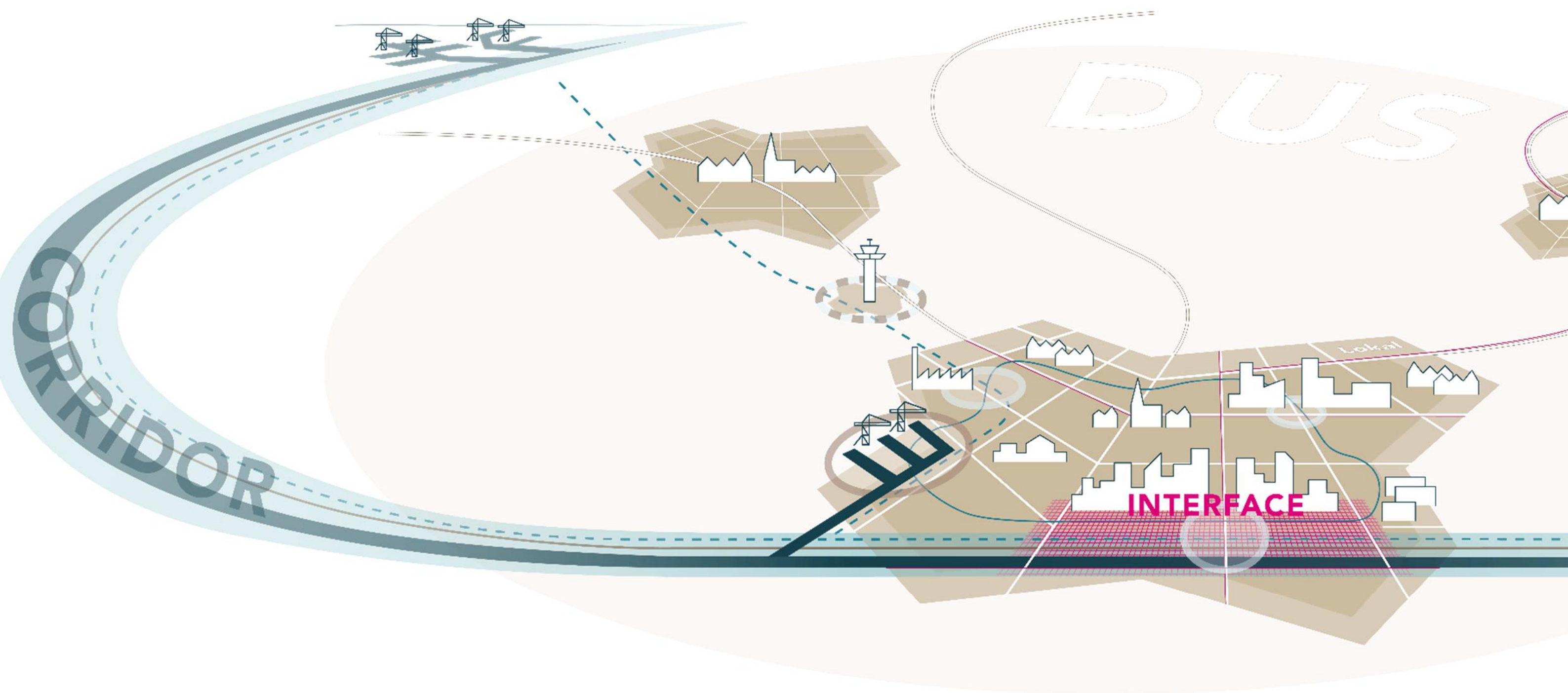
Report

Project number: 360835
Reference:
Date: 26-09-2019

Transportation at the corridor-last mile interface: an inventory of good practices

Spindesign: Work package 2



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1 Introduction

1.1 Context

National Road Authorities (NRA's) are responsible for the performance of major road networks for traffic of people and freight. These organization face fundamental challenges in their efforts to improve the robustness and connectivity of their networks. NRA's are confronted with global trends such as urbanization, regional empowerment, the rising domination of e-commerce, innovative mobility and logistical concepts, circular economies and a growing importance of sustainability, health and living quality.[1] These trends emphasize the interrelatedness of the networks of NRA's with other parts of the transport system and with surrounding areas.

A specific challenge for NRA's is the performance of their networks in urban regions. In these areas the infrastructure networks of NRA's have to process national, regional and local traffic flows. This takes place at the interfaces between transportation corridors and last mile transportation. Due to the combination of national, regional and local flows, these interfaces face transport problems, such as traffic jams, delays and environmental issues. In addition to these issues, also area quality is often lower than desired.[2]

In order to deal with a rapidly changing context and to enhance the organization of transportation at the interface of corridor and last mile traffic, NRA's require a shift towards **a collaborative planning approach**: planning major transportation infrastructure in collaboration with other forms of infrastructure, other modalities and spatial developments and vice versa. A challenging task that requires collaboration with other stakeholders and different governance forms.

1.2 Challenges for collaborative planning

Consequently to the interrelatedness of issues at the interface of the corridor and the last mile, NRA's and other planning authorities have become interdependent. These organizations experience great difficulty in achieving their aims by means of a traditional sectoral approach. Rather, NRA's and other planning authorities depend each other for achieving their own particular aims and for improving transportation systems as a whole. A collaborative approach of transportation at multiple spatial scales and with other spatial functions is more effective at maintaining and improving the performance of the NRA's networks. The same is true for other actors involved in transportation planning and for the performance of transportation in the region in general. The complexity of planning issues at the interface of national, regional and local traffic flows forces NRA's and other planning authorities to actively engage in collaborative planning at the interface with other spatial scales and with other spatial functions.

Despites this interdependence, enhancing transportation (i.e. improving the robustness and connectivity of the transport system) at the corridor-last mile interface is challenging. First of all, since the essence of planning at this interface is dealing with interactions between various spatial scales, the interface is not the specific responsibility or interest of any governmental body. This implies that, in order to enhance the performance of transportation at the corridor-last mile interface, planning authorities at different levels (or other organizations, e.g. private or semi-private organization) need to cooperate at a scale which

[1] Source: trend analysis SPINtrends

[2] Source: Study 'Snelweg en Stad': https://www.bna.nl/onderzoeks-project/snelweg-en-stad1/

is no-one’s prime interest, ambition or responsibility. Moreover, each of these organizations have their own views on transportation, procedures and regulations and funding. Within this fragmented context, organizing the collaboration that transportation planning and design at needs is challenging.

1.3 SPINdesign – a study on collaborative SPace and INfrastructure design

The SPINdesign project develops a **toolbox** and a **vision** on collaborative planning and design of transportation in the urban region. The toolbox helps NRA’s to optimize the multi-modal performance of their networks in the context of recent trends in mobility and spatial development.

These recent trends and innovations are explored in another study: SPINtrends. SPINtrends distinguishes between four categories of trends that affect thinking about transportation, mobility and infrastructure.

1. Technological developments
2. Behavioural changes
3. New economies
4. Sustainability and social equality

The SPINtrends study analyses on what time frame these trends are relevant, what are relevant geographical scales, what traffic types they influence and whether they influence traffic demand or supply. Eventually the SPINtrends study concludes about relevant concepts for innovation of planning and design at the interface of the corridor and the last mile.

The SPINdesign toolbox will consist of a framework of collaborative typologies. These typologies assist NRA’s and other planning authorities at the interface of space and mobility to engage collaborative planning and design at the interface between corridor transport and last mile mobility. The *vision* document for CEDR’s members will contain strategies on how to improve the connection between long-distance and last mile, and on how NRAs can combine and use the ‘basic’ solutions and measures from the Toolbox for tailor-made designing and planning of the interface at the DUS level.

The range of strategies for collaborative planning at the interface of transport and space is broad. For several years, NRA’s across Europe are actively exploring these strategies. Therefore, as a first research step in the SPINdesign project, this study provides an overview of **good practices in collaborative strategies** for transportation planning. Therefore, this inventory does not include conventional approaches such as building additional infrastructure or expanding the capacity of existing infrastructure. SPINdesign looks specifically for interventions in other dimensions (mobility, spatial context or hubs and terminals), either in combination with (new) infrastructure or not. These strategies are presented in a catalogue with innovations from transport planning practice. This catalogue serves as input for the development of a toolbox for NRA’s and a vision document.

1.4 Scope – an interface approach

The SPINdesign study focusses on the ‘interface between the corridor and the last mile’. Across Europe, these sections of the motorway network seem to face similar issues related to transport quality and area quality. In order to frame this best practice study we consider such an interface usually contains most of the following features:

- A motorway, often build in more rural context with less mobility

- Currently in an urban context
- Besides the corridor traffic usually also has large degree of local and regional traffic
- Is challenged by issues concerning air, noise, accessibility, barriers
- Surrounded by a changing spatial context: brownfield development ,etc.,
- Faces rapid changing mobility, logistics, etc.

This does not imply the good practices only focus on this typology. The aim of this study is to explore good practices that improve transport quality and/or area quality at the above described interfaces. However, actual interventions in the transport system may take place in other parts of the system.

With regard to the impact of planning strategies, enhancing transportation at the corridor-last mile interface may take place in different forms. A distinction can be made between internal and external interfaces of transport systems.

- Internal interfaces can be understood as the relations between various elements of multimodal transport systems (i.e. roads, public transport networks, hubs, terminals, parking facilities, paths for biking and walking).
- External interfaces are the relations of transport systems with other spatial elements, such as housing, business, recreation, nature, etc.

1.5 This report

The core of this report is the catalogue with good practice from accross Europe. However, in order to explore and analyse examples from planning practice in a structured way, first a conceptual framework is developed. For that purpose, the next chapter conceptualizes transportation at the corridor-last mile interface. After that, chapter three sets out the research approach for the exploration of good practices. In chapter four the selected projects are presented in factsheets. Chapter five finalizes this report with concluding remarks and a short preview towards the next steps of the SPINdesign study. This section abstracts findings from the inventory with regard to the ingredients as well as the underlying success factors. It also includes an NRA-perspective on the findings in this study, which discusses the different postions NRA's could take and the planning and design skills that are needed from NRA's.

2 Transportation at the corridor-last mile interface

2.1 Transportation systems

Transportation is the movement of persons, freight or information from one geographic location to another. This involves many different elements, of which vehicles and infrastructure are the most tangible. Additionally, the way transportation takes place is also formed less tangible elements, such as the price of transportation, the availability of information or personal preferences. Together, these elements may be seen as a transport system. Transportation systems are the systems that make possible the movement of persons, freight or information from one geographic location to another.

A systems approach observes transport from different dimensions and distinguishes between transportation at multiple spatial scales and different traffic flows, such as people and goods.

2.1.1 Different dimensions

A well known model in transportation planning is Bertolini's node-place model.[3] The core of this model is the duality between node value (including infrastructure and nodes) and the place value (space) of a location. The duality is however rather abstract and does not cover the all relevant elements of the transportation system at the corridor-last mile interface. For the purpose of this study, it is worth observing transport systems with more detail. This study therefore argues that the options for NRA's and their partners in urban contexts to intervene in transportation issues at the corridor-last mile interface are broader. In addition to infra and nodes, also mobility and the spatial context are dimensions that can be intervened in to influence transport and area quality at the corridor-last mile interface.

Arguably, transportation systems consist of multiple dimensions, for example infrastructure networks, hubs and terminals, spatial context and mobility (i.e. the use of the network). These dimensions can be seen as the controls that NRA's and other planning authorities collaboratively have to intervene in transportation systems in order to optimize the performance of the system. In each of these dimensions innovations that could enhance the efficiency and sustainability of transportation are ongoing.

Infrastructure networks

The most clear physical representations of the transport system is probably the infrastructure links that the network consists of. A transport system may be regarded to contain various unimodal networks – i.e. roads, railways etc. At these links the actual transportation of people, goods and information takes place. Together with the hubs and terminals the infrastructure networks form the hardware of the transport system.

Examples of concepts in the dimension infrastructure networks: expansion of the current network with new infrastructure (e.g. new road, railway) or expansion of exitsing infrastructure (e.g. widening roads), new infrastructure for an additional modality (e.g. new railway or bike path).

Hubs and terminals

The hubs and terminals are the nodes where the unimodal networks connect – i.e. stations, air- and seaports, terminals etc. In people traffic these nodes are referred to as hubs, while

[3] See e.g. Chorus, P., & Bertolini, L. (2011). An application of the node place model to explore the spatial development dynamics of station areas in Tokyo. The Journal of Transport and Land Use, 4(1), 45-58.

in freight traffic these nodes are referred to as terminals.[4] Together with the infrastructure links, the hubs determine the capacity of the network.

Examples of concepts in the dimension hubs and terminals: realization of multimodal hubs to connect road, bicycle rail and other public transport networks, such as park and ride/bike, stations and ports.

Spatial context

The spatial context infleunces transportation in two ways. First, the spatial context consists of the origins and destinations for transportation. These determine the need for transportation. This may be regarded as the internal spatial context of the transport system. Second, the transport system also has an external spatial context. This is the landschape/environmental that surrounds the network and hubs.

Examples of concepts in the dimension spatial context: coordinating spatial development with transport facilities, TOD, area-oriented strategies and greenfield and brownfield development.

Mobility

How the network is used is a derived function from the demand for transportation and the available transportation options[5]. On this basis users of the network make choices about the modes that are used, the routes that are taken, when trips are made etc. So, when the infrastructure and hubs and terminals are seen as the hardware of the transport system, the mobility dimension can be seen as the software. It is the way that infrastructure and hubs are used by the traffic. Interventions in the mobility dimension include all measures that have an impact on the interface of the corridor and last mile but are not physical measures (either infra, hubs or spatial).

Examples of concepts in the dimension mobility: MAAS, traffic and network management, intelligent transport systems and vehicle innovation and use optimization programmes. influencing how the network is used ....

The figure below illustrates the four dimensions of transport systems and a selection of urban transportation concepts that can be associated with each of the dimensions.[6]

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[4] See e.g. the Vital Nodes-study: https://vitalnodes.eu/

[5] Source: Rodrigue et al. (2016), The Geography of Transport Systems (4th edition), see also https://transportgeography.org/?page_id=284

[6] See also the report SPINtrends – Overview of future trends in mobility and spatial development (2019).

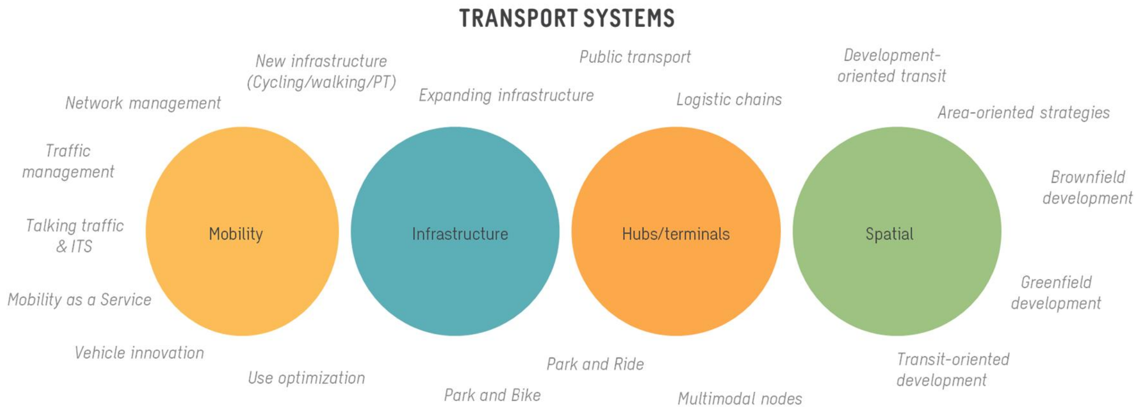

Figure 2.1 The four dimensions of transport systems with a selection of related concepts. Infrastructure, the spatial context, hubs & terminals and mobility are the controls that NRA's have to influence transportation in the urban region.

2.1.2 Different spatial scales

Transport systems are layered systems that consist of networks at various spatial scales. Examples are networks for long-distance transport, regional networks and networks for last-mile transport. Characteristics of long-distance networks are large scale, (inter)national, corridors, highway network, between functional urban areas, high speeds, high capacity traffic flows. These are the main transport corridors on which long-distance traffic is concentrated. In contrast, networks for last-mile transport are characterized by small scale, local, within cities, slow speeds, smaller flows aimed at the dispersion of traffic.

In between the supra-regional corridor-level and sub-regional last mile-level, there is a regional scale. This is not a clearly demarcated spatial scale, but it relates to terms such as the functional urban area and the daily urban system. The functional urban area and the daily urban system can both be understood as the geographic area around urban cores (high density areas) in which the majority of trips takes place (i.e. daily trips, such as travel to work etc).[7] [8] Functional urban areas and daily urban systems may be regarded as coherent areas for daily activities such as living, working and other daily provisions (shopping, leisure).[9] [10].

These areas can be defined by travel time or trip distance. International research shows that the average time spent travelling to work or study differs from 20 to 40 minutes between western countries. Across the Eurozone the average daily travel time is around 30 to 40 minutes.[11] This spatial scale is increasingly considered to be a relevant spatial scale for

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[7] Source: https://www.ans-verkeerenruimte.nl/projecten/nmca/40-daily-urban-system

[8] Source: OECD (2013), Definition of Functional Urban Areas (FUA) for the OECD metropolitan database: http://www.oecd.org/cfe/regional-policy/Definition-of-Functional-Urban-Areas-for-the-OECD-metropolitan-database.pdf

[9] Mokhtarian, P. L., & Chen, C. (2004). TTB or not TTB, that is the question: A review and analysis of the empirical literature on travel time (and money) budgets. Transportation Research Part A: Policy and Practice.

[10] Source: https://agendastad.nl/wp-content/uploads/2015/03/14091-Eindrapport-De-veranderende-geografie-van-Nederland-Regioplan-25mrt2015.pdf

[11] Source: OECD (2016), Time spent travelling to and from work (LMF2.6):https://www.oecd.org/els/family/LMF2_6_Time_spent_travelling_to_and_from_work.pdf

exploring challanges in transportation and accessibility and, hence, for enhancing the efficiency and sustainability of transportation.

For analytical purposes this study distinguishes transportation at three spatial scales:

- Transit traffic travels through urban area, but has neither its location of departure nor its destination in the area.
- Regional traffic travels to and from the urban area. It has either its departure location or it destination in the area.
- Local traffic has both its departure location and it destination in the urban area.

2.1.3 Different traffic flows

Transportation systems accomodate different traffic flows. A differentiation can be made between person traffic and freight traffic. The characteristics of these traffic flows differ with regard to travel volume, travel time, travel motives and travel preferences etc. This meas that the conditions under which people and freight travel could changes their behaviour are different. Therefore, each traffic flow requires a specific approach and measures in order to mitigate the impact of flows on the corridor-last mile interface. For example, for a part of freight traffic an option may be to change travel times, while this is not an option for groups of person traffic due to work and school obligations.

2.1.4 A conceptual model

The model in figure 2.2 schematically viasualizes transportation at the interface of the corridor and the last mile and its relation to the urban context. The model shows the relation between the dimensions of the transport system (infrasucture, hubs & terminals, the spatial context and mobility), the scale levels of the transport system (local, regional and transit) the different traffic flows in the transport system (people and freight).

