Naar een betere afstemming van goederenvervoer, infrastructuur en ruimtelijke ontwikkeling voor steden en corridors

- WORK IN PROGRESS -

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Samenvatting

De Europese Commissie heeft in haar beleid voor de TEN-T corridors zogenaamde Stedelijke Knooppunten (Urban Nodes) gedefinieerd, waar verschillende modaliteiten met elkaar verbonden (moeten) worden. Een belangrijke vraag voor de Europese Commissie is hoe te komen tot (kosten)effectieve en duurzame integratie van deze Stedelijke Knooppunten op de TEN-T-corridors. Hoe te komen tot multimodale verbindingen tussen lange-afstand en laatste-kilometer transport, met name bij goederenvervoer en logistiek? Dit paper betoogt dit integrale planning van mobiliteit, ruimte en infrastructuur vergt waarbij verschillende ruimtelijke schaalniveaus, modaliteiten, sectoren en belanghebbenden van belang zijn, zowel in de Stedelijke Knooppunten als op de Europese en nationale netwerken. Belangrijke vraagstukken hierbij zijn: multimodale toegankelijkheid, vracht-/logistieke innovaties en trends, interacties met personenvervoer, ontwikkeling van robuuste infrastructuurnetwerken, sociaaleconomische vitaliteit, milieukwaliteit en leefbaarheid van stedelijke gebieden en regio's.

Voor deze opgave is dit najaar het zgn. 'VitalNodes'-project gestart in het kader van het EU Horizon2020-Programma. Dit is een gezamenlijk project van nationale infrastructuurautoriteiten, regionale en lokale overheden, stadsnetwerken, en consultants in vracht en logistiek. Bij het project worden kennis, ervaringen en innovatieve oplossingen uitgewisseld voor de integratie van multimodale stedelijke knooppunten en het TEN-T-netwerk. Dit moet resulteren in: een praktische gereedschapskist (een 'toolbox') met instrumenten; in gevalideerde aanbevelingen voor een dergelijke integrale planning voor de Europese Commissie; en in een multidisciplinair netwerk van professionals en experts – zoals stedelijke en infrastructuurplanners (op nationaal, regionaal en lokaal niveau), beheerders, (vracht)vervoerders, financiers.

Dit paper introduceert het VitalNodes-project. Daartoe, bespreekt het paper allereerst de achtergrond, problematiek en opgaven rondom de integratie van stedelijke knooppunten en corridors en meer algemeen de integratie van mobiliteit, infrastructuur en ruimte. Daarbij ligt de nadruk op goederenvervoer en logistiek. Daarna wordt dieper ingegaan op het belang van verschillende schaalniveaus en verschillende relevante dimensies (ruimtelijk, netwerk, tijd, waarde, institutionele en implementatie) bij het komen van integrale planning. Om meer inzicht te geven in de beoogde oplossingsrichtingen bespreekt het paper eerdere ervaringen die zijn opgedaan met een dergelijke integrale planning van infrastructurele en ruimtelijke ontwikkeling. Tenslotte, wordt behandeld hoe het VitalNodes-project de komende jaren kennis en ervaringen bij elkaar brengt om zo op Europees niveau te leren over vitale stedelijke knooppunten en corridors. Hierbij hopen we ook op inbreng van collega's uit de Nederlandse vervoersplanologische praktijk.

1. Introduction

Achieving a (cost)efficient and sustainable integration of urban nodes on the TEN-T core network corridors, addressing the multimodal connection between long-distance and last -mile transport is complex. This is certainly true for freight and logistics. Different spatial scales, modalities, sectors and public, private and societal stakeholders are concerned and all have to be taken into account when integrating mobility, infrastructure and spatial development in both urban nodes and corridors. Important issues relevant to such integration are: multimodal accessibility, trends and innovations in freight logistics, inter-actions with passenger transport, development of robust infrastructure networks, as well as socio-economic vitality, environmental quality, liveability of urban areas and regions.

To tackle these challenges, the *'VitalNodes' project* has been started (as part of EU's Horizon 2020) that focuses on the integration of infrastructure planning, urban planning and freight transport for sustainably incorporating urban nodes into TEN-T corridors. To this end, the project will firstly analyse best practices, experiences and opportunities in the various urban nodes and corridors. Secondly, actors within various fields – such as urban planners, infrastructure coordinators/operators, freight operators and financiers – need to collaborate early on to achieve an integrated planning and decision-making process. Therefore the project will bring existing networks together and create a 'network of networks' for ensuring long-term engagement and successful implementation.

This paper introduces the VitalNodes project. First, the paper discusses the background and challenges related to the integration of urban nodes and corridors – and more in general the integration of mobility, infrastructure and spatial development – focussing especially on freight and logistics. Subsequently, the paper elaborates on the relevance of different levels of scale and the various dimensions relevant for achieving integrated planning. Regarding this, the paper addresses such issues as: spatial concepts applied (multi-modal corridors, nodal development); multi-modal network optimisation at various spatial scales; innovative concepts for freight and logistic; life-cycle issues; value creation, assessment and capturing; and multi-level governance and institutional approaches. In order to provide insight in the potential of integrated planning approaches, the paper discusses earlier experiences gained with such integrated planning of infrastructure and spatial development. Finally, the paper addresses the general approach deployed by the VitalNodes project in order to develop planning approaches for integrated infrastructure and spatial development, which increase the integration on the TEN-T corridors and the vitality of the urban regions of tomorrow.

