Final Vital Nodes Toolbox (Mark 2) – based upon experiences gained with Tiers 1, 2 and 3

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Authors: Kevin van der Linden and Raymond Linssen

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Written by	Kevin van der Linden (Rijkswaterstaat) Raymond Linssen (Rijkswaterstaat) In collaboration with the Flemish Department of Environment & Spatial Development, Eurovienna, Trafikverket and Ecorys
Reviewed by	Ricardo Poppeliers (Ecorys) Marlene Damerau and Susanne Böhler (Rupprecht Consult)
Approved by	Sjaak van der Werf (Project Coordinator) Jos Arts (Innovation Manager)
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Executive summary

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

This toolbox builds upon the experiences of the Vital Nodes project between November 2017 and June 2019. Besides, this toolbox builds upon the Networking for Urban Vitality initiative (NUVit; www.nuvit.eu), by using the existing NUVit toolbox. First a **process guideline** will be described with the key question "What is the **added value** of integrating the spatial and network dimensions?" being the focal area for integration Urban Mobility and TEN-T policy. Combining the spatial and network dimensions results in potential synergies that have to be considered by addressing the how-question. This question relates to the implementation dimensions.

After this, the toolbox gives an overview of methods and approaches with impact:

- Methods required for the **value** dimension: Fingerprint as method to explore the functional urban area of an urban node, stakeholder mapping and additional value capturing methods;
- Methods required for the **strategy** (**'what'**) question: integrated space and network approach, such as Research by Design, mapping on different scale levels, Logistics Oriented Development and mobility management.
- Methods required for the '**how'** question: implementation drivers and barriers. The appointment of an independent 'mediator', experiences with multi-level governance and a framework for pro-active collaboration the start of an 'agile team' and the importance of a time and financial focus are described.

Finally, **conclusions** from the Vital Nodes experiences and the toolbox development are given:

- Time, institutional and financial are all implementation drivers and barriers;
- Methods and approaches have not been specified for every dimension, but are specified for the different process phases ('why', 'what' and 'how');
- Vital Nodes proofs that using a mix of the methods described is necessary to take further steps in exploring the integration of urban nodes in TEN-T. The added value and synergies need to be appraised among stakeholders in urban nodes. Recommendation to the European Commission is to stimulate using this toolbox and the Vital Nodes workshop format, among the urban nodes.

- An important conclusion is that an urban node has a wide functional urban area when it comes to logistics, different from a person mobility perspective as the Daily Urban System (commuter-oriented). Solutions for challenges in urban nodes can be found elsewhere on the corridor in this functional urban area (FUA),

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1 Introduction

This toolbox builds upon the experiences of the Vital Nodes project between November 2017 and June 2019 and replaces the 'Preliminary Vital Nodes toolbox (mark 1)' that was based upon experiences gained with the pilot case Vienna (Deliverable 3.4; January 2018). Besides, this toolbox builds upon the Networking for Urban Vitality initiative (NUVit; www.nuvit.eu), by using the existing NUVit toolbox. The enriched, final toolbox is the result of further discussions and fine-tuning in cooperation with the growing Vital Nodes network. In particular the application and results of the workshops in Tier 1, 2 and 3, as conducted in the period between November 2017 and June 2019, offered valuable input. In addition to the overview of solutions and their (potential) impact (Deliverable 2.2), good practices that have been identified and delivered after the finalization of this deliverable in October 2018 (during the Tier 2 and 3 activities that have taken place in the period October 2018 – June 2019) are added to the toolbox.

The presented guiding principles and approaches relate to stimulation of intermodal urban freight and logistics, linking long-distance transport and last-mile logistics, integrating urban nodes with the TEN-T corridors and networks, and for novel combinations of stakeholder groupings. While safeguarding its relevance to the various stakeholders in the growing Vital Nodes network (Vital Nodes Consortium, 2017). Herewith the Vital Nodes toolbox and its guiding principles deliver important input for the final recommendations on investments needs, funding needs and research needs for a better integration of urban nodes in the TEN-T network (Deliverables 5.4 and 5.5).

1.1 Vital Nodes experiences and insights

Experiences within the Vital Nodes project show that:

- Linking long distance transport and last-mile freight and logistics should be seen within the broader challenge of the integration of urban nodes with the corridors and TEN-T networks;
- A major element is the integration of two policy domains and different spatial levels. On the one hand urban mobility, as defined in the Urban Mobility Package (2013), containing supporting measures in the domain of urban transport and complemented by the concept of Sustainable Urban Mobility Plans (SUMP) and, on the other hand, TEN-T policy, as defined in the TEN-T guidelines focusing on corridors and urban nodes (EC 1315, 2013). This means operating on the interface between urban/regional and corridor (TEN-T) levels via integrated land-use and infrastructure and mobility planning;
- Exploring and defining an urban node's Functional Urban Area (FUA) proves to be key as connections and flows in a freight/logistics perspective are different from a regional person transport perspective (Daily Urban System, relating to commuting). As the FUA is often larger, and relating to connectivity between nodes, initiatives between urban nodes, elsewhere on the corridor can be very effective to relieve the core urban nodes as illustrated by several cases.

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Which has led to the following insights regarding the toolbox:

- Many approaches, methods and related examples have been investigated, but at the same time many of these 'good practice' methods could not be implemented, due to several barriers (such as lack of governance at the regional level);
- 'Good practices' are in place in many urban nodes, but are not monitored on smart objectives. This leads to the need for smart objectives in order to be able to define good practices and to learn ('why');
- Methods and approaches within the six NUVit dimensions (see Section 2.2) are in place, which can be used from a holistic perspective for the integration of urban nodes with the corridors and TEN-T networks.

Within this Vital Nodes toolbox the need, as follows from the experiences as described above, are reflected via:

- Guiding principles (in the form of process guidelines) – which describe the relation between the dimensions (what);
- An overview of approaches and methods, aiming at the integration of urban nodes with the TEN-T network from the perspective of different, interrelating, dimensions (how).

1.2 Reading guide

In chapter 2 a process guideline is given that describes the relation between the different dimensions, being the guiding principles of the Vital Nodes toolbox. This guideline is presented as six interrelating dimensions, specifying three important and hierarchical questions:

1. **Why** should I act? - What is the added value which you are aiming at?
2. **What** are potential synergies between the spatial and network dimension for which strategies have to be chosen to obtain value?
3. **How** can I implement the strategies effectively?

The Vital Nodes experiences learn that if the added value is not clear or objectives are not made SMART, the 'how' question remains a barrier. In that case, there is also the risk that an individual tool ('how') is seen as the 'silver bullet', leading to measure level tools.

Chapter 3 highlights approaches and methods, aiming to the integration of urban nodes with the TEN-T network from the perspective of the six interrelating dimensions. These methods are illustrated with several case examples, to give a clearer picture. But these examples should solely not be seen as general solutions, but as elements of an overall strategy geared to the specific context (in an urban node/corridor section) thereby contributing to tailor-made strategy and approach.

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2 Guiding principles

The guiding principles described in this chapter enable to relate the presented approaches and methods in this toolbox to each other and to the overarching goals of planning for a specific node or corridor. The guiding principles are categorized as dimensions. These dimensions are based on the 'Networking for Urban Vitality' (NUVit) approach (see Arts *et al*., 2015; www.nuvit.eu) and are described in Section 2.2.

2.1 Policy context

A major element is the integration of two policy domains and different spatial levels, which form the basis. On the one hand urban mobility – as defined in the Urban Mobility Package (2013) – containing supporting measures in the area of urban transport and mobility, and complemented by the concept of Sustainable Urban Mobility Plans (SUMP) and, on the other hand, TEN-T policy – as defined in the TEN-T guidelines focusing on corridors and urban nodes (EC 1315, 2013). This means operating on the interface between urban/regional and corridor (TEN-T) levels via integrated land-use and infrastructure planning (figure 1).

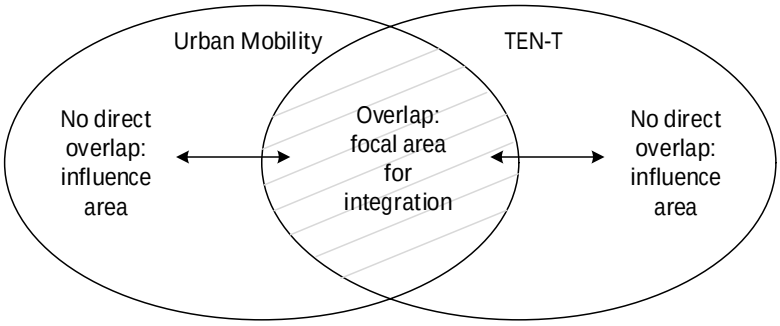

Figure 1: Identifying added value in the focal area for integration of urban nodes and TEN-T

The overlapping area of both policies depict that both fields do not only overlap based on the policy fields, but also thematically and geographically.

2.2 Dimensions of the Vital Nodes Toolbox

The Vital Nodes toolbox comprises 6 main dimensions (see figure 2 and also deliverable 3.4):

- Network dimension, regarding multi-modal optimization, various spatial scales, and explicitly regards freight logistics
- Spatial dimension, regarding spatial concepts, synergy on accessibility
- Time dimension, regarding time linkages between short-term and long-term, strategy development
- Value dimension, regarding value creation, assessment and capturing of (combined) development
- Institutional dimension, regarding institutions, (multi-level) governance, organizational capacity
- Implementation dimension, regarding drivers, barriers, dissemination and communication.