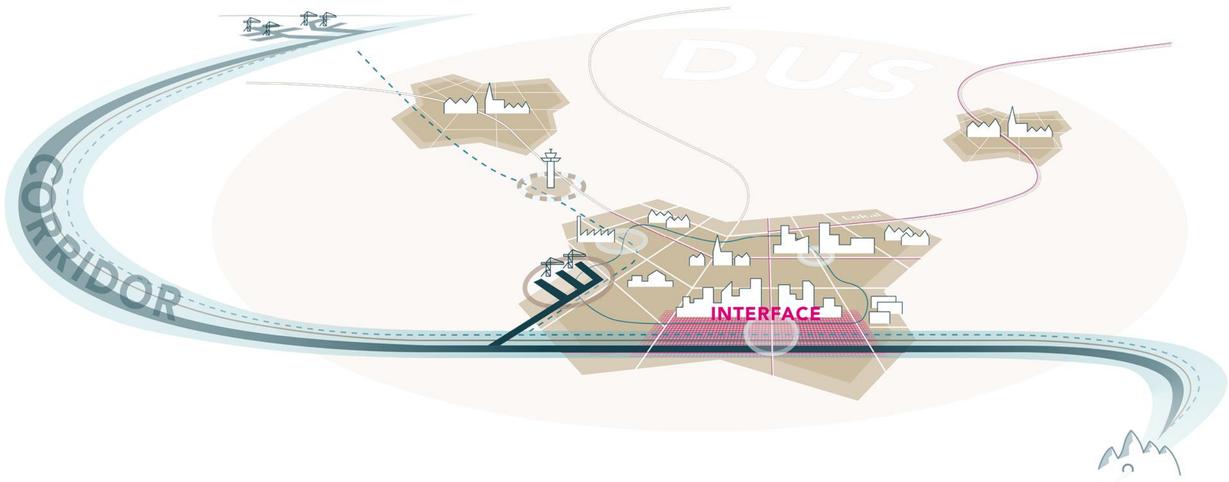


Figure 2.2 A spatial conceptualization of the corridor-last mile interface. The model shows the four transport dimensions (infrastructure, spatial context, hubs & terminals and mobility) and scale levels (local, regional and beyond the region) from the perspective of the corridor-last mile interface.

2.2 Impact

Chapter 1 describes the challenges NRA's face in maintaining and improving the performance of their network. It also describes the internal and external interface of NRA's networks and the need address to interdependence between these interfaces and to actively engage in collaboration.

With regard to these interfaces, the internal interfaces of transport systems define the supply of usable transport facilities; the external interface may be seen as mechanisms for steering the need for transportation of passengers and freight. Therefore both the internal and the external interfaces of transport systems may provide tools to enhance transportation in the urban region.

Consequently, the impacts of transport projects that focus on internal and external interfaces is also two sided. Internal impacts concern the quality of transportation. The impact of measures on the quality of transportation can be observed from the connectivity and the robustness of the transport system.

- Connectivity concerns is the relative location of an object to the destination centers in terms of **time and effort**.[12]
- Robustness concerns the **capacity** on the transport system (multi-modal) within the daily urban system and the system's ability to **maintain its function** in case of disruption. [13]

External impacts concern the area quality of the corridor-last mile interface. These can be observed from indicators such as spatial quality, social quality and environmental quality.

- Spatial quality concerns the **attractiveness of an area** as a location living, working and recreation, in terms of meeting the needs and desires of users.
- Social quality concerns the **opportunities for social inclusion** that an area offers to residents and other users.
- Environmental quality concerns the performance of an area with regard to **environmental factors**, such as noise, air quality, etc.

[12] Source: https://articles.extension.org/pages/62111/what-are-the-differences-between-mobility-accessibility-and-connectivity-in-transportation-planning

[13] See also: Vital Nodes (defined as accessibility)

3 An inventory of good practices

3.1 Research approach

In order to enlarge the knowledge of different collaborative planning strategies for transportation at the corridor-last mile interface the SPINdesign study starts with an international good practice study. This section outlines the approach of the international good practice study. The study consists of three main steps: concept definition, selection of good practices and analysis.

Step 1. Concept defintion

To provide a focus for the exploration of planning practice the first step was to define and understand the interface of the corridor and last mile transportation, its problems and what the main challenges for transportation planning at this scale are. This steps consisted of a series of workshops and resulted in a conceptual model that was used for the selection and analysis of good practices. Basically, the conceptual model shows the controls that NRA’s, in collaboration with other authorities, have for influencing transportation at the corridor-last mile interface.

Step 2. Selection of good pratices

The aim of this catalogue is to illustrate the options that NRA’s have for influencing transportation at the corridor-last mile interface, when operating in a collaborative setting. Therefore, rather than aiming for a comprehensive overview, the selection of good practices aimed at illustrating the variation of collaborative planning options. To goal of the selection to provide an overview of planning strategies at the different dimensions, scales and traffic flows, within different planning cultures. For that purpose, the international network behind the SPINdesign study consists of experts from Austria, Denmark, Finland, Germany, Norway, the Netherlands, Sweden and the United Kingdom. Moreover, the network consists of experts in all dimensions of the transport system.

The main selection criterion was that the projects entailed interventions in any of the dimensions of the transport system (or combinations) and that projects have a positive effect on transportation corridor-last mile interface (i.e. enhance robustness and/or connectivity). Also, in order to come to a relevant selection of projects for the catalogue, selection is based on the trend analysis from the SPINtrends study. Finally, in order to be effective as input for the toolbox and vision, the catalogue focuses on completed projects (i.e. planning process completed).

Step 3. Analysis and drawing lessons

To provide relevant input for the SPINdesign toolbox and vision on collaborative transportation planning, analysis of the projects takes a structured approach. The analytical framework focuses on four main questions:

- Background: What is the need for the project?
- Ingredients: What ingredients does the project include?
- Success factors: How has the project been realized?
- Impact: What is impact of the project?

The analysis of the projects is presented in factsheets in chapter 4.

4 Overview of good practices

This chapter presented the factsheets of the selected good practices. The following good practices are included in this good practice study (alphabetical order).

Project	Country	Dimensions	Levels of scale	Type of transport
A2 Tunnel Maastricht	The Netherlands	Infrastructure, spatial	Local, regional & transit	People & freight
Airdrie-Bathgate Rail Link	United Kingdom	Infrastructure	Regional	People
Better Use Inland Waterways	The Netherlands	Infrastructure, mobility	Regional & transit	Freight
Bijlmer Arena Station	The Netherlands	Infrastructure, spatial, hub	Local, regional & transit	People
Car free city centre	Norway	Mobility & spatial context	Local & regional	People
Congestion Charge Stockholm	Sweden	Mobility, infrastructure, spatial	Local, regional & transit	People & freight
Cycle Super Highway	Denmark	Infrastructure	Regional	People
GATE Genoa Cable Car	Italy	Infrastructure, hub, spatial	Local & regional	People
Helsinki Cycling Network (including Baana)	Finland	Infrastructure & mobility	Local	People
MaaS Helsinki	Finland	Mobility	Local	People
Microconsolidation Strassbourg	France	Hub, mobility	Local & regional	Freight
Mobipoints	Norway, Germany, Belgium, the Netherlands	Hub, mobility	Local & regional	People
Nordhavn Copenhagen	Denmark	Spatial, hub, infrastructure	Local & regional	People
Produktive Stadt	Austria	Spatial context, hub	Local	People &freight
Railport Scandinavia	Sweden	Hub & mobility	Local, regional & transit	Freight

Project	Country	Dimensions	Levels of scale	Type of transport
Ringland Antwerp	Belgium	Infrastructure, spatial	Local, regional & transit	People & freight
Ring Rail	Finland	Infrastructure, hub, spatial	Local & regional	People
Science Park Turku	Finland	Infrastructure, spatial	Local & regional	People
Shared E-bikes	The Netherlands	Mobility	Local & regional	People
Zaanstad Corridor	The Netherlands	Infrastructure, hub, spatial	Regional	People

Helsinki Cycling Network

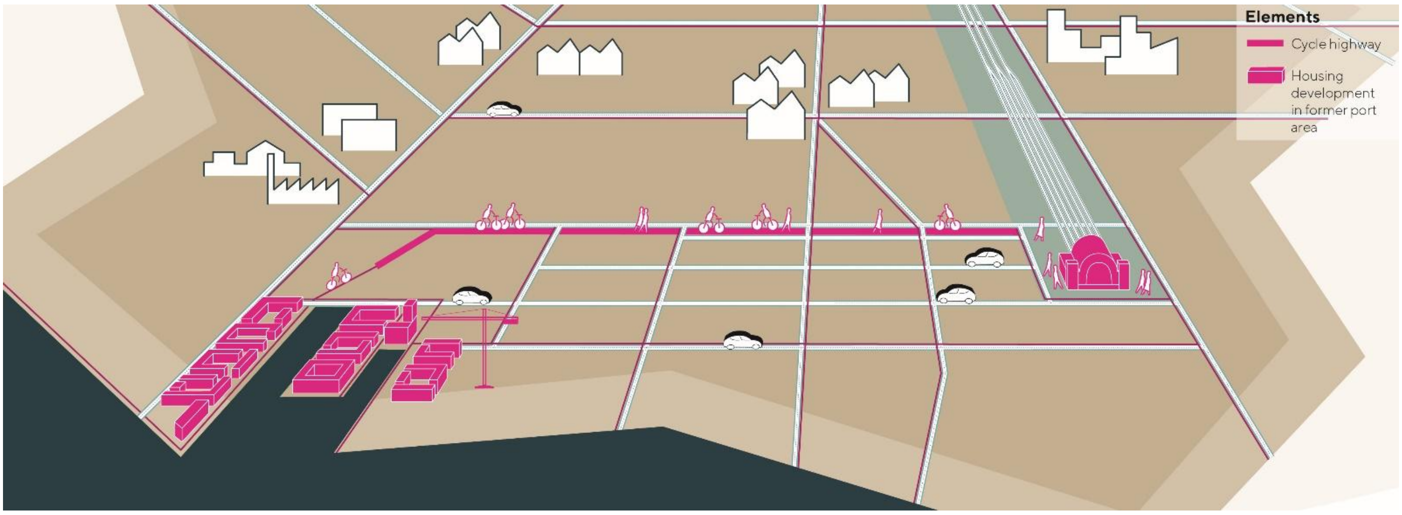
Finland

Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	ü Local
ü Mobility	☐ Freight	☐ Regional
☐ Hubs/terminals		☐ Transit
☐ Spatial context		

Background

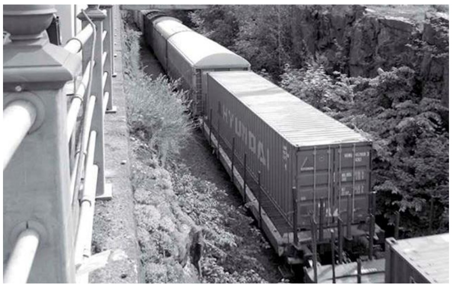
Helsinki's population increases with nearly 10 000 residents per year. To ensure liveability in the Helsinki region and use the limited space as efficient as possible, Helsinki set the ambition to increase bicycle usage from 10-11% to 15% in 2020. To achieve this, a comprehensive network of cycle paths is drawn up and will eventually be 130 kilometres in length. The network will connect major residential areas, hubs, areas where people work and the city centre with fast and direct cycle paths.

Baana, 'railway' in colloquial Finnish, is the first section of this high-quality cycle path. It runs in an old railway cutting seven metres below street level for 1,3 kilometres. The railway became obsolete in 2008 due to the relocation of the harbour.



Ingredients

The whole network of cycle paths compromises upgrading and redesigning existing **infrastructure**, and the adding of new infrastructure to solve missing links in the network.
Baana was the first step to make the comprehensive network and opened in 2012. The route runs from the old port area to the city centre. The port is being redeveloped as a residential area and has a focus on the bicycle network. Because of the ambition of Helsinki to ensure a change in **mobility** towards more usage of the bicycle, there is a strong focus on the comfort of the cycle routes. The cycle paths are designed wide enough to ensure easy and safe overtakes by other cyclists. This makes the path comfortable and safe for both slower and quicker cyclists. Furthermore, the Baana routes are located in a pleasant urban space, features greenery and has special attention to lighting.
The infrastructure is also meant to be used as a feeder network for public transport. Park and rides (cycle parking) at station locations are being developed to ensure a smooth transition between cycling and public transport. With some restrictions, bicycles are allowed on metro's.



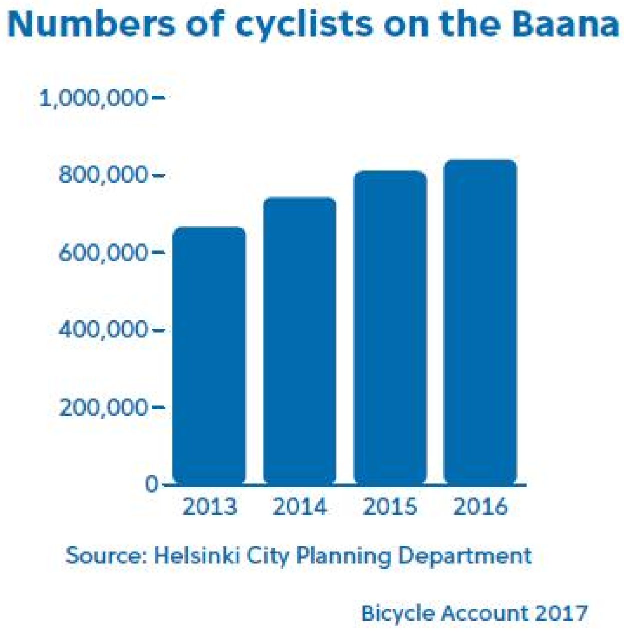
Success factors

The Baana cycle path is the first step in the comprehensive cycle network for Helsinki. The **high-quality** of this part of the route, set the quality level for all the whole network. It is an example of adaptive infrastructural usage where obsolete infrastructure is transformed into new infrastructure. Additionally to the infrastructure, a bicycle service centre has opened you can repair your bikes and buy bicycle supplies.
Nowadays, this part of the cycle network is one of the **most popular** in the Helsinki region. The **number of cyclist has increased** by more than 150 000 cyclists. People use the route mainly to travel to work or school and a third of the residents that cycle daily, also use public transport daily. The route is therefore also meant as a **feeder network** for the public transport network. However, due to the increased number of cyclists the parking places at the (metro) station is lacking behind.

Interface impacts

Transport impacts	Area impacts
☐ Connectivity	☒ Spatial quality
☒ Robustness	☐ Social quality
☐ …	☒ Environmental quality
	☐ …

The project has the focus to ensure liveability in the Helsinki region, despite the pressure on the spatial quality due to urbanisation. The cycle paths show an increased number of cyclists and there is an emphasis on the quality of the network by green features, special attention to lighting and implement the cycle path in a pleasant urban space.
Because of the cycle paths, park and ride facilities, the bicycle can be used as a feeder for the public transport network.



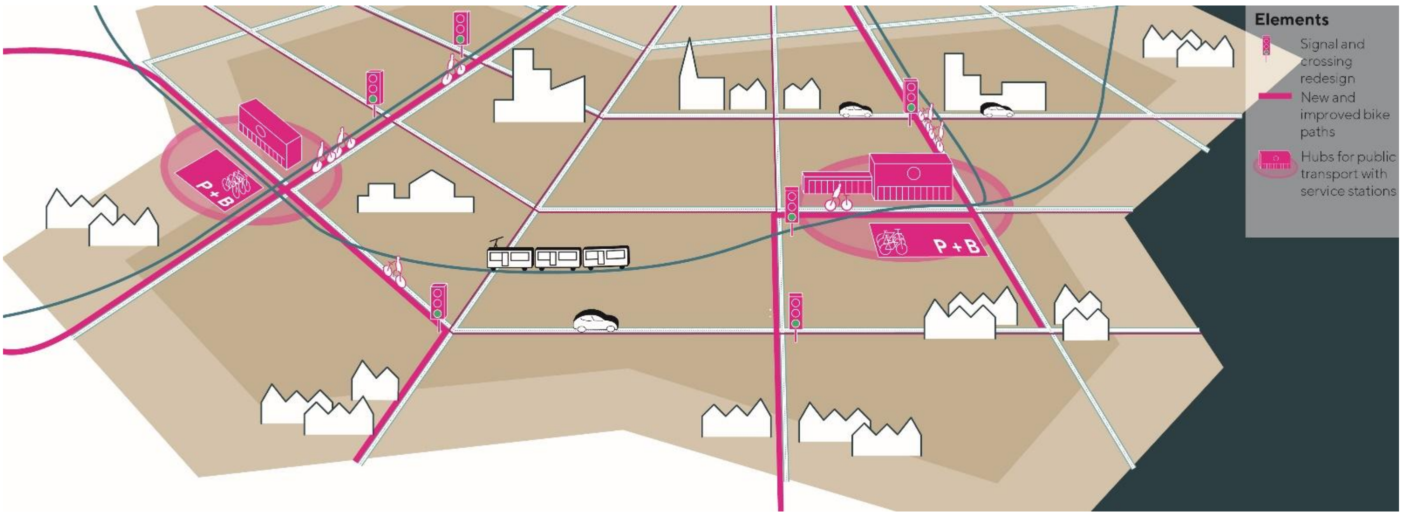
Cycle Superhighway - Copenhagen

Denmark

Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	ü Local
ü Mobility	☐ Freight	ü Regional
☐ Hubs/terminals		☐ Transit
☐ Spatial context		

Background

Denmark is famous for its cycle culture. However, in the neighbouring municipalities of Copenhagen, the number of cyclists is slowly decreasing. To encourage more people to cycle, several so-called supercykelsti (cycle superhighways) have been developed. These routes ensure connectivity in the Copenhagen Metropolitan area.
The main purpose of the Cycle Superhighways is to create an infrastructural network comparable to public transport and the car. The routes connect work, study and residential areas and makes it easier for cyclists to commute by bike.
The main target-group of the Cycle Superhighways are commuters that travel between 5 to 30 kilometres daily. The routes provide a smooth ride with fewer stops and increased safety. Furthermore, the cycle routes run near stations to make it more attractive to combine cycling with public transport.
The Albertslundruten is the first cycle route in the Cycle Superhighway network and it was ready in 2012.



Ingredients

The network is aimed at upgrading existing **infrastructure** and adding features to the route. Traffic lights got a countdown light to indicate the waiting time, and green waves were implemented. Other traffic lights got footrests that can be used by cyclists while they are standing still. The cycle paths are recognisable by signage and marking on the path.
Apart from upgrading the infrastructure, missing links in the network were solved by adding new cycling infrastructure. Furthermore, service stations along the route allow cyclists to pump their tires on the spot if needed.
The main target group for the cycle superhighway are **commuters** to change their **mobility** from cars to bicycles.
The project has three main goals: increase the number of cyclists by 20% over a period of five years; increase travel speed by 10% over a period of five years and improve traffic safety along the route. The route starts in the city centre near the train station and runs west via several districts and recreational areas to the municipality Albertslund.

Success factors

The route has seen an increase of around 34 % of cyclists using the route in 2016. In november 2012 an evaluation showed that approximately 1/3 of the new cyclists used to travel by car or public transport, which indicates that the project has been succesful in moving people away from the more poluting forms of transportation to the active and more green type of transport. This obviously also helps on the congestions on the roads although the evaluation also indicates that too many cyclists on the bike path causes new problems.

The project did not manage to change the travel speed significantly which was primarily due to the number of signals that remained on the route. However, it was indicated that the improvement of the pavement has been positive towards maintaning constant travel speed. The evaluation of the project did not include traffic safety for which reason it is unclear wherther or not the project has been succesfull in reaching that goal.

Interface impacts

Transport impacts	Area impacts
☐ Connectivity	☒ Spatial quality
☒ Robustness	☒ Social quality
	☐ Environmental quality

A socioeconomic analysis of the Superhighway network shows that when the network of all 28 routes are fully implementet the return on the projects will be 11%, equal to 5,7 billion DKK.

