TRANSFORMING EUROPEAN METROPOLITAN REGIONS

PRACTICAL GUIDE ON IMPLEMENTATION OF THE STATION AREA CONCEPT

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ABSTRACT

The Station Area Concept (SAC) builds on a station area that is defined as an area in and around a railway station (or equivalent transport nodes in a regional express bus system), mostly using 500 meters and 1000 meters buffer zones as an easy approximation for accessibility. It is defined by an area developed with dense housing, mixed use, and liveability targets that create attractiveness. Station areas are recognized as a development priority in terms of mobility, urban development, and climate targets. They are the starting points for transforming the urban environment from low-carbon station areas to low-carbon metropolitan regions.

The Practical guide on implementation of the Station Area Concept builds on the concept of transit-oriented development (TOD) and supplements it with two approaches, developed in SMART-MR project. The first, a Liveability-Oriented Area Development (LOAD), addresses liveability of urban station areas and the second, a Low-Carbon District (LCD), focuses on four main areas (land use, housing and living, business and services, mobility), and addresses them through four main aspects (climate change mitigation, resilience, circular economy, and social sustainability and health).

The conceptual framework of the SAC is based on the experiences gained in the SMART-MR project and follows the logic of change management (Kotter steps presented in chapter 2). Further on, we define station areas and present them as nodes in the polycentric regional structure. We continue with the presentation of the steps that can be followed in developing each individual station area. The development of station areas is presented through three pilot areas – Ytterby in Sweden, Malmi in Finland and Grosuplje in Slovenia.

With the guidelines we intend to support local and regional authorities in improving the ways to achieve liveability in polycentric metropolitan regions and to contribute to more sustainable and climate resilient settlement structure.

CONTENT

1 INTRODUCTION

Mobility planning does strongly depend on land-use planning and settlement. To achieve sustainable development at the regional level, that would decrease the need for private cars, a settlement must be linked to existing public transport corridors. In the SMART-MR project, the development of and around transport nodes that was discussed within the fourth workshop in Gothenburg in December 2017, addressed the development of urban station areas as an example of densification of settlement and services in the urban station areas. By using the case of Ytterby, the Gothenburg Region (GR) developed a densification study, that has supplemented the Transit-Oriented Development concept (TOD) with sustainable density principle, as proposed by the UN-Habitat. The methodology thus addresses mobility and land use of particular area, and by combining them it presents station areas as nodes in a polycentric spatial development structure. In addition to this, station areas are not just densified, but as proposed by the fourth SMART-MR workshop in Gothenburg and fifth SMART-MR workshop in Helsinki (in April 2018), they should be developed in a way they would provide the maximum liveability possible. Thus, not only sustainable modes of transport and sustainable density should be respected, but – taking into consideration the climate change mitigation and adaptation – also the principles of low-carbon urban development (discussed in the fifth workshop in Helsinki). In this regard, the GR developed a Liveability-Oriented Area Development (LOAD) concept, that addresses liveability of urban station areas and the Helsinki Region Environmental Services Authority (HSY) the Low-Carbon District (LCD) concept, that is focused on four main areas (land use, housing and living, business and services, mobility), and addresses them through four main aspects (climate change mitigation, resilience, circular economy, and social sustainability and health).
To achieve the maximum output out of the LOAD and LCD concepts, we decided to merge them into one development concept Station Area Concept (SAC). Thus, both concepts were further developed, interconnected and strengthened by defining the detailed process for the implementation.
With these guidelines, we present measures to support local and regional authorities in improving the ways to achieve liveability in polycentric metropolitan regions. In this case the station areas are presented to be the new liveable urban communities as urban nodes of city growth and development, and as user interface of low-emission rail transport. The guidelines can serve other regions in achieving more sustainable territorial development.

2 SMART-MR STEPS IN BUILDING SUSTAINABLE AND LIVEABLE STATION AREAS

Metropolitan regions face numerous challenges and climate change seems to be one of those that will profoundly transform our way of life, mobility, planning, actually, the way metropolitan regions act and develop.

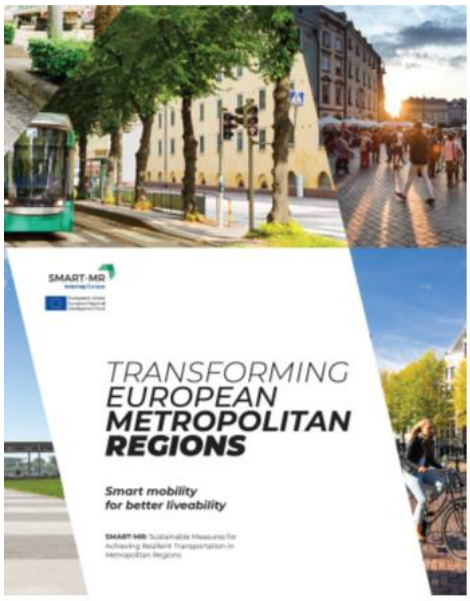
Climate change requires enhanced understanding of all the consequences that climate change brings, shift towards climate-friendly lifestyle, stronger commitment to low-carbon targets and at the final stage, adaptation to climate change by achieving behavioural change and a shift towards more sustainable development patterns.

Thus, the SMART-MR project has supported local and regional authorities in improving transport policies and providing sustainable measures for achieving resilient low-carbon transportation and mobility in metropolitan regions. To tackle this issue, ten project partners from eight metropolitan regions (Oslo, Gothenburg, Helsinki, Budapest, Ljubljana, Rome, Porto, and Barcelona) have shared their experience in transport and mobility planning by holding seven topically interrelated workshops. Cooperation and coordinated approach in addressing climate change are a prerequisite for leading a change towards more sustainable development. We all need to work together to support and speed up the systemic change in our communities to reduce global warming. The concrete and coordinated actions on the local level are the key to reduce unnecessary

emissions and to introduce new green solutions. Namely, local level is a place where important decisions and investments are done.

All necessary technologies to achieve low-emission society are already available. Following experiences gained with the SMART-MR project and available knowledge we define participatory planning as an efficient mean for joint effort in facing climate change, whereas creation and communication of vision and strategy are logical consecutive steps. Focused on mobility and land-use planning, we present short- and long-term wins in development of and around transport nodes. By acknowledging the importance of integrated planning, we present general guidelines that can be combined uniquely in each metropolitan region to reduce climate change impacts, improve mobility and enhance its liveability.

Figure 1: SMART-MR guide and the Kotter steps.



Kotter's steps for leading change	Chapters in this publication
Establishing a Sense of Urgency	2 The Sense of Urgency: The Climate Is Already Changing
Creating the Guiding Coalition	3 Joining Forces to Face Climate Change in Metropolitan Regions
Developing a Vision and Strategy	4 Creating a Vision and Strategy
Communicating the Change Vision	5 Communicating a Vision and Empowering New Habits
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The transformative change suggested by the SMART-MR project is presented by following Kotter's steps of change management (Kotter 1996):

The Sense of Urgency: Reduce Global Warming - Create New Local Opportunities to Urban Green Growth

Sustainable growth requires a knowledge on how to develop metropolitan areas, densify urban structure and provide sustainable mobility in the metropolitan regions. While national governments are the signatories of the Paris Agreement, it also recognizes the role of cities, regions and local authorities in addressing climate change. The challenge is to create a common understanding, that fast actions are needed. Thus, we need to accelerate our efforts to reduce emissions now.

Joining Forces to Green Growth and Well-being in Metropolitan Regions

Coping with climate change requires an intensive cooperation among all administrative levels, sectors, governmental and nongovernmental bodies, and citizens to transform the international goals to national, regional and local level goals and actions. Politicians, public administration and planners, as the most responsible for the successful planning and implementation, should not disregard the needs and interests of other actors e.g. inhabitants, economic sector and NGOs. At the local level, emerging initiatives are easy to understand and inhabitants and NGOs respond adequately. The backbone of the planning should therefore be a collaborative and inclusive participatory process. It must start at the very beginning of the planning process and should be sufficiently promoted to engage all the relevant and interested parties. We have to plan and build cities in such a way that everyday life is as

climate-friendly as possible for everyone. The urban environment should support the choices for all to reduce their carbon footprint.

Creating Strategy and Vision

To ensure integral and sustainable development of the station areas a shared vision is of crucial importance. The central issue to be addressed while formulating a shared vision is '*What kind of urban area we want to live in?',* whereas, it should be created by involving all the interested parties. A common strategic vision provides a description of the quality of living and a view of better liveability in the local neighbourhoods around the station. It will serve as a guide for developing general spatial planning measures in which mobility and transport are integrated, today and in the future.

Communicating Vision and Empowering New Habits

A good, motivation-building-oriented communication approach, which is well defined can expect to receive adequate level of acceptance and can potentially be followed by expected long-lasting behavioural change. Therefore, change must firstly take place in people's awareness and only then they are prepared to internalize common vision and change their behaviour. It is of great importance for communication strategies to explain to different levels of public, with strength and clarity, what will be the situation at the end of the process and what are the main societal benefits (CIVITAS Vanguard 2011). One way is by showing good examples to citizens about things that will create change in their daily lives and compare them to negative alternatives in case transportation measures will keep on ignoring the climate-smart principle.

In this way, the main challenge of communication is to determine joint interests in mobility. The critical part of the strategic approach is the sensemaking – why we do this. We need to create a culture of planning that is based on regular communication, participatory planning, mutual consultation, trust and joint decision-making, which is a best way to mitigate potential conflicts already in initial stages.

Pawing the Way to Long-Term Effects

In combating climate change, metropolitan regions face new challenges, especially in regional mobility, which cannot be solved solely with classic mobility measures. Broader perspective is needed, integrating relevant sectors, new technologies and new solutions. Establishing a healthy and liveable environment for us and for our children in the field of transportation, land-use planning and environmental protection requires sustainable measures that ensure long-lasting effects towards low-carbon society: regional mobility planning, low-carbon logistics, successful transport management and sharing solutions, and the transit-oriented development supported by low-carbon station areas. Development of and around transport nodes decreases car dependency, congestion and pollution and creates better regional accessibility. If the active development of the station-based services is further enhanced, the added value of the trip chains can be strengthened, and people can be encouraged to use public transport. Developing station areas as hubs for city logistics, can be part of the modern e-commerce and its logistics be handled in a centralized way and reduce the number of trips.

Generating Short-Term Wins

In the short term, the main focus in station areas is to develop walking and cycling possibilities, public transport and smooth trip chains to support the shift in people's behaviour towards a low-carbon everyday life-style. Priority order in planning of urban space around stations and in station areas should be walking, cycling, public transport, logistics, car-sharing services and finally limited space for private car-parking.

Integrating Measures to Build a Liveable Station Area

The need for change in urban areas is driven by population growth, by the impacts of global warming, air quality issues and changing business structures. This requires an approach to create sustainable mobility that meets the needs of a larger population including businesses and freight distribution in the station areas.

To summarise, mobility in many metropolitan regions is car dependent and logistics is often excluded from the mobility thinking. To change this the regional/local authorities need the overall picture on mobility and freight transport patterns in the area. Using information and communication technologies (ICT) for collection of data on end-users' travel behaviour can provide this information and give the users an improved travel experience. The car-oriented mobility needs to be substituted with a more sustainable provision of mobility by providing sharing options or improved public transport for example through integrated ticketing. Additionally, car dependent regions can be developed to rail based and transit-oriented urban areas.

The lack of metropolitan collaboration (both on institutional, administrational, planning and operational level) has been identified as a barrier in tackling suburban car traffic and the development of suburban public transport services. The focus on inter-municipal and regional collaboration is essential to solve the above issues. Further, a sectoral approach to infrastructure development separating between modes and means of transport is no longer appropriate. Investments must be aligned with transport strategies connecting both transport and spatial planning, which might decrease the need for private car dependent mobility and provide more sustainable development.

Making the Shift Towards Liveable Future in Metropolitan Regions

Co-creating process must be established that benefits from the stakeholders' contribution and creates a common understanding on the need for a jointly adopted common vision and strategy. In metropolitan regions it is necessary that the vision is sustainable and that innovations create liveability, also by supporting inhabitant's mobility needs. The vision needs to be shared by stakeholders and jointly manifested. To empower urgent actions that mitigate global warming, stakeholders that are professionally responsible for planning and decision makers should include the metropolitan vision and strategies in their work regardless of subject. E.g. when creating any new project, reduction of greenhouse gas emissions should be a part and addressed accordingly and the positive gains communicated. Visions and strategies must lead to more liveable and sustainable metropolitan regions.

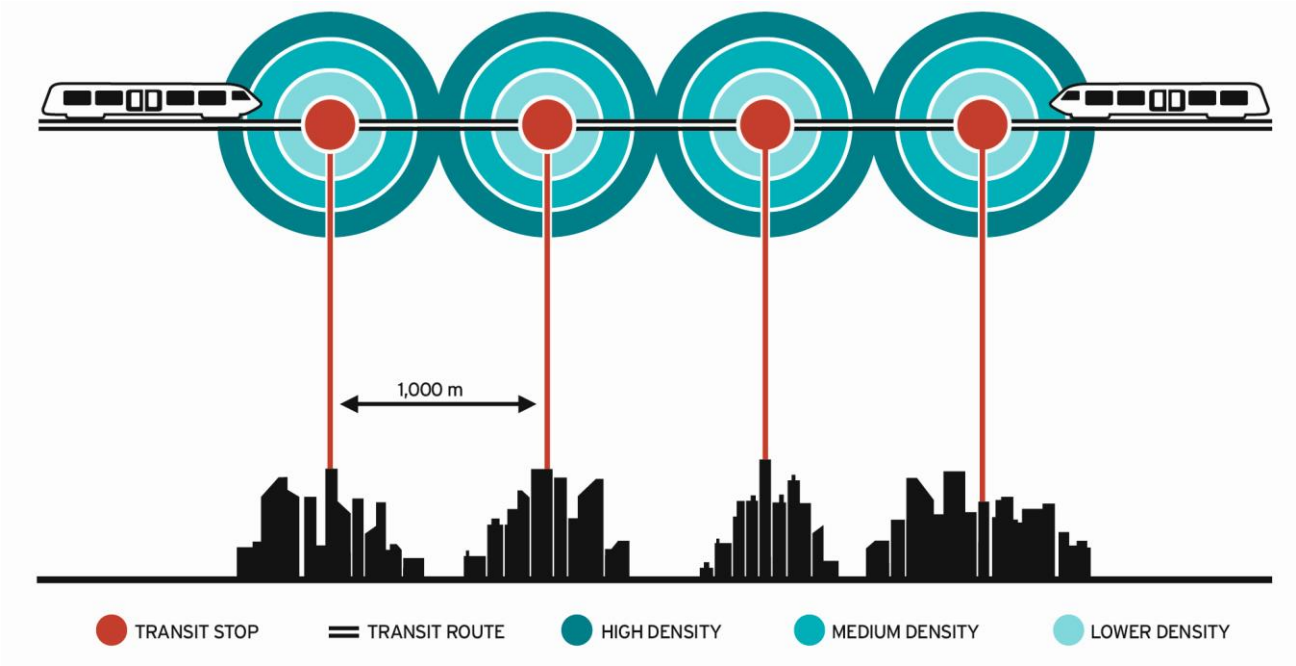
3 THE STATION AREA CONCEPT

A station area is defined as the area in and around a railway station (or equivalent transport nodes in a regional express bus system), mostly using 500 meters and 1000 meters buffer zones as an easy approximation for accessibility. It is defined by an area developed with dense housing, mixed use, and liveability targets that create attractiveness. Station areas are recognized as a development priority in terms of mobility, urban development, and climate targets. They are the starting points for transforming the urban environment from low-carbon station areas to low-carbon metropolitan regions.

Station areas or public transport hubs are the key focus for transit-oriented development (TOD). The TOD main drivers are reduction of car use and reducing congestion and pollution by avoiding urban sprawl. At the same time, TOD aims to increase regional accessibility by acquiring well-connected and affordable land for development in transport corridors.

TOD integrates transport and land-use planning, but at the same time it is a narrow concept that focuses on transport and how to make transit as effective as possible. It is defined as an area that has a compact and dense design with both housing and services within walking distance of public transport and with regional connectivity (Figure 2). Thus, TOD economizes mobility by decreasing the need for travel and by making possible efficient provision of public transport. In addition to TOD, there is a need for a broader perspective for community and low-carbon development, both in densifying the existing urban area and in creating new station areas.

Figure 2: Transit-oriented development (Lehmann 2015).



The new station area concept creates the need to redefine TOD. Supported by the study "Sustainable Density in Station Communities" (Nordström, Swartz and Ståhle 2017), recommended density for exploitation used by UN Habitat (2015) is added. The aim of the sustainable densification and compact areas is both to increase the population within the given space and also to maintain a well-defined division of land use that ensures that a high-quality and accessible urban area with an optimal land-use mix is obtained (Figures 3 and 4).

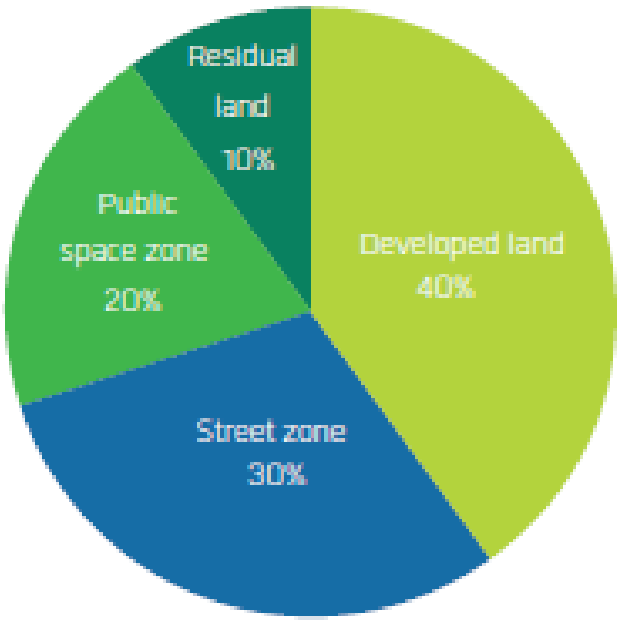
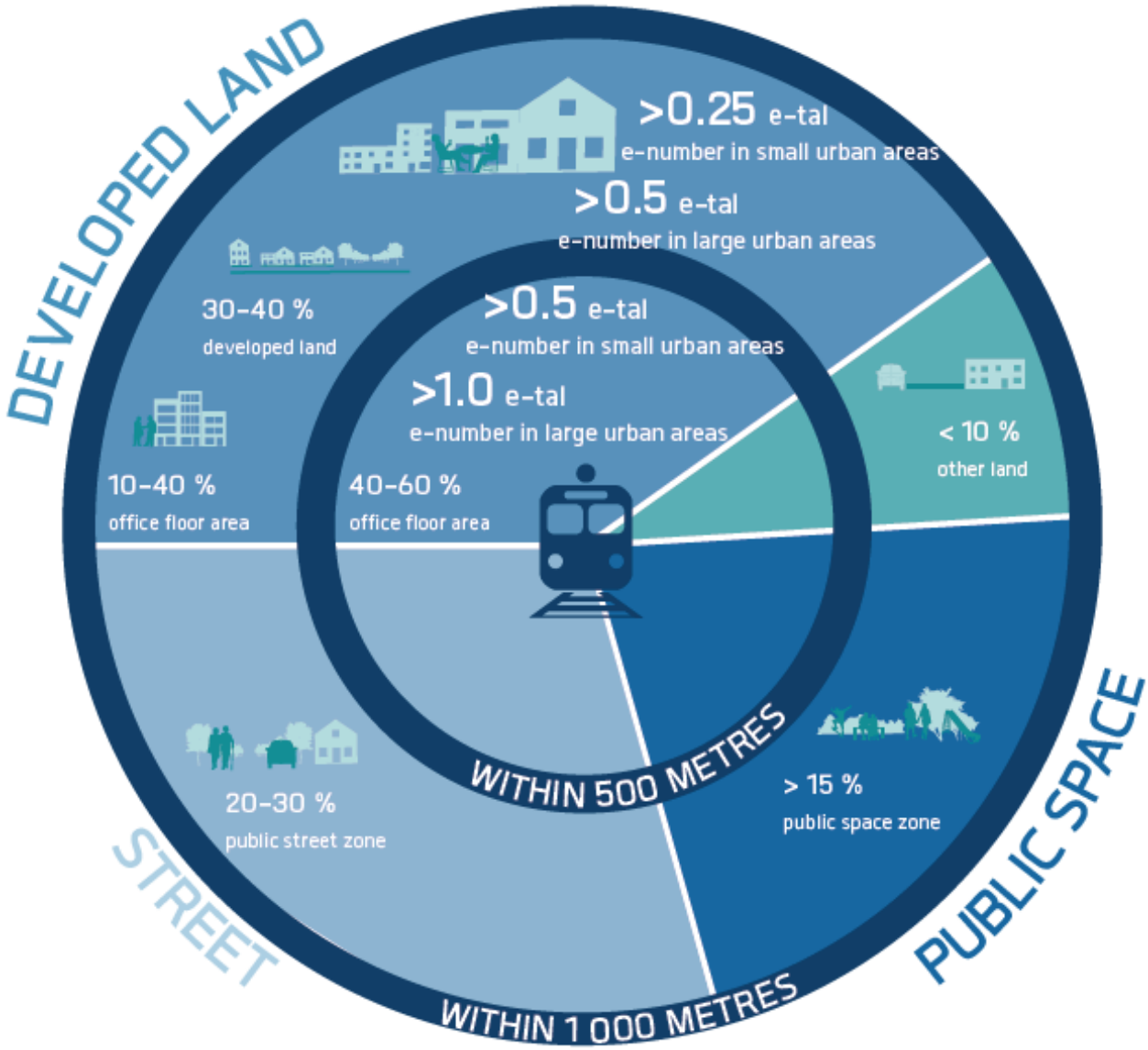


Figure 3: Example of efficient distribution of land use (Nordström, Swartz and Ståhle 2017).

Figure 4: Land-use recommendations: Guidelines for sustainable density in station areas. Station areas are recommended to be developed with a mix of housing options. (Nordström, Swartz, and Ståhle 2017).



However, increasing density is just the first step and a wider social-environmental holistic approach is needed to ensure better liveability and attractiveness of station areas. This can be done by starting the planning process from other perspectives than just transport. Station areas should thus use what is commonly considered a sustainable development perspective, combining the three dimensions: economic, environmental, and social development.

In the Helsinki region, the station area concept was further supplemented with low-carbon criteria in order to assist planners in meeting the climate targets. This will help cities develop low-carbon areas both in existing urban structure as well as in planning new station areas. In the concept, there are four perspectives on low-carbon station areas – land use, housing and living, mobility, and businesses and services – and there are four cross-cutting themes: climate change mitigation, resilience, a circular economy, and social sustainability and health. In addition, technology integration and leadership are recognized as essential parts of transformation. Nearly seventy different criteria will help planners and city developers transform low-carbon areas step by step (Figures 5 and 6).

Figure 5: The low-carbon district toolkit for station areas includes planning criteria in four themes and four crosscutting perspectives.

