VITAL NODES

Deliverable 4.3

Validated recommendations for Tier 2 and Tier 3 groups of urban nodes

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Abbreviations

CEEC	Central European Countries
CEDR	Conference of European Directors of Roads
CEF	Connecting Europe Facility
ECO	Ecorys
EFSI	European Fund for Strategic Investments
EIM	European Rail and Infrastructure Managers
ERDF	European Regional Development Fund
EU	European Union
EUR	Euro
FUA	Functional Urban Area
O-D	Origin-Destination
OMG	Departement Omgeving Vlaanderen
PPP	Public Private Partnership
PO	Project Officer
RWS	Rijkswaterstaat
STRIA	Strategic Research and Innovation Agenda
SUMP	sustainable urban mobility plan
TEN-T	Trans-European Transport Network
TFK	Trafikverket
UMP	Urban Mobility Package
WP	Work Package

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Executive Summary

Urban areas have become an integral part of the development of the TEN-T network, which is reflected in the concept of urban nodes. Annex II of the TEN-T Guidelines lists 88 urban nodes of the core TEN-T network, which were identified based on socio-economic criteria. These urban nodes ensure the connection between the different transport modes, as well as the connection between long-distance and regional, peri-urban and intra-urban freight transport and logistics. The Vital Nodes project contributes to more effective and sustainable integration of urban nodes into TEN-T corridors by innovative solutions for optimising accessibility, liveability and vitality, and to create equal emphasis of development on corridors and nodes.

One of the objectives of the Vital Nodes project is to deliver validated recommendations for a more effective and sustainable integration of the urban nodes into the TEN-T corridors. This deliverable (*D4.3 Validated recommendations for Tier 2 and Tier 3 groups of urban nodes*) contributes to this objective by providing information on the validation of future research, funding and regulation needs for the better integration of the urban nodes into the TEN-T network. Therefore, results of the validation process provide important input for final recommendations of Vital Nodes (developed in work package 5).

Work package 4 (WP4) follows a stepwise explorative and user-driven approach (*Facilitate wide-scale deployment of innovative solutions covering all 88 nodes*), using a workshop model that was elaborated in a first advanced series of workshops with urban nodes (the 8+1 urban nodes of Tier 1 urban nodes – see D3.3). Following this approach, WP4 carried out several workshops and involved a multitude of public and private urban nodes' stakeholders from across Europe.

The collected input from these workshops forms the source of information of the present document. We understand "validation" as a bottom-up process to approve and deepen the understanding of the challenges and needs of urban nodes. Thus, we enrich and deepen preliminary findings by adding complementary results on a broader basis than in Tier 1 and with an escalating involvement of stakeholders, thereby making the recommendations increasingly concrete and broad.

We would like to thank all the participating representatives of the nine nodes Antwerp, Bilbao, Cologne, Duisburg, Ljubljana, Piraeus, Tallinn, Sofia and Venlo for their active participation in our events of Tier 2 urban nodes as well as participants of the Urban Nodes Forum Conference and Civitas workshop, which forms the Tier 3 urban nodes. All delegates have been willing to engage in dialogue and discussions and to share valuable experiences and practices, which helped to improve our knowledge base which further steps and measures are needed for a better integration of the urban nodes in the TEN-T.

An essential finding of the interaction with urban nodes is that the challenges are even more complex and demanding than assumed. Although the experiences of the individual nodes differ significantly from each other, which is also a consequence of their function for the network, all the nodes explicitly pursue measures for better connectivity and interoperability. While planning measures for passenger transport are standard of daily planning, there is still a clear need for knowledge for solutions in freight transport. Vital Nodes has undoubtedly contributed to closing this gap.

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1 Importance of urban nodes development for the TEN-T

Transport provides vital functions to the European Union and their cities, enabling economic growth and access to jobs and services. Urban nodes[1] are crucial for the effectiveness of the core network of the TEN-T (Trans-European Transport Network), as they are the origin and/or destination of most long-distance transport flows[2]. They host major multimodal transport hubs and are crucial regarding the interfaces of long distance and last mile delivery. However, freight transport, spatial planning and urban mobility are still mainly conventional shaped worlds, which have not yet been integrated. With an increasing number of inhabitants in combination with ever-growing freight transport volumes, different problems arise in urban nodes, which call for an integrated and innovative approach.

Urban areas have become an integral part of the development of the TEN-T network, which is reflected in the concept of urban nodes. Annex II of the TEN-T Guidelines lists 88 urban nodes[3], which were identified based on socio-economic criteria, and have played a key role in structuring the TEN-T core network. These urban nodes ensure the connection between the different transport modes, as well as the connection between long-distance and regional, peri-urban and intra-urban freight transport and logistics. With core network corridors acquiring importance as socio-economic environments too[4], urban nodes play a key role as centres of socio-economic, spatial and technological development.

An effective integration of a node in the TEN-T core network corridors is complex. As each urban node has its own specific characteristics and issues, it would be too simplistic to assume that there is a one-size-fits-all solution. Different spatial scales, modalities, sectors and stakeholders are concerned, and all have to be taken into account when optimising the integration of solutions for accessibility and profitability of freight logistics on the one hand with vitality and liveability of urban areas becoming increasingly important on the other. As freight transport and urban logistics grow and innovate swiftly, and increasingly impact socio-economic development, as well as accessibility and spatial and environmental quality of urban regions, there is a need for deliberate, governmental involvement. In view of these developments, infrastructure planning, urban planning, and passenger and freight transport must become more integrated to effectively and sustainably incorporate urban nodes into TEN-T corridors[5]. To this end, actors within various fields, such as urban planners, infrastructure coordinators and operators, freight and logistic operators and financiers, need to collaborate early on in the planning

1 Definition ‘urban node’, EU 1315/2013, Article 3

2 COM 2011/0650 final, COD 2011/0294

3 See: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013R1315 Annex II List of Nodes and the Core Comprehensive Networks.

4 See, e.g.: DG Internal policies (2013), TEN-T Large Projects – investments and costs, Policy Department B, Structural and Cohesion Policies, Brussels. http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/495838/IPOL-TRAN_ET(2013)495838_EN.pdf; Dijkstra, L. (ed.) (2014), Sixth Report on economic, social and territorial cohesion, European Commission, Brussels. http://ec.europa.eu/regional_policy/sources/docoffic/official/reports/cohesion6/ 6cr_en.pdf; and See Balázs, P., L.J Brinkhorst, P. Cox, M. Grosch, K. Peijs, C. Trautmann, P. Wojciechowski (2016), TEN-T Corridors: Forerunners of a forward-looking European Transport System, Issue papers of European coordinators, 12 May 2016, Brussels.

5 See: Arts, J., T. Hanekamp & A. Dijkstra (2014), “Integrating land-use and transport infrastructure planning: towards adaptive and sustainable transport infrastructure”, *Proceedings 5th TRA Conference 14-17 April 2014 Paris*, IFSTARR, Paris.

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and decision-making process. This allows for a more integrated perspective at investments in mobility, infrastructure, passenger transport and freight logistics from (inter)national (corridor), regional and local perspectives.

This means that there is need for a combination of TEN-T related goals and the objectives of sustainable urban mobility plans (SUMPs)[6], as promoted by the Commission in the 2013 Urban Mobility Package (UMP)[7]. Within this framework, these goals open the perspective for forward-looking practices and integrated approaches, which both enhance transport solutions and stimulate synergies with other urban functions[8]. Regarding the complexity of the challenges there is no 'silver bullet'. A focus on innovative technical solutions and methods will not be enough. There is need for an integrated approach that connects the world of infrastructure, mobility, freight, and logistics with the world of urban and spatial development. An approach in which there is attention for soft innovations, addressing the multiplicity of the challenges by integrating different spatial scales, sectors, modalities, stakeholders and multi-level governance. This need for integration is acknowledged by key stakeholders such as National and Regional Infrastructure Authorities[9], DG MOVE[10], as well as the Coordinators of the TEN-T corridors, who stress the importance of integrated strategies, platforms for exchanging experiences and a multi-level governance approach.

Besides the above-mentioned challenges, the urban nodes cope with a variety of challenges (see also Deliverables 2.3 and 3.3), such as: Increasing congestion and costs,[11] intensifying climate change impact,[12] growing health impact related to poor air quality,[13] higher number of road accidents,[14] as well as inefficient use of space[15].

6 See: http://www.eltis.org/mobility-plans/sump-concept

7 See: https://ec.europa.eu/transport/sites/transport/files/themes/urban/urban_mobility/doc/apum_state_of_play.pdf, and https://ec.europa.eu/transport/sites/transport/files/themes/urban/urban_mobility/doc/2009_urban_mobility_leaflet_en.pdf

8 See Balázs, P., L.J Brinkhorst, P. Cox, M. Grosch, K. Peijs, C. Trautmann, P. Wojciechowski (2016), TEN-T Corridors: Forerunners of a forward-looking European Transport System, Issue papers of European coordinators, 12 May 2016, Brussels

9 Covering the relevant modes of transport.

10 See presentations of S. Phillips (SG CEDR), L. Erixon DG Trafiverket - SE), J.H. Dronkers (DG Rijkswaterstaat, NL) and D. Rosca (DG MOVE) given at the EU Conference on "Networking for Urban Vitality, An integrated approach on Infrastructure and Spatial Planning", EU Symposium – organized as part of the Netherlands' EU-Presidency – 23 June 2016, Amsterdam – www.nuvit.eu

11 COM (2011) 144 final, 13 Increase of 50% of costs by congestion in 2050

12 See: https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1509035065.pdf

13 COM (2011) 144 final, 30 Urban transport is responsible for 25% of CO2 emissions.

14 COM (2011) 144 final, 30 69% of all road accidents occur in cities.

15 See: https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1509035065.pdf

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2 Aim and outreach of Vital Nodes

The Vital Nodes project contributes to more effective and sustainable integration of urban nodes into TEN-T corridors[16] by innovative solutions for optimising accessibility, liveability and vitality, and to create equal emphasis on corridors and nodes.

Against the above-mentioned challenges, objectives of the Vital Nodes project have been defined, which are two-fold:

1. To deliver validated recommendations for a more effective and sustainable integration of all 88 urban nodes into the TEN-T corridors, focusing on freight logistics;
2. To establish a long-lasting European expert network, based on existing (inter)national and regional networks for safeguarding long-term continuity in knowledge and implementation.

In relation to the first objective, the Vital Nodes project will contribute with evidence-based recommendations for the further implementation and deployment of innovative approaches. These recommendations address a more (cost-) efficient and sustainable integration of long-distance and last-mile freight delivery and logistics in urban areas, also considering passenger transport flows. Vital Nodes will collect best practices, experiences and opportunities, as well as deploying novel combinations of existing technologies and services.

The goal of WP4 (*Facilitate wide-scale deployment of innovative solutions covering all 88 nodes*) is to reach out to all urban nodes and to initiate a bottom-up and a discussion process among urban nodes representatives. This dialogue aims to push sustainable freight transport planning in urban nodes higher up on the agenda by acknowledging the multiple challenges and the specific and complex environment. There is a need for trade and international goods transport in Europe, but European policy also pursues ambitious climate goals[17], and considers healthy and liveable cities important[18]. Freight transport flow is predicted to increase on every level of the TEN-T – on the local, regional, national and corridor scale. At the same time, freight is a highly competitive environment and public policy has difficulties of addressing this area effectively. Therefore, it is urgent to better integrate urban nodes into planning for sustainable freight transport and to raise awareness about the prominent role of urban nodes on all levels – as well as encouraging urban node stakeholders to become more proactive.

WP4 reached out to planners in urban nodes, infrastructure coordinators and operators, freight and logistics operators, or funding specialists in mobility, infrastructure, passenger transport, freight and logistics to discuss local challenges, projects, ideas and specifically the needs in the urban nodes. In dedicated workshops WP4 had the task to initiate discussions and to facilitate networking among all urban nodes of the TEN-T following a stepwise-approach.

[16] Since 2013, the European Union's trans-European transport network policy disposes of core network corridors – an instrument that combines the benefits of a coherent infrastructure development across national borders and transport modes, of a future-oriented transport policy and of a strong governance structure with each other
[17] Commission communication on a policy framework for climate and energy from 2020 to 2030 - COM(2014) 0015
[18] European Commission (2013): Together towards competitive and resource-efficient urban mobility / Urban Mobility Package.

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The WP4 exchange process was (1) foremost used to receive qualified feedback on challenges and needs and to provide the European Commission with feedback on TEN-T and CEF-guidelines as well as funding and innovation needs. (2) Outreach activities were also used to contribute to the creation of a bottom-up network of practitioners and experts on the topic of sustainable freight planning on the local, regional, national and TEN-T scale. Another target (3) was to improve knowledge and evidence by collecting data and information from urban nodes on challenges and visions, ideas, strategies and solutions and their impact. Thus, WP4 was also supposed to contribute to the WP3 Vital Nodes toolbox[19]. The deliverable is a further development of D4.2 (*Validated recommendations of Tier 2 groups of urban nodes*), which showed intermediate results after a first phase of interaction with the urban nodes. These results were complemented by further stakeholder dialogues, primarily with the Tier 3 urban nodes group. In this respect, this report provides a comprehensive overview of the results of this dialogue process.

3 Validation concept and structure of this deliverable

This deliverable contributes to the first of the two above-mentioned Vital Nodes objectives by supporting the development of recommendations addressed to the European Commission on how to stimulate the sustainable integration of urban nodes in TEN-T and how to increase the effectiveness of the core network of the TEN-T.

The deliverable presents the overall result of Work Package (WP) 4 (*Facilitate wide-scale deployment of innovative solutions covering all 88 nodes*) and provides input for WP 5 (*Validated recommendations on integrating nodes and corridors, on funding needs and instruments, and on future research needs*), which aims to provide validated recommendations on integrating nodes and corridors, on funding needs and instruments, and on future research needs.

We understand “validation” as a bottom-up process to approve and deepen the understanding of the challenges and needs of urban nodes. Thus, we enrich and deepen preliminary findings by adding complementary results on a broader basis than in Tier 1 and with an escalating involvement of stakeholders, thereby making the recommendations increasingly concrete and broad.

Even though WP4 workshops have tried to involve a wide range of stakeholders the description of the specific situation and needs of an urban node inevitably remains selective as performance and planning of an urban node is influenced by a great variety of stakeholders, of whom only a sub-set could get involved.

[19] D3.5 (Final VitalNodes Toolbox, based upon experiences gained with Tiers 1, 2 and 3) (based on D3.4 (Preliminary VitalNodes Toolbox, based upon experiences gained with the pilot case Vienna)) will add appraised good practices from Tier 2 and Tier 3 as well as the validated finger prints from Tier 2. This validation has not yet carried out.

