



Validated Recommendations

Validated recommendations
for funding instruments and needs,
future research needs and integration
of Urban Nodes on the TEN-T corridors

Deliverables D5.2, D5.4 and D5.5

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Author: S. van der Werf, J. Arts, K. van der Linden

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Editors	Sjaak van der Werf (RWS), Jos Arts (RWS), Kevin van der Linden (RWS)
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Written by	Geert Smit (ECO), Martijn de Bruijn (OMG), Kevin van der Linden (RWS), Ricardo Poppeliers (ECO)
Contributors	Marlene Damerou (RUPP), Tomas Holmlund (TFK), Ruben van Kersbergen (TFK), Rainer Müller (EUROVienna), Peter Staelens (EUROCITIES), Giacomo Lozzi (Polis), Ivo Cré (Polis), Thomas Ertel (EGTC Rhine – Alpine Corridor)
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Abbreviations

ALICE	Alliance for Logistics Innovation through Collaboration in Europe
CEDR	Conference of European Directors of Roads
CEF	Connecting Europe Facility
ECO	Ecorys
ECTP-CEU	European Council of Spatial Planners-Conseil européen des urbanistes
EFSI	European Fund for Strategic Investments
EGTC	European Grouping of Territorial Cooperation
EIM	European Rail and Infrastructure Managers
ERDF	European Regional Development Fund
ERTMS	European Rail Traffic Management System
EU	European Union
ESPON	European Observation Network for Territorial Development and Cohesion
EUR	Euro
FP	Framework Programme
FUA	Functional Urban Area
INE	Inland Navigation Europe
MoS	Motorways of the Seas
O-D	Origin-Destination
OMG	Departement Omgeving Vlaanderen
POLIS	European Cities and regions networking for innovative transport solutions
PPP	Public Private Partnership
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
VN	H2020 project Vital Nodes
WP	Work Package



Executive Summary

Point of departure: policy context

The Vital Nodes (VN) project contributes to more effective and sustainable integration of urban nodes into TEN-T corridors.¹ This is done through innovative solutions, which optimise accessibility, liveability and vitality, designed to create equal emphasis on corridors and nodes.

The Vital Nodes project has two main objectives:

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; and
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.

This report focusses especially on the first objective to deliver validated recommendations on the integration of urban nodes into the TEN-T network, on funding instruments and needs and on future research needs.²

Key is the integration element, bringing two important policy domains together, i.e. urban mobility policy as defined in the Urban Mobility Package (2013), defining supporting measures in the area of urban transport and complemented by the concept of SUMP (Sustainable Urban Mobility Plans), and TEN-T policy, as defined in the TEN-T guidelines (2013).³

The TEN-T guidelines define 'urban node' as: "an urban area where the transport infrastructure of the TEN-T network, such as ports, including passenger terminals, airports, railway stations, logistic platforms and freight terminals located in and around an urban area, is connected with other parts of that infrastructure and with the infrastructure for regional and local traffic". The guidelines (article 50) stress the importance of "the integration of urban nodes into the TEN-T network (including promotion of sustainable urban mobility)" and that there is need of (article 30): (i) providing connections (at various levels), and (ii) mitigation of the exposure of urban areas to negative effects of transport (as a result of being an urban node on the TEN-T network) for the 88 urban nodes on the core network (listed in Annex II of the TEN-T Guidelines).

Based on the TEN-T guidelines, the following comments can be made:

- The concept of urban node is broadly defined. The selected 88 urban nodes fit the definition but cannot only be justified based on the description;
- the urban area seems to be defined at the scale level of the city in Annex II. Challenging issues in the field of freight and logistics, passenger flows, sustainability, liveability and especially integration of urban nodes in the TEN-T network, however, require an integrated policy answer, which often goes beyond the city level as such challenging issues also comprise the peri-urban and regional areas surrounding cities. Therefore, where needed, the focus of the Vital Nodes project is on the urban-regional or Functional Urban Area (FUA) level.

¹ 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.

² A total of four outputs are defined, see VN documentation (www.vitalnodes.eu)

³ REGULATION (EU) No 1315/2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU

- the 'dual objective' of urban nodes is reflected in the TEN-T regulation, i.e. addressing TEN-T related urban nodes objectives (providing connections, mitigating negative effects), while also promoting sustainable urban mobility;
- the function of the urban node is defined in terms of providing connections. This is understood from a TEN-T or corridor perspective. The function of the urban node in terms of socio-economic development of the city or region is not addressed.

The functionality of an urban node is highlighted in the TEN-T corridor.⁴ Urban Nodes are a **constitutive element of the TEN-T Network** and foster the integration of the network into urban circumstances like spatial structure, economy and regional development. The structures of Urban Nodes are **polycentric** and not defined by administrative borders. Instead they are functional areas including the hinterland of a city and the peri-urban-areas with flexible borders depending on local, regional and European developments. Any transport infrastructure, enterprise, manpower and administrative level therein are part of the node. Within the functional area the status as an Urban Node can represent an important locational factor.

Policy domains: Urban Mobility and TEN-T

The objective to integrate urban nodes in the TEN-T network, is influenced by two policy domains, i.e. Urban Mobility and TEN-T policy. As presented in, the two policy domains overlap, for example on 'last mile' solutions or – more generally – in providing connections. This is the so-called 'focal area' for integration. At the same time, it is understood that Urban Mobility and TEN-T policy are broader (than the overlapping area) – for example in terms of the promotion of cycling for urban mobility policy or accessibility to remote regions for TEN-T policy, however, these areas which do not directly overlap could influence the integration of urban nodes in the TEN-T network.

It can be concluded that the Vital Nodes project focuses on the overlapping area between urban mobility and TEN-T, while considering the wider policy setting in order to extend the overlapping area for further integration. The earlier mentioned filter for defining recommendations will focus on the overlap and on integration of urban nodes in TEN-T.

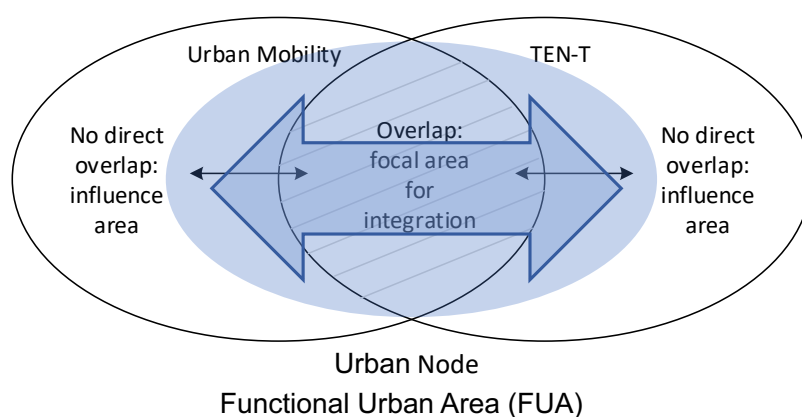


Figure 1: Focus of Vital Nodes: urban nodes and related policy fields

⁴ E.g. <https://www.scandria-corridor.eu/index.php/en/corridor/urban-nodes>. See: article 30 and 41 of REGULATION (EU) No 1315/2013

Vital Nodes: developing a comprehensive policy strategy

Within the Vital Nodes Toolbox (D3.5)⁵ a broad range of methods and approaches is described, categorised by three questions: why, what and how:

1. **Why** should one act in the current situation (what is the added value)?
2. **What** are (potential) synergies between the spatial and network dimension and what strategies might be chosen to obtain value?
3. **How** could the chosen strategy be implemented effectively?

The Vital Nodes consortium concludes that key in the process of developing a comprehensive policy strategy in the multi-actor context (*Figure 1*) is 'value' and the related question: "What is the added value of integrating the spatial and network dimensions?" That is why it is important for each actor to specify smart objectives and define the added value from an own perspective (for the urban nodes, region, logistics sector, infrastructure providers etc.). Resulting in the answer on the 'why'-question: "Why should one act in relation to the current situation?" This added value could be either positive or negative and related to one's own smart objectives.

The linkage between policy objectives reflecting spatial and network challenges regard the interfaces between land-use and urban/regional mobility on the one hand and transport infrastructure, freight and logistics of the broader corridor level/functional urban area (TEN-T) on the other. Answering the 'what'-question – "What are (potential) synergies between the spatial and network dimension and what strategies might be chosen to obtain value?" – leads to a required 'project' focus. When searching for challenges, linkages and synergies between the network and spatial dimensions different geographical scales are important – the local/city level, the functional urban area level, and the corridor level. Looking for the interrelationships between these different scales is essential for Vital Nodes – multi-scalar thinking, zooming in and out – at which the Functional Urban Area (FUA) is key for the integration of urban nodes on the TEN-T network corridors (see Vital Nodes Toolbox, D3.5).

The potential synergies have to be considered by addressing the 'how'-question; "How could the chosen strategy be implemented effectively?" Relating to the interrelated implementation dimensions, consisting of 'time', 'institutional' (or governance) and 'financial'. E.g. the creation of socio-economic value through connecting communities of various sides of a physical barrier by overcoming this barrier, while connecting the communities resulting in increased spatial quality and liveability.

The described relation between the dimensions all starts from knowledge about the topics and the (local) context. For that reason, it has to be stressed how important it is to work together with all relevant stakeholders and actors from the field in a multi-stakeholder approach. The network and spatial dimensions issues are often related to content-based discussions in which advisors and specialists play an important role. The implementation dimensions are more evaluative and tactical and operational in nature (timing, governance and institutional issues, financial issues), often involving generalists and strategic advisors/governors, also regarding the decision-making process.

The resulting process scheme (*Figure 2*) necessarily consists of a feedback loop, in which data and monitoring are vital, covering interaction with relevant stakeholders and continuously looking back and forward to the added value created for each of the related stakeholders. An important aspect of the Vital Nodes approach is the fact-based comprehensive nature, in which interaction multiple stakeholders about integration of urban nodes along corridors is fuelled with data, maps, knowledge, experience about both multi-modal infrastructure, mobility, freight/logistics and spatial developments at the urban node, FUA and corridor level.

⁵ See: www.vitalnodes.eu

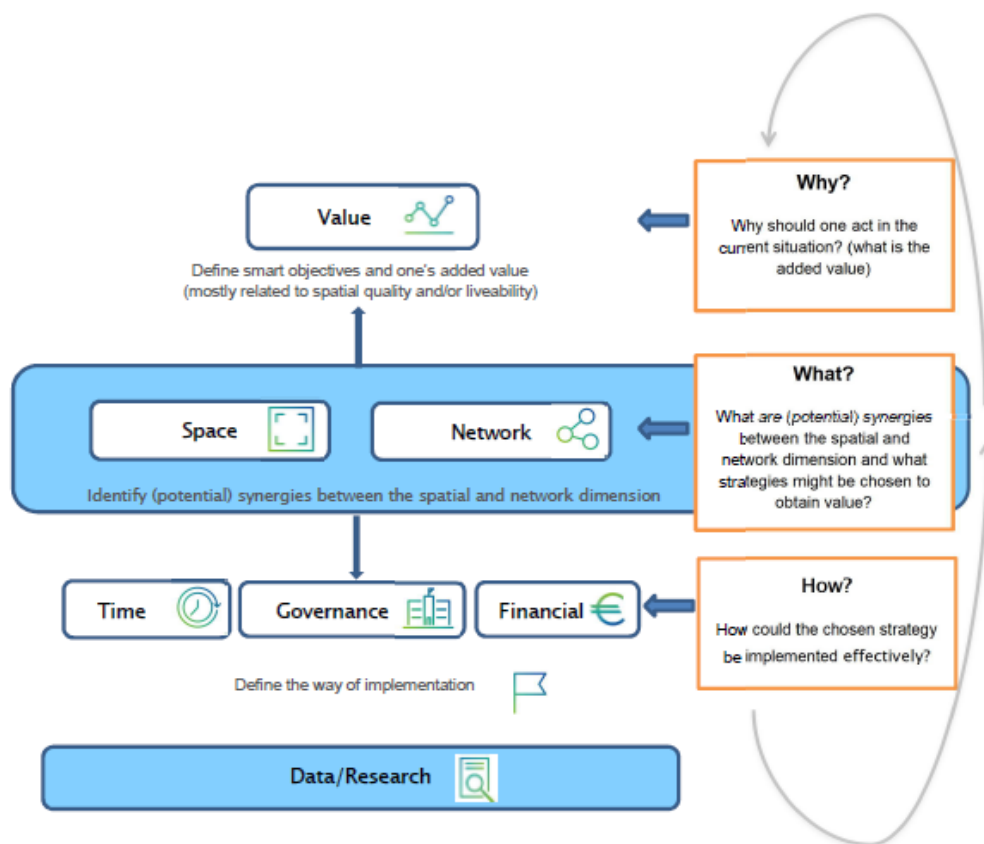


Figure 2: Guiding structure for comprehensive policy strategy for integration of urban nodes and TEN-T

The validated recommendations of the Vital Nodes project are categorized in 5 different clusters, which are corresponding with the structure of the Vital Nodes Toolbox of D3.5. The cluster 'Research/data' is an additional cluster because one of the objectives of the Vital Nodes project is to deliver validated recommendations on research (D5.4) as well. Based on the Vital Nodes Toolbox (see *Figure 2*), there are 5 different clusters where the validated recommendations are linked with:

1. Strategy/Value
2. Network/Space
3. Governance/Time
4. Finance/Funding
5. Research/Data

In this overview the 5 different clusters are mentioned with the numbered recommendations. Also, the group of actors is mentioned. These are the target groups who can act at the recommendation.

1. Strategy + Value

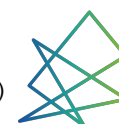
Recommendation	Actor
1. Support the use of the Vital Nodes Toolbox as a guide for developing a fact-based comprehensive policy strategy to achieve the objectives of integrating urban nodes, Functional Urban Areas and TEN-T (e.g. by incorporating the VN Toolbox into a SUMP topic guide).	EC
2. Support the common understanding of the responsible actors at different policy levels (urban, Functional Urban Area (FUA) ⁶ , national, transnational).	EC, Urban Nodes, FUA
3. Support collaborative planning at different policy levels – urban, Functional Urban Area (FUA) ⁷ , national, transnational (e.g. by incorporating the VN lessons into the new TEN-T policies and guidelines, and by revisioning the list of 88 urban nodes of the TEN-T Appendix II).	EC, Urban Nodes, FUA
4. Develop a value oriented comprehensive policy (data based, using indicators, monitoring for assessment of value and focused on capturing values created).	Responsible policy actors

2. Network + Space

Recommendation	Actor
5. Develop a multi-modal transport planning and coordinated asset management, considering its impact at local, FUA and corridor level.	Infrastructure managers at Urban node, regional and national level
6. Develop additional guidelines on ITS applications at the interface between long-distance and last-mile transportation and the use of <i>traffic management tools</i> for information and navigation services.	Infrastructure managers at city, regional and national level.
7. Invest in infrastructure interfaces at urban nodes, <i>both</i> in infrastructure connections, terminals, hubs and logistic centres.	Urban Nodes, infrastructure managers, terminal and logistics centres operators
8. Stimulate the coordination of freight/logistics and persons transport, e.g. by considering for (large) freight transport infrastructure also persons transport impacts and measures (vice versa).	Urban Nodes

⁶ See: recommendations on Time and Governance in Chapter 4

⁷ See: recommendations on Time and Governance in Chapter 4



Recommendation	Actor
9. Support the development of consolidation centres, which improve the link between the TEN-T and urban nodes, as they contribute to time savings for drivers and shared capacities for last-mile transport. Also employ the potential of such consolidated centres for production as well as for deployment of alternative fuels infrastructure and other innovation deployment.	EC, Urban Nodes
10. Utilize the strategic real estate positions of relevant land owned by infrastructure managers (such as unused railway tracks and marshalling yards) or by logistics service providers in urban areas because for developing a comprehensive policy strategy land use and real estate are vital elements.	Urban Nodes, financing institutions
11. Support the development of guidelines and standards for access restrictions in urban nodes along main transport routes on the TEN-T core network.	Urban Nodes, freight and logistic sector

3. Governance + Time



Recommendation	Actor
12. Stimulate a more <i>active collaboration between stakeholders</i> vertically across governance levels and horizontally across sectors and disciplines. Expand the <i>geographical scope</i> of urban nodes and focus on <i>regional cooperation on the FUA level</i> . Regarding this also provide incentives for public-public and public-private cooperation and for the involvement of civic society.	EC, Urban Nodes
13. Enable TEN-T related cross-border collaboration and solutions for urban nodes taking into account the FUA.	Urban Nodes, national transport departments, EC and international partners
14. Develop skills and knowledge on freight logistics and integrated planning by stimulating active <i>capacity building</i> in urban nodes.	Urban Nodes, European Network organisations
15. Investigate the possibility to increase the involvement of the urban nodes into the coordination of the nine TEN-T core network corridors (CNCs) by a - dedicated urban nodes working group; and - dedicated Urban Nodes European Coordinator.	EC
16. Create an action program, including a roadmap for implementation on how to better link their urban nodes to the respective corridor(s).	Urban Nodes
17. Facilitate institutional networking by establishing a community of urban nodes/TEN-T corridor professionals (see also WP! Deliverable VN Legacy) .	Urban Nodes



4. Finance + Funding

Recommendation	Actor
18. Provide funding for urban nodes focused on integration in the TEN-T corridors by pre-allocating budget in upcoming calls. E.g. a stepwise 5-10-20% of CEF funding for integrated investment in infrastructure, mobility, logistics, spatial and environmental measures enhancing such integration.	EC , financing institutions
19. The complex investment needs of urban nodes should be recognized in CEF financing – going beyond sectoral boundaries in grant decisions (e.g. similar to the climate mainstreaming objective of MFF).	EC, financing institutions
20. Combined funding solutions should be explored for integrating urban nodes in TEN-T corridors. e.g. by using existing urban earmarking (ERDF), or by linking up to SUMP's) Multiple funding sources can be mobilized to implement integrated strategy, which can be stimulated by defining eligibility and award criteria. Also an exchange platform with different EC services (DG MOVE, REGIO), and EIB could facilitate streamlining of procedures.	EC, EIB, financing institutions

5. Research + Data

Recommendation	Actor
21. Facilitate research, innovation and implementation by mobility labs. Use <i>urban nodes as research, innovation and implementation platforms</i> , being the main hubs for local/regional network (FUA) and TEN-T network (e.g. regarding alternative fuels, digitalisation).	Urban Nodes, TEN-T coördinators
22. <i>Stimulate further development on data-based policymaking and planning</i> , including the creation of a <i>data collection framework</i> and applying the <i>relevant datasets</i> .	Urban Nodes, EC
23. Develop a comprehensive list of data indicators by establishing a <i>monitoring framework</i> ⁸ to determine the functioning of urban nodes, the FUA and network	EC, Urban Nodes
24. Develop <i>tools to support sharing of mobility related data in urban nodes</i> with other public and private partners in the logistics chain at corridor level. In order to move towards multimodal Logistics as a Service.	EC, Urban Nodes, other public and private partners in the logistics chain
25. Promote further research on the interfaces of freight/persons, intra-/inter-urban, last-mile/long-distance transport and on spatial-economic analysis of Functional Urban Areas, integrated assessment and business-cases as well as related multi-level governance approaches.	EC

⁸ Note: this recommendation needs to consider the work that is done in the SUMP project (See: Rupprecht, https://www.eltis.org/sites/default/files/c3_bohler.pdf)

Outlook

The Vital Nodes project, and more specifically this report, has clarified the need for collaboration on all levels to integrate infrastructure and spatial planning in the FUAs. The results of Vital Nodes workshops in the urban nodes show that there is a need for further cooperation between urban nodes. To this end it is important to sustain a network for exchange of experience and knowledge and to extent knowledge on approaches for integrating urban nodes along corridors – the Vital Nodes Network, as is described in the Vital Nodes Legacy. The Vital Nodes partners are willing to contribute in-kind to such network but it will need support of the EC, which is elaborated in a Road Map (see Appendix G).

From Vital Nodes and this report, it can be concluded that there is ‘no silver bullet’ for the integration of urban nodes along the TEN-T corridors. This integration issue is complex and multiplicity, an requires a cross boundary-spanning approach with the following major ingredients:

- linking the different scales (local, Functional Urban Area, and corridor level);
- linking multiple modalities, multiple uses (freight/logistics - persons transport), multiple dimensions (network, spatial, value, time, institutional, financial, implementation);
- raising awareness of urban nodes to be situated on the TEN-T network corridors;
- applying an integrated, multi-governance approach (beyond the conventional city boundary, with the FUA as starting point);
- importance of fact-based planning (linking strategic visioning, action programmes, project implementation and monitoring and evaluation);
- developing adequate data and assessment tools, and deeper understanding in spatial-economic analysis of urban nodes, FUAs and corridor segments;
- developing funding focused on integration and supporting combined/co-funding;
- establishing an urban nodes coordinator, working group and a community/network of professionals.

As indicated at the beginning, the objective to integrate urban nodes in the TEN-T network, is influenced by different policy domains, i.e. urban mobility and TEN-T policy. It can be concluded that for further deploying and extending the Vital Nodes knowledge and network, there is need for extending the overlapping area between urban mobility and TEN-T, thereby considering the wider policy setting in and enhancing further integration.