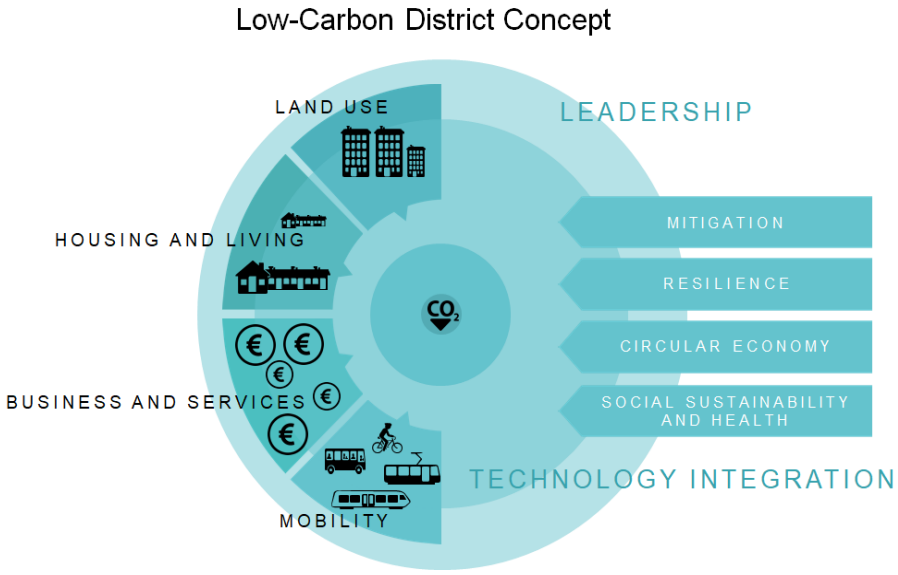
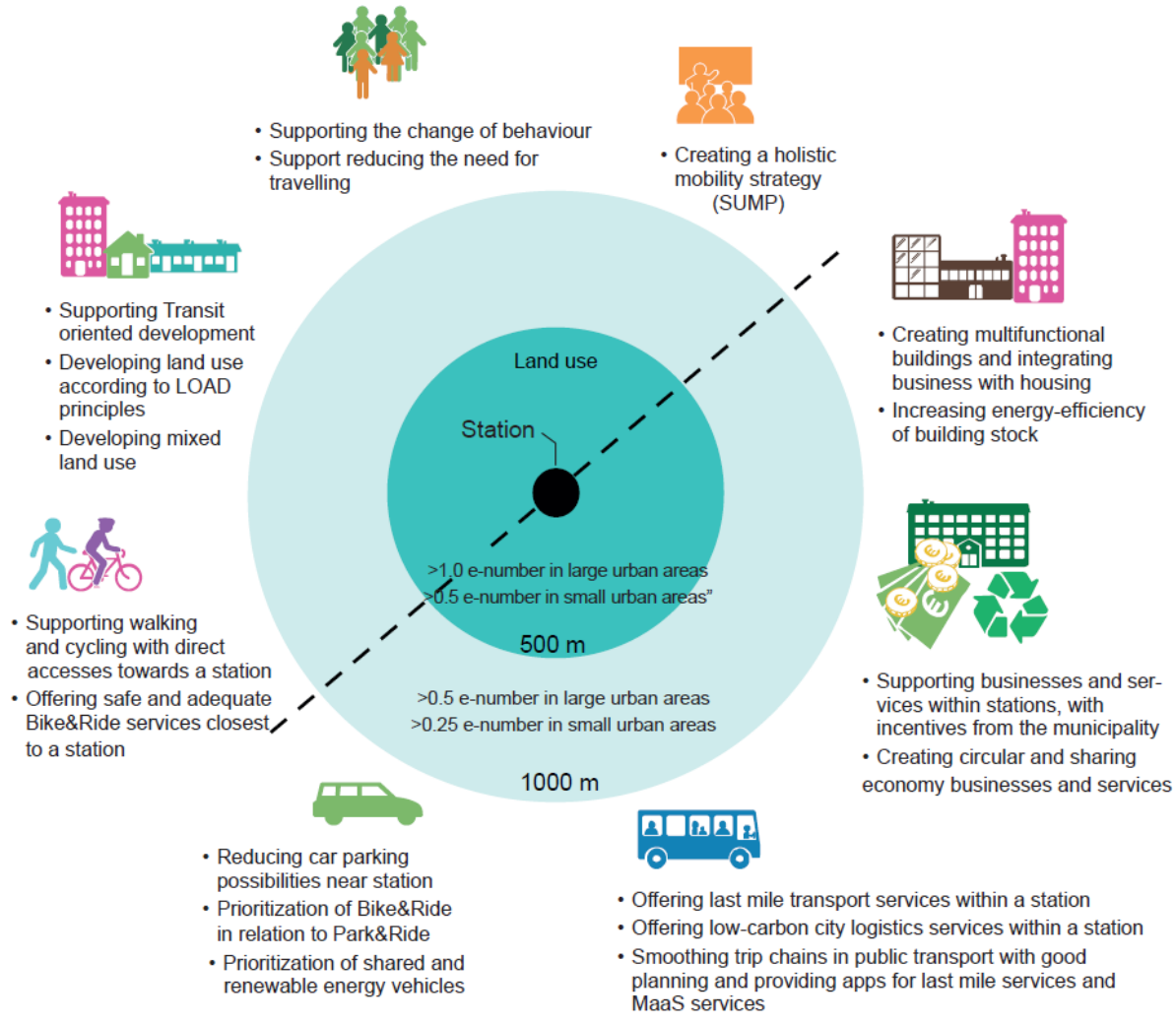


Figure 6: Low-carbon district toolkit for developing climate-friendly station areas.



From a business operational viewpoint, station areas have much untapped potential as a marketplace. Improving and strengthening services at station areas will increase the added value of trip chains, will make rail transportation more attractive, and will also reduce the need for travel. Enhancing the service palette of the stations makes people's everyday lives easier and encourages movement toward low-carbon mobility. Last-mile transport services, low-carbon city logistics services, and MaaS services within a station also reduce emissions. A vibrant station area also makes a sharing economy possible. Sharing and circular economies and new models of ownership can be seen as a means to reduce consumption.

The public sector is considered to have a key role in encouraging and facilitating companies to locate themselves close to stations and introduce new types of low-carbon business operations. New business operation models may result from new types of public-private partnerships. The public sector is also seen in encouraging and facilitating the public's initiatives. Social sustainability is an important theme in developing liveable oriented station areas.

If the active development of station-based services is further enhanced, the added value of the trip chains can be strengthened and people can be encouraged to use public transport. Developing station areas as small hubs for city logistics can be part of modern e-commerce and its logistics can be handled in a centralized way to reduce the number of trips.

The development of public space and safety are considered key measures for improving station areas. Upgrading public space in particular is the most focused measure to be taken to increase station areas' usability, also from the perspective of safety.

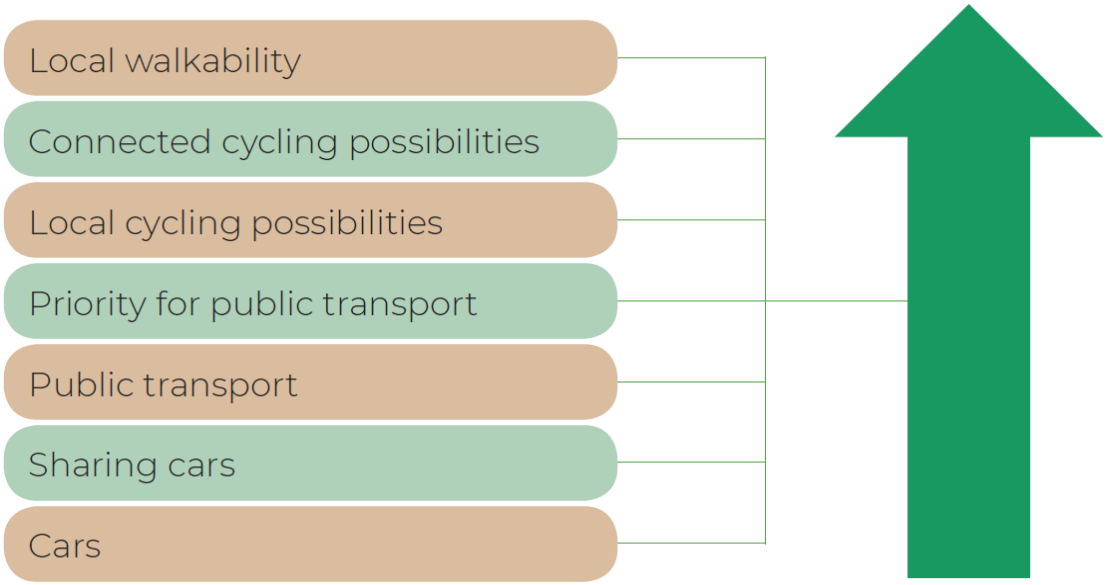
Locating services centrally on ground floors at the station and nearby will also increase social activities and enhance safety. As a minor measure, increasing smart and energy-efficient lighting and enhancing underpasses and overpasses will also increase the feeling of safety.

The station area concept proposes a flexible attitude for how to reach dense housing, mixed use, better liveability and low-carbon principles at the local level, adapting recommendations to unique circumstances of each individual station area. It can be applied for pre-existing station areas when complementing urban structures and for new station areas when planning land use. By including the low-carbon development aspect, the building stock in station areas should consist of energy-efficient multifunctional buildings with businesses integrated with housing. Housing should also be mixed; that is, station areas should provide different types of housing supply for people's different needs. It is also important to increase affordable housing near stations. Increasing the amount of housing stock and residents improves the ability of services to enter the region and increase their profitability. All this requires close joint planning of land use, housing, and mobility.

In the short term, one main focus in low-carbon station areas is to develop walking and cycling opportunities, public transport, and smooth trip chains to support the shift in people's behaviour toward a low-carbon everyday lifestyle. The priority order in planning urban space around stations and in station areas should be walking, cycling, public transport, logistics, car-sharing services, and finally limited space for parking cars (Figure 7).

Direct, uninterrupted, and unimpeded walking and cycling connections to station areas with good, safe, and weatherproof bicycle parking and maintenance facilities are a starting point for low-carbon trip chains. By prioritizing bike-and-ride in planning, an attractive mobility alternative will be offered. Promoting the use of electric bikes as city bikes and with better charging infrastructure would also expand the functional area of a station. Cars are not a priority in parking, and park-and-ride areas should be planned further away from the station, especially if implemented close to city centers. This land area is more important to use as a liveable urban space or for housing. These measures can make possible low-carbon trip chains in a reasonably short-term perspective, thereby reducing emissions from the transport sector.

Figure 7: The priority order of transport modes in low-carbon areas.



3.1 PLANNING STEPS IN STATION AREA DEVELOPMENT

As the conditions differ between and within metropolitan regions, each station area must be developed in a unique way, addressing particular needs of a specific area. However, the planning steps are universal and can be followed no matter the spatial context of an area.

To enhance planning of the station areas, we thus developed guidelines with consecutive planning steps, combining various planning approaches, from desktop research to participatory planning. The starting point of the process is the SMART-MR guide – Transforming European Metropolitan Regions: Smart mobility for better liveability (SMART-MR 2019), that is based on Kotter (1996) steps of transformative change.

The consecutive planning steps are:

1. Defining polycentric structure at the regional/national level

In this step the planers evaluate the regional spatial structure and define potential locations for station areas based on:

- transport corridors with a sufficient public transport provision (sufficient frequency and capacity of the public transport)

- provision of public and private services

- a need for supplementary areas based on the population growth (demographic projections).

2. Regional/station area analysis and benchmarking

In this step a thorough analysis is made, focussing on the main pillars of station area development (e.g. land use, housing, businesses and services, transport provision, etc.). This way we define basic facts, starting points and critical issues to be further discussed in the participatory process.

3. Getting the political support for the participatory process

Before starting with the participatory process, it is necessary to gain political support for such a process, ensuring results of the process will be taken into consideration and used to the maximum possible extent in the planning and decision-making process.

4. Identification of stakeholders and their perspectives

To ensure the best possible results, stakeholders in the participatory process must be carefully selected to ensure all the stakeholder groups and their perspectives are adequately represented. Particular focus should be given to marginal groups that have limited resources and knowledge to participate.

5. Implementation of the participatory processes

Various forms of public participation are used to identify main challenges, build joint vision, short-term and long-term effects/measures, and to propose priorities to be followed during the development of the station area.

6. Re-evaluation of the participatory process results vs. regional analysis

The results of the participatory process must be confronted with the results of the regional analysis (step 2) to ensure decision-making is data-based and to prevent the final decisions are predominantly influenced by stakeholders that are louder, more powerful or possess more resources, knowledge and skills to influence the discussion.

7. Defining detailed measures, responsibilities, timetable and roadmap

Based on the former steps, a detailed plan is prepared, containing detailed measures, responsibilities, timetable, resources needed, etc., enabling the development of the station area in an organized and transparent way.

8. Communication of goals and measures and political decisions

In this step the final decisions are shared with the public, focussing on the goals we would like to achieve with the planned measures, advocating for a greater support to measures despite their potential unpopular elements (e.g. disincentives for use of the personal cars).

9. Successful implementation

The plan, developed in step 7 is implemented, guiding the development of an area in a sustainable way, to ensure the objectives foreseen with the development of the station area are duly reached.

10. Monitoring system and constant evaluation

During the implementation of the plan the activities are regularly monitored and assessed to ensure successful implementation of the activities and especially, to confirm the planned and implemented measures have the positive impacts, planned with the development of a station area.

These steps are explained in the following chapters, starting with a basic description of the step and further illustrated by some examples we developed in our three pilot areas: Malmi in Finland, Grosuplje in Slovenia, Ytterby in Sweden.

4 SHAPING POLYCENTRIC STRUCTURE OF TRANSPORT NODES: SELECTING LOCATIONS FOR THE POTENTIAL STATION AREAS

By developing station areas at the level of metropolitan regions we seek to support a polycentric development of metropolitan regions and thus to ensure they develop in a sustainable way.
The polycentric settlement structure is based on the three main conditions:

1. Station areas are located in areas with a growing population.
2. Station areas have sufficient provision of public services.
3. Station areas have sufficient/good accessibility by/to public transport.

To test the fulfilment of the aforementioned conditions, three main analyses must be ensured:

1. Demographic projections,
2. Analysis of the central settlements based on the services of general and general economic interest,
3. Analysis of the existing transport network and public transport provision.

4.1 DEMOGRAPHIC PROJECTIONS

Demographic projections are most often used to analyse the demographic potential of the area, as well as to predict or estimate future population development. Below, we present basic features of cohort-component method (analytical demographic projection) and mathematical predictions of future demographic development. Detailed information for calculating the demographic projections are attached in Annex 1.

Cohort-component method (analytical population projection)

The analytical population projection uses Lexis diagram as the method of calculation. The calculation is done separately for male and female population. One-year age groups can be used, but most often the five-year age groups are calculated for five-year periods for a time interval of 10 to 25 years from the start date of the projection calculation.
Projection is usually based on four hypotheses:

- fertility hypotheses,
- mortality hypotheses,
- hypotheses about migration within the considered area, and
- hypotheses about migration with other areas (regions, other countries).

For individual hypotheses it is necessary to calculate the coefficients expressed per person (per capita) or per 1000 population. The coefficients can be calculated from the demographic variables of a past time period or may be (for variant solutions) assumed according to the needs of the projection calculation.

Advantages of the method:
• Inclusion of more data on population structure,
• Ability to produce projection variants,
• Better possibility of calculating derived projections (labour force, school-age population, women in fertility period, pensioners).
Disadvantages of the method:
• In some cases, data are not available for smaller spatial units,
• Projections are less appropriate for smaller areas (less than 5,000 inhabitants).

Trend extrapolation (mathematical population projections)

Mathematical population projections are calculated by extrapolating the selected mathematical functions into the future. The calculation of the mathematical projection is based on the knowledge of the characteristics of population reproduction in the past and on the hypotheses of future development.

To analyse the characteristics of population reproduction so far, data on population composition and demographic trends for several dates in the past are needed. These may be data from population censuses, which are usually conducted every 10 years. It is even better to rely on shorter (five-year) periods. This kind of population data can be found in current birth, death and migration registers.
The choice of mathematical function depends on the number and content of the population data available. For more data, statistical methods must be used to determine the trend (growth curve).

Advantages:
• A smaller number of input data is required for the calculation than in the case of analytical projection,
• Fast calculation that is fairly reliable for shorter periods of time,
• The projection can be made for smaller spatial units for which less population information is available (settlement, small municipality, school district, etc.),
• They enable a quick assessment of the demographic consequences of the planned projects (construction of new residential districts, creation of larger infrastructure areas, effects of the planned motorway, etc.),
• Allows easy calculation of multiple projection variants.

Disadvantages:
• Less reliable results for longer projection periods,
• Poor prospects for a more complex assessment of the population structure in the future,
• Limited possibilities of calculating derived projections (labour force, school-age population, women in fertility period, pensioners etc.),
• Poor comparability between areas for which the same method of assessment of future population development was chosen.

Demography of Grosuplje, Slovenia – basic structures, trends and demographic projection

In the period 2008/2018, the population of the Municipality of Grosuplje grew faster than the entire population of Slovenia. The reason is suburbanization and related immigration from the nearby Slovenian capital Ljubljana. From 2008 to 2018, the population increased by 2587 or 14.3% to 20.672 people, which means an average annual growth rate of 1.34%. Annual increase in population caused by immigration was higher (7.9 persons per 1000 inhabitants) than the natural population increase (5.5 persons per 1000 inhabitants). In the same decade, the municipality had a higher total fertility rate (1.83) than the rest of Slovenia (1.58). The municipality also had a younger population than the whole of Slovenia. In 2018, the aging index – ratio between the old population (65+) and young population (0–14) multiplied by 100 – was 85 compared to 129 in the rest of Slovenia (SiStat database).

46% of the population growth of the municipality in the past decade was concentrated in the Local Community of Grosuplje (44% of the total population). The local community includes the economic and administrative centre of Municipality and the town of Grosuplje with 9179 inhabitants in 2018. Demographic trends and structures are very similar to municipal ones. To assess the future development of the local community population, a demographic projection for the period 2018/2038 was calculated. The projection hypothesizes the continuation of demographic trends from the period 2008/2018. The method of calculation was cohort analysis of five-year age groups by gender. It was based on three hypotheses:

- Fertility hypothesis

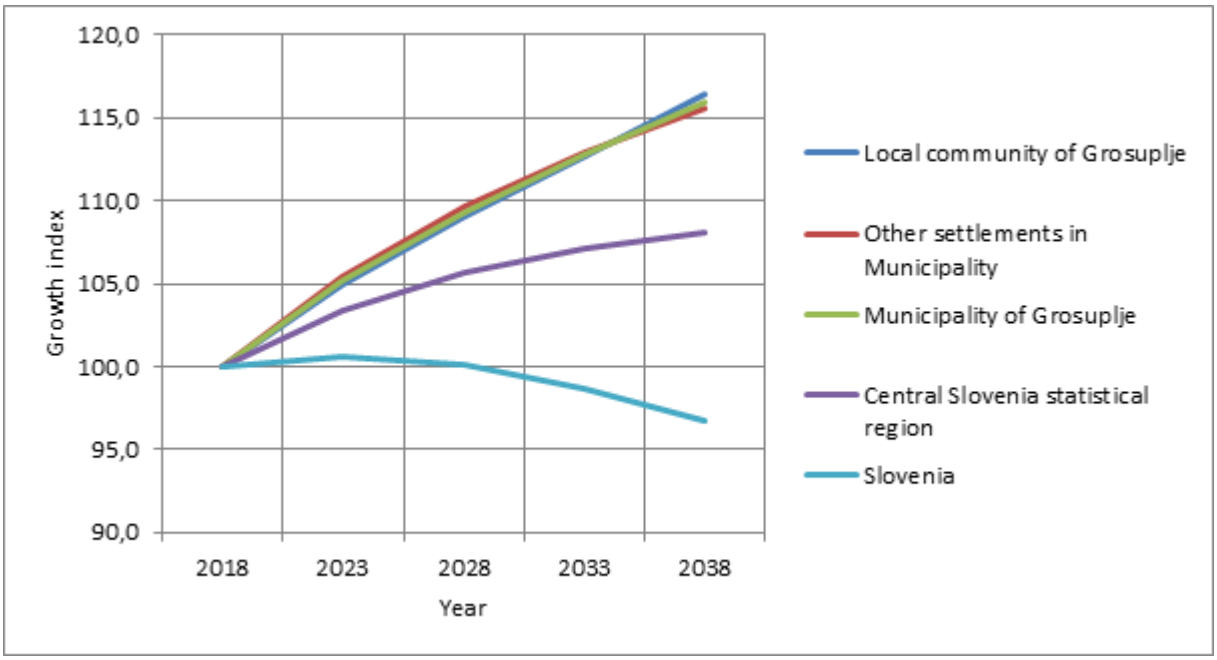
- Mortality hypothesis

- Migration hypothesis

Some results of the projection were compared with the results for the municipality of Grosuplje as a whole, for the Ljubljana Urban Region (municipality is a part of that region) and for the whole Slovenia. The comparisons were summarized according to a methodologically comparable demographic analysis for the whole of Slovenia (Nared et al. 2019).

According to the results of the demographic projection, population growth will continue in the next two decades. The increase will amount to 1,500 inhabitants in the local community of Grosuplje and 3,300 in the entire municipality. The growth dynamics will decrease compared to the period 2008/2018, average annual growth rate would be 0.75%, both at the level of local community and municipality. In the same period, the population of the Ljubljana Urban Region will grow with an average annual growth rate of 0.4%. The total population of Slovenia will decrease by 67,000 or 3.3% (Fig. 8).

Figure 8: Total population growth index according to the results of the demographic projection 2018/2038 (2018 = 100) – Local community of Grosuplje and comparisons. Sources: SiStat for the population 2018; demographic projection 2018/2038.



Local and regional population growth in Slovenia over the past three decades is in all cases related to immigration. Immigration from abroad also plays an important role, especially from other states of the former Yugoslavia. The problem of population reproduction is low fertility, which decreased markedly after 1990. Fertility in the municipality of Grosuplje is above average compared to Slovenia, but still too low for generational reproduction. The problem is solved (covered up) by immigration, similar to several other municipalities in the Ljubljana Urban Region. The consequence is the aging of the population. According to the results of the demographic projection (Fig. 9), the number of people in the Grosuplje Local Community in the age category 0 to 24 will start to decrease after 2028. The number of people in the age category 25 to 64 (labour force) will increase by 11% between 2018 and 2038. The share of the younger labour force (25 to 44 years) will fall from 55 to 44% in the same period. According to the projection, the strongest growth

will be in the age group of 65 and over, and from 2018 to 2038 it will increase by 60%. The projection values for the whole municipality are similar. The picture of the overall change in the age and gender composition of the population of the Local Community of Grosuplje between 2018 and 2038 is represented in the graphic image by population pyramids (Fig. 10).

Figure 9: Local Community of Grosuplje – changes in the number of large age groups according to the results of the demographic projection 2018/2038. Sources: SiStat for the population 2018; demographic projection 2018/2038.

