Benchmarking integrated infrastructure planning across Europe – moving forward to vital infrastructure networks and urban regions

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Abstract

Achieving a smart green and integrated transport system is key to sustaining and developing the economic, social and environmental vitality of urban Europe. Within this context the challenge is to deliver the next generation of infrastructure governance, design, management and operation that enables optimal accessibility, liveability and vitality across the various scales: from the local daily urban system to the wider EU-regions that cluster metropolitan areas. To tackle this challenge, a research programme has been developed for EU’S Horizon 2020 – Networking for Urban Vitality (NUVit) – that focuses on the integration of the planning of multi-modal transport infrastructure with land-use planning. This paper discusses best practices amongst Europe of such integrated infrastructure planning – including cases from The Netherlands, Sweden, Estonia, Belgium. On basis of a benchmark we do an analysis addressing such issues as: spatial concepts (multi-modal corridors, nodal development); multi-modal network optimisation at various spatial scales; life-cycle issues; value creation and capturing; and, institutional and governance approaches. The paper ends by exploring the main elements of an integrated infrastructure planning approach that enables us to move forward to innovative, vital infrastructure networks and urban regions of tomorrow.

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1. Introduction: the challenge of integrated infrastructure planning

Today’s investments in the physical environment, in particular in infrastructure and mobility, are a main driver for urban economic and environmental vitality of tomorrow’s urban areas. Achieving a smart green and integrated transport system is key to sustaining and developing the economic, social and environmental vitality of urban Europe. At the same time, transport infrastructure authorities across Europe face ever-tougher challenges to accommodate increased traffic while dealing with climate change and delivering environmental and societal objectives. This requires a shift from current small-scoped – *ad hoc, technical solution driven* – planning approach towards a broad/network-scoped – *integrated, strategy driven* – planning approach. Within this context the *challenge* is to deliver the next generation of infrastructure and mobility governance, design, management and operation that would enable optimal accessibility, liveability, health, safety and security across the scales: from the local daily urban system to the wider EU-regions that cluster metropolitan areas. This challenge of consistency across different spatial scales is widespread across metropolitan regions in Europe. Deployment on a EU-regional scale should be centred on TEN-T clusters such as in the Benelux/Nordrhein-Westfalen – part of the economic centre of Europe, the so-called ‘Blue Banana’. Fundamental in addressing this challenge is: 1) further optimisation of multimodal mobility of daily urban systems (DUS), which is only possible when the local peri-urban system and the long distance freight transport are taken into account; 2) considering TEN-T as a whole (corridors and their interlinks) for regions where the TEN-T network is highly clustered, interlinked with regional and local networks.

To tackle this challenge, a research programme has been developed for EU’s Horizon 2020 – *Networking for Urban Vitality (NUVit)* – that focuses on innovations for the integration of planning of multi-modal transport infrastructure with land-use planning (see www.nuvit.eu). This enables synergetic integration of spatial development with investments in infrastructure (across all relevant scale levels: local, regional and corridor) in order to achieve the highest added (asset) value. Best practices across Europe show that by implementing this integrated NUVit approach significant benefits can be achieved in accelerating infrastructure delivery, environmental and spatial quality, investment climate, mobility network resilience and stakeholder commitment (see Arts et al. 2014a,b).

This paper builds on the results of the NUVit-programme. It aims to explore the main elements of an integrated infrastructure planning approach that enables us to move forward to vital infrastructure networks and urban regions. To this end, the paper will discuss best practices amongst Europe of such integrated infrastructure planning – this includes cases from e.g. The Netherlands, Sweden, Estonia and Belgium. On basis of this benchmark we will do an analysis addressing such issues as: spatial concepts (e.g. multi-modal corridors, nodal development, transit oriented development), multi-modal network optimisation at various spatial scales, life-cycle issues, combined value creation and capturing, and institutional and governance approaches. The paper ends by exploring the main elements of an integrated planning approach for moving forward to vital infrastructure networks and urban regions.