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The various dimensions can be seen as the compartments of the toolbox in which the various approaches and methods developed can be ordered, and which helps also the process of when and how to apply those.

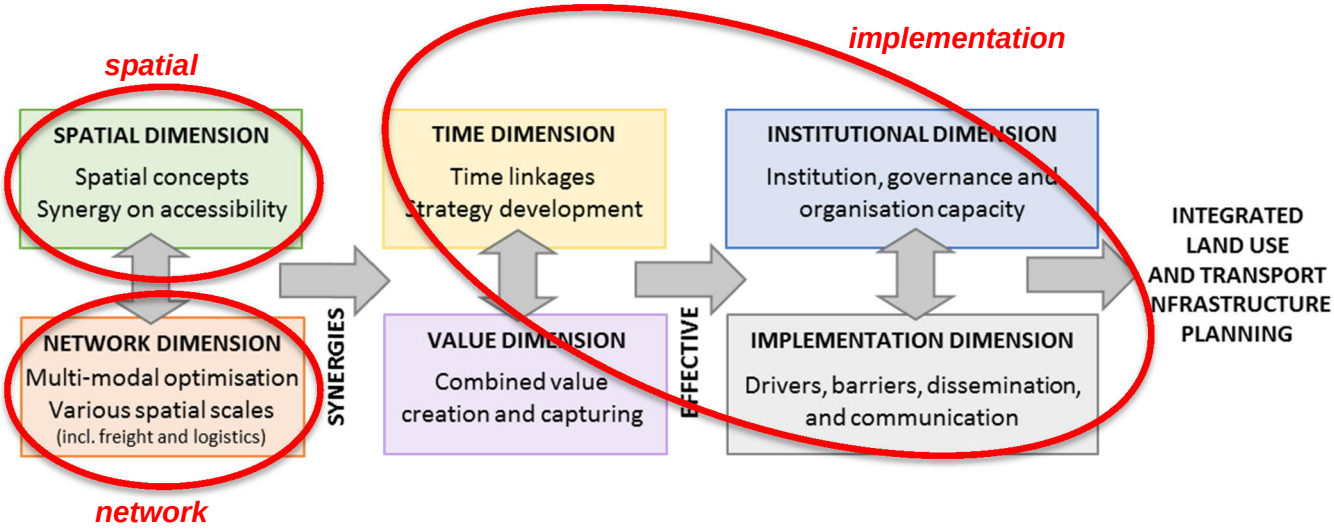

Figure 2: Linkages between different dimensions (red circles are further explained in section 2.3)

The experiences gained show that the various dimensions are related in a logical way. The spatial and network dimensions regard the linkages between transport infrastructure, mobility and land-use. Resulting in potential synergies that have to be considered at which the time and value dimensions are relevant. Finally, this requires an adequate institutional and implementation approach to become effective integrative planning. Therefore, transport infrastructure can be carefully coordinated with spatial developments resulting in tailor-made solutions to the local situation, enhanced vitality of regions and well-functioning (inter)national transport corridors and networks.

On basis of the experiences gained with the Urban Node workshops (D3.3 and D4.3) it is clear that, in addition, the Vital Nodes toolbox focuses on one or more of the aspects related to the 6 dimensions, such as:

- Linking long-distance and last- mile freight logistics
- Defining the Functional Urban Area
- Integrating urban nodes with the TEN-T networks/corridors
- Stimulating inter-, synchro- and multimodality
- Linking and combining different stakeholder groupings to get to integrated solutions
- Integrating land-use and infrastructure planning
- Short term and long-lasting benefits.

Challenges in integrating freight logistics of urban nodes into TEN-T network corridors have a multi-dimensional character: Not only network issues of the (freight logistic) transport and mobility system have to be considered, also spatial issues related to urban vitality (socio-economic development, spatial and environmental quality and liveability) have to be addressed, 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.

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The overall Vital Nodes concept focuses on integrating land-use and infrastructure planning as both planning sectors have considerable impact on each other. 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 cycle – also known as the Land Use - Transport Feedback Cycle. Regarding these interactions, the approach focuses on the three geographical scales (levels) to address the challenge: local (intra-urban locations), urban-regions (the level of the Daily Urban System (for person mobility) and the Functional Urban Area (for freight), peri-urban and regional level), and international (TEN-T) corridors. The concept depicted in figure 2 comprises the integration of six dimensions of mobility, land-use and infrastructure planning in such a way that synergy is created. These six dimensions are very closely related, so the value of this basic framework is the synergetic integration of the elements. This integration goes beyond a local SUMP (Sustainable Urban Mobility Plan) as regional and (inter)national mobility and infrastructure networks, as well as broader spatial opportunities, are taken into account. Hereafter, the six dimensions will be discussed with specific attention for freight logistic conform the focus of Vital Nodes.

2.2.1 Spatial dimension

For this dimension critical aspects are the ability to deal with scale issues, transport analysis and spatial design as both a strategic and technical tool in order to achieve integrative spatial concepts (zooming in, zooming out between the three spatial scales). The freight transport sector is organized 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 transhipment points on a regional level (e.g. Distribution Centres) or on a local level (e.g. Urban Consolidation Centres), centralized vs decentralized 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 residential-commercial area with optimally designed access to public transport), and area-oriented approaches (integration of infrastructure and other policy areas e.g. environment, housing, business, recreation).

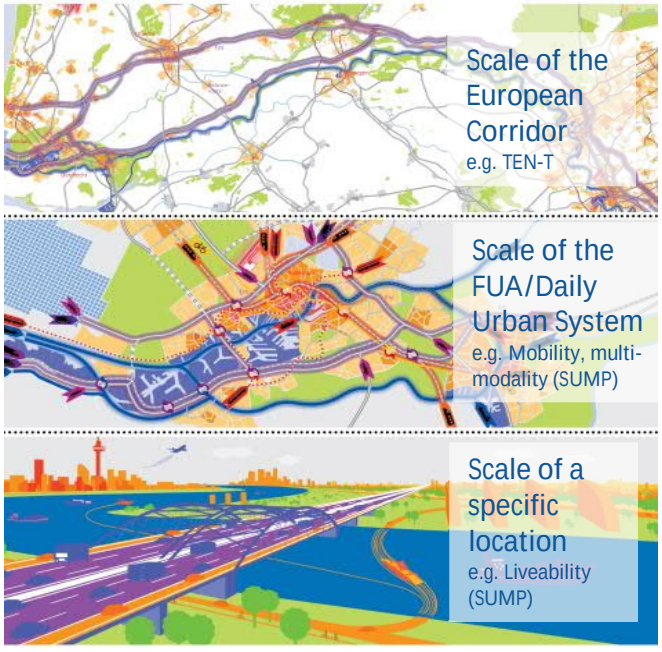

Figure 3: Linking different scales

Cases across Europe show that coordinated optimization of infrastructure and spatial development at the Daily Urban System / Functional Urban Area 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

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measures at local scale may help to solve bottlenecks at the Daily Urban System / Functional Urban Area 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 (figure 3).

2.2.2 Network dimension

This dimension relates to multimodal network optimization at various geographical scales: corridors at (inter)national level, Daily Urban Systems / Functional Urban Area at urban-regional level and landscaping at local level (see also figure 3). Translated to the Vital Nodes focus on freight and logistics this relates to:

1) 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);

2) Long distance freight dimension, including: main function of a node (freight, passengers transport), 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).

2.2.3 Value dimension

This dimension relates to creating value, assessing value and capture value. Several state-of-the-art approaches contribute to assessing value – e.g. Social Cost-Benefit Analysis, Life-Cycle Assessment, Environmental Assessment (EIA, SEA) – to creating value and capturing value in combined infrastructure and spatial development projects. Regarding freight and logistics, the value dimension relates 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 transhipment points. These locations (e.g. Urban Consolidation Centers – 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' – which is

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relevant when integrating urban areas and network corridors. Creating synergies and added value for the linkage between spatial and network dimensions are further explained in section 2.3 (Process guideline).

2.2.4 Time dimension

This dimension relates 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). These analyses help to determine time linkages for a 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 (synchro modality, 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: the value of time is high in relation to 24/7 operations and just-in-time delivery). 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 and intra-urban level that ask for new approaches from policymakers, and innovative developments from transport practitioners.

2.2.5 Institutional dimension

This comprises analysing different governance approaches and organizational framework at all institutional levels. With respect to freight logistics 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: could be vehicle related (loading weight), emission related (EURO Norms), fuels related (alternative fuels directive), time related (time windows), incentive-based (e.g. subsidy schemes) or infrastructure related (e.g. UCC's and loading bays). In Vital Nodes the institutional dimension regards 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 of these.

2.2.6 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 methods/approaches not straightforward. The toolbox is linking the different dimensions with each other to overcome 'silo thinking'. An example regards to the differences in timing between (inert) infrastructures, (fast cycles in) freight and logistics, and (incremental) spatial development posing specific implementation issues to integrated solutions. This is also true for the differences in spatial level ((trans)national infra networks and freight transport vs. local spatial development and last-mile logistics) as well as differences in stakeholders involved (market,

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private parties vs governmental parties). Therefore, in the Vital Nodes conceptual model (Vital Nodes Consortium, 2017) explicit attention is paid to the implementation of the identified solutions for individual cases as well as of the Vital Nodes conceptual framework and toolbox developed.

