D.T1.4.1 – KNOWLEDGE TOOL FOR PILOTS/ACTION PLANS IN THE FIELD OF LAST MILE CONNECTIVITY OF NODES/TERMINALS

Last mile connections

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1. Executive summary

Within the TalkNET project, five knowledge tools have been developed in order to make available a review of best practices and relevant knowledge in the two macro fields of action of the project, that is to say Multimodality and Eco-innovation, and the related five identified sub-topics:

1	LAST MILE CONNECTIONS OF MULTIMODAL NODES	MULTIMODALITY
2	NODE MANAGEMENT OPTIMIZATION	
3	ASSESSMENT OF MULTIMODAL SERVICES	
4	ALTERNATIVE FUELS DEPLOYMENT	ECO-INNOVATION
5	ENERGY EFFICIENCY SOLUTIONS	

The objective of the TalkNET project is to improve the coordination among freight transport stakeholders for increasing multimodal environmentally-friendly freight solutions. Within the project framework, stakeholders have been included in defined project clusters (five project clusters) that correspond to the five identified sub-topics and that allow to gathered actors with common interest for cooperation.
Within this goal TalkNET partners are involved in a continuous transnational consultation process with the stakeholders in order to define how to deal with the above mentioned fields of action.
The knowledge tools delivered are the results of this process: it deals with the collection of the relevant knowledge in these fields both from inside and outside the partnership. Therefore, the knowledge tools will include both the significant experiences of the project partners and those gathered outside at EU level from other actors and operators.
More in details, the use of the knowledge tool allows to focus on a specific issue considering the following logical steps:

1. needs identified as relevant for the partner or/and the stakeholders expressing an interest for the issue;
2. problems deriving from non-satisfaction of the needs preliminary identified, hampering the optimization of a specific process or/and situation;
3. identification (if any), of past attempts to remove, mitigate or solve the problems above-mentioned, offering suitable solutions;
4. identification of the weakness affecting the past attempts;
5. mapping of feasible good practices implemented in order to give answer to the same or similar needs in a comparable context. Good practices identified can refer not only to cases implemented within the Interreg CENTRAL EUROPE Programme area but in general, provided that the needs and the context can be brought back and then compared to the punctual situation under analysis;

6. systematization in order to achieve a clear overview of the elements characterizing the good practices identified and their analysis in order to find out key elements or/and processes that can be adapted to the specific situation in order to provide feasible solutions.

For needs, it is meant the necessities identified internally or externally, by the stakeholders, to which it is not possible to provide a credible answer without implementing a series of actions aiming at solving weakness or/and obstacles.

A good practice can be seen as an example of someone with the same needs that was able to satisfy them. Accordingly, it is a method, model or technique that has been accepted as superior to several alternatives because it produces results that are superior to those achieved by other means or because it has become a standard way of acting.

The points mentioned above correspond to the approached adopted by the TalkNET project when dealing with knowledge management and review of best practices. This is demonstrated within the "Summary report of the inputs collected from the stakeholders and tools development" (D.T 1.4.4-2.4.4), that is strictly linked to the best practices collection as the step before to the development of the knowledge tools. In fact, stakeholders were involved in the preparation of the knowledge tools as partners took part in and/or organized meetings with relevant stakeholders to collect their inputs that are functional to the elaboration of these outputs. They allowed to investigate those best practices that can be possible answer to the stakeholder's needs.

Therefore a review of the current/up-to-date knowledge in the sub-topics identified by the project will be delivered and the knowledge available will help project partners in the implementation of the project activities. In particular, this benchmark will be useful and necessary to develop the project action plans (A.T1.5-2.5 – planning phase of the project activities) and the pilot actions (A.T 3.2 – testing phase of the project activities).

Anyway, TalkNET thematic knowledge tools will offer knowledge and best practices review that will be available not only to project partners but also to the operators acting in the fields of multimodality and eco-innovation. In particular, this knowledge tool is focused on the best practices gathered in the first field of last mile connections of multimodal nodes.

The structure of the document is the following: in chapter 2 it is given an overview of the TalkNET project; in chapter 3 it is given an introduction to the best practices that this documents propose, focusing on the EU and then the TalkNET approach about last mile connections of multimodal nodes; chapter 4 is the most relevant part of this document giving the collection of best practices and knowledge both from inside and outside the partnership; chapter 5 gives main conclusions of this work.