A more integrative approach will not be guaranteed by stimulating a smarter multi-level approach only, but also relates to other issues, for example the link between Horizon 2020 and Connecting Europe Facility (CEF), and linking well and making smart use of networks and events as TRA conferences, TEN-T Days and SUMP conferences etc. A better balance between infrastructure and sustainable mobility on the one hand, and liveable, economically vital urban regions on the other, may only achieved be when a multi-sector approach with corresponding research & innovation, funding and governance mechanisms is adapted.

By following such approach, also in the future there is need for a Vital Nodes Network in order to provide exchange of knowledge and experiences, and recommendations that can be taken as input for EU policy development and implementation, on e.g. the ongoing/future evaluation, and the subsequent revision, of the urban mobility package, the SUMP-guidelines, and the TEN-T regulations.

1 Introduction

1.1 Background

Transport provides vital functions to the European Union and their cities, enabling economic growth and access to jobs and services. Urban nodes⁹ are crucial for the effectiveness of the core network of the TEN-T (Trans-European Transport Network). Urban nodes are often the origin and/or destination of most long-distance transport flows.¹⁰ Urban nodes are also the location of major multimodal transport hubs (for both persons and freight/logistics transport) and are crucial regarding the interfaces of long-distance and last-mile delivery). However, urban nodes must also tackle social and environmental issues, such as urban/peri-urban congestion, poor air quality, noise exposure, and transport safety. Institutionally, however, freight/logistics transport, urban mobility, infrastructure and spatial planning are still mainly conventional shaped worlds, which have not yet been integrated.

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, facilities). Efficient freight delivery across the nodes into the last-mile is crucial for urban vitality (regarding social, economic and environmental quality of life), as well as dealing with social and environmental issues, such as congestion, air quality, noise exposure and 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 construction and intelligent use of the European transport network.¹¹

With an increasing number of inhabitants in combination with ever-growing freight transport volumes, different problems and challenges arise in urban nodes, which call for an integrated and innovative approach.

1.2 The Vital Nodes project

The TEN-T programme is the main action plan for comprehensive transport infrastructure development throughout the European Union¹² and is essential for the ambition to realise a single transport area in Europe¹³. While responding to economic and private users' needs, this infrastructure development must fulfil key societal requirements, such as balanced accessibility and sustainability.

⁹ Definition 'urban node', EU 1315/2013, Article 3; see also Chapter 1.2.1

¹⁰ COM 2011/0650 final, COD 2011/0294

¹¹ 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

¹² See: http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/site/brochures_images/b1_2013_brochure_lowres.pdf

¹³ See: The Transport White Paper from DG MOVE setting the "new" EU transport policy: COM(2011) 144, White Paper 2011 'Roadmap to a Single Transport Area - Towards a competitive and resource efficient transport system'.

The Vital Nodes project contributes to more effective and sustainable integration of urban nodes into TEN-T corridors¹⁴ by innovative solutions for optimising accessibility, liveability and vitality, and to create equal emphasis on corridors and nodes.

The Vital Nodes project has two main objectives:

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; and
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.

To address these two objectives: methodological approaches have been developed (D2.1 Appraisal methodology and guidelines, and D3.2 Format for Vital Nodes workshops for urban nodes and future case); validated recommendations on the integration individual urban nodes in the TEN-T Network have been made for the tier 1, 2 and 3 urban nodes (D3.3, D4.2, D4.3); solutions have been inventorized (D2.2, 2.4 and D6.2); a Vital Nodes Toolbox has been developed (D3.5); and a follow-up strategy and road map has been developed (D1.1-3 Vital Nodes Legacy); and validated recommendations have been made (D5.2, D5.4, D5.5) – See Appendix H for an overview.

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 taking into account passenger transport flows. Vital Nodes has collected good practices, experiences and opportunities, as well as deploying novel combinations of existing technologies and services.

The second objective has been worked out in Work package 1 (D1.1, D1.2 and D1.3) and brings existing networks together to create a network of networks for ensuring long-term engagement and successful implementation. Creating long-lasting cooperation between these existing networks is central to Vital Nodes. In order to enhance a sustainable legacy, the Vital Nodes network is not replacing existing networks but rather carefully connecting them, enhancing cooperation and knowledge development and exchange.

A more integrative approach will not be guaranteed by stimulating a smarter multi-level approach only, but also relates to other issues, for example the link between Horizon 2020 and Connecting Europe Facility (CEF). A better balance between infrastructure and sustainable mobility on the one hand, and liveable, economically vital urban regions on the other, may only be achieved when a multi-sector approach with corresponding funding and governance mechanisms is adapted. These mechanisms will be brought together in the recommendations for the future research and funding needs. This task will deliver recommendations in a broader perspective and take also other Commission research and funding programmes into account, for example the European Regional Development Fund (ERDF), as well as multi-donor funding.

¹⁴ 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.

This remainder of this report focusses especially on the first objective to deliver validated recommendations on the integration of urban nodes into the TEN-T network, on funding instruments and needs and on future research needs.¹⁵

1.2.1 Point of departure: policy context

Key to Vital Nodes is the integration element, bringing two important policy domains together, i.e. urban mobility policy as defined in the Urban Mobility Package (2013), defining supporting measures in the area of urban transport and complemented by the concept of SUMP (Sustainable Urban Mobility Plans), and TEN-T policy, as defined in the TEN-T guidelines (2013)¹⁶.

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 nodes¹⁷, 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 too¹⁸, urban nodes play a key role as centres of socio-economic, spatial and technological development

The TEN-T guidelines define 'urban node' as (article 3): "an urban area where the transport infrastructure of the TEN-T network, such as ports, including passenger terminals, airports, railway stations, logistic platforms and freight terminals located in and around an urban area, is connected with other parts of that infrastructure and with the infrastructure for regional and local traffic". The guidelines (article 50) stress the importance of "the *integration of urban nodes into the TEN-T network* (including promotion of sustainable urban mobility)" and that there is need of (article 30): (i) providing connections (at various levels), and (ii) mitigation of the exposure of urban areas to negative effects of transport (as a result of being an urban node on the TEN-T network), for the 88 urban nodes on the core network (listed in Annex II of the TEN-T Guidelines).

Based on the TEN-T guidelines, the following comments can be made:

- The concept of urban node is broadly defined. The selected 88 urban nodes fit the definition but cannot only be justified based on the description;
- the urban area seems to be defined at the scale level of the city in Annex II. Challenging issues in the field of freight and logistics, passenger flows, sustainability, liveability and especially integration of urban nodes in the TEN-T network, however, require an integrated policy answer, which often goes *beyond the city level* as such challenging issues also comprise the peri-urban and regional areas surrounding cities. Therefore,

¹⁵ A total of four outputs are defined. See: VN documentation (www.vitalnodes.eu)

¹⁶ REGULATION (EU) No 1315/2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU

¹⁷ See: <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013R1315> Annex II List of Nodes and the Core Comprehensive Networks

¹⁸ 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](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

where needed, the focus of the Vital Nodes project is on the urban-regional or *Functional Urban Area (FUA)* level.

- the 'dual objective' of urban nodes is reflected in the TEN-T regulation, i.e. addressing TEN-T related urban nodes objectives (providing connections, mitigating negative effects), while also promoting sustainable urban mobility;
- the function of the urban node is defined in terms of providing connections. This is understood from a TEN-T or corridor perspective. The function of the urban node in terms of socio-economic development of the city or region is not addressed.

1.2.2 Policy domains: Urban Mobility and TEN-T

The objective to integrate urban nodes in the TEN-T network, is influenced by two main policy domains, i.e. Urban Mobility and TEN-T policy. As presented in, the two policy domains overlap, for example on 'last mile' solutions or – more generally – in providing connections. This is the so-called 'focal area' for integration. At the same time, it is understood that Urban Mobility and TEN-T policy are broader (than the overlapping area) – for example in terms of the promotion of cycling for urban mobility policy or accessibility to remote regions for TEN-T policy, however, these areas which do not directly overlap could influence the integration of urban nodes in the TEN-T network.

It can be concluded that the Vital Nodes project focuses on the overlapping area between urban mobility and TEN-T, while considering the wider policy setting in order to extend the overlapping area for further integration. The earlier mentioned filter for defining recommendations will focus on the overlap and on integration of urban nodes in TEN-T.

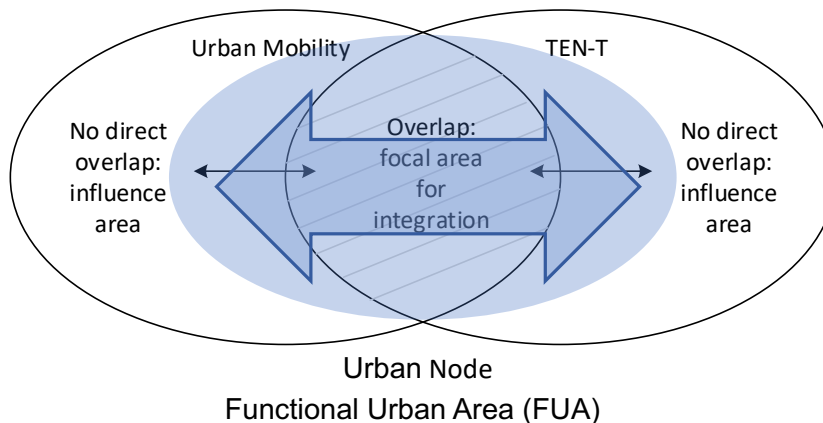


Figure 1: Focus of Vital Nodes: urban nodes and related policy fields

1.2.3 The challenges

While preparing and conducting the urban node workshops several trends and developments influencing the relation between the TEN-T (core) network and the urban nodes have been addressed and discussed. Global developments such as changing freight transport flows (China – Europe) that might have a major impact at regional and local scale levels e.g. in Budapest. These trends are affecting spatial planning and mobility and freight flows in and between metropolitan areas and will have impact on infrastructure networks and liveability, especially in urban areas. The most important, mutually connected and often-mentioned trends are listed below (see also D3.3). A trend is perceived as a general trend when it was discussed in at least five of the nine urban node workshops. Some of these trends will have major impact on the organisation of an urban node and the related transport flows in and around the urban node.

Growing cities with low-emission transport policies

In many European urban areas population is growing and policy has to focus on densification in the existing built-up areas with redevelopment of brownfield areas into mixed-use neighbourhoods. This results in enormous building tasks and related transport flows increasing pressure on the current transport system. At the same time cities are implementing Sustainable Urban Mobility Plans (SUMP) and are stimulating sustainable transport modes for inhabitants, employers, employees and visitors. In the meanwhile, energy flows are changing, automation starts playing a bigger role in mobility and innovations as 3D-printing could bring production closer to the cities. As many cities are introducing Low Emission Zones (LEZ) and enhance car-free or car-light lifestyles the position of urban ring roads is changing. The urban ring road might become a 'clash' between local goals for real estate development and liveability on the one hand and national and European goals stimulating seamless long-distance transport flows for persons and freight on the other hand.

Another topic in this context of urbanisation, densification and SUMP policy is the implementation of small distribution centres – 'microhubs' – in or near many urban nodes historic city centre. A microhub supports the modal shift from truck or van to a clean(er) vehicle, often an electric delivery van or cargo bike, in the last-mile freight delivery. Challenge is finding a good location for this micro hub(s) and linking up with global players. Developing smart policies on last-mile freight delivery and coherent regional planning of consolidation centres should diminish conflicts between citizens' liveability and housing densification on the one hand and the logistic sector's interest to deliver goods in time. Causing a 'challenge of space' on different scale levels.

E-commerce: increasing freight volumes and changing flows

More and more orders are placed online and via automatic order systems, which is called e-commerce. E-commerce and every day in-time delivery increase the amount of goods transported, between and within cities. Pressure on main road and rail networks is increasing, resulting in bottlenecks in and around urban nodes. However, this trend occurs at higher, European and global levels as well. Of high impact will be the development of the New Silk Road including new infrastructure and services between China and Europe e.g. ideas extending the broad-gauge railway system to Western Europe. Freight flows might shift or increase as a result of this development. Therefore, it is important to explore in what way the New Silk Road might impact the European transport network and freight flows.

XXL warehouses and logistics sprawl

Investments in freight logistics are mainly done by private or semi-private operators focusing on profit maximisation and cost minimisation. Seamless and often automated utilization of production processes and growing stock availability within short distance of major consumers markets is of growing importance for e-commerce companies. More and more products are required and big stocks are no exception – leading to an economy of scales and development of XXL warehouses. Drawback of this trend can be seen in many European towns and smaller cities

where the retail function is decreasing. But the enormous growth in trucks and vans crossing neighbourhoods and burden (road) infrastructure in and between cities is another major sign of this trend. Discussion is if a global player as for example should contribute financially to maintenance and improvement of public funded infrastructure – infrastructure that is now used for free and is playing a key role in achieving the company's commercial objectives. Another challenge is preventing the suburban landscape around European urban nodes from 'logistics sprawl': Should every municipality welcome a new distribution for a single company or should regions stimulate multi-company consolidation centres at well-balanced locations?

From a spatial point of view the changing relationship with the labour market is important. Logistic oriented companies choose their location based on the availability of labour potential and on access to this regional labour market. Based on these choices the logistical activities might be located on locations that seem less logic places from an infrastructural point of view.

Growing demand of flexibility of logistics

In the manufacturing industry – which is reshoring to Europe - robotization is taking over several functions while on road, rail and water digitalisation boosts multi-modality and aims to improve the efficiency of the corridors. Intelligent Transport Systems (ITS) are focused on aligning freight and demand for transport and different modalities and increase the efficiency of (using) the different modalities. Sharing transport modes and distribution/consolidation centres and vehicles on road, rail and inland waterways which is open and available for third parties is a growing demand. The wish to be flexible and share space and data to realise shorter waiting times in harbours grows. This so-called synchromodality becomes more important to stimulate fast and efficient freight delivery. However, combining cargo flows and stimulating synchro modality requests better collaboration between different private companies and different multimodal network operators, in terms of sharing data, liability, cross-border regulations, etc.

Transition of ports and industrial areas

Especially in many Western European urban nodes a shift towards a more service-oriented economy can be observed where classical industrial activities are diminishing. Which makes redeveloped warehouses need to be supplied with goods being consumed by residents, workers and visitors. Ports and industrial areas are changing in terms of types of goods transhipped and manufactured – as a result of the energy transition and development of automation – and new service and production activities step in. This results in different needs regarding labour force and a change from former industrial areas into brownfields that can be developed for housing, offices, new production services and mixed-use functions. Example is a former shipyard in the Rotterdam region that has been transformed into a maritime hotspot for innovative off-shore activities. This trend can be sketched as the quest to reinvent the 'the productive city': What opportunities can be identified to strengthen the regional manufacturing economy and thus contribute to an economically strong and socially inclusive urban region?

As our society is on the eve of major impacts of energy transition this will change the position and function of urban nodes that are to a large extent dependent on the transport and storage of fossil fuels and bulk. This impact is beyond the scope of the Vital Nodes project but during several of the urban node workshops stakeholders mentioned this trend and potential upcoming changes of major concern as changing freight flows, the planning of refuelling infra and the connection with energy grid development.

Freight and logistics versus persons transport and infrastructure planning

The nodal function of urban nodes is not widely known and recognized in all urban nodes. On policy and strategy level not every stakeholder and organisation is fully aware of the (potential) strategic position on the European transport network and the advantages and disadvantages of being an urban node. Most urban nodes focus on last-mile initiatives and for several cities the potential impact of the trends sketched before are beyond their local and

regional planning scope. In practice a real barrier exists between the planning of transport and infrastructure for persons and freight: Passenger transport is (mainly) driven by public policies whereas freight and logistics is (mainly) driven by market parties. As logistics enterprises focus on private goals as transport efficiency, public assets as network development and spatial planning are beyond their scope. As some of the trends described in this chapter offer combination or win-win opportunities for local and regional policy makers, it would be valuable to explore these opportunities e.g. for integrating freight and logistics in labour market policy and urban functions as housing, mobility and liveability. The Vital Nodes workshops have been a first step to create awareness and to put freight and logistics beyond the last-mile on the urban agenda. Further exploration of potential opportunities needs follow-up actions, deepening meetings and dissemination of experiences throughout Europe.

1.3 Scope of this deliverable

This deliverable contributes to the first of the two above-mentioned objectives of the Vital Nodes project by presenting validated recommendations to the European Commission to stimulate the sustainable integration of urban nodes in TEN-T and increase the effectiveness of the core network of the TEN-T. As such, this deliverable is an integral part of the delivery of Work Package (WP) 5, aimed at providing validated recommendations on integrating nodes and corridors, on funding needs and instruments, and on future research needs. This document integrates the deliverables D5.2, D5.4 and D5.5, as three deliverables are closely related. Reasons for this is that the validated recommendations for the sustainable integration of urban nodes into the TEN-T network cannot be seen separately from the validated recommendations on financial instruments and on funding- and research needs, vice versa.

1.3.1 Vital Nodes Framework: developing a comprehensive policy strategy

Within the Vital Nodes Toolbox (D3.5) a broad range of methods and approaches is described, categorised by three questions: why, what and how:

1. **Why** should one act in the current situation (what is the added value)?
2. **What** are (potential) synergies between the spatial and network dimension and what strategies might be chosen to obtain value?
3. **How** could the chosen strategy be implemented effectively?

The Vital Nodes consortium concludes that key in the process of developing a comprehensive policy strategy in the multi-actor context (*Figure 1*) is 'value' and the related question: "What is the added value of integrating the spatial and network dimensions?" That is why it is important for each actor to specify smart objectives and define the added value from an own perspective (for the urban nodes, region, logistics sector, etc.). Resulting in the answer on the 'why'-question: "Why should one act in relation to the current situation?" This added value could be either positive or negative and related to one's own smart objectives.

The linkage between policy objectives reflecting spatial and network challenges regard the interfaces between land-use and urban/regional mobility on the one hand and transport infrastructure, freight and logistics of the broader corridor level/functional urban area (TEN-T) on the other. Answering the 'what'-question – "What are (potential) synergies between the spatial and network dimension and what strategies might be chosen to obtain value?" – leads to a required 'project' focus. When searching for challenges, linkages and synergies between the network and spatial dimensions different geographical scales are important – the local/city level, the functional urban area level, and the corridor level. Looking for the interrelationships between these different scales is essential for Vital Nodes – multi-scalar thinking, zooming in and out – at which the Functional Urban Area (FUA) is key for the integration of urban nodes on the TEN-T network corridors (See: Vital Nodes Toolbox, D3.5).

The potential synergies have to be considered by addressing the ‘how’-question; “How could the chosen strategy be implemented effectively?” Relating to the interrelated implementation dimensions, consisting of ‘time’, ‘institutional’ (or governance) and ‘financial’ (*Figure 2*). E.g. the creation of socio-economic value through connecting communities of various sides of a physical barrier by overcoming this barrier, while connecting the communities resulting in increased spatial quality and liveability.

The described relation between the dimensions all starts from knowledge about the topics and the (local) context. For that reason, it has to be stressed how important it is to work together with all relevant stakeholders and actors from the field in a multi-stakeholder approach. The network and spatial dimensions are often related to content-based discussions in which advisors and specialists play an important role. The implementation dimensions are more evaluative and tactical/operational in nature (timing, governance and institutional issues, financial issues), often involving generalists and strategic advisors/governors, also regarding the decision-making process.

The resulting process scheme (*Figure 2*) necessarily consists of a feedback loop, in which data and monitoring are vital, covering interaction with relevant stakeholders and continuously looking back to the added value created for each of the related stakeholders. An important aspect of the Vital Nodes approach is the fact-based comprehensive nature, in which interaction multiple stakeholders about integration of urban nodes along corridors is fuelled with data, maps, knowledge, experience about both multi-modal infrastructure, mobility, freight/logistics and spatial developments at the urban node, FUA and corridor level.