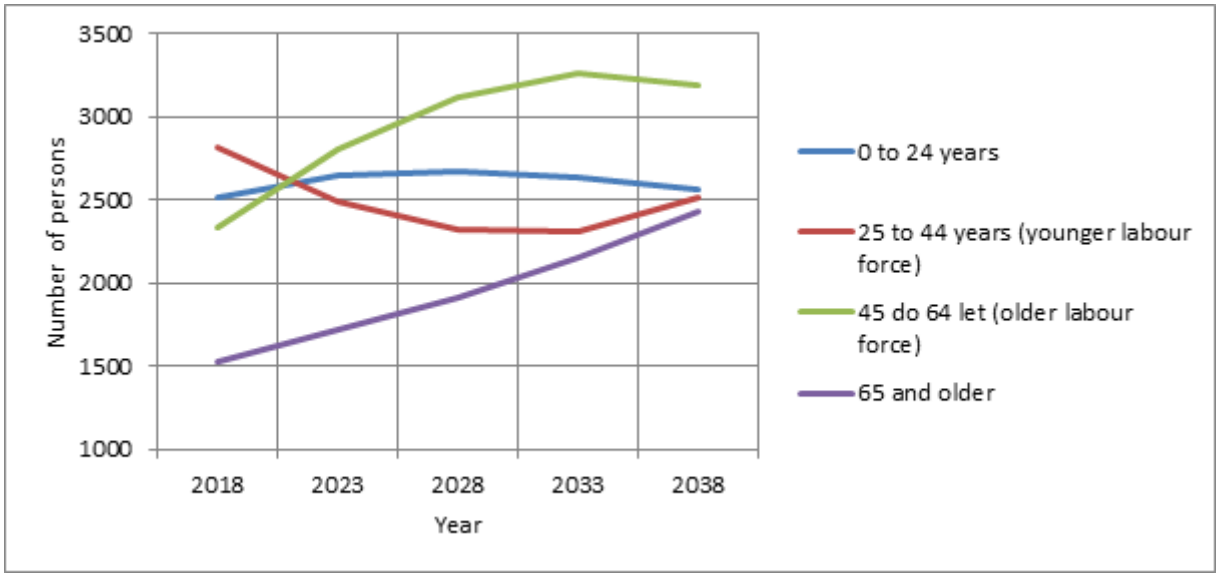
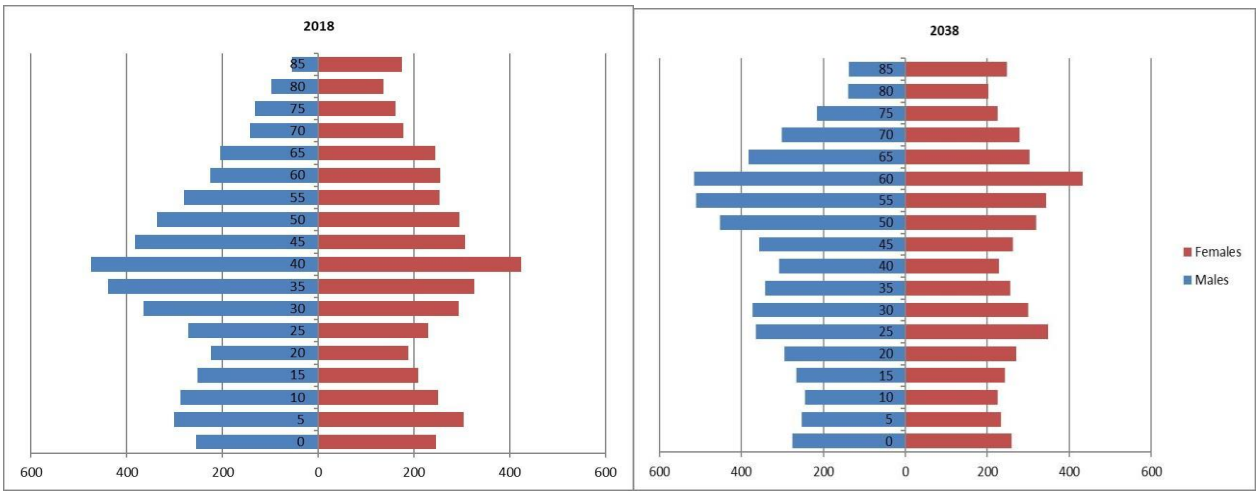


Figure 10: Local Community of Grosuplje - population pyramids for 2018 and 2038. Results of demographic projection 2018/2038.



4.2 SERVICES OF GENERAL AND GENERAL ECONOMIC INTEREST

The analysis of central settlements is based on services of general interest, which government bodies define as such and for which special public service obligations apply (ESPON Evidence Brief 2013; Noguera-Tur & Martínez 2014). Following examples like Meijers (2007), we limited the broader selection of services to four main functions: public administration, education, healthcare, and the judiciary. This narrower selection of services of general interest made it possible to define central settlements relatively transparently. With the addition of new functions, the definition of central settlements would be less transparent because the various functions appear in the same settlements and the addition of new functions would not offer significantly different results.
Proceeding from definitions of central settlements to date, we defined six levels of centrality (Table 1; Nared et al. 2017). Assessment of the overall level of centrality was made using an index of level of centrality (l_{cen}), indicating the average level of centrality from the four functions.

(1) $l_{cen}=\frac{\sum_1^4 f}{4}$

Table 1: Level of centrality for settlements and criteria for individual levels.

Level of centrality	Population*	Expected functions*
1. National center of international importance	≥ 100,001	– Public university – University medical center – Higher court
2. Center of national importance	20,001–100,000	– College, university faculty, or academy – Large general hospital
3. Center of regional importance	10,001–20,000	– District court – Junior college – Hospital – High school – Regional administration
4. Center of inter-municipal importance	3,001–10,000	– Health center – Local government office – Local court
5. Center of local importance	1,501–3,000	– Full primary school – Health station – Municipal headquarters
6. Center of rural importance	501–1,500	– Branch primary school

* The expected size of settlements and the expected functions could be adapted to the needs of each of the countries.

In classifying the settlements into individual levels of centrality, we defined the following classification limits (Table 2).

Table 2: Classification limits for defining levels of centrality.

Level of centrality	Centrality index value
1. National center of international importance	≤ 1.50
2. Center of national importance	1.51–2.50
3. Center of regional importance	2.51–3.50
4. Center of inter-municipal importance	3.51–4.50
5. Center of local importance	4.51–5.50
6. Center of rural importance	≥ 5.51
6a. Center of rural importance with fewer than 500 people	Fewer than 500 people and at least two functions

To be defined as a station area, the settlement should achieve level 4 or higher (1, 2 and 3).
In a later chapter the indicator is exemplified, for a station area, using numbers and diversity of services.

Assessing polycentric settlement system in Slovenia based on services of general interest

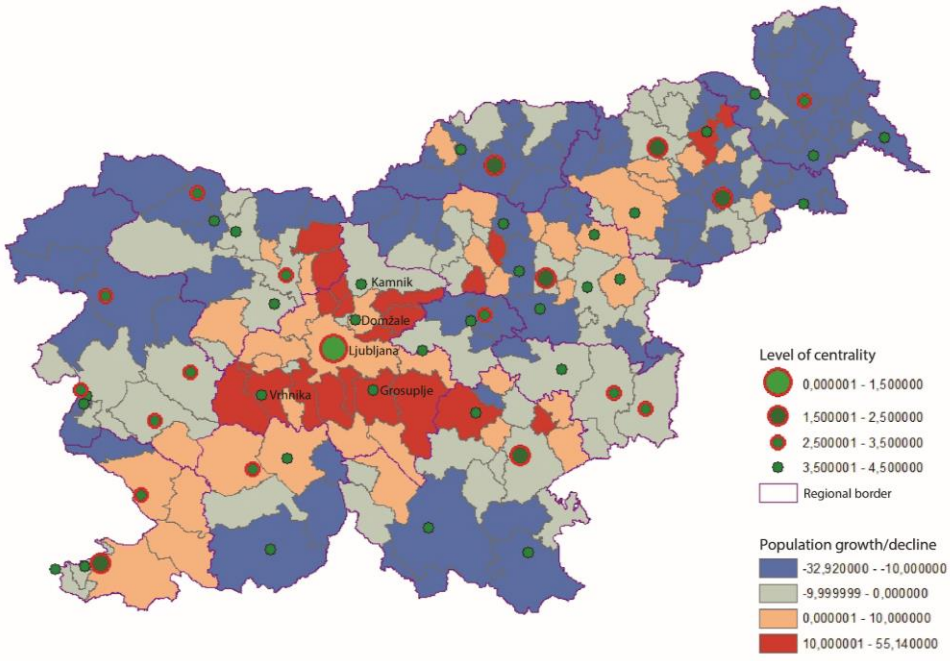
In 2016 a Slovene settlement system was analysed in order to provide necessary analytical inputs for the Slovene Spatial Development Strategy (Nared et al. 2017). In the analysis, settlements were grouped according to the level of centrality, using the criteria presented in tables 1 and 2.

Altogether, we identified 396 individual central settlements in Slovenia, 58 with centrality level 4 or higher, which would represent suitable locations for station areas in terms of service provision.

In Ljubljana Urban Region there are five cities fulfilling the mentioned criteria: Ljubljana is a national center of international importance, whereas Grosuplje, Vrhnika, Domžale and Kamnik are centres of inter-municipal importance.

Thus, In Ljubljana Urban Region there are five possible cities, where station areas could be developed according to the sufficient provision of services, however, the population in Kamnik is not expected to grow, which means Kamnik doesn't meet the first criteria.

Figure 11: Population growth in Slovene municipalities and central settlements (centrality level 4 and higher) in Slovenia.



4.3 ACCESSIBILITY BY PUBLIC TRANSPORT

Public passenger transport (PPT) should be of good quality and competitive regarding travel time, frequency and capacity. These requirements could be achieved only in the case of railway connections, exceptionally by very good bus connections on dedicated bus lanes – bus rapid transit (BRT). The requirements are:

- Travel time towards the regional centre should be lower or at least equal as by personal car. This condition should be applied at least at peak hours, preferably also at off peak time. Travel time to the regional centre should be 30 minutes or less, exceptionally up to 45 minutes.
- PPT frequency: Minimum 2 connections per hour in peak time and 1 hourly connection at off peak time, which means at least 23 daily connections. Higher frequency is of course desirable.
- Train (bus) capacity should be sufficient, seats should be available for all passengers.
- Integrated ticketing for trains, regional and city buses, and PPT information is essential.
- The distance to the railway station should be 1 km or less.
- Daily commuter flow (students and workers) from the local communes along the railway corridor towards the regional centre should be high enough to enable organisation of attractive PPT. We suggest the total number to be at least 5000 commuters.

Assessing PPT in practice

1. Check the travel time between the potential station area and the regional centre by using Google Transit, A to B applications or any other journey planner.
2. Check the frequency of connections using Google Transit or any other journey planner.
3. Check the availability of different transport modes, integrated ticketing.
4. Check the daily commuter flow (mainly accessible at statistical offices).

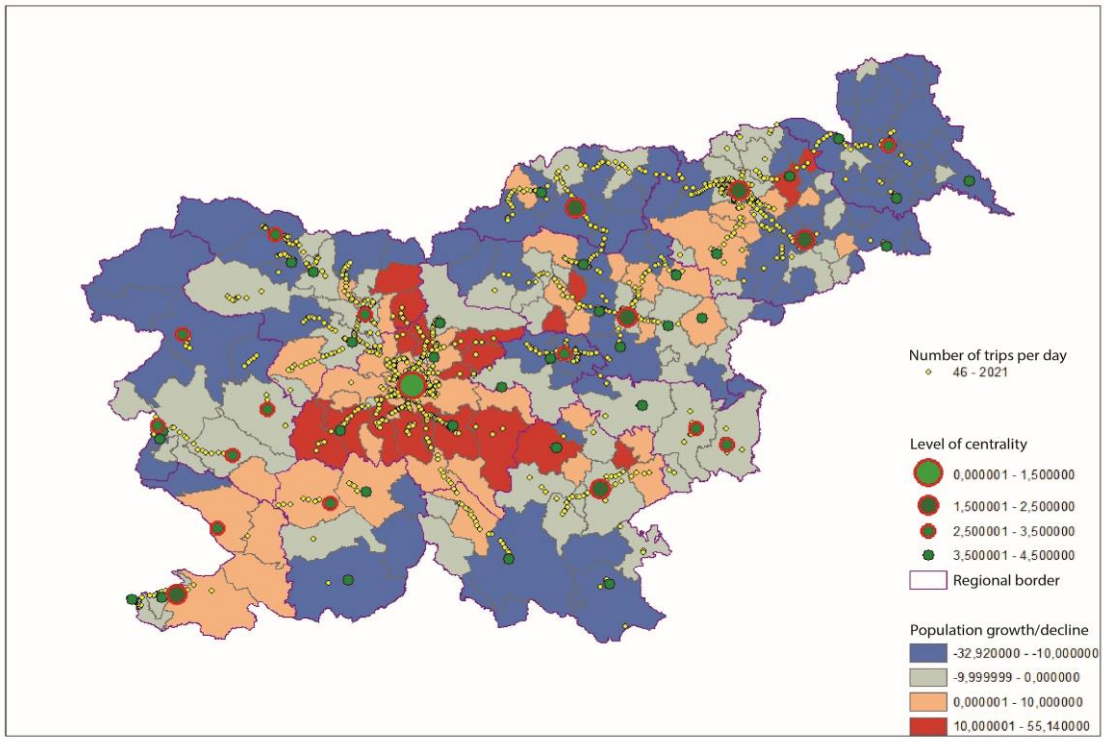
In case the location meets the aforementioned criteria, it could be further developed as a station area. Measures to improve the public transport between the station area and the nearby employment/regional centre is highly desired/recommended.

Analysis of accessibility to public passenger transport and identification of main gaps in its supply

In 2019, the accessibility to public passenger transport stops in Slovenia was analysed, using GIS tools (Gabrovec et al. 2019). In the study databases of public passenger transport stops, schedules and population registry were combined and merged and then the proportion of people living inside the 500 and 1000 m buffer of stops with suitable frequency of daily connections was calculated. Based on this data, it was possible to define public transport stops with sufficient provision of daily trips, which should reach at least 23 pairs per day.

After adding this parameter to the ones presented in the figure 11, we can observe the majority of central settlements with the centrality level 4 or higher have sufficient number of trips and consequently sufficient accessibility. However, just some of the locations have competitive public transport in terms of travel timest towards the regional centre (Figure 12).

Figure 12: Population growth in Slovene municipalities, central settlements (centrality level 4 and higher), and number of available daily trips by public passenger transport in Slovenia.



Assessing accessibility to public transport in Grosuplje

The town of Grosuplje is the administrative, economic and traffic center of the municipality. It is 17 km away from Ljubljana, the capital of Slovenia. The settlement developed along the old route between the Ljubljana Basin and the Krško Basin and is a crossroads of road and railway traffic (lines Ljubljana–Metlika and Ljubljana–Kočevje split here). The Grosuplje railway station has been active since 1893, when the railway line between Ljubljana and Kočevje was built, followed the next year by the railway line from Ljubljana to Novo mesto, being extended in 1914 to Metlika and Karlovac in Croatia. Due to a decrease in the number of passengers, the rail passenger line to Kočevje was gradually abolished between 1968 and 1971, but has been reestablishing after 2008 and is expected to start again in 2021.

The Grosuplje railway station is interesting for local residents mainly because it offers relatively favourable and quite fast access to Ljubljana, where the majority of commuters work. In Ljubljana, there are three exit train stations: Ljubljana Rakovnik (20 minutes from Grosuplje), Ljubljana Vodmat (24 minutes) and Ljubljana (28 minutes). Compared to the car (19 minutes to Ljubljana Railway Station), the intercity bus line (23 minutes) and integrated city bus line (50 minutes), the train line is a viable commuting option as it is not affected by heavy traffic on the corridor every single day, which often double the driving time to Ljubljana in the morning rush hour.

The spatial accessibility to the Grosuplje railway station (by foot, bicycle and car) was determined with the Isochrone tool within the QGIS software package on the basis of OpenStreetMap data. The analysis revealed the great potential of the railway station for being developed as a station community: 1574 people lives within the 5 minutes from the station, 5317 within 10 minutes, while within 15 minutes, which is usually perceived as an acceptable walking distance for railway users, 7750 inhabitants live, which means almost all the inhabitants of the town of Grosuplje and the nearby village of Brezje pri Grosupljem. Access to the railway station can be further facilitated by using a local city bus, which makes a circular ride through the town with ten stations (a round trip usually takes about 12 minutes).

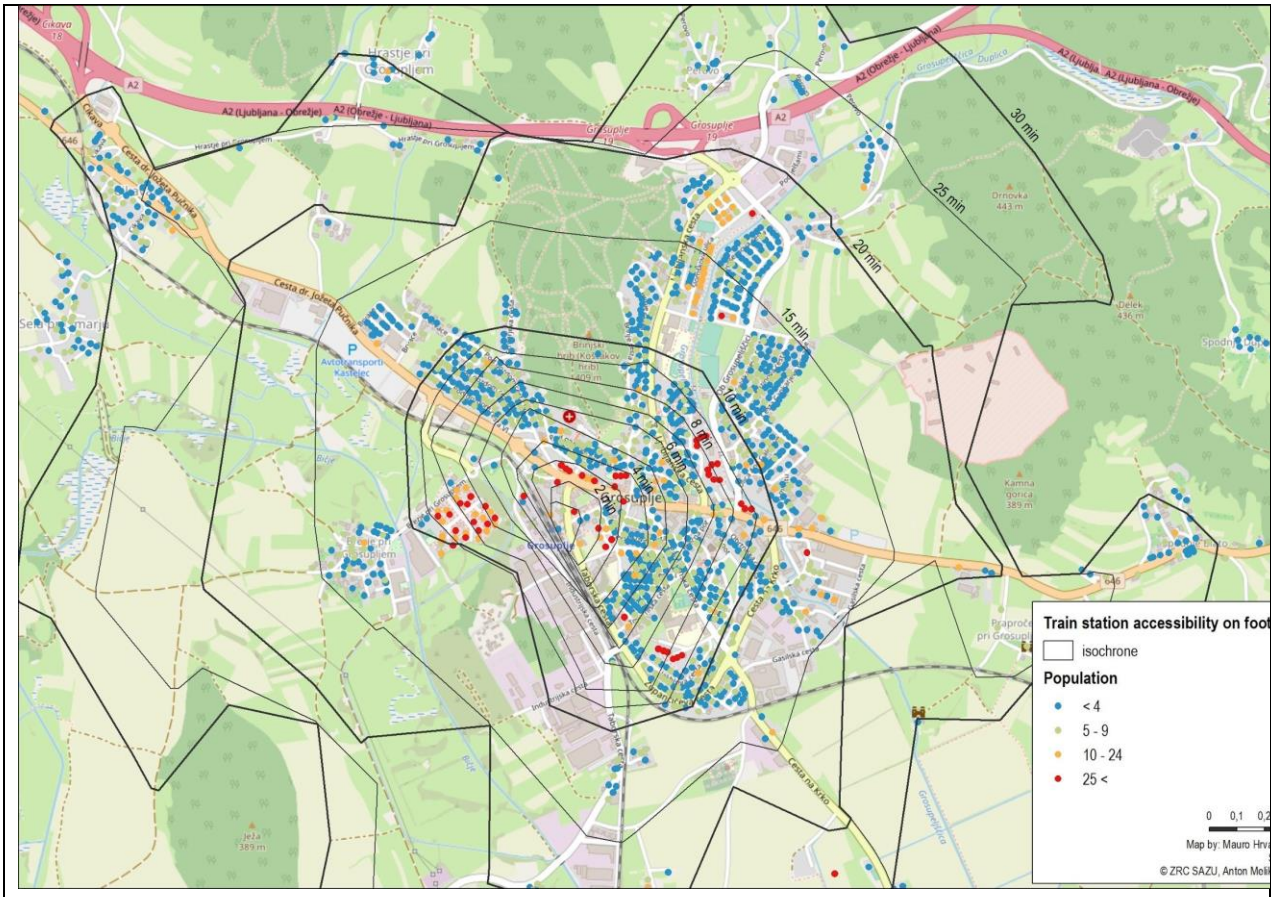


Figure 13: A basic assessment of walking accessibility to the Grosuplje train station.

Bicycle allows even faster access to the train station: 8136 people can reach the station in 5 minutes, more than 10,000 people in 10 minutes, which means all residents of Grosuplje and residents of the nearest surrounding villages, and more than 14,000 people in 15 minutes. At the train station, cyclists currently only have “a canopy” that can accommodate a rather limited number of bikes. The bikes there are partially protected from the weather, but largely exposed to potential thieves. In 2019, the secured e-bike storage was open, allowing storing and filling up to 8 electric bikes. In order to attract a larger number of multimodal (bike + train) commuters, it is necessary to install missing cycling paths from the neighbourhoods towards the station and set up a large, modern and safe bicycle shed for all types of bikes.

Access to the Grosuplje railway station by car is probably the most interesting for the inhabitants of the surrounding settlements. After just 5 minutes of driving, the station can reach 9971 people, after 10 minutes 17,558 and after 15 minutes 20,288 people, which is 98.6% of the total population of the municipality. As with bicycles, cars have parking problems. In 2020, a parking garage with a capacity of 222 parking spaces was opened in the immediate vicinity of the station and functions as P + R. Unfortunately, its use is currently being friendly only for those who want to continue their journey by city bus as the price does not cover the train ticket as well. However, the Slovenian Railways plan to build a parking platform with a capacity of 120 cars.

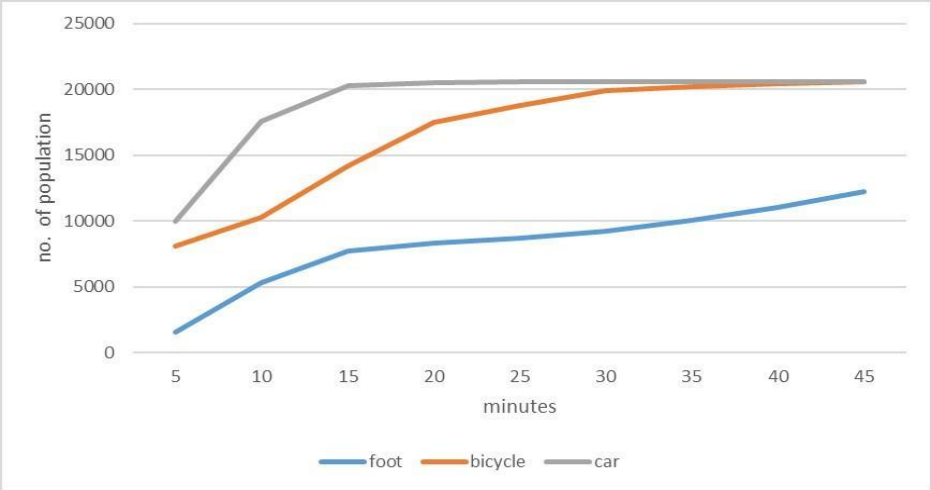


Figure 14: Spatial accessibility to Grosuplje railway station by transport modes.

Currently, 11 trains from Metlika, 3 trains from Novo mesto and 4 trains from Ivančna Gorica go through Grosuplje to Ljubljana every day. During the morning peak hours, the train leaves every 30 minutes. Two more trains from Kočevje are expected after the line will be reestablished in 2021. Grosuplje got its first bus connection with Ljubljana before the Second World War, and a regular suburban bus connection in 1971, when the bus started running every hour. In 2011, an integrated bus line operated by Ljubljana Passenger Transport was established with even higher frequency of drives, but with longer travel time. The number of train passengers from Grosuplje is not known. However, it would probably be increased significantly if the train frequency would be improved, especially during the morning rush hours. Another limitation of the railway line is that the railways are not yet integrated with the Ljubljana city bus system, which makes changing lines unattractive for commuters. An additional incentive may be the introduction of new trains, which is already promised in 2021, as current trains are decades old and therefore less comfortable.

In the area of Grosuplje, the busiest section of the A2 motorway between Grosuplje and Ljubljana is crossed by an average of 56,831 vehicles per day (in both directions; Directorate of the Republic of Slovenia for Infrastructure 2019). The hourly flow of car traffic shows two distinct peaks: the morning peak is the result of many daily migrants commuting to work or school in Ljubljana, and the afternoon peak is the result of returning daily migrants from Ljubljana back home. Among 9836 economically active inhabitants in the municipality of Grosuplje, around 2/3 (6402) commutes to other municipalities, while 4643 or 72.5% of the commuters work in Ljubljana (Statistical office ... 2019).