2.2.7 Relation between the six dimensions

In figure 2 and in the text above a description is given of the six dimensions. The experiences gained within the Vital Nodes project confirm that the 6 dimensions are related in a logical way. The spatial and network dimensions regard the linkages between transport infrastructure, freight logistics and land-use. This includes innovative solutions for freight and logistics. Combining spatial and network dimension results in potential synergies that have to be considered.

Within the Vital Nodes project, especially the spatial and network dimensions have been discussed, resulting in insight in potential synergies, and related to this recommendations have been developed (see D3.3 and D4.3). Besides, this has resulted in the insight that in order to obtain added value within a multi-stakeholder approach, defining one's smart objectives is key to successfully and effectively integrate urban nodes on the TEN-T network while achieving added value for each participating stakeholder and on different geographical levels.

Finally, to become effective integrative planning it is needed to develop an adequate institutional approach and to deal with such implementation issues as barriers/drivers. Subsequently, transport infrastructure can be carefully coordinated with spatial developments resulting in tailor-made solutions to the local situation (landscaping, context sensitive design), enhancing vitality of regions (at the level of the Daily Urban System/Functional Urban Area) and well-functioning (inter)national transport corridors and networks.

These insights lead to the process guideline as described in the next section (2.3), guiding the approaches and methods described in section 3.

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2.3 Process guideline

Key in the process is the overarching dimension '**value**' and the thereto-related question: "What is the added **value** of integrating the **spatial** and **network** dimensions?" That is why it is important for each stakeholder to specify smart objectives and define the added value from an own perspective (for the city, 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.

> *From the Vital Nodes activities, as conducted (see D 3.3. and D4.3), can be concluded that all the major issues/challenges identified regarding the integration of urban nodes on the TEN-T network do have spatial characteristics that are linked to 'spatial quality' and 'liveability' in urban and surrounding areas. The spatial quality definition is therefore important. However, within the current appraisal criteria in CEF there is no attention nor a definition of spatial quality. This highlights the importance to specify smart objectives and formulate/define the added value from one's own perspective.*

The linkage between the spatial and network dimensions regard the interfaces between land-use and urban/regional mobility (SUMP – Daily Urban System) 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.

> *Vital Nodes experiences gathered in the Tier 1, 2 and 3 urban nodes (deliverable 3.3 and 4.3) show that the different geographical levels are influencing the integration between Urban Mobility and TEN-T. Requiring to also relate to the regional and FUA level while facing local issues/challenges. The project typologies as referred to are further described in deliverable 2.3 and consist of optimizing a terminal, optimize infrastructural systems, adding infrastructure, optimizing a mode, adding a mode, spatial development and planning and governance and institutional arrangements.*

These 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' (see figure 4). 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.

> *Covering the 'how'-questions has shown to be really context depending. Examples of the diverse context are among others the political system, governance structure, financial mechanisms in place and culture aspects. This requires specifying methods in tailor-made approaches, while using the 'ingredients' as presented.*

The use of a specific method/approach and the reason why a stakeholder should use a method is depending on the objectives and goals (formed by the answer of the 'why'-question), these can differ.

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 from the field in a multi-stakeholder approach. The network and spatial dimensions are

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often related to content-based discussions in which advisors and specialists play an important role. The implementation dimensions are more evaluative and strategic in nature, often involving generalists and strategic advisors/governors, also regarding the decision-making process.

The process scheme necessarily consists of a feedback loop, covering interaction with relevant stakeholders and continuously looking back to the added value created for each of the related stakeholders.

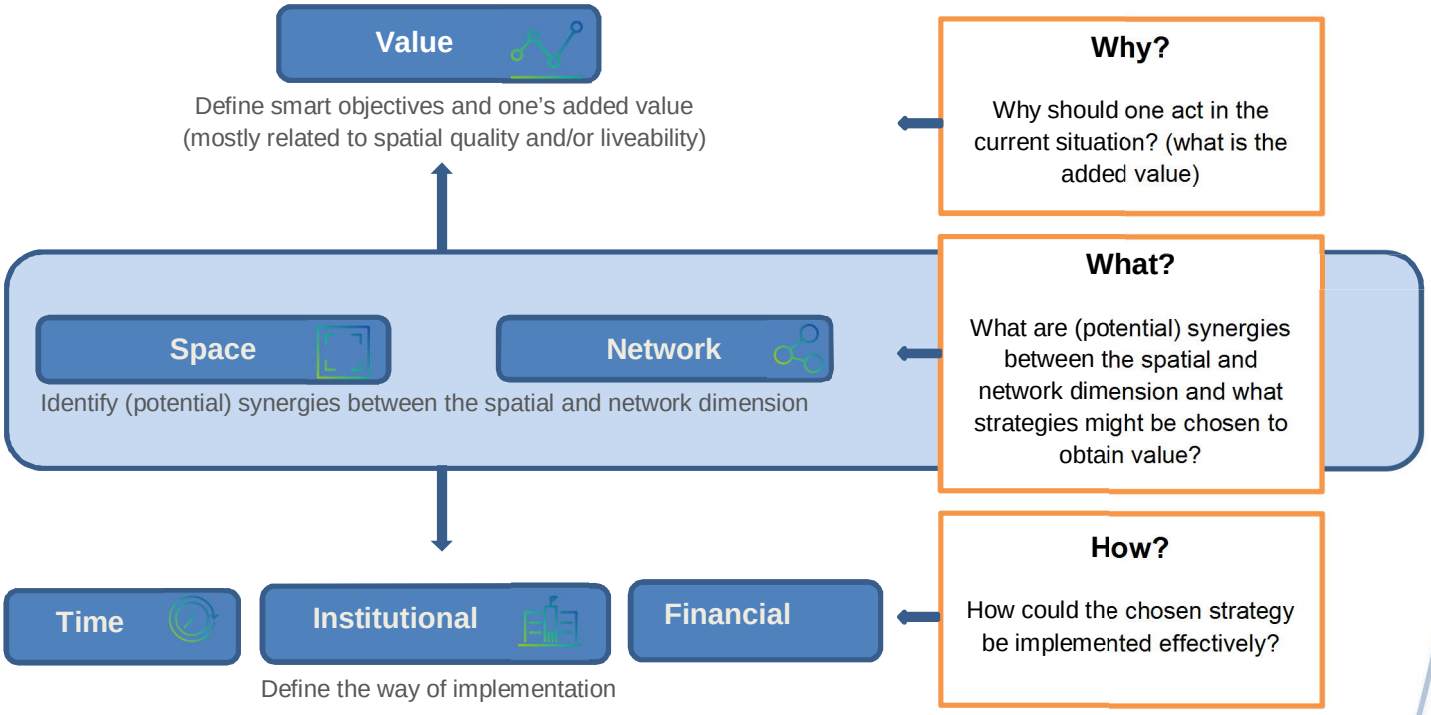

Figure 4: Configuration of the dimensions after application in Vital Nodes for integration of urban nodes and TEN-T

2.4 Requirements for stakeholders themselves

The Vital Nodes toolbox requires that stakeholders using this toolbox make for themselves smart objectives, which they aim for. In order to make it possible to answer the 'how'-question and proceed towards implementation resulting in added value.

The overview of good practices (see D2.2) can be grouped alongside categories of solutions, but also give the possibility to group alongside the previously described hierarchical questions (why, what and how). These groupings give the user of the toolbox the possibility to search methods or approaches related to the actual phase and aiming at a certain objective (an ambition or an active challenge/problem). Key is that the integration of the first and last mile with the TEN-T network is not an aim in itself. It should lead to a positive impact on objectives set by the joint stakeholders for an urban node region or corridor section. Besides these objectives might differ per stakeholder, and as we know many different stakeholders are involved in the overlap or focal area of integration between urban mobility and TEN-T.

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3 The Vital Nodes toolbox

Within this section of the toolbox a broad range of methods and approaches is described, categorised by the phases – why, what and how – as described in the previous section. The methods described are of great help by tackling the questions;

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

The section consists of more process oriented methods and approaches and more content related methods and approaches. Some of the methods are accompanied by a case description in order to illustrate an example of the methods application in practise.

Within the Vital Nodes project a workshop format (deliverable 3.2) is used. This format consists of multiple relevant methods as described in this section. It therewith covers more than just one of the phases (why, what, how) and forms a valuable format to deal with all dimensions. The methods included in this format are the fingerprint (why), stakeholder mapping (why), mapping (what), besides it is based on a multi-stakeholder approach (why) and addresses challenges (what) and drivers and barriers (how). Conclusively good practices (how) are collected (deliverable 2.2.) during the workshops.

3.1 Methods and approaches required for the value dimension (why)

Why?	It is important for each stakeholder to specify smart objectives and define the added value from an own perspective (for the city, region, logistics sector, etc.) in order to specify the added value of integrating the spatial and network dimension. 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.
What?	
How?	

In order to achieve a context-specific approach relevant to the specific urban node and corridor, the Vital Nodes toolbox requires ***that stakeholders have data, capacity and tools, including models, to be able to formulate SMART objectives and /or their function for the TEN-T network.***
The following aspects are therefore important;

- *Data collection methods*
  Up-to-date data about the various infrastructure, transport modalities, socio-economic and environmental issues, project proposals at a sufficient level of detail (e.g. NUTS 3) prove to be important (see deliverable 2.1). As developing new or additional data collection methods is beyond the scope of the Vital Nodes project, these type of instruments are not included in the Vital Nodes toolbox.
    - However, it has to be said that the current models (Eurostat/ TEN-TAC on European level versus local/regional models) use different data-sets, leading to different interpretations of

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results. Focusing on the overlap area, these data-sets (and models) should be harmonized to talk the same language. This recommendation is Vital Nodes specific.