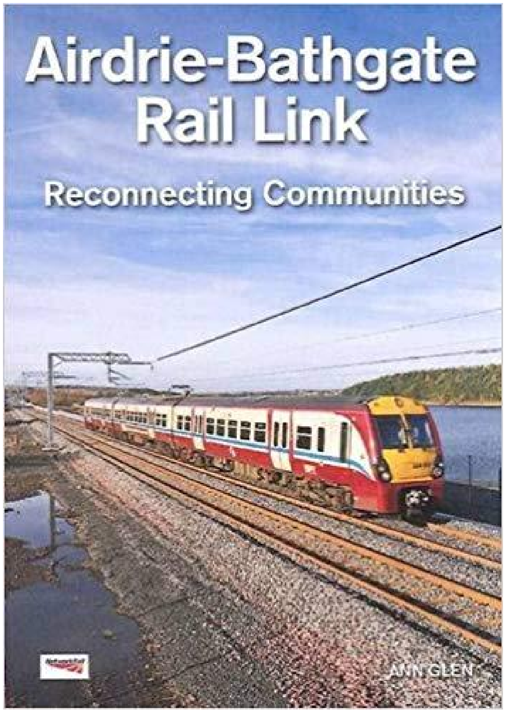
Airdrie-Bathgate Rail Link

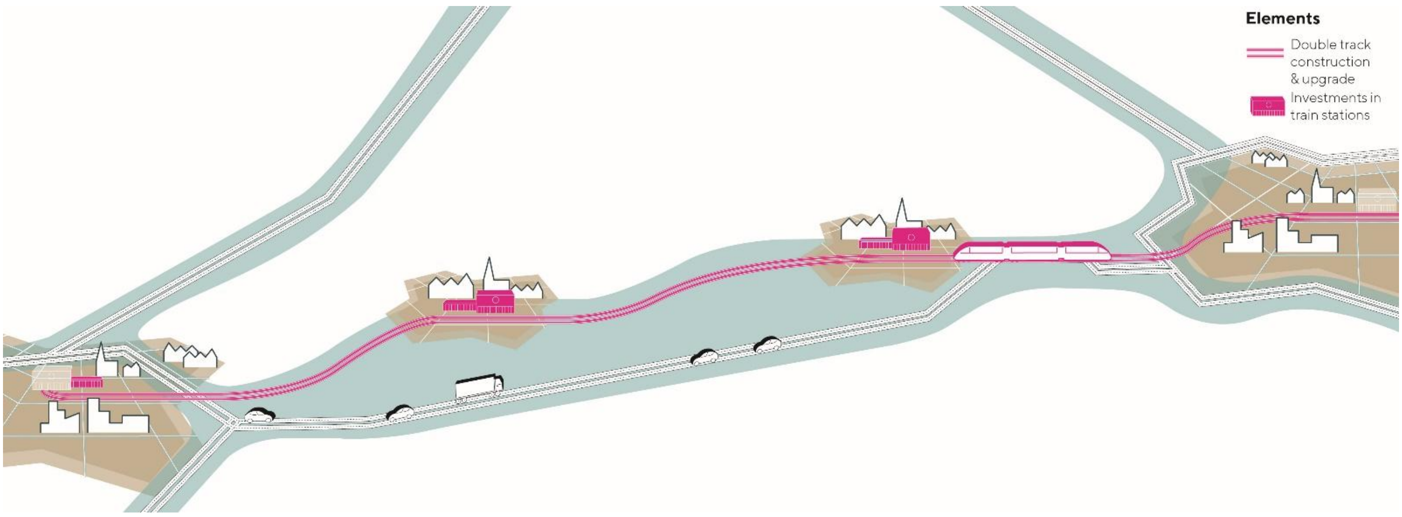
United Kingdom

Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	☐ Local
☐ Mobility	☐ Freight	ü Regional
ü Hubs/terminals		☐ Transit
☐ Spatial context		

Background

The Airdrie to Bathgate rail link improvement project originated from the Central Scotland Transport Corridor Study which was carried out from 2001 until 2003 to assess solutions for easing transport problems in central Scotland. One of its objectives was to offer a sustainable public transport alternative to the M8 between Glasgow and Edinburgh and therefore reduce road congestion. In 2003, the Scottish Ministers decided to introduce a 15 minute frequency rail service between Glasgow and Edinburgh, via Airdrie and Bathgate. The Airdrie to Bathgate Rail Link Improvement Project was created and became fully operational by May 2011, at a cost of £300 million. 2012 was the first calendar year of full services. One of the goals of the project was to assist enhancing social inclusion of the areas between Edinburgh and Glasgow (North-Lanakshire and West-Lothian).





Ingredients

The Airdrie-Bathgate rail link links several towns between the urban areas of Glasgow and Edinburgh to the rail systems of these cities. This was achieved through various **infrastructural works** and investments in train stations (**hubs**). The works included reopening 22km of closed route from Drumgelloch, near Airdrie, to Bathgate as an electrified, double track railway. A second track was constructed for 2km between Airdrie and Drumgelloch and for 10km between Bathgate and Newbridge Junction. The existing 26km between Bathgate and Haymarket East Junction was electrified.

The service was designed to deliver a double-track electrified railway with a nominal minimum design speed of 80mph, although where reasonably practical 90mph is the target speed. The line was intended to be capable of supporting a minimum operation of four passenger trains per hour in each direction using modern electric multiple unit rolling stock. On the eastern section of the line, the number of trains increased from 2 to 4 per hour, on the western sections from 4 to 6 trains per hour.

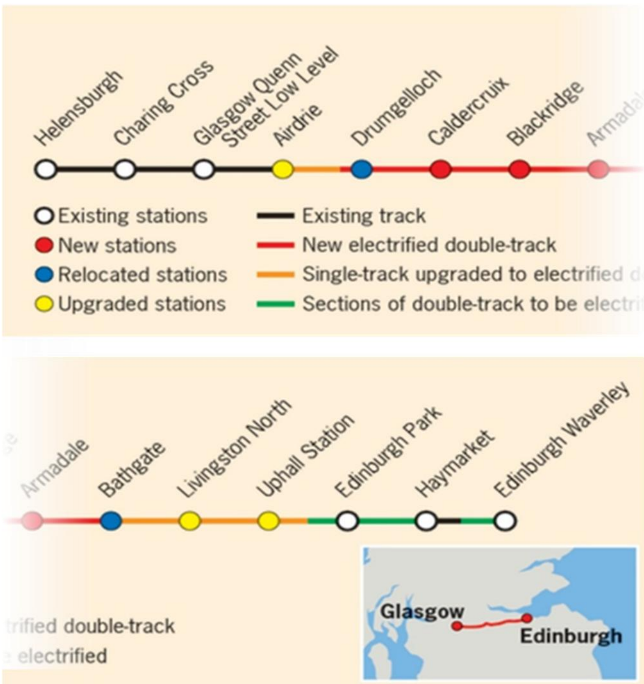
Success factors

(Re)construction of the Airdrie-Bathgate Rail Link started after a relatively short plan period. Catalyst for the project came from a key recommendation of the Central Scotland Transport Corridor Studies in 2002, which primarily focussed on examining trunk road links. However, the **multi-modal study** also championed championed several complimentary rail-based schemes, including the Aidrie-Bathgate link. On this basis, Scottish executive agreed to support the project and provide funding. The project became part of the Scottish Infrastructure Investment Plan, which made **large funds** available. In the plan the project is mentioned as a **key priority** for the Scottish Government. From that point a **strong and decisive planning process** was started. An important pillar of the process was the **participation of local communities**. Communities were invited to share ideas and concerns about implementation of the project. This has resulted in the realization of additional stations and relocation of startions to locations that better suit local spatial development.

Interface impacts

<u>Transport impacts</u>	<u>Area impacts</u>
☒ Connectivity	☐ Spatial quality
☒ Robustness	☒ Social quality
☐ …	☐ Environmental quality

By offering an additional form of transportation the effects of the Rail Link includes an expansion of the capacity of the transport system in the Glasgow-Edinburgh area and it allows for modal shift. Measured results include, for example, 31% mroe passengers at existing stations along the route (compared to 14% UK-avarage growth). With regard to social impact, impacts are not fully clear, but the rail inks is considered to provide an improved means of travel for more disadvantaged members of society and, as such, may improve accessibility and, more generally,assist in promoting social inclusion.



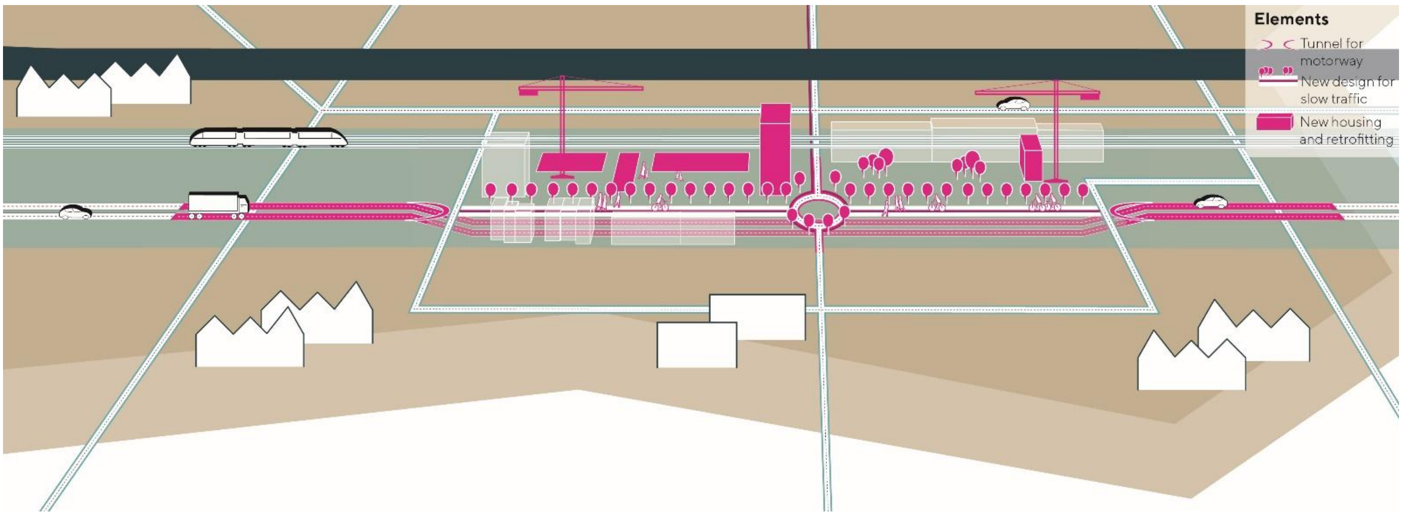
A2 Tunnel – Maastricht

The Netherlands

Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	ü Local
☐ Mobility	ü Freight	ü Regional
☐ Hubs/terminals		ü Transit
ü Spatial context		

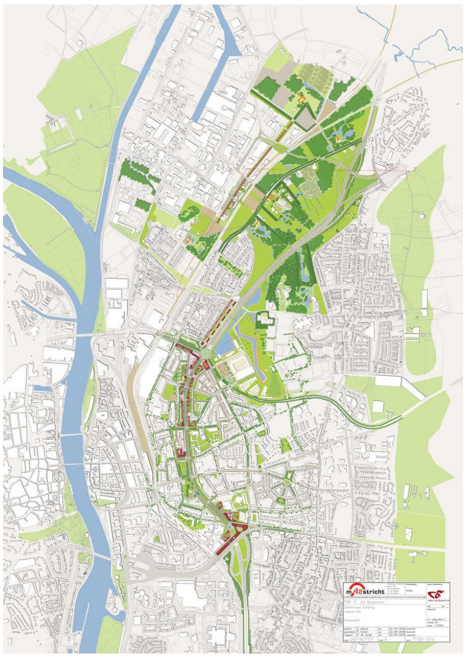
Background

The A2 Motorway is one of the major international transport routes in the Netherlands. Planners have long recognized the route as a major bottleneck. From a transport perspective, the obvious solution would be the construction of a new road to the east or west of the city. However, the situation proved to be much more complex. The A2 is also used by local and regional traffic. The situation is complicated by liveability problems due to close proximity of transport to residential locations. Moreover, the motorway also formed a barrier in the Maastricht urban system. In the early 2000s the project was re-announced as an integrated project, including a two-tier tunnel. The area that is freed up is to be used for recreation (an urban park) and the surrounding social housing is to be upgraded.



Ingredients

When the project was re-announced in the early 2000s, the municipality proposed to integrate the national, regional and local interests at the motorway-urban interface. An integrated plan was prepared to coherently address the interrelated transport and urban issues. The plan combines interventions in **infrastructure** and in the **spatial structure** of Maastricht. The infrastructural intervention is the realization of a two-tier tunnel. The tunnel separates transit traffic, from regional and local traffic. Moreover, the tunnel removes major infrastructure from the urban environment. Subsequently, the spaces freed up by the tunnel construction are to be used for recreation (an urban park) and the surrounding social housing is to be upgraded. In 2016 the tunnel was opened. The area above ground is currently being redeveloped. Finally, although the Maastricht train station is close to the A2-passage (roughly 300 meters) the station area was not included in the reconstruction. So, the project missed opportunities to create a **multimodal hub**.



Success factors

The project is a **public-private partnership** among Rijkswaterstaat (NRA), local and regional government and private companies (construction). This public-private partnership **collaboratively designed and built** the tunnel and is also responsible for redevelopment of the area above the surface. The contract with a market party helped to maintain the partnership between public stakeholders.

The collaboration was **throughout all levels of the project**, at the project-level as well as at the administrative/policy level. Joint goals were created between national, regional and local governments. In the project organization the various layers of government cooperated with private constructors on planning and realization.

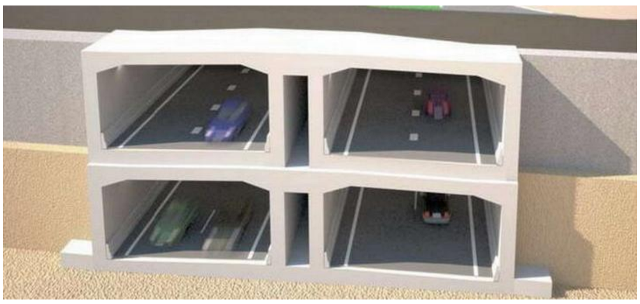
An **independent quality advisor** was installed to oversee the quality of integration between the various domains in the project.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☒ Spatial quality
☒ Robustness	☒ Social quality
☐ …	☒ Environmental quality
	☐ …

With regard to transport, the primary impact of the separation of different traffic flows and additional measures to take away bottlenecks such as traffic lights and zebra crossings is the improvement of of the **robustness** of transport system at all spatial scales. Additionally, the project also improves the **connectivity** at the regional and local spatial scales.

In addition to the traffic effects, also the **general quality of the area** has been improved, with less nuisance from traffic, reconstruction of areas for recreation and living and enhanced opportunities for residents and other users.



Nordhavn – Copenhagen

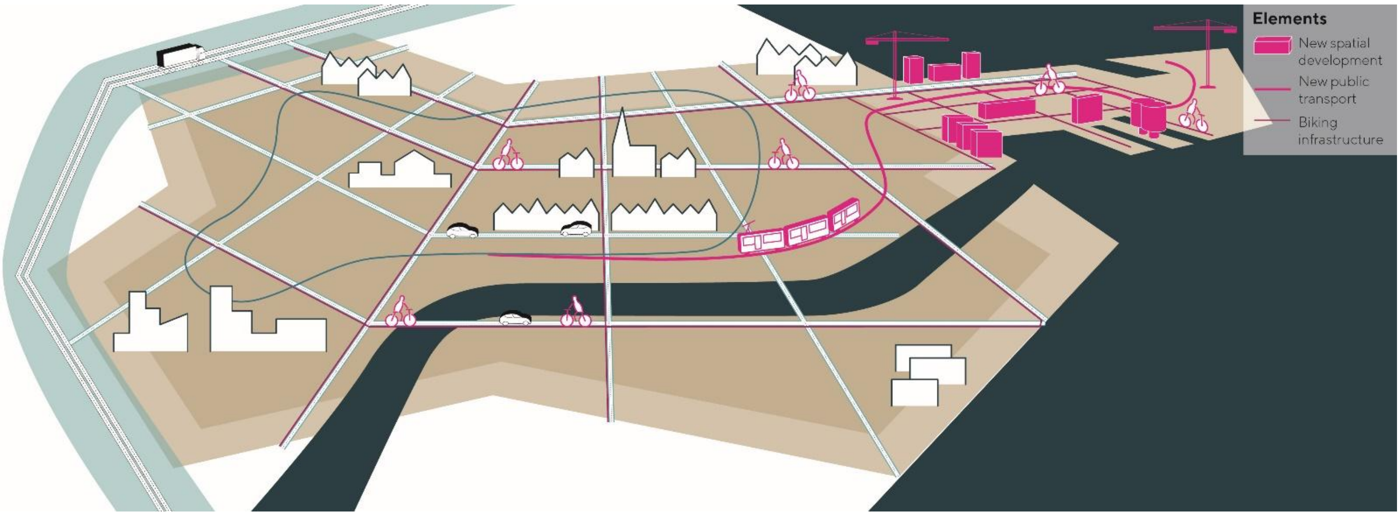
Denmark

Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	ü Local
☐ Mobility	☐ Freight	ü Regional
ü Hubs/terminals		☐ Transit
ü Spatial context		

Background

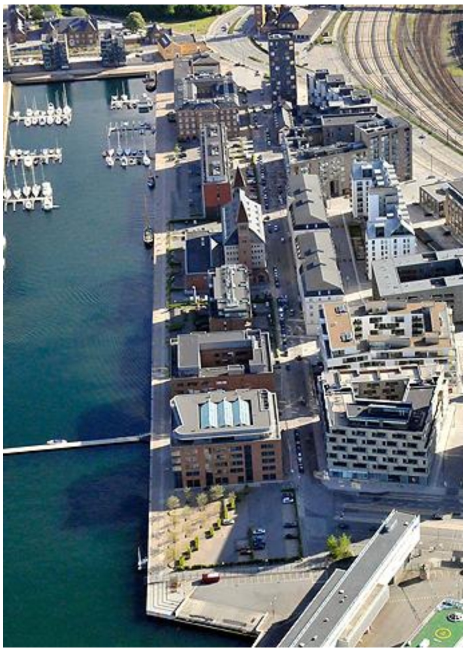
The Nordhavn project is an integrated city development project, partly on the location of former industrial facilities and partly on newly reclaimed land in Øresund. The project combines the development of new residential and business areas, with the realization of new infrastructure including a segment of the Copenhagen metro.

The project is part of the strategies of Copenhagen to accommodate growth. From 2012 to 2025 Copenhagen is expected to grow 18 %. On completion the district will have 40,000 residents and 40,000 jobs. One of the goals of the project is to decrease the need for commuting (especially by car) by creating residential areas in biking distance to central Copenhagen and by creating new business areas with good accessebilty to public transport.



Ingredients

This integrated development area combines spatial development with the construction of new infrastructure and transport hubs. The **spatial development** of this brownfield area comprises redevelopment of former industrial and port areas, as well as development of reclaimed land. The developed functions include housing, working and recreation. Integrated development of these functions diminishes the need for residents to travel. In addition, the local **infrastructure** of the area is newly developed including a new metro connection to Copenhagen's public transport network. Development takes place in three stages: currently the first two stations are being built (opens 2020), later an additional 4 stations will be added two at a time (2030 and 2040). The metro stations will connect Nordhavn with the rest of the metro system as well as with the local and regional train networks. Finally, the development could potentially end up as a part of Copenhagen's flood defense stategy. Together with a suggested development area south to Nordhavn it could form a robust barrier between the current (old) city and Øresund. This new waterfront makes the open connection to the sea much more narrow.



Success factors

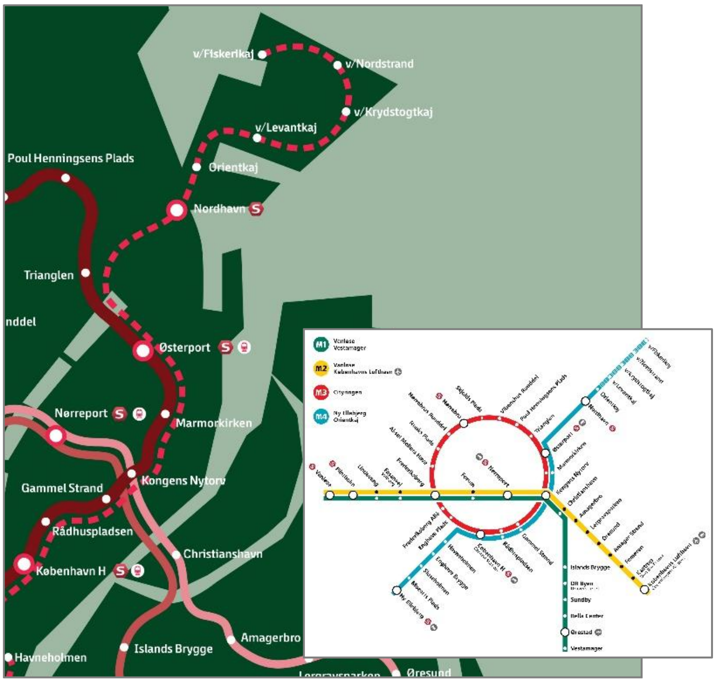
Copenhagen is facing a significant increase in population over the coming years. The project aims to be able to accommadate 40.000 inhabitants when fully developed. The project will hence not solve the problem but will be a step towards **more housing** in Copenhagen.