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A further methodological caveat should be raised about the context of Tier 2 an Tier 3 interaction in WP4: While in-depth communication with Tier 1 urban nodes was organized in intensive specialized workshops, WP4 has planned to involve a much higher number of stakeholders, contributions of Tier 2 and Tier 3 urban nodes, therefore, are provided in a different format. Additionally, the group of Tier 2 and Tier 3 urban nodes is more diverse in experience and awareness than Tier 1 urban nodes, which were selected on the basis of both high expertise and awareness.

In all workshops, we followed an explorative and user-driven bottom-up approach using Tier 1 urban nodes workshops as an orientation for the feedback and dialogue process with urban nodes. The guiding question was which challenges are perceived by the urban nodes and which needs are identified by them for further nodal development.

The structure of this deliverable is as follows: We present the Vital Nodes transferability concept (*D4.1 Vital Nodes transferability, outreach and node-integration strategy. Knowledge exchange concept, operational cooperation and integration plans*) and our rationale for adopting it during the course of our work in WP4. The background for this adaptation and its implementation is explained. Then final validation results are presented on the basis of identified topics.

3.1 Transferability concept

Vital Nodes follows a gradual theoretical outreach approach (see Figure 1). The project´s stepwise deployment began with a pilot case in Vienna, which has served as test bed. Then, the procedure was further tested and fine-tuned through its application on eight advanced urban nodes (Tier 1[20]). After the experiences with individual urban nodes in Tier 1 (1+8 urban nodes), the application should be extended to a total of 18 urban nodes (Tier 2) and finally to cover all 88 Urban Nodes of the Core Network (Tier 3).

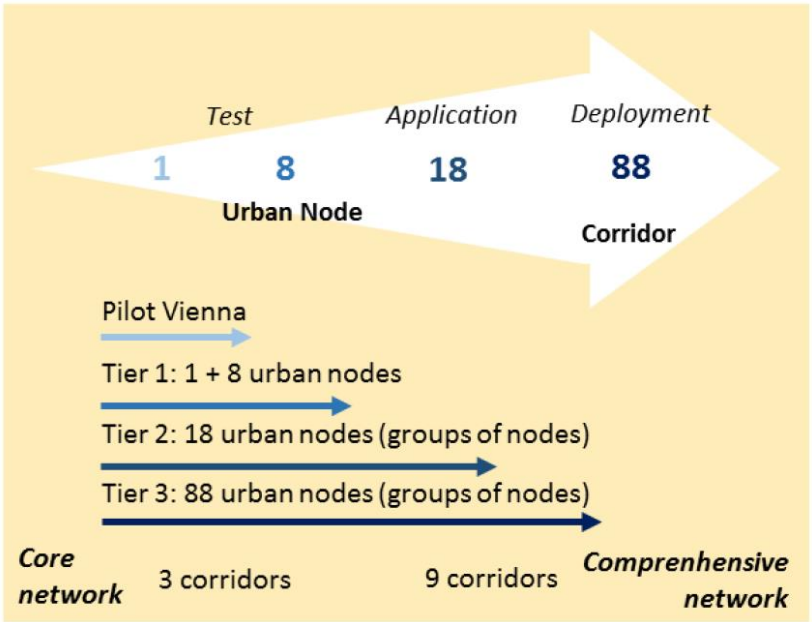

Figure 1: Vital Nodes' Stepwise deployment approach

[20] Vienna, Rotterdam, Gothenburg, Budapest, Hamburg, Genoa, Turku, Strasbourg, Mannheim.

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On that basis nine urban nodes were selected for Tier 2. This list of nine nodes has been approved by the Project Officer (PO)[21].

The aim in the selection of Tier 2 was to ensure sufficient variation of urban nodes in terms of context conditions and, therefore, challenges and needs. Besides a geographical coverage and the representativeness of urban nodes located in cohesion countries, also urban nodes profile variables have determined the selection.[22] To this end WP2 formulated pre-defined criteria which reflect the relevance of the solutions for specific types of nodes.[23] These criteria were applied to Tier 1 nodes and were also proposed for Tier 2 nodes. This typology was supposed to help identify and cluster challenges and potential solutions as well to group urban nodes for workshops.

The seven criteria are:

1. Cross border function: Is it a cross border node, is it multi-modal or uni-modal.
2. Sea port: Sea port node and gateway or a regional hub.
3. Inland function: The node is inland, small or big (threshold is 1 million inhabitants or more).
4. Relation of the node (logistics FUA) and the Corridor: inbound focused on local consumption versus outbound focused on production and transit of goods.
5. The node is located in a developed or in a cohesion region.
6. The node is centric or poly-centric.
7. The node serves multiple or only one urban area.

The operational concept for Tier 2 foresaw to carry out three workshops consisting of two to three urban nodes and for Tier 3 to build seven groups à 10 nodes This was planned to be preceded by a grouping process of clustering the selected urban nodes according to the seven criteria above. In addition, the specific interests of the urban nodes in the grouping needed to be considered. For the purposes of interest analysis and pre-grouping, bilateral dialogues with the selected urban nodes were established, a webinar and an online survey were conducted. In addition, practical considerations had to be evaluated regarding the time resources and availability of the stakeholders. The original planning also stipulated that all Tier 2 workshops should take place in one of the selected urban nodes and thus assume the role of hosts.

As a reaction to a variety of obstacles in the engagement process of a first group of Tier 2 urban nodes. has led to an adjusted approach. Despite an intensive communication with node representatives, the interest in the planned engagement activities and the grouping process was unsatisfactory: (1) Three of the twelve selected urban nodes were not responsive, despite repeated contact attempts, two urban nodes declined immediately.[24] (2) The attempt of grouping nodes according to the seven criteria as a means of identifying workshop topics was seen critically by the contacted nodes representatives, and (3)

[21] Copenhagen, Antwerp, Tallinn, Bratislava, Valencia, Sofia, Gdansk/Gdynia, Piraeus, Duisburg/Venlo
[22] On request of the PO also two nodes (Venlo and Duisburg) of the comprehensive network have been taken up in the list. Due to the strong regional relation the two nodal nodes could be seen as one test case.
[23] See for more details on the urban node typology D2.3 Synthesis document for nodes 1 + 8 including grouping of solutions.
[24] It was agreed with the consortium to start contacting two urban nodes from the reserve list. Both urban nodes were not-responsive.

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interest in hosting larger workshops was generally low, despite the support and financial contributions from Vital Nodes[25].

We have identified several obstacles that made it difficult to follow through our initial engagement concept. However, these points also indicate structural issues that need to be borne in mind in future engagement and networking activities of urban nodes in Europe:

(1) Urban nodes represent a very high diversity in awareness of TEN-T. This is much higher in Tier 2 nodes than in Tier 1 and will be even higher in tier 3. Our main contact persons are working in urban planning or transport planning departments, who (exceptionally) may have a high level of awareness about the role of their node as one of the 88 TEN-T nodes, and, consequently, very different awareness of the potential added value of getting engaged in the Vital Nodes project. For those (few) highly experienced nodes, the added value of Vital Nodes is limited, because they have more specialised and advanced means of networking already available. The majority of contacted urban nodes representatives, however, has a rather limited awareness of the strategic need of EU-level engagement. Both, high and low level of awareness lead to reluctance, or difficult to fulfil expectations towards an engagement in Vital Nodes.

(2) The institutional readiness in many nodes must be considered as weak, making it difficult to identify the key stakeholders, get consolidated responses on key questions, or good practice solutions. In most of the nodes there are explicit and clear responsibilities for nodal development. This then contributes to problem of authorization within a hierarchical administration structure. In some governance systems, the 'urban node' concept is also considered more as a national than a local issue.

(3) Freight transport poses a specific difficulty, as there is a often low level of (regulatory) competence – despite a widely felt high problem pressure. Freight transport and logistics are problematic areas of public policy making by many urban node representatives that we were in contact with. The concept of integrating planning for freight transport and urban and passenger mobility is not prevalent even though it is considered an important planning topic.

In addition, it should be noted that the distinction between Tier 2 and Tier 3 urban nodes was not relevant in terms of content but only in terms of practical considerations. While there is still a clear difference between Tier 1 urban nodes and the other urban nodes in terms of functionality, awareness and strategies, this is not significant between Tier 2 and Tier 3. Some urban nodes could not participate in the Tier 1 or Tier 2 process for reasons of time and capacity despite their principle appropriateness.

[25] This has led to delays in timing, unsatisfactory recruitment of nodes representatives and hosts - despite high efforts in WP4.

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4 The validation processes

In this section, the outreach process with Tier 2 and Tier 3 urban nodes is described. Vital Nodes developed a transferability concept (*D4.1 Vital Nodes transferability, outreach and node-integration strategy*). Based on first interaction with Tier 2 urban nodes and lessons learnt, the concept has been adapted to improve effectiveness of the outreach and to increase the involvement of Tier 2 urban nodes representatives[26]. The validation process with Tier 3 urban nodes was carried out based on the enhanced knowledge on challenges and needs of urban nodes and result in D4.3 (Validated Recommendations for Tier 3 groups of urban nodes).

4.1 Outreach concept

To fulfil Vital Nodes' project obligations of reaching out to Tier 2 and Tier 3 urban nodes within a very limited time period, we developed a flexible approach for recruiting node representatives, for the workshop approach and workshop topic selection. WP4 applied flexibility towards more mixed meeting formats (more in line with urban node expectations and local needs) and to set aside the pre-defined grouping process on the basis of the seven analytical criteria.

The theoretical criteria-based grouping approach was helpful as an analytical grid but not necessarily practicable. It was more effective to first disregard the grouping process and follow practical considerations, and then structure workshops' agenda and breakout sessions accordingly. It had also become clear that relevant topics (in stakeholders' view) should be offered for better communication. Nevertheless, for some urban nodes it might be helpful to have a bilateral interaction to facilitate the dialogue process among local and regional stakeholders first before to participate in a group process. Other urban nodes have, again, very precise expectations which nodes they would like to exchange with and saw this as a basic requirement for general participation.

In all workshops, we have followed an explorative and user-driven approach. We used the preliminary recommendations (from WP5) as a general structure and orientation for the investigation to identify the principle needs for further node development. At all events Vital Nodes was presented as well as the intermediate results of the project analyses. This concerns in particular the results from the Tier 1 workshops as well as the compilation and evaluation of the solutions in the Tier 1 urban nodes. The aim was to set the basis for a long-term interest in the 'urban node' approach and TEN-T generally, to understand concerns/ needs and to a trigger creative exchange process among stakeholders. Urban nodes stakeholders were always encouraged to present their own strategies and solutions. This successfully created a good basis for discussions about needs for a more efficient nodal development. To facilitate discussions, urban nodes fingerprints that had been prepared for the nodes in the Venlo workshop were used throughout the discussion process.[27]

The diversity of the urban nodes was even higher than expected. Differences in thematic interests and specific planning competencies are more striking than expected. The need for further development and

[26] The background for this adaptation and its implementation is presented here, as this represents an additional result that needs to be considered in urban nodes involvement.
[27] The concept of the fingerprint is fully described in D2.1 Appraisal methodology and guidelines on its application for workshops (as integrated part of the methodology).

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the existence of good examples also depends on this. Nodes with less experience have a greater need for good examples and policies. It was also interesting to note that nodes on the comprehensive network can play an equal role as a core network node, when they have, for example, a higher relevance than an urban node situated on the core network. In this respect, it was highly beneficial to involve nodes of the comprehensive network also into the engagement process.

Table 1: Activities and procedures of the validation process

Action	Involved parties	Period
Drafting of the transferability concept (D4.1)	Rupprecht Consult & WP2, WP3 & WP5 Vital Nodes experts	**M6-7**
Webinar for Tier 2 urban nodes	Urban Nodes: Antwerp, Venlo, Duisburg, Sofia, Bilbao; WP5, WP3 & WP2 Vital Nodes experts	**M11**
Bilateral contacts with Tier 2 urban nodes representatives	Tier 2 urban nodes, Rupprecht Consult	**M8-M14**
Online survey with Tier 2 urban nodes about challenges and solutions and preferred grouping	Tier 2 urban nodes, Rupprecht Consult	**M12-M13**
Discussion on status of outreach concept at GA	Vital Nodes consortium	**M13**
Project meeting in Utrecht about adjustment of outreach concept	Rupprecht Consult & WP2, WP3 & WP5 Vital Nodes experts	**M14**
Workshop with Tier 2 urban node Sofia	Rupprecht Consult; Sofia urban nodes representatives	**M15**
Workshop with Tier 2 node Duisburg	Rupprecht Consult, Duisburg node representatives	**M16**
Workshop with seven Tier 2 urban nodes in Venlo	Urban Nodes: Antwerp, Venlo, Cologne, Sofia, Piraeus, Bilboa, Tallinn; WP4, WP3, WP2 & WP1 Vital Nodes experts	**M16**
Workshop with Tier 2 urban node Ljubljana	Rupprecht Consult, Eurovienna, Ljubljana node representatives	**M16**
Workshop with Tier 2 urban node Gdynia	Rupprecht Consult, Eurovienna, RWS	**M17**
Nine thematical workshops at the Urban Nodes Forum Conference in Budapest	Rupprecht Consult, Polis, Eurocities[28]	**M18**
Consolidation workshop in Cologne	Rupprecht Consult, EGTC, Eurocities, Polis[29]	**M19**
Civitas site visit & workshop Liveability aspects in freight transport planning in Budapest	Rupprecht Consult, Eurocities, Representatives from Budapest, Warsaw and Antwerp	**M20**

In the workshops we have tried to create a structured and open, trustful working atmosphere, which has allowed everyone to speak freely and openly on their local conditions, especially their challenges. All meetings with the urban nodes' representatives took place in a highly concentrated and motivated atmosphere, which is also due to the very good preparation and contribution of all involved consortium partners. All discussions and dialogues of the workshops were thoroughly documented. These results

[28] Partners responsible for the organisation of the urban nodes forum conferene. All other Vital Nodes partners participated as well as representatives from 23 urban nodes and other stakeholders.
[29] Remote participation from RWS and Traffikverket; comments received from Ecorys and Eurovienna.

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have been categorized and thematically clustered. Within these clusters, stated challenges and needs of urban nodes are highlighted and tentative consequences for action have been formulated.