- *Appraisal framework*
  Regarding impact analyses (such as CBA, SEA, see section 3.1.3). As developing new or additional assessment methods is beyond the scope of the Vital Nodes project, these type of instruments are included in the Vital Nodes toolbox.
    - However, one should be aware of different required impact analyses focusing on different objectives (economical, social, environmental);
    - One should be aware that appraisal is an integrated part of the Vital Nodes workshop format.
- *Functional urban area*
  The exploration and identification of the functional urban area of an urban node is key as relations and flows from a freight and logistics perspective are different from a regional person transport perspective. While addressing the integration of urban nodes on the TEN-T network. This is a Vital Nodes specific aspect, see section 3.1.1.
- *Mapping*
  In order to formulate smart objectives it is necessary to specify which stakeholders are required at the different scale levels (see section 3.1.2.).

3.1.1 Fingerprint as method to explore the functional urban area

In order to get better grip on the different scale levels and to subsequently enable a discussion about their interlinkages, an overview of facts and figures on different scale levels in relation to the specific urban node should be developed, a so called ‘fingerprint’. On the basis of the urban node workshops held by the Vital Nodes project (see deliverable 3.3 and deliverable 4.3), it can be concluded that the fingerprint is an useful approach as a guiding method before, during and after workshops and it enables distinguishing different types of urban nodes, due to the use of comparable data and standard categories. Within the fingerprint, data should be collected about the functional urban area of the urban node as well as the use of the networks related to freight and logistics.

The fingerprint should 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. The information is categorized on successively three different scale levels: TEN-T corridor level/functional urban area, the regional/metropolitan/Daily Urban System level and local/city level (see also deliverable 3.2). Ideally facts and figures on the functional urban area level are present, in case the urban node already has a clear definition of its functional region. Developments, characteristics and governance structures are included as well. Exploring and defining an urban node’s Functional Urban Area is key as relations and flows from a freight and logistics perspective are different from a regional person transport perspective (Daily Urban System).

Urban nodes have very diverse geographical and infrastructural characteristics such as their size and location, their position on one or more TEN-T corridors, urban and regional and socio-economic developments, and the state of the art of their local and regional multimodal infrastructure networks. Based on the urban node’s fingerprint main challenges have been addressed.

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The fingerprint is a tool to support discussions from a content point of view between stakeholders during the workshops and to improve the understanding of the specific location and circumstances of the urban node, including challenges. Each urban node fingerprint is based on European Commission definitions and data (EuroStat) to facilitate comparison. Based on these facts and figures the fingerprint should be drafted and maps should be developed.

Within the fingerprint instrument several elements should be combined; facts and figures (data and analyses), challenges, drivers and barriers, (potential) solutions and impacts. In most cases the value dimension (answering the question why one should act and what delivers added value), is focused on the facts and figures as a result of data collection and analyses combined with the appraisal methodology related to the impacts. Challenges are identified by the search for synergies (see section 3.2), while drivers and barriers and (potential) solutions are specified in the implementation phase (see section 3.3).

- ***Facts and figures (data and analyses)***
  Containing an analysis of infra networks (regarding road, rail, navigation and aviation), traffic figures and trends for the various modalities – with a focus on freight and logistics relationships (source-destination), interrelationships of this with passengers traffic (also in relation to public transport and active modes), spatial lay-out of the area, trends and the institutional framework. All at the three scales – corridor level, functional urban area - region, local/city level – in order to enable analysis and discussion about the interrelationships between the scales: Zooming in and out.

- ***Impacts (appraisal methodology)***
  The added value needs to be appraised using appraisal methodology. In this case (Vital Nodes specific) use has been made of the impact criteria accessibility, safety, economy, vitality and connectivity (see deliverable 2.1). Spatial/urban quality might be raised by; moving industry, urban densification, overcoming barriers, negative effects of congestion in urban nodes and/or circular economy – energy transition.

3.1.2 Stakeholders mapping

For getting specific insights in freight and logistics mechanisms it is essential to attract stakeholders from the freight and logistics sector as well. An example of Vital Nodes is that successfully attracting stakeholders from this sector varies per urban node:

- If there is a monopolistic sector of freight, there is a huge dependency of the monopolist. This means that there might be no incentive to join a workshop;
- If a public authority choose to leave the sector of freight completely to the market, there is no policy incentive for the public authority to discuss with the freight sector in the workshop. While the mind set of the effect of freight in reaching objectives should be specified;
- The functional urban area (FUA) from a freight perspective is custom made per node. Therefore, it is essential to have the right stakeholders from the freight sector.

In combination with stakeholders form the infrastructure, mobility (road, rail, navigation and aviation), spatial planning and environmental sectors this leads to a more general list of stakeholders to be identified on the different scale levels as shown in the table below.

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Table 1 List of stakeholder categories as part of stakeholder mapping (deliverable 3.2)

Stakeholder / organization
National level
Ministry of Transport
National road administration/authority
National waterway administration
Railway infrastructure manager
Environment agency
Regional level
Province/Regional representatives
Airport
Service providers / forwarder(s)
Urban/spatial planner/strategic advisor
Environmental agency/specialist
Local level
Urban Node/city – spatial development department
Urban Node/city – transport/freight & logistics department
Urban Node/city – environment department
Port authority
Operator of multimodal hubs (focus on freight and logistics)
Public transport operators
Others
Research institute/university
Freight/logistic transport representative
Company representative
Chamber of Commerce
Safety representative
Others…

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3.1.3 Additional value capturing methods

Cost–benefit analysis (CBA): CBA is a systematic approach to estimating the strengths and weaknesses of alternatives used to determine options which provide the best approach to achieving benefits while preserving savings. A CBA may be used to compare completed or potential courses of actions, or to estimate (or evaluate) the value against the cost of a decision, project, or policy. It is commonly used in policy decisions (particularly public policy) and project investments.

Economic impact analysis (EIA): An EIA examines the effect of an event on the economy in a specified area, ranging from a single neighborhood to the entire globe. It usually measures changes in business revenue, business profits, personal wages, and/or jobs. The economic event analyzed can include implementation of a new policy or project, or may simply be the presence of a business or organization. An economic impact analysis is commonly conducted when there is public concern about the potential impacts of a proposed project or policy.

Multiple-criteria decision-making (MCDM) or **multiple-criteria decision analysis** (MCDA) is a sub-discipline of operations research that explicitly evaluates multiple conflicting criteria in decision making. Conflicting criteria are typical in evaluating options: cost or price is usually one of the main criteria, and some measure of quality is typically another criterion, easily in conflict with the cost. Structuring complex problems well and considering multiple criteria explicitly leads to more informed and better decisions.

Mutual Gains Approach (MGA): The Mutual Gains Approach to negotiation is a process model, based on experimental findings and many real-world cases, that lays out four steps for negotiating better outcomes while protecting relationships and reputation. A central tenet of the model, and the robust theory that underlies it, is that a vast majority of negotiations in the real world involve parties who have more than one goal or concern in mind and more than one issue that can be addressed in the agreement they reach. The model allows parties to improve their chances of creating an agreement superior to existing alternatives. MGA emphasizes careful analysis and good process management.

Social impact assessment (SIA): A methodology to review the social effects of infrastructure projects and other development interventions. Although SIA is usually applied to planned interventions, the same techniques can be used to evaluate the social impact of unplanned events, for example disasters, demographic change and epidemics.

Stakeholder Engagement Plan (SEP): A formal strategy to communicate with project stakeholders to achieve their support for the project. It specifies the frequency and type of communications, media, contact persons, and locations of communication events. It is created at the beginning of the project and updated frequently as stakeholder communication needs change.

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3.2 Methods and approaches required for the synergy question: integrated space and network approach (what)

Why?	The linkage between the spatial and network dimensions regard the interfaces between land-use and urban/regional mobility (SUMP – Daily Urban System) 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.
What?	
How?	

In order to identify synergies between the spatial and network dimension that are relevant to the specific urban node and corridor, the challenges regarding infrastructure network, mobility (multimodal), spatial lay-out, bottlenecks and developments as well as institutional framework need to be identified. Insights in the specific circumstances of an urban node and corridor are therefore required to show the issues that need to be dealt with. A main focus is on the case of Vital Nodes is on freight and logistics, taking into account other aspects. These insights ask for integrated approaches (see section 3.2.1), having visualisations as powerful way to bring different themes and fields of attention together (see section 3.2.2) in a more process oriented method. On the content side the main orientation of the issue approach is of big influence on the potential synergies addressed (see section 3.2.3 and 3.2.4).

3.2.1 Research by design

Research by design is a method that can take on different forms depending on the litigation that is initiated. The term 'research by design' itself implies that, it is not a method to create a masterplan or a finished product. Rather, it is a method used during the process to open the debate at different times, to trigger different interests from different starting points, to broaden the perspective and to create insights with the stakeholders present. This is mainly done with an approach coming from different angles:

- By desktop research and (spatial) analyses to get to know the context of the area. By analyzing different base layers, different systems, like the historical context, the physical system and industrial tendencies, where do people live? How do they move? What is the area's identity?
- By a participation approach; in order to get to know the true details of a site/place. Answering questions as how does the place function regarding space/freight/different scale levels and stakeholders?