2. Conceptualizing vitality of networks and regions

Integration of land-use planning and transport planning is crucial for more resilient and sustainable planning outcomes as is discussed in academic literature as well as recent policy documents in various countries (see for a detailed discussion Arts et al. 2014a). 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 (Arts 2007, Banister 2005). They 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 (see Arts et al. 2014a). The integration of transport infrastructure and land-use planning is seen as an essential element of a more inclusive, sustainable transport planning (Arts 2007, Banister 2008, Cervero 2009, Van Wee et al. 2013).

Transport and land use planning sectors can have considerable impact on each other by as explained by the so-called ‘Land-Use Transport Feedback’ cycle (Wegener & Fürst 2004). 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 – ‘land-use transport integration’ (LUTI) modelling (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. In order to achieve adaptive (flexible and robust) and sustainable transport infrastructure and regions, the way forward is to consider the whole transport land-use cycle, which means alignment of different scale levels – at the (inter)national scale for the infrastructure network component as well as at the local level area-specific embedding.

The conceptual framework of this paper builds on a research programme – Networking for Urban Vitality (NUVit), www.nuvit.eu – developed for EU’s Horizon 2020 and focusing on integrating land-use and infra planning. The NUVit conceptual model comprises integration of six dimensions of mobility, land-use and infrastructure planning in such a way that synergy is created (see Figure 1). It might be clear that other groupings are possible and that these six dimensions are very closely related; the value of the basic framework is the synergetic integration of the elements. This conceptual model has been developed and checked on basis of analysis of cases, workshops and group discussions with international experts (Fehrl 2013, MUST 2013, Arts et al. 2014b, NUVit 2015). The concept is related to SUMP (sustainable urban mobility planning, Banister 2008, Zhao 2010) but goes beyond a local SUMP as regional and (inter)national mobility and infra networks and broader spatial opportunities are taken into account as well. The NUVit concept aims for both short-term project benefits (duration, budget, and public support) and long-lasting benefits in terms of enhanced quality of infrastructure (network resilience, spatial quality of the surrounding area, investment climate). Vitality is at the heart of the model.

The six dimensions depicted in Figure 1 are (see Arts et al. (2014a) for a detailed discussion):

- **Spatial dimension (uni- ☐ multi functional)**: Regarding spatial concepts with synergetic effects on accessibility. Examples are multi-model corridors, transit oriented development and area-oriented approaches. Critical aspects are the ability to deal with scale issues, transport analysis and spatial design.
- **Network dimension (uni- ☐ multimodal)**: Optimising multimodal network at various spatial scales: corridors at (inter)national level, daily urban systems at metropolitan level and landscaping at local level.
- **Time dimension (construction ☐ full life cycle)**: Linking stages in a full life-cycle of places and infrastructures (this also relates to renewal, redevelopment, circular economy, asset management), examining changing paradigms (lifestyles and linkages to mobility), strategy development for transitions towards multi-modality and integration with land-use.

![Fig. 1. the NUVit conceptual model (after Arts et al. 2014b).](image-url)
• **Value dimension (problem solving ↔ creating conditions):** Examining state-of-the-art models and approaches to assess value – e.g. Social Cost-Benefit Analysis, Life-Cycle Assessment, Environmental Assessment – to create value and capture value in combined infra and spatial development projects.

• **Institutional dimension (single ↔ multi actor):** Comprising the analysis of existing organizational and institutional frameworks, which leads to an overview of proven governance approaches – regarding public-public and public-private partnerships, stakeholder engagement – at all levels for implementation.

• **Implementation dimension (‘one shot’ ↔ stepwise, adaptive):** Finally, a critical aspect in innovation is the deployment and the implementation. Therefore, in the NUVit conceptual model explicit attention is paid to the implementation of the framework and toolbox developed. This dimension includes making an inventory of implementation issues and drivers in order to tackle implementation barriers.

3. **Benchmarking vitality of infrastructure initiatives**

As stated before, the conceptual framework for NUVit has been deduced from a variety of cases in Austria, Belgium, Estonia, France, Germany, The Netherlands, Spain and Sweden (see MUST 2013, Arts et al. 2014b, NUVit 2015). Due to the limited space available in this paper we focus on three cases: Ringway Utrecht in The Netherlands, Ostlänken-Linköping in Sweden, Rail Baltic-Tallinn in Estonia. These cases are benchmarked by comparing the shifts in the different NUVit dimensions 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.