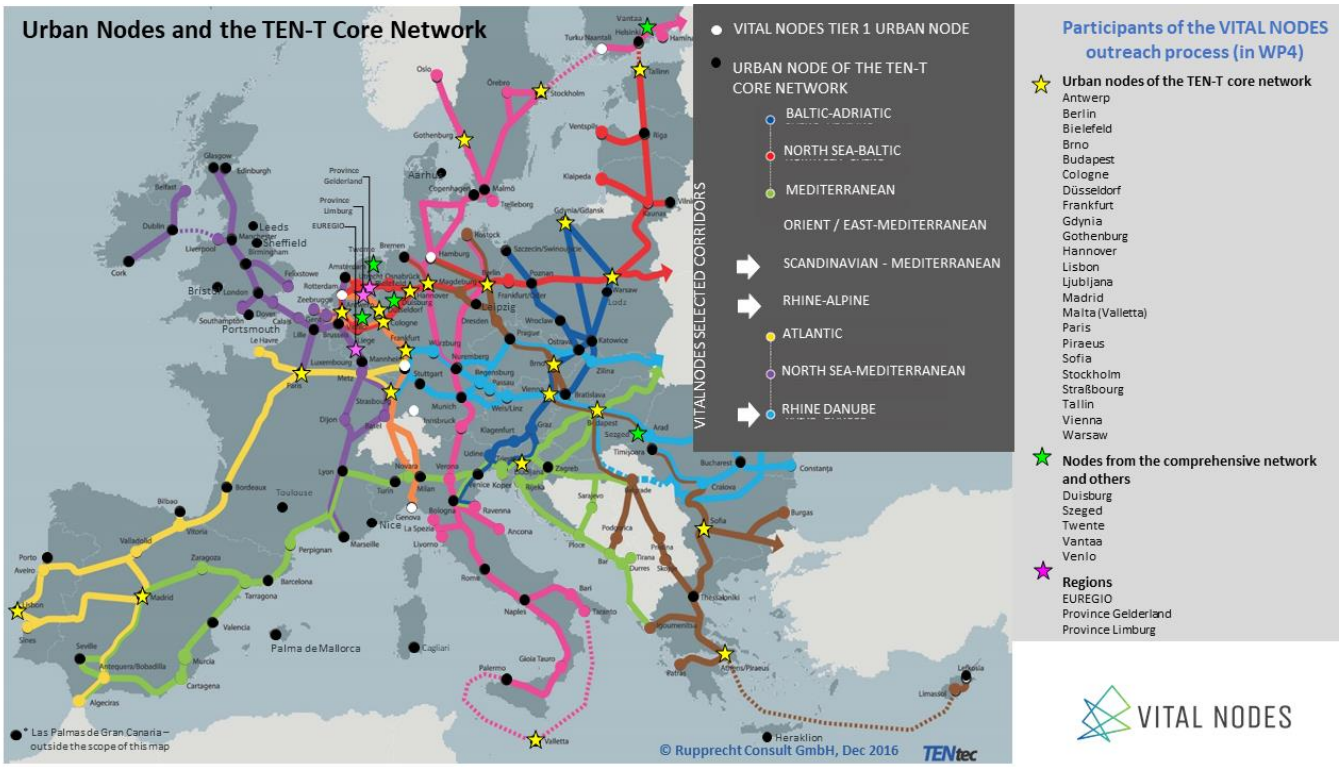
Tier 2 urban nodes engagement process

We organised Tier 2 urban nodes' outreach activities as bilateral workshops, as well as group workshops 'by-invitation-only'. Workshop topics were chosen on the basis of the specific feedback we received from intensive bilateral exchanges with urban nodes representatives, in order to focus on topics that are perceived to be relevant for a wide range of stakeholders. We also more strongly considered the integration of the passenger transport perspective whenever applicable, even if our focus remains on freight transport and logistics. A strong focus was also set to identify specific topics for future activities beyond Vital Nodes.

The required nine (Tier 2) urban nodes were successfully integrated into the outreach process. Although there are deviations from the originally pursued list of urban nodes, all nodes involved contributed intensively to the dialogue. So far, one large workshop (in Venlo at the beginning of February) and three workshops each in the urban nodes (Sofia, Duisburg, Ljubljana) have been carried out very successfully. The different steps of the validation process including the workshops is presented in **Fehler! Verweisquelle konnte nicht gefunden werden.**. Overall, 50 urban nodes representatives have been involved personally in the face-face Tier 2 urban nodes outreach process.

The following figure shows the result of the engagement process with Tier 2 and Tier 3 urban nodes.

Figure 2: Nodes of the Tier 2 and Tier 3 engagement process



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Tier 3 urban nodes engagement process

For the engagement process of the Tier 3 urban nodes a central event the Urban Nodes Forum Conference was conceived. On the basis of the exchange of experiences with the Tier 2 urban nodes, topics for nine workshops were identified. A detailed reporting template was developed for these (see Annex). The workshops were each supported by a moderator and note taker.

In fact, after the Urban Nodes Forum Conference, there was a wealth of information available. These results were complemented and processed by those of the events with the Tier 2 urban nodes. In a Vital Nodes internal workshop, topics were clustered and condensed using an analytical hermeneutic approach. Thus, a list of eight recommendations how to integrate urban nodes into the TEN-T have been generated.

Box 1: List of eight recommendations how to integrate urban nodes better into the TEN-T

1. Improve freight efficiency and quality of life
2. Coordinate on the corridor-level and involve urban nodes actively
3. Stimulate multi-level governance across borders
4. Support the creation of data platforms and promote data (including knowledge) exchange between stakeholders and urban nodes
5. Facilitate governance in urban nodes
6. Involve urban nodes by using established networks
7. Develop indicators and methodologies to identify investment needs in urban nodes and to assess function and performance
8. Align international trade development with European, national and local policy requirements

Furthermore, characteristics for an ideal (Vital) urban node have been suggested. These criteria can be used as a reference and as a comparison to the current status.

Box 2: Characteristics of a Vital Node

An ideal Vital Node,

1. includes the Functional Urban Area (FUA)
2. is both origin and destination of goods & passengers and a place where people live.
3. reconciles the TEN-T network function with a multiplicity of local functions (“is both an urban area and a node").
4. its stakeholders have a high awareness of being an urban node and of its connectedness.
5. uses adequate planning instruments which cover freight and passenger movements (SUMP).
6. has defined smart objectives which are monitored.
7. uses good multi-stakeholder governance within (including private sector).
8. is an interface of goods and services,
9. is an innovation centre,
10. uses different funding streams.

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In the following, the results of the interaction process with the stakeholders of Tier 2 and Tier 3 and other experts are outlined. These are presented along the eight identified topics. To visualize the challenges and strategies, the boxes show numerous examples from the consulted urban nodes. This also shows how intensively some nodes already address the issue and pursue targeted solutions for transport problems at the regional level (in freight transport), which can serve as example for other urban nodes or can be taken-up by TENT corridors as a general strategy.

The last chapter focusses on next steps and the further validation in in-depth thematical workshops and validation workshops in the framework of WP5.

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5 Results of the validation process towards innovation, funding and regulation needs

Urban areas are key elements of the TEN-T network and must respond to growing mobility needs and increasing freight transport by implementing new logistic concepts, ensuring transport modes' seamless interconnection and accommodate spatial-economic growth and urban expansion (housing, working, recreation, facilities). Freight delivery across and within the nodes and its hinterland into the last-mile is an important part of the overall value-chain and efficient organisation and management is crucial for urban vitality regarding social, economic and environmental quality of life. At the same time urban areas need to tackle also social and environmental issues, such as urban/peri-urban congestion, poor air quality, noise exposure, and road safety. All of this is key to ensuring a more sustainable development of Europe's urban areas and, at the same time, ensure that urban areas properly support the completion, implementation and intelligent use of the European transport network[30].

Eight topics have been identified within the validation and consultation process with urban nodes stakeholders, which are presented in the following. First, the initial situation and the resulting challenges are described, and approaches to solutions, strategies and practices are presented. The aim is to get a better understanding of which topics the EU and its TEN-T policy has to take up and develop for the integration of urban nodes to guarantee a high functionality of the TEN-T but also in times of increasing traffic flows to improve the resilience of the corridors and the reliability of the network as a whole.

5.1 Improve freight efficiency and quality of life in urban nodes

As a first objective of TEN-T policy and funding, improving freight efficiency means to support urban nodes in one of their main functions as interfaces between long-distance transport and local redistribution of goods. A second objective should be to improve the quality of life in urban nodes to mitigate the negative effects of freight traffic.

First, the objective to improve freight efficiency responds to a range of problems caused by increasing freight traffic in urban nodes. Raising numbers of freight unities on road, rail and water as through-traffic or first and last mile traffic induce bottlenecks in several ways. Thus, urban nodes need to mitigate a range of negative effects coming from freight transport. Especially in nodes with high volumes of freight flows, the emergence of logistic hubs has led to additional traffic. More often than not, freight flows cross urban centres and residential neighbourhoods, lead to congestion and high emission of air pollutants or noise. As well, interfacial capacities between long-distance and local redistribution in the nodes are often not sufficient. Major logistic hubs bring disadvantages, such as a high surface consumption, compared to a relatively low quantity of jobs provided by the freight sector. When particularly highly functioning, urban nodes do not have enough resources to make up for these disadvantages, especially from the health and urban mobility point of view. Urban nodes that are connected to ports could be particularly affected, because the emergence of logistic hubs has led to additional traffic.

[30] See: Arts, J., T. Hanekamp, R. Linssen & J. Snippe (2016), "Benchmarking Integrated Infrastructure Planning Across Europe – Moving Forward to Vital Infrastructure Networks and Urban Regions", Transportation Research Procedia, Vol.14 (2016), pp. 303-312.

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"All transport modes cross the city, and all freight goes through the city. There is a big need for infrastructure measures to address bottlenecks, especially in view of increasing freight volumes."

"Freight trucks enter the city-centre, there are bottlenecks of 4 km on the way to the port."

"The two last miles between the highway and the port are the real problem because freight transport crosses the city and residential areas. Here, we have a high stress level. As well, the connection to the supra-regional network is problematic."

The second objective, improve quality of life in urban nodes, is a reaction to growing awareness for health impacts coming from traffic. It leads to citizen protests in urban nodes and can cause considerable delay of infrastructure projects when citizen participation and liveability have not been part of integrated project planning and strategies and need to be caught up on. For this reason, it becomes crucial to take citizen concerns about their quality of life seriously and integrate them from the start into project planning while making liveability aspects a main objective of integrated projects.

These above described bottlenecks are multi-dimensional: they are produced by and also affect economic, infrastructural, spatial and governance factors. They can not to be solved by separate infrastructure measures, because they do not only represent infrastructural obstacles, but are also reinforced by economic and institutional weaknesses and instabilities, geopolitical challenges or silo-sectoral policy approaches. In their complexity, and in order to ease freight transport and to make it more sustainable, these bottlenecks demand for integrated solutions on the local, regional and transnational level[31].

To mitigate secondary effects of freight traffic, three strategies are recommended to be applied in urban nodes. They can be separated into integrated (1) spatial planning, (2) optimisation of the local network capacity, and (3) modal shift.

5.1.1 Integrated spatial planning for infrastructure development

Infrastructure development can be a catalyst for spatial planning, when stakeholders are included, and win-win situations are identified early on in the process. Integrated spatial planning for infrastructure development ideally brings together all stakeholder dimensions that potentially decrease emissions in the freight sector and creates at the same time local understanding and partnerships. A range of aspects are important for successful development and implementation.

- First, a good communication with citizens and co-creation from the start can increase the quality of life in urban nodes, while also improving interfaces between long-distance and local transport.
- Second, integrating the freight dimension into sustainable urban mobility/logistics planning (SUMP/SULP) is a great way to plan for freight on the urban nodes level, while considering a different functionality of the surrounding areas (FUA).
- Third, access-restrictions are a way to relief city-centres from heavy freight transport but need to be harmonized between urban nodes.

Engaging citizens and stakeholders for liveable urban nodes

Integrating the needs and expectations of citizens into infrastructure planning is becoming increasingly important, because dialogue is an essential tool to overcome community resistance, as shown by the

[31] Peric, A.: Presentation at Urban Nodes Forum, Budapest (04.04.2019)

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example of the Antwerp ring road. The challenge here was that growing awareness of citizens raised more needs and expectations than previously considered. Dialogue is in this context an essential tool to overcome community resistance by integrating residents' perspectives into the planning process. It is also an example for the urgent need for good communication, cooperative planning and institutional coordination in infrastructure development in urban nodes.

Box 3: Intensive mediation for a huge infrastructure project, the Antwerp ring road

Antwerp as the biggest city in Flanders locates the 2nd biggest port in Europe, and is an important cross-road between Ghent, Brussels, Limburg/Eindhoven and the port Bergen Op Zoom in the Netherlands. In 2000, a masterplan was approved with a multimodal plan for Antwerp including road, waterways and public transport and the construction of a major ring-road. However, the quality of live (leefbaarheid) of residents affected by the ring road, was not considered in the planning process. Citizen concerns about air quality and health became louder, and in 2009, 59% of 135.000 participating citizens voted in a referendum against the construction of the ring road. Consequently, in 2010, the government decided to build a tunnel instead of a bridge, imposing several conditions: that the current trajectory will be kept, but the bridge will be replaced by tunnels and open trenches, that costs didn't change and that it would not cause more delays. The east tangentials (a part of the old "outer" ring) would be built, and there would be no separation of traffic flows on the ring. As a reaction, different citizen initiatives appeared with different demands on health and environmental impacts, and in 2015, the city of Antwerp launched the call for a curator of the ring road, with the mission to study the feasibility of covering the whole ring-road, while ensuring participation and co-creation of stakeholders and residents. Goal of the process was to document ambitions in 2016, and the organisation of a competition for pilot projects in 2017. Success factor was to select an independant 'curator' with planning experience and sufficient capacity to organise high-quality workshops, and to engage in a real and broad dialogue with gradual cooperation gaining trust. Positive effects of this broad participation process are that 'capping' of the ring allows for housing to be created by the private market, and job creation by the construction works. Lessons from this process for infrastructure development on the TEN-T are that a process approach is more feasible than a project-approach, creating trust by remaining open towards the needs of residents and by focusing on the community rather than on the institutions. More information on this interesting process and the applied 'research-by-design' methodology can be found in the VitalNodes Toolbox (D.3.5)[32].

There are a lot of innovative measures to get citizens on board and to include their perspectives in infrastructure development projects, such as the 'research by design' method applied in North-South Limburg.

Box 4: 'Research-by-design' in North-South Limburg

In North-South Limburg, participative methods such as local storytelling and co-creation were used to apply the 'research by design' methodology for the revitalisation of the north-south connection between Hasselt and Eindhoven. Growing traffic intensity in both passenger and freight (> 45,000 p / day) and the limited capacity of the street made an intervention necessary. The so-called 'NZ' (for North-South) as part of the TEN-T should as well be appropriately designed to connect and guide the economic potential of the region. Introducing ecological sustainability of the urban environment, liveability, economic progress, accessibility and safety as planning objectives into the revitalisation process changed the approach and perception of the planning process. A week for co-creation with manifold different stakeholders brought important information and perspectives into the project. The applied integrated design approach reduced the gap between policy implementation and realisation and visualize a strategic approach. The 'research-by-design' method is part of the VitalNodes Toolbox (D.3.5), where it is explained in detail[33].

[32] Van der Linden, K., Linssen, R. (2019): VitalNodes Final Toolbox (Mark 2) – based upon experiences gained with Tiers 1,2 and 3.
[33] Van der Linden, K., Linssen, R. (2019): VitalNodes Final Toolbox (Mark 2) – based upon experiences gained with Tiers 1,2 and 3.