Accordingly it is translating these analyses and different visions of the different stakeholders in interpretative drawings, schemes and design propositions. Integrating the regional and local scales between the different policy areas that would otherwise not be linked.

Research by design can be a valuable generator for the direction of the process and the executed process. For a good implementation, 'research by design' is in need for freedom within a process and the preservation of the neutrality of the researchers. Research by design is not a linear process, and with different partners it can create the feeling of loss of control, that can become threatening quickly. However, by broadening the view, from (sectoral) line infrastructure to the broader area or region, it is

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possible to connect different policy areas and scales that are otherwise overlooked. In order that the line infrastructure can become the leverage project for a sustainable transition of a region in which society can also benefit.

In other words, a visual strategy can be linked to a strategic approach. Good examples ensure that people's thinking world and thus the scope of thought of people become larger. The unthinkable can be made conceivable in an enlarged thinking space. Only then people are capable of thinking: "If that is what it's going to be like, I want it, too."

Inspiration from this method could be extracted via:
- Participation tools with stakeholders;
- Balance between the environment, safety and transport flows;
- Using design as a tool.

Case North-South connection province of Limburg, Flanders

For over 40 years now plans have been made to undouble the 'Grote Baan' (a four-lane road connecting the city of Hasselt with towns and villages in the north of the province of Limburg in Flanders (not to be confused with the Dutch province of Limburg) by a diversion road. At this moment the 'Grote Baan' is cross-cutting several communities, especially in the municipality of Houthalen-Helchteren. According to the Flemish administration, this diversion would eliminate the "missing link" in the motorway network. However, this North-South connection has never been fully completed. This infamous highway project is in many ways symptomatic for the end of an era of top-down planning of heavy infrastructure works, entirely based on the needs of the automobile, without consideration for spatial quality or quality of life. At the same time, this outdated plan was a catalyst for 40 years of civil protest and political debate. Campaigns for environmental movements were accompanied by the emergence of ecological parties, social movements etc.

The 'Grote Baan' segment in Houthalen-Helchteren is currently as good as the only remaining part that has not yet been undoubled by the A24 motorway. On Belgian territory it remains the only bottleneck of the notorious North-South connection. It is hardly surprising that this diversion route has long dominated the agenda. The exponential growth of traffic underlined the need to resolve the conflict between the heavy traffic flows and the local environment (figure 5). Or with a different view: the conflict between road capacity and mobility.

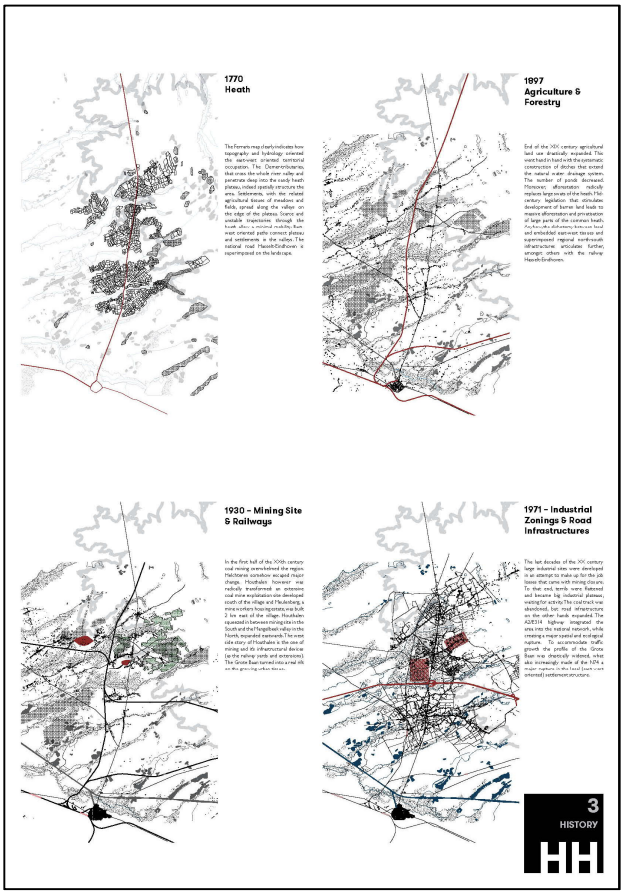

Figure 5: Historical analysis as part of the research by design study for the area around the municipality of Houthalen-Helcheren

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Case: Research by design in Antwerp

The case of Antwerp (BE) tells a story about rethinking infrastructure, seeing mobility challenges as a way to tackle other urban issues and using design as a tool to incorporate dreams and expectations and bring different actors around one table. Integrated infrastructure design acts as a catalyst for sustainable urban development.

The growing port city of Antwerp, located on the Rhine Alpine core network corridor, counts approximately 520,000 inhabitants and covers 205 km^2. The area of Antwerp is highly congested, while 75% of the traffic is through traffic (figure 4).

20 Years ago research solutions for increasingly serious mobility issues has started to be discovered with a referendum by the city in October 2009, having liveability as an important topic and possibilities to tunnel the ring road as one of the outcomes. Local stakeholders did not agree upon the plans. Which made the Flemish government use an external expert (intendant) to bring the big amount of parties together for a constructive dialogue.

The decision was made to organise a high-pressure cook design competition with 'local' support as one of the man criteria. A specific pilot project in each segment and design strategies and principles that work on the overall ring structure for a short term scenario and long term scenario with complete covering of the ring road (figures 5 and 6). In total the competition was divided in 6 segments on which 6 teams worked during 9 months. Each design team combined with experts and locals.

Ambitions were formed by the wish to:

- Realise a competitive integrated city region, putting Antwerp on the map;
- cover the ring road in order to create a healthy future city;
- connect communities, turning backsides into front sides;
- work as a spine for new metropolitan, large scale functions;
- create a multi-generational project, long term engagements are needed;
- have a new model for collaboration – work community round liveability and mobility;
- create conditions for a modal shift 50/50;
- realise spatial recognition of the traffic flows for freight and person traffic.

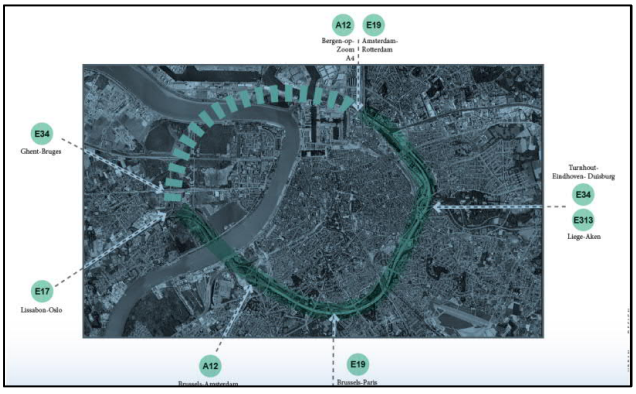

Figure 6: City of Antwerp at the crossroads of highway corridors coming together on a heavily congested (incomplete) ring road

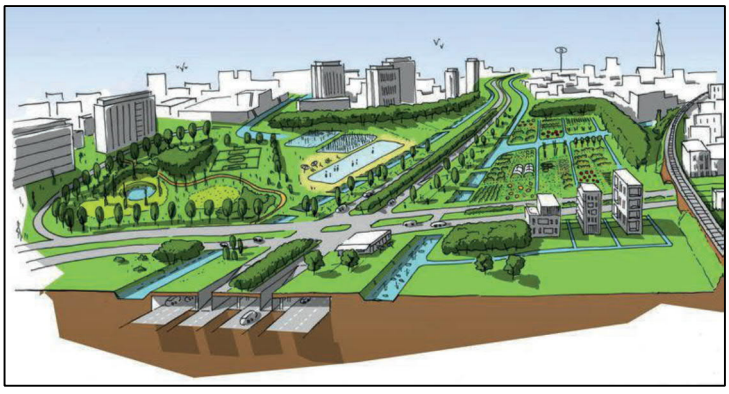

Figure 7: Visualisation of a part of the covered ring road

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3.2.2 Mapping

As an integrated part of the broader approach, maps of the different spatial levels have to be made as a guide during stakeholder discussions. It is of ultimate importance to work with maps, as shown below, to make stakeholders understand:

- Working on three scale levels – corridor level, functional urban area, region, local/city level – as prerequisite for understanding the (potential) relation between solutions and investments at local, regional and corridor scales.
- Interaction between spatial and infrastructure concepts and investments.
- Impact on a variety of objectives, and underlying mechanisms;
- Overseeing the range of possible solutions on different scale levels.

Mapping is therefore an integrated part of a method to make stakeholders understand the base case, by using visualization, as well as impact of possible solutions beyond their own ('silo') scope (figure 8).