2. About TalkNET project

The aim of TalkNET is to improve the coordination among freight transport stakeholders for efficient and environmentally- friendly multimodal transport solutions in central Europe.

TalkNET involves sea and river ports, inland terminals, rail operators, logistic service providers, regional authorities and development agencies:

8 CORE PORTS	3 CE REGIONS	OPERATORS/PRIVATE
Port of Venice (IT) Port of Trieste (IT) Port of Koper (SI) Port of Budapest (HU) Public ports of Slovakia (SLO) Port of Rijeka (HR) Szczecin & Swinousce Seaports Authority (PL) Inland Port of Verona (IT)	Veneto Region/Veneto Strade (IT) West Pomeranian Region (PL) Usti Region dev. Agency (CZ)	Lokomotion (GER) Rail Cargo Hungaria (HU) Codognotto Poland (PL) Italian-German Chamber of Commerce, Munich (GER)

The project results will be achieved focusing on the following fields of action:

1: Last mile connections of multimodal nodes → INFRASTRUCTURES

It deals with the optimization of the links of the terminal/node with last mile connections. It is focused on the improvement of the links to the main transport networks node-to-node, in particular core and comprehensive TEN-T networks.

2: Improvement of multimodal terminals efficiency and optimization → MANAGEMENT EFFICIENCY

It deals with the optimization of the internal dimension of the terminal/node and it involves the improvement of its efficiency. It is focused on the improvement of the terminal operative and logistics management systems.

3: Market opportunities to reinforce or activate new multimodal services → SERVICES

It deals with market analyses to improve intermodal connections and existing/new logistics services and solutions. It is focused on the creation of new multimodal services to tackle bottlenecks affecting the several transport routes (rail, road, sea).

4: Alternative fuels deployment → ALTERNATIVE FUELS

It deals with the increasing use of transport means supplied by alternative fuels instead of fossil fuels. It is focused on the potential deployment of alternative fuels for ports/inland terminals and logistics operators (e.g. LNG demand analysis) to understand what is the real consumption of these type of fuels in the transport network.

5: Deployment of energy efficiency in transport operations → ENERGY EFFICIENCY
It deals with the research of the best tailor-made solutions to manage the partners' project logistics chains aiming to reduce the use of energy. It is focused on the creation of management solutions with a high level of efficiency to reduce the waste of energy during all transport/handling operations.

TalkNET project is developed in three macro Work Packages: WPT1 Multimodality, WPT2 Eco-Innovation and WPT3 Pilot Actions. Before implementing the pilot actions four main activities are implemented.
The first activity (AT1.2 - A.T2.2) includes the analysis phase focused at regional level. It aims to assess problems, needs and challenges of the identified project nodes' regions and measure the impacts of the stakeholders business activities on the five sub-topics previously defined. In this phase, the stakeholders are involved at a territorial level. The analysis will end with a further step that is the mapping of stakeholders.
The second activity (A.T1.3 - A.T 2.3) is about the identification of the clusters according to the results of the previous analysis. In this phase, the stakeholders are involved at cluster level.
The third activity (A.T1.4 - A.T2.4) develops the knowledge tools, which collect the knowledge from within and beyond the partnership on the five project sub-topics. The involvement of the stakeholders in this phase is at the transnational level. The thematic tools are developed and define the connection between the three work packages.
The fourth activity (A.T1.5 – A.T2.5) concerns the planning phase. Here the actions plans are implemented and they will be more suited to tackle problems and needs founded in the previous phases. Stakeholders are involved at node level.
The following step is to plan how to respond at problems/needs previously identified by the project: it is the testing phase, the core part of the TalkNET with the pilot actions (A.T3.2), with the cooperation of the stakeholders form the design to the evaluation of the final results of the pilot actions.

2.1 Overview of action plans and pilot actions

After the analysis phase, through the action plans project partners will implement the planning phase on the five project priorities: last mile connections, node management optimization, assessment of multimodal services, alternative fuels deployment and energy efficiency solutions. They are set up in cooperation with the relevant stakeholders.

