Transport Operator and Confort Urban – the company responsible for the street and parking management).

IS THIS SOMETHING FOR US?

- Planning based on data is essential for sustainable development. A decision support system gathering all of the relevant data in one place, with a tool for interpreting and providing predictions on future development, helps to ease the process of urban planning.
- The actions for seamless mobility in connection with TEN-T nodes are extremely complex issues that require interdisciplinary approaches. Science-based decision support activities should become a usual approach for addressing such complex mobility issues. The development of a mobile laboratory for emissions is important to be able to include environmental aspects in the decision-making process.
- A decision support tool is a game changer and requires an appropriate commitment of the authorities to promote it to be used by a critical mass of persons involved in the implementation of sustainable transport measures.
- In cases where there is a lack of regulation on the exchange of data, it is very useful to involve the top decision makers and to follow a top-down approach. As such, an institution such as Constanta's Mobility Forum, involving decision-makers and stakeholders from both city and port, has been an important driver to acquire the necessary data.
- Having the Decision Support Tool validated to be used is just the beginning of a new process. The use of such a tool requires adequate allocation of resources allowing the continuous updating of the information, the software applications, and the internal procedures for decision making.

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