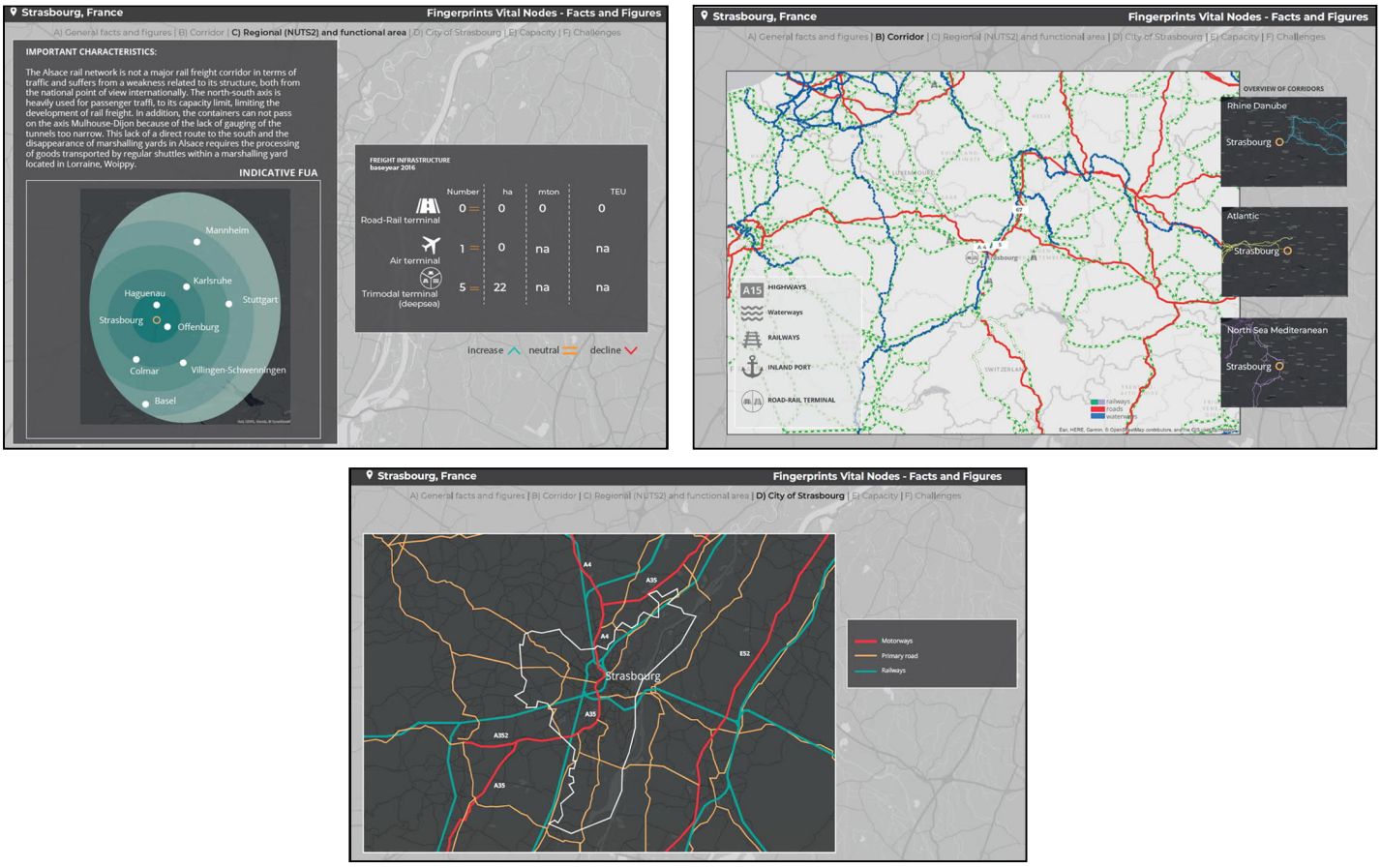

Figure 8: Maps on different scale levels (TEN-T/(inter)national level, FUA/regional level, local level), example Strasbourg

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3.2.3 Logistics Oriented Development

Economic activities will mainly concentrate in city regions. This will result in a growth of convenience logistics, warehouses and on-demand delivery which will have a growing impact on liveability issues (environment, quality of life, health and noise) and accessibility in cities. In fast growing cities, competition on space is a major challenge. By means of spatial design (see section 3.2.1) the spatial appearance of freight and logistics activities could become embedded into the local and regional spatial context, resulting in an improved spatial quality, better stakeholder involvement and more societal acceptance of these types of land use. Besides it is recommended to develop and experiment with a new generation of approaches is therefore recommended to cope with the challenges logistics, infrastructure and spatial development face, especially in urban nodes. In some urban areas 'Logistics Oriented Development' (LOD) has been discussed as a potential planning approach contributing to adding value by integrating these spatial and network challenges. LOD combines transport infrastructure, terminals (nodes) and modes of transport (via road, rail, water and aviation) and brings together (interests of) local, regional and national planning authorities, infrastructure providers and actors in the transport and logistics sectors. The concept of LOD has been explored as well in 'FLUXNET', a research project funded by the Conference of European Directors of Road (CEDR). Recommendation in this project is to test and further develop the strategy 'Logistics Oriented Development' in a follow-up practice-based research project to become fully valid and operational" (Broesi and Hanekamp, 2018).

3.2.4 Mobility management

Mobility Management is a concept to promote sustainable transport and manage the demand for car use by changing travelers' attitudes and behavior (www.epomm.eu). At the core of Mobility Management are 'soft' measures like information and communication, organizing services and coordinating activities of different partners. 'Soft' measures most often enhance the effectiveness of 'hard' measures within urban transport (e.g. new tram lines, new roads and new bike lanes). Mobility Management measures (in comparison to 'hard' measures) do not necessarily require large financial investments and may have a high benefit-cost ratio.

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3.3 Methods and approaches required for the implementation - drivers and barriers (how)

Why?	When the 'project' focus is clear and issues/challenges are identified as synergies between space and network, resulting in a developed strategy, the '**how'-question** can be addressed; "How could the chosen strategy be implemented effectively?" Relating to the interrelated implementation dimensions, consisting of 'time', 'institutional' (or governance) and ' financial' aspects, resulting in added value.
What?	
How?	

In order to implement a strategy to tackle identified issues/challenges and realise synergies between space and network on different scale levels the local **drivers and barriers** should be defined. Giving insights to locally important aspects in relation to solution direction(s), possibilities and impossibilities. Addressing (potential) solutions depends on the type of practise and can be found through previous experiences, on different scale levels and more process related in the form of awareness raising. Bringing together drivers and barriers within an multi-stakeholder approach requires guidance of the process (see section 3.3.1). Besides collaboration on multiple levels should be formed (see section 3.3.2 and 3.3.3) and when implementing, the focus of experts should be used in order to get to a common solution (see section 3.3.4).

3.3.1 Independent process manager / mediator

Large infrastructure projects in an urban environment often face fierce opposition from community groups because of the heavy freight traffic and the forthcoming environmental impact (air quality, noise, etc.) for the city. Social acceptance for such projects is low. Combined with a lack of decent participation and miscalculations of stakeholder interest further decreases the social acceptance and leads to general distrust between different stakeholders and the initiating government. On the long run this may lead to public protest, opposition challenging the project and impeding legal procedures leading to stalemate situations.

The appointment of an independent 'process manager' or 'curator' might prevent or disentangle such stalemate situations, working as an independent mediator. Having achieving consensus among different stakeholders and public trust as main goal. Setting up an intensive consultation and collaboration process. Setting up a 'real' and broad dialogue in so-called work benches for the design process is essential in order to (re)gain trust.

Stakeholders as a driving force in the process

Bringing together a stakeholder coalition for large infrastructure projects is crucial and is considered indivisible from its spatial design, via co-creation and participation. The visions of different citizen initiatives should be integrated, and their authors involved as stakeholders in the process. The project should no longer be regarded solely as an infrastructure project, but should be considered as a shared space in the city. The project thus includes technical, spatial, social and cultural layers integrating space and network dimensions.

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Case: Intendant Antwerp

In Flanders the Oosterweel link project in Antwerp has been a source of controversy for some 20 years. After years of growing traffic saturation, the Flemish government launched a plan to ‘close the circle’ of the Antwerp ring road. From the start the original plan, a tunnel under the River Schelde combined with a long bridge over the harbor and nearby city districts, encountered fierce opposition from community groups. Their opposition was based on livability issues and general distrust of government proposals. They managed to challenge the project a first time in a referendum in 2009 when 135.000 people came out to vote. A majority voted against the project. The government tried to improve the project by putting the proposed bridge ‘underground’. In 2014 the enhanced project was challenged a second time by ongoing legal procedures and the possibility of a new referendum. A new community group (Ringland) pleaded for a ‘third option’: A complete covering of the existing Antwerp ring road. The covering of the ring road would provide whole new sections of lands for parks and urban development, mitigating part of the environmental impact. Their ideas gathered significant public and local political sympathy and support. This resulted in an absolute stalemate between the government and community groups.

In 2015 the Flemish government appointed an ‘intendant’, a mediator, to investigate the various opinions surrounding the Antwerp Ring project in order to achieving consensus. In the autumn of 2016, the ambition statement for the cover for the Ring was set up. That statement bundles the results of 10 months of intensive consultation and collaboration with various stakeholders (figure 8). On the one hand, a coalition was formed for the project, and on the other hand, a vision for the complete covering was created (through research by design methods, as described in the previous chapter), together with the stakeholders. The goal statement does not document a final plan, but functions as a compass for the further collaboration between the stakeholders and the design teams.