2. Background: challenges in integrating urban regions and corridors

The *Trans-European Transport Network (TEN-T)* is the main action plan for comprehensive transport infrastructure development throughout the European Union (EC 2013) and is essential for the ambition to realise a single transport area in Europe (EC, 2011). Thus it is closely related to the core aims of the EU regarding free transportation of persons and goods and a single market. While responding to economic and private users' needs, this infrastructure development must fulfil key societal requirements, such as balanced accessibility and sustainability.

Urban areas are key elements of the TEN-T network and have to respond to *multiple challenges* such as growing mobility needs and increasing freight transport, changes in mobility demand 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). Urban areas must also tackle social and environmental issues such as urban/peri-urban congestion, poor air quality, noise exposure, and road safety. All of this is key to ensuring a more sustainable development of Europe's urban areas and, at the same time, make sure that urban areas support properly the construction and intelligent use of the European transport network (see Arts et al. 2016; Broesi et al. 2017).

Under current EU policy, urban areas have become an integral part of the development of the TEN-T network, which is reflected in the concept of the so-called '*urban nodes*'. Annex II of the TEN-T Guidelines lists 88 urban nodes (EC, 2014), which were identified on basis of socio-economic criteria and have been playing a key role in structuring the TEN-T core Network – see Figure 1. These 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 gaining importance as socio-economic environments too (DG Intern, 2013), urban nodes play a key role as centres of socio-economic, spatial and technological development.

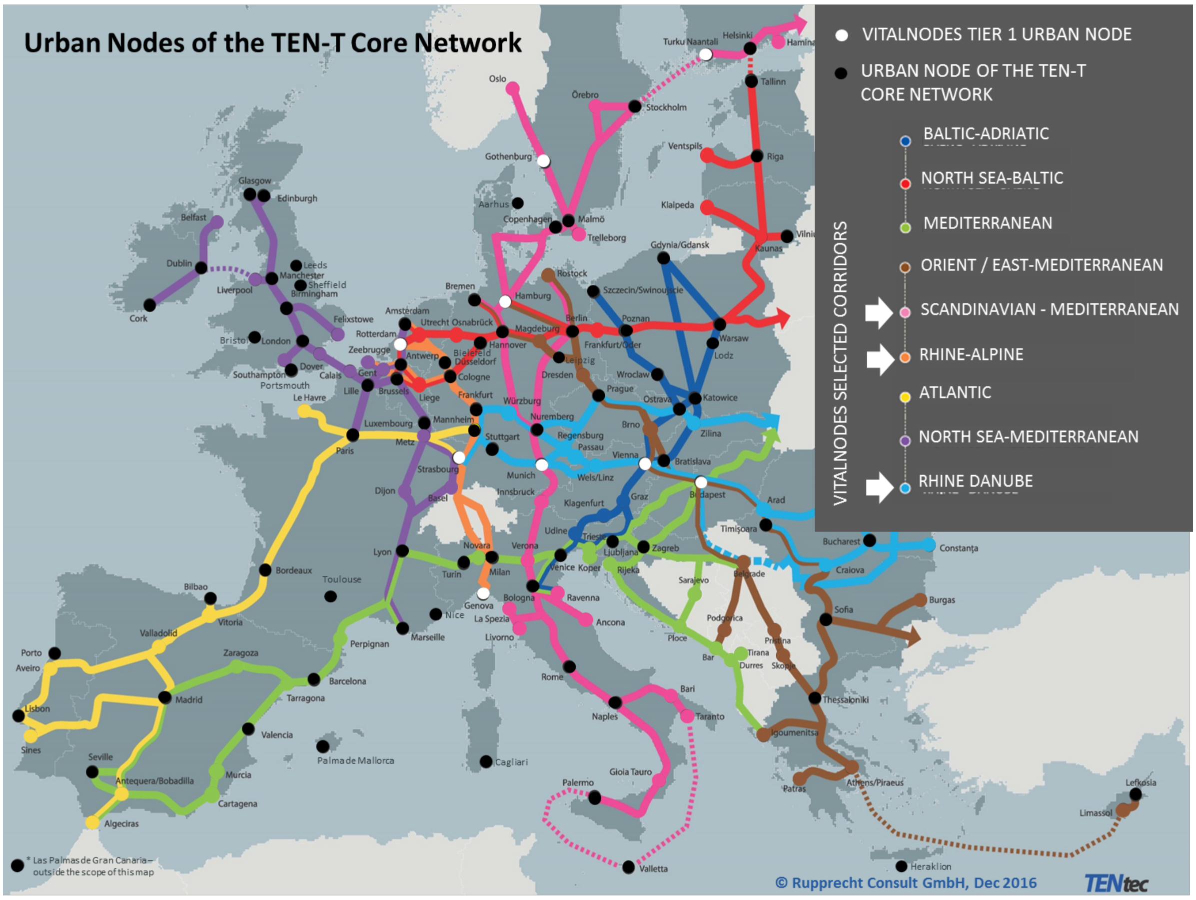

Figure 1: TEN-T core network corridors and urban nodes (NB: white bullets indicate the 1st tier of urban nodes addressed in the VitalNodes project – see section 6)

For the functioning of the TEN-T network, developments in the *freight and logistics sector* are key. Freight transport activity is projected to increase; when compared to 2005 by around 40% in 2030 and by some 80% by 2050 (EEA, 2010). At this, the modal split is rather uneven – e.g. road transport accounts for about 75% of goods transport on land today – causing important issues at TEN-T corridors and urban nodes. To align the means of planning authorities to cope with the growing demand it is paramount to increase efficiency of freight transport. Part of the solution may be technical innovations in freight and logistics, as well as the optimisation of multimodal transport chains, because it may allow making best use of the advantages of the different modes in different contexts (EC, 2011). However, to guarantee network performance and efficient investment strategies, planning authorities need also to be empowered with tools to influence the modal choice by the freight and logistic sector (Broesi et al., 2017). Here collaborative planning of integrated infrastructure and spatial development is important.