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Working jointly with institutional partners in the context of SUMP

The Sustainable Urban Mobility Plan (SUMP) has become a mainstream tool in many European cities, because it offers guidance how to include stakeholders and their interests into a strategic plan for sustainable mobility.

> *"A Sustainable Urban Mobility Plan (SUMP) is a strategic planning instrument for local authorities, fostering the balanced development and integration of all transport modes while encouraging a shift towards more sustainable modes. It aims to solve urban transport problems and contribute to reaching local and higher-level objectives for environmental, social and economic development."*[34]

To adapt the tool to freight in urban nodes, the challenge is to (1) develop a freight perspective, which is still underrepresented in many SUMP's, (2) to include the Functional Urban Area (FUA) into existing or newly developed plans, and (3) to link these activities in concept with long-distance freight transport on the TEN-T corridors.

(1) It is important to make the freight dimension more acceptable in planning and communication and to apply SUMP principles to freight transport. Freight transport and land consumption by logistics are largely driven by private companies, and data on origin and destination, loading, multimodal travel, standardised freight movement, traffic distribution are usually not available. This makes it difficult to plan for freight, and there is also a missing awareness in urban nodes that SUMP's can be used for infrastructure and freight planning. The Sustainable Urban Logistics Plan (SULP) is a derivative of the SUMP, applying a freight perspective to the eight SUMP planning principles[35].

Box 5: SUMP and SULP in Sofia

The municipality of Sofia has developed a SUMP and is at present developing a SULP. For the first time, the city searched the dialogue with stakeholders and citizens, which resulted in a city-wide open policy dialogue process on urban mobility. The identified key problems concerning freight are: a fragmented approach to the problem, lack of data and comprehensive research on the state of urban logistics and a lack of strategy to improve the situation. The developed measures in Sofia include an automated process for requesting and issuing license for entry into the city centre and Zone 1 for heavy goods vehicles, the collection of data for the commercial traffic, and a system for controlling the entry of heavy goods vehicles into the city centre and Zone 1.

(2) The SUMP should also integrate the Functional Urban Area (FUA) of an urban node, and not only its daily urban system. A FUA from a freight perspective does not necessarily comply with the passenger transport perspective that is usually adopted. Thus, its definition can be different when analysed in terms of freight, because freight adds complexity and more functionality to the FUA. This means, e.g., to include the first and last mile into the FUA, the position of terminals, commuter flows and spatial development requirements with regard to freight.

[34] Eltis (2016): Institutional cooperation. Working jointly with institutional partners in the context of Sustainable Urban Mobility Plans. European Commission/DG Move. Brussels.
[35] Eltis (2019): Develop and implement a Sustainable Urban Logistics Plan (SULP). European Commission/DG Move. Brussels.

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Box 6: A regional SUMP in the metropolitan region of Ljubljana

In the metropolitan region of Ljubljana, 26 municipalities have agreed to work on a regional voluntary SUMP, which is a major improvement of regional cooperation in Slovenia. The municipalities agreed to work together with a focus on sustainable urban mobility for different modes – such as cycling, walking and public transport, and also developed a perspective on freight. One of the major problems identified in the process is the bad infrastructural condition of the national railway system. Better communication and cooperation with the national level to improve the railway infrastructure is one important condition to better connect Ljubljana to its hinterland.

Box 7: Growth zone in Vantaa

A good example for a successful dialogue in a FUA with altogether 15 cities is the 'growth zone' in Vantaa, in the Helsinki region which is experiencing population growth. A common objective of carbon neutrality for the capital region by 2030 was introduced by a regional agreement on land-use, housing and mobility, and financed by the national state and the municipalities, as well as by a Master Plan 2020, and supported by Vantaa Light Rail project, Parking Policies, City Bike Sharing, Car Sharing and MaaS. All actions have to comply to the overall objective of CO2 reduction. Actions are, e.g., congestion charging and the planned extension of the rail network to connect more remote areas with the TEN-T corridor, to make these areas accessible by rail for commuters.

(3) Linking the FUA in a SUMP or SULP with the TEN-T corridor means to create sustainable interfaces between local and long-distance freight transport. In this context, anticipating the impacts of infrastructure development projects on different scales, such as local, FUA and TEN-T, is ideal. For example, the new tri-modal terminal in Lauterbourg, north of Strasbourg, helps to relief bottlenecks in the city of Strasbourg. As well, tackling infrastructure development together with local transport planning brings positive effects, because economic growth, spatial development and the socio-economic context are interconnected with transport. This is demonstrated by the example of the new high-speed line that connects the urban node Gothenburg with the Gothenburg Landvetter Airport. Here, the planning of the high-speed line was the initiating factor for an integrated strategy that includes the residential and economic development in proximity to the airport and sustainable public transport connections between the development areas.

Box 8: Integrated planning for the Landvetter Airport

Gothenburg as a demographically and economically growing region developed a growth strategy with the objectives of residential densification, better efficiency of infrastructure and labour market growth. The new high-speed railway will connect the airport with the two largest and most important urban areas in west Sweden. This will enable regional development. The planning of the highspeed line that will connect Gothenburg with Landvetter Airport initiated an integrated planning process that addressed not only the question of how to better connect the airport, but also sustainable economic and residential development and public transport connection by other modes. In this regard, the so-called 'Airport city' will concentrate warehousing, logistics, operations and offices, retail and hotels, providing estimated 10,000 new jobs. Sustainable energy supply with district heating and green electricity is planned. The new residential area of Landvetter Södra will become a sustainable community with 25 000 inhabitants and is planned to start construction works in 2020.

A lesson from the Landvetter Airport strategy is to focus on a "growth" model: to build partnerships and trust on a small scale first, and to continue from there, integrating further development aspects. The Landvetter airport experience is much in line with recommendations from the INTERREG Central Europe project AIRA of how to improve accessibility of FUA's to airports. They suggest starting where it is most obvious: with service provision for daily commuting employees. As well, improving accessibility of airports requires multimodal infrastructure, such as air-rail links, and links between the whole functional

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urban area and the airport, not just the city. Seamless service provision, integrated wayfinding, and ticketing are stated as crucial, along with measures to raise awareness and motivate customers and employees to change mind-sets and behaviour.

Make standards for access restrictions to link municipal regulations to the TEN-T

Another planning instrument, which can be the result of a SUMP, is the access restriction, such as practised in Madrid, where only "clean" freight is allowed in the city-centre, with exemplary support from citizens and policy makers.

Box 9: Clean freight in Madrid

The European Commission forced Madrid to implement a masterplan to reduce traffic emissions. Therefore, the city launched an air quality plan, supporting a low emission zone in November 2018. Through-traffic within the low-emission zone has been forbidden and drivers are pushed to use the 1st ring around the centre. The new access regulations are based on the DGT environmental rating classifying vehicles according to their emissions. 5 categories and 4 different stickers (0 Emissions, ECO, C, B, No sticker). Furthermore, traffic and parking restrictions affect light and heavy freight vehicles. There is, however, free access for bikes, residents, public transport, taxi, emergency services, and low-emission vehicles. The low-emission zone covers the whole central district of Madrid, or 472 ha. As a result, traffic has decreased in Madrid Central with up to 30% in Gran Vía and 13% in San Bernardo (on working days). The use of public transport has increased with an average of 5,2% of bus use and 6,2% of metro use. The bus speed has increased in Madrid Central as well as in the neighbouring districts. Traffic is only slightly higher in the M-30 ring belt (by 0,9%).

The city council established a working group with freight operators. At the moment, it is defining a set of legal and economic criteria to establish micro-logistic hubs as a real-estate product in Madrid. Furthermore, the city is fostering the use of clean vehicles in last mile logistics and of municipal parking facilities for micrologistic activities. As well, use of new vehicle typologies in urban freight (ebikes, eScoots, etc.) is regulated.

The EU-funded CIVITAS project ECCENTRIC is supporting logistics operator to set up a logistics scheme for consolidation centers and prototype for electric vehicles. It is essential, as it is the case in Madrid, to get a clear political support for all these measures.

For successful access restrictions, a multitude of local actors needs to be involved with conflicting needs. Likewise, long-distance mobility between urban nodes needs to be ensured. For this reason, guidelines and standards for access restrictions in city-centres are necessary, because logistics operators and other companies need to be able to adapt their technologies, equipment, and infrastructure.

5.1.2 Optimisation of the local network capacity

Amending local network capacity is an objective of all consulted urban nodes to tackle increasing freight traffic. Especially port cities express severe capacity difficulties. The problem is that private interests often oppose those of municipalities and residents. Approaches to solve capacity problems are to add infrastructure, improve infrastructure, separate local and through-traffic and finding solutions for the last mile. Some urban nodes, however, are literally overwhelmed by the increase of freight traffic and lack the institutional resources and competences to optimise their local network capacity.

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Box 10: Infrastructure and regulatory bottlenecks in Piraeus

In Piraeus, the emergence of large hubs due to Chinese investment has led to more freight traffic in the city. The biggest passenger port in Europe has a volume of 5 Million containers per year and is owned by a private company, which is Chinese. The city is well connected with highways, however, there is no railway connection to the airport. Traffic to the port goes through the city and causes major problems, including parking of trucks. Huge capacity-problems with increase in demand and seasonal peaks and low enforcement (in parking) reduces road capacities. There are almost no possibilities for infrastructure extension, therefore, there is a need for a better organisation of transport flows and for cooperation between sea and inland freight flows and better enforcement. But, the municipality feels helpless, also due to the recession in Greece, and is missing the resources to develop and implement strategies. The high number of cars per household adds to the congestion problem. In Piraeus, there is a great need for support in applying spatial planning instruments, e.g., developing a SUMP or a SULP, in data-based planning, to identify locations within the FUA for multimodal hubs instead of close to the port, or for campaigning for behavioural changes.

Adding infrastructure

A common approach to solve capacity problems is to add infrastructure but this often leads to wider problems and requires political intervention.

Box 11: Construction of a bypass-road to Talinn's port

In Tallinn, freight trucks enter the city, causing bottlenecks of 4 km on the way to the port. The municipality reacts by building a new road (the 'green lane') for passenger and freight transit to the port, with parking space outside the city borders. Tallinn has a SUMP in place, with access restrictions to the city-centre excluding heavy vehicles. Due to the pressure on the corridor, Tallinn hopes for 'Rail Baltica', the planned train connection from Warsaw to Tallinn, and the tunnel extension to Helsinki, with the objective that all freight should then go through the tunnel or via rail, and relief the city by leaving out the port. The city expresses the need to manage freight on the regional, but also on the corridor scale.

When the ambition is to add infrastructure, liveability, or 'quality of life' goals are hard to integrate when economic objectives are in the centre of attention, and higher governance levels interfere to protect these interests.

Box 12: Expansion and restocking of inner-city highway in Duisburg

In Duisburg, municipal plans to build a tunnel for the highway A-59, which is crossing a neighbourhood, were cancelled by the federal land Nordrhein-Westfalen due to the estimated duration time of the construction works. The decision of the city-council was not accepted by the federal ministry. Instead, the intention of the federal Land is to restock and thereby extend the highway. The neighbourhood in question is already particularly affected by through-traffic to the biggest inland port in Europe, also final destination-point of the Chinese 'New Belt Road Initiative'. Residents are opposing, fearing a decrease of their quality of life, and a dispute between the municipal and regional government is becoming apparent[36].

Box 13: Investments in ring roads instead of railway development in Sofia and Ljubljana

Sofia experiences a lot through-traffic, with a focus on road transport, due to the low quality of the national railway network. Most of the freight is on its way by truck through Bulgaria to Romania. It is planned to add road infrastructure to fill missing links in the ring-road around the capital). In Slovenia, the main focus of the national government has been to invest in road infrastructure. Current approaches to solve increasing traffic around Ljubljana are e.g. to widen the ring road around the city and plans for an intermodal hub integrating rail have been delayed. A rail ring around Ljubljana would be difficult to realize because of wetlands in the south and water reserves in the North.

[36] https://rp-online.de/nrw/staedte/duisburg/duisburg-cdu-fordert-tunnel-fuer-meiderich_aid-39181699

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Improve infrastructure

More sustainable approaches aim at improving existing infrastructure in the urban node. For example, the 'rail node Hannover' case (Box 22) shows how amending nodal railway capacity improved the interface between long distance and local transport in Hanover on three modes: road, rail and inland waterways. An analysis and projection of actual and future rail freight flows both in the inner node and from the major ports in Northern Germany to Hanover had predicted an increase of freight rail transport of 41 % until 2030 for the urban node. Municipal, national and the German Railways Company have subsequently mobilised their resources to plan for the rail node extension. Another example for the improvement of railway infrastructure is the extension of the Rail node Cologne (Box 23).

Separation of local and through-traffic

Separation of local and through-traffic is an import precondition for efficient traffic management in urban nodes. Urban consolidation centres (UCC) are a means to improve the link between TEN-T network and urban nodes, as they contribute to time savings for drivers and shared capacities for last-mile transport. The example 'Goodhubs' (Box 21) illustrates how freight traffic can be reduced in urban centres, when UCC are installed near highways and with a good connection to city-centres via e.g. small and clean vehicles or cargobikes.

There is a need to explore the potential of Urban Consolidation Centres (UCC) for a more efficient use of existing infrastructure (capacity-sharing) in terms of emission-savings and cost-benefit scenarios. As well, case study research on urban nodes cooperation in sustainable shipping (e.g. capacity sharing platforms, cooperation between UCC) is suggested. As well, there is a need to define standards for UCC that also include governance.

Last mile solutions

Growing online commerce and the relevant increase of delivery traffic in urban nodes is seen as a major problem by many urban nodes' representatives. High levels of congestion due to commercial and freight traffic by non-optimised loads and delivery routes cause high levels of environmental pollution, noise, risks for historical buildings due to vibrations resulting from freight traffic and risks for pedestrians and biker's safety. Last-mile solutions aim at optimising capacities, thereby reducing CO2 emissions in city-centres.

> *"Online commerce by Amazon, Alibaba etc. will increase, they build delivery centres and road transport is massively affected, congestion will increase in cities, and it is important to assess its impact and prepare for it."*

There is an expressed need to analyse the impact of online commerce on urban and regional development, urban mobility, space consumption, congestion, traffic, goods flow and local economy on every level of the TEN-T. In this context municipal regulations and standards for access regulations and the last mile are needed. There is also general agreement on the innovative potential of urban nodes in urban logistics. Urban nodes refine this recommendation by suggesting nodal labs examining the different effects of AI solutions for last-mile delivery and self-driving technology in urban nodes, also to determine legal preconditions for transferability to other Member States.

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Box 14: Last mile in Strasbourg

In Strasbourg, a problematic situation in the historic centre with a relevant number (5000+) of shops, restaurants, commercial activities caused more than 5000 pount of delivery/day in this district. A communication process with stakeholders resulted in the finding that without restrictions, there would be no business model for logistics services. A strategy based on two principles (1) access restriction rules for deliveries and (2) multimodality was developed. As a result, there is a reduced impact of freight traffic in the city centre, along with a reduced total number of vehicles. Improved distribution schemes have been developed, such as optimisation of load (consolidation) and delivery routes. Private innovative services for eco-friendly delivery were created, along with a fluvial shuttle between port and city-centre.