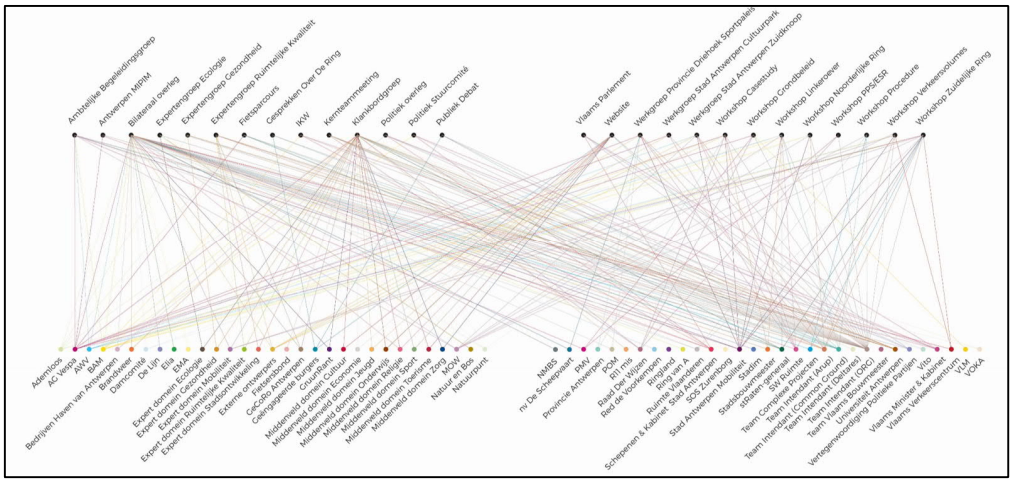

Figure 9: Months of intensive consultation and collaboration among various stakeholders

The work of the intendant proofs to be successful in disentangling the stalemate and gives clear perspective for the future process and collaboration. Important lessons were learnt for future projects.

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3.3.2 Multi-level governance: towards network governance

In the wicked complexity of urban and regional development, transport and infrastructure planning, transport and logistics will never be the only goal of policy makers. Embedding transport and logistics topics in surrounding governance systems is crucial for creating public value, meaning mutual benefits for urban and regional development (liveability, spatial quality, etc.) as well as stimulating connectivity and seamless transport for persons and freight flows. Realising this public value can be realized in various ways. Teisman *et al.* (2018) distinguish different roles for governments. Besides more 'classical' roles with strict government control as 'Public Administration' (having lawfulness and legal equality as basis) and 'New Public Management' (focusing on achieving previously agreed results in an effective and efficient manner) more emphasis is needed on networking and responsive roles of the government, 'Network Governance'.

Key for the networking government is the principle that policy goals are often achieved in collaboration with others. To realize their own goals, organizations must be able to look for external partners who can contribute to the realization of these goals, because they have similar or partially overlapping interests and goals. Bringing interests together is the core of the *networking* government's perspective. Key words are: Coalitions of parties, solving problems based on shared interests. Tools for cooperation are covenants, agreements and or public-private partnership agreements (PPPs). Core of a networking government is the ability to forge results-oriented coalitions and the ability to bring those coalitions to the finish line of achieved results. Regulations, cultures and collaborative models are influential.

Another perspective is 'Societal Resilience' (Hajer, 2011). Public value is "made" by the government, but by others as well. The government does not look for external partners for its own implementation agenda, but to link up with the social dynamics that already exist. Sometimes an initiative fits in with its own agenda and fits within the frameworks which the government applies. However, often initiatives only partially fit within the goals and frameworks of the government. The Antwerp case shows that the public initiative for the ring road absolutely needs a link with societal initiatives and by looking much more 'from the outside in'.

Case: Northern Growth Zone, Finland

The Northern Growth Zone in SouthWest Finland is connected to Stockholm in the West, Tallinn in the South and St. Petersburg in the East. It brings together an economic area of 333 billion euros. The Zone exists of 5 sub-regions, 27 municipalities and is semi-polycentric. Concrete ambition in this region is to plan a new 'short cut' railway track between Helsinki and Turku – the 'One Hour Train' – to reduce travel time between these cities from the current 2 hours to around 1 hour and 15 minutes (figure 10). When this new rail road is in service, more capacity will be available for rail freight on the existing railroad. The 'One Hour Train' plan is not just a railway but a regional development tool, connecting the whole South West Finland to the capital region.

Figure 10 Planned high speed rail connection Turku - Helsinki (source: Tunnin Juna)

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3.3.3 Framework for pro-active collaboration

Any fruitful collaboration process starts with the desire to understand the challenges stakeholders face and the need they have to deal with them. The results of the Vital Nodes project suggest the need for multimodal, multi-level solutions, especially in high-density areas, which require collaboration between multiple parties in a pro-active manner.

The aim of this proactive collaboration framework is to 'reinforce the engagement and participation of stakeholders of different background related to infrastructure and spatial planning'. These three processes can structure the collaboration process from before the project starts until the project delivers:

1. Before the project: Build a **comprehensive stakeholder analysis** and stakeholder engagement plan based on the projects' scope. Define the main challenges (problem analysis).
2. During the project: Have recurrent **stakeholder dialogues** (intensively and continuously) Collaborative planning within infrastructure networks and spatial development
   During the project: **Collaborative decision-making** using the 4-step principle.

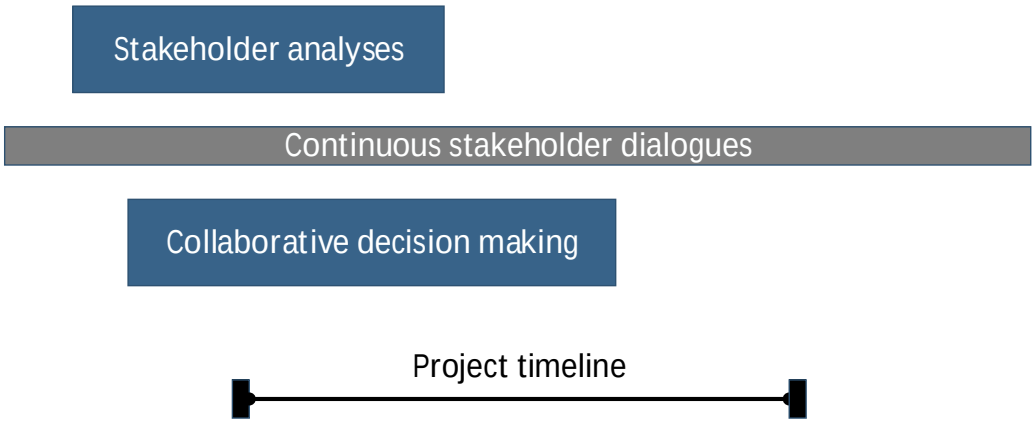

Figure 11: Proactive collaboration framework with three interrelated processes

Ad 1. Comprehensive stakeholder analysis
First, relevant stakeholders need to be identified for a particular issue. These are the actors that could influence or are influenced by the project. A Stakeholder Engagement Plan (SEP) is useful. The identification of stakeholders should be a broad selection, not limited to the initial/common project focus. The project requirements state the scope of a plan. A multi-modal, multi-level context could therefore identify additional chances within the proximity of the project.

Ad 2. Continuous stakeholder dialogues
During the engagement activities, it is important to listen and be open to understand the challenges from all points of views. Different forms of discussion could be used for this. In order to free the minds of the participants and avoid thinking in usual directions (crossing boundaries and thinking outside of the box).. This is also a moment to build a lasting dialogue structure within the area. A lasting dialogue transcends the project environment, with a focus on long-term objectives on spatial and infrastructure planning.

Ad 3. Collaborative Decision-making (4-step principle)
During a collaborative decision-making process, the focus is on the challenges and the collective ambitions to resolve it. Because stakeholders often have different perspectives towards the issues, the

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definition of the shortcoming is important. The 'four step principle' (figure 12) could be used for this because this principle focuses on the shortcoming and not on the measure itself.

1. Initiate: rethink what is possible to do 'without financing'? (e.g. taxes, fares, rerouting of the public transport as well as other traffic, change speed limits)
2. Understand the situation: optimise what improvements are possible in the existing network / area (e.g. squeeze in an extra lane by making the other narrower).
3. Test possible solutions: minor rebuilds (e.g. add extra lanes next to the existing ones).
4. Form a direction and recommend measures to be taken: bigger infrastructure / spatial investments.

Figure 12: The 4-step principal methodology (Ad 3)

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3.3.4 Agile team (for innovative solutions for freight delivery)

Innovative ways of cooperation and process development are needed to tackle challenges related to the increase of urban freight, CO_2 goals within urban areas, growth of e-commerce and the thereto related number of freight deliveries and more. At the same time creating added value in terms of city attractiveness.

The establishment of an 'agile team' as an innovative way of cooperation, to develop solution focused concepts can help to develop and implement strategic solutions. This 'agile team' of experts works as a start-up of experts covering the logistics sector as well as urban planning, governance, business administration and legal aspects. Within a given set of framework conditions;

- For a limited period;
- Working on agreed challenges with open solutions;
- Iterative learning process and short decision making;
- Self-organised;
- Errors are allowed.

Case City Hub, result of an agile team

In the city of Vienna an agile team of less than ten experts has been appointed for four months, tackling the topics; organisation, location, IT, processes, personal, calculation of business case(s) and development of consolidation and services with customers.

Main challenge to be tackled by this appointed team was the increasing freight flows in the urban area. For this reorganisation, the construction of an interim storage facility, a so-called 'hub' is proposed. This hub enables to replace several parallel delivery trips by one ride on the 'last mile', thus to deliver goods smart and clean in a given area (figure 13). Suppliers go to the hub, where deliveries are collected and consolidated for specific target areas.