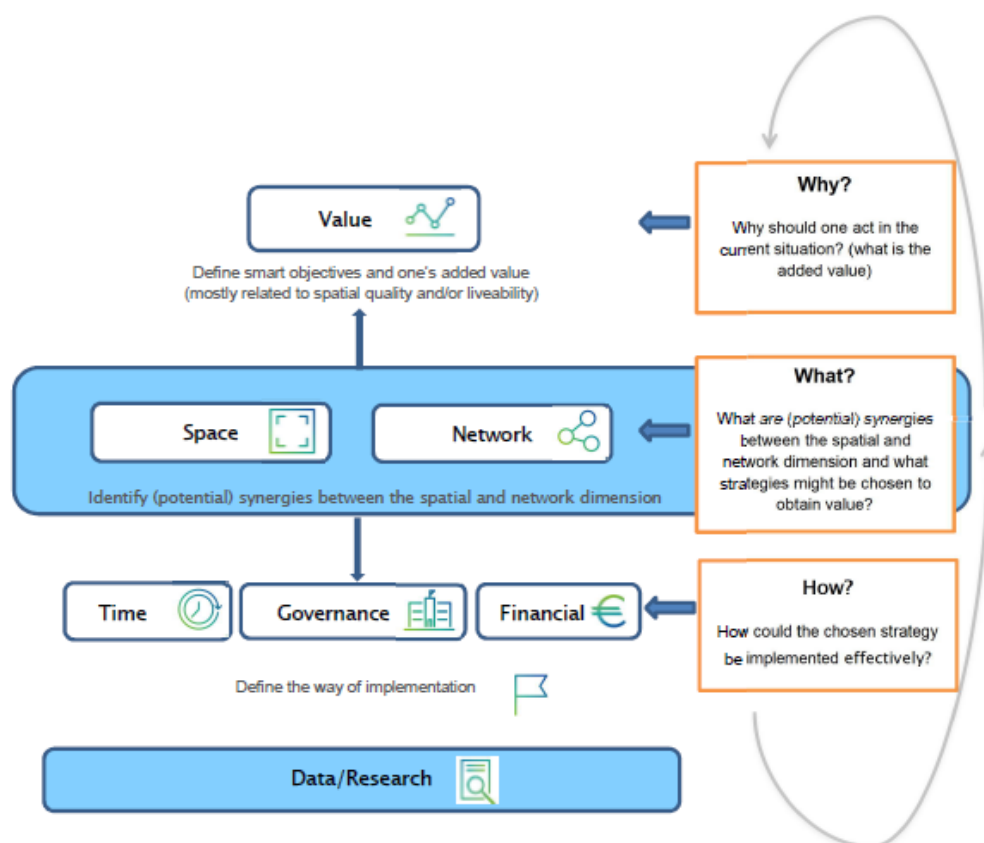


Figure 2: Guiding structure for comprehensive policy strategy for integration of urban nodes and TEN-T

The validated recommendations of the Vital Nodes project are categorized in 5 different clusters, which are corresponding with *Figure 2* and the structure of the Vital Nodes Toolbox of D3.5. The cluster ‘Data/Research’ is an additional cluster because one of the objectives of the Vital Nodes project is to deliver validated recommendations

on research (D5.4) as well. The *Table 1.1* below provides an overview of the five clusters for the 25 policy recommendations:






Cluster		Chapter	Number
Strategy/Value		2	1, 2, 3, 4
Network/Space		3	5, 6, 7, 8, 9, 10, 11
Governance/Time		4	12, 13, 14, 15, 16, 17
Finance/Funding		5	18, 19, 20
Research/Data		6	21, 22, 23, 24, 25

Table 1.1: Overview of the Clusters and recommendations

1.3.2 Validation process

During the Vital Nodes project, workshops have been carried out with (urban) nodes across Europe (the 8+1 urban nodes of tier 1, and 9 extra urban nodes of Tier 2, and Tier 3 urban nodes), as part of WPs 2, 3 and 4, which are closely related. This also makes the deliverables of these work packages strongly related. The validated recommendations in this deliverable are based on the above-mentioned WP deliverables, as well as on findings from key events, as included in WP6.2, additional expert meetings and validation among 88 urban nodes.

Next to the input gathered at the workshops of WP2, 3 and 4 (See: Appendix C) there has also been an important role within the Vital Nodes project for the Vital Nodes Advisory Board. The advisory board is made up of key representatives working in the field of infrastructure and spatial / urban planning, modality providers, freight and logistics, SUMP and several city networks. The Advisory Board advised and informed the Vital Nodes project about new and European developments within their field of expertise/network as well as gave feedback on (preliminary) results of the Vital Nodes projects (as part of the enriching and validation process). The Advisory Board members have committed to a post vital nodes project meeting in February 2019 (See: Appendix G).








Cluster		Organisation	Name
Network/Space		Inland Navigation Europe (INE)	Mrs. K. De Schepper
Network/Space		Conference of European Directors of Roads (CEDR)	Mr. S. Phillips
Governance/Time		EUROCITIES	Mr. M. Avramov
Network/Space		European Council of Spatial Planners- Conseil européen des urbanistes (ECTP-CEU)	Mr. J. Scheers
Research/Data		Alliance for Logistics Innovation through Collaboration in Europe (ALICE)	Mr. F. Liesa
Network/Space		European Rail and Infrastructure Managers (EIM)	Mrs. M. Heiming
Governance/Time		European Cities and regions networking for innovative transport solutions (POLIS)	Mrs. K. Vancluysen

Table 1.2: Overview of the members of the Vital Nodes Advisory Board

In addition, to the Advisory Board meetings also expert meetings were organised to discuss specific recommendations and to enrich and validate them further from the perspective of expert and organisation.




Cluster		Organisation
Funding/Finance		JASPERS, EIB, Société du Grand Paris
Governance (Cross – border FUA)		City of Venlo, Province of Gelderland, EGTC Rhine Alpine Corridor
Research/Data		ESPON, RWS, Eurostat,
Network/Space (Energy Transition)		Cities of Duisburg, Venlo, Nijmegen, Allego, Energieagentur NRW, Shell, , Ecorys, EGTC, Provinces of South Holland and Gelderland, Air Liquide, Deltaport ¹⁹

Table 1.3: Overview of the Vital Nodes expert meetings/workshop

¹⁹ This expert meeting was a workshop held on 25 September in Duisburg and included also the following participants: ZBT/ University of Duisburg-Essen, Institute for Mobility and Planning, University of Duisburg-Essen, Fraunhofer-Institut für Materialfluss und Logistik IML, Staatliche Rhein-Neckar- Hafengesellschaft Mannheim mbH, Metropolregion Rhein-Neckar GmbH

Summarising, the validated recommendations are based on the following sources which covers all five clusters:

1. The workshops and results of WP3 and WP4²⁰
2. The deliverables of WP2, WP3, WP4
3. Input from the Advisory Board of Vital Nodes²¹ (*Table 1.2*)
4. Policy Dialogues (October 2018 and 2019)
5. Urban Nodes Forum (Budapest, April 2019)
6. Input from experts (*Table 1.3*)
7. Survey with the 88 urban nodes²² (See: Appendix D)

The workshops of WP3 and WP4 (including the Urban Nodes Forum, Budapest), the Policy Dialogue (October 2018) and expert meetings resulted in a final set of recommendations. These recommendations have been sent to all 88 urban nodes in a survey (see: Appendix D). The main objective of this survey was to check if the recommendations of the Vital Nodes project could be supported by all 88 urban nodes. A scale of 1-5 has been used to check the level of support of the urban nodes. EURO CITIES has sent the survey to the urban nodes. All 88 urban nodes have been given the opportunity to reflect on the recommendations of the Vital Nodes project. In general, the overall conclusion that can be drawn from the survey results is that the responding urban nodes can support the recommendations of the Vital Nodes project.

To further validate the recommendations, a series of workshops and expert meetings with key stakeholders has been organised Autumn 2019 about the preliminary recommendations (in a consultation document, the Vital Nodes Summary Note) to enrich and validate the preliminary recommendations into the final recommendations of this report.

1.3.3 Validated policy recommendations

This Chapter introduces the 25 validated policy recommendations of Vital Nodes, grouped according to the five clusters as defined in Chapter 1.3.1. The two tables in this Chapter provide more detailed information how the validated policy recommendations are linked to ongoing policy initiatives (*Table 1.4*) and how the recommendations are linked to the originally defined deliverables of Vital Nodes (*Table 1.5*). A more detailed description of each of the policy recommendations is included in the Chapters 2-6 of this report.

²⁰ See: Appendix C for an overview. Note: in coordination with the project officer also workshops were organized in Duisburg and Venlo which are not an urban node mentioned in Annex II of Regulation No. 1315/2013

²¹ In meetings on 7 February 2018 and 12 September 2018, review period of these deliverables (combined D5.1 / D5.3) 3 October 2018 up to 20 October 2018

²² Survey is sent by EUR which used a database to reach out to all 88 urban nodes. This database included also some urban areas, cities and regions.

Table 1.4: Policy recommendations and ongoing policy initiatives

Cluster	Recommendation Vital Nodes project	SUMP revision	Urban Mobility evaluation	TEN-T evaluation
Strategy/Value	1. Support the use of the Vital Nodes Toolbox as a guide for developing a fact-based comprehensive policy strategy to achieve the objectives of integrating urban nodes, Functional Urban Areas and TEN-T (e.g. by incorporating the Vital Nodes Toolbox into a SUMP topic guide).	X	X	X
	2. Support the common understanding of the responsible actors at different policy levels (urban, Functional Urban Area (FUA) ²³ , national, transnational).	X	X	X
	3. Support collaborative planning at different policy levels (urban, Functional Urban Area (FUA) ²⁴ , national, transnational (e.g. by incorporating the VN lessons into the new TEN-T policies and guidelines, and by revisioning the list of 88 urban nodes of the TEN-T Appendix I, Annex II).	X	X	X
	4. Develop a value oriented comprehensive policy (data based, using indicators, monitoring for assessment of value and focused on capturing values created).	X	X	X
Network/Space	5. Develop a multi-modal transport planning and coordinated asset management, considering its impact at local, FUA and corridor level.	X	X	X
	6. Develop additional guidelines on ITS applications at the interface between long-distance and last-mile transportation and the use of <i>traffic management tools</i> for information and navigation services.		X	X
	7. Invest in infrastructure interfaces at urban nodes, <i>both</i> in infrastructure connections, terminals, hubs and logistic centres.	X	X	X
	8. Stimulate the coordination of freight/logistics and persons transport, e.g. by considering for (large)	X	X	X

²³ See: recommendations on Time and Governance in Chapter 4

²⁴ See: recommendations on Time and Governance in Chapter 4

	freight transport infrastructure also persons transport impacts and measures (vice versa).			
	9. Support the development of consolidation centres, which improve the link between the TEN-T and urban nodes, as they contribute to time savings for drivers and shared capacities for last-mile transport. Also employ the potential of such consolidated centres for production as well as for deployment of alternative fuels infrastructure and other innovation deployment.	X	X	X
	10. Utilize the strategic real estate positions of relevant land owned by infrastructure managers (such as unused railway tracks and marshalling yards) or by logistics service providers in urban areas because for developing a comprehensive policy strategy land use and real estate are vital elements.	X	X	X
	11. Support the development of guidelines and standards for access restrictions in urban nodes along main transport routes on the TEN-T core network.	X	X	X
Governance/Time	12. Stimulate a more <i>active collaboration between stakeholders</i> vertically across governance levels and horizontally across sectors and disciplines. Expand the <i>geographical scope</i> of urban nodes and focus on <i>regional cooperation on the FUA level</i> . Regarding this also provide incentives for public-public and public-private cooperation and for the involvement of civic society.	X	X	X
	13. Enable TEN-T related cross-border collaboration and solutions for urban nodes taking into account the FUA.	X	X	X
	14. Develop skills and knowledge on freight logistics and integrated planning by stimulating active <i>capacity building</i> in urban nodes.	X	X	X
	15. Investigate the possibility to increase the involvement of the urban nodes into the coordination of the nine TEN-T core network corridors (CNCs) by a - dedicated urban nodes working group; and - dedicated Urban Nodes European Coordinator.		X	X

	16. Create an action program, including a roadmap for implementation on how to better link their urban nodes to the respective corridor(s).	X	X	
	17. Facilitate institutional networking by establishing a community of urban nodes/TEN-T corridor professionals (see also WP1 Deliverable VN Legacy).			X
Funding/Finance	18. Provide funding for urban nodes focused on integration in the TEN-T corridors by pre-allocating budget in upcoming calls. E.g. a stepwise 5-10-20% of CEF funding for integrated investment in infrastructure, mobility, logistics, spatial and environmental measures enhancing such integration.		X	X
	19. The complex investment needs of urban nodes should be recognized in CEF financing – going beyond sectoral boundaries in grant decisions (e.g. similar to the climate mainstreaming objective of MFF).			X
	20. Combined funding solutions should be explored for integrating urban nodes in TEN-T corridors e.g. by using existing urban earmarking (ERDF), or by linking up to comprehensive plans. Multiple funding sources can be mobilized to implement integrated strategy, which can be stimulated by defining eligibility and award criteria. Also an exchange platform with different EC services (DG MOVE, REGIO), and EIB could facilitate streamlining of procedures.		X	X
Research/Data	21. Facilitate research, innovation and implementation by mobility labs. <i>Use urban nodes as research, innovation and implementation platforms,</i> being the main hubs for local/regional network (FUA) and TEN-T network (e.g. regarding alternative fuels, digitalisation).		X	
	22. <i>Stimulate further development on data-based policymaking and planning</i> , including the creation of a <i>data collection framework</i> and applying the <i>relevant datasets</i> .		X	X

	23. Develop a comprehensive list of data indicators by establishing a <i>monitoring framework</i> ²⁵ to determine the functioning of urban nodes, the FUA and network		X	X
	24. Develop <i>tools to support sharing of mobility related data in urban nodes</i> with other public and private partners in the logistics chain at corridor level. In order to move towards multimodal Logistics as a Service.		X	X
	25. Promote further research on the interfaces of freight/persons, intra-/inter-urban, last-mile/long-distance transport and on spatial-economic analysis of Functional Urban Areas, integrated assessment and business-cases as well as related multi-level governance approaches.		X	

²⁵ Note: this recommendation needs to consider the work that is done in the SUMP project (See: Rupprecht, https://www.eltis.org/sites/default/files/c3_bohler.pdf)

Table 1.5: Policy recommendations characterised by Vital Nodes defined deliverables

Cluster	Recommendation	Funding instruments and needs (D5.2)	Future research needs (D5.4)	Integration of urban node on the TEN-T corridors (D5.5)
Strategy/Value	1. Support the use of the Vital Nodes Toolbox as a guide for developing a fact-based comprehensive policy strategy to achieve the objectives of integrating urban nodes, Functional Urban Areas and TEN-T (e.g. by incorporating the Vital Nodes Toolbox into a SUMP topic guide).	X	X	X
	2. Support the common understanding of the responsible actors at different policy levels (urban, Functional Urban Area (FUA) ²⁶ , national, transnational).		X	X
	3. Support collaborative planning at different policy levels (urban, Functional Urban Area (FUA) ²⁷ , national, transnational (e.g. by incorporating the VN lessons into the new TEN-T policies and guidelines, and by revisioning the list of 88 urban nodes of the TEN-T Appendix II).		X	X
	4. Develop a value oriented comprehensive policy (data based, using indicators, monitoring for assessment of value and focused on capturing values created).		X	X
Network/Spatial	5. Develop a multi-modal transport planning and coordinated asset management, considering its impact at local, FUA and corridor level.		X	X
	6. Develop additional guidelines on ITS applications at the interface between long-distance and last-mile transportation and the use of <i>traffic management tools</i> for information and navigation services.		X	X
	7. Invest in infrastructure interfaces at urban nodes, <i>both</i> in infrastructure connections, terminals, hubs and logistic centres.		X	X

²⁶ See: recommendations on Time and Governance in Chapter 4

²⁷ See: recommendations on Time and Governance in Chapter 4

	8. Stimulate the coordination of freight/logistics and persons transport, e.g. by considering for (large) freight transport infrastructure also persons transport impacts and measures (vice versa).		X	X
	9. Support the development of consolidation centres, which improve the link between the TEN-T and urban nodes, as they contribute to time savings for drivers and shared capacities for last-mile transport. Also employ the potential of such consolidated centres for production as well as for deployment of alternative fuels infrastructure and other innovation deployment.		X	X
	10. Utilize the strategic real estate positions of relevant land owned by infrastructure managers (such as unused railway tracks and marshalling yards) or by logistics service providers in urban areas because for developing a comprehensive policy strategy land use and real estate are vital elements.		X	X
	11. Support the development of guidelines and standards for access restrictions in urban nodes along main transport routes on the TEN-T core network.		X	X
Governance/Time	12. Stimulate a more <i>active collaboration between stakeholders</i> vertically across governance levels and horizontally across sectors and disciplines. Expand the <i>geographical scope</i> of urban nodes and focus on <i>regional cooperation on the FUA level</i> . Regarding this also provide incentives for public-public and public-private cooperation and for the involvement of civic society.		X	X
	13. Enable TEN-T related cross-border collaboration and solutions for urban nodes taking into account the FUA.		X	X
	14. Develop skills and knowledge on freight logistics and integrated planning by stimulating active <i>capacity building</i> in urban nodes.		X	X
	15. Investigate the possibility to increase the involvement of the urban nodes into the coordination of the nine TEN-T core network corridors (CNCs) by a - dedicated urban nodes working group; and - dedicated Urban Nodes European Coordinator.		X	X

	16. Create an action program, including a roadmap for implementation on how to better link their urban nodes to the respective corridor(s).		X	X
	17. Facilitate institutional networking by establishing a community of urban nodes/TEN-T corridor professionals (see also WP1 Deliverable VN Legacy) .		X	X
Funding/Finance	18. Provide funding for urban nodes focused on integration in the TEN-T corridors by pre-allocating budget in upcoming calls. E.g. a stepwise 5-10-20% of CEF funding for integrated investment in infrastructure, mobility, logistics, spatial and environmental measures enhancing such integration.	X		X
	19. The complex investment needs of urban nodes should be recognized in CEF financing – going beyond sectoral boundaries in grant decisions (e.g. similar to the climate mainstreaming objective of MFF).	X		X
	20. Combined funding solutions should be explored for integrating urban nodes in TEN-T corridors e.g. by using existing urban earmarking (ERDF), or by linking up to comprehensive plans. Multiple funding sources can be mobilized to implement integrated strategy, which can be stimulated by defining eligibility and award criteria. Also an exchange platform with different EC services (DG MOVE, REGIO), and EIB could facilitate streamlining of procedures.	X		X
Research/Data	21. Facilitate research, innovation and implementation by mobility labs. <i>Use urban nodes as research, innovation and implementation platforms,</i> being the main hubs for local/regional network (FUA) and TEN-T network (e.g. regarding alternative fuels, digitalisation).		X	X
	22. <i>Stimulate further development on data-based policymaking and planning</i> , including the creation of a <i>data collection framework</i> and applying the <i>relevant datasets</i> .		X	X

	23. Develop a comprehensive list of data indicators by establishing a <i>monitoring framework</i> ²⁸ to determine the functioning of urban nodes, the FUA and network		X	X
	24. Develop <i>tools to support sharing of mobility related data in urban nodes</i> with other public and private partners in the logistics chain at corridor level. In order to move towards multimodal Logistics as a Service.		X	X
	25. Promote further research on the interfaces of freight/persons, intra-/inter-urban, last-mile/long-distance transport and on spatial-economic analysis of Functional Urban Areas, integrated assessment and business-cases as well as related multi-level governance approaches.		X	X

²⁸ Note: this recommendation needs to consider the work that is done in the SUMP project (See: Rupprecht, https://www.eltis.org/sites/default/files/c3_bohler.pdf)

2 Validated recommendations on Strategy and Value

2.1 Introduction

This cluster relates to creating 'Strategy and Value', assessing, capturing and adding value. In the Vital Nodes toolbox (D3.5) examples of state-of-the-art models and approaches are collected to assess value – e.g. Social Cost-Benefit Analysis, Life-Cycle Assessment and Environmental Assessment (EIA, SEA) – to create value and capture value in combined infrastructure and spatial development projects. Regarding freight and logistics, the strategy and value dimensions relate closely to the importance of value-added logistics in urban freight transport chains. An optimized freight transport network seamlessly links the national/regional level with the urban level in transshipment points. These locations (e.g. Urban Consolidation Centres – UCC) could become viable as value is added to the products transhipped there.

Investments in transport infrastructure and logistics enhance accessibility of locations, beneficial to socio-economic development. This should be balanced with the potential negative impact of infrastructures and freight logistic flows at which spatial and environmental quality are important – relating this to the spatial dimension. Better coordination between transport infrastructure, freight logistics and spatial development provides socio-economic value not only within cities (enhanced competitiveness at intra-urban level; of one urban node) but also between cities (at inter-urban level). As is shown by the major issues/challenges identified regarding the integration of urban nodes on the TEN-T network, all having clear spatial characteristics that are linked to 'spatial quality' and/or 'liveability' in urban and surrounding areas. Urban regions that are well connected by multi-modal infrastructure may act as one big agglomeration providing enhanced competitiveness – they 'borrow size'²⁹ – which is relevant when integrating urban areas and network corridors.

2.2 Validated recommendations

Validated recommendation - 1

Support the use of the Vital Nodes Toolbox as a guide for developing a comprehensive policy strategy to achieve the objectives of urban nodes, Functional Urban Areas and TEN-T (e.g. by incorporating the Vital Nodes Toolbox into a SUMP topic guide).

Background

The Vital Nodes toolbox (D3.5) offers different approaches, methods and mechanisms that contribute to defining the added value between 'Space' and 'Network' (See chapter 3). In other words; to identify added value and create an integrated strategy in the focal area of urban mobility and TEN-T policy. The Vital Nodes toolbox does not contain concrete measures but describes methods and approaches at a more 'meta level' that offer windows of opportunity in identifying this added value, based on specific experiences in urban nodes and from multiple consortium partners in their own practices. As challenges in integrating freight logistics of urban nodes into network corridors have a multi-dimensional character ('wicked problems') there is no 'silver bullet' to solve these challenges.

²⁹ NUVit, Networking for Urban Vitality (2015), Report on the NUVit, Borrowed Size seminar, prepared by Deltametropool for Rijkswaterstaat, 3 September 2015, Brussels; https://www.nuvit.eu/wp-content/uploads/2018/08/196_networking-for-urban-vitality_2015-2016_web.pdf; NUVit Workshop on Borrowed Size. September, 2015 Brussels BE

Besides, specifying approaches and methods includes multiple dimension as there are many interrelated variables between the dimensions towards integrated planning.