In relation to the latter, literature about *'Land-Use Transport Integration' (LUTI)* is relevant; transport and land-use planning sectors can have considerable impact on each other as explained by the 'Land-Use Transport Feedback' cycle (Wegener & Fürst 2004). In short, the transport system affects a region's accessibility, which affects the planning of land use in that region and the activities that will take place, which in turn will affect mobility and subsequently the further development of the transport system, thereby starting a new circle. These relationships between land use and transport are intensively studied for developing traffic models –LUTI models (Wegener & Fürst, 2004; TRB, 2004; Van Wee et al., 2013). Because of these relationships, separated planning of transport infrastructure and land uses results in ignoring the important effects that transport plans can have on land-use plans and vice versa. There is an increasing awareness of the potential synergies that can be obtained by integrating transport infrastructure and spatial development. Moreover, the integration of transport infrastructure and land-use planning is seen as an essential element of a more inclusive, sustainable transport planning (Banister, 2008; Cervero, 2009; van Wee et al., 2013; Heeres, 2017).

However, such *integration is scarcely present in practice* as has been discussed by various authors (te Brömmelstroet & Bertolini 2009, Heeres et al. 2012a,b). Planning and realisation of transport infrastructure and spatial planning have been separate worlds ('silos') with specific planning systems that contained own specific planning legislation, sectoral policy frameworks regarding different levels of government, own funding mechanisms as well as a specific planning agencies. In infrastructure planning, government agencies – usually responsible for only a certain infrastructure mode: road, water, rail, etc. – develop often projects with limited scope (Banister 2005). They often focus on solving a bottleneck, applying a minimalistic approach oriented on formal requirements for public consultation, implementing expensive end-of-pipe mitigation measures. Similarly, spatial planning authorities pay all too often little attention to the mobility effects of their development plans (Arts et al., 2014,2016; Geet et al., 2017).

3. The importance of interactions between scale levels

As has been discussed in the previous section, an effective integration of a node in the TEN-T core network corridors is important but also complex. As each urban node has its own specific characteristics and issues, it would be too simplistic to assume that there is a one-size-fits-all solution. Different spatial scales, modalities, sectors and stakeholders are concerned and all have to be taken into account when optimizing the integration of solutions for accessibility and profitability of freight logistics on the one hand with vitality and liveability of urban areas becoming increasingly important on the other. As freight transport and urban logistics grow and innovate fast, and increasingly impact socio-economic development as well as accessibility, spatial and environmental quality of urban regions and corridors, there is need for deliberate, governmental involvement. In view of these developments, a multi-scale integration of infrastructure planning, urban planning, passenger and freight transport is needed for effectively and sustainably incorporating urban nodes into TEN-T corridors (Arts et al., 2014).

On basis of earlier experiences three spatial levels seem to be particularly important – see Figure 2:

1. The scale of European Corridors
2. The scale of Daily Urban System (DUS)
3. The scale of a specific location.

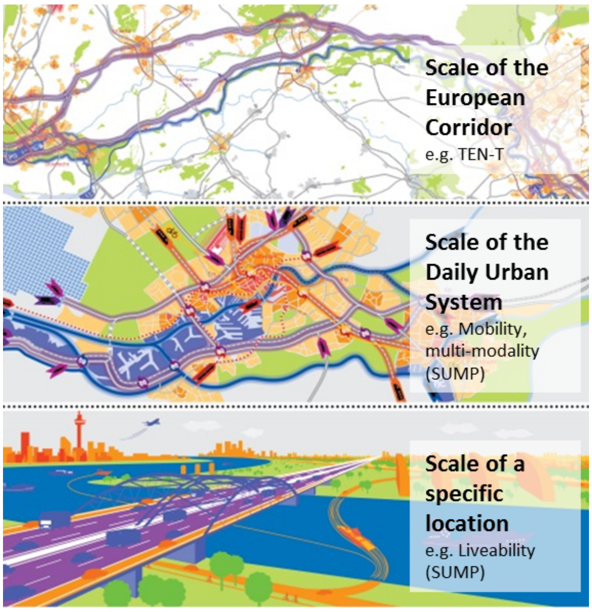

Figure 2: Linking different scales (NUVit, 2014)

Cases across Europe (see e.g. NUVit, 2014; RWS, 2013; Heeres, 2017) show that coordinated optimisation of infrastructure and spatial development at the DUS level (e.g. an urban node) 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 DUS 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 an 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 (RWS, 2013). Consistently addressing all (geographic) scale levels depicted in Figure 2 is fundamental for an integrative approach (NUVit, 2014).

4. Multiple dimensions in integrating infrastructure and spatial development

Considering the complexity of the challenges there is no *silver bullet*; focus on innovative technical solutions/methods will not be enough. As suggested by the notion of LUTI, there is need for an integrated approach that connects the world of infrastructure, mobility, freight, logistics with the world of urban and spatial development. An approach, in which there is attention for soft innovations addressing the multiplicity of the challenges by integrating not only different spatial scales (see also Broesi 2017; Section 3), but also different sectors, modalities, stakeholders and multi-level governance. Challenges in integrating freight logistics of urban nodes into network corridors have a *multi-dimensional character*. Not only network issues of the (freight logistic) transport and mobility system have to be considered, but also spatial issues related to urban vitality (socio-economic development, spatial and environmental quality and liveability), as well as issues of short-term and long-term development, value creation and capturing issues, multi-level governance and institutional issues, and issues related to implementation have to be addressed – see conceptual model in Figure 3.