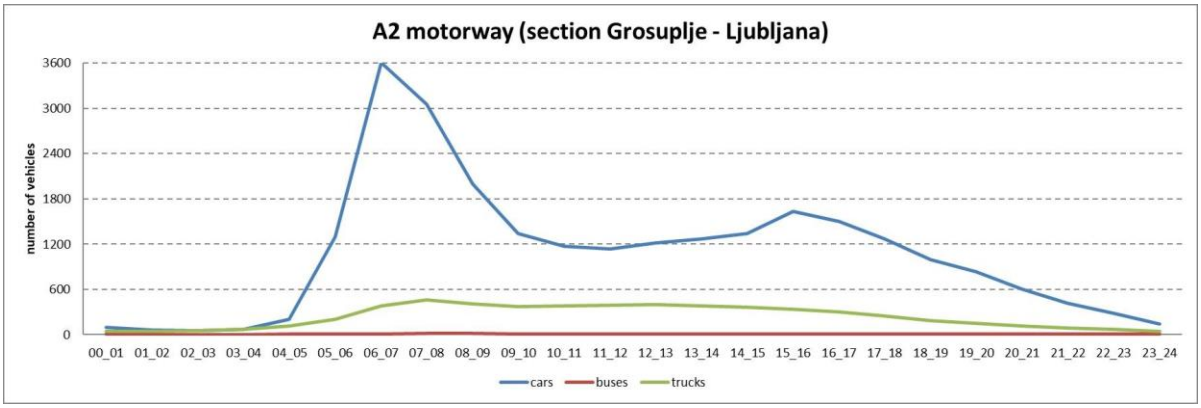


Figure 15: Average hourly traffic flows during weekdays from Grosuplje to Ljubljana (Directorate of the Republic of Slovenia for Infrastructure 2019).

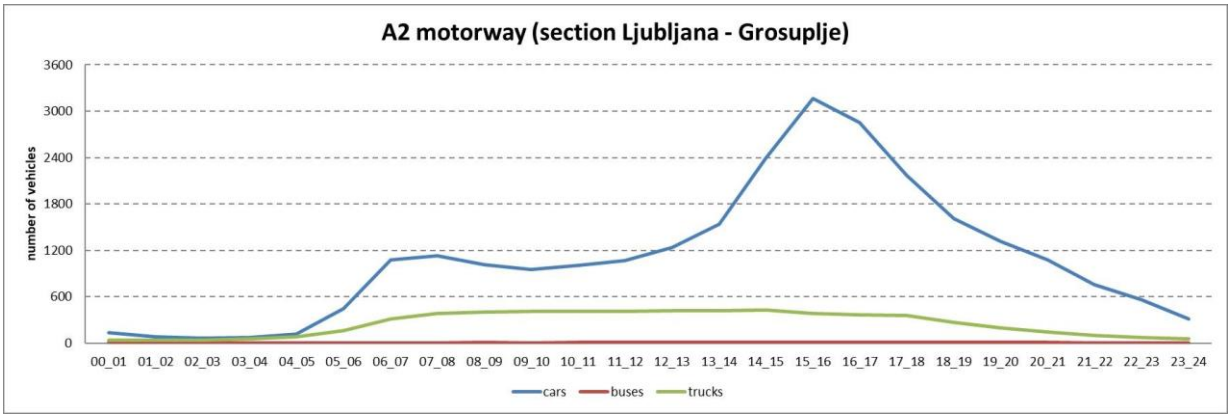


Figure 16: Average hourly traffic flows during weekdays from Ljubljana to Grosuplje (Directorate of the Republic of Slovenia for Infrastructure 2019).

All the results show that Grosuplje meets the aforementioned criteria and has a great potential to be further developed as a station area and contribute to reducing heavy traffic and encouraging sustainable mobility shift in the Ljubljana Urban Region. Measures to improve the public transport between the station area and the nearby regional centre should focus on introduction of new trains, higher frequency of trips, and further integration of the public transport system on the regional level, which would make a recently installed public parking garage more attractive for train commuters.

4.4 DEFINING THE POLYCENTRIC STRUCTURE AT THE REGIONAL LEVEL

By following the steps presented in chapters 4.1, 4.2 and 4.3, we can define a final list of locations that can form a polycentric structure of the metropolitan region (e.g. figure 12). Locations, fulfilling the mentioned criteria, can become nodes in a regional spatial structure and are thus suitable to be developed as station areas. These steps can thus be a crucial input into regional spatial development and mobility plans, presenting a general vision of the region, like the structural illustration in Gothenburg Region (Figure 18).

5 REGIONAL/STATION AREA ANALYSIS

After the polycentric structure at the regional level is defined, it is necessary to analyse interrelations among the station areas and conditions within each individual station area. The analysis must be comprehensive enough to provide detailed understanding of needs and potentials, however its design can differ from station area to station area based on the regional conditions, extent to which we would like to develop station areas, or fields we would like to particularly address (e.g. services, housing, land use, etc.). In developing station areas we primarily pursue the quality of life, meaning the station areas are locations where inhabitants will enjoy everyday life. To support this, their needs must be fulfilled both locally, and with sustainable travel modes, regionally. This chapter thus shows some indicators that are important when analysing and developing a station area.

5.1 METHODOLOGY

The definition of a station area is applied to a station area in Sweden. These regional analyses are made using data from the Swedish Statistical Office (SCB). Socioeconomic data are clustered to the buffer zones. Comparative analyses are therefore made possible between station areas in the Gothenburg region using a geographical information system (GIS) combined with Power Bi to visualize findings.

The methodology is exemplified using Ytterby station area, situated north of Gothenburg as an example (also used in the background study).
Some regional benchmarking is made to set Ytterby in its regional context.
Recommendations and indicators are given where possible. These should be seen in its regional context and can be adjusted to local situations bearing in mind that sustainability indicators often are universal. It is the fulfilment locally that can seem overwhelming but sustainability is built with the local communities as building blocks. The argument can be made that if sustainability is not achieved here, what other areas should be forced to compensate for this shortcoming, so that global goals can still be reached.

Regional benchmarking, in these examples using data from 50 station areas in the Gothenburg region, exemplifies and makes an understanding of the indicators.

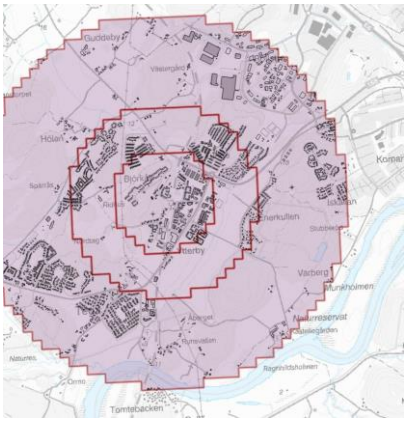


Figure 17. Ytterby station area, with buffer zones (500 meters, 1 and 2 km) and location of present housing.

5.2 DERIVING FROM THE REGIONAL POLYCENTRIC STRUCTURE

As shown in chapter 4.3, the regional mobility context, where to set the importance of the station areas is important. Polycentric structure must thus be adapted to existing transport corridors, predominantly rail corridors, but if the regional mobility is defined by a regional bus system, the bus nodes and interchanges can equal station areas in the analysis.

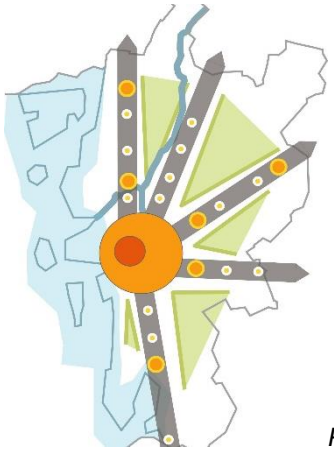


Figure 18. Structural illustration of the Gothenburg region.

In the Gothenburg region a structural illustration points out the station areas as one of the important structural elements for regional mobility. This structural illustration and its regional agreements are the main planning tool for regional spatial development. All local municipalities in the Gothenburg region have politically supported the agreements and local comprehensive spatial plans fulfil the intentions of the structural illustration. The structural illustration shows how the regional core is connected, within the transport corridors, to the station areas.

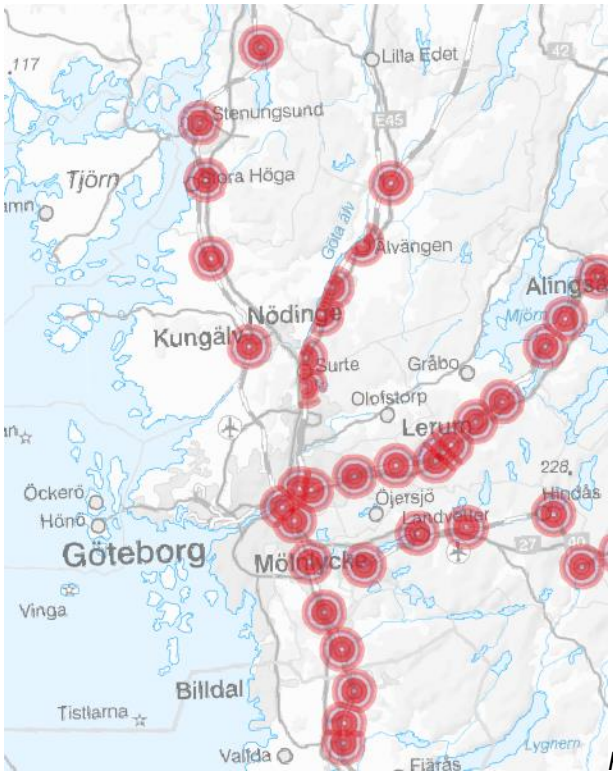


Figure 19. Station areas within the Gothenburg region.

Structural illustration (e.g. figure 18), development model or a map of concrete station areas (e.g. figure 19) can be further used for the regional benchmarking - when all the station areas within the region are in question, or to station area analysis, when an individual station area is in question.
Below we exemplify the process by focussing on housing, land use, density, business, location and mobility, green structure and land use, and services.

Housing

Housing, for present and potential new inhabitants, needs to be affordable. Public authorities may subsidize the cost of housing to varying degrees. Different system prevails in all European countries. National or local financed social housing is a common method. In Sweden, for example, housing costs are subsidised on a household level in reference to income. Thereby no social housing is built creating segregation. However, the important factor is that the local community has a mix of types of housing, single family houses, semi-detached houses and flats. Housing can be owned or rented. Depending on national circumstances regarding how housing is subsidized there is a clear demand for a choice of housing opportunities. Mixing different housing opportunities minimizing segregation and other negative effects of singular housing options. An indicator that is defined by the mix of different housing can be made.

Land use

Land use, in station areas, can be divided into categories. The guidelines divide the land use into developed land, street, public space and other land use as shown in the figure 4.
Station areas are often located within an agricultural area. Land used for agricultural purposes can be a valuable asset for developing the area into housing or services, however, the possibility for this depends a lot

on a regional context. The land use changes should be regarded in a wider context, prioritizing the use respecting the given limitations (e.g. high quality arable land) and potentials for a more sustainable settlement pattern. Namely, by allowing development only within suggested buffer zones urban sprawl will be curbed. Urban sprawl decreases density and makes sustainable travel less likely.

Ytterby has 1,5 hectare presently used for grazing within the 500 meter buffer zone and 5,8 hectare in the 1000 meter buffer zone.

The recommendation is to only allow use of land for development close to the station, buffer zone 500 and 1000 meter and minimize development outside these buffer zones.

Calculating land use for different usage can be done with various methods. One simple method used here is clustering different categories of buildings using a buffer of 30 meters calculating the built up area as an approximation of the plot floor space used in the study Sustainable density in station communities (Nordström, Swartz and Ståhle 2017). The plot floor space is defined as the floor space on the plot divided by the surface area of the plot. Using these plot floor space a development of 1.0 means that the building floor space covers the land space. Using a building with 2 floors the actual area will be covered half with building and half with open area. The figure 20 shows how 1.0 in development can result in different building alternatives.

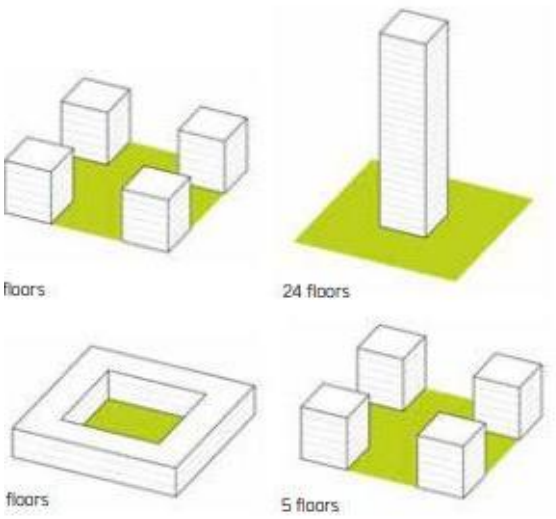


Figure 20: Different number of floors, same plot floor space (Nordström, Swartz and Ståhle 2017).

The recommendation is that 40% of the land is used for building purposes. Note that the plot floor space is equal in the example of the graphic.

The regional span of land used, in station areas, for buildings is between 9 and 95% for the 500 meter buffer zone. This shows that the potential for additional development varies greatly between the station areas in the Gothenburg region.
For the 1000 buffer zone the span is between 8 and 83% developed area for buildings.

The regional recommendation for buildings are between 40 and 60% area for developed land in the 500-meter buffer zone and between 30 and 40% in the 1000-meter buffer zone.

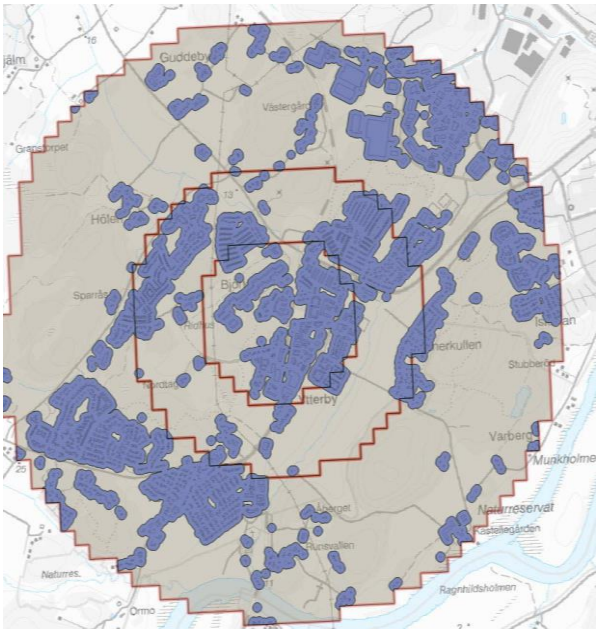


Figure 21: Calculating floor space using buffer of housing at Ytterby station community.

The share of different building categories can, in turn, be calculated within the developed land. In the Ytterby case the 500 meter buffer zone is 101 hectare. 61% of this buffer is used for buildings using the above definition. The developed area in the 500-meter buffer is used for housing (57%), for services (17%), and industrial use (4%). Unspecified buildings cover 22% of the developed area. The undeveloped area is 39% including street and public space. In the 1000-meter buffer zone 35% of the land used for buildings.

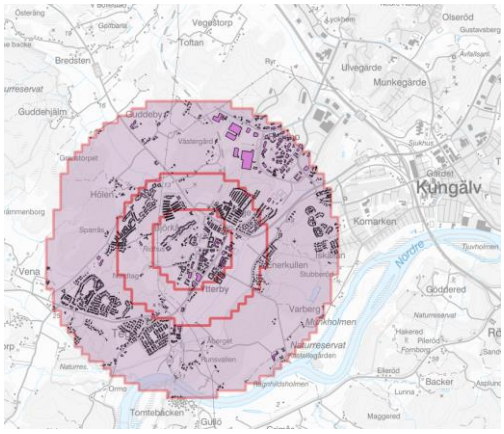


Figure 22: Calculating floor space using buffer of services at Ytterby station community (Lilaq).

The regional span for the share of housing in the 500-meter buffer zone is 38%, industry 19%, services 15% unspecified 28%. For the 1000-meter buffer zone it is 46%, 16%, 12% and 26% respectively.

It is even possible to evaluate the type of housing into subcategories. The analysis in the study, Location indicators for sustainable travel habits (GR 2019), shows that the station areas with a high share of single housing are more prone to use the car for necessary regional mobility (and even local mobility). In Ytterby the housing category of 57% can be split into 46% flats and 11% single family housing or row houses for the plot floor space. For the 1000-meter buffer zone the plot floor space 71% can be split into 6% flats 66% of single family housing. The figures of housing split indicate that a car dependency is increasing with distance from the station.

The regional average is 38% plot floor space used for housing in the 500-meter buffer zone and split into 50/50 for flats/single family housing. And for the 1000-meter buffer zone the 46% plot floor space is split into 17/29 flats/single family housing.

The recommendation for housing is that there should be a mix of flats and single family houses. The mix gives households a variety of housing options. A single family house uses more plot floor space and therefore reduces the density. As the plot floor space for flats does not include the number of flats it indicates that to achieve a high density a low proportion of single housing is required. Recommended use of mixed housing as an indicator will give an easy adaption of the universal recommendation for density to the local situation. The mixed use indicator can then be used as a tool enabling a focus on specific station areas where a change is necessary so that it contributes to sustainable density at the regional level.

Step 1. Specific examples from Ytterby

Step 2. Benchmarking with Gothenburg region. Ytterby will then be in relation to the regional situation.

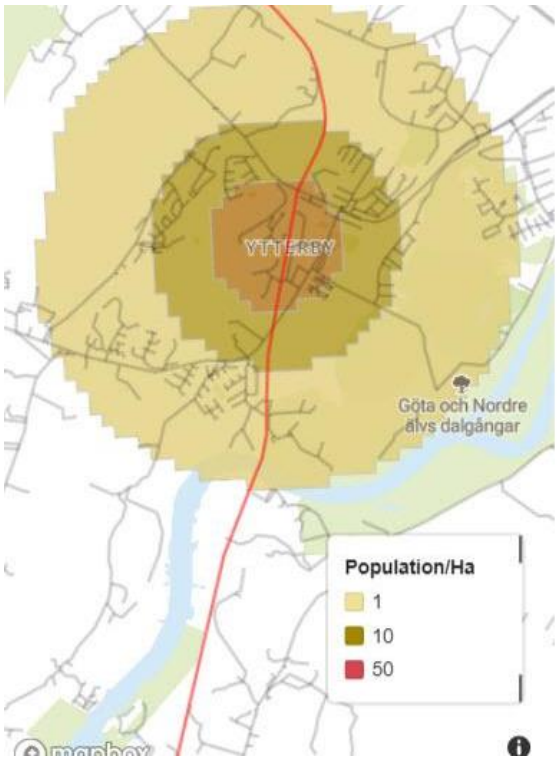
Step 3. Use the general recommendation for sustainable density i.e from the Ytterby study. Give this as the regional value of density to reach for.

Step 4. Discuss at the regional level or propose an indicator for mixed housing drawn from the benchmarking experience. i.e if the indicator in the region ranges from x to y the proposed indicator value could be set at the upper scope. This would mean that if all station areas mixed use indicators would be the same the recommended sustainable density level would also be reached.

Step 5. Use the indicator for mixed use when addressing spatial planning issues at the local station area.

Density

To achieve a high degree of local services and other amenities the number of inhabitants and workers in an area is essential. The figures for Ytterby show that the 500-meter buffer zone has 21 inhabitants per hectare while the 1000-meter buffer zone has 8 inhabitants per hectare and the 2000-meter buffer zone has 3 inhabitants per hectare. But the total number of inhabitants, 6900, is more or less equally split between the 500 and 1000-meter buffer zones, ranging from 2100 to 2600. The density reveals that in the centre, where the distances are short more inhabitants have reasons to use shared space and therefore there is a demand for organising such space. The same argument goes for the local entrepreneur when deciding where to locate a new café. Close to the station where most people have a reason for passing and potentially stopping for a cup of coffee.



Buffer_Natt Area_Natt	500 Population in Area	500 Density	1000 Population in Area	1000 Density	2000 Population in Area	2000 Density
Landvetter	2 252	23	2 643	10	2 581	3
Lerum	2 203	22	2 933	15	3 777	7
Lindome	1 952	19	2 998	12	5 539	6
Lisebergs station	2 732	27	14 336	58	42 802	63
Mölndal	3 170	32	6 862	27	20 288	21
Mölnlycke	2 430	24	3 886	15	9 562	10
Nol	794	8	1 561	6	1 591	2
Norsesund	152	2	275	1	1 433	2
Nödinge	1 639	16	2 456	10	1 928	2
Partille	1 679	17	5 582	22	13 158	13
Stendalen	854	9	1 099	4	1 214	1
Stenungsund	1 219	13	2 872	11	4 857	5
Stora Höga	432	4	758	3	2 539	3
Surte	1 442	14	1 140	4	2 779	3
Svenshögen	259	3	204	1	290	0
Sävenäs	1 283	13	9 971	49	20 005	33
Södra Lödöse	33	0	277	1	1 546	2
Västra Bodarne	646	7	439	2	308	0
Ytterby	2 099	21	2 109	8	2 584	3
Åsa	231	2	313	1	2 543	3

Figure 23: Population density in Ytterby, buffer zones.

The opposite argument goes for the outer buffer zone. The potential customer probably uses their car, out of convenience, to visit the facility.

The regional density in station areas is varying from 2 inhabitants per hectare to 36 in the 500-meter buffer zone. For the 1000-meter buffer zone the range is 2 to 58 inhabitants per hectare. The regional average is 13 inhabitants in the 500-meters and 11 inhabitants in the 1 000-meter buffer zone.

Table 3: From E-numbers to residents. The table shows how different measures of density and degrees of floor space can translate into numbers of residences and population

	District Floor Space Index 0.5		District Floor Space Index 1.0	
Measures of density	As the crow flies 500 m (π500²)	Per hectare (100x100 m)	As the crow flies 500 m (π500²)	Per hectare (100x100 m)
Land area (m2)	785 000	10 000	785 000	10 000
District floor space	0,5	0,5	1	1
Total GFA (floor area)	390 000	5 000	785 000	10 000
Proportion residents	50 %	50 %	50 %	50 %
Proportion workplaces	40 %	40 %	40 %	40 %
Proportion public services	10 %	10 %	10 %	10 %
GFA residential	200 000	2 500	400 000	5 000
GFA offices	160 000	2 000	320 000	4 000
GFA public services	40 000	500	80 000	1 000
Number of residents	3 900 (50 m²/pers)	50	7 800	100
Number of workers*	2 900 (50 m²/pers)	33	5 800	65
Total population	**6 900**	**80**	**13 600**	**165**
Residences (2 pers/residence)	2 000	25	4 000	50

It is possible to make a theoretical calculation to establish what density can be expected with different kinds of housing strategies. Using the calculations from the study “Sustainable density…” this table gives that 50% of the population should be residents and 40% workers and 10 public services (school, healthcare visitor etc.). The table to the right shows how to calculate population number based on two different density indicators and density levels. By multiplying district floor space with land areas, the total amount of GFA (floor area) can be obtained. This is then distributed over residents, workers and public services. A GFA of 50 sq.m. per person has been used to calculate the number of residents and workers within the different distances. Given these suppositions, the guidelines for floor space give a potential for 13500 residents and workers within 1 km of a station in current small urban areas (5-15000), 27000 residents and workers in larger urban areas (populations higher than 15000 today).