Example: Growth zone 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 the areas accessible by rail for commuters.

Example: 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 high-speed 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.

Validated recommendation – 2

Support the common understanding of the responsible actors at different policy levels (urban, Functional Urban Area (FUA), national, transnational).

Background

An important conclusion from the Vital Nodes workshops is that an urban node has a functional (urban) area when it comes to logistics, which is wider and differs from a person mobility perspective - Daily Urban System (commuter-oriented). Solutions for challenges in urban nodes can be found elsewhere on the corridor in this functional urban area (FUA), as the tri-modal terminals in Venlo (NL) and Lauterbourg (FR) illustrate. The first 'relieves' pressure in the urban node of Rotterdam, the second in the urban node of Strasbourg. Solutions elsewhere in the FUA result in added value for the urban nodes, in terms of spatial quality, less freight transport movements, traffic safety and liveability. To carry out this support it's important to define and operationalize local and FUA objectives which are not specified as TEN-T objectives such as: spatial quality and liveability. In addition it's also important to support the awareness and common understanding of the Functional Urban Area from freight perspective by defining functional indicators, because the collection of basic and advanced data on urbanised areas is a challenge. It is difficult to gain insight into the local service networks and intensity of transport of regional and urban logistics. When data is available, it is often only proxy data and comparability between urbanised regions is uncertain. Both the Daily Urban System (DUS) and Functional Urban Area (FUA) do not reflect data on NUTS levels, as they do not match the exact same area and therefore it's important to have a common understanding on the FUA based on data from three levels (urban, national and European) – fact-based. Harmonization of the level of data in the models at different policy levels is therefore key.

Example: 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 Sea 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.

Validated recommendation – 3

Support collaborative planning at different policy levels (urban, Functional Urban Area (FUA)³⁰, national, transnational) (e.g. by incorporating the Vital Nodes lessons into the new TEN-T policies and guidelines, and by revisioning the list of 88 urban nodes of the TEN-T).³¹

Background

To support collaborative planning at different policy levels, the interaction between transport (passenger and freight) and spatial planning at different levels has to be supported. At urban level (within the urban node); at Functional Urban Area (FUA) level in coordination with regional stakeholders; at national level, where planning-programming-budgeting for main infrastructure is done and national policies and regulations for spatial planning are in place; and at transnational level (especially in cross-border regions).

It's crucial to understand that local problems, for example congestion, health impacts and low water levels on waterways, might have solutions at corridor level, for example modal shift, energy transition in the transport sector, climate adaptation and mitigation measures. This also works the other way around: long-distance, national/regional transport issues need to take into account local bottlenecks in infrastructure, transport liveability etc. Thus, a collaborative approach is to be pursued in finding solutions, involving stakeholders within and outside the FUA (i.e. at state, corridor level).

³⁰ See: recommendations on Time and Governance in Chapter 4, number 13

³¹ Annex II of Regulation No. 1315/2013

Example: 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.

Validated recommendation – 4

Develop a value oriented comprehensive policy (fact based, using indicators, monitoring for assessment of value and focused on capturing values).

Background

Stimulate further development on fact-based policy making and planning, including the creation of a data collection framework and applying the relevant datasets. To this end, it is important to have a clear insight into the mechanisms that enable measuring developments related to infrastructure development, traffic management, spatial planning, multimodal hub development and economic and environmental impacts. This includes making an analysis of freight flows on corridor segments – including, among others, aligning their managing authorities, facilitating the identification of traffic and freight flows on the local, metropolitan, national and TEN-T level, and identifying bottlenecks and missing links, resulting in investment needs. The data framework should be tailor-made to the urban node, at city or FUA level, and comply with cross-border requirements. The specific characteristics of the urban nodes should be carefully considered as some urban nodes have a strong link with other (nearby) urban nodes, while other urban nodes have a cross-border focus, e.g. Vienna, Strasbourg and Mannheim. For that reason, the data framework should be tailor-made and comply with cross-border requirements.

Example: Urban Data Centre Venlo

At the UDC/Venlo, CBS and city government researchers work together and use data in both the social and the economic field. Through the UDC, the city hopes to gain better insight into, for example, its residents' educational level, traffic movements and the economic value of enterprises located in Venlo. Aside from contributing its knowledge in the field of data collection and analysis in these areas, CBS is also bringing in expertise in such areas as data infrastructure and the safeguarding of privacy and quality of data. The CBS Urban Data Centre/Venlo is located in the local municipal offices in Venlo.³²

³² <https://www.cbs.nl/en-gb/news/2017/16/cbs-and-venlo-have-launched-urban-data-centre>

3 Validated recommendations on Network and Spatial

3.1 Introduction

For the spatial dimension critical aspects are the ability to deal with issues covering a multiplicity of scale levels, transport analyses and spatial designs. Having both strategic and technical components to achieve integrative spatial concepts (zooming in, zooming out between the three spatial scales). The freight transport sector is organized on a global scale, with international trade via ports as the most important market. This global trade boils down to national, regional and local transport services and logistics. The spatial dimension relates to linking the local and regional, (inter)national transport services in the most optimal way. With a search for spatial concepts with synergetic effects on accessibility, freight and logistics.

- The network dimension relates to multimodal network optimization at various geographical scales: corridors at (inter)national level, Daily Urban Systems at metropolitan level and landscaping at local level. Translated to the Vital Nodes CSA focus on freight and logistics, this relates to: Urban logistics dimension, including urban vehicle access regulation schemes; low emission zones; congestion charging; off hour deliveries; logistics schemes for e-commerce; green and efficient urban logistics vehicles; use of IT (e.g. time windows, load factor, low emission zones, cargo bikes, urban consolidation centres, etc.); and
- long distance freight dimension, including: main function of a node (freight, passengers transport; multi or uni-modal; gateway or regional hub; big or small; inbound – consumption or outbound – production and transit; developed or cohesion region; centric or poly-centric), type of logistics (service/industry, freight function (throughput/transfer, first-/last-mile), complexity of logistics activities (e.g. level of Value Added Logistics (VAL)/Value Added Services (VAS) activities, size of freight flows), type of freight (long distance, share of container/bulk). More in general, the network dimension relates to transport modes' seamless interconnections between infrastructures (at different levels; not only at the beginning and end of freight logistic chains but also in the intermediate connections, corridors for creating robust connectivity), optimising the use of existing infrastructures (traffic and mobility management, ITS; IT and data management), network analysis (multi-modal modelling) and improvement of network linkages ((re)development of infra links).

Cases across Europe show that coordinated optimization of infrastructure (network) and spatial development at the Daily Urban System level (in relation to passenger transport) and Functional Urban Area level (in relation to freight) can be the key to safeguard corridor interests while solving local spatial conflicts in urban nodes. This not only relates to large investments in infrastructure. Small measures at local scale may help to solve bottlenecks at the Daily Urban System level and the corridor level. For instance, at urban ring roads often up to 30% of the traffic is local. 'Shaving off' some of this share by local and regional mobility measures may reduce traffic sufficiently to solve congestion bottlenecks at the urban ring road. If such a ring road is part of an (inter)national transport corridor such 'smart acupuncture' measures can be of importance to the (inter)national transport network.

3.2 Validated recommendations

Validated recommendation – 5

Develop a multilevel planning approach and coordinated asset management, considering its impact at local, FUA and corridor level.

Background

On the three different scale levels the networks are strongly related and greatly impacting each other when it comes to traffic flows. Efficient measures focussing on network optimisation and/or sustainable development of the network therefore needs collaborative appraisal of measures on the TEN-T network, development and maintenance of infrastructure relevant for TEN-T corridors, notably from a local and FUA perspective. It is recommended that infrastructure managers closely coordinate their activities in order to optimise combined asset management needs and minimise impact on traffic at local, FUA and corridor level.

Example: Vienna FUA

Municipalities around Vienna are responsible for their local spatial planning. Planning of logistics and consolidation centres is not coordinated at the regional level. While Vienna is concentrating major logistics functions in the Rail Road Terminal Wien Süd, 'Logistics Sprawl' is a real threat in Vienna's surrounding metropolitan region.

Validated recommendation – 6

Develop additional guidelines on ITS applications at the interface between long-distance and last-mile transportation and the use of traffic management tools for information and navigation services.

Background

Through smart information, traffic streams could be analysed and traffic flows influenced. Traffic management is a strong tool for mitigating bottlenecks on local, regional and national transport networks. The integration of ITS applications between national and regional networks (and possibly local networks) could improve mitigation of traffic interdependencies between the various network levels, supporting the seamless connection between long-distance and urban traffic for passengers and freight. While seamless connections by ITS applications are mentioned in the TEN-T guidelines, the need for collaboration and information use of different stakeholders has not been included. The consortium recommends additional guidelines on ITS applications at the interface between long-distance and last-mile transportation and the use of traffic management tools for information and navigation services, for example to suggest 'safe' routes and to keep dangerous goods from city centres.

Example: C-ITS Corridor Rotterdam-Frankfurt-Vienna

The C-ITS corridor project will introduce two cooperative services on the route between Rotterdam and Vienna. The project has four main objectives. (1) Improved road safety: Cooperative systems provide vehicles with information from other vehicles and roadside systems about hazardous situations which drivers may not yet be able to see, such as fog, rain, icing, obstructions or slow or stationary vehicles on the road. (2) Fewer incidents and congestion: Vehicles become sensors on wheels. Cooperative systems can gather and analyse data from vehicles. (3) A more efficient use of the road network: Road managers can use cooperative systems for traffic management purposes. And (4) Reduced CO2 emissions: Cooperative systems contribute to sustainability. Using the available information effectively will minimise CO2 emissions. An example would be a "green wave" (synchronised traffic signals) for heavy vehicles.

Validated recommendation – 7

Invest in interfaces at urban nodes in infrastructure connections, terminals, hubs and logistic centres.

Background

Between 2010 and 2050, it is estimated that passenger transport will grow by about 30% and freight transport by 60%.³³ A strong and coordinated action is needed to make the expected increase in goods transport sustainable by creating good conditions for transport and 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 think in systems along the corridors. The investments in interfaces can take various forms, such as:

- To (re)vitalise and intensify utilisation of existing parts of the road, rail, waterway network, thereby extending the capacity of existing infrastructures.
- To develop railway bypasses in order to separate freight and passenger traffic within the urban nodes, which would reduce the vulnerability of the network within the cities.
- To develop infrastructure to increase the resilience of the (long- and short distance) network (e.g.: bridges and tunnels as missing links (natural barriers) to avoid spill over effects when calamities happen)

Example: 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' initiative³⁴ 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.

³³ Transport Outlook 2012, Seamless Transport for Greener Growth, OECD

³⁴ <https://www.eco2city.eu/>

Example: Planning for hydrogen shipping between Arnhem-Nijmegen and Duisburg

With the Duisburg port at the mouth of the Ruhr into the Rhine, Duisburg assumes an important function for inland navigation and logistics in the Trans-European Transport Network (TEN-T). In the discussion on alternative propulsion concepts, Duisburg is actively striving for the use of fuel cell technology and is pursuing the development of a hydrogen infrastructure for shipping and truck traffic. In the long term, rail and local public transport will also be powered by hydrogen. The explicit aim of a regional planning process, involving research, private mobility and energy stakeholders, is to define the forthcoming implementation steps for the next ten years in a roadmap and to promote acceptance. Questions of supply, capacity, requirements for planning, regulation and standards, but also of regional, supra regional and international connectivity are immensely important in this large-scale communication and planning process beyond the region, and require coordination among the stakeholders.

Validated recommendation – 8

Stimulate the coordination of freight/logistics and persons transport, e.g. by considering for (large) freight transport infrastructure also persons traffic impacts and measures (and vice versa).

Background

As an effect of the growing population and increasing urbanization within the urban area and the thereto related growing transport flows both for passenger as freight and logistics, a real challenge of space occurs. Lots of different functions are fighting for their place in the urban areas as well as in peri-urban areas. This causes the needs for mixed use and continued attention for socio-economic relations to maintain a liveable city. 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.³⁵ 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 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.

³⁵ See: Arts, J., T. Hanekamp & A. Dijkstra (2014), "Integrating land-use and transport infrastructure sustainable transport infrastructure", Proceedings 5th TRA Conference 14-17 April 2014 Paris, IFSTARR, Paris

Example: Synergies between passenger and freight transport

Examples for synergies between freight and passenger transport³⁶: the freight-tram in Zürich, 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 cooperation's 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.

Validated recommendation – 9

Local and through-traffic are often using the same tracks and therewith hinderance of the different transport flows occurs. Support the development of consolidation centres, which 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. Also employ the potential of such consolidated centres for productions as well as for deployment of alternative fuels infrastructure and other innovation deployment.

Background

Separation of local and through-traffic is an import precondition for efficient traffic management in urban nodes. Urban consolidation centres (UCC) can be 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. There is a need to explore the potential of Urban Consolidation Centres (UCC) in order to value its contribution for a more efficient use of existing infrastructure (capacity-sharing) in terms of emission-savings and cost-benefit scenarios. Besides the development of standards, including required governance schemes.

It is recommended to consider the following aspects in developing the consolidation centres:

- To develop the centres at strategic locations at the interface between long-distance and regional/local freight traffic;
- To cover the FUA in terms of freight;
- To link-up with alternative;
- To develop shared capacities for the regional redistribution and last-mile transport;
- To integrate different modes, where possible and to promote modal shift, also for employees;
- To provide adequate alternative fuels and charging infrastructure for redistribution of goods.

Example: 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 Vital Nodes toolbox (D.3.5)³⁷

³⁶ De Langhe, K. (2019): What role for rail in urban freight distribution. Presentation at the Urban Nodes Workshop in Venlo, February 8, 2019

³⁷ Van der Linden, K., Linssen, R. (2019): Vital Nodes Final Toolbox (Mark 2) – based upon experiences gained with Tiers 1,2 and 3

Validated recommendation – 10

Utilize the strategic real estate positions of relevant land owned by infrastructure managers (such as unused railway tracks and marshalling yards) or by logistics service providers in urban areas, because for developing a comprehensive policy strategy land use and real estate are vital elements.

Background

The boost of E-commerce leads to growing freight volumes and in many places the development/appearance of XXL warehouses serving urban nodes agglomerations. The location and position of these warehouses influences network performance (capacity, robustness), as has been addressed in multiple urban nodes. Currently the development of (XXL) warehouses is not coordinated, and only little incentives apply to deal with multimodality, sustainable land use, end-user proximity and network robustness (multimodal), since there are no incentives coming from the current functioning of the infrastructure, mobility and spatial planning networks. This can result in a development boom in uni-modal locations instead - locations with a proximity to the region and multi-modal connectivity.

Example: 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.³⁸

Validated recommendation – 11

Support the development of guidelines and standards for access restrictions in urban nodes along main transport routes on the TEN-T core network.

Background

Many urban nodes on the TEN-T network have introduced access restrictions for vehicles, including freight, in their urban areas. In order to support the logistic sector to adapt their technologies, equipment, and infrastructure along the value chain, and to accommodate to regulations, it is important to harmonize intelligent access regulations among (cross border) urban nodes. It is essential to support the development of guidelines and standards for intelligent access regulations in urban nodes along main transport routes on the TEN-T core network. For successful intelligent access regulations, 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 required.

³⁸ <https://www.vrt.be/vrtnws/en/2018/10/05/bpost-installs-changing-room-for-customers-at-ghent-post-office/>

Example: 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 micro logistic activities. As well, use of new vehicle typologies in urban freight (e-bikes, eScoots, etc.) is regulated. The EU-funded CIVITAS project ECCENTRIC is supporting logistics operator to set up a logistics scheme for consolidation centres 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.

Example: 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 pound 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.

4 Validated recommendations on Time and Governance

4.1 Introduction

Time and governance relate to linking the planning stages in a full life cycle. This asks for an examination of changes in use (new development, renewal, redevelopment), of changing lifestyles and their linkages to mobility (changing use of transport modes), of metabolic potentials (circular economy/cradle-to-cradle concepts, asset management, alternative fuels) and of linkages to mobility and accessibility (changing flows of people and goods). On the other hand it comprises analysing different governance approaches and organizational frameworks at all institutional levels. In Vital Nodes this comes down to; what institutional design is most effective for a certain case (urban node, grouping of urban nodes) to achieve integration of urban nodes in the network corridors and linking long-distance transport with last-mile freight-delivery. This entails also issues of institutional embedding, governance models as well as issues of the cultural setting, resulting in solutions for inter-governmental cooperation (public-public partnerships), market involvement (public-private partnerships), stakeholder engagement (users, citizens, interest groups), the governance of organizational networks, and smart mixes.

4.2 Validated recommendations

Validated recommendation – 12

Stimulate a more active collaboration between stakeholders vertically across governance and horizontally across sectors and disciplines. Expand the geographical scope of the urban nodes and focus on regional cooperation on the FUA level. Regarding this, also provide incentives for public-public and public-private cooperation and for the involvement of civic society.

Background

The urban area should be seen as a FUA but defined in Annex II at a level of a (central) city/ municipality. However, challenging issues in the field of freight and logistics, infrastructure network development, sustainability, liveability and especially integration of urban nodes in the TEN-T network, require an integrated policy answer, which often goes beyond the city level (i.e. the administrative boundaries of the central municipality). Therefore, it is recommended to apply an urban- regional approach and focus on the FUA level. In this process, that requires intensive collaboration, incentives to create win-win situation could be used for public-public and public-private cooperation schemes at urban node and FUA (transit regions) level. Stimulation of the cooperation between disciplines (e.g. between spatial planners and mobility and infrastructure experts) and responsible actors/bodies on different relevant (governmental) levels, could result in more integrated solutions, since many challenges are interrelated and silo thinking persists.

Example: 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'39 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.

Validated recommendation – 13

Enable TEN-T related cross-border collaboration and solutions for urban nodes taking into account the FUA.

Background

Often borders between European regions erect barriers for cross-border freight and logistics processes. Public and private collaboration in cross-border processes and chains and between urban nodes and freight hubs in different countries could support improving seamless and efficient multimodal transport flows in multiple Member States. Besides opportunities could be taken for offering a more harmonised cross-border labour market with common rules and legislation. Authorities at several levels should take their responsibility for improving conditions for freight and logistics. This can be done by streamlining regulations, technical standards for interoperability, collaborative planning (for example in integrated mobility, energy and digital solutions) on local, national and EU-level. This needs especially arise with new transport solutions where new regulations still have to be set.

Examples: Bratislava Urban Regional Cooperation (BAUM)

BAUM (Bratislava Urban Regional Cooperation)⁴⁰ is a joint initiative between (2007-2013) the provinces of Lower Austria and the Burgenland, the Slovak capital City of Bratislava and the Bratislava Self-Governing Region. The aim is to establish a platform for all stakeholders in the BAUM region to direct its spatial development. Since the accession of Slovakia to the EU there is greater cross-border movement in the region, with people living on the Austrian side and working on the Slovak side, and vice versa. Schools and kindergartens are full again and many children in the region are educated bilingually. The strong growth dynamics of Bratislava are affecting the rural Austrian villages through increased demand for new settlements, leisure and recreational areas. The formerly rural villages are becoming suburban towns. There is a need for a well-balanced strategy for the future development of Bratislava and the towns in the surrounding area to limit unwelcome activities in the border region such as uncontrolled expansion. Over the course of the BAUM project, the first cross-border urban regional cooperation management structure will be established. Creating the common platform will define the conditions for further regional development and the consensus of all stakeholders will establish clear foundations for systematic development.

³⁹ <https://www.slimnaarantwerpen.be/en/home>

⁴⁰ https://ec.europa.eu/regional_policy/en/projects/austria/introducing-harmonised-development-in-the-cross-border-region-between-austria-and-slovakia

Validated recommendation – 14

Develop skills and knowledge on freight logistics and integrated planning by stimulating active capacity building in urban nodes.

Background

Planners in urban nodes need more support to tackle the challenges related to local, regional and long-distance freight transport. The problems are manifold, such as lack of awareness of the importance of the topic, lack of knowledge in fact-based planning, collaborative and multi-level planning, how to integrate the TEN-T perspective on freight into a SULP, and operationalising the use of the FUA with a freight perspective. Supporting staff exchanges, experts visits and short term trainings with special focus on freight planning for urban planners and traffic planners is seen as a good way to increase institution capacity. It is recommended to create opportunities for further knowledge exchange and learning for planners on every level. 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 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 fact-based planning, is considered highly important.

Examples: SULPiTER (Interreg)

SULPiTER⁴¹ is supporting (e.g. by training events and webinars) policy makers in improving their understanding of FUAs freight phenomena in an energy and environmental perspective. The project is enhancing their capacity in urban freight mobility planning in order to develop and adopt sustainable urban logistics plans (SULPs). Policy makers in Bologna, Budapest, Poznan, Brescia, Stuttgart, Maribor and Rijeka will engage, in cooperation with further local, regional and national non-partner authorities and with technical partners. They will work on transnational policy capacity building, and on the development of transnational analytical and governance tools, resulting in improved and adopted policies for the future energy and environmental sustainability of freight transport in central European FUAs.