Furthermore, the area is being developed with the hope to **lower the need for commuting**. This is done by creating housing in close proximity to both new jobs in Nordhavn as well as exiting jobs in the center of Copenhagen. In addition, the area will through its infrastructure encourage the citizens to **use bikes and public transport** rarther than cars.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☒ Spatial quality
☒ Robustness	☐ Social quality
☐ …	☒ Environmental quality
	☐ …

In 2015 the first residents moved in. Currently there are approximately 2,000 inhabitants and 4,500 jobs. Eventually, the area will be home to 40.000 inhabitants and 40.000 jobs. The area will be connected to the local and regional transport system of Copenhagen via its own metro line and potentially also by the suggested eastern harbour tunnel. This multimodal connection improves the connectivity as well as the robustness of the Copenhagen transport system. Moreover, the high quality area developement with housing and commercial functions close together lowers travel needs for residents of the area.



GATE – GENOA

Italy

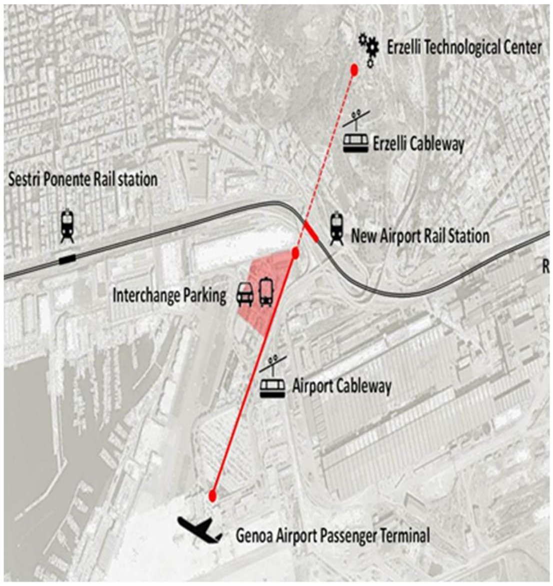
Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	ü Local
☐ Mobility	☐ Freight	ü Regional
ü Hubs/terminals		☐ Transit
ü Spatial context		

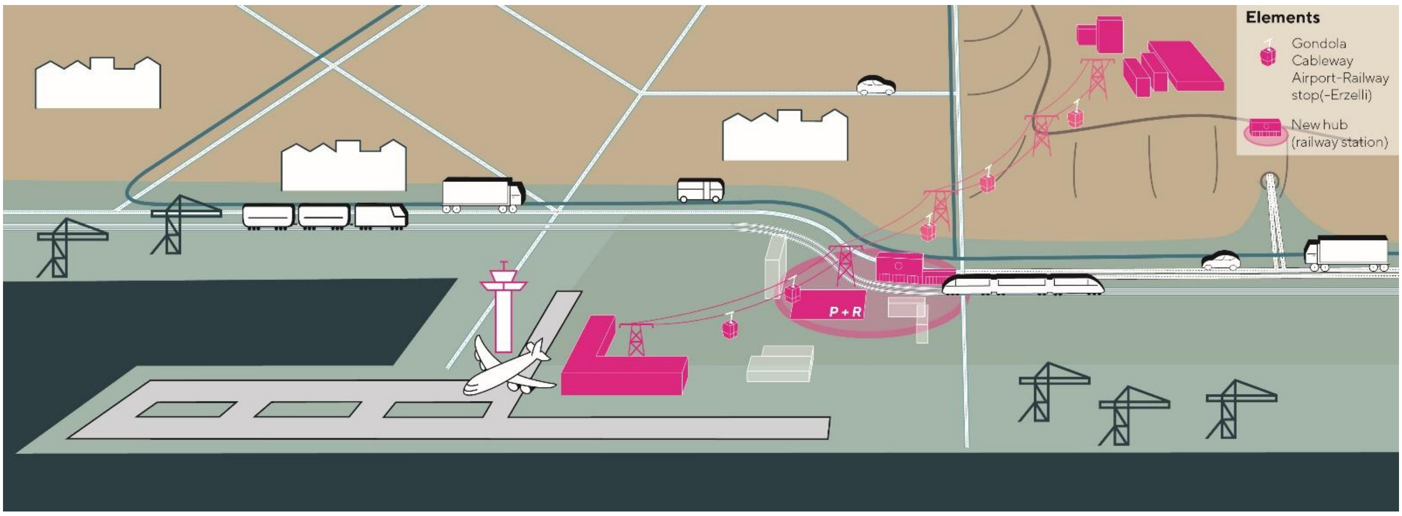
Background

The mid- western part of Genoa has been undergoing various infrastructure programs and urban transformation projects. A series of projects aim to upgrade the local public transport system with innovative solutions including an intermodal hub around the Genoa international airport “Cristoforo Colombo”.

Despite being located fairly near the Ventimiglia railway line, no easy access to the rail network is provided to passengers who need to board a bus to the nearest train station. The modernization and expansion of the airport provided the opportunity to reconsider the link of this network node with the city and the public transport network. The GATE project “Genoa Airport a Train to Europe“, aims to realize the intermodal connection from the airport, to the city of Genova and the train and public transport networks.

Further, the Erzelli area, a hill overlooking the city, contains an important technological and scientific park that is rapidly growing. Erzelli is, physically very close to the railway and the airport but difficult to reach due to the steep hill slopes.

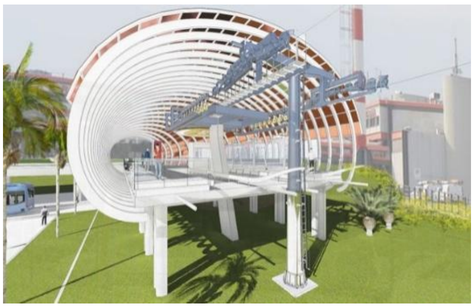




Ingredients

The GATE project consists of two distinct subprojects: the new Erzelli / Airport railway stop, **building a node to the railway network closer to the airport** and the development of new **infrastructure capacity** in the form of a **gondola-type cableway** link between the new stop and the airport passenger terminal. The solution chosen has the capacity to carry 600 - 700 people per hour enabling use also by passengers with reduced mobility. Finally an adaptation of the highway junction is also planned.

A second phase of the project foresees the construction of a cableway extension to the Erzelli area, The cableway will provide a link to an efficient mass transport system for employees, students and citizens, and at the same time provides a very rapid connection between the Erzelli park and the airport.



Success factors

The design of the project has been developed by a **consortium of local stakeholders** (Regione Liguria, Comune di Genova and Aeroporto di Genova) and linked to the **strategic action plan** for the broader Genova urban area.

(Co-)funding was obtained from the the EU Commission within the CEF program for the studies that have been completed. The project has been positioned as part of the TEN-T corridors development with the intermodal hub better connecting the airport and port of Genoa to the Pan European network.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☒ Spatial quality
☒ Robustness	☒ Social quality
☐ …	☒ Environmental quality
	☐ …

The project aims to promote the use of public transport instead of cars and buses for airport users. Further, capacity is expanded connecting better a fast developing area with the public transport network while linking it to the intermodal hub at the airport

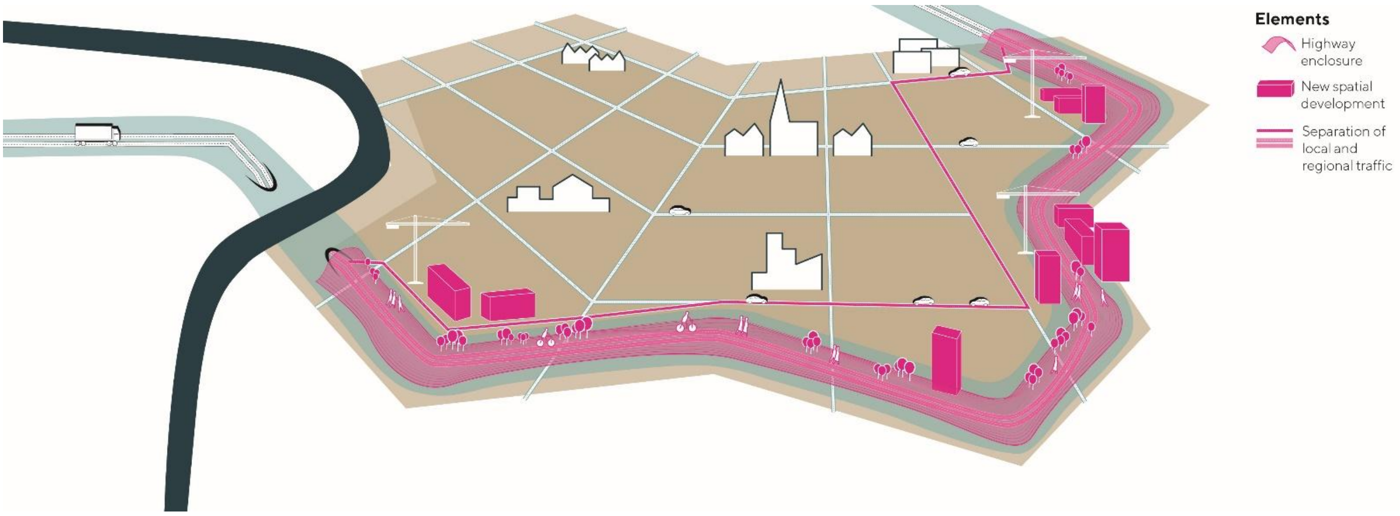
Ringland– Antwerp

Belgium

Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	ü Local
ü Mobility	ü Freight	ü Regional
☐ Hubs/terminals		ü Transit
ü Spatial context		

Background

The ring road around Antwerp is infamous for its congestion. To solve the congestion issue the Belgian government decided in 1999 that it wanted to complete the ring road by building a tunnel under the river Schelde and a bridge over the port area. This project, called the *Oosterweelverbinding,* increasingly met with opposition from citizens groups (*Ademloos, Ringland en stRaten-generaal)* who addressed the health and liveability issues near the existing ring road. These citizen groups criticised the narrow focus of the project and came with their own plans for the ring road. One of these plans is the Ringland Antwerp, which involves a complete redesign of Antwerp's ring road and the covering up of this highway. The latter makes it possible to develop new urban areas and parks.



Ingredients

The idea of Ringland to cover up the ring road gained increasing support of both citizens and politicians since it was introduced in 2014. In 2017 the Flemish government, the city of Antwerp, the port of Antwerp and the citizens groups signed an agreement (*Toekomstverbond)* to work together and find the right balance between Antwerp's mobility and liveability*.* This agreement combines both an **expansion of the infrastructure capacity** by closing the ring road for local traffic (*Oosterweel light)* , along with measures **targteting mobility and spatial development**. In the agreement the stakeholders have decided that in the near future: 1) the ring road will be closed with a tunnel, 2) the ring road will be covered up and new public green spaces and houses will be devloped on top of the new tunnels, 3) a **modal shift** will be encouraged to reach the goal of reducing the number of trips made by car to fifty percent of the total and 4) **separating local and regional traffic from transit traffic** by rerouting traffic from the port to a norther bypass far from the city centre.

Success factors

The Antwerp ring project has transformed over the years from an infrastructure project with a narrow scope and a small selection of involved stakeholders to a **broad mobility and spatial programme** with a high number of involved stakeholders. The citizen groups were able to get a seat at the table by promoting their owen plans using al sorts of means, like organizing festivals, inviting famous Belgian artists to create a song, and crowdfunding campaigns to pay for new studies. The increased complexity of the multiactors stakeholder network demanded an active stakeholdermanagement. A solution was found through the appointment of an **independent expert (the 'intendant')** who managed to **bring parties together**, **develop trust**, and who helped to **create synergy** between the different projects.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☒ Spatial quality
☒ Robustness	☒ Social quality
☐ …	☒ Environmental quality
	☐ …

The plans of the citizens groups have been incorporated in the Antwerp ring project. No longer is it a project solely aimed at increasing the infrastructure capacity of the ring road, but it also aims to separate local traffic from transit traffic, encourage modal shifts and improve area quality. With the project still being in the phase of design, it remains unclear what the actual effects of the project will be.

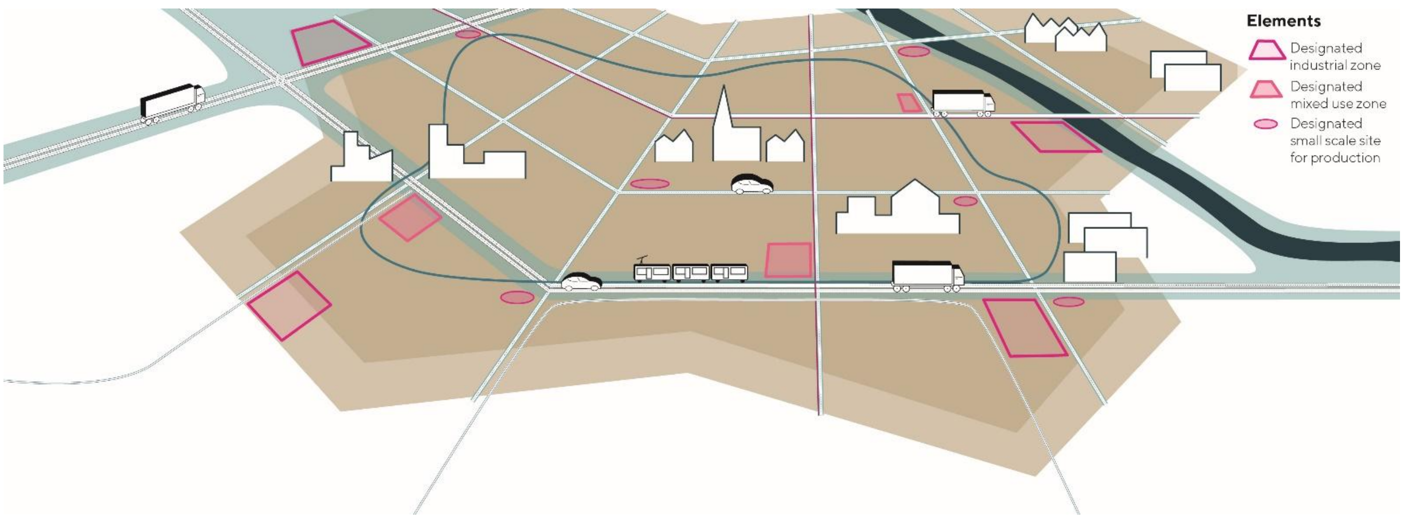
Produktive Stadt - Vienna

Austria

Ingredients	Traffic type	Traffic scale
☐ Infrastructure	ü Person	ü Local
☐ Mobility	ü Freight	☐ Regional
ü Hubs/terminals		☐ Transit
ü Spatial context		

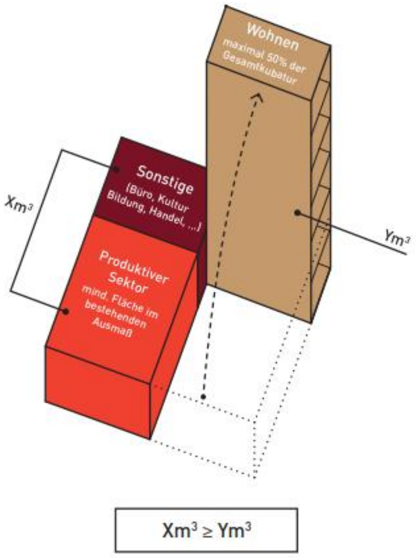
Background

The productive sector is one of the drivers of Vienna's economy. However, the sector lacks room to grow (and to keep up with population growth) within the city. In order to maintain it's position as a productive city Vienna has launched the 'Produktive Stadt'-strategy. The underlying concept of the strategy defines the conditions under which growth of different types of production locations is possible. This includes ideas about transportation, mobility and logistics in order to combine a liveability with economic growth. Under these conditions the city plans to add 300 ha of production space within the boundaries of the city. The strategy is branded as a paradigm change: from displacement to integration.



Ingredients

The Produktive Stadt-concept is primarily a **spatial strategy**. The central idea of the strategy is the designation of three types of production areas. The first type are the industrial zones. These zones are meant for large scale production businesses that have a big impact with regard to emmission, transportation etc. This type is developed in dedicated zones with good transport accessbility (not only road, also rail and water). However, attention is also paid to a mobility change for the staff. To encourage the use of public transport, the connections fo these zones to public transport networks are improved and attention is paid opportunities for biking and walking in the zones. The second type is mixed use production zones. In these zones production locations and housing are developed next to each other. These locations are centrally located and well-connected to public transport. The physical adjecency of living and working decreases the need for many local trips. A third type are a group of single small scale sites of production. Like the second type, these locations are offered new smart logistical concepts. The Produktive Stadt-strategy, for example, includes a city-wide plan for the development of large and small **hubs and depots**.



Success factors

The Produktive Stadt-strategy is part of Vienna’s urban development policy. It is implemented as an **intersectoral cooperation** between the city’s department of urban development and the department of economic development. This provides the city with a double opportunity to steer development: with economic incentives and by means of the designation of specific spatial zones.

The underlying concept was development by the city of Vienna in close cooperation with industrial and economic interest groups (such as the chamber of commerce and the local business agency). This form of **public-private cooperation** ensures the societal support to the strategy.

Interface impacts

Transport impacts — Area impacts

☒ Connectivity
☒ Robustness

☒ Spatial quality
☒ Social quality
☒ Environmental quality

The Produktive Stadt-strategy is a long-term project for Vienna. It is currently rolled. Various impacts on the interface may be expected from the strategy. Smart location choices in combination with improved public transport and innovations in smart logistics eventually enhance the robustness of the network as well as the connectivity within te city. Moreover, less urban (car) mobility may be expected to improve the spatial, social and environmental quality in the city.

Abb. 29 Hubs + Depots

Zaanstad corridor

The Netherlands

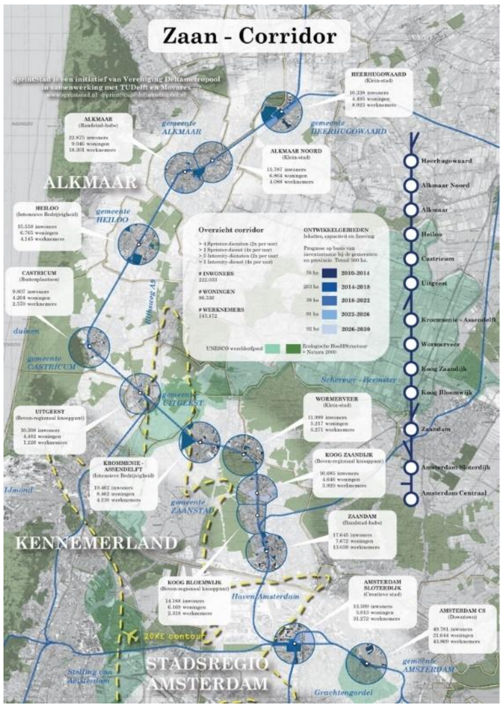
Ingredients	Traffic type	Traffic scale
☐ Infrastructure	ü Person	☐ Local
ü Mobility	☐ Freight	ü Regional
ü Hubs/terminals		☐ Transit
ü Spatial context		

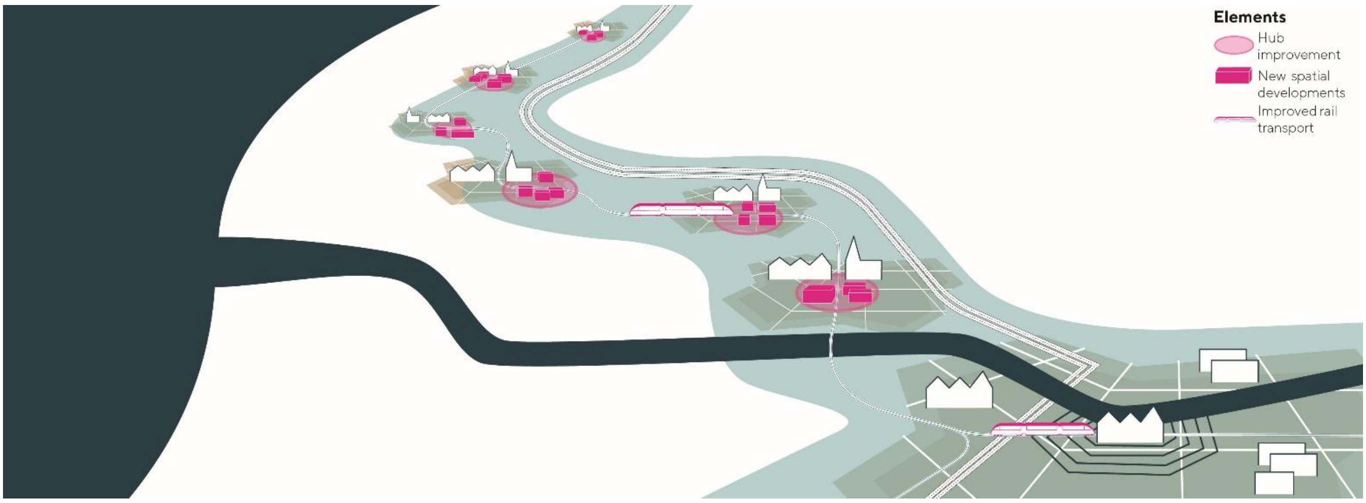
Background

Cities are coping with growing numbers of inhabitants. Amsterdam is likewise growing. The demand for houses is predicted at 230.000 additional houses within the next 20 years. These will be developed in the metropolitan region of Amsterdam.