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The total area in a station community in the 500-meter buffer zone is 101 hectares and in the 1000-meter buffer zone is 256 hectares. Given the recommendation that some 40% of the area should be for building, the total area open for development will be 143 hectares. The other measurement is floor space development, with 1.0 all areas covered by buildings. In this area 80 inhabitants and workers, per hectare, are expected if a sustainable density would be achieved. In addition, the advised split between workers and inhabitants is 50/50. Using the figures for space per residence and worker means that in the 143 hectare area aimed for

development 33 workers (and 4 visitors to schools etc) per hectare means 156x37=5800 and the 156x50=7800 inhabitants. In total 13600 workers and inhabitants. Depending on development strategies the density reached will vary.
To simplify the calculation one can use housing typologies. 10 single family houses fill up 1 hectare of developed land space. If the 156 hectare available space is used for single family housing 1560 residences result in a total capacity of 3000 to 4000 inhabitants depending on average family size (2,3 persons/household is the average in Sweden). The sustainable density recommendation of 7800 inhabitants would suggest that using a different housing policy would give a potential larger population. Terraced housing would give a higher density as the land use is around 1,0 with up to 100 households per hectare resulting in 10 times the total inhabitants i.e. 30000 inhabitants if all the available land would be used for residence. Thus, a sustainable mix housing strategy can be created by using examples in the table 4.

	District floor space	Number households per hectare	Number of inhabitants	
Single family	0,1	10	230	
Terraced housing	0,25-1	25-100	600-2300	
Flats	1,0-2,0	100-200	2300- 4600	

Table 4. Examples of house references Photo 12_1, 12_2 and 12_3

Business

In Ytterby, only a small proportion of the inhabitants that work, have their work local (400 out of 3000). The rest work elsewhere, (2600 out of 3000). 900 out of the 2600 work at another station community and can potentially use the train service. This means that the proportion working and living in Ytterby is only 13%. In the nearby Business Estate “Rollsbo” just over 200 persons from Ytterby work. Rollsbo is situated within cycling distance, approximately 2 km from Ytterby.

The Gothenburg region has a workforce of 530,000. 73,000 of these both live and work within 1000 meters of a train station. That is 13,7% of the total workforce that both live and work in a station area. In addition, 190,000 workers live or work in a station area but commute from elsewhere. These figures show the potential importance station areas have for sustainable mobility in the Gothenburg region. It also shows that a majority of workers have either their workplace or their home located in a station area. One conclusion to draw is that the station has an important role as a mobility hub.

Workers commute into Ytterby to work at local industry and services.

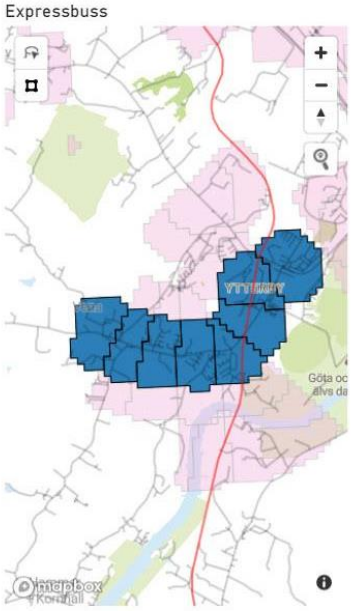
In Ytterby 450 workers from the outside come to work and their workplaces are mainly located in the 500-meter buffer zone. This means the indicator for density is increased by 4 workers per hectare.

Ytterby has a combined density for inhabitants and workers of 20 per hectare in the combined 500- and 1 000-meter buffer zones.
The regional average is 30 inhabitants and workers per hectare within 1 km from the station.

The recommendation is that 80 inhabitants and workers live in small station areas per hectare and 160 inhabitants and workers in larger areas. Small station areas can be defined as currently having a population of 5-15,000 residents and workers within 1 km of the station and larger station areas can be defined by having populations higher than 15,000 today.

Location and mobility
Ytterby is located three kilometres from the main centre of Kungälv Municipality. Kungälv centre has no train service, and regional commuting is made in Kungälv by a very frequent bus service. Some of which also is connected to Ytterby. The Ytterby bus station is located adjacent to the train station.
The motorway divides the municipality (and Kungälv) and provides high quality access to both Ytterby and Kungälv. Recently a dedicated bus lane has been added between Kungälv and the regional core city of Gothenburg.
The express bus system adds sustainable travel options for regional commuting. The map shows the 500-meter buffer zones of bus stops within Ytterby in blue and potential destinations within the express bus system. Some 970 inhabitants have a destination within the express bus system (direct and/or indirect). As rail and bus destinations overlap the choice is up to preference.

Attribut_från	500	Totalt
Ytterby vägskäl_500	273	**273**
Ytterby station_500	469	**469**
Ytterby brandstation_500	11	**11**
Vena_500	7	**7**
Tegskiftegatan_500	108	**108**
Kyrkbäcksgatan_500	35	**35**
Kanehallsvägen_500	5	**5**
Dannemarksgatan_500	62	**62**
Totalt	**970**	**970**



Attribut_till	Värde
Backadalsmotet_1000	10
Backadalsmotet_500	8
Bäckebolsmotet_2000	6
Dannemarksgatan_500	15
Delsjömotet_1000	5
Delsjömotet_2000	29
Delsjömotet_500	5
Eriksdal_1000	5
Fars Hatt_500	6
Frölunda Torg_500	5
Heden Nya Allén_500	5
Hjalmar Brantingsplatsen_1000	13
Hjalmar Brantingsplatsen_2000	21
Johannefred_2000	6
Järnvågen_1000	13
Järnvågen_2000	7
Kanehallsvägen_500	5
Keybageriet_500	5
Totalt	**970**

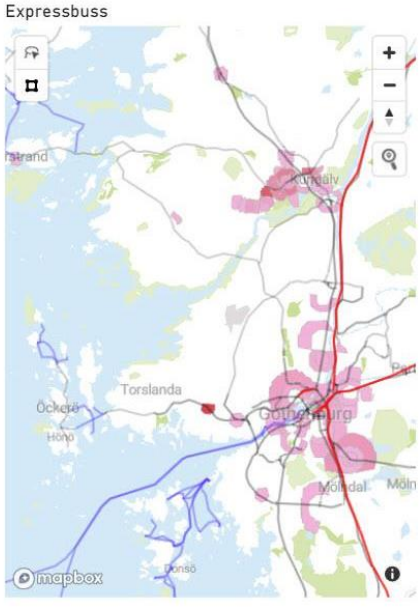


Figure 24: Commuting patterns if using express bus from Ytterby. Blue in the left map shows a 500-meter buffer from bus stops and pink in the right map shows access to workplaces. In total 970 workers have potential access using the express bus system to their workplace.

Ytterby Station Community has a regular train service of every 30 minutes. The single track is not allowing higher frequent service. The track is also used for industrial use at the nearby petrochemical industrial plant in neighbouring Stenungsund Municipality. Current initiatives to create double track depends on the possibility of creating a higher demand for regional commuting by rail, i.e. higher population in existing station areas.

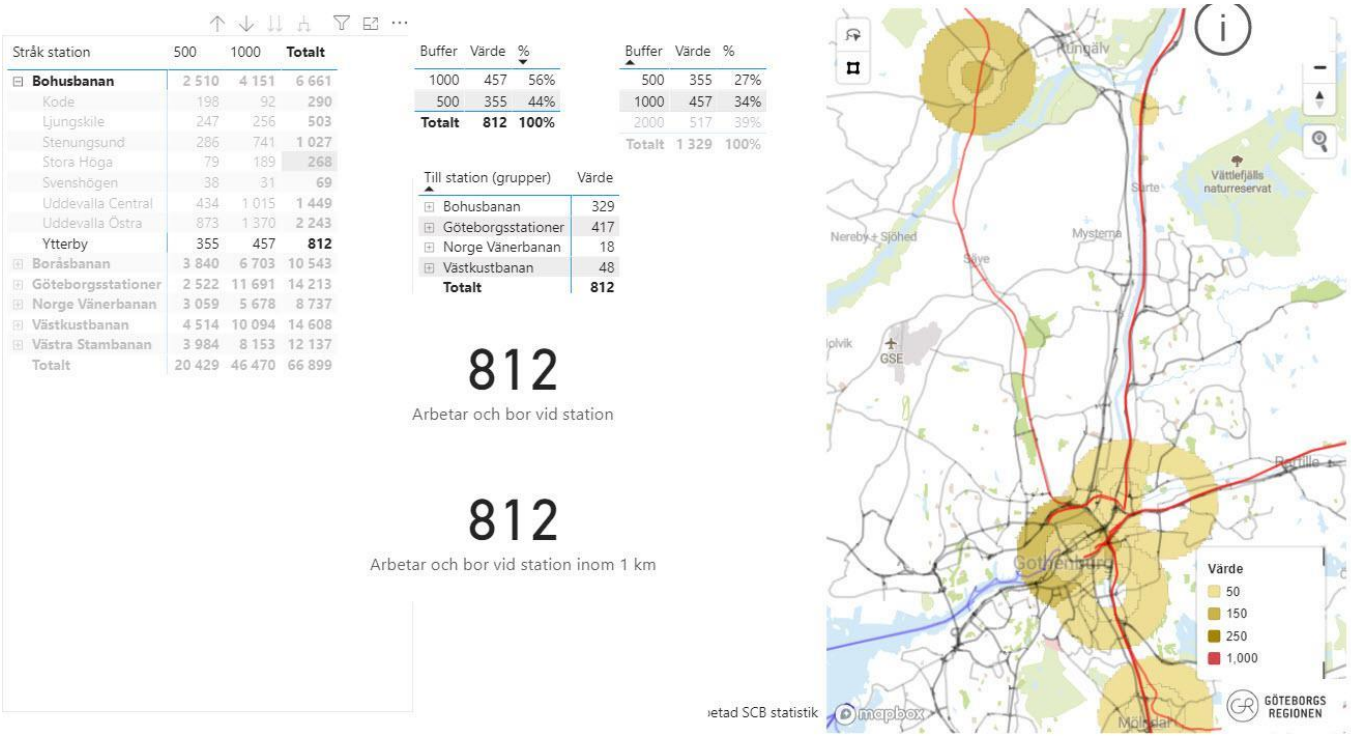


Figure 25: Commuting patterns if using rail from Ytterby. Using a 500 and 1000-meter buffer zone from Ytterby station the map shows access to workplaces located within the same distance from the station at the destination. In total 812 workers have potential access using the rail system to their workplace.

Sustainable travel modes include walking and cycling. Within the Ytterby station area it is possible to walk to work. Using cycling distances between train stations has made it possible to calculate the potential share of sustainable travel modes in these well-defined connections. In the case of Ytterby, the distance to the next station is more than 7,5 km. 7,5 km is set as a proxy for cycling on an ordinary bike. And 15 km for an electric bike. The station closest is Kode, 14 km. The number of commuters between these station communities is only 48 from Kode to Ytterby and none the opposite direction.

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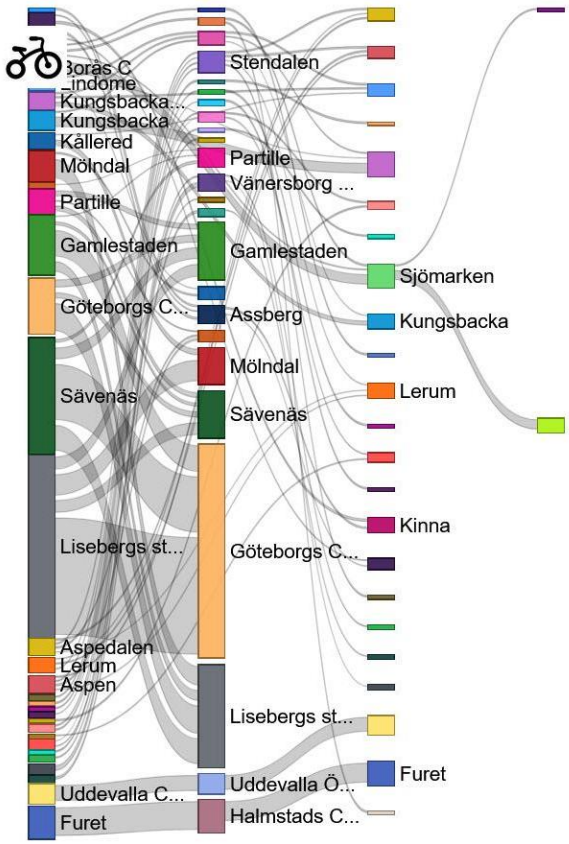


Figure 26. Potential accessibility using bicycle as a substitute for commuting by rail. The visual shows all cycling potentials, within 7,5 km, between station areas in the Gothenburg region.

Ytterby has a Park&Ride facility of 231 spaces for cars and also extensive bicycle parking. Both are in immediate access to the train and bus station. No information is available on how the commuters use these

spaces. Nor how the hinterland is defined, or how the train and bus system is used, or surveys over commuter destinations.

Green structure and land use

Exploitation of land in a station area is subject to fierce competition. Consideration to the needs of housing and accessibility should balance the needs of space for workplaces and services. Even the degree of densification of the area needs to balance the needs of the green area to create a liveable community. The recommendation of an efficient land use is to balance all needs to be both efficient and still create a pleasant environment (e.g. figure 3).

When exploiting the land with low density housing only a few inhabitants will have easy access to the station and the benefits regional commuting will give. High density of housing and workplaces will give an overcrowded situation. Thus, use the green structure as public space, with parks, jogging tracks or other use that benefits the local inhabitants.

The area closest to the railway station will have the most convenient regional access. Therefore, it is important to use the land accordingly.
One of the main conflicts will often be exploitation or preserving current use. In the Ytterby case there is a substantial area used for agricultural purposes. This land use is not accessible as a public space. Often it will even be a barrier that will mean less access within the community. Can some of the agricultural land use be used for recreation? Or should it be used for growing produce for local consumption? One obvious risk is that inaccessible land use will cause exploitation further from the station and create unwanted urban sprawl. Another aspect is how to enable sustainable development in the station areas, especially how to focus on biodiversity in relation to land use. Farming, especially when using intensive methods, has low biodiversity while land for grassing and marshes are higher in biodiversity. This distinction can be used when balancing exploiting and conserving the land. Recommendation is to favour exploitation of agricultural land that is monocultural and preserve land use that has high biodiversity.

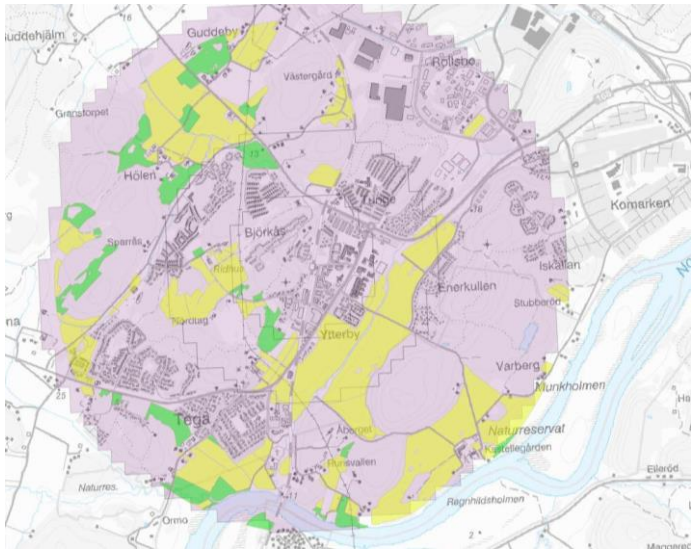


Figure 27: Agriculture land use in the Ytterby station community. Yellow monocultural land use (fields). Green high level of biodiversity (grasing)

Services
The indicator for services is defined with an increasing number of services and diversity. In defining the polycentric structure at the regional level we only used four basic services (public administration, health, education and judiciary), which simplifies the approach as many services co-locate in the same centre, however, in assessing the station areas these are more attractive if there are more services and also alternative outlets.

Ytterby has some services such as school, church, sports hall but is lacking many facilities.

By analysing the availability of some crucial functions, like grocery stores, pharmacies, post offices and petrol stations an indicator can be created, also considering the fact that present services constantly evolve due to new market situations. Online shopping with parcel outlets has gained importance, fossil fuel is expected to be replaced by charging stations, services like home delivery of food are becoming more frequent. This indicator analyses the present situation.

Indicator for services, based on four services - Grocery store, Pharmacy, Post office and Petrol station, can be developed, using four levels:

Indicator level 1, 2 of 4 facilities,
Indicator level 2, 1 of all facilities,
Indicator level 3, 1 of all facilities and 2 of 4 doubled,
Indicator level 4, 2 of all facilities or more.

Ytterby 500-meter buffer zone would with this indicator set up be between level 1 and 2 (Ytterby has 3 of 4 functions), Ytterby 1000-meter buffer zone has indicator level 1, and if we merge both buffer zones Ytterby would have indicator 3.

In Ytterby a school for pupils up to 16 years is provided. For the age group of 16-18, upper secondary education is provided at the centre of Kungälv or in Gothenburg. This is a situation shared similarly with all other station areas.
In the Gothenburg region all municipal and independent schools participate in the upper secondary admissions scheme, where all applications to the region's approximately 60 upper secondary schools are registered and allocated. The upper secondary course programmes available in the Gothenburg region can be applied for by all young people, regardless of where they live in the region.

In the 500-meter buffer zone of Ytterby there is a large grocery store including a post office, 2 pharmacists and in the 1000-buffer zone an additional petrol station with post office facility. Ytterby also has some local public administration facilities.

The regional average is to have at least 2 groceries stores, 2 pharmacists and 3 post offices with delivery of parcels and petrol stations meaning the area reaches Indicator levels 3 or 4.

Recommendation is that station areas have a full spectrum of facilities, both in number of facilities and diversity, located locally or accessible using public transport.

Untapped Potential of Station Area Service Development in the Helsinki Metropolitan Area

There are new rail investments in the Helsinki Metropolitan Region, like the Ring Rail Line and continuation of West metro, and the transverse Light rail connection is being built, so there is a lot of untapped potential in the station areas in terms of economic and service development.

According to analyses done in the Helsinki Metropolitan Area the service structure at station areas varies according to size of the stations. The size of the station area is defined by combining the number of residents and workplaces in 1000 m radar with the number of rail transport users on that station. However, the size does not directly implicate what kind of services can be found at and around the station. This reflects the challenges of profiling station areas. Many factors impact how the service provision develops.

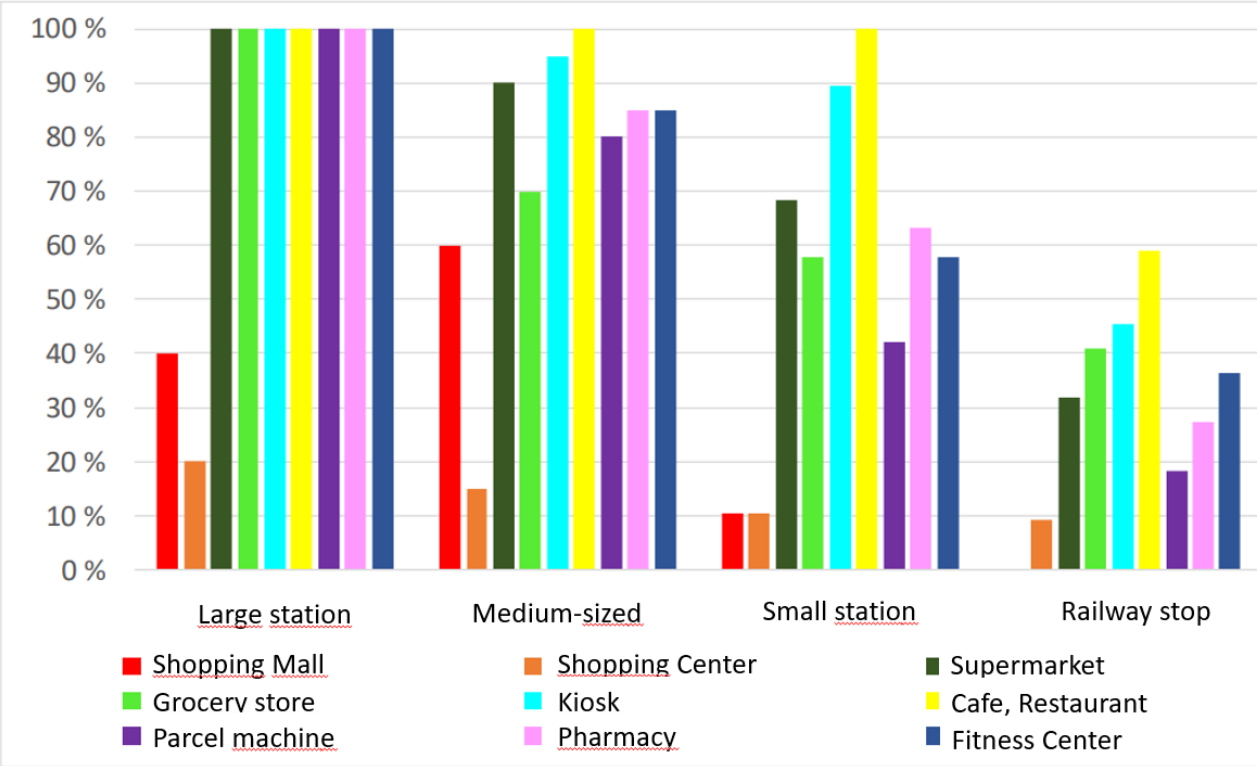


Figure 28: Provision of commercial services by the size of the station area (500 m radar) in Helsinki Metropolitan Area (WSP 2019).

Generally, provision of commercial services is large in station areas where the station is situated in the downtown area or where there is a shopping centre connected to the station. In suburbs where a shopping centre is situated further away from the station the commercial services around the station remain less. It is relevant to consider how stations connect to the existing service structure. The services are best available to rail transport users when they are located in the station building in very close proximity to the station. However, a traditional station building typically accommodates only a few services. One key challenge of developing station areas is that stations are not well connected to existing service structures.

A challenge is the scattered ownership at station areas. In order to fully exploit the potential of developing station areas there is a need to find ways to stimulate landowners to work towards shared development goals to develop multi-functional and attractive station areas. Further challenges have been identified:

Figure 29: Identified Challenges of Developing Stations as Places for Businesses (WSP 2019).

To make station areas attractive to businesses they should be "*close, dense and liveable enough*". There is untapped potential of developing station areas as nodes in urban structure, supporting the switch towards carbon-neutral urban environment and bringing the services close to the citizens.

Recommendations for developing station areas into business platforms include developing not only the commercial spaces, but also the urban environment around the station. Commercial spaces should be easily accessible, centralised and supporting each other, well located in terms of the micro location and flexible for multiusage. The station areas should be developed by connecting the station with the surrounding urban structure, prioritising station areas in the new housing development, and by developing a safe and comfortable urban space.

Developing Business Premises and Spaces
Close proximity with easy access
Visibility from the station
Centralization of services
Pop up possibilities
Reduction of experienced distance
Connecting station with urban and service structure
Good micro location needed
Planned together with service providors
Flexible spaces
Sufficient technical facilities
Possibility to spread to public space or to street
Large enough and easy to find

Developing Urban Environment
Comfortable and safe urban space with good lighting
Attractive urban space does not create the feeling of getting away
Increase the sence of place and place making
Improving reputation and image
Increase of new housing
Close, dense, and liveable enough
Safe, stress-free and shared space
When a space is not attractive to people, it is not attractive to businesses

Figure 30: Recommendations to develop station areas as places for businesses (WSP 2019).

The Smart Stations project (ERDF 2018-2021) in the Helsinki Metropolitan Area promotes the potential of station areas as development platforms of new low-carbon and climate-friendly services. The project develops stations for low-carbon businesses through concrete piloting and experiments and promotes private-public co-operation in enabling a climate-friendly lifestyle in metropolitan areas.

6 GATHERING POLITICAL SUPPORT FOR THE PARTICIPATORY PROCESS

Due to comprehensiveness of the challenges posed by global warming and complexity of the solutions provided, the station area concept requires a deliberate and thoughtful support of all the crucial players: politicians as decision-makers, planners, experts, public transport providers, citizens, and economy.