Validated recommendation – 15

Investigate the possibility to increase the involvement of the urban nodes into the coordination of the nine TEN-T core network corridors (CNCs) by a:

- dedicated urban nodes working group
- dedicated urban nodes European Coordinator

Background

All nine CNCs have a dedicated ('horizontal') corridor coordinator, representing the corridor and coordinating activities taking place regarding the corridors and on the corridors. Besides, several cross-cutting working groups are in place with a specific rail, port and regional focus within the nine CNCs. Relevance of the urban nodes for/on the corridor network could be better articulated, by actively involving the (main) urban nodes. Possibly realised by having an additional dedicated Urban Nodes working group and/or the assignment of a dedicated Urban Nodes European Coordinator, in addition to the already existing 'horizontal' coordinators for European Rail Traffic Management System (ERTMS) and Motorways of the Sea (MoS).

⁴¹ <https://www.interreg-central.eu/Content.Node/SULPiTER.html>

Examples: TEN-T coordinator MoS

The TEN-T corridor approach is an innovative multi-level governance system for bringing Europe closer to all stakeholders, primarily its citizens. It has proven to be effective to focus on delivering EU added value. The Core Network Corridors are a powerful instrument of communication, cooperation, collaboration and coordination. In the framework of their mandate, the European Coordinators have engaged in a very close cooperation with Member States, regions, infrastructure managers of all modes, users and stakeholders at local, regional, national and European level. In particular, the TEN-T corridor approach ensures that efforts are concentrated on the implementation of cross-border projects but also allows encompassing several relevant aspects of transport investment across different policy areas. Motorways of the Sea (MoS) is a key building block of the TEN-T Network. It aims at reviving Short Sea Shipping in Europe. It complements and extends the 9 Core Network Corridors, increasing connectivity between core and comprehensive ports of the European Union.⁴²

Validated recommendation – 16

Create an action program, including a roadmap for implementation, on how to better link the urban nodes to the respective corridor(s).

Background

To ensure and stimulate the cooperation between different actors, (governmental) levels and disciplines over time, the creation of an action program, including a roadmap for implementation would help. Besides it could tackle the barriers which, among others, urban nodes see themselves often confronted with – changing plans over the timespan of a political/governmental agenda. The plan will identify prioritised actions with responsible parties, timelines and required resources. The defined actions should be matched with funding programmes tailored towards the needs that arise from the program.

Example: The West Sweden Agreement

The West Swedish Agreement is a series of infrastructure initiatives for trains, busses, trams, bicycles and cars stretching to around 2027 which will contribute to positive and sustainable growth in West Sweden. These initiatives will make it easier to get around, will lead to better and more attractive public transport, more reliable transport for business and industry and expanded commuting services for everyone living, working or studying throughout West Sweden.⁴³

⁴² Delivering TEN-T, Facts & Figures, September 2017, EC (DG MOVE)

⁴³ https://www.trafikverket.se/contentassets/401bffc4233546eeb2854e86e53fb6cd/this_is_the_west_swedish_agreement.pdf

Validated recommendation – 17

Facilitating institutional networking by establishing a community of urban nodes/TEN-T corridor professionals.

Background

Currently, there is no mechanism which ensures a continuous exchange between 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 the 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 EUROCITIES⁴⁴ 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 during the TEN-T Days (e.g. continue to invite mayors as keynote speakers) should be strengthened. This community can offer access to financial and legal expertise to replicate innovative mobility solutions. It can also support capacity building and the promotion of interest.

Example: The Vital Nodes Network

The Vital Nodes network consists of three main elements: (1) the Vital Nodes consortium partners; (2) the Vital Nodes Advisory Board and (3) the Vital Nodes Expert Pool (see also D1.1, D1.2 and D1.3). The involved partners who are committed for further support will further discuss and develop issues on Urban Nodes integration in TEN-T corridors. New knowledge, development and practical experiences will be disseminated at planned external events and activities. In addition the Advisory Board members have committed to a post vital nodes project meeting in February 2019. A follow-up will be discussed with the members. Expert pool members could be invited to Vital Nodes or other events to share knowledge, validate insights and / or support urban nodes on inquiries and challenges (linking experts together). This will be on a voluntary basis.

⁴⁴ 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

5 Validated recommendations on Funding and Finance

5.1 Introduction

In order to further improve the sustainable integration of urban nodes at local, national and TEN-T level, we see important investment needs. In turn these investments contribute to the EU's overall transport objectives and the development of strong economic and sustainable regions.

The current TEN-T guidelines recognise and formalise the role of urban nodes in these transport networks as important hubs that facilitate the flow of people and goods⁴⁵. In addition, the investments are related to freight and passengers transport being the major centres for production and consumption. Maximising the potential of this vital funding stream will ensure that urban nodes are able to meet current and future challenges.

An integrated approach to projects and governance also requires integrated funding. Integrated projects will generally cover a variety of challenges, for example, improvement of air quality, economic growth and increasing liveability, which benefit a broad group of stakeholders. In order to increase this integrated approach, financing from different European funds would be very beneficial.

5.2 Validated recommendations

Validated recommendation – 18

Combined funding solutions should be explored for integrating urban nodes in TEN-T corridors.
E.g. a stepwise 5-10-20% of CEF funding for integrated investment in infrastructure, mobility, logistics, spatial and environmental measures enhancing such integration.

Background

Given that there is a delimitation between European funds and what type of actions they can support, urban nodes should be stimulated and facilitated to use multiple funding sources to tackle their mobility challenges in an integrated way. One way would be to use existing urban earmarking (proposal for 6% ERDF for cities) and its condition to have an integrated urban strategy and involvement of urban authorities. These urban strategies, which a majority of urban nodes already have, can be more closely aligned with Sustainable Urban Mobility Plans (SUMP). Multiple funding sources can be mobilized to implement such a combined strategy. This can be facilitated by defining eligibility and award criteria in (work)programmes of these funds requesting a focus on such an integrated approach. A non-exhaustive list of European funding that could play a role in the integration of urban nodes on the TEN-T corridors are: CEF, InvestEU, ESIF (Cohesion Fund, ERDF, Interreg), Horizon Europe and LIFE. An exchange platform with different Commission services (notably MOVE and REGIO) and the EIB could facilitate the streamlining of procedures for funding instruments.

⁴⁵ See: Second Work Plan Rhine-Alpine 2016

Validated recommendation – 19

Provide funding for urban nodes focused on integration in the TEN-T corridors by pre-allocating budget in upcoming calls.

Background

Freight and TEN-T investments in urban nodes are complex and expensive, due to multiple demands for land (example: Vienna) and use of existing infrastructure, in addition to the need to mitigate negative impacts in a densely populated area. This creates bottlenecks at network level while at the other hand potential for decarbonisation (example: Turku) in urban nodes is huge. Therefore urban nodes have investment needs in infrastructure, mobility, spatial and environmental measures enhancing the integration of urban nodes on the TEN-T network. This could be in the form of investments that focus on:

- (i) peri-urban networks (where long-distance, inter-urban and short-distance, intra-urban mobility meet); and
- (ii) intra-urban networks in economic core areas and cross-border regions (to strengthen agglomeration effects, conform 'borrowed size').

In this process it is important to coordinate with spatial development in order to strengthen the socio-economic and environmental benefits (creation of multiplier effects) of EU funded investments that enhance integrated spatial and multimodal transport development and that increase coherent development of innovation, sustainability and liveability.

Validated recommendation – 20

CEF Work programmes should give specific attention to urban nodes in order to boost the investments named above.

Background

The complex investment needs of urban nodes should be recognized in CEF financing. Many CEF investments in urban nodes can fall under the climate mainstreaming objective of the Multi-annual Financial Framework and the CEF in particular. Given the observed interlinkages between regional planning and infrastructure development due attention should be paid to the funding of preliminary spatial planning research for large infrastructure development (not only technical engineering studies).

Capacity to design good CEF proposals which fulfil all requirements and procedures is considered challenging by urban nodes. INEA can play an important role in capacity building, for example by organizing project development and project management workshops dedicated to urban nodes.

6 Validated recommendations on Data and Research

6.1 Introduction

As mentioned in the introduction, urban nodes are crucial parts of the TEN-T network and to be considered the 'backbone' of Europe's economic activity. This should also be seen in light of a growing population and density. More than 75% of the European population is living, commuting and working in the urban areas of Europe and this will increase to more than 80% by 2050. Through the elimination and avoidance of bottlenecks, increasing the seamless (multimodal) connection on the TEN-T network, as well as the reduction of negative effects for the population of urban areas by reducing emissions and securing the quality of life, it is possible to create various positive effects for the economic development of a region and increase liveability at the same time.

In order to support the development of urban nodes as part of the TEN-T network, dedicated research and good quality data are needed. This chapter presents recommendations on future research⁴⁶. Discussing the challenges in the urban nodes workshops held – based upon facts and figures, trends and impacts – stakeholders agreed that the functional urban area of their urban node is often more extensive than the city: it also includes the region surrounding the urban node. This surrounding region is from a freight perspective more extensive than the surrounding region from a passenger transport perspective. The current definition of regions (NUTS3) does not reflect the functional urban area of the Tier 1 urban nodes. In some cases, the functional urban area of one urban node might include another urban node. This is the case, for example, with Vienna, Strasbourg and Mannheim urban regions. The functional urban area for an urban node will always be tailor made – depending on the various relevant spatial-economic functions for the specific urban area – the functional relationships regarding steel industry are different than for the ICT or for food products, etc. (what was called by one of the workshops participants as 'dynamic FUAs'). However, the data, indicators, monitoring methods etc., can be standardized and thereby exchangeable and comparable over Europe. For that reason, data should become available in a consistent manner to be able to profile the functional urban area and streamline discussions between stakeholders and regarding planning and investment decisions (such as TEN-T related decision-making).

From an European perspective, it is necessary to structure the development of the integration of urban nodes with the TEN-T. To achieve this, it is crucial to come to a common understanding and description of a functional urban area. This can be done via a functional typology and guidance in indicators and the related data and information collection (see also D2.4 Synthesis document for nodes incl. grouping of solutions).

⁴⁶ In the process of formulating research needs, the research and innovation roadmaps of the transport European Technology Platforms (ETPs) are considered.

6.2 Validated recommendations

Validated recommendation – 21

Facilitate research, innovation and implementation by mobility labs. Use urban nodes as research, innovation and implementation platforms, being the main hubs for local/regional network (FUA) and TEN-T network (e.g. regarding alternative fuels, digitalisation).

Background

Develop urban nodes, being the main hubs ('interface') for connecting the local and regional network (FUA) with the TEN-T core network corridors, as forerunner for deploying innovative solutions. The urban nodes can develop 'infrastructure' for both last-mile and long-distance zero-emission transport, by providing facilities and infrastructures for alternative fuels (e.g. multi-fuel stations, ports with electricity supply for ships 'walstroom') thus, supporting modal shift and energy transition along the corridors. Carefully planned and developed consolidated terminals in which multiple logistic services and operators are working together in one terminal might be relevant platforms for such innovation in an urban node. For long-distance transport becoming zero-emission mode, such as electrification of rail and shipping, there is a need for standardisation of zero-emission infrastructure.

In this process, it is important to facilitate good practices and develop standards: compatibility and link-up of integrated projects in the energy and mobility sector with other urban nodes (e.g. consolidation centres which link alternative fuels provision (long-distance) with innovative zero-emission delivery concepts (regional and local transport). In addition, transit oriented development (TOD) hubs might be combined with logistics terminals and hubs (logistic oriented development hubs LODs)⁴⁷, e.g. to facilitate last-mile delivery by public transport passengers themselves. Cities such as Groningen (The Netherlands) are experimenting with such innovations as part of its 'Groningen Accessible' programme ('Groningen Bereikbaar') and of its Hive Mobility⁴⁸ platform in this city that is explicitly meant as a living lab for mobility and logistics innovation, education and implementation in the broader urban region of Groningen.

Example: Electric green last mile in Province of Limburg

The 'Electric green last mile'⁴⁹ 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.

⁴⁷ See e.g. CEDR Fluxnet project, CEDR (2017), FLUXNET - multimodality integrated with land use, freight and logistics, Part 1: Trends and Good Practices.; Broesi, R., T. Hanekamp & J. Arts (2018), Fluxnet: Multimodal infrastructure integrated with land use, freight and logistics, paper 7th Transport Research Arena Conference (TRA, 16-19 April 2018 Vienna), Proceedings TRA 2018 Conference (#10154).

⁴⁸ <https://campus.groningen.nl/en/news/new-innovation-center-hivemobility-on-zernike-campus>

⁴⁹ <http://www.smartlogisticscentrevenlo.com/nl/nieuws/electric-green-last-mileproject>

Example: 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.

Validated recommendation – 22

Stimulate further development on fact-based policymaking and planning, including the creation of a data collection framework and applying the relevant datasets.

Background

To this end, it is important to have a clear insight into the mechanisms that enable to measure developments related to infrastructure development, traffic management, spatial planning, multimodal hub development and economic and environmental impacts. This includes making an analysis of freight flows on corridor segments, facilitating the identification of traffic and freight flows on the local, metropolitan / regional (FUA level), national and TEN-T level, and to identify bottlenecks and missing links and resulting investment needs. The indicator and data framework should be tailor-made to the urban node and comply with cross-border requirements. Indicators for such a methodology should, e.g. allow to assess the impact of freight functions and feed into measurable criteria for an 'ideal' urban node, which can serve as a benchmark. Indicators should be set up to reflect the functionality of a node. In Vital Nodes a basis has been set by typology criteria including cross-border versus not cross-border, poly-centric versus mono-centric, direction of the flows (transit / incoming / outbound) and sea port vs inland port. Added by an impact framework with specified criteria. Functional dimensions, impact indicators, criteria and a harmonized data collection are required to be able to develop smart objectives⁵⁰ in integrated development strategies and project proposals, and thus, help to (ex ante) assess whether a project will have enough impact in its specific context. The relevant dimensions, indicators, criteria and data sets need to be further developed. Such a value driven approach (objective and data-based) of assessing infrastructure needs can also be used for analysing hinterland accessibility in a FUA, accessibility of the comprehensive network or peripheral regions to the core network, and connectivity. As well, it could be applied for planning modal shift, energy transition, resilience and climate adaptation.

⁵⁰ 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?

Example: 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.

Validated recommendation – 23

Develop a comprehensive list of data indicators by establishing a monitoring framework⁵¹ to determine the functioning of urban nodes, the FUA and network.

Background

Challenges do occur for cross-border transport. This includes road, waterways and rail. Concerning rail freight, the Rastatt tunnel accident in August 2017 showed clearly the challenge. Lowering of tracks during tunnel construction works led to closing down railway traffic for passengers and freight between Karlsruhe and Basel for almost 2 months. To stimulate infrastructure fitness and resilience (or network robustness) connectivity with the French railway network should be improved including breaking down regulations in cross-border freight traffic. In addition, improved connectivity with other modes – roads, waterways networks – can improve the overall transport network's robustness – regarding this improvement of connectivity at the level of segments of corridors (e.g. Rotterdam/Antwerp – Rhein/Ruhr⁵²; Oresund region or Northern Italy) and FUAs is important. In order to guide the data and information collection as well as to harmonize data over the nodes, it is preferred to make use of available data at Eurostat. Insights which are statistically comparable between nodes require harmonized European data (for freight, cities, et cetera).

⁵¹ Note: this recommendation needs to consider the work that is done in the SUMP project (See: Rupprecht, https://www.eltis.org/sites/default/files/c3_bohler.pdf)

⁵² Regarding this is relevant the East/South-East Freight Corridor programme in the Netherlands started in 2017 which regards the corridor between Rotterdam and the Rhein-Ruhr area (Germany) consisting of a highly developed network main highway, railway and waterway (and pipeline) connections. Faith-Ell C., Kalle, H., Arts J. (forthcoming), Connecting the dots: Rethinking large-scale corridor infrastructure planning, Paper submitted to Proceedings of 8th Transport Research Arena Conference, April 27-30, 2020 Helsinki, Finland

Figure 3 below gives a stylised understanding of an Urban Node from a freight transport perspective.

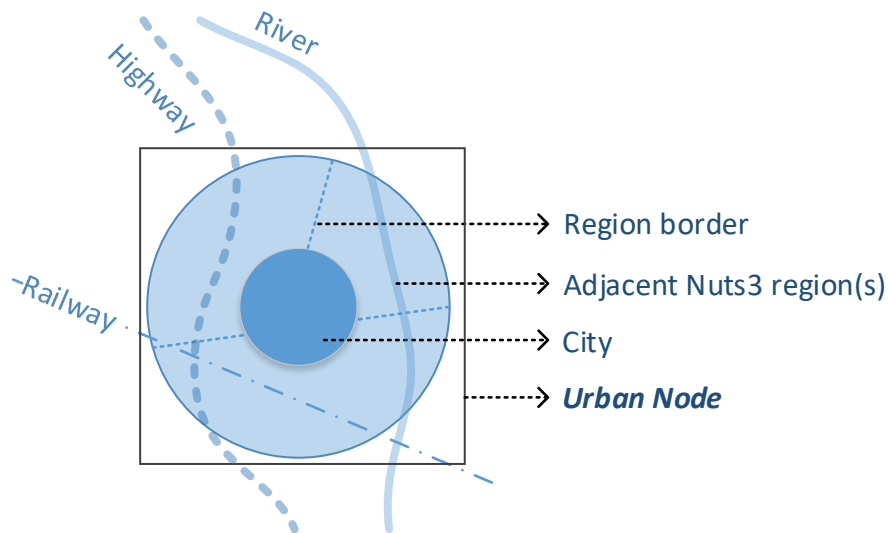


Figure 3: Urban Node from a freight transport perspective

Data on NUTS3 level can be used based on the available Eurostat data. Available data at NUTS-3 level is data on demographics (area, population size, population density), GDP and national annual road freight transport by regions of loading and unloading. The information that is not available at NUTS-3 level is data on rail / IWW transport and freight transport statistics. Therefore use of other available data sources is required as much as possible, including national statistics agencies, policy documents, Wikipedia, OECD territorial reviews, websites of port authorities, websites with data on intermodal terminals and websites from EU-funded transport projects in the respective nodes. This definition makes that the geographical scope of an Urban Node can differ amongst NUTS3 regions. To structure data and information collection and to better understand transport developments, this definition was useful, clear and robust in the Vital Nodes project.

Related solutions with potential impact: Gothenburg West Sweden Agreement, Turku Northern Growth Zone, Vienna Produktieve Stadt, Turku CaaS, Turku autonomous shipping, Rotterdam urban logistics emissions, Rotterdam living lab urban logistics.

Validated recommendation – 24

Develop tools to support sharing of mobility related data in urban nodes with other public and private partners in the logistics chain at corridor level. In order to move towards multimodal Logistics as a Service.

Background

In order to move towards multimodal Logistics as a Service. It is important to create standards that allows for the exchange of historical and real-time data between public authorities, freight operators, infrastructure and traffic managers. It is recommended to support and develop cooperation models for mobility data and capacity sharing between public and private sector. It is necessary to develop data-sets and standards for collecting clear data on transport flows and movement on TEN-T. Suggestions are: origin and destination for every good (should be

indicated on the package), loading, multimodal travel, standardised freight movement, traffic distribution. In the Vital Nodes project the ‘fingerprint’ of an urban node is used as a fact sheet. This fingerprint tool – together with the functional typology criteria and assessment indicators and criteria - could be further developed e.g. by guiding standardized data-collection and analysis.

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

Validated recommendation – 25

Promote further research on the interfaces of freight/persons, intra-/inter-urban, last-mile/long-distance transport and on spatial-economic analysis of Functional Urban Areas, integrated assessment and business-cases as well as related multi-level governance approaches.

Background

The Vital Nodes project has clearly showed the importance of an integrated approach to freight/persons transport, inter/intra-urban transport, last-mile/long-distance transport as well as the interaction of land use and transportation (also called LUTI)⁵³ both intra urban at the level of urban nodes, and inter-urban FUA and TEN-T corridors (segments). In order to support such integrated planning approaches, deep understanding is needed into the spatial-economic functioning of cities, functional urban areas as well as TEN-T corridor segments. This relates to get insight in the spatial-economic structure, development and interactions of specific areas at these various levels. This relates to the intra-urban scale of combining last-mile logistics, micro-hubs, TOD and urban development (at which SUMP are relevant (See: Appendix F) as well as the urban regional scale of peri-urban networks (the interface of long-distance, inter-urban, and short distance intra-urban mobility). Here the worlds of infrastructure, long-distance freight /logistics (TEN-T) and urban mobility and development meet (SUMP; as earlier discussed in *Figure 1*). Finally this relates to inter-urban transport and spatial development at the scale of the FUA and TEN-T corridor segments.

Regarding the latter the strengthening agglomeration effects and the concept of borrowed size is relevant⁵⁴. Borrowed size looks at agglomeration in a regional network perspective. It suggests that several medium-sized cities in each other's vicinity may function as a larger metropolitan region by borrowing each other's functions. Many highly productive urban regions in the EU are indeed small- to medium-sized whose dominant competitive advantage is that they exhibit high degrees of connectivity compared to urban or home market scales. The Dutch, Belgian and German Lower Rhineland regions actually are prime examples of such urban scales (See: *Figures 3a and 3b*).