Accessibility is already one of the biggest challenges for the metropolitan region Amsterdam, and this will be increasingly difficult in the future. To ensure accessibility on the long term, a set of measures is being developed that do not only include infrastructural modifications to the motorway's, but also to the local roads, public transport, the bicycle infrastructure and multimodal transport.

The Zaancorridor links several major economic and residential regions in Noord-Holland with Amsterdam. To accommodate all the new people in the Amsterdam metropolitan area, new houses and businesses are developed adjacent to public transport hubs.





Ingredients

Accessibility, spatial design and traffic are intertwined and co-dependent. Therefore, the connection between infrastructural developments is integrated into the **spatial context**. A set of measures is developed that include mobility, urban design and liveability into a comprehensive strategy for the challenges along the Zaancorridor. To accommodate all the new people in the Amsterdam metropolitan area, new houses and businesses are developed adjacent to public transport hubs. Along the Zaancorridor, about 16.800 additional houses will be developed. The ambition is to develop more than 50% in close proximity of public transport **hubs**. This will persuade people to change their **mobility** from car usage to public transport. The area next to the train stations will receive an upgrae. Functions will be in close proximity features like coffee houses will give an impulse to some of the train stations. To ensure a change in mobility, measures are taken to enhance the connection between public transport and the first/last mile. The bike network will be upgrated by solving missing links, bike parking places are added near hubs to increase the connection between train en bike, and mobility management will encourage employers to change the mobility of their employers.

Success factors

The project is part of a **comprehensive approach** to ensure accessibility in the region. The national government set the ambition and objectives. To create a layered and widespread supported plan, the regions constructed three regional objectives that contributes to the main objective. The province Noord-Holland coordinated the whole process. Each region had their own interests with a common goal. During **participative workshops**, the three objectives were divided into three regional strategies. These were all aimed to increase liveability.
The Zaancorridor has a disbalance in the route people take. In the morning, most people travel south towards Amsterdam and in de afternoon the other way around. At the moment, six trains depart in each direction an hour. With all the developments, an increase of 10 to 20% in train travellers during the peak hours is expected. Measures are taken to accommodate longer trains (extent platforms) and to ease the speed limit for trains are considered to make the journey more efficient.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☒ Spatial quality
☒ Robustness	☐ Social quality
	☐ Environmental quality

The pre-conditions to develop houses and offices near public transport hubs and all the additional measures, will accommodate the growing population and provide them with sustainable and efficient alternatives to cars. Furthermore, this project provides a method to translate a major challenge into smaller comprehensive objectives.

Science Park – Turku

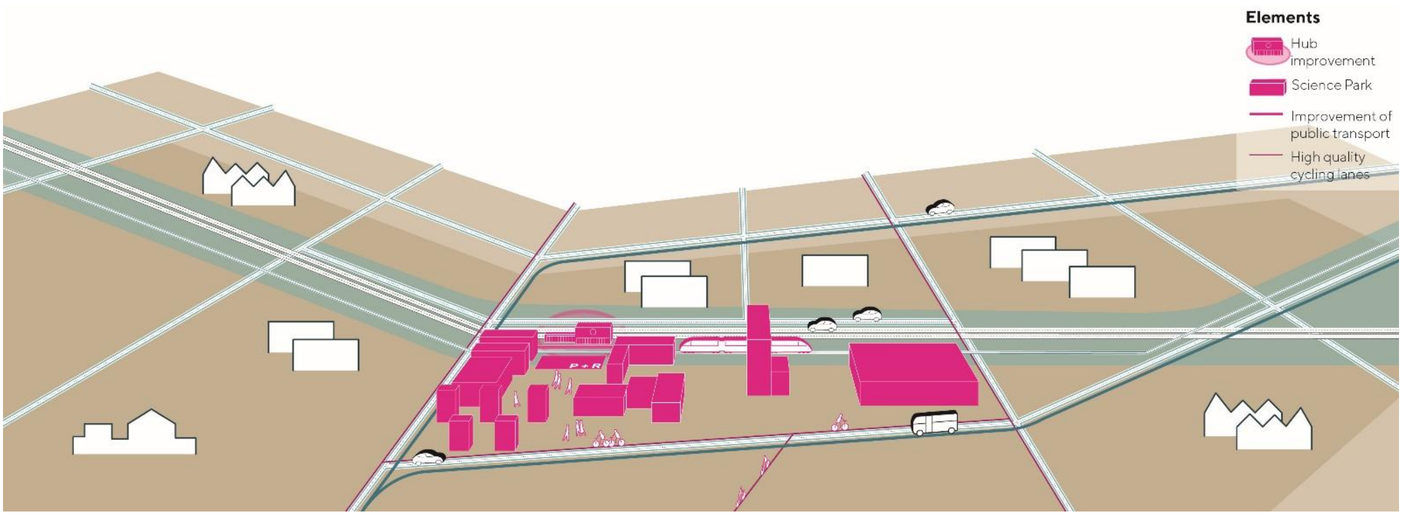
Finland

Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	ü Local
ü Mobility	☐ Freight	ü Regional
ü Hubs/terminals		☐ Transit
ü Spatial context		

Background

The Turku Science Park spearhead project is one of the city's three spearhead projects and an important component in developing the appeal and competitiveness of Turku. The objective is to use new networked operating models to create an internationally attractive cluster of expertise with logistic appeal. Reaching from the university campus to the Kupittaa business cluster and further, this area is the city's most significant growth centre of know-how and high technology jobs.

A number of campuses are foreseen to become part of this new cluster including a university, health, business and sport campus. Comprising over a million square meters of new construction and a 4 billion investment the Science Park aims to create, over 10,000 new jobs and apartments for 20,000 new Turku residents.



Ingredients

The goal of the spearhead project is to combine the projects of **land use, building, and transport** with innovation activity, into **mutually supportive, comprehensive urban development**.

The One Hour Train initiative will provide a strong connection to the capital region's commuter belt ensuring at logistical attractiveness. The Science Park is connected to the international transport networks via the Kupittaa Railway station which will develop to a **transport node**. This will also embrace **smart mobility solutions** with shared bicycles and car applications while promoting cycling and walking with connections to the city center via a public transport link of improved functionality, a pedestrian street and bicycle lanes. At the same time accessibility for all is aimed and park-like routes are developed in the area as high-quality cycling lanes.

High-density is achieved with tall buildings to improve location and accessibility, particularly to railway transport. Mixing functions with the coexistence of residential and business areas are meant to minimize the transport need.

Success factors

The project is organised as a limited liability company, Turku Science Park Ltd., with the City of Turku as its largest shareholder, however members to this are also 300 companies operating in Turku while the project works in close partnership with local universities and hospitals.

The One Hour Train connection and the Northern Growth Zone will link the centres of eastern Finland into a continuous labour market and economic area and ensure the attractiveness of the area. Trip time, further to the time required to arrive to the train station, will only amount to a few minutes.
The location also offers an important reserve in space for future potential development.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☒ Spatial quality
☒ Robustness	☒ Social quality
☐ …	☒ Environmental quality
	☐ …

The spatial development is combined with the provision of transport alternatives and mixed-use building to reduce transport needs. Particular focus is placed on developing an attractive link to the city centre for cycling or walking.

Bijlmer Arena – Amsterdam

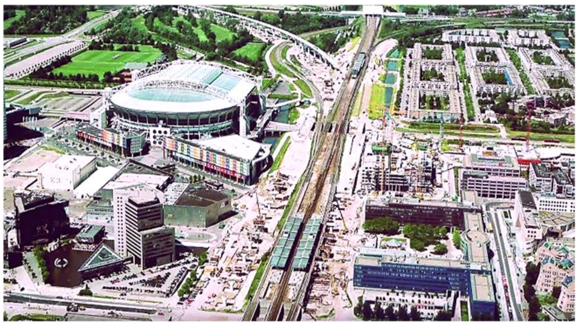
The Netherlands

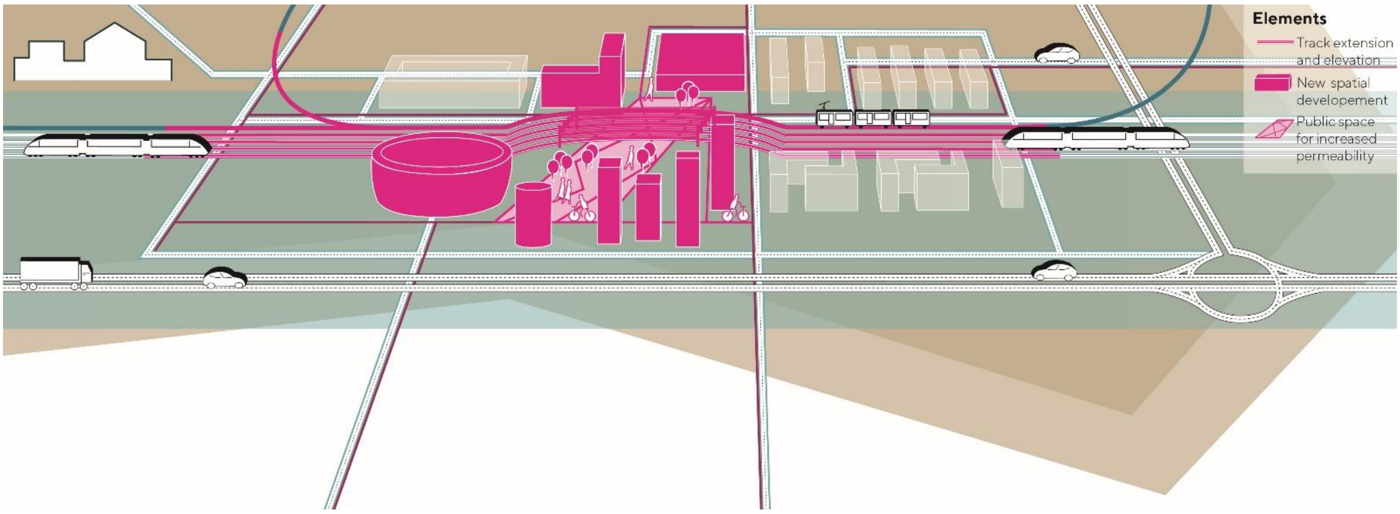
Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	ü Local
ü Mobility	☐ Freight	ü Regional
ü Hubs/terminals		ü Transit
ü Spatial context		

Background

The train station Bijlmer Arena lies in between Amsterdam and Utrecht, two major cities in the Netherlands. It was, and is, one of the busiest train connections. The capacity of the train tracks and the Bijlmer station was insufficient, and the train tracks divided two parts of soutern Amsterdam. A new development area with the stadium, and an older part were the crime rates were high and a relatively high proportion of people lived in poverty.

In 1995 the decision was made to double the tracks between Amsterdam and Utrecht and to combine it with the spatial development adjacent to the Bijlmer train station in the process (including the development of leisure facilities such as the Johan Cruyff-stadium and a concert hall, but also large offices).





Ingredients

ProRail and the city council joint their forces to come up with an integrated plan: upgrate the **infrastructure** by adding more train tracks, expand the capacity of the train station, improve the spatial quaility of the the adjacent area, and improve the connection between the Bijlmer district and the new development area ArenA. Furthermore, the train station was meant to develop into a major multimodal **hub** in the metropolitan area of the Randstad. The adjacent **spatial context** was designed car-free, with a focus on pedestrians, open and light, and had a mixture of facilities. A new boulevard underneath the train viaduct was developed to facilitate these measeures. The boulevard connected the two parts of Amsterdam with an open area, where people are free and safe to linger.

Success factors

Since the development of the new station, the area and train station have grown into a major multimodal hub. Trains depart frequently towards several regional, national and international destinations, the metro connects the area with the extensive metro network of Amsterdam, the train station connects multiple bus lines and the area is easily accessible for pedestrians and cyclists. Cyclists can park their bike for free for the first 24 hours in an guarded parking garage. The Johan Cruijff ArenA stadium has a transfer area where people can park their car and continue their journey by the public transport system of Amsterdam.
The area around the train station is compact and has a mixture of facilities such as offices, shops and malls, leisure (stadium, film theatre, concert hall), schools and housing.

The name of the train station changed from Bijlmer to Bijlmer Arena (after the football stadium). This seemed to have a positive effect on the image of the station.

Interface impacts

Transport impacts	Area impacts
☐ Connectivity	☒ Spatial quality
☒ Robustness	☒ Social quality
☐ …	☐ Environmental quality
	☐ …

The train tracks high above the ground made the direct connection between the districs possible, increasing the social and spatial quality. Furthermore, the tracks were doubled which resulted in a more robust network.

Microconsolidation – Strassbourg

France

Ingredients	Traffic type	Traffic scale
☐ Infrastructure	☐ Person	ü Local
☐ Mobility	ü Freight	☐ Regional
ü Hubs/terminals		☐ Transit
☐ Spatial context		

Background

The rise of e-commerce has a big impact on cities. Not only is it changing the shopping streets, but it also leads to a considerable increase in freigth deliveries both to businesses and recidences. These delivery trucks are increasingly leading to congestion in city centres, especially those with a historic core, and cause both noise and air polution. At the same time developments in technology and ICT create opportunities to consolidate these deliveries in for example empty stores. These logistical micro-hubs or *micro consolidation centres* are then supplied by trucks and the last-mile delivery can be done using different and often cleaner and more flexible modes of transport, like electric cargo bikes or small electric vehicles. One prime example of micro-consolidation is *Espace de Livraison de Proximité* or ELP, which has been introduced in several French cities.

Ingredients

Although microconsoliation projects come in many forms and shapes in general they have the following characteristics in common: a) they aim to reduce the total vehicle trips in urban areas by bundling the goods close to the reception point or at the reception point itself, b) logistical facilities are set up at the hearth of the city center, c) they focus on the delivery small and light freight, d) they make use of clean modes of transport for the delivery, and e) delivery is done by specialized transportation companies. The Espace de Livraison de Proximité project was initiated in several French cities, such as Bordeaux, Rouen, Lyon, Clermont Ferrand and Montpellier. Originally it was a publically owned initaitive, which has been privitized over the years. With the privitization of ELP operations in French cities, the initiative has also changed over the years. Overall, the ELP are made up of **small logistical spaces**, of between 500 to 1,000 m2 that are served by a large vehicle of a single operator who **consolidates the freight** and delivers it using bikes and small vehicles in a specific area. A recent new ELP initiative has been introduced in Strasbourg. Here four light vehicles will cover the Strasbourg region. Cargo bikes will be used to carry goods up to 400 kg in total. The bikes have electric assistance and some are including a coolbox to carry conditioned goods. Cohabitation of cargobikes and pedestrians will be guaranteed as cargobike drivers need to sign an agreement on respecting safety and security in the streets.

Success factors

ELP has been initiated in French cities with a historical city centre. These cities experienced difficulties with freigth deliveries due to issues with parking, narrow streets and large pedestrian zones. An important starting condition is thus the **need for flexible and small modes** of transportation. The development of ELP can however be supported with different kind of measures. For example, the city of Strasbourg has implemented an **environmental zone** to reduce the number of diesel trucks. Moreover it provides an incentive for companies to make use of electric vehicles or cargo bikes by **extending the delivery window** in the city centre for these modes of transportation. Public authorities also play an important role in **finding and funding the logistical space** required to consolidate goods. Morover, a **close colaboration between public and private actors** is important to mobilize both carriers and traders to support the initiative.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☐ Spatial quality
☒ Robustness	☐ Social quality
☐ …	☒ Environmental quality
	☐ …

The major goal of ELP is to reduce parking problems, air pollution and congestion in the city centres by lowering the number of trips made by large vehicles. Moreover, the initiative should also lead to new jobs and a more safe environment. For Strasbourg the initiative is expected to offer a sustainable alternative for 40-45 classical trucks per day in the city center.

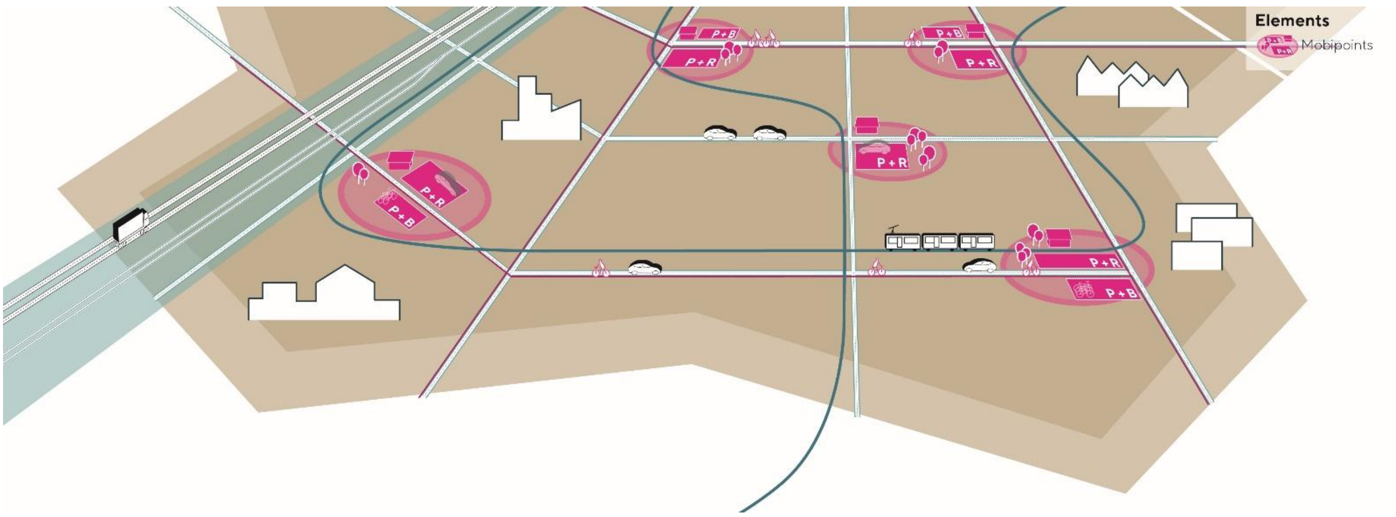
Mobipoints

Belgium, Norway, Germany & the Netherlands

Ingredients	Traffic type	Traffic scale
☐ Infrastructure	ü Person	ü Local
ü Mobility	☐ Freight	ü Regional
ü Hubs/terminals		☐ Transit
☐ Spatial context		

Background

Mobipoints are small scale multimodal transport hubs in residential or business areas. Mobipoints offer a practical solution for flexible, multimodal transportation and may be regarded as the spatial implementation form of Mobility as a Service. Mobipoint locations bring together various transportation modes, such as public transport (currently often bus) facilities for car and bike-sharing and parking facilities for cars and bikes. In addition, mobipoints may contain extra facilities such as vehicle charging, kiss and ride or safe parking, but also non-transport related functions such as parcel distribution, toilets and wifi-hotspots. The concept was developed in Norway (Bergen), Germany (Bremen), Belgium (Flanders) and the Netherlands (Groningen/Drenthe) as part of an Interreg North See Region-project.