Integrating public views, ideas and visions into planning decisions gives the decisions greater legitimacy, and it also increases the public's empowerment, initiates a process of social learning, and builds local knowledge.

However, participation as such is not enough if it is not clearly connected to the planning and decision-making processes in a way the all involved understand the frames for decision making. An efficient and result oriented participation process elaborates how, when and by whom decision making is done – what are the decision-making paths in the organization and most importantly the schedule of planning and decision making. The relevant and important issues for that planning level and decision-making processes should be discussed in advance. The proposals to improve the plans towards liveable, climate friendly society can be implemented in the decision-making process. It is essential that no false impression of ability to have impact is generated. When there are no intentions of investments or real aims to change the status quo, disappointment for the participatory process might evolve. Contrary, a shared understanding of what can be impacted and in which phase of planning generates trust in the process.

To ensure this, the participatory process must be fully endorsed by the political structure that is in charge of decision-making. Politicians' support and their commitment to follow the results of the participatory process are crucial components of the participatory process, providing motivation to participants who believe their effort might result in better decisions.

Why adopt participatory process?

Politicians should be aware of the benefits that can be gained by the participatory process. It increases the legitimacy and quality of decisions and ownership, it can generate greater trust in open and accessible administration, and a greater objectivity of views on unresolved challenges because anyone interested in the matter is also acquainted with the opposing viewpoints (Nared 2020). It results in sustainable and supportable decisions that reflect community values, agency credibility and faster implementation of plans and projects (Sagaris 2014). This way participation contributes to robust projects or, according to Hong (2018), the quality of projects is more important than their speed or cost.

The participatory planning process usually takes longer than the traditional planning processes, but it can ease the implementation of the project/measure to the extent that it justifies the additional resources and time. Overall the participatory process enables easier and faster implementation of transport planning because the measures are coordinated among the key stakeholders (Nared 2020).

How to start the process?

There are two prerequisites for the effective implementation of participatory processes and participatory planning (Nared 2020):

- the political will of the decision-makers to actually allow stakeholders to influence decisions on the decision makers and

- suitably selected methods with highly qualified planners.

At the very beginning of the process, it is vital to highlight its purpose and potential limitations and explain how the results will be included in the plans. This limits the (potentially too high) expectations of the participants and also provides some justification if the results of the participatory process cannot be fully enforced in the plan for financial or other reasons. In this case, it is necessary to honestly, truthfully and clearly present the reasons for the situation (Nared 2020).

Things to have in mind

The participatory process must be tailored to the concrete conditions both in terms of the participating stakeholders, the methods used and the intensity of participation because sometimes more frequent stakeholder participation is required and sometimes none at all (Nared 2020). The selection of methods is key for reaching the widest possible range of residents (Hong 2018), whereby the methods employed must be able to capture and promote the residents' knowledge and awareness (Sagaris 2014; Swapan 2014).

It is of crucial importance to prudently include various and all the relevant stakeholders, to provide highly qualified and experienced facilitators for providing a good command of the required methods, sufficient information and awareness raising. The results of the participatory process must be included in the final plans and policies (Nared 2020).

The differences in participation across various territorial levels are also important. At higher territorial levels or in more complex projects, the participatory process is based primarily on highly qualified institutional stakeholders and the representatives of individual resident groups. At the local territorial level, the participants' engagement is greater since the projects are usually more concrete, less abstract and easy to understand (Nared 2020).

Planners are the bridge to participants

In addition to the role of politicians as key decision-makers, the role of planners is especially important. Planners play the key role; through their expertise and experience, they must ensure suitable participation of all groups and thus contribute to highlighting joint interests (Nared 2020). Planners can ensure "mutual learning between the expert-based knowledge and experience-based knowledge". They should provide expert knowledge to the public administration representatives and, together with them, also enhance the participation of organizations whose expertise can help the residents. They can also approach the residents directly, using communication to imprint a sense of ownership on them and help them develop the skills to engage in autonomous participation (Hong 2018).

The trust in the planners or experts and the expectation that the results will in fact be included in the plan are crucial for resident participation and the resulting success of measures (Nared 2020). This trust can be maintained by including the decisions adopted in the process into the plans, using well-thought-out participation methods, and through work that convinces participants that they can influence the decisions (Nared 2020). This shows the need for well-qualified planners and facilitators that must be well acquainted

with the situation and well-versed in methods. To avoid a negative experience, planners must reflect on and prepare their interventions well before starting to work with stakeholders (Dionnet et al. 2013).

Key challenges in the process

Various types of stakeholders; politicians, planners, public administration and residents, play various roles in the participatory process (Nared 2020). Wealthier and well-connected investors and decision-makers may obtain expert opinions and exploit the governance structures to achieve their own interests, whereas the residents are left to their own knowledge and abilities (Pacione 2014; Sarzynski 2015). Even though all the stakeholders in the participatory process must strive for a strong sense of community (Hong 2018), it should be noted that every stakeholder group has its own tasks and expectations, which is why they never fully advocate shared interests, but seek to reach their own goals and convince others with their arguments (Pütz 2011).

Convincing the residents about a project's usefulness without first considering and including the people's needs and expectations in the project most likely leads to failures in both the participatory process and the project or plan itself (Sagaris 2018). However, resident participation depends on the local context. In terms of metropolitan regions, for example, participation can be discussed within the context of their governance, whereby not only residents, but also various territorial levels, sectors, institutions, and associations must be involved in managing and preparing plans. This results from the division of competences among various administrative units and sectors that often neglect integrative planning because of their own interests and partial plans (Pacione 2014). A common learning process and participative planning are of crucial importance for achieving better governance and must be supported by active involvement of institutional and non-institutional actors from the entire functional area (Nared 2016).

7 IDENTIFICATION OF STAKEHOLDERS AND THEIR PERSPECTIVES/ VIEWS

Stakeholder mapping

A careful selection for relevant stakeholders is essential because it is the basis for all further steps, as the chosen stakeholders will be implementing the idea of sustainable and liveable station areas. There are many ways to identify stakeholders for a process, but it has to be done in a methodical and logical way to ensure that stakeholders are not easily omitted. This may be done by looking at stakeholders organizationally, geographically, or by involvement with various process phases or outcomes. It is important to understand that not all stakeholders have the same influence or are equally affected on a process. On the one hand, there are stakeholders who may be directly impacted positively or negatively by the process, and on the other hand, those who may be indirectly affected by the outcomes of a proposed intervention. Examples of directly impacted stakeholders are the project team members or a customer who the process or project is being done for. Those indirectly affected may include an adjacent organization or members of the local community. Directly affected stakeholders, usually have greater influence and impact than those indirectly affected (What is … 2017).

The **identification of stakeholders** can be done through (Bole and Bigaran 2013):

- brainstorming process which enables the project team to collect a list of people/groups/institutions,
- studying documents, initiatives, and expertise related to the topic,

- conversations with individuals and representatives of various organizations,
- browsing websites connected to the pilot area to see the local offers, masters,
- field work (interviews, questionnaires).

The **identification criteria of stakeholders** for the building station areas have to answer 5 questions:

1. Who are the public authorities / knowledge institutions / civil society / business or stakeholders from economic activities that are interested in the management of station areas?

2. What is their role (policy provider, knowledge provider, direct user, indirect user …) in a process?

3. Who are the potential beneficiaries?

4. Who might be adversely impacted or has constraints about the process?

5. Who may impact the process or has a power to influence?

When the stakeholder identification process is finished you should have a comprehensive list of groups of all of the potential project stakeholders with their characteristics, such as geographical scope, sector of activity/field of intervention, institution, stakeholder classification, contact person and role.

Reaching the potential stakeholders

The next step is reaching the potential stakeholders. One way is to reach them through online and offline social and professional networks which enable us to find stakeholders with common or relevant interests. A personal email should be sent to the potential stakeholders and other key players with the purpose of cooperation. If necessary, it is recommended to phone call them and invite them to join the idea of taking part in the governance process. If possible, involve leadership (dean/director of the institution) as co-organizer of the working groups (employees are more inclined to participate when asked by higher management).

Mapping these relationships and content will help you identify creative ways to reach your stakeholders and earn trust and referral. It can also help understand social influence, political context and potential risks. In order to reach all the potential stakeholders the approach is usually based on informality and active listening, that means „*to be able to set aside one´s own ideas and perspective and be willing to give a chance to the other participants to convince one of their ideas*“ (Bole and Bigaran 2013, 7).

Questionnaire

In order to gain participants´ interest, the participation process should be facilitated and specifically designed to the theme, situation or problem. Therefore, raising the right questions and issues could provide manifold results, a common learning process and innovative ideas arising from confrontation of ideas. Powerful questions invite inquiry and new potential stakeholders. Questions in order to get more information about their connections to the topic are needed. Take time to design specific and clear questions that need to be asked (Alfarè and Nared 2014).

After contacting the potential stakeholders, send them a questionnaire in order to obtain key information for further in-depth analysis of the relevant stakeholders. Based on the questionnaire develop a **stakeholder list** with their characteristics, such as:

- type of stakeholder and their perspectives;
- field of activity;
- area of activity;

- main objectives of the organization for the participation in the station area development;
- confidence and experience in inclusive governance processes;
- confidence and experience in developing station areas;
- what aspects of the pilot area management are of interest for the organization;
- interest of engagement in the development of station area process;
- what could be the influence of the organization in the development of the station area.

Classification of stakeholders

Group the relevant stakeholders for the pilot area based on the Interest-influence matrix. This matrix considers the relative interest of a stakeholder in the management of the station areas versus their level of influence over that issue or decision in order to create a stakeholder map (Dearden et al. 2003; Hunjan and Pettit 2011; Maguire, Potts and Fletcher 2012). Using this approach, classify the stakeholders **as *key players, context setters, subjects and the crowd***. It shows in an understandable way which stakeholder categories demand priority attention.

The first step is to list the stakeholders that represent those who have an important role in the project's development (which were contacted via questionnaire in order to identify their interests for the pilot area). Then insert the names of stakeholders in the four quadrants of the grid. There should be between five and ten individuals in each quadrant (Programme Manual 2017). Focus on the stakeholders located in the upper-right box that represents the stakeholders with high interest and high influence/power. One of the important steps is also to discover which stakeholders might help to develop the process and how, to detect their needs and aims and mark the already existing cooperation or networks between them. The stakeholder list needs to be constantly updated during further steps.

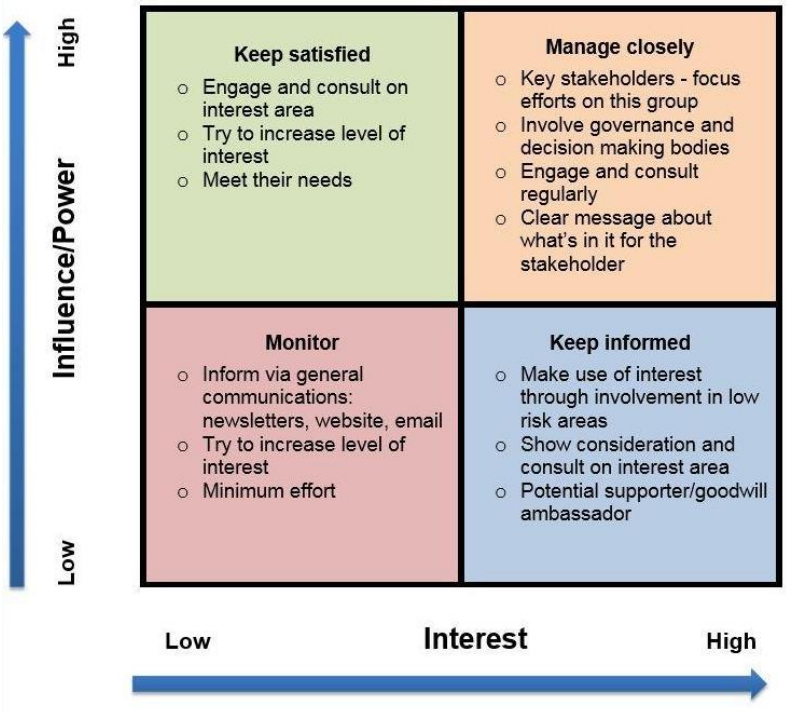


Figure 31: Interest-influence matrix used to identify stakeholders with differing levels of interest in and influence over your research (Programme manual 2017).

Group the stakeholders with high interest and the higher influence/power in the process (upper right box), to four main pillars: public authorities, knowledge providers/institutions, civil society and stakeholders from the economic activities/businesses. In terms of stakeholder' heterogeneity is recommended that all four main pillars are equally represented. If this is not the case, you have to include also those stakeholders with a medium interest and influence/power in the participatory process.

After grouping the stakeholders, the following reflection helps to validate the findings and to prevent forgetting some of the important ones (ODA 1995):

- Have all relevant stakeholders been listed?
- Have all potential supporters and opponents of the project been identified?
- Have the interests of vulnerable groups been identified?
- Are there any new stakeholders that are likely to emerge as a result of the project?

All the stakeholders should be included in the further process of implementation of station areas and should be in a later phase in-depth interviewed. The interviews should be structured and should focus on the characteristics and challenges that the pilot area is facing, the opportunities and threats, as well as the role of each stakeholder. Particularly, stakeholders should not only be evaluated according to their type (e.g. daily commuters), but also according to their perspective (e.g. commuters in favour of public transport, commuters in favour of personal cars). The interviews should contribute to the understanding of different interests involved and to the evaluation of the potential involvement of the main stakeholders.

An outcome of this mapping process is a stakeholder register with an emphasis on the interested and influenced ones. This is a necessary tool during the development of station areas and provides significant value for the project team to communicate with stakeholders in an organized manner (What is … 2017).

Case from Helsinki region: selection and involvement of the relevant stakeholders in Malmi station District

On the regional level the involved stakeholders should be carefully selected. During the Malmi vision making process there has been an attempt to communicate and cooperate widely with the stakeholders of the project in order to map the needs and wishes for the Malmi renewal. Openness has created trust, interest to develop the area and synergy between the actors of the area. It is recognized that trust, mutual respect, and clear rules are important elements of the process.

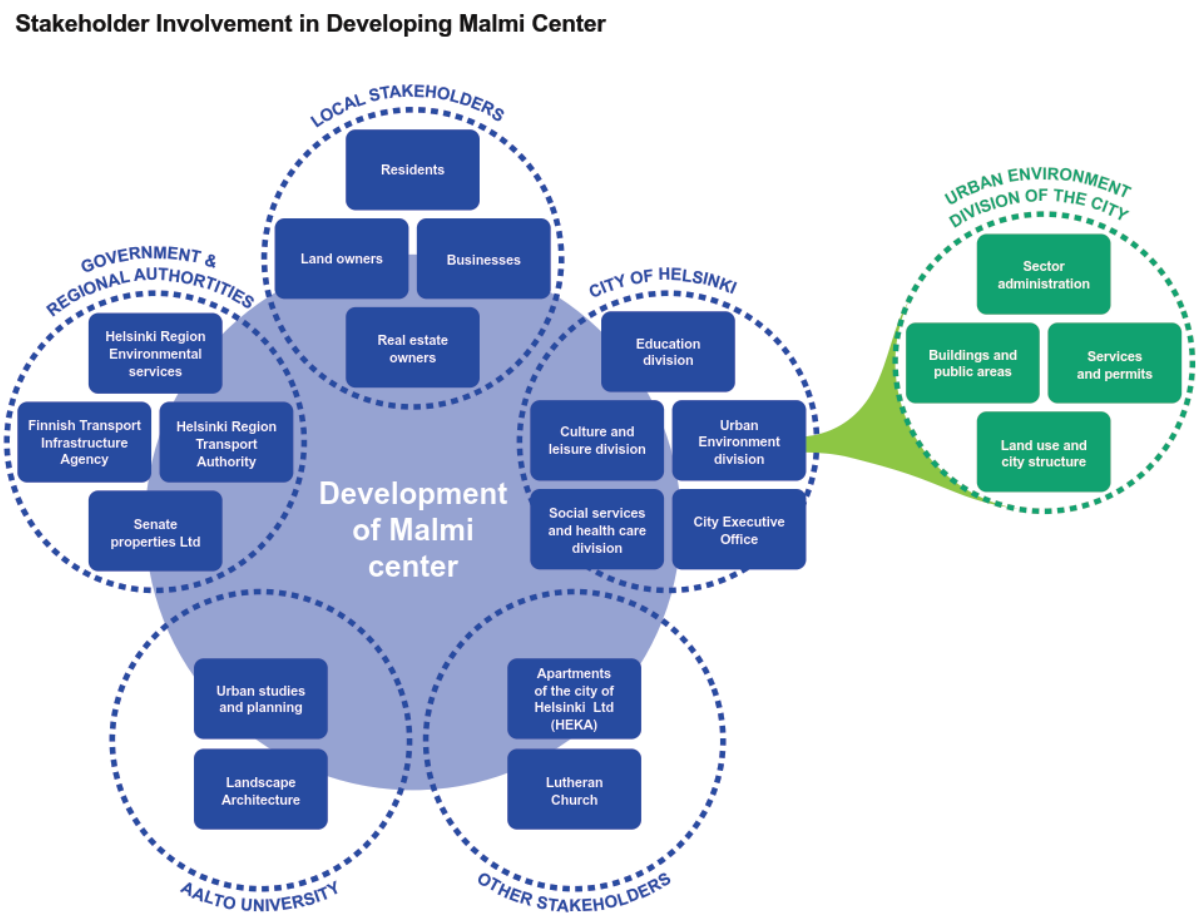


Figure 32: Stakeholders involved in Malmi vision making process (adapted, Mentula 2020).

8 LEADING PARTICIPATORY PROCESSES TO BUILD JOINT VISION, AND TO CREATE SHORT-TERM AND LONG-TERM EFFECTS/MEASURES

Participatory planning is planning that includes stakeholders in the planning process. Successful management of public participation makes the planning process more effective by narrowing the gaps between different perspectives, shaping solutions acceptable to all social groups, preventing unproductive competition, ensuring the participation and motivation of local actors, participants' identification with decisions that concern their environment, and strengthening their creativity and recognition.

Important part of creating the context-specific participatory process is building a joint vision together with the stakeholders. Involvement of the key stakeholders early in the process enables them to bring forward the most important goals of their organizations.

Participatory planning should be integral part of planning in all fields and at all territorial levels

Coping with climate change requires intensive cooperation among all administrative levels, sectors, governmental and nongovernmental bodies, academia, and the public. Governance thus plays a significant role. It can only be effectively realized by acknowledging everybody's part in the adaptation process and

allowing everyone to speak. Measures, investments, and activities should follow a well-defined strategy, which must be tested within the participatory process, engaging all the parties affected. Therefore, participatory planning should become an integral part of planning in all fields and at all territorial levels. This includes coordination among administrative levels (local, regional, and national authorities), sectors, nongovernmental organizations, and the general public. Participatory process must start at the very beginning of the planning process and should be sufficiently promoted to engage all the relevant and interested parties (SMART-MR 2019).

Furthermore, planning processes at the local and regional levels depend greatly on the local or regional context: the government structure, natural and social features of the area, the legal framework, stakeholders' engagement, and so on. For this reason, the participation process must always address local specifics by raising the right questions, involving relevant stakeholders, and following local and regional traditions and habits. The participatory process should have clear rules agreed upon from the beginning. The scheduled timetable for the decision-making process is important information for the participants: Who will decide, about what, and will the decisions be guidelines or more binding legal frameworks for developers and landowners and what is the right level of issues solved details expected in each levels of participation.

Due to specific government structure, legislation, and natural and social features, planning is specific for each region, as are the actors that should be involved in the planning process. In combating climate change and ensuring sustainable and resilient mobility in metropolitan regions, the transport sector must be addressed together with land-use planning and the housing sector. Consequently, participation is mostly institutionally based. It takes more effort, time, and energy to establish a strategy, whereas the results are long-lasting and ensure smoother implementation of the strategy (SMART-MR 2019).

Joint vision towards the station area - what we need to transform?

The station area concept aims to create a joint understanding, what are the possible actions to promote the change towards a liveable urban community focusing on the station areas transformation. The concept provides a thematic structure for the diverse issues and actions which will support the urban transformation, accessibility and human behaviour. The concept provides a common understanding for all stakeholders, to identify which are the issues that will have impact in planning, implementation and in maintenance.

To define joint vision and necessary measures, we suggest to follow the Low-Carbon District concept that provides a framework for the low-carbon station area transformation. It consists of four sectors: 1. Land use, 2. Housing, 3. Mobility and 4. Services and livelihoods. These sectors have been examined through four cross-case sustainability themes: climate change mitigation, climate change adaptation, circular economy as well as social sustainability and health. Based on this cross-case analysis more than 70 measures have been developed. All together, these measures create a three-stage path for progressing towards a low-carbon station area according to the impact that a measure can have on the four sustainability themes. The measures have been classified to have a small, medium or significant impact on sustainability. For instance, a small climate change mitigation impact in the land-use sector can be achieved when walking, cycling and public transportation are prioritized in the transport planning of the station area. A significant impact in turn can be facilitated when the station area is designated in the land-use development plan as an environmental zone, allowing only low-emission vehicles to the area.

The measures are presented in The Low Carbon District (LCD) planning tool which can be used in delivering any low-carbon, district-scale development projects.

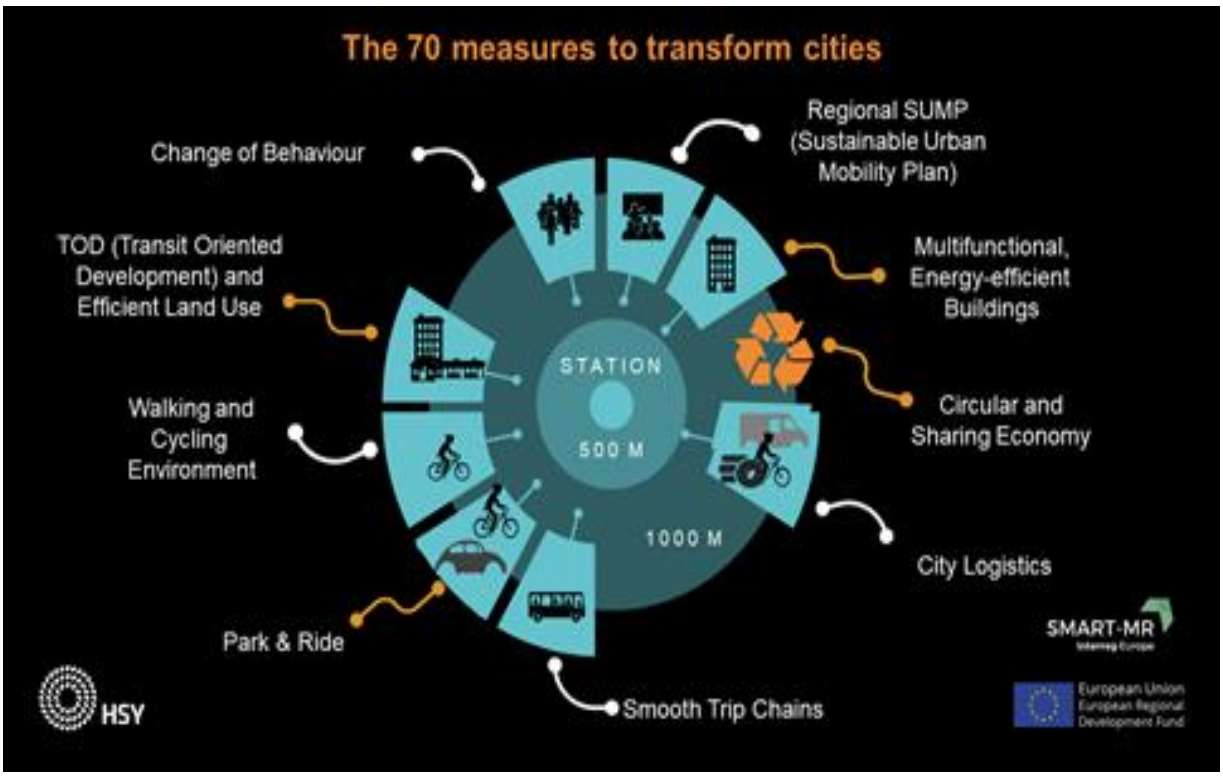


Figure 33: Measures to transform cities and station areas.