Spatial dimension

For this dimension, critical aspects are the ability to deal with scale issues (Figure 2), spatial and transport analysis and spatial design (as both strategic and technical tools) in order to achieve integrative spatial concepts (zooming in, zooming out between the three spatial scales). The freight transport sector is organised on a global scale, in which international trade via ports is 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. The search is for spatial concepts with synergetic effects on accessibility and freight logistics. Key concepts are for instance (see also Broesi et al. 2017): transhipment points on a regional level (e.g. Distribution Centres) or on a local level (e.g. Urban Consolidation Centres); centralised vs. decentralised freight logistic concepts; multi-modal freight and logistic terminals (road, rail, shipping, air transport); logistic clusters that combine transhipment with manufacturing, and logistics services. Relating to both freight and passenger transport are relevant multimodal corridors, Transit Oriented Development (mixed-use of residential-commercial areas with optimally designed access to (public) transport), area-oriented approaches (integration of infrastructure and other policy areas e.g. environment, housing, business, recreation).

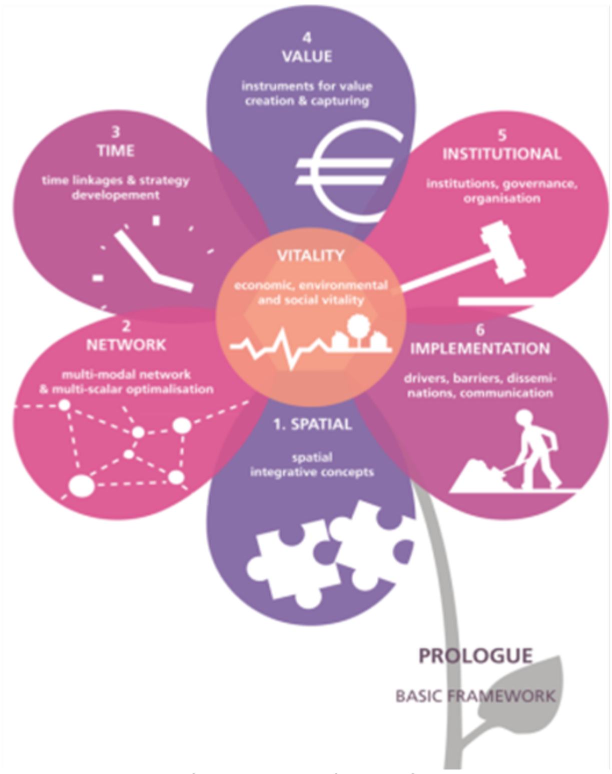

Figure 3: six dimensions relevant for integrating infrastructure and spatial development (NUVit, 2014)

Network dimension

This 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 (see also Figure 2). Translated to a focus on freight and logistics, this relates to (Ecorys, 2015, 2016):

1) *urban logistics dimension* ('first / last mile') 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; IT use (e.g. time windows, load factor, low emission zones, cargo bikes, urban consolidation centres) (EC, 2009);

2) *long distance freight dimension*, including: main function of nodes (freight, passengers transport); type of logistics (service, industry); freight function (throughput or transfer, first-/last-mile); complexity of logistics activities (level of Value Added Logistics (VAL);

Value Added Services (VAS) activities; size of freight flows); type of freight (long distance, share of container or bulk) – see e.g. 'Swiftly Green (2015), DG Move (2016). 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, Intelligent Transport Systems (ITS), shared mobility; automated driving; IT and data management; Mobility as a Service, MaaS); sustainable urban mobility plans (SUMPs, see DG M&T, 2013; Eltis, 2017), network analysis (multi-modal modelling) and improvement of network linkages ((re)development of infra links).

Time dimension

This dimension relates to linking the planning stages into 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 (alternative fuels, circular economy, cradle-to-cradle concepts, asset management – see AM4Infra, 2016); and of linkages to mobility and accessibility (changing flows of people and goods over time). These analyses help to determine time linkages for strategy development for transitions towards multi-modality and integration with land-use. More specifically regarding freight and logistics aspects, the time dimension is mainly related to policies (e.g. urban access regulations, time windows and low emission zones), interactions between infrastructure and logistics (synchromodality, optimally flexible and sustainable deployment of different transport modes in a network for logistic operators) and logistics transport service providers' behaviour. Logistics is a time-critical transport discipline; time is of essential value in business models since the value of time is high in relation to 24/7 operations and just-in-time delivery. Another issue is E-commerce, as a fast-growing market segment, representing a more important market share. This is reflected in the physical-spatial reality by growing flows at corridor as well as the peri-urban/intra-urban level that ask for new approaches from policy makers, and innovative developments from transport practitioners.

Value dimension

This dimension relates to closely to state-of-the-art models and approaches to assess value (social Cost-Benefit Analysis, Life-Cycle Assessment, Environmental Assessment – EIA, SEA) to create value and to capture value in combined infrastructure and spatial development projects (see Heeres, 2017; Hilbers et al., 2017; Mouter, 2010; Beukers et al. 2014). Regarding freight and logistics, the value dimension relates closely to the importance of value-added logistics in urban freight transport chains. An optimised freight transport network links seamlessly the national/regional level with the urban level in transhipment points. These locations (e.g. Urban Consolidation Centers or UCC) could become viable as value is added to the products transhipped there. More in general, 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). Urban regions that are well connected by multi-modal infrastructure may act as one big agglomeration providing enhanced competitiveness (they 'borrow size'; see e.g. Witte et al.2013; Deltametropool 2015; de Groot et al.2015), which is relevant when integrating urban areas and network corridors.