In terms of economic growth good connected medium-sized cities can function as one large city, and hence can also benefit from an agglomeration premium. But this is conditional on the quality of inter-urban physical connectivity (multimodal transport networks), local amenities and the housing markets. Regarding such concepts as FUA, TOD, LUTI, Borrowed Size and agglomeration effects much literature is available but this is more theoretical and general and geared to practice of urban nodes and TEN-T corridor networks. Further spatial-economic analysis is needed to support fact-based decision-making integrated development of infrastructure and

⁵³ See Wegener, M., Fürst, F., 2004. Land-Use Transport Interaction: State of the Art. Dortmund; and, more specifically related to Networking for Urban Vitality, also 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. 303-12

⁵⁴ Deltametropool (2015), Borrowed Size – NUVit, report international seminar, Vereniging Deltametropool / Rijkswaterstaat, Rotterdam / Rijswijk

spatial development to strengthen socio-economic benefits (creating multiplier effects) of EU funding. To this end spatial economic mapping of the individual FUAs related to urban nodes, as well as the important corridor segments is important⁵⁵.

To enhance such research into spatial-economic relationships at FUA and corridor segment level, there could be linked up with the Horizon Europe programming. In this way the EC could provide an important follow-up to Vital Nodes and its outcomes.

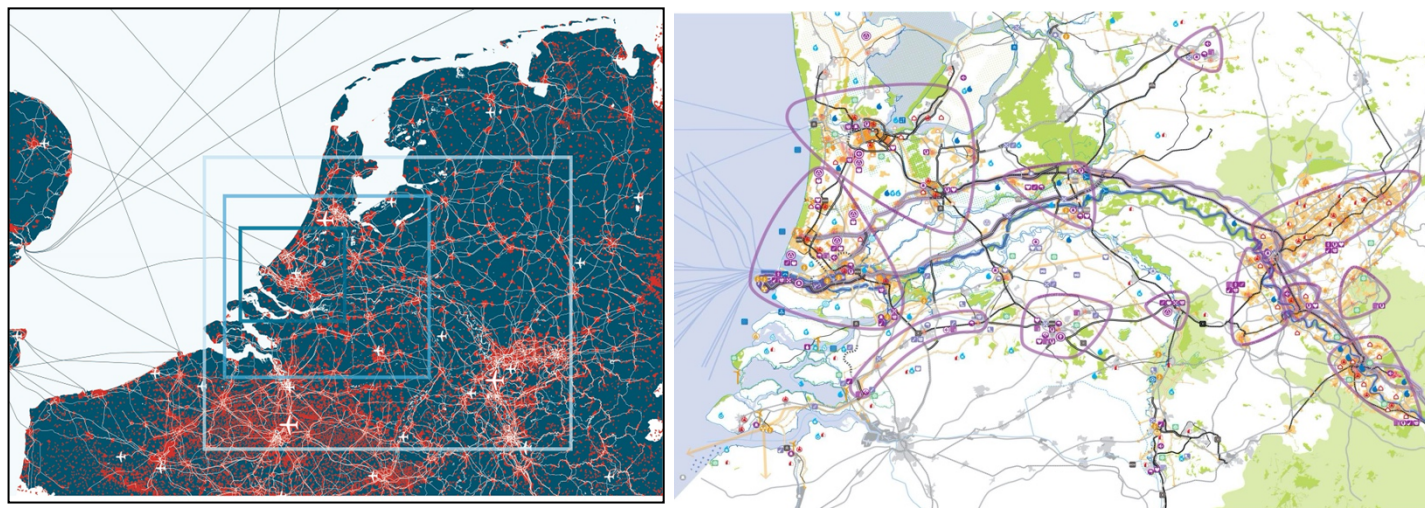


Figure 3a and 3b

Example of a borrowed size region ABC Region (Amsterdam-Brussels-Cologne)

By enhancing understanding of spatial economic relationships, by mapping these at European scale, and by providing relevant indicators, data and monitoring, the further development of tools can be supported, such as assessment of integrated development proposals (valuation: Cost-Benefits Analysis that better can deal with 'soft' effects of spatial and environmental added values, tools for preparing Business Cases). Finally, in relation to this further development is needed on multi-level governance approaches that support the integration of urban nodes at TEN-T corridors. This regards especially integrated planning of infrastructure, mobility/logistics and spatial development at the FUA level – beyond the conventional city boundary.⁵⁶

⁵⁵ See www.nuvit.eu for such mapping example: 'Linking the economic regions in Europe'. This provides a first draft of how the TEN-T corridors support the economic interaction of various metropolitan regions in Europe with the objective to derive spatial-economic indicators. The aim is to enable a shared understanding among strategic public and private stakeholders of the relationship between transport connectivity, regional competitiveness, quality of life at the European level. The objective is to support these discussions with a reference base that is transparent and fact based (from established sources such as EUROSTAT, OECD, ...) as well as easy to use as a communication tool e.g. in workshops and seminars feeding into this discussion. The project has two stages.

⁵⁶ See the Vital Nodes SUMP Topic Guide (Appendix F) that will be developed as follow-up to Vital Nodes. Another example is the CEDR programme on 'Collaborative Planning of infrastructure and spatial development' – see Heeres, N., van der Leek, M., Broesi, R., Hanekamp, T. and Arts, J. (2019)

7 Outlook

The Vital Nodes project, and more specifically this report, has clarified the need for collaboration on all levels to integrate infrastructure and spatial planning in the FUAs. The results of Vital Nodes workshops in the urban nodes show that there is a need for further cooperation between urban nodes. To this end it is important to sustain a network for exchange of experience and knowledge and to extent knowledge on approaches for integrating urban nodes along corridors – the Vital Nodes Network, as is described in the Vital Nodes Legacy. The Vital Nodes partners are willing to contribute in-kind to such network but it will need support of the EC, which is elaborated in a Road Map (see Appendix G).

From Vital Nodes and this report, it can be concluded that there is ‘no silver bullet’ for the integration of urban nodes along the TEN-T corridors. This integration issue is complex and multiplicity, an requires a cross boundary-spanning approach with the following major ingredients:

- linking the different scales (local, Functional Urban Area, and corridor level);
- linking multiple modalities, multiple uses (freight/logistics - persons transport), multiple dimensions (network, spatial, value, time, institutional, financial, implementation);
- raising awareness of urban nodes to be situated on the TEN-T network corridors;
- applying an integrated, multi-governance approach (beyond the conventional city boundary, with the FUA as starting point);
- importance of fact-based planning (linking strategic visioning, action programmes, project implementation and monitoring and evaluation);
- developing adequate data and assessment tools, and deeper understanding in spatial-economic analysis of urban nodes, FUAs and corridor segments;
- developing funding focused on integration and supporting combined/co-funding;
- establishing an urban nodes coordinator, working group and a community/network of professionals.

As indicated at the beginning, the objective to integrate urban nodes in the TEN-T network, is influenced by different policy domains, i.e. urban mobility and TEN-T policy. It can be concluded that for further deploying and extending the Vital Nodes knowledge and network, there is need for extending the overlapping area between urban mobility and TEN-T, thereby considering the wider policy setting in and enhancing further integration.

A more integrative approach will not be guaranteed by stimulating a smarter multi-level approach only, but also relates to other issues, for example the link between Horizon 2020 and Connecting Europe Facility (CEF), and linking well and making smart use of networks and events as TRA conferences, TEN-T Days and SUMP conferences etc. A better balance between infrastructure and sustainable mobility on the one hand, and liveable, economically vital urban regions on the other, may only achieved be when a multi-sector approach with corresponding research & innovation, funding and governance mechanisms is adapted.

By following such approach, also in the future there is need for a Vital Nodes Network in order to provide exchange of knowledge and experiences, and recommendations that can be taken as input for EU policy development and implementation, on e.g. the ongoing/future evaluation, and the subsequent revision, of the urban mobility package, the SUMP-guidelines, and the TEN-T regulations.

Transportation at the corridor-last mile interface: An international inventory of good practices in collaborative transportation planning, Paper submitted to Proceedings of 8th Transport Research Arena Conference, April 27-30, 2020 Helsinki, Finland.



Appendices

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[Appendix H: Governance Vital Nodes project](#)

[Appendix I: TEN-T Guidelines \(2013\)](#)

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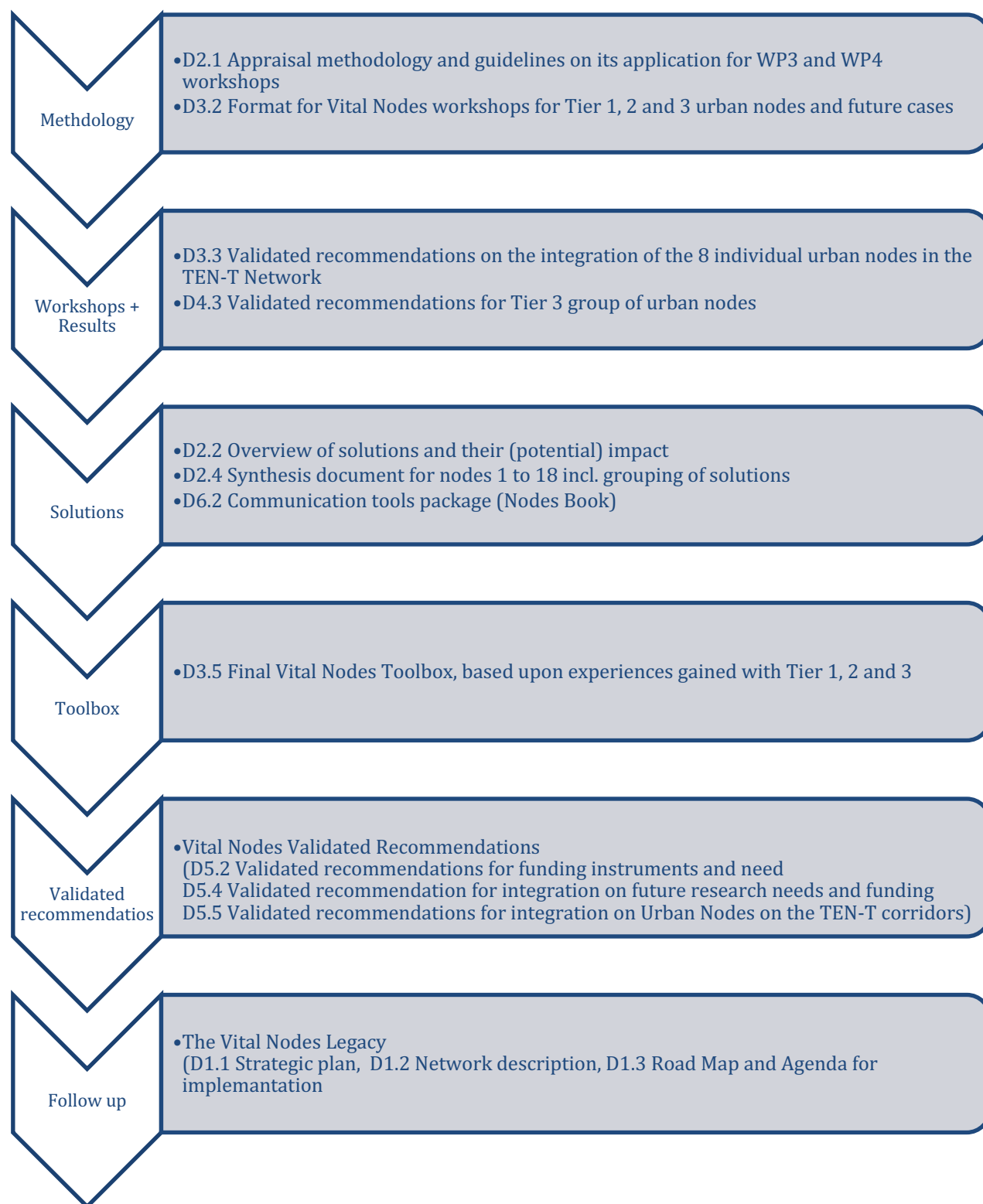


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Appendix B: Overview Vital Nodes results



Appendix C: Overview Vital Nodes Workshops, Tier 1 , 2 and 3 urban nodes

Urban Node	Date
Vienna (Kick off workshop)	16 November 2017
Vienna	17 January 2018
Rotterdam	29 March 2018
Gothenburg	12 April 2018
Budapest	3 May 2018
Hamburg	30 May 2018
Genova	12 June 2018
Turku	20 June 2018
Strasbourg	27 June 2018
Mannheim	11 July 2018
Sofia	25 January 2019
Duisburg	6 February 2019
Venlo	8 February 2019
Ljubljana	14 February 2019
Gdynia	13 March 2019
Budapest (Urban Nodes Forum)	3 and 4 April 2019
Duisburg	25 September 2019

Appendix D: Survey and results

Introduction

The main objective of Vital Nodes project is to deliver validated recommendations on integration of urban nodes into the TEN-T network. The 25 recommendations are the result of the urban nodes workshops of WP3, WP4 and the (bilateral) expert meetings. To ensure validation of these recommendations the preliminary recommendations (the so-called 'Vital Nodes Summary Note', d.d. 20 in September 2019) were send to the 88 urban nodes by EUROCITIES using their database. EUROCITIES received 14 responses in total. The survey questionnaire and the results of this survey can be found this appendix. Overall it can be concluded that survey results confirm the relevance of the Vital Nodes recommendations, the respondent gave the recommendations mainly scores between the 3-5 (1 being strongly disagree, 5 being strongly agree). This can be seen as a confirmation of the recommendations and also indicates a rather little diversion in the scores. Sometimes a lower score (2) was given but at the same time also higher scores (5) were given for the same recommendation. The answers to the open questions have been used to enrich and refine the formulation of the preliminary recommendations into the final recommendations. Below you will find the invitation and questionnaire of the survey.

Original questionnaire

This survey aims to validate the recommendations of the Vital Nodes project with the urban nodes. The primary objective of Vital Nodes is to deliver validated recommendations on the integration of urban nodes into the TEN-T network.

We identified a set of recommendations divided in five clusters:

1. Strategic planning
2. Governance
3. Network
4. Funding
5. Data

Some of these recommendations have sub aspects. We ask you to mark each recommendation and sub-recommendation on a scale from 1 until 5 (explanation of each mark is given in the table below). Besides giving a mark on the scale, there is also the option to give a remark on each recommendation. If you wish to comment on a recommendation, you can do it in the most right column, indicated with 'Remark'.

Mark	Meaning
1	Strongly disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly agree

General questions:

1. What is the name of your organisation?
2. Which urban node do you represent?

Strategic planning

Recommendation	Mark (1-5)
1. An integrated strategic plan should be developed in which the urban mobility and TEN-T objectives are incorporated . Within this integrated strategic plan, how do you rate the importance of the following aspects	1 2 3 4 5
a. Incorporate relevant TEN-T aspects in strategic plan. <i>Such as interconnection between long-distance and local/regional transport infrastructure, optimisation of local network capacity, socio-economic development opportunities, health, climate change and mitigating measures.</i>	1 2 3 4 5
b. Interaction between transport and spatial planning on different levels is needed: on urban, functional urban area (FUA), national and transnational level.	1 2 3 4 5
c. Mainstream freight transport and logistics in the strategic plan. <i>Current strategies are often strongly oriented towards persons transport. Mainstreaming it makes interactions between freight and logistics and persons transport explicit.</i>	1 2 3 4 5
d. The focus on modal shift and decarbonisation at the interface between long-distance and local/regional transport. <i>Intermodal solutions are needed to make optimal use of the modes of transport involved.</i>	1 2 3 4 5
e. External factors should be carefully considered and vulnerability scenarios should be developed in relation to the impact of these external factors. <i>This includes developments such as international trade developments, climate change, energy transition, urban development, etc.</i>	1 2 3 4 5
Do you see other elements that should be included in the integrated strategic plan?	
2. The strategic plan should be accompanied by a specific action plan , which provides a roadmap for the implementation of the strategic plan. <i>The action plan will identify prioritised actions, with responsible parties, timelines and required resources. The defined actions are matched with funding programmes.</i>	1 2 3 4 5
3. The strategic plan and action plan should be mainstreamed into the SUMP process.	1 2 3 4 5
a. In order to facilitate this process, specific SUMP guidelines should be produced, providing guidance to urban nodes. <i>These guidelines could expand on recently developed guidelines, such as SUMP Guidelines for Metropolitan Areas and Sustainable Urban Logistics Plan (SULP) Guidelines.</i>	
b. In the process of developing SUMP guidelines, the Vital Nodes Toolbox should be used. <i>This contributes to an integrated approach by considering (i) Network dimension; (ii) Spatial dimension; (iii) Time dimension; (iv) Value dimension; (v) Institutional dimension; and (vi) Implementation dimension.</i>	
4. Use relevant land that is now used as railway and marshalling lands for urban development purposes. <i>This creates financial means to invest in freight and logistics solutions, facilitating for example last-mile delivery.</i>	1 2 3 4 5

Governance

Recommendation	Mark (1-5)
5. Promote active collaboration between relevant stakeholders . What is your opinion on the following aspects related to stakeholder collaboration:	
a. Apply an urban-regional approach and focus on Functional Urban Area (FUA) level. <i>This requires collaboration with stakeholders (both public and private) at FUA level.</i>	1 2 3 4 5
b. Stimulate cooperation between disciplines , for example between city planners and mobility and infrastructure experts.	1 2 3 4 5
6. Develop TEN-T related cross-border collaboration of urban nodes that have close linkages in their infrastructure networks. <i>These collaborations have clear economic benefits for both urban nodes. An example is the strong connection between Vienna and Bratislava in terms of freight and logistics and commuter traffic, or the important link of Port of Rotterdam with Venlo, Duisburg and Milan.</i>	1 2 3 4 5
7. Support capacity building in urban nodes. <i>Planners in urban nodes need more support to tackle challenges related to local, regional and long-distance transport. A good way to increase institutional capacity is offering dedicated learning opportunities with a special focus on freight planning for urban and traffic planners.</i>	1 2 3 4 5
8. Establish a community of urban nodes professionals into the coordination of the nine TEN-T core network corridors (CNCs). <i>For the exchange of information, capacity building and promotion of interests, playing an active role in integrating urban nodes in the TEN-T corridors.</i>	1 2 3 4 5
9. Increase involvement of the urban nodes into the coordination of the nine TEN-T core network corridors (CNCs).	1 2 3 4 5
Within this recommendation, what is your opinion of the following options:	
a. Actively involve the (main) Urban Nodes in the CNC coordination, for example by having a dedicated Urban Nodes working group	1 2 3 4 5
b. Assign a dedicated Urban Nodes European Coordinator	1 2 3 4 5

Network

Recommendation	Mark (1-5)
10. Use a coordinated approach in cross-sector transport planning and asset management . <i>This considers the development and maintenance of infrastructure relevant for TEN-T corridors. Infrastructure managers should closely coordinate their activities in order to optimise combined asset management needs and minimise impact on traffic at local, FUA and corridor level.</i>	1 2 3 4 5
11. Improve traffic management to mitigate bottlenecks on local, regional and national transport networks. <i>Through smart information, traffic streams could be analysed and traffic flows influenced.</i>	1 2 3 4 5
Within this recommendation, what is your opinion on the following aspects:	
a. Use of traffic management tools and Intelligent Transportation Systems (ITS) applications to deal with issues related to TEN-T traffic <i>For information and navigation services. For instance to suggest safe routes and to keep dangerous goods from city centres.</i>	1 2 3 4 5

Recommendation	Mark (1-5)
<p>b. Integrate ITS applications, applied at urban level and harmonised at TEN-T level. <i>This could be a strong tool to mitigate traffic interdependencies between the various network levels, supporting the seamless connection between long-distance and urban traffic for passengers and freight.</i></p>	1 2 3 4 5
<p>12. Develop the potential of urban nodes as forerunner for deploying innovative solutions at the interface between TEN-T and regional/local networks.</p> <p>Within this recommendation, what is your opinion on the following aspects:</p>	1 2 3 4 5
<p>a. Urban nodes as forerunner for distributing and deploying alternative fuels</p>	1 2 3 4 5
<p>b. The modal shift and energy transition along the corridors should be supported by developing zero-emission infrastructure for long-distance transport and urban nodes being centers for new inter- and multimodal logistics concepts and structures.</p>	1 2 3 4 5
<p>c. The establishment and connection between (mobility) labs should be supported to facilitate the link-up and compatibility of innovative solutions along existing and future logistic value chains.</p>	1 2 3 4 5
<p>d. Facilitate good practices and develop standards, compatibility and link-up of integrated projects in the energy and mobility sector with other nodes. <i>E.g. consolidation centers which link alternative fuels provision (long-distance) with innovative zero-emission delivery concepts (regional and local transport).</i></p>	1 2 3 4 5
<p>13. Invest in infrastructure interfaces at urban nodes; in terms of infrastructure connections.</p> <p>Within this recommendation, what is your opinion on the following aspects:</p>	1 2 3 4 5
<p>a. (Re)vitalize and intensify utilization of existing parts of the road, rail and waterway network, thereby extending capacity of the existing infrastructures.</p>	1 2 3 4 5
<p>b. Develop railway bypasses in order to separate freight and passenger traffic within the urban nodes. This would reduce the vulnerability of the network within the cities.</p>	1 2 3 4 5
<p>14. Support standards for consolidation centers, which 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.</p> <p>Within this recommendation, what is your opinion on the following aspects with regards to developing the consolidation centers:</p>	1 2 3 4 5
<p>a. Develop the centers at strategic locations at the interface between long-distance and regional/local freight traffic.</p>	1 2 3 4 5
<p>b. The consolidation centers focus on a regional level, i.e. at the level of FUA.</p>	1 2 3 4 5
<p>c. Develop shared capacities for the regional redistribution and last-mile transport.</p>	1 2 3 4 5
<p>d. Integrate different modes, where possible, and to promote modal shift for employees.</p>	1 2 3 4 5
<p>e. Provide adequate alternative fuels and charging infrastructure for redistribution of goods.</p>	1 2 3 4 5
<p>15. Initiate harmonized access restrictions</p> <p><i>Many urban nodes on the TEN-T network have introduced access restrictions for vehicles in their urban areas. In order to support the logistic sector, it is important to harmonize access restrictions between urban nodes. Thus, the development of guidelines and standards for access restrictions should be supported.</i></p>	1 2 3 4 5