Ingredients

The main ingredient of Mobipoints is its function as a **transport hub**. Mobipoints integrate various transportation modes in one location. The conventional transport hub is often a large scale hub, focused on the big traffic flows coming in to an urban area, that is located at the edges of the urban region. Often the modal shift in these hubs is inflexible, from car to one form of public transport.

Mobipoints are small scale locations, developed as a network of hubs. Mobipoints offer a varying range of transport services that is broader than conventional large-scale hubs. This way a flexible hub location emerges, in which various connections are possible: bike to shared car, public transport to shared E-bike, or private car to bike, etc. The concept of small scale hubs suits a dense network in urban regions, but it also contributes to maintaining transport quality in less dense, rural areas.

Moreover, this local type of hub suits the **mobility** concept of MAAS, in which people have access via a platform to multiple modes of transportation and choose their optional form of transportation on travel purpose, weather conditions etcetera.

Success factors

Mobipoints are an innovative concept that is currently being implemented at growing scales. The main succes factors for the current Mobipoints seem to be a high transport quality level, additional services and recognizable branding.

With regard to transport quality, the multimodal connectivity of the Mobipoint is important. This is reached by a public transport connection and reliable other transport modes (such as shared cars and bikes). Additional facilities make the of Mobipoints more attractive. This could for example be the availability of lockers or a parcel pick up point. Finally, recognizable branding and easy use is important. Buss stops with bicycle parking already exists. Recognizable branding in combination with attractive and easy subcriptions enhance the attractiveness of the concept.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☐ Spatial quality
☐ Robustness	☒ Social quality
☐ …	☐ Environmental quality
	☐ …

Mobipoints create opportunities for flexible multimodal travel. The main effect that may be expected is a modal shift from a single modality to multimodal travel behavior. It offers the chance to align travel purpose and travel mode: demand based transportation. Mobipoints may therefore be seen as the spatial implementation of MAAS.

In Bremen the initiative has contributed to the growth of car-sharers to 15.000 persons 2018. The ambition is to grow to 20.000 persons in 2020.

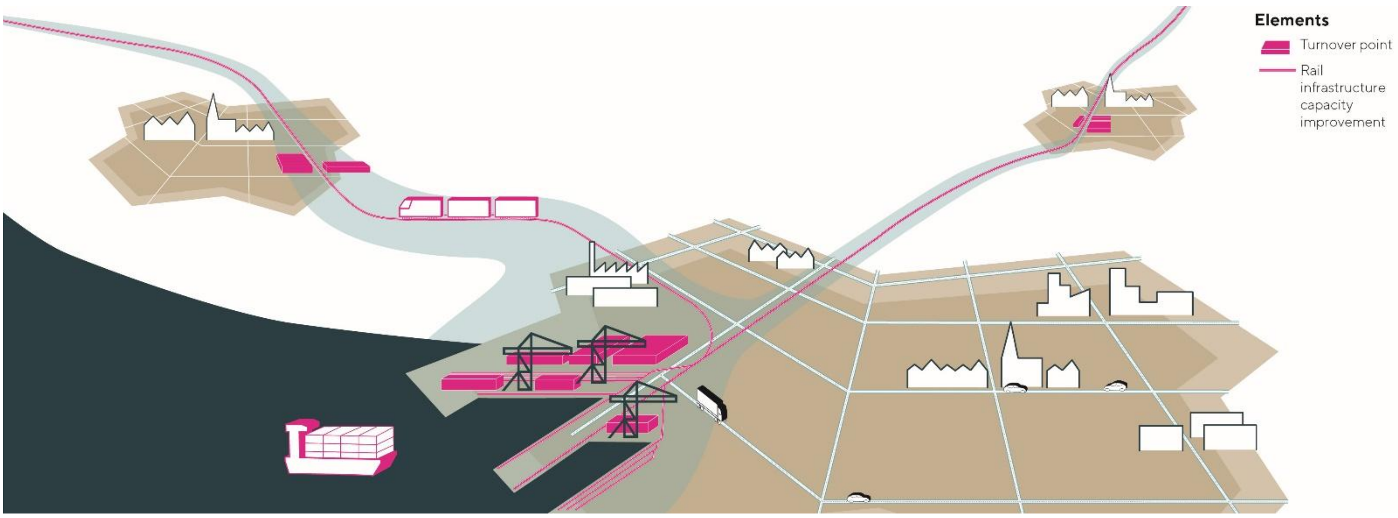
Railport Scandinavia – Gothenburg

Sweden

Ingredients	Traffic type	Traffic scale
ü Infrastructure	☐ Person	ü Local
ü Mobility	ü Freight	ü Regional
ü Hubs/terminals		ü Transit
☐ Spatial context		

Background

Gothenburg is the second largest city in Sweden (with a population of almost 600.000), it has a large manufacturing industry and the biggest port of Scandinavia. Moreover, seventy percent of the Nordic industry and population are within a 500 kilometer radius of Gothenburg. Nevertheless, the important manufacturing and transportation industries also have a few downsides. These industries have a serious negative environmental impact on the city, the road freight transport lead to congestion in the city, and the industries make a large contribution to the overall CO_2 emission. That's why the Port of Gothenburg (PoG) sought ways to lower its environmental impact by developing a network of rail shuttles to increase the modal shift of the port.



Ingredients

To encourage this **modal shift** the Port of Gothenburg decided in 2000 that half of the growth in the container segment should enter or leave the port by rail in 2020. To reach this goal PoG realized that it had to set up an effective system of inland terminals throughout Sweden and Norway. Untill then the development of inland terminals in Sweden has been a bottom-up development. Inland terminals were developed and owned by municipalities eager to reap the benefits of having a direct link with a seaport. PoG decided to take more control of its hinterland network and thereby strengthen its own position.That's why PoG signed deals with inland terminals to control container positioning and promote their services. In 2002 the development of the hinterland network gained momentum when the Swedish Ministry of Transport, the PoG and the Västra Götaland Region started to co-finance investments in the **rail infrastructure capacity**. To support the **modal shift from road to rail**, it was decided to decentralize customs. With customs operating at the inland terminals, it became much easier for goods to be quickly transported from and to the port of Gothenburg. In addition, the efficiency of rail freight from the Port of Gothenburg was enhanced by its **integration into broader urban development plans** of the city of Gothenburg, strengthening its coherence.

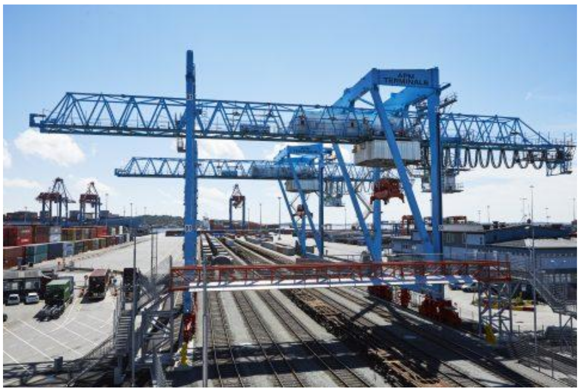
Success factors

The success of the railport Scandinavia can be explained by serveral factors. First, the PoG has played a crucial role of setting its own **ambitious target** for a fifty percent modal shift and has played a key role in **managing the network of stakeholders** (both public and private) involved in the development of the hinterland network. Secondly, the success of the hinterland network can be explained by the **support of multiple public actors (local, regional and national) both financially and in terms of policies and regulations**. Gothenburg is known internationally for its innovative policy practices. Finally, the rail port is a success because of the **efficiency** by which goods can be transported from and to the port of Gothenburg. The reduced transportation costs and innovative planning have made rail a viable and **reliable mode of transportation**, even on relatively short distances. Moreover, the railport system is organized to provide the best service possible for all types of cargo, ensuring **flexibility** and capacity where needed.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☐ Spatial quality
☒ Robustness	☐ Social quality
☐ …	☒ Environmental quality
	☐ …

The system currently offers rail shuttles to more than 25 destinations, with the most operating on a daily basis. More than 50 percent of the containers now enter and leave the port by rail, which saves around 60,000 tons of carbon dioxide emissions and 360 truck per day in the city. the system also eases Gothenburg's traffic congestion, reduces air pollution from trucks and the industries' transportation costs have been reduced.



Car-free city centre - Oslo

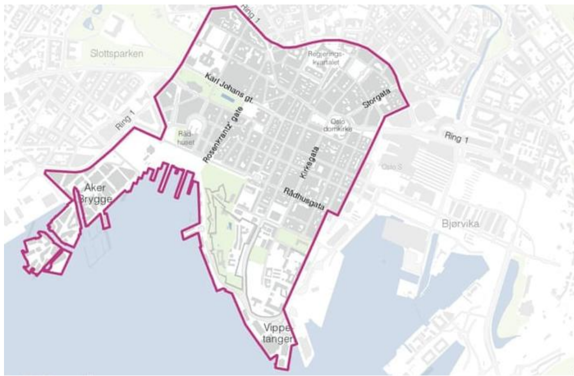
Norway

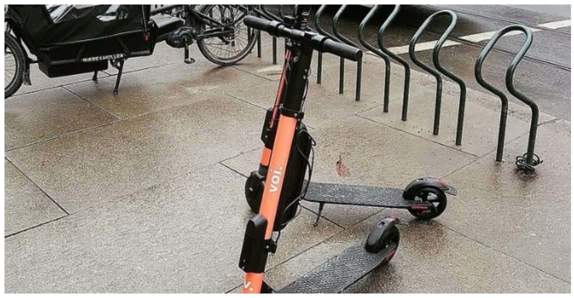
Ingredients	Traffic type	Traffic scale
☐ Infrastructure	ü Person	ü Local
ü Mobility	ü Freight	ü Regional
☐ Hubs/terminals		ü Transit
ü Spatial context		

Background

Like many other European cities, Oslo is experiencing pressure on liveability due to limited available space. The green party campaigned to make the city car-free and won the city's election. The city council decided in 2016 to create more priority and space for public transport, cycling and walking instead for the car. The goal of the project is to make Oslo a more lively and nice city to live in.
Vice Mayor for urban development Hanna Marcussen said: "It's a paradigm shift from planning the city for cars to planning for people."

Transit traffic is totally separated in Oslo from local and regional traffic. A highway tunnel underneath the city forms a link in the national motorway network and has a limited number of ramps to connect to the city above.
In recent years, the city removed hundreds of car parking spots, and replaced them with bike lanes, plants, tiny parks and benches and wide pedestrian roads.





Ingredients

The goal of car-free city centre is to increase liveability by limiting the space for cars, but not limiting the possibilities to move around. Thus, the city fosters a **mobility** transition from car to more environmentally friendly modes of transport. This includes the use of small electric cars, (electric) bicycles, increase the use of public transport and micro-mobility such as kick-scooters. The obstruction of cars from the city centre is accompanied with adding new bike lanes, revitalise public areas and further develop public transport. This is all paid by with the fees from the toll ring around Oslo. The project changes the **spatial context** from streets being car-oriented towards streets for people and space efficient modes of transport. To limit through traffic, a new traffic plan is implemented. The city centre is divided in an eastern and western part, with very limited connections for the car between them. The city council wanted it to be more ambitious, but was held back due to concerns about supply traffic. There is no plan in force to accommodate cars that come from outside Oslo into the city, for example by investing in public transport or transferia. This would have been an obvious strategy to further strengthen the effects of this project. However, cooperation was close with public transport organisations that took the opportunity to increase the efficiency and accelerate the development of infrastructure for public transport on their own.

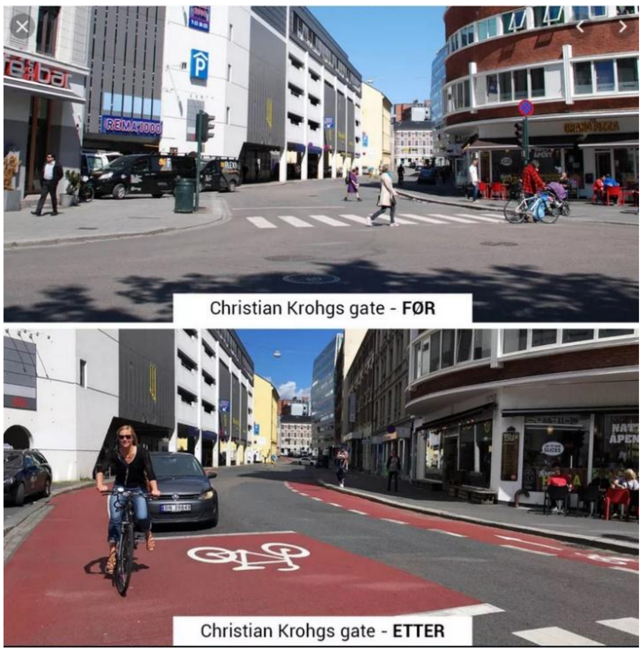
Success factors

The Oslo city council put in place a dedicated governmental team to implement the plan. However, to implement the political goals for real was proven more difficult than expected. After a year, the division was dissolved again to ensure an integrated approach.
Although there was a lot of political will to make the city centre car-free, concerns about economic, accessibility and traffic flow effects made that the plan was changed into the plan to make more space for people by limiting the car infrastructure and remove (almost) all parking places in the streets.
Furthermore, there are numerous legal and planning difficulties. Therefore, modest steps, that met the land use plans, are made to show people what can be done with the space. Parking spots were replaced with parking spot sized parks, benches or bicycle parking places. In the meantime the planning change processes is put in motion.
The cooperation in the projectteam is very effective and open. There were even evenings to disclose all socalled 'fuck-ups' to learn from faults.

Interface impacts

Transport impacts	Area impacts
☐ Connectivity	☒ Spatial quality
☒ Robustness	☒ Social quality
☐ …	☒ Environmental quality
	☐ …

Although the plans have been implemented for only a couple of years, there are some impacts visible. More people stay and linger in the streets that have been redesigned, making them more lively.
Furthermore, there is a decline of 11% of cars in the city centre.



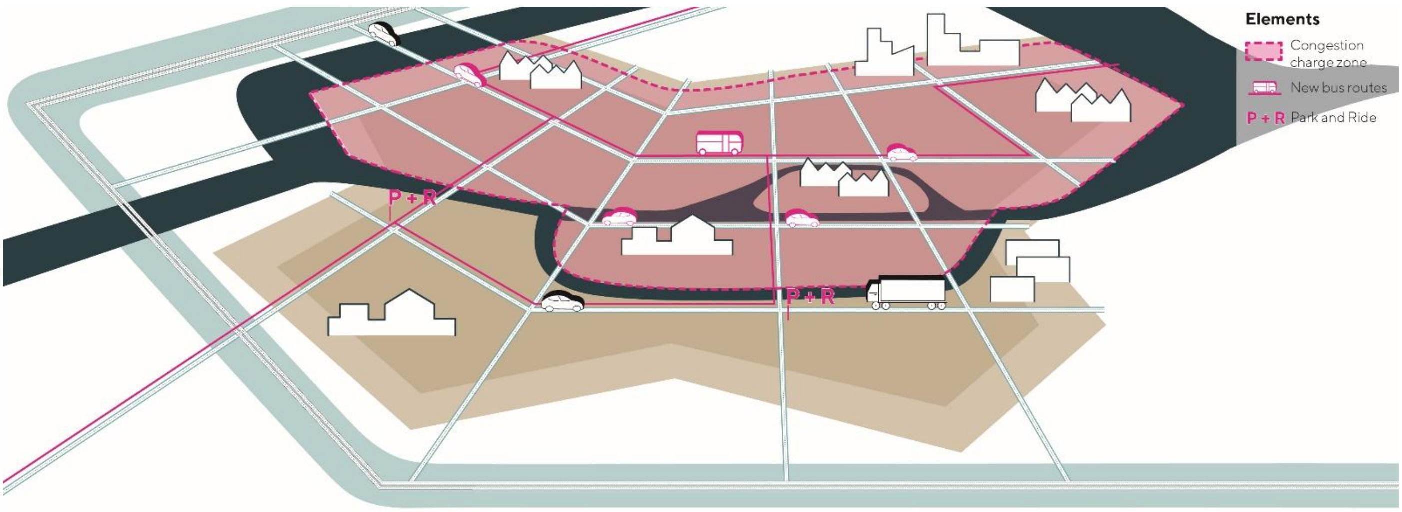
Congestion charge - Stockholm

Sweden

Ingredients	Traffic type	Traffic scale
☐ Infrastructure	ü Person	ü Local
ü Mobility	ü Freight	ü Regional
☐ Hubs/terminals		ü Transit
☐ Spatial context		

Background

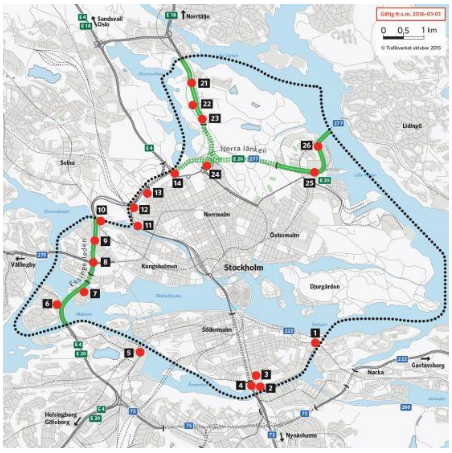
The population in the Stockholm metropolitan area grows by more than 20 000 per year. This rises traffic in the area and inevitably lowers the service for drivers, and increases several environmental and liveability problems. To reduce traffic and improve the (perceived) environment, the Stockholm City council initiated a trial for congestion tax. At 18 exit and entry locations of the city centre, cameras were installed to register the vehicle registration plate.
The trial took place between January and July 2006. Afterwards, a public referendum was held to gauge the public opinion. 51,5% voted for a permanent implementation of the congestion tax. In August 2007 the permanent congestion tax was implemented.
Although, the charge is a national tax that flows into the countries coffer, the Stockholm regional Politian's secured a ten-year infrastructure package of around 10 milliard euro's.



Ingredients

The goal of the congestion tax is to change the **mobility** from car traffic by 10-15% to other modes, times or places. As part of the trial, the public transport system was extended with 18 new regional bus routes, the adding of 2 800 park-and-ride places and over 600 bike-and-park places. These were however implemented half a year prior to the trial, while the major increase of passengers in public transport came into effect only after the introduction of the congestion tax.

The taxes are charged during the daytime at each entry and exit location of the city centre on weekdays between 6:30 and 18:29. No tax is charged in the weekends, public holidays nor the day before, and in July. Camera's register the vehicle registration plate. The prices vary between different times, with the highest charges during the periods and places where the traffic is heaviest. The exact amount is displayed on screens at the control points and is between SEK 11 and SEK 35 (€1,07-3,43). In January 2016 the tax was increased by 75% with an especially higher differentiated charge for peak hours. The goal of the increased tax was to steer traffic towards other periods than the peak hours and to help financing infrastructure services in the Stockholm region.



Success factors

Before the trial, the public attitude towards the tax was negative. Over two-thirds of the Stockholm region population was against the charge. Public support increased however substantially during the trial period. When the referendum was held, 51,5% voted in favour of the congestion tax. Public support has continued to grow with a level of over 70% in 2013.

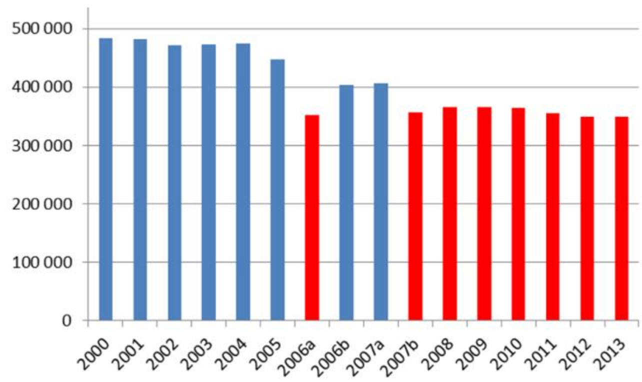
Since the first day of the trail, the congestion tax has successfully reduced a remarkable number of car traffic. The number of cars during the peak hours has decreased by more than 20%. Since the permanent implementation, the reduction is stable with 20% less cars on the roads compared to 2005.