Growing e-commerce increases the number of last mile delivery in urban areas and causes a loss of attractiveness in shopping and urban areas by noise increase, traffic congestion, and parking problems. There are innovative approaches in cities to reduce freight traffic in city-centres directly related to online-commerce.

Box 15: Changing room at post-office in Ghent

For a pilot project by the Belgian post office, Bpost, a changing room was installed at a post office in the East Flemish city of Ghent. The changing room will allow people to try on their ordered clothes before taking them home, thus, preventing trips for returns of clothes, at least within the city.[37]

Another way of coping with the topic is the implementation of urban distribution centres in close proximity to city-centres.

Box 16: Zero-emission distribution centre Bielefeld

Bielefeld uses a former container terminal near the city-centre as a zero-emission distribution centre for freight. The area, which is located closely to the city centre, cannot be developed for residential functions due to the vicinity of chemical industries. Being part of the 'Zero Emission City Center Bielefeld' the conversion to a distribution centre was funded by ERDF resources. Zero emission modes, such as small e-trucks and cargo-bikes, are used for delivery.

Organising governance for urban consolidation centres is a challenge, because a multitude of actors are involved with conflicting needs.

Box 17: Thinkport Vienna

The thinkport Vienna by Boku Wien and Hafen Wien is a contact point for logistics companies in Vienna, hosting the 'agile team city of Vienna'; a temporary organisational structure that brings together stakeholders from different municipal departments and the private sector to develop together approaches for sustainable city-logistics. Aims are to increase cooperation and collaboration across and to better use existing capacities for emission-free transport. One project is a consolidation centre as a B2B solution, including delivery, marketing and packaging waste disposal. More information on the 'agile team' in Vienna can be found in the VitalNodes toolbox (D.3.5)[38].

Synergies between freight and passenger transport

Urban rail infrastructure is often only used for passenger transport. Its usage for freight transport represents an opportunity to solve capacity problems. More and more cities and public transport companies experiment to use capacities of passenger transport for freight.

[37] https://www.vrt.be/vrtnws/en/2018/10/05/bpost-installs-changing-room-for-customers-at-ghent-post-office/
[38] Van der Linden, K., Linssen, R. (2019): VitalNodes Final Toolbox (Mark 2) – based upon experiences gained with Tiers 1,2 and 3.

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Box 18: Examples for synergies between passenger and freight transport

Examples for synergies between freight and passenger transport[39]: the freight-tram in Zuerich, which transports waste in added waggons; the Freight-tram ('Tramfret') in Paris, a pilot project by the Paris municipality and the supermarket chain Casino between 2011-2018, which transported retail products. Other cooperations are, for example, to permit couriers to use trains or public transport, such as with DHL in London, the ic:courier in Germany, or the A-Way express in Canada for their deliveries. Key success factors are: Better environmental performance of rail and congestion in urban areas. Key failure factors are the interference with passenger transport, high investment cost, no cooperation between stakeholders, resistance to change, and a need for road pre- and post-haulage.

This kind of synergies requires enough space on the street (as a spatial dimension), and decisions on the geographical position of consolidation centres: from where to where are the synergies taking place, and what is the relevant last mile? Using trams will limit the range to about 30 km's. Therefore, the question whether, e.g., a tram can be used for last-mile transport also depends on the range of the last mile. Concerning the network dimension, using trams for freight are an optimal use of existing infrastructure, however, this is only valid for areas with tram infrastructure. The urban nodes that will profit from freight trams are probably mono-centric with high congestion challenges – poly-centric urban nodes will not benefit from such solutions. As well, the solution goes for small volumes, and less for big containers, and also, micro-consolidation needs to be organised.

Exploring and supporting synergy options between passenger and freight transport for capacity-sharing requires communication with the private sector. The results can be used to find solutions in discussion with local stakeholders according to the specific local context.

A good example for public-private communication is the platform 'market place for mobility' within the programme 'Smart Ways to Antwerp' (Box 32) where companies receive financial and administrative support when they find smart solutions for modal shift, using, e.g. waterways, or sharing existing capacities.

5.1.3 Plan for modal shift of freight on the local level

It is generally agreed that long-distance freight transport should shift to rail and ship, and that the distribution of goods on the local level should be taken over by other modes. In order to manage increasing freight and passenger numbers while at the same time facilitating efficient multimodal integration of freight railway, an important objective is to debundle freight and passenger rail transport, along with an optimization of efficiency and capacity of the local network. At the same time, negative impacts for residents, such as noise emissions, should be reduced.

There are only few bottlenecks along the core rail network where new infrastructure is needed, therefore a focus should be on the maintenance in the railway network. This includes upgrading, modernization and maintenance of the existing infrastructure and increase of capacity by smaller measures. As investment in railway infrastructure is hardly profitable for private funding, blending facilities (e.g. pension funds contribution) need to be further investigated and expanded.

There are also high expectations towards new hubs and terminals of the next generation. The 'ideal' intermodal terminal is planned based on data analysis and predictions of freight flows within an urban node and on the corridors that cross it. Such an 'ideal' terminal has enough capacity and also subscribes

[39] De Langhe, K. (2019): What role for rail in urban freight distribution. Presentation at the Urban Nodes Workshop in Venlo, February 8 2019.

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to zero-emissions by bringing together electrified rail/ hydrogen-fuelled rail and alternative fuels for shipping and road transport.

> *"Railway nowadays is not reliable for freight."*
>
> *"The bad shape of the railway system is hindering the TEN-T development in the node and on the corridor."*

Box 19: Development of capacities for freight in Cologne

An example is the Cologne network expansion which includes uncoupling of passenger and TEN-T freight traffic (See Box 23). Next to the passenger network, also the freight rail network is upgraded, and freight and passenger traffic are separated. There was a high coordination effort in the funding acquisition process for the project as different bodies (federal, state) are responsible and cooperated. Total costs of the Cologne railway node measures are around 3,6 billion Euros, with a cost-benefit ratio of 1,7.

However, planning for modal shift of freight to rail is also seen as difficult on the local level because of the long duration of planning procedures for new rail tracks. Here is a risk that the potential of rail is left out when planning, for example, for local energy transition. Thus, it is perceived as less time-intensive to plan for alternatives fuels infrastructure for trucks rather than rail to connect intermodal hubs within urban nodes. For example, Duisburg would like to connect inner-city intermodal hubs by rail but prefers to provide infrastructure for hydrogen-driven trucks instead – because of long planning procedures.

Concerning freight railway, the main objective should be multimodal integration of rail freight transport. This assumes a regulatory framework that takes multimodality and its timely implementation into account.

5.2 Coordinate subordinate challenges on the corridor-level by involving urban nodes actively

A variety of challenges needs to be tackled on a higher level by actively involving stakeholders in urban nodes and their local strategies. The main reason is to connect otherwise spatially isolated projects with each other, or to coordinate infrastructure development on several scales. These challenges are energy transition, climate mitigation and adaptation measures, and modal shift in long-distance transport.

5.2.1 Make sure energy transition connects and enables integrated solutions

The topic of energy transition in the freight sector came up regularly during the consultation process with urban nodes. It seems to be controversial whether it is a topic that should be discussed in the context of spatial planning for and in urban nodes on the TEN-T. Is energy transition a topic for planners? The answer is yes, because infrastructural amendments according to technological adaptions in the energy provision for mobility need to be planned and negotiated between stakeholders in and also between urban nodes. Public acceptance for technologies is crucial and needs to be sought for by municipalities. Ideally, the introduction of new energy technologies is only a starting point for further integrated solutions that also address, e.g., strategic concepts for urban mobility.

Energy is a game-changer. When an urban node decides to invest into one new technology, such as Duisburg into hydrogen infrastructure for the whole logistics sector, what needs to be discussed is how this possibly affects planning in other urban nodes on the corridor maintain mobility. What are the

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necessary steps to combine ambitious local approaches for carbon neutral logistics in urban nodes, how can insulation be avoided, and spill-over of innovative solutions facilitated? The European dimension consists of establishing connectivity. What are infrastructural and legislative conditions for energy transition in cross-border transport?

The topic is characterized by a general technological insecurity on all levels, and the famous “hen and egg”-problem. The majority of consulted urban nodes deal with it in one way or another. The most secure solution seems to be to invest in conventional e-mobility solutions for the last mile in city-centres. The Electric green last mile project goes further and delivers goods in regional distances.

Box 20: Electric green last mile in Province of Limburg

The ‘Electric green last mile’[40] in the region between Venlo, province of Limburg, and Duisburg tests goods distribution within a driving range of 150 km. Seven electric trucks and GTW of 44 tons with need of charging infrastructure of 300kW (ultra-fast charging) are driving and testing different logistics scenarios to find the best case scenario for further out roll of these 100% electric trucks while being monitored in the period 2017-2020. The aim is a CO2 reduction of 1900 tons. Another objective is to create a cooperation model for sharing capacity.

Concepts that affect long-distance transport are rarer and need courage from decision-takers, because they request a technological commitment from municipalities and the logistic sector, with the relevant investments in infrastructure. A high communication and harmonization effort is necessary between many different stakeholders. Two kinds of a ‘do-it attitude’ were discussed in the Vital Nodes project.

Box 21: Clean Energy Hubs, Province of Gelderland

The province of Gelderland presents a pragmatic approach of technological and energy flexibility by its ‘Clean Energy Hubs’ initiative, offering a diverse and flexible set of alternative fuels for long-distance freight transport (mostly road and shipping) at strategical locations near logistic companies and highways in Gelderland and the Netherlands. Their aim is a European roll-out along the TEN-T corridors.

The city of Duisburg develops a regional roadmap with surrounding municipalities and the urban node Duesseldorf for the development of hydrogen infrastructure for the shipping and road logistic sector. The objective is to also integrate rail and public transport, and, in the long-term, individual vehicles. Their stand is confident: if major logistic hubs such as Duisburg decide on a technology, regional logistics companies have to adapt.

Box 22: Transition to a CO_2-free transport with hydrogen in Duisburg

Duisburg is, with 488.000 inhabitants, not an urban node of the core network, but shows, as the biggest European inland port and final station of the ‘One belt one road initiative’ an important function for inland shipping and logistics in the TEN-T. It is listed as core infrastructure. The municipality is actively pushing the use of fuels-cell technology and hydrogen for the local logistics sector, thereby aiming at influencing regional and international usage of alternative fuels. The objective is to develop and implement hydrogen infrastructure for shipping and road logistics, in the long-term also for rail and public transport. In a regional and cross-border planning process, the municipality develops a roadmap for the necessary steps of the next 10 years, cooperating with stakeholders from research, mobility and energy. Questions of supply, capacity, planning needs, regulations and norms, but also of regional and international connectivity are important in this big communication and planning process, and need to be discussed with many different stakeholders.

[40] http://www.smartlogisticscentrevenlo.com/nl/nieuws/electric-green-last-mileproject

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Thinking along the supply and logistic chains and in regional connections when developing projects is necessary for planning energy infrastructure. For example, cargo load on the Rhine is influenced by propulsion technologies, and there should be information-exchange between nodes about infrastructure needs and project coordination on segments of corridors and / or overall TEN-T corridors.

> *"There is a need for regional approaches and thinking in corridor-segments when it comes to developing projects on the node level, and to enquire what port cities along the Rhine need. For example, Mannheim and Duisburg need LNG to cover the Rhine, so there should be more synchronization."*

Ideally, long-distance transport should be taken over by electrified rail. Where electrification of rail is stumbling, such as, e.g., in cross-border regions, there is also a chance to apply fuel-cell technology for railway locomotives. Accordingly, there is a need for intermodal terminals which combine different modes in a sustainable way. Such an intermodal terminal connects electrified or fuel-cell driven rail with electrified or alternatively fuelled trucks for redistribution within shorter distance. Generally, a European facilitation is needed, because member states need to be encouraged to push electrification of rail forward.

5.2.2 Modal shift in long-distance freight transport

Between 2010 and 2050, it is estimated that passenger transport will grow by about 42% and freight transport by 60%.[41] A strong and coordinated action is needed to make the expected increase in goods transport sustainable by creating good conditions for modal shift in urban nodes. This means to strengthen the interfaces between low-emission modes for long-distance transport and emission-free modes for local redistribution of goods. Engaging urban nodes in this coordination means to facilitate good practices and to think in systems along the corridors. It should be a major objective to prevent insulation of projects or even emergence of new bottlenecks by missing compatibility of technologies, regulations or standards. In this regard, co-creating the European dimension in local projects by asking for standards, compatibility and link-up of integrated projects in the energy and mobility sector with other urban nodes is extremely important.

Box 23: The Dutch 'GoodHubs' Initiative

A good starting point for coordinating modal shift of freight from a European perspective is to facilitate exchange between urban consolidation centres (UCC), including the shipping, road and rail sector. The Dutch 'Goodhubs' initiative[42] acts as a facilitator between UCC in European cities with the objective to reduce freight transport in city-centres. It supports and coaches local entrepreneurs to invest in trimodal sustainable hubs at identified locations including alternative fuels provision for ships and trucks. It is the declared opinion of the initiative that it is important to avoid that cities 're-invent the wheel' when building UCC, but to establish standards which can be easily adopted by administrations and the private sector in urban nodes.

Another crucial success factor for achieving modal shift in long-distance freight transport is the separation between passenger and freight rail transport.

[41] Impact Assessment accompanying the Proposal for a Directive amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastractures, 31/05/2017, https://ec.europa.eu/transport/sites/transport/files/swd20170180-ia-part1-eurovignette-infrastructure.pdf
[42] https://www.eco2city.eu/

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Box 24: Measures to improve the rail node Hanover

Rail freight traffic volume in the node Hanover, which is crossed by three different TEN-T corridors, is predicted to raise by 43% until 2030. This was the result of an analysis and projection of the actual and future freight flows on the corridors in the hinterland of the German North Sea (Hamburg, Bremen, Wilhelmshaven), Baltic Sea (Luebeck, Fehmarn Belt) and North Sear West Range (Amsterdam, Rotterdam, Antwerp), taking international freight traffic flows into account. Being classified as an urban node on the TEN-T not only widened the analytical scale to include European traffic flows in analysis and simulation of future freight rail development. It also helped to securing support from the federal German government and German Rail Company for a technical upgrade of the rail node Hanover. Thus, European visibility on the TEN-T corridors, and the fact that Hanover was not only a German, but also an important European node on three corridors, helped when the Hanover region lobbied for infrastructure modernization support from the federal government and German Rail. Consequently, national funding for studies and a cost-benefit analysis of infrastructure improvements were mobilised, followed by integration of a construction measures package into the national federal transport infrastructure plan. This is a good example how classification as TEN-T urban node can, combined with data analysis and projection of freight flows on the relevant corridor segments, help to convince national stakeholders to plan for modernization and update of rail infrastructure for successful management of today's and future freight flows.