Institutional dimension
This comprises analysing different governance approaches and organisational frameworks at all institutional levels. With respect to logistics and freight aspects: urban freight transport is a niche discipline in the wide variety of transport services. This niche is confronted with a vast set of regulations: vehicle related (loading weight), emission related (EURO Norms), fuels related (alternative fuels directive), time related (time windows), incentive-based (subsidy schemes) or infrastructure related (UCCs and loading bays). The institutional dimension relates also 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 – Heeres, 2017), market involvement (public-private partnerships – Verhees et al. 2016; Leendertse et al. 2016), stakeholder engagement (users, citizens, interest groups; Hamersma 2017), the governance of organisational networks, and smart mixes (e.g. Stead et al. 2004; van Geet et al. 2017).

Implementation dimension
Finally, a critical aspect in innovation is deployment and implementation. The barriers with which professionals are confronted are numerous regarding freight logistics but also infrastructure and spatial development. This makes the implementation of measures not straightforward. There is a need for mapping of barriers and measures (physical-spatial, institutional, social-economical, environmental/liveability) and linking the different dimensions with each other in order to overcome *silo thinking* (see also van Geet et al. 2017). For instance, differences in timing between (inert) infrastructures, (fast cycles in) freight and logistics, and (incremental) spatial development that pose specific implementation issues to integrated solutions. This is also true for the differences in spatial levels of ((trans)national infra networks and freight transport vs. local spatial development and last-mile logistics), as well as differences in stakeholders involved (market, private parties vs governmental parties). Therefore, in the conceptual model of (Figure 3) explicit attention is paid to the implementation of developed solutions.

5. Earlier experiences with integrated planning

Although integrated planning of infrastructure and spatial development is scarce (as discussed in Section 2), there can be found good practice cases (see e.g. Deltametropool, 2015; Heeres 2017). In order to provide insight in the potential of integrated planning approaches (applying multiple scales and dimensions discussed in the previous sections), we need to use earlier experiences, as the VitalNodes project only started recently. Therefore we discusses in this section earlier experiences gained as part of the NUVit-initiative, although they are not specifically focussing on freight logistics issues. We focus on 3 cases (earlier discussed in Arts et al., 2016): Ringway Utrecht in The Netherlands, Ostlänken-Linkőping in Sweden, Rail Baltic-Tallinn in Estonia. These cases are bench-marked by comparing the shifts in the different dimensions (see Section 4, Figure 3) of the initial approach with the current. In the cases scale issues and complex urban contexts made it necessary for projects to change the approach in order to be successful.

Ringway Utrecht

The Ringway Utrecht is a highway expansion project initiated in the late 1990s, the draft decision has been published and the project is in the pre-tender phase. The project has a history of conflicts with regional stakeholders, since the limited road infrastructure scope was not accepted widely. The project started to adopt more inclusive elements in order to cope with the complex urban conditions. Consequently, the project has linked up with spatial developments in the city region.

Figure 4: Ringway Utrecht and its spatial/economic context

Regarding the dimensions (discussed in Section 4) over project time, from start to current, the following shifts can be seen:

1 *Spatial dimension*: During the planning process the project shows a shift from a focus on the road and its direct surroundings for project realisation (creation of extra lanes + noise barriers etc.) towards a broader area focusing on spatial optimisation. Critical in the discussions were barrier effects of the project for (economic) growth of the University Campus and connectivity of the city to the surrounding landscape.

2 *Network Dimension*: The project has a firm focus on road infra. However, during the process increasingly elements were added to improve connectivity with the local road network, public transport, slow traffic (multi-modality, transit-oriented development).

3 *Time Dimension*: The project has a time framing that focused on realisation of the road extension, however in the discussions with stakeholders the project had to be framed towards long-term socio-economic development of Utrecht. Adaptation to a multi-modal strategy that is more using an adaptive planning approach.

4 *Value Dimension*: The project remains financed by central government. The discussion about the added value shifted from a local mobility issues towards a regional-economic competiveness discussion.

5 *Institutional Dimension*: The project is managed with a traditional single-actor project team with extra multiple stakeholder involvement in the process and decision-making. The project has been advised by the Chief Government Advisor on Infrastructure and the project team has been strengthened with expertise.

6 *Implementation Dimension*: In order to create space within the project-driven approach, an independent Quality Team was introduced in 2012. This Quality Team helps the transition and to supply for independent quality control on cross-sectoral issues of infrastructure and spatial quality.

Overall shift: within a firm project scope a significant move towards more integration can be observed. Scale issues regard discussions with the surrounding concerning spatial, economic and mobility effects on a metropolitan scale.

Ostlänken Linkőping high-speed rail

Figure 5: Proposal for Linköping passage

The Ostlänken railway and Linköping passage is a high-speed rail project initiated in the 1990s. The project started with the regional desire to create better connections to Stockholm and to facilitate the increase in rail traffic (modal shift). Ostlänken intended to run from South Stockholm to Linköping. The time plan was to start building by 2017, with completion scheduled within the next 11 years. Construction costs for the new 160km railway are calculated to be 30bln SEK. Recently, a new railway corridor connecting Linköping-Göteborg via Jönköping is planned, called Götalandsbanan. Ostlänken will be part of this corridor. Together, the Ostlänken and Götalandsbanan railways would allow travelling Stockholm-Göteborg in two hours. Currently it is not yet decided how the railway will cross or bypass Linkőping.