Funding

Recommendation	Mark (1-5)
16. Earmark funding for urban nodes focused on integration in the TEN-T corridors.	1 2 3 4 5
Within this recommendation, what is your opinion on the following aspects:	
a. Provide funding for urban nodes focused on integration in TEN-T corridors by pre-allocating budget in upcoming calls. <i>This could be in the form of investments focusing on (i) peri-urban networks, (ii) intra-urban networks and/or (iii) coordination with spatial development.</i>	1 2 3 4 5
b. Create funding programme mechanisms for applying an integrated approach for urban nodes in relation to TEN-T. <i>This can be realised by defining eligibility and award criteria.</i>	1 2 3 4 5
17. Stimulated and facilitate the use of multiple funding sources and blending options for urban nodes.	1 2 3 4 5

Data

Recommendation	Mark (1-5)
18. Develop data-based policy making and planning , including the creation of a data collection framework and applying the relevant datasets . <i>Related to infrastructure development, traffic management, spatial planning, multimodal hub development and economic and environmental effects of digitalisation.</i>	1 2 3 4 5
19. Establish a monitoring framework to determine the functioning of the urban node and the role of the urban node on the TEN-T network. <i>The framework should include performance indicators as well as relevant data sources.</i>	1 2 3 4 5
20. Develop tools to support sharing of urban node related data with other partners in the logistics chain/corridor. <i>A framework could be developed, which should allow for the exchange of historical and real-time data between public authorities, freight operators, infrastructure and traffic managers.</i>	1 2 3 4 5

Urban Node		1	1a	1b	1c	1d	1e	2	3	3a	3b	4	5	5a	5b	6	7	8	9	9a	9b	10
Recommendation		4	4	4	3	2	3	5	3	2	4	3	5	5	5	5	4	4	4	4	3	3
Hamburg																						
Venlo Region		5	5	4	5	5	3	5	3	5	5	4	5	5	5	5	4	5	5	3	4	3
Bremen/Hamburg		5	4	5	3	5	5	3	3	3	2	4	3	2	3	5	4	4	4	3	3	3
Budapest		4	4	5	4	4	3	4	5	5	4	3	4	5	4	4	4	3	3	4	4	4
Munich		2	2	2	2	2	2	3	2	3	3	3	2	3	3	3	3	3	3	3	3	3
Hamburg		4	4	4	4	5	4	3	3	4	3	3	5	3	4	4	4	4	4	4	3	4
Berlin (-Brandenburg)		4	5	5	4	5	3	4	3	5	3	4	4	4	5	5	5	4	5	5	5	4
Antwerp		4	4	5	5	4	5	5	4	5	4	3	5	4	5	5	5	5	4	4	4	3
Vienna		4	4	4	3	5	3	4	5	4	3	3	4	5	5	4	4	2	5	5	5	4
Cross Border area Gelderland		5	5	5	4	5	4	5	3	4	4	4	5	5	5	5	3	4	4	4	2	5
Sofia		5	5	4	4	5	3	5	5	5	5	3	4	4	5	3	5	4	5	5	5	4
Lisbon		5	4	5	4	3	4	5	5	3	3	2	4	3	5	3	5	4	4	3	3	3
Lille		5	5	5	4	4	3	3	5	5	4	5	5	4	4	4	4	3	4	3	4	4
Rome		5	5	5	4	4	4	4	5	5	4	4	5	4	5	3	4	3	3	3	3	x

Urban Node		11	11a	11b	12	12a	12b	12c	12d	13	13a	13b	14	14a	14b	14c	14d	14e	15	16	16a	16b	17	18	19	20
Recommendation		4	3	4	3	3	3	4	3	4	5	5	3	4	5	4	4	3	2	4	5	4	3	5	5	4
Hamburg																										
Venlo Region		5	5	4	4	4	4	3	5	5	5	5	5	5	5	5	4	3	5	4	5	5	5	4	5	5
Bremen/Hamburg		4	4	4	3	3	5	2	3	4	5	5	5	4	4	5	5	3	5	2	2	3	3	5	5	3
Budapest		4	3	3	4	3	4	4	5	4	4	3	4	4	5	5	5	4	5	4	4	4	3	4	4	4
Munich		3	3	3	3	3	2	2	3	3	3	3	3	2	2	2	2	2	3	3	3	3	3	3	3	3
Hamburg		5	5	4	4	4	4	4	3	4	4	3	4	5	3	4	4	5	3	3	4	4	5	4	4	5
Berlin (-Brandenburg)		4	4	4	4	5	5	4	5	5	5	5	3	4	4	5	5	5	3	5	3	5	5	3	4	3
Antwerp		5	4	5	5	5	5	5	5	4	5	5	5	5	4	5	5	5	5	5	5	4	5	5	5	5
Vienna		5	5	2	5	5	5	4	5	3	3	4	4	5	5	3	5	5	5	5	5	5	4	5	5	5
Cross Border area Gld.		4	5	5	4	4	5	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4
Sofia		5	5	4	4	4	5	3	2	5	3	2	5	4	5	4	5	5	3	4	5	5	3	4	5	3
Lisbon		4	4	4	5	4	5	4	5	4	5	3	4	4	3	5	5	4	3	3	4	3	5	5	4	5
Lille		5	5	5	5	5	3	3	5	4	4	5	3	5	3	4	5	5	5	4	5	4	5	4	2	4
Rome		5	4	4	4	5	4	4	5	4	4	4	x	4	4	4	5	5	5	3	3	4	3	5	3	4

Appendix E: Overview Vital Nodes dissemination activities

Table 2.1: Overview dissemination activities 2018

Activity		Date		Location
1	High-level Conference on European Multimodal Freight Transport	20.03.2018	20.03.2018	Sofia
2	TRA2018	16.04.2018	19.04.2018	Vienna
3	EUROCITIES Mobility Forum	23.04.2018	25.04.2018	Prague
4	CIVITAS Urban Freight Conference	23.04.2018	24.04.2018	Brussels
5	TEN-T Days 2018	25.04.2018	27.04.2018	Ljubljana
6	Polis Urban Freight (UF) Working Group Meeting	25.04.2018	25.04.2018	Brussels
7	SUMP Conference 2018	14.05.2018	15.05.2018	Nicosia
8	Rhine-Alpine Corridor Conference	06.07.2018	06.07.2018	Brussels
9	Cities for Mobility International Congress	17.06.2018	19.06.2018	Stuttgart
10	EUROCITIES Mobility Forum	10.09.2018	12.09.2018	Burgas
11	CIVITAS Forum	19.09.2018	21.09.2018	Umea
12	EU Week Cities and Regions	08.10.2018	19.10.2018	Brussels
13	CVS Congress	21.11.2019	22.11.2019	Leuven
14	VREF Conf. on Urban Freight	17.10.2018	19.10.2018	Goteborg
15	Corridor conference	06.11.2018	08.11.2018	Rotterdam
16	1 st Policy Dialogue	08.11.2018	08.11.2018	Brussels
17	CVS congress	22.11.2018	23.11.2018	Amersfoort
18	POLIS Conference	22.11.2018	23.11.2018	Manchester
19	Polis UF Working Group Meeting	21.11.2018	21.11.2018	Manchester
20	EUROCITIES AGM	28.11.2018	30.11.2018	Edinburgh

Table 2.2: Overview dissemination activities 2019

Activity		Date		Location
1	Urban Nodes Forum	03.04.2019	03.04.2019	Budapest
2	CIVITAS Study visit #1	03.06.2019	05.06.2019	Budapest
3	Congress Topcorridors	06.06.2019	06.06.2019	Zoetermeer
5	North Sea Baltic Working Group	14.06.2019	14.06.2019	Brussels
6	SUMP Conference	17.06.2019	18.06.2019	Groningen
7	AESOP annual congress	09.07.2019	13.07.2019	Venice
8	GO SUMP Final Conference	17.09.2019	19.09.2019	Malaga
9	CIVITAS Forum	02.10.2019	04.10.2019	Graz
10	XXVI World Road Congress	06.10.2019	10.10.2019	Abu Dhabi
11	TEN-T Atlantic Corridor workshop (H2020 project MORE)	08.10.2019	08.10.2019	Lisbon
12	2nd Policy Dialogue	15.10.2019	15.10.2019	Brussels
13	EUROCITIES Forum	21.10.2019	23.10.2019	Uppsala
14	CVS Congress	21.11.2019	22.11.2019	Brussels
15	POLIS Conference	27.11.2019	28.11.2019	Brussels
16	Polis UF Working Group Meeting	29.11.2019	29.11.2019	Brussels

Table 2.3: Overview dissemination activities 2020

Activity		Date		Location
1	TEN-T (Orient/East-Med, Med, Rhine-Danube) Corridor workshop (MORE)	25.02.2020	25.02.2020	Budapest
2	TRA2020	27.04.2020	30.04.2020	Helsinki

Appendix F: Vital Nodes SUMP Topic Guide: Recommendations for better freight/logistics planning in urban nodes on the TEN-T network (Abstract)

By Marlene Damerau, Susanne Böhler-Baedeker, Siegfried Rupprecht (Rupprecht Consult), Kevin van der Linden (Rijkswaterstaat), Ricardo Poppeliers (Ecorys), Jos Arts (Rijkswaterstaat), Sjaak van der Werf (Rijkswaterstaat)

Aim of the Topic Guide

European long-distance transport infrastructure connects cities and regions by TEN-T corridors on different geographical scales. How can the system be developed in a way that it meets the demands of spatial quality and liveability also in urban nodes, while enabling them to fulfill their main functions to connect and distribute traffic on the TEN-T between small and large-scale networks?

The Vital Nodes Topic Guide provides orientation for planners and decision makers on different institutional levels to better plan for freight and logistics at the interface between long-distance and local or regional freight transport. It focusses on the overlap of the policy fields of urban mobility and TEN-T – including the interaction between passengers and freight transport - and addresses three questions which complement available SUMP related knowledge⁵⁷ :

- Why should one act in a specific situation – based on their smart objectives – in order to realize added value. Including the relevant inventory on which stakeholders (who) need to be involved on the level of the urban node and its Functional Urban Area (FUA) to plan for freight and logistics in a coherent and sustainable way?
- What is the appropriate catchment area to plan for sustainable freight and logistics, and how can it be defined?
- How can both the greater spatial level – urban node – and the freight and logistics perspective be addressed in the context of a SUMP, bringing municipalities, urban regions and national transport infrastructure authorities together?

Target groups

Target groups of the Topic Guide are those actors who are involved in the planning and development of freight and logistics infrastructure, such as planners who work for public authorities on the municipal, regional or national level, infrastructure coordinators and operators, or freight and logistics operators, as well as logistics experts, industry, commerce and consumer associations.

Vital Nodes relevance for SUMP

Vital Nodes broadens the SUMP scope in terms of spatial scale, value driven approach, functionalities of areas, stakeholder involvement, and planning content and objectives.

57 Chinellato, M.; Morfoulaki, M. (2019): Topic guide sustainable urban mobility planning in metropolitan regions - Sustainable urban mobility planning and governance models in EU metropolitan regions, Brussels; Aifandopoulou, G.; Xenou, E. (2019): Sustainable Urban Logistics Planning, Brussels

- First, one lesson from Vital Nodes is to define the Functional Urban Area (FUA) of an urban node from a freight and logistics perspective, which may differ from the usual delimitation of the area – Daily Urban System (DUS) based on commuter flows. Even though the concept of sustainable urban mobility plans (SUMP) is now embracing a more regional perspective, there is still a limitation to address, as responsibility for the main transport network is assigned to national transport infrastructure authorities.
- A second important lesson is to define indicators for the functionality of areas / nodes.
- A third important lesson from Vital Nodes is, therefore, to involve national stakeholders on the level of the urban node.
- The fourth lesson learnt is to include the transversal objective “spatial quality” or “quality of life” into the planning and development process of TEN-T relevant infrastructure, which leads to a more integrated way of supra-regional infrastructure planning.

Relevance of SUMP for Vital Nodes and the TEN-T

Integrating both a TEN-T and freight and logistics perspective into the multi-layer approach. Strategic planning and visioning, basic elements of the SUMP cycle, are until now – even on the city-level - rarely practiced to develop freight and logistics in a sustainable way. Applied on the scale of the urban node, FUA and national/trans-national level, these methods have potential for better strategic land use planning, hub development, and, thus, improving efficiency of freight transport, and consequently, reducing GHG emissions on the TEN-T.⁵⁸

Vital Nodes Toolbox

The Vital Nodes toolbox offers strategic advice to practitioners who plan for TEN-T infrastructure and the line with urban nodes and shows methods and good practices for integrated land-use and infrastructure and mobility planning at the interface between urban/regional and corridor levels.

It consists of a systematic overview of potential added values that can be realized through a more rational and fact-based infrastructure development on the FUA level. It furthermore explains the potential benefits of merging the objective “quality of life” or “spatial quality” into infrastructure development strategies, and, finally, shows ways how to effectively implement these strategies.

Planning examples from European urban nodes

The Vital Nodes Topic Guide provides the Vital Nodes fact-based identified and analysed urban nodes' examples which showcase forward looking and innovative planning and implementation experiences to the SUMP community.

⁵⁸ Binding GHG emissions reduction target of 40 % on member states level also in the transport sector;
https://ec.europa.eu/clima/policies/effort/regulation_en#tab-0-0

Appendix G: Vital Nodes Roadmap and Agenda (from D1.1-3)

Introduction

The work initiated by Vital Nodes project will continue (in some form) after the completion of the project in October 2019. This follows the strategy which is set out in the Strategic Plan (The Vital Nodes Legacy; D1.1-3).

The Agenda builds on the results from WP6 (Dissemination and Communication). WP6 has investigated the upcoming conferences and other events that may be of interest for VN. There are several future (2020) events where VN network can have a role (See: *Table 3.2*). It is difficult to create detailed agenda for the Vital Nodes network for 2021 and further because there isn't a detailed list of related events available.

Roadmap

The Vital Nodes Legacy report explores and defines a strategy to create a self-sustaining and durable network and aims to implement the outcomes and results of the VN project. One of the main objectives of the VN Network is to implement and deploy the findings of the VN project. The network safeguards and disseminates the recommendations from WPs 2-5 for further deployment throughout Europe's urban nodes.

To fulfil this goal, we have investigated and evaluated several network structures:

0. *No coordinated follow-up of Vital Nodes ('Conventional H2020 project procedure')*
The Vital Nodes Consortium continues its work until the end of the project, with some final dissemination events and workshops.
1. *Coordinated working group (Polis / EUROCITIES / NUVit)*
VN works within the existing NUVit framework and support the creation of a joint Polis / EUROCITIES Urban Nodes/TEN-T thematic activity under CIVITAS.
2. *Call LC-MG-1-12-2020*
The Vital Nodes consortium (or a part of) has voiced its intention to bring forward the VITAL NODES approach in the Innovation Action and CSA aspects of the Horizon 2020 call LC-MG1-12-2020. If granted to the projects with VN consortium member representation, the VN network or similar activities could be smoothly handed over.
3. *Linking up with TEN-T deployment instruments and governance*
Currently the TEN-T policies and regulations are evaluated and revised. This provides an opportunity to take up recommendations of VN (see final report WP5 on Validated recommendations on:
3a) Forming a dedicated **TEN-T working group on Urban Nodes**. In this option the Vital Nodes consortium continues its work under a newly formed working group on the integration of urban nodes on TEN-T corridors.
3b) Creation of an **Urban Nodes TEN-T Coordinator**. This coordinator can help to further emancipate and implement the issue of integration of Urban Nodes into the Corridors, and keep this issue on the TEN-T and European agenda. Options 3a and 3b are not mutually exclusive but could complement each other very well (See: recommendation number 15).
4. *An independent Vital Nodes Network*
Finally, the Vital Nodes consortium could create an own controlled network. It will include a financial and legal structure to ensure a long-lasting collaboration with VN stakeholders with an own scope and strategy.

There are pros and cons with each of the five alternatives, as shown in the *Table 3.1* below. There is a preference of the consortium to build a coordinated working group (option 1), driven by the NUVit platform and supported by Polis and EUROCITIES. The involved VN consortium partners are committed to implement this Option 1 could be combined later with Option 2 and/or Option 3 for sustaining the VN Network and legacy to the mid-term respectively long-term, which however can only be done in close collaboration with and of EC/DG-MOVE).

Table 3.1: Overview (dis)advantages Options 0 - 4

Option 0 No coordinated follow-up of Vital Nodes	+	Consortium members take VN knowledge further in their own organisation
		No financial structure is needed
	-	Does not fit with VN ambitions
		Does not fulfil any VN function (Collaboration, competence building, support)
		Is not a self-sustaining structure
Option 1 Coordinated Working Group	+	Participation is fully dependent on voluntary and on ad hoc basis activities (no safeguards)
		Can fulfil some VN functions (Collaboration, competence building, and support) in the short term.
		Builds on an existing network structures / has a stable support base
	-	No financial structure is needed
		Narrow scope: NUVit / EUROCITIES / Polis do not cover the whole VN topic range
Option 2 New Horizon Call	+	Difficult to maintain the network on the longer term.
		Core group is relatively small - not all consortium members will continue to participate (Participation is dependent on voluntary action)
	-	VN concepts and methods continue through a follow-up project on urban nodes(LC-MG 1-12-2020)
		Way to secure funding and mid-term Vital Nodes legacy (for time of H2020 project)
		Narrow project scope - does not deliver on all VN functions (Collaboration, competence building, support / advice)
Option 3a Linking up with TEN-T Option 3b Urban nodes coordinator	+	Only a call - no guarantee that proposal by VN Consortium will be granted, so no guarantee for continuation
		Does not build a full network structure
	-	Close integration within and collaboration on TEN-T policy developments
		Can fulfil all VN functions (Collaboration, knowledge competence building, support / advice)
Option 4 Vital Nodes Network	+	A comprehensive approach for urban nodes on the TEN-T corridors
		VN will not set the agenda, agenda setting to be done by EC. Scope on VN topics could change.
		Some financial commitment / external financial support is needed
	-	Governance of TEN-T working group has to be further elaborated and discussed.
		Can fulfil all VN functions (Collaboration, competence building, support / advice)
	+	Can build and implement road map / measures. VN can set the agenda.
	-	High financial commitment / external financial support is needed
		Many existing networks exist, that have a part of the VN scope, and will have similar actions

As discussed above, the most realistic continuation of VN is option 1, which however depends on in-kind contributions and existing (known) actions which will change (diminish) over time. An example is the CIVITAS thematic workshops arranged by Polis/EUROCITIES, which will only continue until autumn 2020.

Taking over and maintaining the website is crucial to be able to continue with dissemination of information from VN. The website, which is hosted by Threerooms, UK, <https://www.threerooms.com/> will (according to the contract) only be maintained until November 2021. All project material from the project database shall be transferred and hosted by NUVit. This shall include the reports, workshop documents, expert information, and local knowledge.

Modular extensions

If previous VN consortium or a slightly altered consortium receives grants from the H2020 MG 1-12 call (Option 2), all VN project documentation/database etc. will be handed over to the new project consortium (which would be in effect the VN inheritor and safeguarded of the VN legacy). This means that we can safeguard and enhance the facilities until at least the end of that project. Otherwise, we continue to store the project material via NUVit but no further development is possible.

If Option 3a (TEN-T working group) and/or 3b (Specific TEN-T Urban Nodes coordinator) is chosen then we have the possibility to further strengthen the institutional level of the VN Network as described in Chapter 3. We are convinced that a modular extension to option 3 a/b is something to strive for, but it requires EC/DG-MOVE are willing to support such network and coordinator.