3.1. **Ringway Utrecht, The Netherlands**

The Ringway Utrecht is a Motorway expansion project in Utrecht (The Netherlands). Initiated in the late 1990’s, currently the draft decision has been published and the project is in the pre-tender phase. The project has a history of conflicts with the stakeholders in the surrounding of the project, since the narrow 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 (Arts et al. 2014a).

Regarding the NUVit dimensions over project time, from start to current, the following shifts can be seen:

1. **Spatial dimension:** During the 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 discussion were barrier effects of the project for the (economic) growth of the University Campus and the connectivity of the city to the surrounding landscape.

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

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 Eastern 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. **Governance 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.

![Fig. 2. Ringway Utrecht and the spatial/economic context.](image-url)
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.

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.

3.2. Ostlänken Linköping high-speed rail, Sweden

The Ostlänken high-speed railway and the Linköping passage is a high-speed rail project initiated in the beginning of the 1990’s. 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 Järna (South of Stockholm) to Linköping. The time plan is to start building by 2017, with completion scheduled within the next 11 years. The construction costs for the new 160km railway is calculated to be 30bilion 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 to travel Stockholm-Göteborg in two hours. Currently it is not yet decided how the railway will cross or bypass Linköping.

![Proposal for Linkoping passage.](image-url)

Regarding the NUVit dimensions over project time, from start to current, the following shifts can be seen:

1 Spatial dimension: The project originated from the wish to function in one single daily urban system with the larger Stockholm area. Issues concerning the integration of the project in the urban area were usually discussed in separate settings such as: the Linkoping station competition (2013) and the Swedish high-speed rail corridor policies and national negotiations (ongoing).

2 Network Dimension: The network dimension is approached from a rail perspective. The 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 infrasrcture’ have been introduced, in which co-funding by local government is explicitly discussed.

5 Governance Dimension: The project is central state managed with multiple stakeholder involvement in the process and decision-making.

6 Implementation Dimension: The negotiations on housing and infrastructure were introduced in 2014 to speed up the process and gather additional funding. This approach is a proven concept to link investments in infrastructure and spatial development and to capture value.

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 the 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 (Swedish Transport Administration) 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 and implementation dimensions). This case illustrates how the NUVit conceptual model works. Traditionally, in infrastructure planning focus is on newly developed tools of only one or two dimensions, which are seen as a ‘Silver Bullet’ (e.g. focus on technical network solution or integrated traffic modelling) while forgetting about the other dimensions needed for successful integrative planning (such as the value governance, spatial dimensions).

3.3. Rail Baltic-Tallinn

The intention of the Rail Baltic project is to fully integrate Estonia, Latvia, Lithuania in a track gauge of 1,435 mm railway transport system widely used in Europe. The Rail Baltic axis Warszawa – Kaunas – Riga – Tallinn is set as the 27th TEN-T priority project by the European Commission 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, one of the most important national and international planning factors 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 NUVit dimensions over project time, from start to current, the following shifts can be seen:

1. **Spatial dimension:** The spatial dimension of the corridor planning focused on the 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 the rail barrier effects.

2. **Network Dimension:** The network discussion has a focus on rail and logistic. First concepts for the relation between the urban economic and mobility developments are discussed within the limited context of the station design (Tallinn symposium, 2015). Further exploration of the DUS seems to have high potential. The increased congestion on the E67 Tallinn-Pärnu-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 funded by the European Union. 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. **Governance Dimension:** The 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 the 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.

*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. 

![Fig. 4. Rail Baltic in European network context.](image-url)
4. Analysis and discussion

4.1. Inclusive approach

The cases discussed all show a shift in time towards a more inclusive approach (see figure 5 below).

All cases regard infrastructure development that is rather interlinked with their surroundings. Often the infrastructure forms a barrier in the urban fabric and limits the development of economic, leisure or natural functions. When looking at the spatial optimization of the area as a whole (infrastructure including 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 confrontations between the project and e.g. municipalities since these interest are not addressed in a satisfying manner. The Ringway Utrecht and the Ostlänken-Linköping cases illustrate this explicitly. It can be concluded that 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 NUVit framework can be a helpful instrument to structure the discussion and to identify critical aspects.