The following partners focus their action plans on the field/cluster of last mile connections of multimodal nodes:

D.T 1.5.4 – Action plan to improve multimodal nodes efficiency and connections - LUKA KOPER (NAPA)	**LUKA KOPER**
D.T 1.5.5 – Action plan to improve multimodal nodes efficiency and connections - RIJEKA (NAPA)	**PORT OF RIJEKA AUTHORITY**

D.T 1.5.6 – Action plan to improve multimodal nodes efficiency and connections – VERONA FREIGHT VILLAGE	**ZAILOG**
D.T 1.5.8 – Action plan to improve multimodal nodes efficiency and connections – BUDAPEST	**FREEPORT OF BUDAPEST**
D.T 1.5.11 – Action plan to improve multimodal nodes efficiency and connections – USTI NAD LABEM	**REGIONAL DEVELOPMENT AGENCY OF USTI REGION**

Eleven pilot actions will test:

- the links to the main transport networks node-to-node;
- terminals' operative and logistics management systems;
- the creation of new multimodal services to tackle bottlenecks affecting the several transport routes (rail, road, sea);
- the potential deployment of alternative fuels for ports/inland terminals and logistics operators;
- the creation of management solutions with a high level of efficiency to reduce the waste of energy during all transport/handling operations.

The following partners focus carry out pilot actions in the field/cluster of last mile connections of multimodal nodes:

PILOT ACTION FOR LAST MILE CONNECTIVITY OF MULTIMODAL NODES

D.T 3.2.1 - Feasibility study for a new rail terminal	**VERONA FREIGHT VILLAGE**

3. Introduction to best practices in the field of last mile connections of multimodal nodes

Following the results of the analysis of the TalkNET partners, it is clear that there are some common needs to satisfy in order to reduce the inefficiencies affecting the last mile connections. These trends can be grouped according to the different business activities.

For instance, the majority of **ports** involved (Venice, Trieste, Koper, Rijeka, Bratislava, Szczecin and Swinoujscie) need to extend their quays and to strengthen the railway connections. Once they have detected the problems, the strategy was to launch a public procurement to identify the company able to carry out the works necessary to improve the nodes.

A good example can be given by Trieste Port Authority that needs to improve the last mile connections of the node. The interventions of Trieste are included in a wider project: the Global project (2018-2025), concerning the upgrade of the railway infrastructures of the Port of Trieste, in order to accommodate the increasing railway traffic flows. The Global project includes:

- ✓ the upgrade of the railway last mile connection;
- ✓ the infrastructural upgrade for the reactivation of the railway line connecting Aquilinia station to Campo Marzio;
- ✓ the upgrade of the existing infrastructure and new railway station at Scalo Legnami;
- ✓ the infrastructural and technological upgrade of the port marshalling yard connecting Piers 5, 6 (RoRo transport) and 7 (containers) to Campo Marzio Station and then to the national railway lines.

Another group of partners is represented by the **dry ports** (Verona freight village, Freeport of Budapest and the Chamber of Commerce of Munich since it has dealt with the activities of the two German freight villages Nuremberg and Hof).

In this case, the needs are quite similar to the maritime ones but more focused on the rail/road coupling.

For instance, in the smaller terminal of the Verona freight village a particular handling technique allows to reduce the inefficiencies usually affecting the last mile connections of the terminals. An example of them is given by the long queues of trucks outside the terminal gates waiting their turn to pick up the loading units. The queues are caused by the trains arrived in delay. The smart way to operate of this terminal permits to handle all the trains already arrived on time, avoiding to wait for many hours the delayed trains which arrival was foreseen in advance by the scheduling programme. In fact, the majority of terminals follow the scheduling because they want to use the same wagons for a specific destination. The terminal manager is not the owner of the wagons so he prefers to use the same ones in each connection to prevent the loss of them. The terminal manager of the aforementioned Verona terminal has made an agreement with the MTO operating in his facilities. This deal foresees to manage the first train arrived at the terminal despite one should follow the scheduling. However, several trains sometimes are stopped on the railway network for many reasons (works, accidents, bad weather conditions, etc.) so it is better to unload the trains already arrived (despite they should be handled after the delayed trains, according the order of the

scheduling) and make possible the departure of these trains on time. This way to operate is possible if only one MTO operates in the terminal. This is the condition that allows to use different wagons for many destinations that permits to reduce the risk to lose wagons to the minimum level. The example described offers many advantages for all the actors involved:

- the MTO can sell many roundtrips;
- the terminal manager can manage more trains;
- the wagons owner can rent more wagons;
- the forwarders can handle many trips since they reduce the waiting times at the terminal gates

In the example above it easy to understand that not only physical interventions can improve the last mile connections but also a different organization of the business activities.