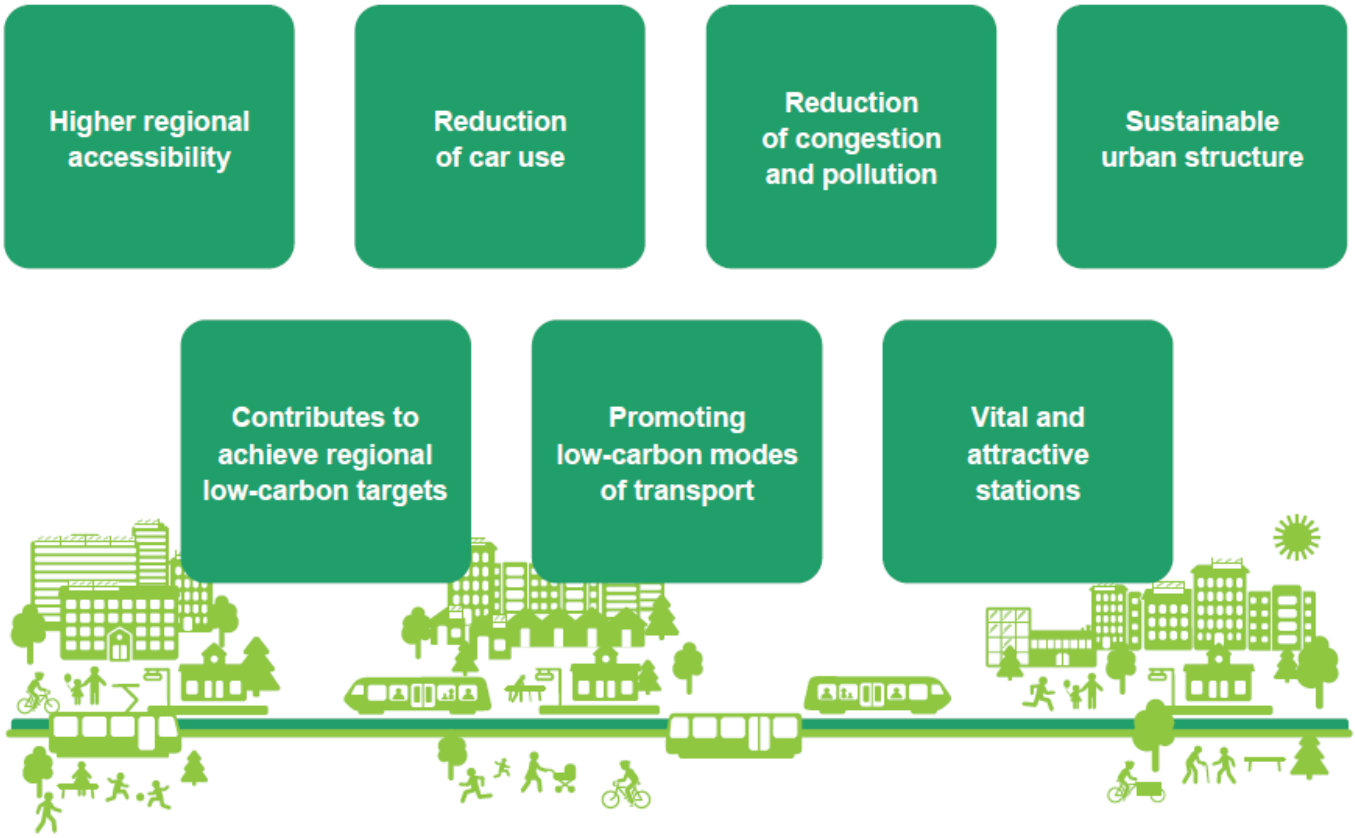


Figure 34: Low-carbon development of and around transport nodes gives long-term benefits.

Building a long-term vision - An example of an agreement on land use, housing and transport in the Helsinki Region

The population growth has been rapid in the Helsinki Region. The cities have committed to goals of being carbon neutral by 2030-35 and a quarter of the emissions come from transportation. Regional and local visions of the favourable development exist. In order to ensure that local actors acknowledge a shared understanding of responsibilities and know what actions are expected from each of them, a voluntary agreement process has been created to bring clarity. The agreement increases the mutual cooperation between the municipalities in the region, creates continuity of cooperation of the municipalities in planning and, especially, strengthens the commitment of the parties to the agreement and to implement the measures defined in the agreement and required for the development of the region. The co-operation results in an agreement (the so called MAL agreement), which is based on the common intent of fourteen municipalities in the Helsinki Region and the State of Finland for the development of the region for 2020-2031. The agreement is based on the plan for the Helsinki Region land use, housing and transport and it was prepared jointly by the Helsinki Region municipalities, Helsinki Region Transport (HSL) and the Finnish Government administrations for environmental affairs and transport.

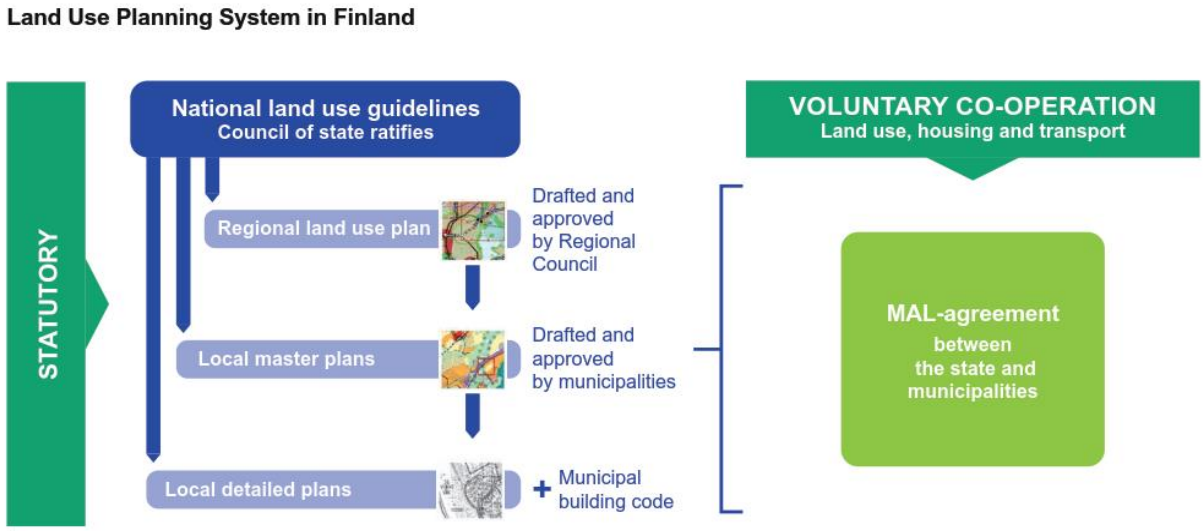


Figure 35: Land-use planning system and voluntary cooperation in land use, housing and transport planning.

The agreement defines the goals and development approaches for a sustainable and low-carbon urban structure and transport system in the region, for housing, and for the quality of the living environment. The agreement describes the courses of action to be taken to achieve the goals, and it states the actions agreed upon. In addition, the agreement states other Finnish Government actions essential for the implementation of the agreement. The other Finnish Government actions stated in the agreement include actions that concern a legislative reform pertaining to the Land Use and Building Act, the preparation of a plan for a national transport system, and other governmental development programmes.

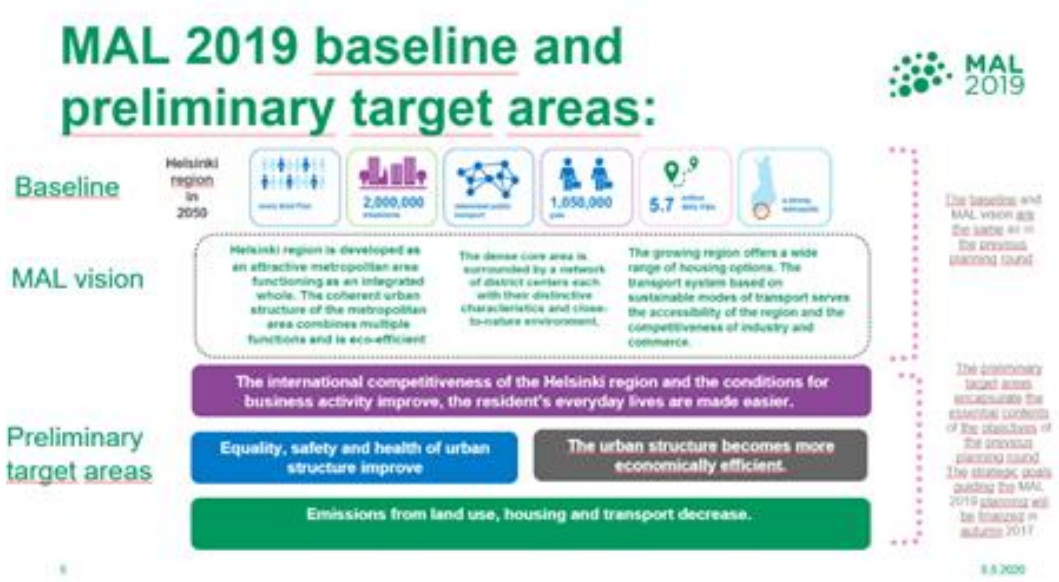


Figure 36: MAL 2019 baseline and target areas (HRT 2019).

Different forms of participation are needed

It is important to combine personal face-to-face contact (via workshops, meetings, focus groups) with online participation methods and awareness-raising (via social networks, websites, etc.). Getting support for active participation should be made by meeting people and going to local communities and not just by merely inviting people to events. The participation process also requires communicating the results in terms understandable to the general public and always providing feedback on citizens' proposals, even if it is negative.

Different forms of participation are needed also to enhance the equal opportunities for everyone to participate. Participatory planning is ever more focused in communicating through digital tools, but it is important to remember that this might exclude some stakeholders (such as elderly people) from the participation. The organizations or NGO's who are advocating for the needs of vulnerable people and groups, should also be integrated in the participatory processes. The commitment to the planning process and to the agreements requires personal relationships and trust between the stakeholders, organisations and people. The digital tools are an essential part of dissemination of information. However, knowing each other is the best way to support the commitment and trust.

Evidence-based decision-making supports the participatory processes

Participatory processes should be supported by solid data, studies, or pilot projects so that the decisions are evidence-based and do not depend only on the opinion of the most engaged stakeholders. Furthermore, developing strategies and plans must be supported by a combination of both solid data and participation because none of them alone could provide optimal results. Data are sometimes difficult to interpret and should be contextualized through the planning process; on the other hand, participatory processes could depend too much on stakeholders' capacity to influence decision-making, and so results from participatory processes should be thoroughly examined. A combination of both can optimize decisions by complementing information with valuable stakeholders' experiences and by influencing stakeholders' positions with relevant information.

Participatory process in Malmi Station District in Helsinki

In the planning of Malmi centre, an exceptionally broad participatory vision making process was established and therefore Malmi serves as a case example here to illustrate how participatory planning process, including wide range of stakeholders, can be realized in developing station areas. Further, Malmi was the pilot case area for piloting the Low-Carbon District concept.

Malmi is a neighbourhood in north-eastern Helsinki which has a train station in its centre. Malmi is a medium sized station area with around 14,000 people living in 1 km radar. Malmi is one of the three city renewal target areas defined in the Helsinki master plan. The centre is being renewed to become the centre of the whole northeast Helsinki area. Before the actual zoning, a vision work was done in order to show the wide range of development possibilities that Malmi centre can have. The vision is used as a catalyst for the renewal. The vision work is followed by compilation of development principles (in 2020) and revision of the detailed plan.

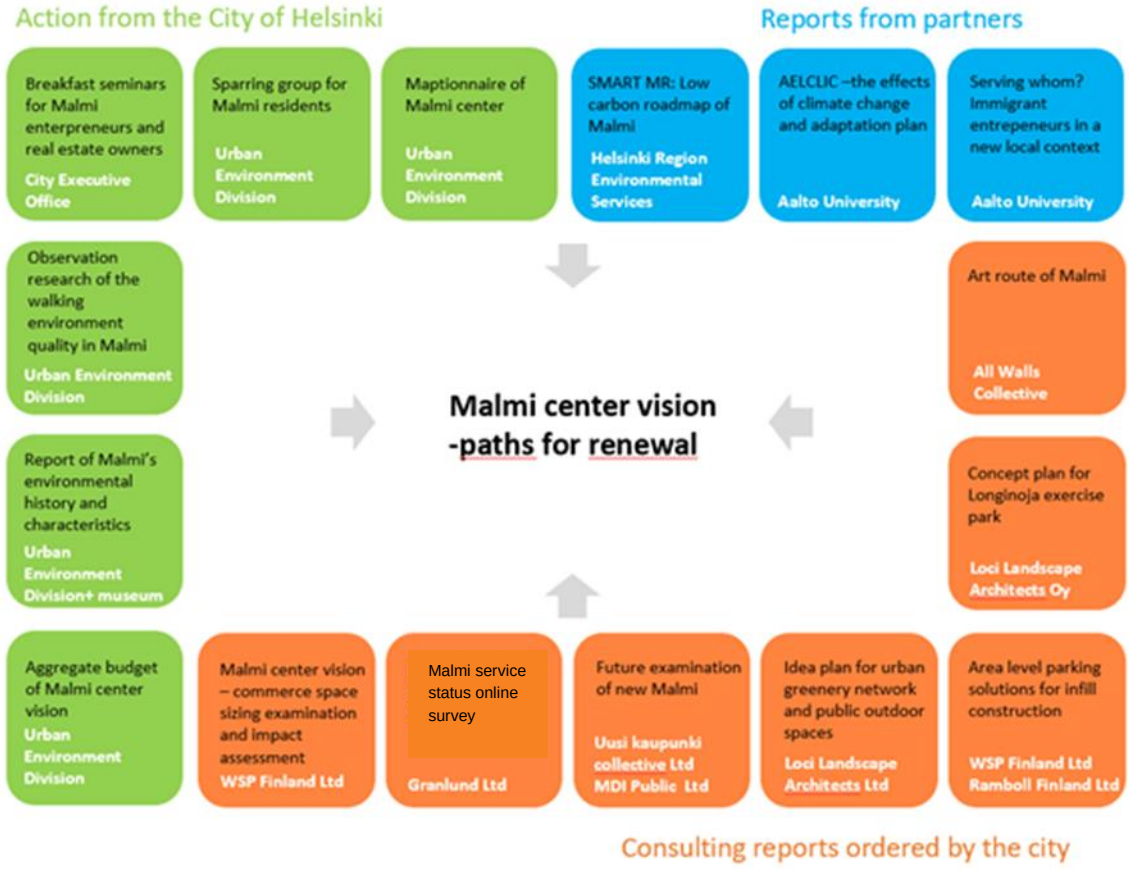


Figure 37: Participatory actions and reports during Malmi centre vision making (Mentula 2020).

Identification of different layers of development

In addition to identifying the most important stakeholders it is essential to identify different layers of development. These layers present the development possibilities of the area and these layers need to be discussed and can be used for presenting the pros and cons of different planning solutions.

Figure 38: Different thematic layers of developing Malmi centre (Mentula 2020).

When possibilities and restrictions of planning solutions are put on a map or on aerial photograph as spatial data all stakeholders can more easily identify and understand possible contradictions of different planning solutions. Visualizations serve as an effective means of communication of pros and cons. Planners should be able to present various options and explain the pros and cons of each solution. The public should be informed about the planning process in the earliest stages in order to express their opinions. At the same time, every group should be aware about its particular role in the planning process (e.g. planners suggest solutions, politicians take decisions) and contribute according to their abilities.

Expressing short-term wins and long-term benefits

To support the shift to sustainable and resilient transportation in metropolitan regions, it is important to implement measures that have both short- and long-term wins. The short-term wins should be communicated in order to mobilize stakeholders and the general public around the same targets. Short-term wins in regional mobility planning are essential to allow broad commitment to the principles of sustainable mobility and to get the relevant people on board.

On the other hand, long-term measures pursue the main objectives of the station areas concept, e.g. sustainable housing and mobility, better liveability, adaptation and mitigation to global warming.

Table 5: Short-term and long-term wins of the activities (SMART-MR 2020).

Field of intervention	**Activity**	**Short-term effects/wins**	**Long-term effects/wins**	**Indicators for measuring progress on the activity**
Participatory transport planning	Public consultation	– New local knowledge and possible tailor-made solutions from stakeholders – Awareness raising – Mutual learning	– Better quality of plans/strategies – Higher public acceptance	– Number of consultation rounds – People attending the consultations – General acceptance of the plan
Participatory transport planning – COVID 19 related activities	Web-questionnaires	- Increased availability of data, enabling planning and decision-making - Data received are easier to analyse and structure - Definition of problems and search for solutions can be more systematic - Better time-management (everyone can answer when having time) - Enables participation of higher number of people	- Evidence-based decision-making - Higher public acceptance	- Number of questionnaires received - Share of inhabitants participating in a survey
Participatory transport planning – COVID 19 related activities	WEB GIS-enabling the stakeholders to locate the proposal or a burning issue	- Spatialized data - Problems are spatially located, so the planners can easily search/define solutions	- Better visualisation of plans	- Number of incentives, problems reported

Participatory transport planning – COVID 19 related activities	Tailored groups of representatives (Charrette, focus group)	- Participants are experts in the field which smoothens the process - Representing different perspectives with one representative per perspective eases the communication and organisation	- By carefully selecting the ones that represent certain perspective, the answers can be more holistic - Better representation of vulnerable groups	- Number of sessions
Creating a mobility plan	Promotion and implementation of interventions to organize and manage the demand for mobility of people and goods	– Broad commitment to the principles of sustainable mobility – Involvement of relevant people	– Lower environmental impact deriving from traffic	– Number of travellers on public transport – Number of private goods transport operators involved
	Regulation of access in some zones (and/or parking)	– Fewer cars – Lower pollution/emissions – Less noise from traffic congestion	– Shift to public transport – Lower environmental impact from mobility	– Number of travellers on public transport – Shortening the time of trips – Measurable lower levels of pollutants in the air
	Support for intermodal nodes and infrastructure planning for both passengers and freight	– Multimodal approach to travel – Optimization of the use of means of transport (more passengers on each means of transport) – Less traffic – Less pollution	– Improvement of mobility – Improvement of resilience of the transport system (through multimodality) – Lower environmental impact from mobility – Better traffic flows	– Number of travellers on public transport – Number of private goods transport operators' trips, last mile – Time of trips – Levels of pollutants in the air

	Informatization of mobility, provision of real-time data on public transport and traffic; integrated ticketing systems on mobile and personal devices	– Optimization and simplification of multimodal travel	– Shift to public transport – Improvement of resilience of the transport system (giving best solutions in real time for travelling) – Lower environmental impact from mobility	– Number of travellers on public transport – Number of users of apps showing real-time data and giving tickets – Time of trips – Levels of pollutants in the air
	Promote diffusion of and experimentation with collective services such as car sharing, carpooling, bike sharing, etc.	– Optimization and simplification of travel in modal shifts – Fewer cars – Less congestion	– Improvement of mobility – Lower environmental impact from mobility	– Number of sharing/pooling service users – Levels of pollutants in the air
	Increase in the size of areas and uninterrupted paths for bicycles and pedestrians	– More soft mobility – Fewer cars – Less noise from traffic congestion – Better and healthier quality of life	– Improvement of mobility – Shift to soft mobility – Lower environmental impact from mobility	– Length of cycle lanes – Pedestrian areas – Levels of pollutants in the air
Creating a mobility plan - COVID 19 related activities	Informatization of mobility, provision of real-time data on public transport and traffic; integrated ticketing systems on mobile and personal devices	– Optimization and simplification of multimodal travel – Lower pollutants impact from mobility – Reduction of the problem of crowding on public transport	– Improvement of resilience of the transport system (giving best solutions in real time for travelling) – Less long-term impact of COVID 19 effects	– Number of travellers on public transport – Number of users of apps showing real-time data and giving tickets – Levels of pollutants in the air – Percent of crowding on public transport compared to maximum capacity

Low-carbon logistics	Planning low-carbon logistics – Multilevel governance – Involvement of stakeholders	– Shift to low- and zero-emission vehicles – Better use of existing infrastructure – Improved terminal structure – Shared data on freight	– Reduction in carbon emissions – Better air quality – Better acceptance and understanding among all stakeholder groups	– Share of low-carbon freight vehicles – Level of NO_x and PM – Dialog between stakeholders and public authorities
	Low-carbon last-mile pilot projects: – Establish consolidation centres for last-mile freight – Transition to e-vehicles in last-mile freight – Transition to bikes in last-mile freight – Extended use of ICT tools – Reduce kerbside parking for private vehicles	– Reduction in freight transport by vans – Better use of existing infrastructure – Modal split in favour of cargo bikes and e-vehicles – Improved efficiency in loading/unloading – Reduction in “search traffic” – Improved accessibility for deliveries	– Reduction in carbon emissions – Better air quality – Better use of existing infrastructure	– Share of low-carbon freight vehicles – Level of carbon emissions – Level of noise pollution – Amount of “search traffic” – Level of NO_x and PM
	Establish charging infrastructure adapted for freight vehicles (vans)	– Transition to e-vehicles in last-mile freight	– Reduction in carbon emissions	– Share of low-carbon freight vehicles – Level of NO_x emissions – Level of noise pollution
	Establish low-/zero-emission zones	– Modal split in favour of cargo bikes and e-vehicles	– Reduction in carbon emissions – Better air quality	– Share of low-carbon freight vehicles – Level of NO_x emissions

Low-carbon logistics COVID-19 causes higher volume and demand due to internet shopping	Consolidation centres Requirement to use 'full capacity' in vehicles Delivery in residential areas Low-carbon vehicle/mode of transport demand	- More delivery providers in the market (not necessarily low-carbon vehicles) - Increase in freight volume - Difficulties in involvement of stakeholders in a fragmented freight market - Traffic safety in residential areas	- Possible shift to higher share of internet shopping - Possible store closures in the city centre, less city life - Densification less attractive	– Level of carbon emissions – Share of low-carbon freight vehicles - Passing of freight vehicles in the toll ring
Managing transportation	Improving mobility solutions	– Better mobility options – Accessible, reliable, and comfortable public transport	– Lower greenhouse gas emissions – More public space for people	– Modal split – Number of public transport trips made
	Enhancing walking and cycling	- Less cars - Less crowd in PT without increasing car traffic	- Better air quality - Reshaping public space in cities	- Modal split - Length of bike lanes - Increased pedestrian public space
	Park-and-ride solutions	– Increased parking capacity in station areas – Fewer cars entering the inner-city area	– Decreased congestion in the city centre – Healthier environment	– Number of park-and-ride sites – Number of park-and-ride spaces – Smaller number of vehicles in the inner-city area
	Introduction of alternative fuelled buses	– Cleaner diesel engines with reduced emissions – Hybrid technology for less fuel consumption	– Zero-emission buses for lower GHG emissions – Healthier environment	– Level of CO_2 emission from public transport – Number of low-/zero-emission buses

Sharing economy	Promotion of the sharing economy	– New and innovative business models	– More mobility solutions	– Number of new business models
	Regulating the sharing economy	– Fair competition – Integration of new business providers with public transport (mobility as a service) – Allowing and encouraging sustainable new solutions and models	– Sustainable mobility – Wellbeing of people	– Existence of regulation at the local/metropolitan level
	Integrating sharing mobility solutions with public transport	– Enables travellers to gain access to public transport on an as-needed basis – Last-mile solutions	– Public transport sustainability	– Modal split (% reduction on private car)
Transit-oriented development	Definition of “Liveability-Oriented Area Development” (LOAD) methodology	– Integration of spatial and transport planning – Co-creation of the neighbourhood	– Higher regional accessibility – Reduction of car use – Reduction of congestion and pollution	– Existence of LOAD methodology
Transit-oriented development COVID 19 related activities	Promoting sustainable density in station areas	- Possible negative attitude to densification due to the spreading COVID 19	- Increased level of mobility by private cars and urban sprawl as a preference of single housing increasing	- Location of new housing. Cost of housing decreases in central dense locations and increases in rural locations.
Transit-oriented development COVID 19 related activities	Promoting sustainable density in station areas	Possible positive attitude to densification due to the spreading COVID 19	- Increase of mobility by walking and cycling due to the negative impact of using public transport during the pandemic. - Mobility shift may be permanent.	- Calculating the shift of mobility modes.