Another example is the extension of the rail network in the Cologne region due to growing demand and stress on the regional railway network.

Box 25: Measures to improve the rail node Cologne

In Cologne, the regional public transport authority, NVR, plans extension measures with a total of estimated costs of 3.6 billion euros. Improvement measures of the network will further disentangle freight and passenger transport in the urban node: Next to the passenger network, the freight network is upgraded. A high coordination effort was necessary for funding the planning costs: the federal state is responsible for regional passenger railway transport, whereas long-distance and freight railway lies in the responsibility of federal ministries.

Similarly, the new metro railway system 'Grand Express Paris' aims at relieving the pressure from the main ring road and the regional public transport system in the metropolitan region of Paris.

Box 26: The 'Grand Paris Express'

Since one out of five people in France live in Paris, pollution, congestion and socio-economic disparities are key issues for Paris. The 'Grand Paris Express' will connect the capital and the suburbs, as well as high speed rail, business hubs and universities. Socio-economic development is one goal of the project. Collaboration with all stakeholders is seen as important enabler in the project. Among those is the dialogue with the residents, this is done via community agents. As one of the biggest consultation projects in Europe, the project took co-creation of stakeholders and citizens seriously from the start and has a dedicated capacity for this. The project is co-financed by European Funds and realized by Societé du Grand Paris, who monitors the implementation of the project. Approximately 200 km of new subway lines and 68 new metro stations are added until 2030. The new metro system will connect the airport, train stations and hubs. Societé du Grand Paris as a state-owned structure brings all relevant stakeholders in its organisational structure together.

A lot of stakeholders are involved from several horizontal governance levels to organize the reorganization and modernisation of a railway node, especially in terms of financing. Here, some urban nodes need more support than others to organise and moderate such a process.

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The high coordination efforts between different administrative levels for financing studies and planning of large railway development programmes to tackle modal shift to railway in urban nodes are probably one reason why the urban node Ljubljana is lacking basic infrastructural equipment for adequate freight rail transport.

Box 27: Missing railway investment in Ljubljana

The one-track railway connection between the port, Koper, and the capital, Ljubljana, is heavily used for rail freight transport. It is currently upgraded by a second track of 27 km between Divača and Koper, financed by CEF. This relieves Koper, heavily frequented by freight in its port function for the whole south-east European region, but not the urban node Ljubljana, in the hinterland of Koper. Every single cargo load arriving in Koper with any destination in South-East Europe is transported on the one-track line through Ljubljana. Freight and passenger transport are not separated, pushing commuters to use cars. The infrastructure is old and not up to date. Municipal and regional stakeholders' complaint about missing national political support for railway, and a general privilege of highway-construction, favouring freight transport on the road. Old, not maintained, infrastructure, insufficient service and software, missing real-time data and communication problems with national levels also delay the development of modern intermodal railway hubs. This creates bottlenecks in Ljubljana, which is rather concerning in view of expected increasing freight volumes in the near future.

Box 28: Missing railway investment in Sofia

The urban node Sofia shows a similar picture. Here, the national railway infrastructure is so outdated, that a municipality in the FUA of Sofia asked the regional transport authority, Sofa Traffic, for the construction of a passenger metro connection from their business district to Sofia, even though they have a railway station in their immediate reach. But also planning for modal shift of freight to rail is difficult in Bulgaria. Old infrastructure with insufficient service, run-down train stations, inefficient operators, old software, no real-time data and a lack of communication between national railway investment and infrastructure companies and the municipal level make the planning process of, e.g., intermodal terminals, problematic. As a result, freight transport takes mainly place on the road, and planning for freight traffic usually means to add road infrastructure or missing highway links in and around Sofa – even though the municipality plans to build intermodal terminals. However, and contrarily to the Hanover railway node, there is no joint effort from different levels and sectors to strengthen railway, there are not sufficient data for data-based planning, and accordingly a lack of analysis to identify the development of freight on the TEN-T and to plan accordingly in the urban node.

The Ljubljana and Sofia examples are, even though quite different from each other, representative for a development in many urban nodes, especially in the CEEC countries. Where the market share of the road sector is much more competitive than railway because of outdated rail infrastructure, it is only plausible that modal shift is not going to happen to rail, if not considerable effort is invested into improving rail services[43]. A general trend to give up on modal shift, and to focus on the most efficient mode, also in urban nodes, is observed.

Another problem is demonstrated in urban areas on the comprehensive network, which are, like Hanover, situated in the hinterland of important ports, such as e.g. Venlo, or e.g. Gdynia, as port city with a severe lack of hinterland rail development. Even Duisburg with the biggest European inland port and a major transhipment site for goods, is not classified as urban node. These cities are heavily affected by freight transport, but are not eligible for CEF funding, because they are "only" classified as core

[43] European Commission (2018): Comprehensive analysis of the existing cross-border rail transport connections and missing links on the internal EU borders. Final report. Brussels.
https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cb_rail_connections_en.pdf

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infrastructure, not urban nodes on the TEN-T. Thus, they are lacking European visibility and support for development or technical update of their railway infrastructure.

5.2.3 Increase resilience of the network on the corridor level

The low water level on the Rhine in summer 2018 demonstrated that there is a need to act in a coordinated way along the river to adapt logistics to these more recent consequences of climate change. The 'Upper Rhine Ports Cooperation' from Mannheim to Basel was created among others to establish a joint river information system between relevant stakeholders in the Upper Rhine Valley, and to stimulate the usage of common tools (see Box 28, 31). Such a river information system can be used for the development of climate adaptation measures on the Rhine. Therefore, there is a need to develop climate change scenarios and climate adaption and mitigation strategies in the freight and logistics sector, including shipping, on the corridors. How can heat, heavy rainfall or drought effect the transportation of goods, and what is the impact according to the character of transported goods e.g. in terms of catastrophe prevention? Which prevention strategies can be applied in urban nodes?

Also, emergency plans especially for the rail freight network needs to be developed in order to be better prepared for unforeseen incidents, such as the Rastatt accident in 2017, which resulted in a lowering of the track of the Rhine Valley Railway and the closing down of several railway connection for almost three months.

Box 29: Rastatt accident and awareness for crisis management

The Rastatt tunnel incident has brought the inadequacy of international crisis management in rail transport to the attention of all stakeholders and the general public. The railway sector responded by publishing a handbook on international contingency management. The handbook defines the procedures at the level of the infrastructure managers: internal communication, communication with the public, re-routing scenarios, allocation principles, etc. It can therefore be assumed that, in case of a similar incident leading to an international disruption, infrastructure Mangers will react much faster and achieve a better level of international coordination than in the past. Concerning the urgent need to improve cross-border interoperability, several political programs and declarations of intent set a framework for concrete measures that can be realised in the short or medium term. In many cases, it is too early to judge whether these framework conditions and/or announced measures will be sufficient. Overall, the Rastatt incident has led to a great deal of awareness raising and to first concrete measures in rail transport. At the same time, there is a catalogue of measures that urgently needs to be implemented. Although the whole Rhine-Alpine Corridor with all its modes was concerned by the Rastatt tunnel incident, concrete measures were mostly limited to the railway sector. The demands formulated in the EGTC position paper for a comprehensive risk analysis for all modes and the preparation of contingency plans for various scenarios using the synchro modality approach are not met, yet. Emergency plans remain limited to the railway sector. Thus, there is still a need to focus on multimodality in order to strengthen resilience in the entire Rhine-Alpine Corridor[44].

[44] Summary of the position paper of the EGTC Rhine-Alpine Corridor on the Rastatt Tunnel Incident, https://egtc-rhine-alpine.eu/de/download/egtc-position-paper-rastatt-tunnel-incident/)

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5.3 Create better conditions for seamless transport across borders

Borders are by nature bottlenecks, because differences in infrastructure, sectorial policies, institutions, economy and geopolitical challenges meet and interfere. Joint infrastructure planning, implementation and maintenance, or the establishment and maintenance of cross-border services are more expensive and time intensive, because barriers for stakeholder cooperation, governance, and data-exchange are higher, as well as for operational and technical harmonization. Standards for cross-border cooperation, including requirements for financing and governance, would help to save time and financial resources. The necessity for standards is recognized by actors in projects that deal with cross-border questions, who can contribute to making cross-border freight transport more efficient and sustainable.

The obstacles in cross-border regions are diverse. The general trend to give up on modal shift to rail, and to focus on the most efficient mode, road, is particularly observed in border regions[45], which is not necessarily linked with missing infrastructure, but with missing cross-border (passenger) services. The role and responsibility of administrative authorities on both sides of borders play is crucial in this regard. One example is the border region between Italy and Slovenia, situated on the Baltic-Adriatic Corridor, and as one of the missing and promising links for detailed examination by the EC. In 2018, a consent between the competent authorities was reached, and passenger transport re-introduced.

Other obstacles are, e.g., different technical systems, missing connectivity of digital systems, standards, languages and missing or outdated railway infrastructure, such as missing electrification[46], which make investments in transport services costly and less attractive for the public sector. Often, private companies jump in and invest, such as, e.g., the three-Country-Train.

Box 30: Three Country Train between Belgium, the Netherlands and Germany

The Three Country train, a private company, offers passenger transport between Aachen, Heerlen, Maastricht and Liege, in resp. Germany, Netherlands and Belgium, and innovated a small cross-border micro-system with considerable effort in adapting to different technical standards, languages and regulations, but with small revenue and missing lobbies for infrastructure update from both sides of the borders.

A further problem for cross-border cooperation are governance differences. For example, Dutch provinces are more powerful and autonomous in relation to the German ‘Laender’ which see themselves more as representatives of the state. This makes it difficult for municipal stakeholders on the Dutch side of the border, because he or she needs to address German ministries in Berlin for certain questions, because there is no equivalent to the Dutch province in Germany. This represents a stumbling block for cross-border communication and makes projects time-intensive and rather scares potential project partners off.

> *“We are working with approaches and technologies from the last century when it comes to cross-border transport services. There is the need for a new generation of cross-border planning and transport.”*

[45] European Commission (2018): Comprehensive analysis of the existing cross-border rail transport connections and missing links on the internal EU borders. Final report. Brussels.
https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cb_rail_connections_en.pdf
[46] https://www.allianz-pro-schiene.de/themen/infrastruktur/daten-fakten/

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But cross-border cooperation can make logistics more efficient by developing joint standards and objectives.

Box 31: The Upper Rhine Corporation

The Upper Rhine Ports Cooperation connects nine inland port authorities from Mannheim to Basel with together 50 million of tons annual waterborne traffic and is situated at the intersection of four TEN-T corridors. The cooperation was set up in 2012, and receives financial support through INTERREG, TEN-T and CEF funding. Thus, trans-border cooperation makes this organisation also eligible for additional (European) funding. Its strategic objectives are to gain competitiveness through cooperation, efficiency gains for multimodal transport and a common digital infrastructure. It started among others to stimulate information exchange on freight flows via RPIS, a digital infrastructure connecting relevant stakeholders in the Upper Rhine Valley: Terminals, barge operators, barges seaports, customs, traffic management centers and river information systems are connected. Exchanged data are used for custom declaration, corridor slot reservation, loading lists transfers and arrival time calculation on the Rhine. The objective is to extend the geographical scope of the traffic management platform on the TEN-T corridors towards main marine ports in Europe and to include data from different transport modes and cargo types.

As well, the 'Goodhubs' initiative, a cooperation of Urban Consolidation Centers (UCC) in European cities (see Box 21), wants to develop and implement standards. Instead of cities 're-inventing the wheel' they claim that standardized consolidation centres with a given set of criteria for sustainable interfaces between long-distance and local freight transport are implemented in urban nodes.

Box 32: ERFLS by EGTC Rhine Alpine

The CEF-financed European Rail Freight Line System (ERFLS) Action, led by EGTC Rhine Alpine, was developed over the years 2015-2018[47]. It investigated the feasibility of the concept of linear intermodal freight trains that make several short stops at a system of terminals along the Rhine-Alpine Corridor, where intermodal units are loaded or unloaded much in the same way as passengers get on and off intercity trains at intermediate stations. Problems that hinder rapid growth of rail freight traffic on the Rhine-Alpine Corridor are identified as: Point-point relations between rail terminals and no frequent line services; lack in infrastructure of intermodal ("smart") terminals; missing efficient and reliable intermodal connections from these terminals especially to inland waterways and highways for goods traffic and a lack of operational (telematics) rules and systems with regular time intervals for line services. The European Rail Freight Line System is an intermodal freight transport concept based on block freight trains travelling according to a regular timetable along a corridor, picking up or leaving intermodal units at intermediate points between their departure and arrival terminals. Both the working of the trains and the way intermodal units are loaded and unloaded aim to resemble the operations of intercity trains for passengers. An important element of the concept is that it is intended to be operationalised already building on current practices and current terminals, introducing a set of modifications as limited as possible. This is so also to ensure that the ERFLS terminals or smart terminals may be used also by conventional intermodal traffic.

It is problematic that cross-border topics are usually allocated to the direct geographical environment of borders, because there are often also weak transport links from border regions to the urban nodes in the vicinity. For this reason, urban nodes should be sensitive towards cross-border topics, and have the relevant institutional competences to deal with it, especially, when they are situated in the further catchment area of border regions. For example, when analyzing commuter or freight flows for future accessibility planning, they should also integrate nearby cross-border regions into their analysis.

Finally, there is a chance to co-create a 'European' dimension in the development and application of new technologies in urban nodes, when neighboring urban nodes, also from the other side of borders, are

[47] https://egtc-rhine-alpine.eu/portfolio-item/erfls/#toggle-id-3

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involved ‘from the start’. This is the case in the Goodhubs project, the ERFLS project by EGTC Rhine Alpine, or in Duisburg, where hydrogen infrastructure research and development activities take place a cooperation with the province Gelderland and Arnhem, with the aim to develop hydrogen infrastructure for sustainable shipping on the Rhine in each of the nodes. Such a cooperation process is a great example for creative development of standards, whereas multiplying the impact of solutions through higher replicability.

The high relevance of cross-border projects for European energy, mobility and digitalisation development is acknowledged in the proposal for a regulation establishing the Connecting Europe Facility, while also recognizing the particular costs and efforts necessary to accomplish them. The Council of the European Union suggests in this proposal a higher co-financing rate for the creation of cross-border institutions with a legal basis for joint cooperation, also suggesting joint governance structures:

> *“Establishment of a single project company, a joint governance structure, a joint venture, a bilateral legal framework, an implementing act (…), or any other form of cooperation. Integrated management structures, including joint ventures should be encouraged, including through a higher level of co-financing.“*[48]

Representatives from urban nodes see investing in institutional infrastructure for cross-border projects as important. In this regard, it would be of help to develop standards for governance and institutional infrastructure in cross-border contexts. There should be committed cooperation and partnership of stakeholders on both side of the borders as a prerequisite for CEF funding in the cross-border transportation sector. The general objective should be goal oriented collaboration for public-private partnerships. An important step into this direction is to support networks and institution-building in urban nodes.