Public transport passengers increased by 4-5%, and due to less congestion, busses improved their punctuality. Cycling numbers increased by 16% during the trial period, though the relationship with the congestion tax cannot be proven. There was no negative effect on retailers, and their business increased by 6% in line with the predictions and the rest of the country.

Interface impacts

Transport impacts	Area impacts
☐ Connectivity	☒ Spatial quality
☒ Robustness	☒ Social quality
☐ …	☒ Environmental quality
	☐ …

The congestion tax reduced car traffic by over 20%, of which only approximately 1% rerouted via a new passage. Furthermore, it reduced the number of traffic accidents and improved the air quality in the city centre. Congestion decreased by 30-50% all over the city. Furthermore, due to the lower levels of car traffic, traffic is perceived safer. Pedestrians, cyclist and children that live in the inner city feel safer.



Shared E-bikes (mobility management)

The Netherland

Ingredients	Traffic type	Traffic scale
☐ Infrastructure	ü Person	ü Local
ü Mobility	☐ Freight	ü Regional
☐ Hubs/terminals		☐ Transit
☐ Spatial context		

Background

De Wetering is a business area situated in the western part of Utrecht. The area is located next to the A2 highway (Utrecht-Amsterdam-corridor). More than hundred companies are located on the narrow, but 3 km long area. Good accessibility is important for the companies, to serve their employees and costumers well, but this has come under pressure. Employees experience daily congestion from the highway towards the companies and a shortage of parking places in the area.
De Wetering is easily accessible by train, however it takes a quite long walk from the Leidsche Rijn train station to the companies (over 15 mn). The companies now work together on improving the last-mile accessibility from this train station, in order to make the use of public transportation a more attractive alternative for employees.

Ingredients

To pursue **employees** to change their **mobility pattern** and make more use of public transport, a form of mobility management, the NU-connect project aims to widen the range of public transport by providing **shared e-bikes**. Those are freely available for employees of companies in the area, which makes it an attractive travel option. The e-bikes are provided in docking stations across the business area and can be turned in at any of these stations.
The presence of the shared bikes at the Leidsche Rijn train station contributes to the offer of **different transportation options** avalaible at this **hub**, next to public transport (train, bus) and park+ride facilities.
The project did not involve any infrastructural investment. Besides the placement of docking stations for the bikes, no upgrade or expansion of the existing infrastructure was needed. This is because the train infrastructure (including a modern station) and bike lanes in the area were already in good condition. The project thus aimed for better use of the existing infrastructure.
To stimulate the use of the e-bikes, the project started off with a campaign-week. There also has been a meeting for employers about cycling promotion and companies could request a mobility consultation.
Striking is that in the Utrecht urban area, in addition to the NU-connect project, several other bike sharing initatives are introduced (for example the Campus Bike in the eastern part of the city). These systems are not linked, while this would improve attractiveness and efficiency of the systems.

Success factors

This mobility management project is initiated by the companies in the area, united under the title Ecotransferium De Wetering, in **collaboration** with U15. U15 is a network of employers in the Utrecht region aiming for more sustainable mobility. In this network, **exchange of knowledge and experience** takes place. Employers find this very interesting, as they can learn how a different mobility pattern can result in sustainability, but also in health benefits and cost-savings. The best practices shared in the network are a catalyst; more and more employers connect to U15.
Based on lessons learnt elsewhere in the city, U15 and the companies at De Wetering realised that providing shared e-bikes could help to improve the accessibility of the area. This is another benefit of the **network structure** of U15: they can work efficiently on **upscaling** in the city and region, which enlarges the covering area of the shared e-bikes. The system has proved its succes elsewhere, thus investment was reasonable for the companies at De Wetering.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☐ Spatial quality
☐ Robustness	☐ Social quality
☐ …	☒ Environmental quality
	☐ …

The offer of shared e-bikes at the train station and other locations throughout the business area, makes the last mile quicker and more comfortable. Consequently, the use of public transport has become a more attractive travel option. This results in less congestion on the roads to and within the area. Besides, it contributes to a more enjoyable environment, less polluted by cars and greenhouse gas emissions. The project, however, did not monitor or evaluate the effects on these aspects.

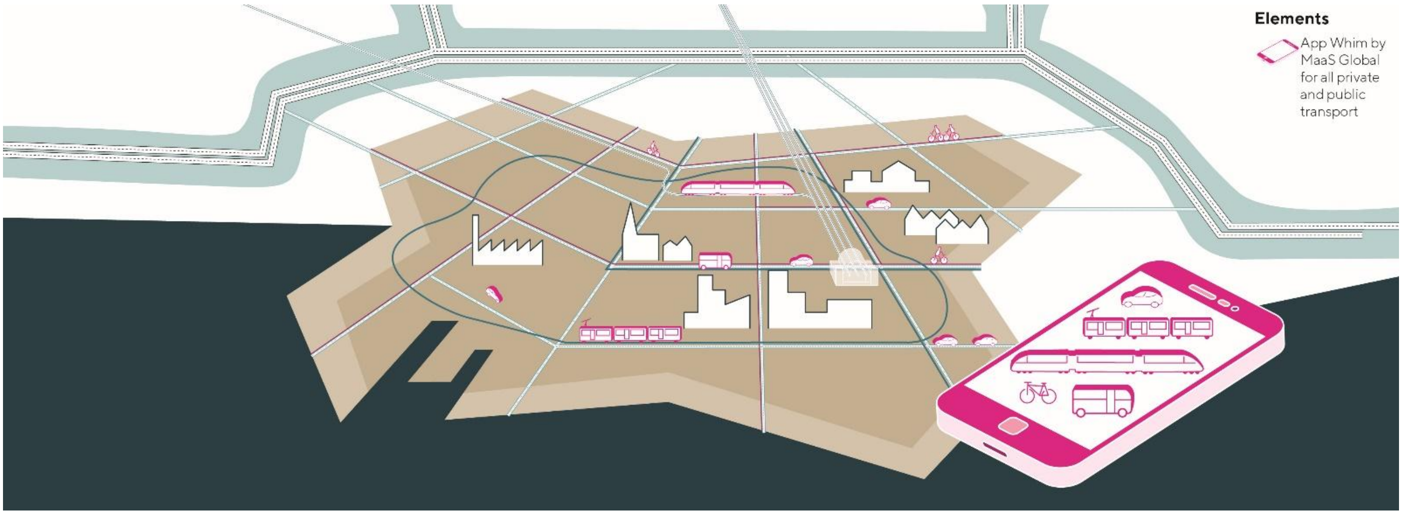
Mobility as a Service – Helsinki

Finland

Ingredients	Traffic type	Traffic scale
☐ Infrastructure	ü Person	ü Local
ü Mobility	☐ Freight	ü Regional
☐ Hubs/terminals		☐ Transit
☐ Spatial context		

Background

Like many other big cities worldwide, Helsinki has to deal with an increasing strain on its infrastructure capacity as the city is growing fast. The limited infrastructue capacity is leading to congestion and air polution. One of the issues that urban planners worlwide experience, is that the results of increasing infrastructure capacity to relieve congestion is rather slow and costly. Moreover, in the case of Helsinki space for additional infrastructure capacity is restricted. That’s why there is an increasing focus on how to make better use of the existing infrastructure capacity, which is made possible by developments in technology and ICT. One prime example of such an innovation in mobiliy is Mobility as a Service (MaaS). The city of Helsinki has been at the forefront of its development. To make the city more liveable the MaaS-operator, MaaS Global, believes that people have to become less car-dependent. MaaS Global therefore offers its costumers multimodal mobility packages which are made available through its app Whim.



Ingredients

Mobility as a Service entails a shift from owning your own mode of transportion (predominantly private car ownership) to a society in which people make better use of the different transportation services available to them. This should lead to a **significant change in how we travel** and should help relieve the negative effects of car travel. Making use of these **multimodal services** is possible because of recent **developments in technology and ICT**, more specifically the introduction of the smart phone. Specific apps for mobile phones were developed, which provide an **integrated platform for all transportation services and offer tailor-made door-to-door travel options** with a single ticket. One of the few examples of a company that offers MaaS services successfully on a commercial basis is MaaS Global from Helsinki, Finland. Since 2016, Helsinki residents have been able to use their app, called Whim, to plan and pay for all modes of public and private transportation within the city. MaaS Global offers both pay-as-you-go services and monthly subscriptions.

Success factors

The introduction of MaaS means a restructuring of the transportation sector. MaaS operators are in direct contact with the costumers of the incumbent private and public transport suppliers. Moreover, they buy transportation services from these suppliers and integrate them into a single service. This requires not only that transportation **suppliers are willing to work closely together with the MaaS operator** and **let go some of their customer relationships**, but that they are also willing to **share a lot of data** on their own services and prices. The success of MaaS therefore depends on the capacity of actors to **build a multi-stakeholder consortium** in which people work closely together. MaaS operators face issues of developing **trust** between the multiple actors, **securing the privacy of customers**, and the **governance of the platform**. **Public actors** can play an important role in the development of MaaS-services. The Finnish government gave Whim a boost with a new Transport Code, which obligates transportation providors to make their data and ticketing functionality available to third parties.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☒ Spatial quality
☐ Robustness	☒ Social quality
☐ …	☒ Environmental quality
	☐ …

Since the introduction of Whim in Helsinki, the use of private cars has halved among the users of the app in favour of public transport and taxis and their spending on transportation services has tripled. Whim has around 60.000 active users per month, who booked around 1,8 million trips.

Ringrail - Helsinki

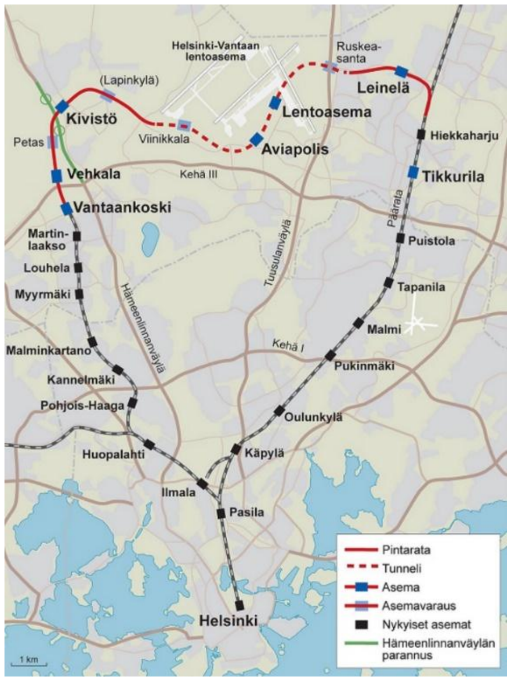
Finland

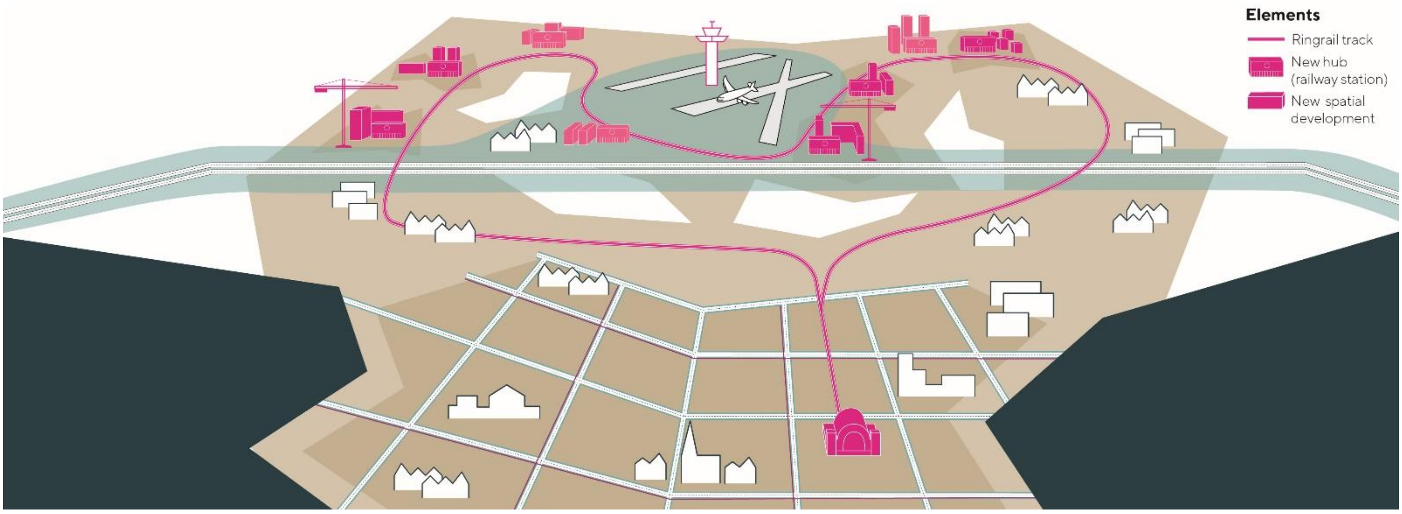
Ingredients	Traffic type	Traffic scale
ü Infrastructure	ü Person	ü Local
ü Mobility	☐ Freight	ü Regional
☐ Hubs/terminals		☐ Transit
☐ Spatial context		

Background

Since 2000, the number of railway passengers has been growing by approximately 40%. One of the challenges the city of Helsinki identified was to create a comprehensive rail network around the cities, connecting all the major economic and residential areas. A major missing link was between two centres in the City of Vantaa, and no rail connection between the city and the Helsinki-Vantaa airport.

Since July 2015 this missing link has been solved by adding a new part of the rail network between the northern ends of the main line and the airport. The new route connects air travel with the local Helsinki network as well as regional and national rail networks.





Ingredients

The added **infrastructure** to solve the northern missing link in de rail network in de Greater Helsinki Metropolitan Area of Finland, connects two main residential and commercial centres in the metropolitan area, provides a new transport link between the city centre of Helsinki with the airport and the rest of the country. People can reach the city centre from the airport within approximately 30 minutes.
Along the route, five new metro stations have been opened and three more are being developed. These are spacious and well-lit designed. Apart from the infrastructural developments, the urban areas for residential, commercial and office buildings are being developed close to the metro stations. New park-and-ride places can accommodate 700 cars and 840 bicycles near the metro stations.
The network is mainly aimed at flight passengers and commuters from residents in new districts in the metropolitan area. The connection provides people with different types of **mobility** at their disposal, thus reducing the need for bus and car traffic.

Success factors

The railway is used by approximately 200.000 commuters, and it 14.000 passengers are expected to use the new stations in 2025. During day-hours, the train runs in 10-minute intervals and the capacity is maximally utilised because the train runs in a loop.
The additional infrastructure created a comprehensive rail network in the Helsinki region, thus enabling development in the **spatial context**. Several new housing, commercial, work and leisure areas have been developed along the Ringrail and other stations.
The Tikkurila Travel Centre became a major **hub** in the Helsinki network. People can change to the national train network, Helsinki rail network and to the airport. The station offers a pleasant environment for doing business and shopping and houses mixed facilities like businesses and leisure.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☐ Spatial quality
☒ Robustness	☐ Social quality
☐ …	☒ Environmental quality
	☐ …

The comprehensive rail network provides people with a good alternative to car and bus traffic. This has a positive effect on environmental impacts.

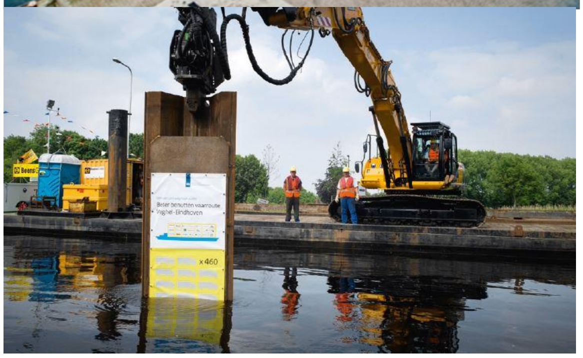
Better Use of Inland Waterways – Noord-Brabant

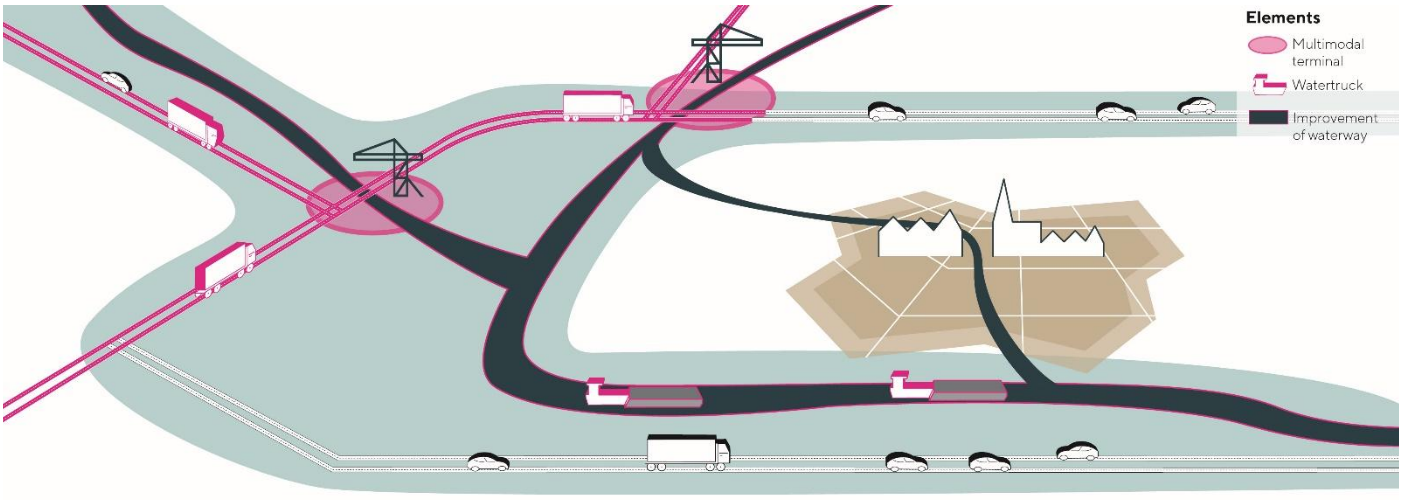
The Netherlands

Ingredients	Traffic type	Traffic scale
ü Infrastructure	☐ Person	ü Local
ü Mobility	ü Freight	ü Regional
ü Hubs/terminals		ü Transit
☐ Spatial context		

Background

The Dutch province of Noord-Brabant is strategically situated between the ports of Antwerp and Rotterdam and has good connections with the European hinterland via road, waterways, and rail. That’s why many logistics companies have decided to base themselves in this province. Yet, the increasing road congestion has a serious negative impact on the accessibility of the province, air quality, and further economic growth. In order to ease congestion the Dutch government decided not to solely focus on expanding road capacity, but also to make better use of the existing rail- and waterways. However, this modal shift is not without its difficulties. In the province of Brabant the number of small cargo ships (under 750 tons) has decreaed rapidly, which has had a negative impact on the overall capacity of inland waterway transportation. In fact, one could speak of a reversed modal shift from waterways to road transport.





Ingredients

To stop this shift from waterways to road it was decided to **improve both the existing waterway infrastructure capacity** and the usage of this infrastructure through **the bundling of goods** and the **use of new vessels**. The waterway infrastructure was made suitable for barges with a length of 110 meters. This was done by upgrading existing locks, the construction of a new canal around the city of Den Bosch, and several relatively small improvements like dredging ports. This made it possible for barges twice the normal size to make use of the waterways, more than doubling the capacity per ship from 400 tons to 900 tons. The second step was making sure that this additional capacity will indeed be used. That's why a 'Smart Deal' was signed with sixteen companies, united in the Berzob foundation, who were willing to contribute to a modal shift from road to water. These companies agreed to **bundle their cargo** with the intention to transfer 460 loads of goods from the road to the waterways. In addition, several companies initiated the Watertruck concept. The watertruck is a small pusher boat with a small barge. These small barges can be combined, depending on the size of the waterway. The watertruck concept should provide companies and shippers **increased flexibility**, comparable to that of road transportation.
Construct the text around the ingredients and emphasize the **ingredients (infrastructure, mobility, hubs/terminals and/or spatial context)** as bold text.