4.2. Best of both worlds? Line meets Area Approach

A fundamental issue in planning infrastructure is the relation between infra (line) and the area surrounding it. It seems that an area-oriented approach in which the performance of an area as a whole is central when projects are considered (Heeres et al. 2012). A best practice example in the NUVit network is T.OP Limburg. The project in Belgian Limburg deals with a spatial reorganisation in order to serve economic revitalisation of the region. The process links local opportunities, to network optimisations and regional economic strengths. This approach is very successful in linking actors and scales, however the step towards concreteness and ownership of infra development is a challenge (see also text Box 1).
4.3. Scale issues

The cases discussed show that the success of a project is closely linked to the capacity to link the different scales. Often scale issues are addressed in a linear way, starting with large-scale infrastructure ‘line’ planning (corridor) and ending with local mitigation measures. Both the Utrecht case and the Linköping case show that this might be an approach where crucial information is gathered at a time when the scope already is relatively fixed. This can result in conflicts between the project and the stakeholders. In all cases the ‘middle’ scale of the Daily Urban System (DUS) is usually poorly discussed in the planning process. For the Utrecht, Linköping and Tallinn cases the current situation of the DUS is taken as a reference point and hardly altered. This leaves a tremendous potential for creating added value of infrastructure investments untouched since this is the scale where most added value (mobility, economic, accessibility) can be found (NUVit, 2015).

Fig. 7. Linking scales for synergetic infrastructure planning.

Cases across Europe show that coordinated optimisation of infrastructure and spatial development at the DUS level can be the key to safeguard corridor interests while solving local spatial conflicts. Moreover, the other way around, small measures at local scale may help to solve bottlenecks at the DUS level and the corridor level. For instance, at urban ringroads often up to 30% of the

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**Text Box 1: Best Practice inspiration: T.OP Limburg**

The Territorial Development Programme (T.OP) Limburg (Belgium) is an innovative planning process in which economic redevelopment and spatial reorganization serve to reinforce each other. Limburg represents a former mining region. Today, the scheduled closure of Ford industries in Genk, one of Limburg’s main economic engines and Flanders’ fourth largest industrial site, presents the region with a major economic and societal challenge. The partners aim to strengthen the region into a multi-productive urban network by stimulating mixed urban business locations, industrial clusters and energy landscapes. The focus is on territorial win-wins between urban and economic dynamics. Mobility and spatial connectivity are the guiding principles for a smart densification and mixing of functions. This counts for both industrial sites and the residential fabric. In order to increase economic density and urban dynamic in a region with low demographic growth, a complementary strategy is being implemented.

1. Spatial dimension: Diversify development strategies based on local potential and multi-modal connectivity.
   Densification is used to feed the network potential.
2. Network Dimension: The planning process aims to tune the scattered local, regional and national infrastructure projects into a cohesive investment strategy which guides economic developments.
3. Time Dimension: The planning process aims at combining short-term win-win situations into creating long-term economic conditions.
4. Value Dimension: Improved North – South cross-border connectivity between Limburg and the urban region of Eindhoven (NL) with many knowledge-based industries.
5. Governance Dimension: The project includes an national government initiated informal planning process to kick start a synergetic cooperation between companies, governments and private parties.
6. Implementation Dimension: The process is driven by several design driven instruments such as research by design, design studio’s summers schools, etc.

Conclusion: the T.OP Limburg is an interesting multi-actor and multi-scalar approach, which investigates synergy between scales, themes and is coalition building. These elements would be a valuable addition to the initial stage of an infrastructure driven process. A challenge is that the many initiatives have difficulties to come from a (strategic) planning stage into concrete project realization.
traffic is local. ‘Shaving off’ some of this share by relatively small local mobility measures (which may regard other modalities; e.g. biking as in Utrecht – see Arts et al. 2014a) may reduce traffic sufficiently to solve congestion bottlenecks at the urban ringroad. If such a ringroad is part of the an (inter)national corridor such ‘acupuncture’ measures can be of importance to the (inter)national transport network.