Another category of TalkNET partners is composed by the **operators** (Lokomotion, Rail Cargo Hungary, Codognotto and Veneto Strade that analyzed the behaviour of the enterprises operating in the Central Europe area). The needs detected by them regard both infrastructural interventions and technology improvements.

The analysis of Lokomotion represents a good example of this joint need. In fact, there are several maintenance works on the railway network that cause disruptions on the line. These planned works usually produce delays on the railway connections. The countermeasure identified by Lokomotion is to create a temporarily detour with additional switches and signals to keep the capacity higher than in the current practise of full closures in order to allow the regular flow of trains. The described solutions is a combination of infrastructure works (detour with additional switches) and ICT solutions (signalling system). In addition, new rules and agreements for the use of the railway line are necessary in order to organize the restricted passage of the trains in these stretches with limited access, avoiding congestions caused for a bad management of the priorities. This system permits to increase the performance of the railway undertakings because they can reach the destinations foreseen with a short delay. The results measured by Lokomotion are excellent:

- Reduction of slot capacity of only 10% (instead of 70%) due to "only" short single-track line
- Planned average delay per train: 0.5 h (instead of 1 – 3 h)

The adoption of these practices permits to improve the railway network efficiency with benefits for the overall intermodal chain.

From the example described, it is possible to understand that there are some common (or “macro”) needs. Despite the different business of the TalkNET partners, the needs are similar and aimed to improve the last mile connections. Making a short list of these needs, it is possible to group them in three main categories:

- **Infrastructural** when are necessary physical interventions to modify the structure both of the nodes and of the connections;

- **Technical** when a software or an IT device can enhance the efficiency of the daily operative activities;

- Legislative when some new rules/laws or agreements/deals increase the opportunities to raise the multimodal traffic, reducing the costs and the environmental impact.

4. Best practices collected in the field of last mile connestions of multimodal nodes

The best practices presented in this document would like to offer good solutions tested and experienced in the field of last mile connections of multimodal nodes.

These good practices have been collected following the criteria of the project field of action and, when possible, of the pilot action foreseen in the related field (2.1 Overview of pilot actions).

Specifically, it deals with solutions tested and proposed by TalkNET project partners and other selected from external operators and actors that partners have deemed to be significant for their activities and business.

Nevertheless, not only good solutions are proposed, but in some cases also the relevant up-to-date knowledge in the thematic field of last mile connection of multimodal nodes, as guidelines to support activities in this specific field.

The selection of the best practices has been strictly influenced by the needs of partners' stakeholders that have been detected from the project activities and the various contacts that the partners had working with them.

Moreover, the variety of the TalkNET project partners has represented an added value for the knowledge management of the project, allowing to gather in turn different stakeholders good solutions adopted.

Title
Last mile connections – Port of Koper
Players included and contacts (if available)
▪ Forwarding agents (Port community - 46 members) ▪ Shipping agents (Port community – 20 members) ▪ Shipping companies ▪ Rail undertakings ▪ Road hauliers ▪ Ministry of infrastructure (Slovenian Maritime Administration, 2 Municipalities) ▪ Institutes, companies – logistic area, traffic and transport
Location
Container terminal and the working and storage areas on the piers and in the hinterland of the container terminal – Port of Koper www.luka-kp.si

Summary

Luka Koper came to the optimal solutions regarding efficiency of the container terminal and regarding the optimization of the port operations.

Overview

Part of the analysis of the technical efficiency of the container terminal of the Port of Koper is the last mile connection of the container terminal and in the same time of the Port of Koper. In this document, best practices from the past years of improving last mile connection of port of Koper are described. Currently planned investments which will be implemented in the future, are not part of this document. Capacities of the Container terminal are determined by the combinations of different elements that in a certain moment represented the bottlenecks. One of them was the wider support and interconnection infrastructure, comprising sea access (depths of channels and basins), railway facilities (railway section of the terminal and of the port and railway connection with the hinterland), road access (truck section of the terminal and port and traffic flow).

By analysing the efficiency and connectivity of the container terminal it was possible to assess the optimal solutions and a comprehensive assessment of the development of the transhipment, of the storage of containers and of the transportation by road and by rail to and from the Port of Koper. The capacity of transportation followed the previously foreseen demand with the improvement of the road and especially the rail connection of the container terminal with the hinterland. Concrete activities and investments for the development of the container terminal were defined based on of internal analysis and analysis of the business environment and resulted in the constantly increasing container throughput in the Port of Koper.