Regarding the six dimensions over project time the following shifts can be seen:

1 *Spatial dimension:* The project originated from the wish to function in one single DUS with the larger Stockholm area. Issues concerning integration of the project in the urban area were discussed in separate settings such as: Linkoping station competition (2013), Swedish high-speed rail corridor policies and national negotiations (on-going).
2 *Network Dimension:* The network dimension is approached from a rail perspective. Transfer to other modes of transport, especially bus transport, was taken into account from the start (external network integration of rail and other transport modality networks). Connection with the future high-speed rail corridor development was introduced in 2014 (internal network integration). With this respect, the Ostlänken project is placed in a new context, leading to new insights: is it a project on a metropolitan scale or a high-speed rail corridor?
3 *Time Dimension:* The time frame is formally focused on project delivery, however the time frame has been significantly influenced by politics.
4 *Value Dimension:* The project is government financed. Recently the so-called 'national negotiations of housing and infrastructure' have been introduced, in which co-funding by local government is explicitly (and heavily) discussed.
5 *Institutional Dimension:* The project is central state managed with multiple stakeholder involvement in the planning process and decision-making.
6 *Implementation Dimension:* Negotiations on housing and infra were introduced in 2014 to speed up the process and gather additional funding. This approach is a proven concept to link investments in infra and spatial development and to capture value.

Overall shift: although the project has been started more than 20 years ago, analysis of the dimensions shows a need for a more inclusive approach taking into account regional level and local spatial integration. Since the corridor policy proposals, the project is explicitly embedded in a national policy discussion about the high-speed railway network and housing development. Experts from Trafikverket concluded that early application of an inclusive approach would have saved time with improved budget efficiency. However, an important prerequisite is that organization and staff are empowered with expertise and tools (governance, implementation dimensions). This case illustrates how the approach works. Traditionally, in infra planning focus is on newly developed tools of only one or two dimensions that are seen as a 'Silver Bullet' (e.g. focus on technical network solutions or integrated traffic modelling) while forgetting about other dimensions needed for successful integrative planning (such as value, governance, spatial dimensions).

Rail Baltic-Tallinn

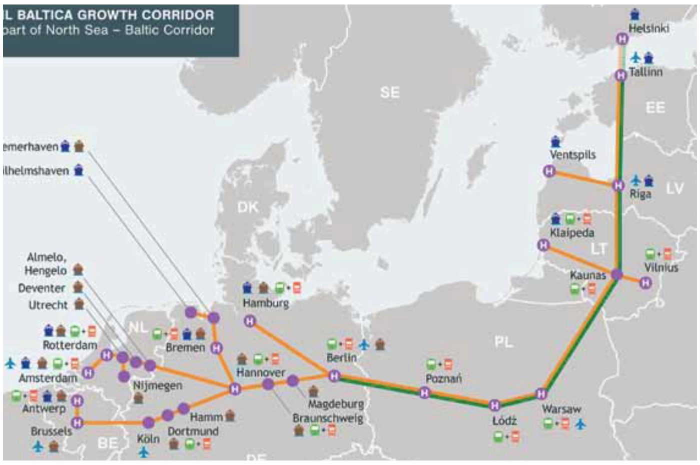

Figure 6: Rail Baltic in European network

The intention of the Rail Baltic project is to fully integrate Estonia, Latvia, Lithuania in a track gauge of 1,435mm railway transport system widely used in Europe. The Rail Baltic axis Warszawa-Kaunas-Riga-Tallinn is set as a TEN-T priority project by the EC in 2004. Development of Rail Baltic meets the national planning strategies for improving railway networks and stimulating economic development in all three Baltic countries. In addition, an important national and international planning factor is to offer transport infrastructure with a sufficiently high level quality. The impact of Rail Baltic to transport and land use cannot be underestimated. It has multiple effects at corridor, regional and local scale levels.

Regarding the six dimensions over project time the following shifts can be seen:

1 *Spatial dimension:* The spatial dimension of corridor planning focused on alignment of tracks and the locations of station nodes. Optimisation of the DUS was not explicitly taken into account. Especially for the spatial economic development of the Tallinn Airport-Rail Baltic station-historic centre area a master plan is needed in order to optimize new land development, the urban mobility network and rail barrier effects.

2 *Network Dimension:* The network discussion has a focus on rail and logistic. First concepts for the relation between urban economic and mobility developments are discussed within the limited context of the station design. Further exploration of the DUS seems to have high potential. Increased congestion on the E67 Tallinn-Riga-Kaunas highway will require optimizing the connection between infrastructures across international borders in order to create a coherent, optimal multimodal system.

3 *Time Dimension:* The time frame has been very politically driven by the member states and dictated by EU deadlines. Focus is especially on project implementation.

4 *Value Dimension:* The largest part of the project will be EU funded. A minority of the funding will be done by the member states. There is a discussion going on whether a traditional cost benefit analysis is suited for such a long-term structure investment.

5 *Institutional Dimension:* Project management is done by a dedicated joint venture company, in which the three Baltic States are shareholders. This organizational form has been chosen to keep the corridor interests into a single planning organization. It has led to issues of cultural differences and conflicting national interests.