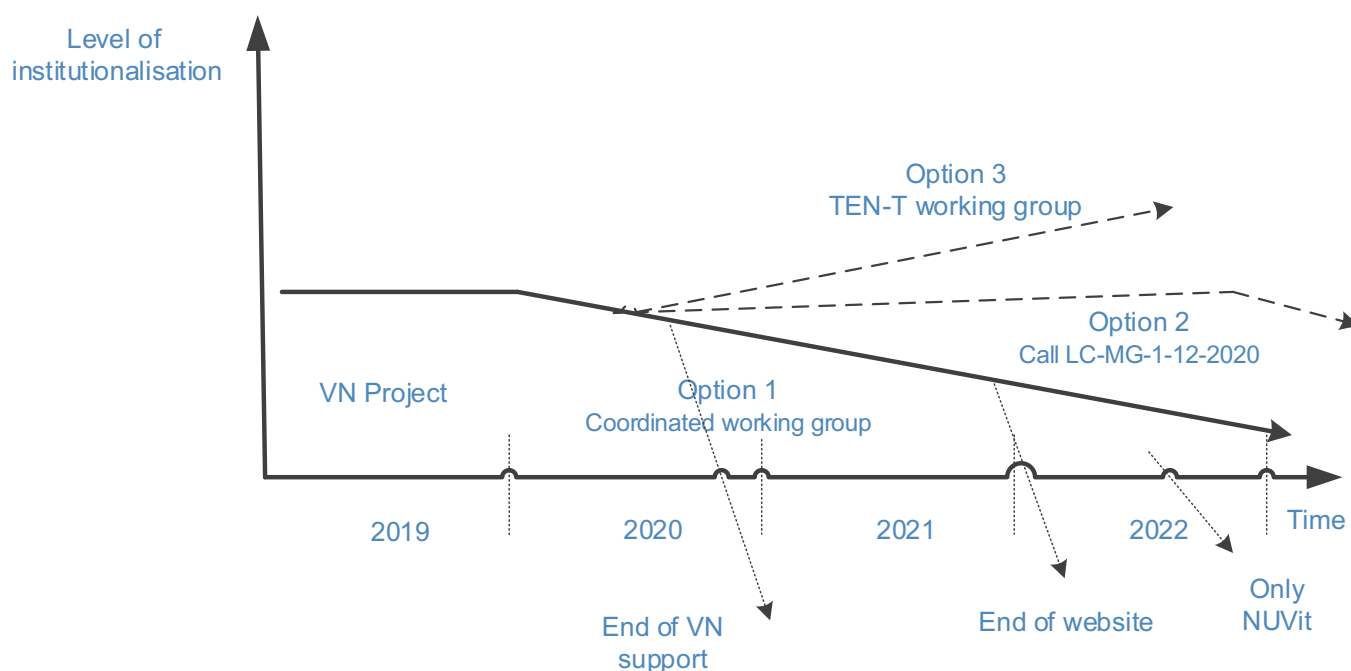


Figure 4: Timeline level of institutionalization depending on network structure

Option 1 will enable to implement the VN functions (functions collaboration, competence building and support) for the short-term. However, without a financial framework, this only can be sustained for the short-term. After 2020 Polis/EUROCITIES support of CIVITAS will end, hampering the sustained support for an Urban Nodes / TEN-T thematic group and activities. The Vital Nodes website is also foreseen for (only) the next 2 years (November 2021) – see Figure 4 above.

By extending with option 2 the level of the VN Network and related activities (working group, workshops, meetings, website etc.) could be sustained for the period of the H2020 project MG 1-12. However, thereafter it would imply an end of the activities (analogous conventional H2020 projects). Option 3a/b provides interesting opportunities for further elaborating VN Network and activities.

Option 3a/b seems to fit best with the current discussions within the EU (as part of TEN-T evaluation and preparation of new policies/regulations) about the importance of Urban Nodes, Functional urban Areas, and the need for further integration of modalities, freight/logistics and persons traffic, the interface of infrastructure mobility and spatial development, etc. *Figure 6* depicts this and shows that option 1 can be used for 'roof tiling' with option 2 and/or option 3a/b which will not be implemented directly after the end of the VN project (=31 October 2019). Regarding this, option 3a/b provides the best safeguard for a sustained VN Network and legacy for the long-term by further strengthening (institutionalising) the embeddedness and deployment of VN knowledge and network into TEN-T policy and practice.

Agenda

As far as we know we have listed internal and external activities for the first years to come. The agenda builds on existing knowledge from WP6 Dissemination and Communication – see *Table 3.2* below (see also Appendix E).

Overview of activities of possible participation Vital Nodes

Table 3.2: Overview activities Roadmap

Option	Activity	Date	Location
1	Advisory Board Meeting	05.02.2020	Brussels
	TRA2020	27.04.2020	Helsinki
	2020 Annual Polis Conference	Autumn 2020	Brussels
	Urbanism Next 2020	Autumn 2020	
	Urban Nodes Forum #2 (2020)	April/June 2021	
	H2020 project MORE workshops		
	Urban Mobility Days 2020	2020	
	Urban Future Global Conference 2020	2020	
	National events		
	Urban Development Network Meetings 2020		
	European Observation Network for Territorial Development and Cohesion (ESPON) Seminars 2020		
	CEDR Research Call Collaborative planning of spatial and infrastructure development Workshops 2020	Autumn 2020	
1 + 2	European Week of Regions and Cities Workshops 2020		Brussels
	Volvo Research and Educational Foundations (VREF) Urban Freight Conference		
	TEN-T days 2020-		
1 + 2 + 3a/3b	TEN-T Corridor meetings 2020		
	TRA conferences 2022-		
	Specific TEN-T related events		
	Vital Nodes Forum		
	TRB Annual meeting		
	18th CODATU Conference on urban mobility		
	World Road Congress		

Appendix H: Governance Vital Nodes project

Organizational structure, decision-making mechanism and management procedures

This appendix describes the governance of the Vital Nodes project – the various parties involved and their respective responsibilities, tasks and roles. Vital Nodes aims at coordinating activities and building networks. Therefore, external bodies have a primordial role in the organisation structure of the project. *Figure 6* shows the management structure of Vital Nodes and the interrelation with external bodies. The Executive Board links all WPs and the innovation manager, while the General Assembly involves all other partners in the project. The three layers of Urban Nodes (Tier 1-3) are linked to the different WPs: Tier 1 is linked to WP3, while Tier 2 and Tier 3 are linked to WP4. Tier 3 (all 88 TEN-T nodes) is also linked to WP1 and WP6 via the city network partners Polis (WP6 leader) and EUROCITIES. The Advisory Board will be in frequent communication with the Executive Board. Selected experts from the Vital Nodes Network's Expert pool, created within WP1, will be invited to participate in the workshops organised by WP3 and WP4. A Vital Nodes Network Secretariat (See WP1) will ensure the transferability of activities from WP6 to the long-lasting self-sustained network created by WP1. Both, the Vital Nodes consortium and the Vital Nodes Network form part of the Community of Practice which represents the end-user group for the results of our project and the boundaries of the Vital Nodes network of networks.

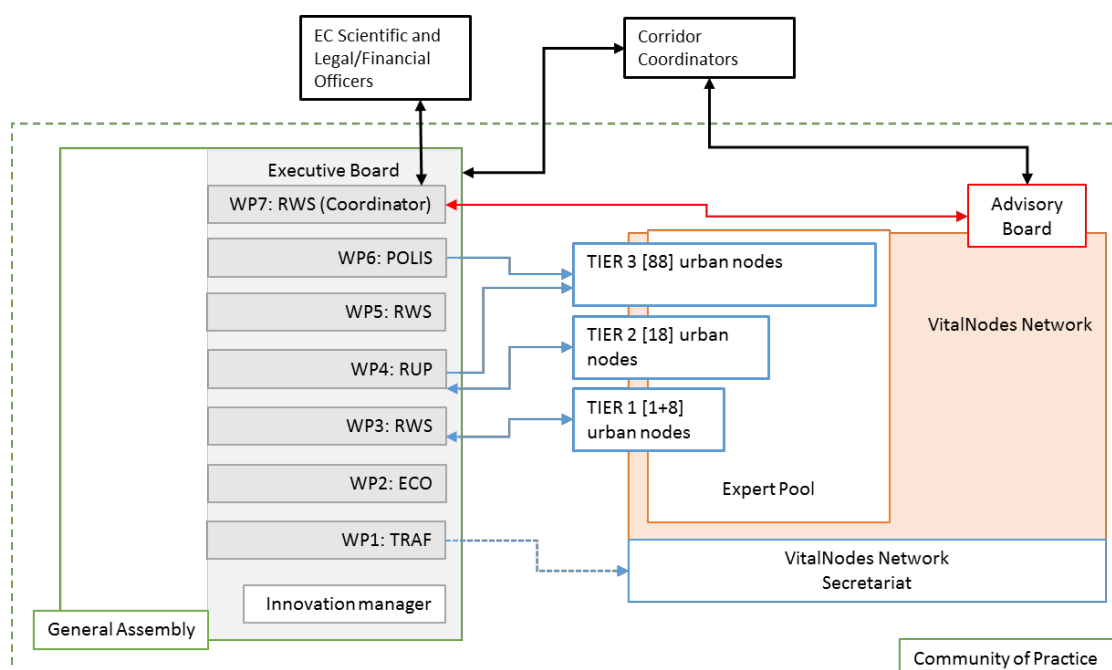


Figure 6: Management structure and interrelation with the Work packages

General Assembly

The General Assembly (GA) is composed of representatives from each partner in the consortium. The GA will be established at the beginning of the project. Meeting at 6-monthly intervals, the GA will discuss and decide on overall project management, strategic management issues and contract amendments.

Executive Board

The Executive Board (EB) is the highest operational body within the consortium. The EB comprises the project coordinator, the work package leaders and the innovation manager. The role of the Executive Board is to monitor and to ensure the project progress in terms of goals, finances, quality, risk management and dissemination

Project Coordinator

The project coordinator is responsible for the day-to-day management, performance monitoring, budget control, management reporting, project logistics and project administration. The project coordinator will ensure *completion of the work in time, within budget, and to a high quality*. The coordinator is the *primus inter pares* and as such responsible for the overall project management, including coordination of the scientific and technical work plan, innovation management and preparatory exploitation activities.

Work package leaders

Work package leaders will coordinate and chair their own work package. Work package leaders deal with the developments and overall coherence and technical implementation of the project output.

Innovation manager

The innovation manager acts as the main contact point for innovation management, quality assurance and risk management. As such, he will communicate with the other EB members regarding quality standards for deliverables, identification and management of risks and needs for independent reviews. The innovation manager will furthermore oversee that new insights resulting from interactions between project partners and external experts and stakeholders during the meetings and workshops are captured in the results of the project and specifically the enriched and fine-tuned Vital Nodes approach and toolbox.

Advisory Board

Within Vital Nodes an Advisory Board is established. The initial purpose of the Advisory Board is to advise the consortium on high-level political and strategic issues. After the project has ended, the Advisory Board will be transformed to create a long-lasting steering group for strategic guidance of the Vital Nodes Network. During the project, the Advisory Board will be invited to specific meetings and workshops (at least five times during the project) to provide feedback on intermediate results, project direction and to provide input about relevant international political and strategic developments. Already committed Members of the Advisory Board are affiliates of important groups and networks, such as ALICE, CEDR, EIM, INE, ECTP-CUE. The Advisory Board members will also help build the Vital Nodes network through their personal network.

Expert Pool

The Expert Pool within Vital Nodes will be involved in the validation of results and recommendations provided by the thematic and urban node workshops. The Expert Pool will be composed by thematic experts (knowledge holders) and by practitioners (knowledge application). The hands-on collaboration of the experts during the project also seeks to ensure the Expert Pool to become part of the Vital Nodes long-lasting and self-sustained network. The Expert Pool will also be consulted on recommendations for policy (WP5), based on the results of WP3 and WP4. The relevant experts and practitioners will be selected from an Expert Pool database to participate in each workshop based on their expertise: regional or local knowledge, thematic knowledge or network knowledge. The Vital Nodes Network Secretariat will host and manage the Expert Pool database during and after the finalisation of the project.

Vital Nodes network tier 1, 2 and 3 urban nodes

The broader Vital Nodes Network consists of the AB members, the expert pool and professionals from the various urban nodes (tiers 1, 2 and 3) as well as other professionals in urban mobility, freight and logistics, infrastructure planning and management, spatial planning etc.

Appendix I: TEN-T Guidelines (2013)

REGULATIONS

**REGULATION (EU) No 1315/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 11 December 2013**

**on Union guidelines for the development of the trans-European transport network and
repealing Decision No 661/2010/EU
(Text with EEA relevance)**

- (30) The guidelines should provide for the development of the comprehensive network in urban nodes, in accordance with Union aims regarding sustainable urban mobility, as those nodes are the starting point or the final destination ("last mile") for passengers and freight moving on the trans-European transport network and are points of transfer within or between different transport modes.
- (41) The core network has been identified on the basis of an objective planning methodology. That methodology has identified the most important urban nodes, ports and airports, as well as border crossing points. Wherever possible, those nodes are connected with multimodal links as long as they are economically viable, environmentally sustainable and feasible until 2030. The methodology has ensured the interconnection of all Member States and the integration of the main islands into the core network.

Article 3

Definitions

For the purpose of this Regulation, the following definitions apply:

m) 'cross-border section' means the section which ensures the continuity of a project of common interest between the nearest urban nodes on both sides of the border of two Member States or between a Member State and a neighbouring country;

Article 30

Urban nodes

When developing the comprehensive network in urban nodes, Member States shall, where feasible, aim to ensure:

- (a) for passenger transport: interconnection between rail, road, air and, as appropriate, inland waterway and maritime infrastructure of the comprehensive network;
- (b) for freight transport: interconnection between rail, road, and, as appropriate, inland waterway, air and maritime infrastructure of the comprehensive network;
- (c) adequate connection between different railway stations, ports or airports of the comprehensive network within an urban node;
- (d) seamless connection between the infrastructure of the comprehensive network and the infrastructure for regional and local traffic and urban freight delivery, including logistic consolidation and distribution centres;
- (e) mitigation of the exposure of urban areas to negative effects of transiting rail and road transport, which may include bypassing of urban areas;
- (f) promotion of efficient low-noise and low-carbon urban freight delivery.

Article 41

Nodes of the core network

1. The nodes of the core network are set out in Annex II and include:
 - (a) urban nodes, including their ports and airports;
 - (b) maritime ports and inland waterways ports;
 - (c) border crossing points to neighbouring countries;
 - (d) rail-road terminals;
 - (e) passenger and freight airports.
2. Maritime ports of the core network indicated in Part 2 of Annex II shall be connected with the railway and road and, where possible, inland waterway transport infrastructure of the trans-European transport network by 31 December 2030, except where physical constraints prevent such connection.
3. The main airports indicated in Part 2 of Annex II shall be connected with the railway and road transport infrastructure of the trans-European transport network by 31 December 2050, except where physical constraints prevent such connection. Taking into account potential traffic demand, such airports shall be integrated into the high-speed rail network wherever possible.

Article 50

Engagement with public and private stakeholders

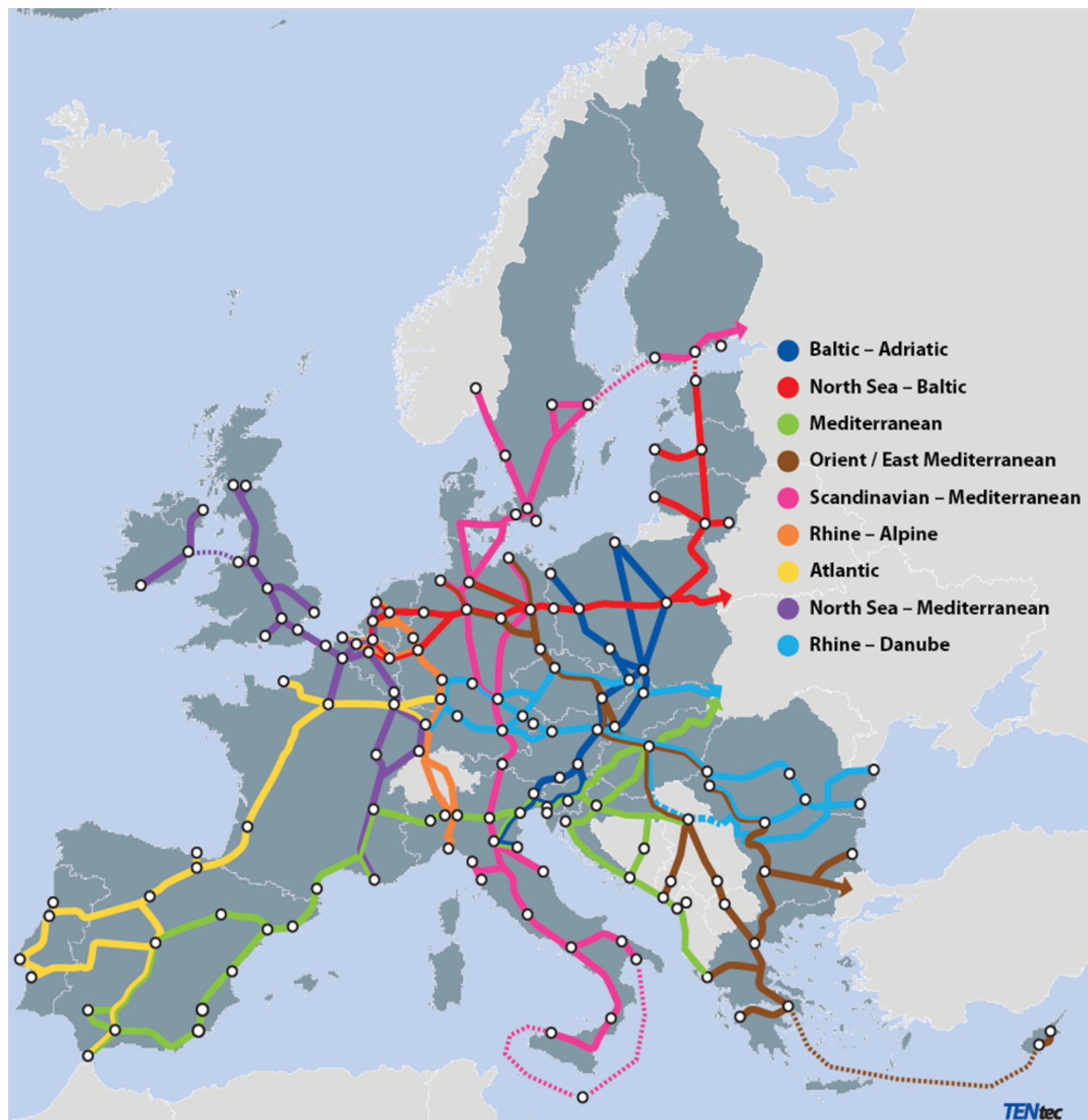
1. Projects of common interest relate to all directly concerned stakeholders. These may be entities other than Member States, which may include regional and local authorities, managers and users of infrastructure as well as industry and civil society.
2. National procedures regarding regional and local authorities as well as civil society affected by a project of common interest shall be complied with, where appropriate, in the planning and construction phase of a project. The Commission shall promote the exchange of good practice in this regard.
3. The stakeholders referred to in paragraph 1 may, within the scope of their competence, also use, in addition to the Connecting Europe Facility and the Cohesion Fund, other specific European programmes, in particular those supporting regional development, 'European Territorial Cooperation', 'Research and Innovation' or 'Environment and Climate action'. Those stakeholders may thereby contribute to achievement of the objectives of this Regulation and, moreover, specifically strengthen:
 - (a) the enhancement of regional mobility, thereby promoting access to the trans-European transport network, for all regions of the Union;
 - (b) the promotion of cross-border projects;
 - (c) the integration of urban nodes into the trans-European transport network (including promotion of sustainable urban mobility);

ANNEX II

LIST OF NODES OF THE CORE AND COMPREHENSIVE NETWORKS

Urban nodes of the core network:

BELGIUM	Antwerpen, Bruxelles/Brussel
BULGARIA	Sofia
CZECH REPUBLIC	Ostrava, Praha
DENMARK	Aarhus, København
GERMANY	Berlin, Bielefeld, Bremen, Düsseldorf, Frankfurt am Main, Hamburg, Hannover, Köln, Leipzig, Mannheim, München, Nürnberg, Stuttgart
ESTONIA	Tallinn
IRELAND	Baile Átha Cliath/Dublin, Corcaigh/Cork
GREECE	Athína, Heraklion, Thessaloniki
SPAIN	Barcelona, Bilbao, Las Palmas de Gran Canaria/Santa Cruz de Tenerife, Madrid, Palma de Mallorca, Sevilla, Valencia
FRANCE	Bordeaux, Lille, Lyon, Marseille, Nice, Paris, Strasbourg, Toulouse
CROATIA	Zagreb
ITALY	Bologna, Cagliari, Genova, Milano, Napoli, Palermo, Roma, Torino, Venezia
CYPRUS	Lefkosía
LATVIA	Rīga
LITHUANIA	Vilnius
LUXEMBOURG	Luxembourg
HUNGARY	Budapest
MALTA	Valletta
NETHERLANDS	Amsterdam, Rotterdam
AUSTRIA	Wien
POLAND	Gdańsk, Katowice, Kraków, Łódź, Poznań, Szczecin, Warszawa, Wrocław
PORTUGAL	Lisboa, Porto
ROMANIA	Bucureşti, Timişoara
SLOVENIA	Ljubljana
SLOVAKIA	Bratislava
FINLAND	Helsinki, Turku
SWEDEN	Göteborg, Malmö, Stockholm
UNITED KINGDOM	Birmingham, Bristol, Edinburgh, Glasgow, Leeds, London, Manchester, Portsmouth, Sheffield



Note: the nine TEN-T core network corridors are based on the CEF and TEN-T Regulations (1316/2013 & 1315/2013); they have been created as a coordination instrument to facilitate the completion of major parts of the core network of strategic importance.

Source: European Commission, Directorate-General for Mobility and Transport, TENtec Information System