There are still several open questions, which have been identified, such as which transborder multi-level governance dialogue models can serve as good practices for establishing standards in cross-border cooperation, and which standards prove to be important? Which organisational models are successful? An interesting example for standards in cross-border governance and cooperation could be the US metropolitan planning organization (MPO), which are made of representatives from local government and governmental transportation authorities. They are funded by the federal state. Their objective is to ensure regional cooperation in transportation planning; federal funding for transportation projects are provided and channelled through this planning process.

5.4 Support the creation of freight data platforms

There are strong differences between urban nodes concerning acquisition and availability of freight data, but also of institutional competences to use these data for planning with a special freight perspective. In Sofia, e.g., there is uncertainty how to gather data for adequate planning, how to include modelling of freight transport into the local SUMP, or how to define the FUA based on data. The city would like to know which goods are transported, times of delivery, origin-destination pairs, and use these data, e.g., for inner-city access restrictions, or for planning of multi-modal terminals. In Ljubljana, the city-administration would like to use traffic management systems to provide ‘safe routes’ in case of emergencies for dangerous goods, but the data are not available. Defining data-sets for freight data platforms on the level of urban nodes and corridor segments would help urban nodes to develop their

[48] Council of the European Union, 7207/1/19, p.7

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strategies for data-based planning and to use their existing infrastructure in a more efficient way. Promoting data exchange between stakeholders seems to be a good way to support the creation and maintenance of relevant freight data platforms. A condition for sharing private data is to offer win-win situations which create trust for both the public and private sector.

5.4.1 Define data-sets, standards for data-sharing and strategies

It is necessary to develop data-sets and standards for collecting clear data on transport flows and movement on TEN-T including. Suggestions are: origin and destination for every good (should be indicated on the package), loading, multimodal travel, standardised freight movement, traffic distribution. In the VitalNodes Toolbox, indicators for a better comparison between urban nodes are used for the 'fingerprint' of an urban node and could be further developed for standardized data-collection and analysis. These indicators contain "an analysis of infra networks (regarding road, rail, navigation and aviation), traffic figures and trends for the various modalities – with a focus on freight and logistics relationships (source-destination), interrelationships of this with passengers' traffic (also in relation to public transport and active modes), spatial lay-out of the area, trends and the institutional framework. All at the three scales – corridor level, functional urban area, region, local/city level – in order to enable analysis and discussion about the interrelationships between the scales: Zooming in and out".[49]

To some extent, cities also need commercial data to better manage transport. National access points could be responsible for standardisation and harmonization. These data should be made accessible for traffic management and routing.

5.4.2 Data-based planning and efficient use of existing infrastructure

It would be helpful for planners to have suitable data to, as a first step, define the FUA or the regional cooperation with the urban node, and, as a second step, to develop strategies and common policies, which are ideally based on facts. For a complete overview of freight flows in urban nodes, it is also essential to obtain and analyse data on freight flows on the relevant corridor segments. These data can be used for planning of new infrastructure and for a more efficient use of existing infrastructure in urban nodes.

[49] Van der Linden, K., Linssen, R. (2019): VitalNodes Final Toolbox (Mark 2) – based upon experiences gained with Tiers 1,2 and 3.

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Box 33: Data collection for transport modelling and identification of infrastructure needs in Gdynia

The municipality of Gdynia drafted a "Last mile study for integrated CNC-urban node focusing on investments complementary to Baltic Adriatic Corridor work plan". The goal of the study is to develop the concept of an optimal, resource-efficient transport system in the last mile section of the Baltic-Adriatic corridor in Gdynia in 2030 and prognostically in 2045, based on data. It includes an analysis and forecast of freight and passenger traffic from / to the sea port in Gdynia, a multi-variant concept of road infrastructure access to the port, a traffic forecast in the city of Gdynia and neighbouring communes (including: Kosakowo, Rumia, Reda), as well as technical, technological, operational, socio-economic and financial comparative analysis enabling political decisions for measures in the Gdynia transport system and development in the TEN-T core network. The statistical basis for the described analysis is summarized in the Gdynia CNC node statistics data atlas – 2016. This statistical report is a pilot document on a European scale, presenting a numerical image of the node of the TEN-T core network in Gdynia, based on data of all transport modes in 2015-2016. The data are used for the 'concept of intelligent traffic management system for trucks at the Port of Gdynia', a model of a technical and organisational optimisation of road access to the port, covering an analysis of costs and benefits. It elaborates strategies and measures for an intelligent road truck traffic management in the port improve cargo turnover in existing in planned cargo terminals. As well, the city developed an action plan to address bottlenecks and missing links in the relevant Baltic Adriatic Corridor segment from the interoperability and sustainable urban mobility perspectives (including traffic flows), traffic development forecasts until 2050 vs. capacity of the port-city infrastructure, statistical measures including the city, port and metropolitan area development (MEGA Gdańsk), a holistic approach to the corridor's last mile development with established multi-level governance model, and a reference for business decisions on supply chains to and from the Port of Gdynia.

5.4.3 Analyse which corridor segments are affected by which cargo streams

An exact analysis of freight flows on corridor segments helps to address bottlenecks and missing links within urban nodes, in order to increase interoperability and sustainable urban mobility. Until now, an exact analysis of freight flows, routes and modes of transport is not possible. It is also unsure whether the TEN-T corridors correspond with the actual freight-flows in Europe.

> *"TEN-T as a concept seems to be as pencil-drawn corridors with respect to passenger transport rather than freight transport. Look at the corridor from a freight perspective at all levels."*

To analyse transport movements, standardized data-sets of would help to plan for sufficient capacities, intermodal terminals, alternative fuels, or parking facilities. Another use would be, e.g., to plan for disaster control, safety or environmental protection to increase resilience on the network. For example, traffic management could indicate alternative routes for dangerous goods in case of earthquakes, heavy rainfalls or drought, by-passing urban areas. Knowing which goods are transported from where to where can create a knowledge-base for political climate mitigation and adaptation strategies in the logistics sector.

> *"The resilience of nodal infrastructure against floods, earthquakes and dangerous goods is an issue in many nodes. It is necessary to have data on goods so that routes can be adapted in case of bottlenecks."*

> *"We need data for policy-making about origin and destination, traffic distribution, loading in order to come to a better data-based planning of infrastructure."*

Another objective could be to analyse the effects of shifts in supply chains on the TEN-T. To achieve this, it is necessary to identify traffic flows and goods on the local, metropolitan, national and TEN-T level.

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"Analyse the effects of potential and actual shifts of supply-chains on the TEN-T, follow the freight!"

Strategies for data exchange and management along the corridors, such as common information systems, are needed. An example for cross-border data collection and platform management is the RPIS, the digital infrastructure of the Upper Rhine Corporation.

Box 34: Upper Rhine Traffic Management Platform

The Upper Rhine Traffic Management Platform by the Upper Rhine Corporation (**Fehler! Verweisquelle konnte nicht gefunden werden.**) is an information system that connects ports authorities along the Rhine to ease container shipment. The aim of the digital infrastructure is to connect relevant stakeholders in the Upper Rhine Valley: Terminals, barge operators, barges seaports, customs, traffic management centres and river information systems. Exchanged data are used for custom declaration, corridor slot reservation, loading lists transfers and arrival time calculation on the Rhine.

5.4.4 Support cooperation models with the private sector to create trust by win-win situations

To promote data exchange and sharing between stakeholders in and between urban nodes, it is essential to support cooperation models between the public and private sector which create trust.

Box 35: 'Smart ways to Antwerp'

In Antwerp, the municipality started a communication platform to create partnerships with the private sector, and initiated specialized workshops, to find solutions for the reduced road capacity situation, and, thus, to make companies share information. These partnerships created input for pragmatic policies on the local level and contribute to improve local regulation. Main reason for action was reduced street capacity due to construction works. In this context, the CIVITAS PORTIS project 'Smart ways to Antwerp'[50] offered an online platform 'Marketplace for Mobility', where companies could apply for funding and administrative support if they had a project idea to reduce freight related traffic in the city-centre. The condition was that they cooperated with each other to share capacities. In 2017 and 2018, 28 projects were selected and received support from the municipality. In the course of the project, the different riverside areas have been identified as urban hubs for last-mile distribution of city logistics. "Smart ways to Antwerp" show how getting in contact with the private sector payed off for the city of Antwerp, because companies "have access to special knowledge", since they have the data, and they know where and when it makes sense to share, e.g., capacities. As a result, logistics operations were optimized. Lessons learned from the project are that there needs to be a win-win situation for the public and the private sector, or a sense of urgency to use a participative approach a way for capacity-sharing.

The industry tends to be rather conservative and hesitant in data-sharing. For obtaining data from the private sector, companies have to be convinced that it is both in their self-interest and in the public interest to share what is perceived as commercial data. It is therefore crucial that conditions for sharing data count for everyone involved.

"Companies want to have a level playing field when it comes to emissions and shifting to cleaner transport."

This makes regulation of data-sharing important. As well, cooperation models should create trust by offering win-win situations to achieve optimal data-sharing. Here, voluntary cooperation, communication,

[50] https://www.slimnaarantwerpen.be/en/home

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promotion and informal organization with the private sector are key, as well as using a current sense of urgency in the context of, e.g. demographic change, or capacity constraints on the local level.

> *"The recommendation is to talk to the private stakeholders, they have so much knowledge, this is crucial to understand the supply chains on every level and how they work."*

This would mean that the public sector initiates, moderates and supports coalitions of private stakeholders in order to solve capacity problems. The public sector can provide financial incentives, data and administrative help or infrastructure, and use the knowledge of logistic operators and private companies to understand supply chains on every level.

> *"Let us support cooperation between the public and the private sector, they can develop innovative logistic concepts for capacity sharing, for example to make the delivery in the city-centre more sustainable."*

Freight-data platforms in urban nodes could be used by companies to offer capacity-sharing services to decrease the amount of, e.g., trucks or ships, which are partly empty. Regulation of these services is important, because sustainability objectives are not automatically in the self-concept of companies. The idea to share capacities is not new in the freight sector, e.g. online platforms for capacity sharing, e.g. for 'crowd-shipping', are seen by some as a new "industry disruptor". But, 'sharing' doesn't always result in emissions reductions, as demonstrated, e.g. by the substitution of public-transport trips by car-trips in the context of 'ride-hailing services' in the US. Thus, the approach of Antwerp to communicate with the private sector, and to offer incentives for imposing a political objective – reduce traffic by using multimodality – is appealing. How can such an approach be further developed and transferred to other urban nodes, or even adopted on the corridor-level?

5.5 Develop a performance-oriented and fact-based funding approach

Nodes and cities with a high function for the TEN-T need prioritised resources (where they are not competing with cities outside the TEN-T) to make up for the secondary effects that go along with being a highly functioning logistic hub, especially on the health and mobility side. The establishment of a performance-oriented and fact-based funding approach would ensure that financing follows freight, with a concentration on high volume nodes, or urban nodes with a high functionality on the network.

> *"It is important to identify urban nodes functionality for the network, here the function of an urban area is most important, not of the daily urban system. This is a different approach to the 88 urban nodes, which is much too theoretical and static."*

Highlighting the functional purpose of an urban node on the TEN-T would allow to better attribute funding according to the relevant functionality for the network. This includes to analyse the performance of logistic hubs on the comprehensive network.

Thus, Duisburg as the biggest European inland port and final station of the Chinese "One road one belt"-initiative in not classified as urban node on the core network, neither is Venlo with its function of a dry harbour for the port of Rotterdam. Their highly functioning logistic hubs are economically important for urban areas on the comprehensive network, but they also bring major disadvantages, such as a high

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consumption of space, high emissions of air pollutants and noise, compared to a relatively low amount of jobs per surface unit.

> *"We see it as problematic that there is no special funding (ERDF) for logistic hubs like us. We suffer from a lot of additional truck traffic due to our position as a major logistic hub, but there is no special funding line for cities like us. We have to compete with any other city for ERDF funding, even though we carry the secondary effects of the freight economy."*

In this context, an objective methodology based on assessing performance would be useful to identify functions and infrastructural needs and would make way for integrated infrastructure development that also takes liveability aspects into account.

Box 36: Data collection Gdynia

Understanding the function of a node in 2030 or beyond needs a vision for the urban node, which is based on its functionality. The example TriCity with Gdansk, Gdynia and Sopot shows that the original idea to give Gdansk priority as an urban node while Gdynia and Sopot 'act' as FUA does not work out. The reason is that Gdansk and Gdynia have both important maritime ports, and while Gdansk is eligible for funding as an urban node, Gdynia is not. But, considering the high growth rate of freight transport in the Baltic sea region, and Gdynia representing an entry point for the Baltic Adriatic Corridor, the city is heavily affected by the freight traffic which crosses the city-centre to the port. However, there is a severe lack of infrastructure to cope with the traffic. The municipality deplores missing road quality standards for TEN-T- accessibility and connectivity. At the same time, the city will face a considerable urban sprawl due to port activities, while missing the railway connection to the hinterland. This means, that growing urban sprawl will be accompanied by growing highway construction and truck traffic, if measures are not taken. So, the municipality of Gdynia asks what the criteria are for recognition as an 'urban node', and wants corridor policy to be reviewed according to the needs and potential of the functional urban area.

5.5.1 Develop indicators and methodologies to identify investment needs in urban nodes and to assess performance

It is thus recommended to develop a more advanced and criteria supported methodology for the distribution of funding, following the actual function of a node on the TEN-T. Such a methodology demands smart objectives and data to assess the value of an intervention[51]. Indicators feeding into this methodology should integrate present freight volumes and projections for future freight flows in the urban node and on the corridor segment. The methodology should be enriched by a survey, in which urban nodes inform about their infrastructure needs. This advanced methodology should be applied by urban nodes on the core and comprehensive network. It should be applicable for analysis and assessment of future infrastructure needs, such as bottlenecks and maintenance.

Indicators for such a methodology should, e.g., allow to assess the freight functions, the FUA, risks and resilience, and feed into measurable criteria for an 'ideal' urban node, which can serve as a benchmark. It is important to take different profiles of FUA into account and to reflect which set of indicators can reflect their functionality: cross-border versus not cross-border, poly-centric versus mono-centric, function and functional area, challenges and impact of solutions. These indicators can then be used to

[51] Van der Linden, K., Linssen, R. (2019): VitalNodes Final Toolbox (Mark 2) – based upon experiences gained with Tiers 1,2 and 3. Brussels.

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develop smart objectives[52] in integrated development strategies and project proposals, and thus, help to assess whether a project will have enough impact in its specific context. The relevant dimensions which serve to assess performance of an urban node need to be explored, and data sets need to be developed. The refined methodology can also serve as a basis for data-based planning from a transport perspective.