Success factors

The Better Use initiative of the Dutch government is a national programme to increase the usage of the existing infrastructure capacity. For the province of Noord-Brabant the major bottlenecks in its infrasructure network were identified and innovative measures were developed by national, regional and local government in cooperation with the industry. An example of such an innovative measure is the **Smart Deal** signed between the government and Berzob. The province of Noord-Brabant, municipalities and the affiliated companies **work together** to ensure that cargo is bundled and that shippers work closer together. Cooperation between the public and private actors is stimulated by the Multimodal Coordination and Advise Center (MCA). This network organisation acts as a **boundary spanner** and encourages **the exchange of knowledge** and provides support on modal shifts.This cooperation between government and industry is however not entirely voluntary. The smart deal also entails a **declariation of intent** by which each company indicated the amount they want to contribute to agreed upon modal shift.

Interface impacts

Transport impacts	Area impacts
☒ Connectivity	☐ Spatial quality
☒ Robustness	☐ Social quality
☐ …	☒ Environmental quality
	☐ …

The Better Use of Inland Waterways project shows the importance of combining improvements in infrastructure capacity with innovative measures to make better use of this new capacity. It also adresses the importance of close cooperation between public and private actors. Companies are making better use of the inland waterways. Nonetheless, the modal shift was not as high as initialy targeted. This has mainly been the result of low economic growth.

5 Concluding remarks

5.1 Conclusions

This inventory of good practices illustrates the variation in strategies to address transport issues related to the interface of corridor traffic and last mile traffic. Across Europe, these sections of the motorway network seem to face similar issues related to transport quality and area quality. The report describes the ingredients and success factors four twenty good practices in collaborative plannig and design for addressing these issues.

5.1.1 Ingredients

With regard to the ingredients of these good practices, the inventory shows that the four dimensions of transport systems – infrastructure, spatial context, hubs & terminals and mobility – each contain ingredients to adress these issues. In many cases, projects combined ingredients of these dimensions into efficient strategies. It appears that effective strategies for the improvement of transportation at the corridor-last mile interface combine multiple dimensions of the transport system in their approach. In some cases, it also becomes clear that the potential of the interface is not fully utilized due a dimension that is not fully involved in the project. An example is the A2 Maastricht project, which lacks to connect investments in infrastructure and area development to public transportation. The scheme in Annex 1 shows in what way the explored practices have combined ingredients.

The good pratices in this catalogue are both strategic, long term projects as well as projects that are directly action-oriented on the short term. Most of the projects that include the dimensions infrastucture and spatial context can be regarded as strategic projects, with a long planning horizon. This also seems to be the case for some hubs and terminals. These projects aim at providing alternative mobilities or changing transport routes (through the provision of new infrastructure facilities), at decreasing the need to travel (by intervening in the spatial constellation of urban regions). Moreover, in addition to enhancing connectivity and robustness of the transport system in the urban region, many of these projects also improve spatial, social and environmental quality of the urban region.

In contrast to these strategic initiatives, projects that include ingredients from the mobility dimension seem to be projects that can be realized on a shorter term. These action-oriented projects yield positive results after shorter planning periods. Factors to explain this are that these projects make use of the existing transport facilities (better use of the transport system through mobility management, for example), that investments are relatively limited in comparison to strategic projects and and that no large scale spatial transformations are needed. The prime effects of these project is the improvement of connectivity; spatial-area impacts are less strong. As a consequence of this action-oriented approach, the impacts of these projects also seems to be smaller than the potential impacts of the strategic projects. These projects can be seen as relatively ’quick-wins’.

It must be noted that the four ingredients that are observed in this study are rather broad dimensions to categorize the different options that planners and designers have for intervening in transport systems. These dimension themselves are too abstract to provide concrete leads for application in actual cases, such as the pilot studies. However, the detail of this good practice study allows the ingredients infrastructure, spatial context, hubs & terminals and mobility to be broken down into practical principles. Annex 2 (table 1) of this report provides an overview of principles, abstracted from the studied good practices, underlying each of the four ingredients (including an explanation, potential impact and a reference to examples from the good practice study). This overview of principles can be used as building bricks for the toolbox of

5.1.2 Success factors

In addition to ingredients, the factsheets also provide a view on the succes factors behind the projects: how have the the projects been succesfully implemented (from emergence of the idea to actual realization)? Since these projects at the interface of different spatial scales and different transport modes, involve the interests of many different stakeholders in the urban region, coordination and cooperation prove to be the main success factor.

The projects in the catalogue each combine different examples of different form of coordination and cooperation. To provide structured input for a toolbox, Annex 2 (table 2) of this report contains a table that categorizes the the success factors into four themes:

- Integrated approach
- Polycentric governance system
- Management of stakeholder networks
- Rules and resources

The theme integrated approach contains success factors related a holistic, interdisciplinary and multi-sector approach to transportation challenges. This success factors is about how different ingredients, aims and ambitions are combined into viable integrated plans and designs.

The second theme is a polycentric governance system. This relates to multilevel governance arrangements that intgerated approaches require in which stakeholders work together to target specific challenges. Under this theme are included the success factors for governance of cooperation between different public stakeholders (accross various spatial scales) and of cooperation between the public and the private sector (either in the role of construction or as operator of parts of the transport system), and of cooperation with the wider community to involve their ideas, wishes and concerns.

The third theme, management of stakeholder networks, is the operational side polycentric governance. This theme contain important ingredients for the success of multilevel governance arrangements. The inventory includes many different organizational forms for collaboration that are tailor made to the aims and objectives behind the collaboration. Examples from the good practices are the drafting of shared action plans, efforts to build trust and public support, agreements on data-sharing and knowledge exchange and the role of independent quality teams and boundary spanners.

For example, the involvement of the private sector is sometimes as a contract partner and in other cases as a stakeholder that is involved in the decision making. The different forms of cooperation have to do with the objectives behind cooperation. Each case requires a tailor made approach.

The fourth and final theme is rules and resources. Rules and resources provide structure, hierarchy and solidity to collaborative networks. This includes the ’instruments’ from the good practices that have been applied to secure succesfull cooperation. Examples are contracts between public and private stakeholders, strategic action plans, funding instruments, the involvement of independent facilitators or shared organization, and community involvement for tailor made solutions, but also the agreement of concrete targets.

5.1.3 The NRA-perspective

Not all projects explored in this inventory are examples of direct NRA involvement. Moreover, not alle projects do take place at the interface of large scale, bundled transportation corridors and the small scale last mile, dispersed last mile traffic. However, all projects do have an effect on the transport quality and (or) area quality at the interface. This implies that all projects are relevant practices with regard to NRA's practices and aims.

It also implies that NRA's may take different positions in projects and in collaboration networks with partners at the interface. First of all, NRA's could act traditionally as leading partners. This role seems appropriate in projects that primarily concern NRA's assets, such as major infrastructure networks. An examples from this good practice study is the Airdrie-Bathgate Rail Link (when rail is within the jurisdiction of the NRA). Secondly, NRA's could partner in more equal, less hierarchical relationships way with other authorities. This role suits projects where interventions in infrastructure are part of a wider package of interventions in the transport system. As examples the highway projects A2 Tunnel Maastricht and Ringland Antwerp can be mentioned, but also the Nordhavn development and the Turku Science Park. A third category, is the type of projects that affect the interface without direct intervention in infrastructure networks. Examples from this inventory are the Mobipoints, MAAS, bike sharing, Car-free city areas, microconsolidation, cycling networks. In these projects the involvement of NRA's would be more indirect, as motivator for other authorities to take action. NRA's may support these networks by providing knowledge and capacity or other resources.

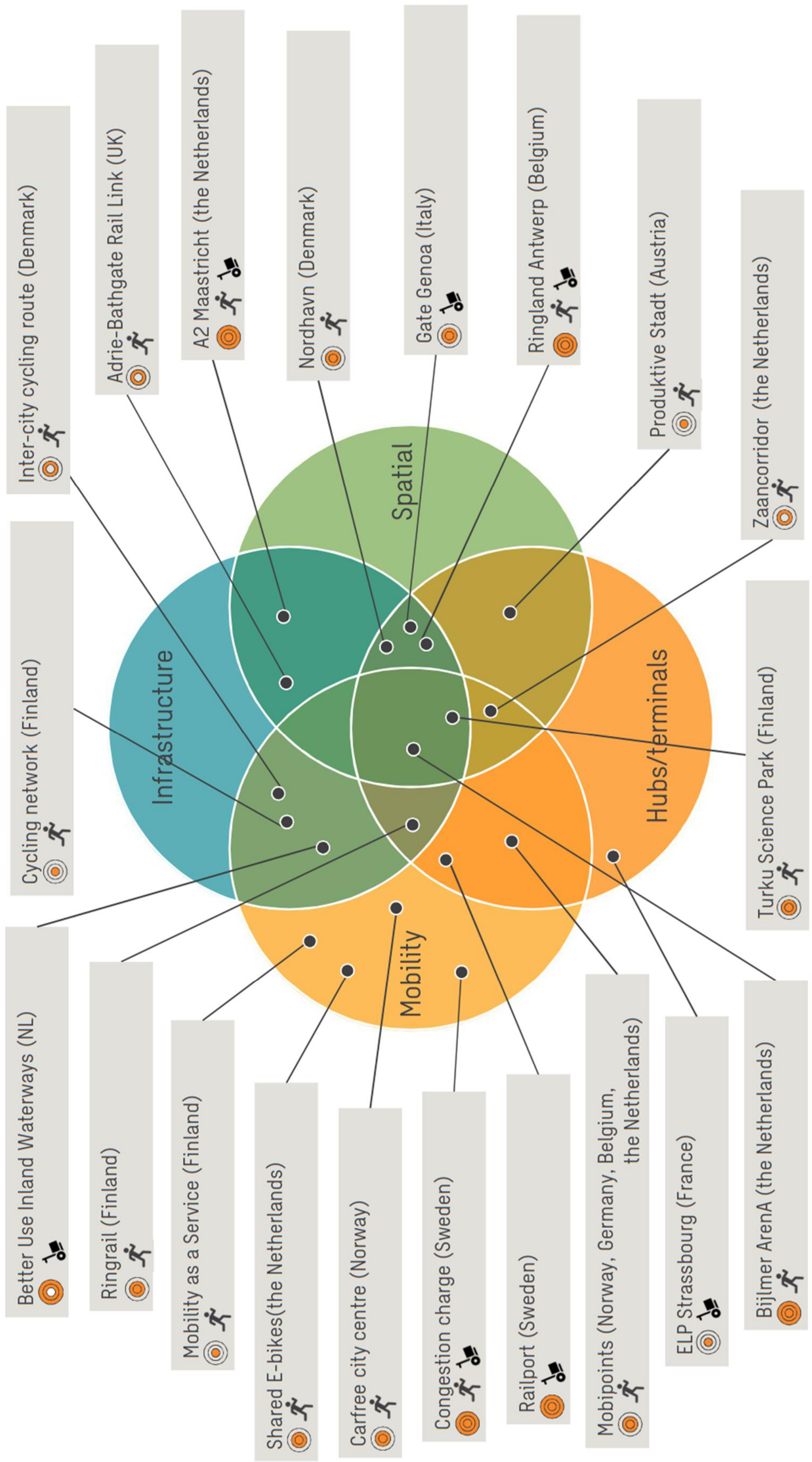
This inventory also clear the need for NRA's to engage in collaborative planning and design. Engaging in such practices requires NRA's to expand their skills in planning and design. NRA's are conventionally strong in what may be seen as technical design: engineering-centred design of efficient, detailed and strong technical solutions. The drawback of this type of design is that it neglects potential synergies between functions, scales and domains. The counterpart of technical design is a relational design culture.[14] This design culture is strong in exploring synergies between transport quality and area quality and on developing appealing visions for places. Relational design involves a focus on the interrelatedness of space, and is characterized by collaborative exploration of problems and potential solutions. Addressing the challenges at the interface of the corridor and the last mile requires an NRA to engage in both types of design.

5.2 Follow up – towards a toolbox

The next step of the SPINdesign-project is the development of a toolbox. The toolbox uses the same transport system-perspective as point of departure. This way the projects in this inventory can serve as an inspirational example to develop tailor-made approaches for future transport issues at the interface of the corridor and the last mile.

[14] Heeres, N., Van Dijk, T., Arts, J., & Tillema, T. (2016). Coping with functional interrelatedness and stakeholder fragmentation in planning at the infrastructure-land use interface: The potential merits of a design approach. Journal of Transport and Land Use, 10(1).

Annex 1 – Schematized overview of good practices



Annex 2 – Ingredients and success factors

Table 1: ***Overview of ingredients and principles from the good practices***

INFRASTRUCTURE

The physical links in the transport system

Principles	*Explanation*	*Potential impact*	*Example from good practice study*
Expand /upgrading existing road, rail, bike, waterways, or alternative infrastructure types	Creating extra capacity by expanding existing networks (additional routes or adding missing links)	Improve network robustness and connectivity and potentially also area quality (if shift from car to ...)	Baana, intercity cycling routes, GATE, Ring roads, Zuid Willemsvaart, super cycle highway Copenhagen, A2 Maastricht, Antwerp Ring, Railport Scandinavia
Add Road	Creating extra capacity by adding infrastructure to existing networks,	Improve network robustness and connectivity and potentially also area quality (if shift from car to ...)	Adding road is not in the good practice study. The study does not consider this an innovative principle.
Add Rail	Creating extra capacity by adding infrastructure to existing networks/option for modal shift from car to ...	Improve network robustness and connectivity and potentially also area quality (if shift from car to ...)	Airdrie-Bathgate Raillink, Ring Rail, Nordhavn (new metro line)
Add Bike	Creating extra capacity by adding infrastructure to existing networks/option for modal shift from car to ...	Improves network robustness and enhances spatial and environmental quality.	Baana, intercity cycling routes, super cycle highway Copenhagen
Transforming infrastrcture	Changing the function of 'old' infrastructure to new infrastructure at the same location > use transport lines for different modalities.		Baana Helsinki
Downgrading infrastructure	reducing capacity in favour of modal shift and spatial quality	environmental quality, soatial quality, modal shift	Copenhagen, shift to bike

SPATIAL CONTEXT

The spatial locations that are functionally served by the transport system, as well as the areas that physically surroundt the infrastructure

Principles	*Explanation*	*Potential impact*	*Example from good practice study*
Mixing Functions	Less mobility due to proximity home/work/services	Area quality, connectivity	Nordhavn
Add function	Less mobility due to proximity home/work/services	Area quality, connectivity	Bijlmer Arena
Change function	For example replacing functions to more logic locations. Less mobility due to proximity home/work/services	Less mobility due to proximity home/work/services and improves area quality	Produktive Stadt Wien
Increasing density near node	More travelers near a station on walking distance	Enhances connectivity and spatial quality	Zaancorridor

Clustering	For example clustering large scale logistical activities (cluster effect/synergies)	Area quality, Feeding terminals and services	Norrkoping, Turku Science Park
Area protection and (re)development	1) Protecting areas againts adverse effects of transport infrastructure (noise, nuisance) 2) Transforming/creating high quality environments for living and working (in surrounding of large infra)	Social, environmental and spatial quality	A2 Maastricht, Nordhavn, Antwerp Ring, Oslo Car Fre Citt Centre
Remove barriers	Taking out barriers bij better spatial configuration (for example landscaping, adding programm) and making connections (for example tunnel for bike, etc)	Connectivity, social inclusiveness	A2 Maastricht,Antwerp Ring, Baana
People oriented areas	People oriented areas (car free) invite/nudge people to shift from car to other modalities in their mobility behaviour	Spatial quality, environmental quality	Car free city centre

HUBS AND TERMINALS

The nodes where unimodel networks connect to each other, where persons and goods/leave enter the network or change modality.

Principles	*Explanation*	*Potential impact*	*Example from good practice study*
Small hubs (local)	Small scale local hubs, large density in urban regions, supports MAAS. Also logistics.	Connectivity, spatial quality, social quality	Mobipoints, ELP, Nordhavn (metro stations), shared E-bikes
Large hubs	Large scale hubs for transfering large amounts of freight or passengers to another modality. Locating hubs at logical points in the network (Railport).	Improve connectivity, social quality	Railport, Airdrie-Bathgate rail link , Railprot Scandinavia
Improve spatial Quality	Enhancing the attractiveness of a hub as transfer point or as a location for living and working.	Spatial quality, social quality	Bijlmer Arena, Antwerpen
Separating and specialization	Clear hub profile, that fits the hubs location: Separating functions that have no synergy/combining functions that have synergy effects. Avoids innefficient transport flows.	Spatial quality, connectivity	Railport

MOBILITY

The use of the transport system

Principles	*Explanation*	*Potential impact*	*Example from good practice study*
Information services	Encouraging modal shift by providing infromation and allowing for coordination	Connectivity, social quality, environmental quality	MAAS, ELP, Railport
Sharing facilities	Sharing infrastructure, sharing vehicles > encouraging modal shift	Connectivity, social quality, environmental quality	MAAS, Better Use Zuid Willemsvaart, Turku Science Park
Combining passenger&freight	Increasing efficiency of (existing) transport flows	Environmental quality	
Pricing	Enforcing change in mobility patterns/behaviour by pricing/price differentiation	Connectivity, environmental quality	Congestion charges, MAAS
Convenience facilities	Extra facilities (concerning transport or not) that make a certain hub or a certain modality more attractive (e.g. bike parking, bike pumps, showers, lockers, parcel/grocery pick up points)	Social quality	Mobipoints, super cycle highways
Changing mobility patterns	Structural modal shift or partial modal shift (from car to other modalities), towards more diverse mobility patterns for travellers.	Connectivity, social quality, environmental quality	Shared E-bikes, mobility management

Table 2: Overview of success factors from the good practices

Themes	*Succes factors*	*Example from good practice study*
Integrated approach Holistic, interdisciplinary and multi-sector approach to challenges	Comprehensive regional approach	Zaanstad Corridor
	Combining ingredients (infrastructure, mobility, nodes, spatial context)	Several/many projects from the good practice study
	Determining key priorities (political)	Airdrie Bathgate Raillink
	Multimodal studies	Airdrie Bathgate Raillink
	Intersectoral coordination (urban design, economics, mobility)	Produktive Stadt Wien, Turku Science Park, Nordhavn Copenhagen
Polycentric governance system An integrated approach requires multilevel governance arrangements, in which stakeholders work together to target specific challenges	Public-private cooperation: Smart deals/convenants between public and private sector	Better Use Zuid Willemsvaart, A2 Maastricht, Turku Science Park, Mobipoints
	Public-public cooperation	A2 Maastricht, Turku Science Park
	Mulitlevel governance	A2 Maastricht, Turku Science Park, shared Ebikes/mobility management
	Local stakeholder consortium/coalitions	GATE Genoa, shared Ebikes/mobility management
	Participation of the local communcity	Airdrie Bathgate Raillink
Management of stakeholder networks Stakeholder networks: important ingredients for success of multilevel governance arrangements	Building public support	Stockholm Congestion charge, A2 Maastricht
	Data-sharing	MAAS, ELP, Better Use Zuid Willemsvaart
	Building trust	MAAS, ELP, Better Use Zuid Willemsvaart
	Knowledge exchange	MAAS, ELP, Better Use Zuid Willemsvaart, shared Ebikes/mobility management

	Upscaling local practices	Shared Ebikes/mobility management
	Informal planning	Zaanstad Corridor (participative workshops)
	Independent quality teams/expert	A2 Maastricht, Ring Antwerp
	Coordination agents / boundary spanners	Better Use Zuid Willemsvaart
	Shared action plans/joint ambitions documents	A2 Maastricht, Ring Antwerp, GATE Genoa
Rules and resources Providing structure, hierarchy and solidity to collaborative networks	Value capturing (in the contract)	A2 Maastricht
	Co-funding (public-public/public private)	A2 Maastricht, GATE Genoa, Turku Sciene Park, Railport Gothenburg
	Taxation (of mobility)	Stockholm congestion chareg, Car free city centre Oslo
	Sufficient funds	Airdrie Bathgate Raillink
	Setting targets	Better use Zuid Willemsvaart

Annex 3 – Reference list for the factsheets

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