6 *Implementation Dimension:* In order to expand the notion that this large-scale infra project can shape future economic conditions for decades an international symposium was organized (March 2015) in order retrieve state-of-the-art international knowledge concerning corridor planning, master planning, local urban design.

Overall shift: Rail Baltic's origin lies in the EU Network context. This corridor interest is dealt with in an institutional manner by functioning in a joint venture planning organization. In the urban economic situation of Tallinn, especially the level of the metropolitan master plan can add value since it will empower a more synergetic infrastructure and node planning.

6. VitalNodes: towards integrated planning of freight, infrastructure and spatial development

Inclusive approach

The cases discussed show a shift in time towards a more *inclusive approach* (Figure 7). All cases regard infra-structure development that is rather interlinked with their surroundings. Often the infrastructure forms a barrier in the urban fabric and limits development of economic, leisure or natural functions. When looking at the spatial optimization of the area as a whole (infrastructure and its surroundings) it can be rather synergetic to solve barrier effects on strategic locations. When this is not taken into account from the start (the current spatial constellation is guiding the future project) it can result in intensive confrontations between the project and, e.g., municipalities, since interests are not addressed in a satisfying manner. The Ringway Utrecht and the Ostlänken-Linkőping cases illustrate this. Including such issues in the project scope from the start can save significantly on time and can improve quality of the region (more than just mobility). The framework (of six dimensions and different scale levels, see Sections 3 and 4) can be a helpful instrument to structure the discussion and to identify critical aspects.

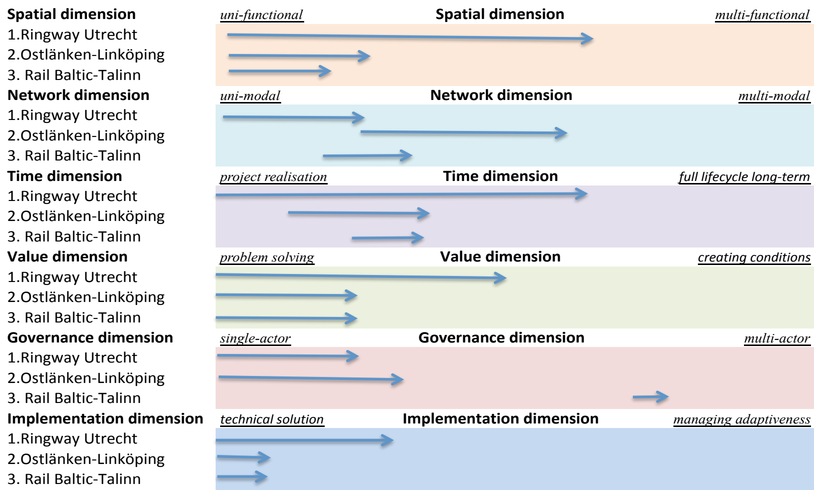

Figure 7: a comparison of the shifts made in the different (Arts et al. 2016)

Linkages between dimensions

The experiences of the cases discussed suggest that the various *dimensions are related* in a logical way (see Figure 8; Arts et al. 2016). The spatial and network dimensions regard the linkages between transport infrastructure and land-use. This might include also innovative solutions for freight logistics. This results in potential synergies that can be elaborated in more depth at which the time and value dimensions are relevant. Finally, this requires an adequate institutional and implementation approach in order to achieve effective integrative planning. As a consequence, transport infrastructure can be carefully coordinated with spatial developments resulting in tailor-made solutions to the local situation (landscaping, context sensitive design), enhanced vitality of regions (at the level of Daily Urban Systems) and well-functioning (inter)national transport corridors and networks (see RWS 2013, NUVit 2014, Deltametropool, 2015). This will be further elaborated as part of the VitalNodes project (see www.nuvit.eu).

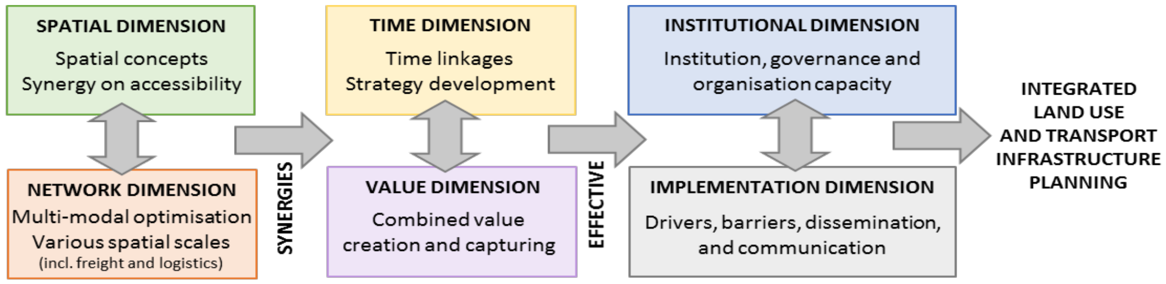

Figure 8: Linkages between the dimensions (adapted from Arts et al. 2016)

VitalNodes project

The *need for such multi-dimensional integration and approach* is acknowledged by key stakeholders such as: National Road Authorities (Broesi et al. 2017); DG Move (NUVit, 2016); as well as the Coordinators of the TEN-T corridors, who stress the importance of integrated strategies, platforms for exchanging experiences and a multi-level governance approach, explicitly referring to this issue (Balázs et al., 2016 pp.51-52). To achieve this, actors within various fields (such as urban planners, infra coordinators/operators, freight and logistic operators and financiers), working at different scale levels (international / national, regional, local) need to collaborate early on in the planning and decision making process. Thereby allowing for a more integrated perspective at investments in mobility, infrastructure, passenger transport and freight logistics from (inter)national (corridor), regional and local perspectives. More specifically, this means that there is need for a combination of the TEN-T policies and policies laid down in sustainable urban mobility plans (SUMPs; see DG M&T, 2013; Eltis 2017), as promoted by the Commission in the 2013 Urban Mobility Package (UMP) (DG M&T, 2012). This opens the perspective for forward-looking practices and integrated approaches, which both enhance transport solutions and stimulate synergies with other urban functions (Balázs et al., 2016).