The major investments implemented on Container terminal in the past years improving last mile connectivity of terminal and can be presented as best practices were:

- Move of storage blocks at the Container Terminal and infrastructure for E-RTG (The movement of storage blocks at the container terminal was necessary in order to improve traffic flow between blocks in terms of providing greater width of transport routes between blocks. Block movement was also required due to the introduction of RMG cranes above the tracks, the construction of two additional tracks, and the electrification of RTG cranes above storage blocks.)
- Crane rails for new RMG cranes which substantially increased train loading productivity and were introduced in the Port of Koper in 2017. The introduced technology was at that time brand new and has not been applied in Koper until then. Since the RMG cranes move on rails, a new 740-metre-long crane lane had to be constructed and the warehousing blocks at the same terminal had to be moved. The new cranes enabled the loading/unloading of containers on five trainsets simultaneously. Until then, Port of Koper had only three railway tracks that were previously extended and subsequently, we built additional two tracks, each 700 metres long.
- Several additional storage areas for containers were arranged consolidating this cargo group on a Pier I, also considering storing containers in heights and working with a container manipulator. In order to keep container in a separate area in the port, several

other investments were needed (relocation of garage, relocation of parking lot, increase in load capacity etc).

- The container terminal at Pier I (except at berth 7) was adapted to accommodate post-panamax ships (required depth -14.5m), which required deepening of the Basin I to -15m hydrographic depth. Work was planned in phases in order to ensure the safety and stability of the existing structures, but at the same time it was necessary to provide for each phase the available space for depositing the excavated material at appropriate landfills (cassettes). Additionally, the dredging along the quay walls depended and was conditioned by dredging of the access/navigability channel to the Basin I (access channels are not under the jurisdiction of Port of Koper, but are under Slovenian Maritime Administration's jurisdiction).
- New truck entrance (The Sermin entrance) was constructed in 2019 and operates as entry point for the Pier II, where dry bulk cargoes and general cargoes are concentrated, as well as large storage areas for cars. It is not directly intended for the container terminal, but optimizes truck traffic flows through the whole port. The routes and the journey time to the car terminal has shortened, there are substantially less crossings among trucks, trains and other machinery, and the internal port logistics and the productivity improved. Once built, 40% of all trucks are redirected to the Sermin entrance, at the existing main entrance mainly trucks transporting containers and perishable goods enter the port zone. There is less congestion for the entry and exit point of container terminal.
- Additional railway tracks (18c, 21a,b,c) were constructed at the container terminal and railway bridge connecting container terminal with its hinterland was enlarged in width.
- Additional superstructure (cranes) was purchased (7x RTG + 3x RMG + 2xSPPX).

Results and experience collected

The combination of all above mentioned measures and investments have given significant results in the development of container terminal of Port of Koper, as is shown in the increased container throughput in the last years: from 476.700 TEU in 2010 to 988.500 TEU in 2018, that represent 107% of increase in 8 years.

Improvements of the last mile connection were mainly: enlargement of terminal capacity and enlargement of rail capacity of the container terminal by introducing RMG technology (improvement of movements of wagons with a depreciation intermediate railway station before the container terminal) and decongestion of the road access to the container terminal: new port entrance that reduced congestion of trucks at the container terminal by redirecting vehicle flow towards the Pier II.

Added value for TalkNET project

The container terminal continuously monitors the operation and the performance of the terminal by using adequate indicators (costs and EBIT, EBIDTA, equipment productivity, efficiency of the operational personnel, efficiency of the yard area). The results of the indicators are used for the improvements in different segments: costs, productivity, utilisation of the equipment and infrastructure, environmental impacts. Consequently, the investment in the last mile connection infrastructure against the acquired capacity and the environmental impacts is optimized. The investments to the container terminal

in the last decade are presented as a best practice example, following its results of increase container throughput in the Port of Koper, which can be transferred also in other ports or adapted and transferred in similar inland logistic hubs.