4.4. Linkages between dimensions

The experiences of the cases discussed suggest that the various dimensions are related in a logical way (see Figure 8). The spatial and network dimensions regard the linkages between transport infrastructure and land-use. This results 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 in order to become 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 – Tordoir, 2013) and well-functioning (inter)national transport corridors and networks (see MUST 2013, Arts 2014b, NUVit 2015). This will be further elaborated as part of the research programme – developed for EU’s Horizon 2020 (see www.nuvit.eu).

5. Conclusions and outlook

The case studies show that infrastructure networks have become an interwoven ecosystem with their surroundings. Sectoral planning which solely focuses on transport network solutions has a limited return since it doesn’t acknowledge this interwoven relationship of transport networks with their surroundings. In reaction to this, we observe a significant shift towards a more inclusive approach in order to be successful (see previous analysis of the cases). National network authorities across Europe face huge challenges to optimize performance on network, economic and environmental performance of their networks including its surroundings. Many of these challenges originate from trends that will even reinforce the interwoven relation between urban conditions and infrastructure networks. Some of these evident trends are: the demographic shift towards metropolitan areas and away from rural regions, the need to strengthen multi-modal connectivity, living environments as a strategic asset for regional competitiveness, etc. One can conclude that dealing with these interconnected relationships will be vital for national network authorities in order to remain their ‘social license to operate’ on the middle and long term. The NUVit initiative, as discussed in this paper, provides a practical framework for dealing with network challenges in complex interwoven situations. It can be concluded that the following topics are important in order to be a successful network operator with a sustainable license to operate:

- Inclusive approach: By an integral, strategy-driven approach that takes liveability (quality of life, spatial quality) into account from the start of a project is feasible and can be advantageous for enhancing the quality of infrastructure projects the spatial quality of the surrounding area, as well as management of time and budgets. Analysis of the cases Utrecht, Linkoping and Rail Baltic (see section 4) shows a shift towards a more inclusive approach present in all cases. Most significant shifts can be seen regarding the more content-oriented dimensions 1-4 (Network, Space, Time and Value, see Figure 5) the more process-related dimensions of Governance and Implementation show less clear shifts. With respect to the latter inspiration can be found in the multi-actor approach the T.OP Limburg case handles (See Text Box 1).
Line meets area: An area-oriented approach can be very successful in linking actors and scales. As can be concluded on basis of the T.OP Limburg case, however, the step towards project deployment and implementation can be challenging since ownership has to be build during the process. In sectoral infrastructure-driven projects (such as the Utrecht, Linkoping and Tallinn cases) ownership is often much more straightforward which is an asset when moving towards project deployment. This shows a potential for a hybrid process where a line based process is enriched with an area oriented approach.

Scale issues: Cases across Europe show that coordinated optimisation of infrastructure and spatial development at the DUS level can be key to safeguard corridor interests while solving local spatial conflicts. The core of this strategy consists of specific local interventions in different modalities that have an overall impact on the DUS level and the corridor level.

Linkages between dimensions: 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 (see Figure 8).

Based on the experiences gained we may draw the conclusion that a more integrated planning approach can lead to a more efficient planning process that leads to improvements in terms of investment costs and social and economic revenues. With respect to external trends the importance of such an approach will become more important for network authorities to keep their social license to operate. The ambition of the NUVit initiative is to realize a sustainable network of experts and practitioners across Europe who will apply and further develop the NUVit principles. A network is already functioning and will continue to exchange new approaches, instruments, experiences, skills and competences. This will result in a mutual learning environment on integrated planning, delivery and operations of infrastructure, mobility and liveability throughout Europe.

References

Banister, D. (2005), Overcoming barriers to the implementation of sustainable transport. Barriers to Sustainable Transport. Institutions, regulation and sustainability, pp. 54-68.
Heeres, N., T. Tillema & J. Arts (2012b). Duurzame planning van weginfrastructuur: een internationaal perspectief (Sustainable planning of road infrastructure an international perspective), Research report Faculty of Spatial Sciences, University of Groningen, Groningen.
Te Brömmelstroet, M.C.G. & L. Bertolini (2009), Integrating land use and transport knowledge in strategy-making, Springer.
Zhao, P. (2010), Sustainable urban expansion and transportation in a growing megacity: Consequences of urban sprawl for mobility on the urban fringe of Beijing, Habitat International, 34/2, pp.236–243.