The approach discussed in this paper will be further developed in the *VitalNodes project.* At this, it will build upon the existing NUVIt approach that is deduced from a variety of good practice cases in Austria, Belgium, Estonia, France, Germany, The Netherlands, Spain and Sweden (see NUVit 2014,2016; RWS, 2013; Deltametropool, 2015; Arts et al., 2016; Broesi et al., 2017). To address the need for an integrated approach, as discussed in this paper, VitalNodes project is designed to meet the following two main objectives:

- to deliver validated recommendations for a more effective and sustainable integration of urban nodes into the TEN-T network corridors focusing on freight logistics.
- to establish a long-lasting European network of experts, end-users and case-owners, based on existing (inter)national networks – a self-sustaining 'network of networks'.

Figure 9 presents the *overall concept and approach* of the VitalNodes project. The project will build upon the existing NUVit concept, toolbox and network. This provides VitalNodes with a head start and enables fast first results for its target group – the EC, experts, end-users and case owners (in urban nodes and corridors). The toolbox will be enriched with a focus on freight and logistics and will be applied to all urban nodes in workshop settings through a step-wise growth model (1+8 → 18 → 88). To these workshops, experts from all relevant fields will be invited to participate, which at the same time will make the long-lasting network grow larger. At the start of the project, a scan will be done on innovative solutions for connecting long-distance transport with last-mile freight logistics.

Also a methodology will be developed for assessing the impact of these (grouped) solutions and for validating the recommendations coming from the workshops. In parallel, activities will be taken-up to create and implement a strategy for making the growing network a permanent structure and for communicating our project and its results to possible new network members and beyond. Through these activities, VitalNodes will deliver three major results: 1) a self-sustaining 'network of networks' consisting of experts, end-users and case-owners; 2) a proven approach for future cases consisting of an enriched and fine-tuned toolbox, an appraisal methodology, and a format for workshops and deployment strategy; 3) validated recommendations on integration of urban nodes in TEN-T core network corridors.

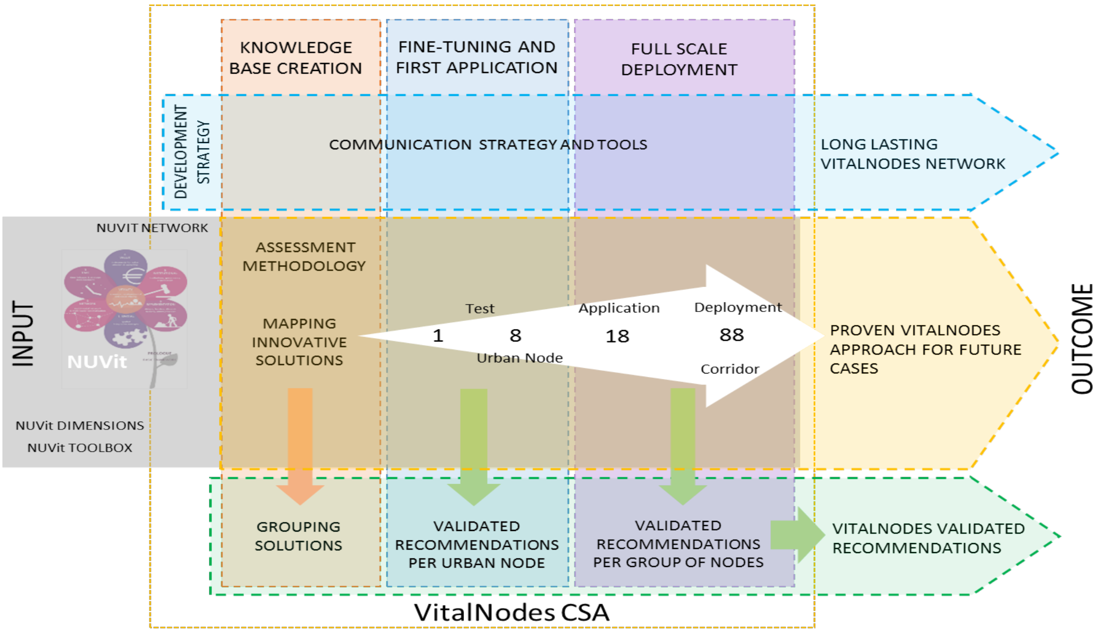

Figure 9: Concept and approach of the VitalNodes project

Conclusions

To conclude, the cases discussed and the experience gained so far show that infra-structure networks have become an interwoven ecosystem with their surroundings. Sectoral planning solely focusing on transport network development, freight/logistics solutions or spatial development has a limited return since it doesn't acknowledge this interwoven relationship of transport networks with their spatial surroundings. In reaction to this, we observe a significant shift towards a more inclusive approach, at which are important multiple dimensions and scale levels – as discussed in sections 3 and 4. The VitalNodes project, introduced in this paper, aims to develop planning approaches for integrated of infrastructure and spatial development, increasing the integration on the TEN-T corridors and the vitality of the urban regions of tomorrow.

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