Title
Reduction of rai transport time – Rail Cargo Group, MÁV, ÖBB
Players included and contacts (if available)
▪ Railway undertakings (e.g. Rail Cargo Group) ▪ Infrastructure managers (MÁV, ÖBB)
Location
Hungary, Austria
Summary
Delays like customs checks/inspections, incompatible information systems, and changes of locomotives/crews have not been resolved in rail freight transport. There are borders where – for regulatory reasons – trains need to switch their locomotive because of the different axle loads. Delay could mean that the train arrives late to the harbour and misses the cargo ship, failing to provide a quality service to the customer. It is a realistic and even not impracticable demand of the market participants to make border crossing and custom clearance procedures easier and faster. Similarly, national rules and regulations related to combined transport have to be formulated in a more understandable way. It is an important factor to make rail/road combined transport more reliable.
Overview
Border crossing points were identified as neuralgic points responsible for most part of the delay in the analysed sections. The issues with border crossings are of triple nature: administrative, technical and organizational. The border-crossing procedure takes a long time especially from/to countries which are members of the EU but not part of the Schengen-area (e.g. Romania or Bulgaria), respectively not members of the EU (e.g. Serbia); the inspection of border-patrol can delay the onward journey of the trains by several hours. This circumstance cannot be improved by the railway undertakings as they are in a quite dependent situation. Our possibilities lay more in the field of technical and traffic organisation. The technical difficulties related to the different voltage used in the two countries (3 kV in Slovenia and 25 kV in Hungary) shall be solved either by the upgrade of infrastructure (building of track for fast change of the locomotive) or by using multi-voltage locomotives. The organizational issues could be solved by better coordination among railway companies and the infrastructure managers. The flow of information between the railway undertakings is crucial for the organisation of traffic. Data related to freight forwarding may be at the recipient railway's disposal before the train's arrival at the border station to

be processed, so no waiting at the border would be necessary: the IT-systems Hermes 30 and Hermes 40 are a good example. Another possible method to reduce the standing time at border stations is if there is no need to change locomotives and /or loco-drivers. The change of locomotive is often done due commercial reasons and for technical ones: the train is being forwarded by another railway undertaking from the border by its own vehicle. The change of loco-drivers is necessary even if the train is forwarded by the same railway company: mainly due to the lack of language knowledge the loco-driver does not have the necessary qualification and licence to drive in the neighbouring country.

Results and experience collected

- The trains forwarded by RCG, in case they run with own locomotives without change, stay at the Hegyeshalom border station only approx.. 15-20 minutes. In times of no loco-driver change (RCH had German-speaking loco drivers with licence to drive in Austria) the crossing of the border took only 2 minutes.
- Several European railway undertakings have purchased and use multi-voltage locomotives in order to ensure cross-border traction in countries with different voltage and network regulations enabling their trains to reach the destinations in time (e.g. RCG, DB, SBB, PKP Cargo, etc.)
  https://kurier.at/chronik/oesterreich/oebb-bestellen-61-neue-super-loks/400439290
  https://presse.oebb.at/de/presseinformationen/oebb-praesentation-der-ersten-lokomotive-oebb-1293-vectron
  http://www.logsped.hu/sikeres_probaut_siemens_vectron_mozdonnyal.htm

Added value for TalkNET project / Link to Pilot actions

Punctuality of freight transport shall be enhanced.
The project should connect all the relevant actors and facilitate their dialogue in order to make border crossing procedures faster and more seamless than they are now.

Title

CargoTram in Dresden

Players included and contacts (if available)

Dresdner Verkehrsbetriebe AG in cooperation with Volkswagen Automobil-Manufaktur Dresden GmbH

https://www.bahnfotokiste.de/strassenbahn/dresden/index.html

https://web.archive.org/web/20150530052353/https://www.dvb.de/de-de/die-dvb/technik/fahrzeuge/cargotram/