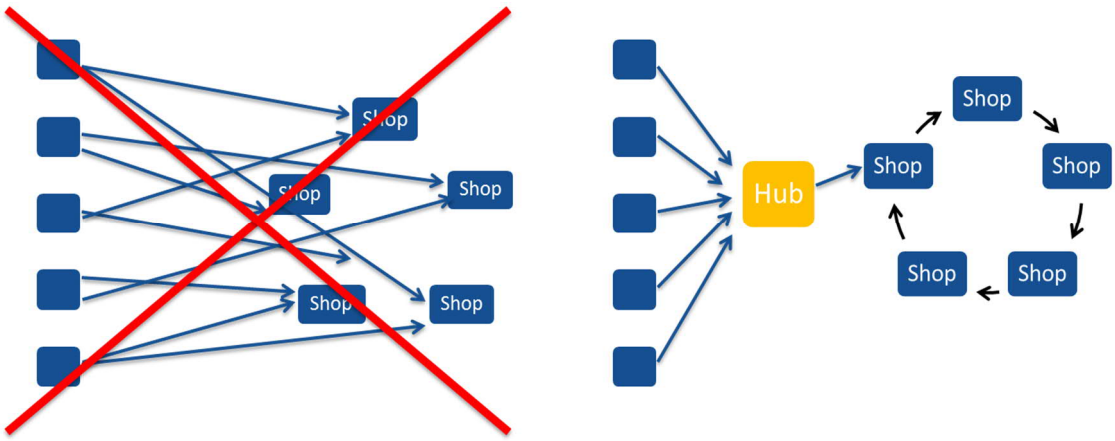

Figure 13: Towards a new concept for freight delivery via a City Hub

In addition to the bundling of goods as a core activity, this hub can be used as a platform for testing and/or establishment of complementary urban themes:

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1. Creation of awareness for traffic restrictions and scientific surveys

   International examples show that the successful implementation of hubs usually has been made in combination with traffic restrictions. Thus, establishing a hub can be used to implement access restriction for delivery traffic in the target area of the hub. Through the parallel scientific monitoring, the effects in the transport system can be observed in real time. This knowledge serves as a basis for a possible future extension of traffic restrictions in other districts.

2. Support of trade during construction-related access restrictions

   Large construction sites may cause substantial problems for the supply of shops. The bundling of the last-mile delivery has the potential to reduce the volume of traffic in these hard-to-reach areas and thus to improve and secure the quality of supply.

3. Visualization of land for logistic activities and surface protection
   An important objective of city planning is to maintain the existing high standards of goods supply. Considering the rapidly growing population, the loss of space in the urban area for the productive sector for the benefit of residential areas and at the same time the increasing demand for logistics space, the safeguard of land for the productive sector has to be supported (Thematic Concept “Productive City” of the City of Vienna).

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Case HUBERT, the city logistics of tomorrow (http://hubert.stadtlogistik.at)

The innovative solution called “HUBERT” is a new logistics service of the Port of Vienna for a sustainable and efficient supply of business and commercial enterprises in the city. Goods are consolidated at the port and delivered using sustainable vehicles (figure 14). This new service builds on the experiences of Eco2City and the GoodHubs 500 cooperation (www.eco2city.eu), that stimulates learning from the experiences available in other cities and develops a uniform solution for cities throughout Europe to attract private participation.

Figure 14: The HUBERT concept scheme

What is the added value (benefits) for participating private partners?

- Employees in urban areas should contribute significantly to the reduction of traffic and private parcels should be delivered to their workplaces (not a privilege but a commitment);
- A facilitation for organisations in every single department and contribution to an increase of the motivation of the personal;
- An increase of the safety standards in the enterprise (no foreign parcel service enters any protected building);
- Consolidated delivery of packages for the company and t employees only once per day;
- Cardboard packing, return sending and first mile shipping is taken care of.

Additional benefits for shopkeepers are:

- Individual agreed and flexible delivery slots;
- Ecological delivery, reduced traffic and emissions (smaller CO_2 footprint);
- Temporary storage of goods;
- Competent counterpart ensured by the logistics competence of the port;
- Transparent costs.

Complementary to the HUBERT project some research activities are ongoing in the city of Vienna:

- Midi-hubs (MiHu) (http://midi-hub.at)
  By means of a generic model MiHu will stimulate cooperative use of Midi-Hubs (inter-urban freight consolidation centre) by multiple courier, express and parcel service providers, with an assessment framework for potential locations. Interest of various stakeholders are balanced.
- RemiHub and KoopHubs (http://www.remihub.tbwrknowledge.org)
  RemiHub stimulates co-utilizing existing central areas and infrastructure as temporary logistic hubs by sustainable transport modes through investigation of requirements and conceptualisation. Koophubs investigates conception of a logistic concept via proof of functionality on a system level (including two stage distribution) by modelling a city hub concept functioning as a zoning concept and stimulating social embedding by adding functionalities.

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3.3.5 Time and financial focus

As part of the implementation of the chosen strategy, the dimensions time and finance are important. Knowing the time horizon of TEN-T developments and SUMPs are long, this requires a joint investment scheme that preferably goes beyond short-term (political) periods and combines initiatives and budgets of different (public) stakeholders in the region and functional urban area.

In order to facilitate this;

- one's objectives need to be smart;
- data needs to be complete and harmonized (having consistent models/results and interpretations);
- all relevant (freight) stakeholders need to be represented.

to make it possible to;

- assesse the value of an intervention;
- create the right directions based on the right mix of stakeholders;
- create one language with the participants;
- specify the functional urban area;
- specify the function of a node for the TEN-T network;
- specify the criteria and objectives for a financial intervention, including the distribution of finance between stakeholders

This leads to the conclusion that finance is very important. Validation will be further explored with financial experts including EIB/Jaspers and formulated within the final Vital Nodes recommendations (deliverables 5.4 and 5.5).

Case: West Sweden Agreement

New residents arrive in the Gothenburg region daily, expecting a well-functioning society. To facilitate this expansion Gothenburg is being developed as a hub with better accessibility for residents living in nearby towns, villages and the countryside. Infrastructure improvements are key to enhancing this accessibility with the West Swedish Agreement playing a vital role. The agreement allows the region to expand sustainably. It is one of the largest investments ever in public transport systems. This will result in a region where residents have a greater choice in where they live and work. It links future plans and visions in infrastructure and spatial development stretching to around 2027, e.g. public transport plans and the construction of a new river crossings, reducing the feeling there is a barrier between two parts of the city.

Major investments included in the West Sweden Agreement:

- Enhanced public transport
- Bicycle and pedestrian paths
- West link, a dual track railway tunnel under the city center
- Hisingsbron, a new bridge over Göta Älv river
- Marieholm Tunnel an additional crossing under the Göta Älv river

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- Gamlestaden Hub allows commuters and residents to change their mode of transport between bike, tram, train and bus

The West Swedish Agreement will cost an estimated SEK 34 billion (2009 figure). The national government will cover half the cost whilst the remainder is funded locally and regionally, partly through the congestion charge system. More information can be found on https://www.vastsvenskapaketet.se.

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4 Conclusions

Experiences gained in the Vital Nodes project confirm the role of the 6 dimensions and their interconnection as described in section 2 (spatial, network, value, time, institutional and implementation dimension). After application in Vital Nodes a new configuration of these dimensions better reflects the 'ideal' process guideline (figure 4) for integrating urban nodes and TEN-T network, than the original scheme (figure 2). Identifying the added value in the focal area for urban nodes and TEN-T (the '**why'**-question) is key and needs to be discussed and appraised by stakeholders in the urban nodes. Methods described in the previous section (fingerprint, multi-stakeholder analysis) have contributed to identifying the (potential) added value for several urban nodes, answering the 'why'-question.

Vital Nodes has added two new elements in comparison to the usual way of exploring transport solutions:

1. The linkage between the broader spatial development of an urban node and transport and infrastructure (mobility and freight) solutions (space and network);
2. The linkages between the local scale, the (regional) functional urban area scale (FUA) and the European TEN-T / corridor scale.

Especially the network and spatial dimensions have been analyzed well during the project, as has been described in the previous sections. This analysis gives input for the '**what'**-question. A common understanding of the specific nature of the node and related challenges was established by using methods as Research by Design and mapping. After that, implementation – the '**how'**-question – has to be guaranteed by focusing on the interconnected implementation dimensions (time, institutional and financial drivers and barriers). Examples of implementation methods are the independent mediator ('intendant') and 'Agile team'.

Summarized, conclusions from the Vital Nodes experiences and specifically the development of this toolbox are:

- Time, institutional and financial are all implementation drivers and barriers;
- That is why methods and approaches have not been specified for every dimension, but are specified for the different process phases ('why', 'what' and 'how'): Discussing the added value of better integrating the urban node and TEN-T network with different stakeholders (**value**; 'why'), exploring (potential) synergies between the **spatial** and **network** dimension and strategies to be chosen ('what') and the **implementation** (including '**time'** and '**institutional'**) of these strategies ('how').
- Vital Nodes proofs that using a mix of the methods described is necessary to take further steps in exploring the integration of urban nodes in TEN-T. The added value and synergies need to be appraised among stakeholders in urban nodes. Recommendation to the European Commission is to stimulate using this toolbox and the Vital Nodes workshop format, among the urban nodes.
- An important conclusion is that an urban node has a wide functional urban area when it comes to logistics, different from a person mobility perspective as the 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 by consolidating freight for respectively Rotterdam (NL) and Strasboug (FR). This FUA is an important link between urban nodes and its policy domain (SUMP guidelines, Urban Mobility Package) and TEN-T and its policy domain (TEN-T guidelines).

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