Such an objective and data-based approach of assessing infrastructure needs can also be used for analysing hinterland accessibility in a FUA, or accessibility of the comprehensive network or peripheral regions to the core network. As well, it could be applied for planning modal shift, energy transition, resilience and climate adaptation.

5.6 Facilitate multi-level governance and increase institutional capacity in urban nodes

What is good governance in the context of integrated freight infrastructure planning on the TEN-T, and why is it necessary? It means that stakeholders from different territorial levels, institutions and sectors work together to optimize interfaces between long-distance and local freight transport. Doing this, they ask for other important development objectives that can be integrated into local strategies. Or, the other way around, they aim at solving local problems and ask which multi-scale transport-goals can be achieved with a local strategy. Following this approach, liveability is automatically one objective of integrated development strategies.

The ‘optimal’ constellation of stakeholders depends on the local context. It can be a very local constellation, or it includes stakeholders from a regional, national level, or stakeholders across borders. They can be public, private or civic, work in different disciplines, and are characterized by their degree of experience, decision-taking and knowledge. Cooperation between different institutional levels and the public, private and civic sector is essential for creating sustainable interfaces between long-distance and local freight transport. Finding appropriate cooperation models with the private sector and balancing it against the interests of other stakeholders and citizens is particularly important for sustainable freight transport. The more interests are considered when planning for infrastructure, the higher the quality of the achieved solution will be. It is also important to consider that innovative solutions are often developed through informal processes and structures, which precede formal structures.

[52] The VitalNodes Toolbox (D3.5) suggests the ‘fingerprint’ method for better comparison of performance between urban nodes. The ‘fingerprint’ contains information on the urban node, the corridors, the current and forecasted function on the corridor, traffic flows, modal shift – including forecast and challenges for the urban node, and was used for preparing the VitalNodes workshop. How can this format be developed and integrated into a methodology to identify investment needs and to assess performance?

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Box 37: Railport Scandinavia

The port of Gothenburg is the largest marine port in Scandinavia, which makes Gothenburg one of its most important logistic hubs. Since the majority of goods transports passed through the city centre, and the national road network cut through the city to the port, the municipality wanted to transform the main supply road. A master plan was developed to relocate the former intermodal terminal of Gothenburg, to make way for new infrastructure and urban development. The municipal 'Railport Scandinavia' is today consisting of around 20 inland terminals in the hinterland of Gothenburg, connected to the port. 60 % of container flows are handled by rail shuttles. Since Gothenburg is also connected to 1 of 2 inland water ways in Sweden, for which 1-2 companies provide a solid base volume, the objective is to also raise the use of ship containers by inland barges (1 barge = 100 trucks), with a focus on small transported volumes.

The participating stakeholders are public and private. Thus, the marine port, 'Railport Scandinavia' and the terminals are owned by the municipalities and operated privately. The railway infrastructure is nationally owned, and shipping on sea/inland waterways is regulated by a national administration. Inland ports are owned by municipalities, and infrastructure fees are imposed by national administrations. And, of course, the logistic companies using the infrastructure are private.

Success factors of 'Railport Scandinavia' are: (1) The efficient cooperation between the Transport Administration, City of Gothenburg and the Port of Gothenburg resulted in a modern intermodal terminal in the very heart of logistics activities in Gothenburg, which creates new opportunities in the region. (2) Cooperation and common understanding between stakeholders at all levels. Thus, the institutional level needs to understand market needs, the business models and the role of the intermodal terminal: Where and how is business created? What is the role of infrastructure, of incentives and fees? (3) Applying a regional perspective helped to focus on a selected set of intermodal nodes. Goods volumes and flows were analysed to assess the impact of investments and to create business opportunities.

Especially urban nodes representatives from cohesion countries ask for guidance to better integrate policy and sectoral goals into comprehensive policies that can be taken up in project proposals.

> *"Stimulate the elaboration of governance models to bring stakeholders on the regional level together, such as public transport, companies, government layers."*

> *"There is a great need for a national strategy on intermodal logistics that links the right logistics to the hubs, considering freight on various levels – national and regional."*

Others go a step further by asking for commitment to multi-level institutional governance and cross-sector cooperation in project proposals. However, some urban nodes representatives see a possible obligation for a SUMP critical, because they fear that they would not be eligible for funding due to communication difficulties between the local and the national administrative levels.

> *"Request to make a SUMP or a policy plan when applying for funding. If there is no policy in place on a TEN-T corridor segment, then no funding!"*

5.6.1 Develop standards as condition for funding of integrated projects

There is a need to assist people working in administrations on several levels to develop coherent projects, also to increase the impact of European funding.

> *"Not only funding is missing, but also a coherent approach of developing and implementing big infrastructure projects. There is a great need for institutional and cross-sector / cross-level*

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governance cooperation to develop and implement mobility projects. Stakeholder coordination and cooperation is a major problem."

"What are good standards for Urban Consolidation Centres that also include governance?"

Possible standards for integrated strategies and institutional cooperation could be further based on the SUMP principles, adapted to the needs and scale of urban nodes and to freight transport planning. Thus, a SULP[53] on the basis of the FUA of an urban node would be the foundation for integrated infrastructure projects proposals. The challenge will be to receive the data necessary for the identification of the FUA and the following steps of the SULP. The eight SULP principles imply to (1) analyse the Functional Urban Area of an urban node with a special freight perspective, (2) develop a long-term vision and a clear implementation plan, (3) assess current and future performance, (4) develop all transport modes in an integrated manner, (5) cooperate across institutional boundaries, (6) involve citizens and relevant stakeholders, (7) arrange for monitoring and evaluation, (8) assure quality.

The VitalNodes Toolbox contains a framework for pro-active collaboration with the aim to 'reinforce the engagement and participation of stakeholders of different background related to infrastructure and spatial planning', which can be taken on by institutional stakeholders to structure the collaboration process[54].

Standards based on objective criteria and data could also be used for fact-based funding. Making cooperation and committed partnerships of stakeholders a prerequisite for CEF funding would foster goal-oriented collaboration for public-private partnerships.

Box 38: 'Grand Paris Express' - governance and consultation

The 'Grand Paris Express' (see Box 24) is stated to be the biggest consultation project in Europe and co-financed by the European Union. It has a dedicated capacity for consultation. Collaboration with all stakeholders is seen as an important enabler in the project, because it connects municipalities and departments in the metropolitan regions. The state-owned structure, 'Societé du Grand Paris', unites institutional stakeholders from municipalities and regional associations, financing bodies, public transport, private companies, stakeholders with planning background from different levels, and the national ministries responsible for environment, economy and cohesion. It has three levels of governance: a management board, a supervisory board and a strategic committee. The latter acts as a think-tank for the project. Dialogue and co-creation with residents took place from the beginning of the project, is seen as particularly important, and is realized via community agents. Since the beginning of the construction works, dialogue is even more intensified.

Key elements to overcome policy coordination challenges for integrated projects on the level of urban nodes, are, threefold: adequate funding, capacity building, and community building for freight transport planning. Since recommendations for funding will be processed later and jointly in the Vital Nodes project, we will concentrate on capacity (5.6.2) and community building (5.7) in this deliverable.

5.6.2 Support institutional capacity-building

It is recommended to create opportunities for further knowledge exchange and learning for planners on every level of the TEN-T. This is a reaction to a high variety in institutional capacity and competences for sustainable mobility and freight-planning in urban nodes. All representatives of urban nodes complained

[53] Eltis (2019): Develop and implement a Sustainable Urban Logistics Plan (SULP). European Commission/DG Move. Brussels.
[54] Van der Linden, K., Linssen, R. (2019): VitalNodes Final Toolbox (Mark 2) – based upon experiences gained with Tiers 1,2 and 3.

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that the freight topic has not the appropriate urgency on the local and/or national political agenda. Thus, building individual and collective competences for freight-planning, especially in data-based planning, is considered highly important.

> *"We want to develop intermodal terminals, but we lack data. So, we don't know the need for intermodal terminals in terms of capacity, where to locate them, how is railway competitive to road, how to predict spatial preferences of logistic companies?"*
>
> *"How can we include modelling of freight transport into SUMP?"*
>
> *"We have a huge cargo and parking problem inside our port city, with major congestion problems. Now we have an extra lane for the tram, this makes the road narrower and creates enormous problems. As well, there is a high average possession of cars per family, up to 4 cars, along with very limited parking space. No underground parking due to archaeological sites. The biggest problem is to find a balance between private and cargo parking. The municipality does not find solutions. We have to change the mindset of the people, we don't know how."*

Offering dedicated learning opportunities with a special focus on freight planning for urban and traffic planners, e.g. by staff-secondments to summer-schools, is seen as a good way to increase institutional capacity. Another recommendation is to facilitate good practices via established networks and structures.

5.7 Involve urban nodes by using established networks and structures

Urban nodes representatives, mostly coming from the public sector, want to be better integrated in the decision-making process. They want to be informed and represent their interests, also to bring forward what the needs in the urban nodes really are. Especially the corridor-fora are seen as too detached from the local situation in the urban nodes. Nodes and logistic hubs should have more participation in decision-making on the TEN-T level.

Currently, there is no mechanism which ensures a continuous exchange with urban nodes stakeholders beyond individual Corridors' working groups of regions and urban nodes. An essential goal of such an exchange would be to raise mutual awareness of stakeholders. Within the TEN-T community there should be an increasing understanding of urban mobility policy and urban nodes stakeholders should be much more aware of their strategic role in the TEN-T and impacts of planning practices on the regional, national and transnational network level. The exchange to raise the profile of TEN-T among urban stakeholders as well as to raise the profile of the urban mobility context among TEN-T stakeholders should be facilitated through an active cooperation with existing networks, like Polis, Eurocities or NUVit. Most of the 88 urban nodes are either Polis or Eurocities[55] members. Urban nodes should also be more involved into well-established conferences on urban mobility (SUMP conference, CIVITAS Forum etc.) in order to facilitate exchange among stakeholders. In addition, the urban profile in the TEN-T Days (e.g. continue to invite mayors as keynote speakers) should be strengthened.

[55] Eurocities has recently published a planning guide for metropolitan regions. https://www.eltis.org/sites/default/files/sustainable_urban_mobility_planning_in_metropolitan_regions.pdf

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"The EU is perceived as far away from conditions here. There should be a change from the top-down to bottom-up decisions, to see what really the needs in the nodes are. The corridor forums are too high-level. Logistic hubs should have more influence."

"What are the conditions for participation in the freight sector? As a logistics company, either you have to gain something from participating or you need to have a real problem and a sense of urgency. There needs to be a win-win for everyone involved."

Many urban nodes representatives ask to organise an annual 'Urban Nodes Conference' such as the Urban Nodes Forum in Budapest, April 4 to 5 2019. The effect of this conference was remarkable, similar to the 'Urban Nodes Workshop' in Venlo, February 8, 2019. At first, it was not easy to mobilise planners, transport authorities, logistics operators, and others to attend the Forum, but discussing the topic ('planning for freight') was an eye opener for many people attending the workshops.

5.8 Align international trade development with European, national and local policy requirements

As well, some urban nodes suggest observing and to analyse Chinese investments and the development of the 'New Silk Road' / 'One Road one belt initiative', which is currently seen as major threat for the planned network and corridor development as well as for FUA which are directly affected by transport and logistics flows. There is a need for more facts and analysis to assess impacts on the infrastructural and economic development as well as related opportunities.

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6 Conclusions from the validation process and interaction with Tier 2 and Tier 3 urban nodes

The consultation process with stakeholders from urban nodes shows a range of validation topics that are of high interest for urban nodes when it comes to planning for sustainable freight, and which have a relevance for TEN-T policy and related funding. The relevance is explained by the significance of the topics for closing the gap between long-distance and local redistribution transport of goods in integrated strategies, by paying respect to the liveability principle. The Vital Nodes Toolbox (D3.5) contributes methodologies, such as the (1) 'framework for pro-active collaboration' or the (2) 'fingerprint', which will be tested/discussed and amended during consecutive workshops under the leadership of WP 5 until October 2019.

(1) The 'framework for pro-active collaboration' will be tested during a thematic Vital Nodes workshop on "Carbon-neutral energy transition and green shipping". This workshop will build on the regional roadmap process for carbon-neutral logistics with municipalities located in the FUA of Duisburg and document a cross-border 'plan game' for fuel-cell shipping on the Rhine between Arnhem and Duisburg. It takes place on September 25th in Duisburg. The main objective is to develop a multi-stakeholder roadmap for carbon-neutral long-distance and cross-border freight transport. Other urban nodes such as e.g. Arnhem/Nijmegen or Duesseldorf as well as further urban nodes along the Rhine will be invited.
(2) The 'fingerprint' will serve as a major input to be discussed with experts from urban nodes and freight organisations during a 'Freight data and indicators' workshop in September 2019, in Trieste. The workshop will evolve around basic requirements for defining optimal data-sets and indicators for smart objectives of integrated projects, data-based planning, definition of FUA's and methodologies for performance-based funding, but also for capacity-sharing moderated by the public sector.

Tentative other topics to further elaborate on are:

- 'cross-border governance', to refine recommendations which can be used for the further considerations about standards for, e.g., governance models in integrated projects, and built upon in further work programmes or funding. EGTC Rhine-Alpine would be an important stakeholder for this topic.
- Adaption to SUMP/SULP planning phases and steps to integrate urban nodes on the TEN-T, and how this can be used for defining smart objectives and performance-based funding procedures.

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8 Annex

Note from Breakout Session [add number and title]

1. Participants mentioned the following challenges (and solutions) of being an effective urban node on the TEN-T (especially from a freight and logistics perspective)

[Please briefly indicate good practices, deviating opinions, new arguments, facts, special situations in member states or in nodes of specific sizes…].

2. The following expectations about future regulations regarding TEN-T and CEF were expressed

[Please provide concise statements and add a short piece of context information on who made the statement that may be useful for interpretation (e.g. "Sustainable last mile delivery can be organised well by cargo e-bikes. Vehicles and supporting infrastructure should be eligible for CEF funding. Representative of SME in logistics area").]

3. Participants would like to have access to results from research in the following areas

[As before.]

Which research needs to you consider relevant to make freight transport on the local, metropolitan and TEN-T level sustainable?

4. The following specific funding needs were expressed

[As before.]

5. Participants presented the following approaches for improved integration of their functional urban areas into the TEN-T (especially from a freight and logistics perspective)

[Please describe key approaches, for example in terms of improving *physical links, policies (e.g. land use planning), networking (e.g. on corridor or regional level).*]

6. The following participants attended

Please provide a list or attach attendance sheet or copy of business cards).

7. The following participants would like to be Vital Nodes experts for WP1

Please provide contact details.

8. The following participants would like to be brought into contact with Vital Nodes experts

Please provide contact details and add relevant field.

Thank you for taking notes and preparing this document! Please send it to Marlene Damerau (m.damerau@rupprecht-consult.eu)

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