Location

Municipality of Dresden, Germany

Summary
The CargoTram as a good example of sharing public transportation space involving last mile connections in city logistics functions, while using an environmentally-friendly, electrically powered vehicle for the transportation of goods
Overview
Among the good practices examined, the Dresden CarGoTram was identified as an example with relevant lessons learnt for the situation in the Freeport of Budapest: the CargoTram is a good example of sharing public transportation space involving last mile connections in city logistics functions, while using an environmental friendly, electrically powered vehicle for the transportation of goods. During the preparation for the start of the CarGoTram project the objective was to use the existing tramway tracks network through Dresden inner city. The VW production site as well as the logistic centre from which the car parts are being transported needed to be connected to the existing tramway track network, keeping the initial infrastructure investment need modest. Another general challenge faced is the competitive usage of tramway tracks used for passenger's transport provided by DVB (Dresden public transport provider, Dresdner Verkehrsbetriebe AG). Dresden Inner City was intended not to be (additionally) loaded with commercial vehicle transport, which was in general not causing major congestion and pollution issues in central parts of Dresden nor in the Saxony region as such. The total length of the route used by CarGoTram is 12 km in both directions. As planned, the route should be served in up to 8 cycles daily, including Saturdays in case of need. Each of the two trains could be loaded with maximum of 60 tons of freight – with volume of 214 m^3. Positive effects of CarGoTram can be primarily noted on the field of environment – next to generating less than half of the CO2-emissions compared to the number of freight trucks with equivalent load, the CarGoTram is producing significantly less noise. Cargo trams also contribute to better usage of the tramway tracks infrastructure and have hence minimal impact on the traffic density in Dresden inner city. Financially seen the cargo tram cost-efficiency grows the more it is used. The operational costs are then comparable to those of commercial road vehicles. The limited storage capacity at VW production site Gläserne Manufaktur turned out as challenging and has been causing difficulties in loading the cargo trams to their full capacity. This example from Dresden shows CargoTram concept as a feasible solution for freight transport in a city area. While the environmental advantage of this solution is a strong pro-argument, Dresden example shows that the existing infrastructure and needs of actors such as enterprises and local community need to be considered and do influence the implementation of similar logistic solutions. The further factors to be considered is the density and usage of the infrastructure for the matters of passengers' transport. Also, the distance and position of the end points related to the present tramway tracks network need to be considered, as the construction of additional tramway tracks leads to boost of the investment costs. After all the sort of goods that needs to be transported needs to be compatible with tramway transport. Similar solutions with trams used for cargo transport

exist in Zurich (for transport of waste), the pilot projects were launched in Amsterdam and Vienna.

The basic preconditions for the replicability of the above example are mostly given in the city Budapest and beyond, in its agglomeration that is connected with the city with the suburban railways (HÉV). The tram network of Budapest is extensive and also there are quite a lot of unused sections of tracks which are also connected with former or current industrial sites or with brownfield sites which are currently unused but would be ideal for city logistics developments.

Results and experience collected

- The CargoTram service is smoothly integrated into the tramway traffic of the city. The CargoTram was using the normal public tramway lines, not disturbing the public transportation service;
- An access line attached to the tramway network needs to be established to reach the destination. In the Dresden Volkswagen factory, the infrastructure was designed from the beginning to be able to be accessed by cargo trams. However, establishing similar tramway connection to already existing factories or logistic centres might be challenging;
- The loading and unloading can be easily organised, using the normal devices (forklifts) usually available at logistics facilities. The total loading/unloading exercise for a fully loaded CargoTram takes only 8-10 minutes with two forklifts;
- The CargoTram can be loaded with standard containers or pallets;
- The loading capacity of the CargoTram equals to 4-5 trucks used in city logistics functions, while only one driver is needed for the operation.

Added value for TalkNET project / Link to Pilot actions (D.T 3.2.8)

For the roadmap's (full) implementation, it is necessary to prepare a realistic set of incentives for the fleet transitions because economic factors will continue to play a major role and precondition for fleet change, thus the accompanied promotion campaign of EFV should also stress the financial gains on the long run. The main expected results of the roadmap set of incentives and promotion campaign will be the acceleration of the transition to EFVs in the fleet of the urban freight transport companies.

The main stakeholders are:

- Ministry of Innovation and Technology;
- Municipality of Budapest (Unit Responsible for Transport);
- District Municipalities and district parking management companies;
- Budapest Public Roads (Közút) Ltd.;
- Clean Air Action Group (CAAG, Levegő Munkacsoport) and other NGOs;
- Freight forwarders;
- MLSZKSZ (Hungarian Association of Logistic Service Centers)

5. Conclusions

Best practices collected in the field of last mile connections of multimodal nodes can be different in relation to the different partners/actors involved. This shows the variety of interventions needed to cope with last mile connection issues to improve mainly the lack of infrastructures in the nodes and connections in the regions. Within this aim, the efforts and the resources to remove the bottlenecks are concentrating in order to foster as much as possible the use of eco-friendly transport solutions.

6. Index

6.1. Collection of best practices

1) Last mile connections – Port of Koper
2) Reduction of rai transport time – Rail Cargo Group, MÁV, ÖBB
3) Cargo-Tram in Dresden