Transit-oriented development COVID 19 related activities	Promoting sustainable density in station areas	- Enabling and promoting remote working at home or at local facilities.	- Less commuting	- Level of commuter mobility. - Survey of attitudes to remote working. (workers and employers)
Shaping low-carbon areas	Promoting use of the low-carbon district concept	– Lower emissions from the transport sector – Liveability of station areas – New businesses - Improved pedestrian and cycling environment at station areas - Preserving green areas and development of green infrastructure	– Sustainable urban structure – Contributes to achieve regional low-carbon targets – Promoting low-carbon modes of transport	– Level of CO_2 emissions – Modal split
	Supporting new services in stations	– Added value to trip chains – Improved social safety - New low-carbon business models (e.g. mobility solutions, e-commerce, remote working)	– Vital and attractive stations	– Service level
Shaping low-carbon areas COVID 19 related activities	Support local development and local economy in station areas	- Maintaining economic activity	- Attractive living and working areas	- Number of SMEs

9 REEVALUATION OF THE PARTICIPATORY PLANNING RESULTS VS. REGIONAL ANALYSIS/GOALS/CONCEPT

The results of the participatory processes must be thoroughly confronted to the regional benchmarking and the analysis at the level of station area. This step namely balances the eventual unbalances of the participatory process that might appear due to different power positions in the participatory process. It is not always the case that the lauthest participants are really those that should have a word. Although they have the right to express their point of view, an independent facilitator, using the results of the analyses, should be the one that gives weight to certain viewpoints.
Similarly, it is not necessary the participatory process would actually achieve the objectives set at the beginning of the planning process or criteria set by the Station Area Concept (e.g. some influential stakeholders might force some unsustainable solutions).
To ensure the entire planning process contributes to more liveable station areas, in this step it is necessary to:

1. check the consistency of the participatory process,
2. confront it with the results of the regional benchmarking and station area analysis,
3. balance the results of the participatory process with the available data and analyses - where needed,
4. provide the final input to be used for defining the roadmap for the future development of the station area.

At this stage the results might also be confronted to political priorities and positions, as well as the budgetary limitations, testing the feasibility of the proposed solutions.

10 DEFINING DETAILED MEASURES, RESPONSIBILITIES, TIMETABLE AND ROADMAP. BEGINNING WITH SIMPLE AND SHORT TERM GAINS

Set up a roadmap- Action cards for shaping a Low Carbon District

The Low Carbon District (LCD) planning tool introduces a shared set of criteria in the form of action cards for planners, managers, clients, users and other stakeholders involved in developing a sustainable and low-carbon station district. The action cards include concrete measures to advance meeting of low-carbon development goals in urban planning. The LCD action cards serve as a set of ideas that can be used in participatory planning, and when setting goals and measures to low-carbon development in station areas. These cards present tangible measures to implement shared low carbon development goals in terms of both new build and regeneration projects. The concrete action cards make it easier to create dialogue between different sectors and with stakeholders and citizens. The action cards also benefit the planner by acting as a checklist in local detailed planning.

All LCD action cards have a three-stage path for progressing towards a low-carbon station area according to the impact that a measure can have on the four sustainability themes. The measures have been classified with star symbols to have a small, medium or significant impact on sustainability.

Figure 39: LCD action cards provide a set of concrete measures to support prioritization of most effective station area-level measures.

The LCD cards support and provide a tool for a context-specific participatory process where building a joint vision together with the stakeholders is of importance. Involvement of the key stakeholders early in the process enables them to bring forward the most important goals of their organizations. A context-specific and a fact-based planning process involves broad use of different spatial and other data.

Building a roadmap – create a story

Agreement on the specific goals are needed to make the joint vision a reality — the roadmap that illustrates how to accomplish those goals. By prioritizing certain items over others, the roadmap prioritizes work that gets the product to those goals. Themes provide structure for the story. Layers of abstraction are vital for roadmaps, particularly in the early stages of planning. It ensures continuing progress on the critical fronts. Organizing a roadmap according to themes gives a good structure, both visually and for the narrative.

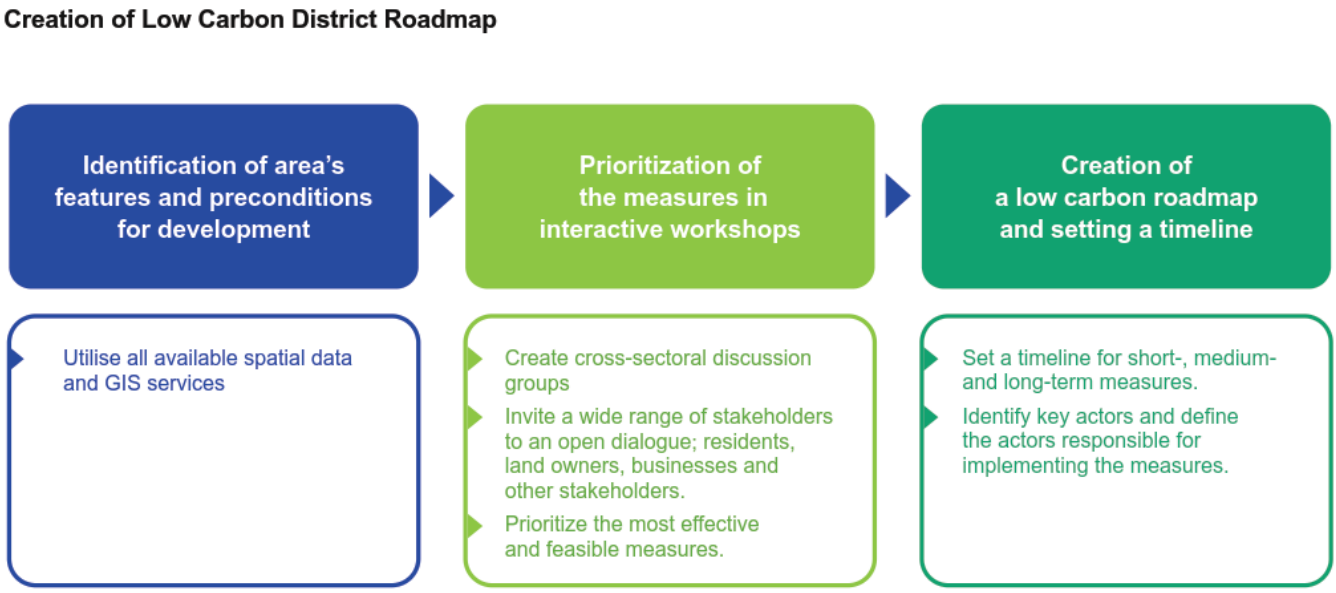


Figure 40: The process to create a low-carbon roadmap.

The low-carbon roadmap for Malmi centre was created during the pilot of Low Carbon District concept. The visualization serves as an effective means of communication of priorities.

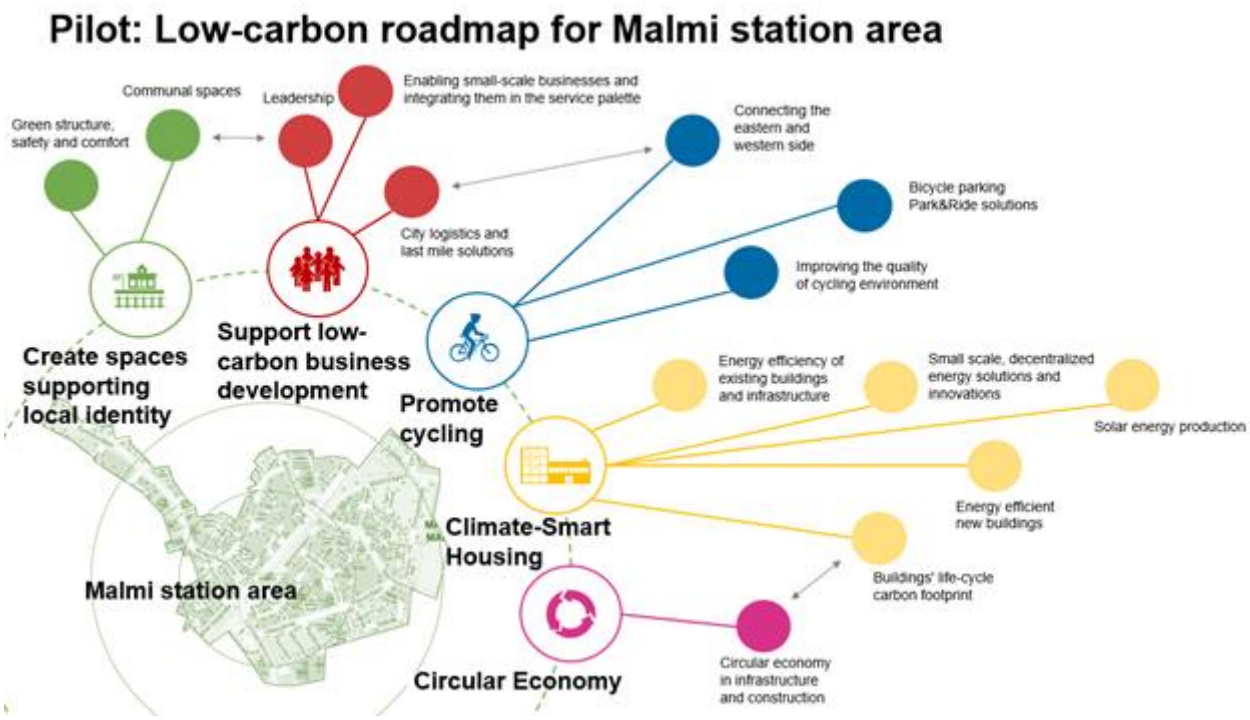


Figure 41: The overview of Low Carbon Roadmap communicates the priorities set for developing Malmi centre as low- carbon area.

The pilot station area can be used as a showroom for a liveable urban area with high quality urban planning and community building. The change towards low-carbon, liveable station areas should be visible in actions and solutions, which provide inspiration and support building a community, where you don't need to think of the choices you made, the environment provides these as the first and best option both for you and for the climate.

Beginning with simple and short-term wins

The way forward is to identify the first actions which could give tangible results of the desired transformation and engage those who are responsible for the resources both human and financial resources. Communication of the results both in media and at the place where the transformation happens is important. Visual aids support the storytelling, infographics and photographs of the desired results available in the station area could strengthen the message of positive change during the transformation process.

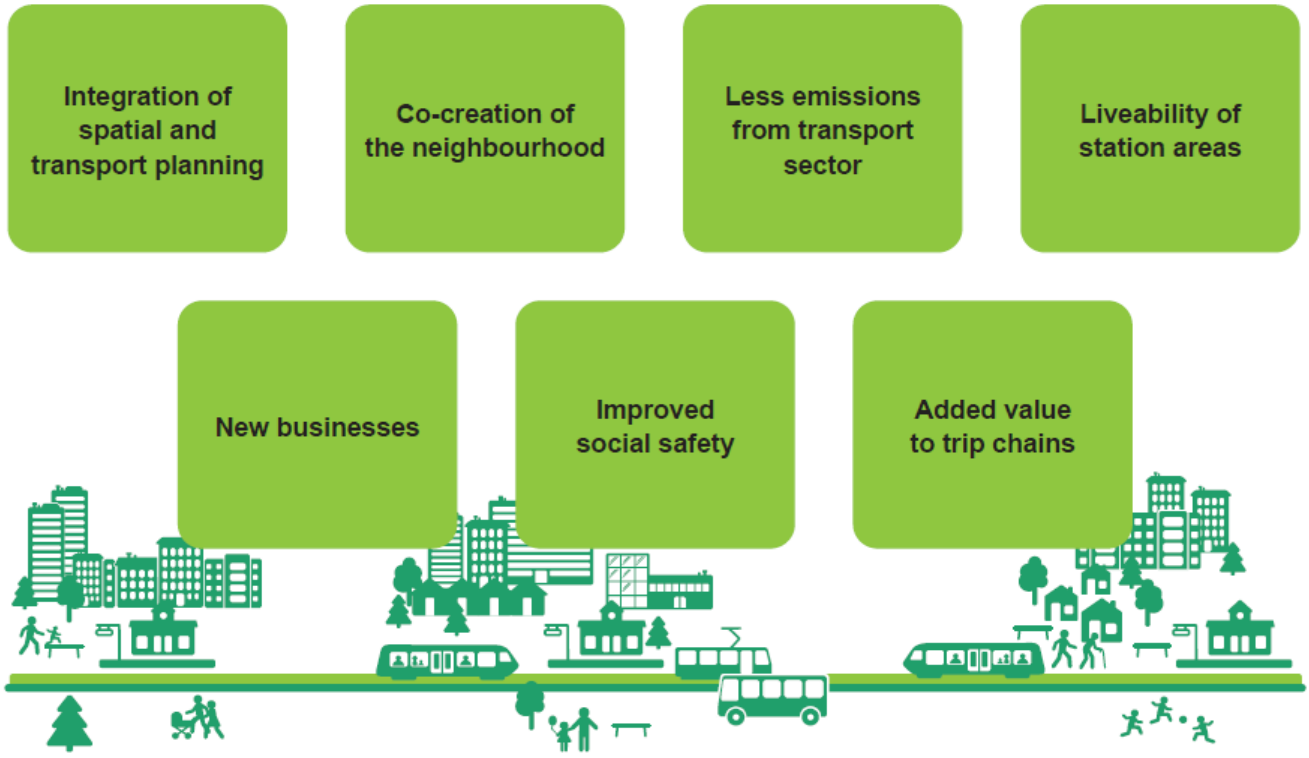


Figure 42: Short-term wins of station area development.

11 COMMUNICATION OF GOALS AND MEASURES AND POLITICAL DECISIONS

Guidelines on how to lead the change within the station area through communication are based on the Kotter's (1996) book Leading Change.

Communicating vision and empowering new habits

No matter how good a vision and strategies are, they are powerless if not successfully communicated to the public. Thus, strong collaboration with the public is an essential tool for achieving common agreement on a transport vision and acceptance of the measures implemented. Despite the various territorial aspects (local/regional), complexity of measures (soft/hard), and levels of stakeholder involvement, only well-defined communication approaches can gain an adequate level of acceptance and be followed by expected long lasting behavioural change.

A common mistake is to think that raising people's awareness and influencing attitudes is a simple one-step process that can change behaviour with nothing but simple information activity. Current generations are already accustomed to the fact that cars occupy nearly 70% of public space in cities. They almost view car ownership as a "human right" and are reluctant to change their behaviour. People unused to environmentally friendly modes of transport are hesitant to shift their mobility habits only because they have received information about the positive health impacts of cycling-related measures.

Therefore, change must first take place in people's minds, and only then are they prepared to adopt a common vision and change their behaviour. It is of great importance for communication strategies to strongly and clearly explain to different levels of the public what the situation will be at the end of the planning process, and what the main social benefits are. One way is by showing good examples to the public about things that really will

change in their daily lives and comparing them to negative alternatives if transportation measures continue to ignore the climate-smart principle.

Communication approaches should empower the audience to participate

In order to raise public interest and receive early encouragement, promotion of activities should begin early in the process. Although basic information material usually suffices in the initial stages, later in the process various effective communication measures must take place. Some of the commonly known approaches are workshops, social media involvement, information events, press conferences, and TV/radio broadcasting. No matter which tools are used, the aim of communication activities must be to overcome solely notifying the public about set goals, visions, and measures. Its main aim is to tailor participatory processes in an attractive manner; not only to consult, but also to involve and empower the target audience in a sufficient manner.

Public authorities need to develop communication campaigns focused on different stakeholder groups, emphasizing the benefits that each of them will experience from the actions to be implemented. Communication activities that are already complex should become even more direct, smart, and creative in their purpose to achieve commonly shared key targets of sustainable mobility. Even if social media was once perceived as a one-way communication tool, good practices of new formats of social media platforms (e.g., Twitter, Facebook, LinkedIn, YouTube, and Instagram), blogs, online surveys, and wiki sites now provide fresh opportunities for visitors to “like” posts, comment, and directly engage in the dialogue process with their own content. Regardless of the territorial scope, the media play an important role in awareness raising and mobilizing society to make a transformative change. Thus, they can contribute to a behavioural shift. In addition to the media, new technologies can also support stakeholders’ involvement by offering new ways of data collection, analysis, and voting.

Most of those involved in communication activity should have a common understanding of its goals and directions. If the guiding coalition isn't the right group, it will have difficulty both creating and sending an appropriate message. The message should be consistent and urgent. When the urgency rate isn't high enough, people don't listen carefully to information. If the vision is too blurry or just a bad idea, selling poor goods becomes a tough job. The superiors tend to think in terms of their immediate subordinates, not the broader constituencies that need to buy into a vision. You should not be comfortable with routine factual communication. Instead you should explore the options like *What will this mean for me? My friends? What other alternatives are there?*

Targeted, jargon-free information can be passed on to large groups of people at low cost. Communication should take place in both directions. Communication should be direct and simple. Clear, memorable, often repeated, consistent communication from multiple sources, based on the behaviour of the executive helps enormously. The downside of two-way communication is that feedback may indicate that we are on the wrong track and that the vision needs to be reformulated. But in the long run it is far more productive to reformulate the vision than to go in the wrong direction - or in a direction that the station area will not follow.

Visions are usually communicated most effectively when many different vehicles are used: large group meetings, memos, newspapers, posters, informal one-on-one talks. When the same message comes to people from six different directions, it has a better chance of being heard and remembered, both on an intellectual and emotional level. So channel A helps to answer some of the questions people have, channel B addresses others, and so on.

Handling disagreements and unpopular measures

Public involvement can also result in disagreements that are sometimes difficult to overcome. Thus, one challenge is to communicate proposed measures in an agreeable manner and find a way of accommodating disagreements. Ensuring the overall quality of communication and the participatory process therefore requires skilled moderation of discussions, strategic selection of appropriate communication tools, and potential mediation in the case of emerging conflicts. In this way, the main challenge of communication is to determine joint interests in mobility and to sensitize participants to a culture of planning that is based on regular communication, trust, mutual consultation, and joint decision-making, which is the best way to mitigate potential conflicts already in the initial stages.

Sometimes effective solutions to certain problems require unpopular measures that might not be positively accepted by the public. Handling these measures is the most challenging part of the participatory planning. Focusing on the end goal rather than the unpopular measures or showing the advantages coming from this measure could be possible solutions. The participatory process realized should also be communicated. Keeping promises realistic, having contingency plans, and involving the public in early stages are also important.

Key elements in the Effective Communication of Vision (Kotter 1996, 90):
- Simplicity: All jargon and technical language that is difficult for ordinary people to understand must be eliminated.
- Metaphor, analogy and example: A verbal picture is worth a thousand words.
- Multiple forums: large and small meetings, memos and newspapers, formal and informal interaction - all are effective in spreading the word.
- Repetition: Ideas only sink in deeply after they have been heard many times.
- Leadership by example: Behaviour of important people that does not match the vision overwhelms other forms of communication.
- Explanation for apparent inconsistencies: Inconsistencies not addressed undermine the credibility of any communication.
- Give and take: Two-way communication is always stronger than one-way communication.

When communicating, it is important not to focus on individual actions per se, but on the results they will produce. Above all, it is important who and how communicates measures that are not popular at first glance, but which in the long term will help to improve the health of the residents, reduce traffic jams on the road, and achieve a higher quality of life for the residents of the station community.
The focus should be on communicating the results of any unpopular measure, not on communicating the unpopular measure itself - for example, reducing the number of free parking spaces for cars, restricting traffic for cars, etc. If unpopular measures are communicated instead of long-term positive results for the residents of the station areas, it is possible that ignorant communication will discourage potential positive results for the station area.
This is especially true in the field of mobility and public transport, where the task of communicating with station area residents through behavioural changes using soft measures is to make residents aware that these measures are necessary, as they will contribute to less congestion, a better environment and better public health in the long run.

12 SUCCESSFUL IMPLEMENTATION

The global warming challenges call for urgent actions. All stakeholders need to be identified and invited to participate in these urgent actions to mitigate climate change challenges. Stakeholders have different perspectives and their role must be clearly defined and recognized in each process/action taken. A co-creating process must be established that benefits from stakeholders' contribution and creates a common understanding on the need for a jointly adopted common vision and strategy. In metropolitan regions it is necessary for the vision to be sustainable and for innovations to create liveability, also by supporting residents' mobility needs. The vision needs to be shared by stakeholders and jointly expressed. To empower urgent actions that mitigate climate-change challenges, stakeholders that are professionally responsible for planning and decision makers should include the metropolitan vision and strategies in their work regardless of subject. For example, when creating any new project, reduction of greenhouse gas emissions and climate change challenges should be part of this and addressed accordingly, and positive gains should be communicated
By communicating the impact of global warming, including and empowering stakeholders to take actions mitigating the challenges, it is possible to create a greater, but possibly different, liveability in metropolitan regions. An awareness must be enhanced that a win-win future exists for the climate, the planet, and its inhabitants. By sharing the best practices, inspiring local examples, innovations, and stories, one can motivate stakeholders at all levels to focus on actions and positive results. The changes toward low-carbon metropolitan

mobility and urban space as well as services should be communicated using clear visual information. The aim is to share knowledge, raise awareness of local solutions, and encourage people to try new low-carbon solutions. By doing this, attitudes can be changed, and that will change the culture of mobility. As observed, there is a common understanding of what needs to be done to create a long term sustainable and liveable society. The main concern is the lack of willingness to make the necessary sacrifices at the global, national, and individual levels. There is a call for strong leadership that will lead people forward.
In creating a station area, it is necessary to follow the joint interest and to achieve a commitment that would result in everybody's action in implementing the vision. This cannot be achieved if the vision is not shared and the idea behind is not owned by all the crucial stakeholders. Even if the vision and idea are shared as well as responsibility on a level of each individual, this is not completely true for responsibilities at the organisational level and for the resources. Thus, decision-makers and politicians who possess the power to decide and resources have a greater responsibility for implementation and success of the plan. It is primarily their role to set objectives, lead the process, communicate and secure the results. It is them who should establish a proper governance system, necessary for the implementation of the plan and it is them who define measures and adapt them to the situation in a respective region and a legal framework.

13 MONITORING SYSTEM AND CONSTANT EVALUATION

Monitoring and evaluating the station area creation, or any other activity is an important part of a program cycle that roughly consists of planning, implementation, monitoring, and evaluation. Monitoring can be defined as a continuous process of regular data collection in order to detect all deviations from the goals set. It is used to obtain important data that guide further activities and is also vital for carrying out evaluation. In the case of station areas building, the purpose of monitoring is to assess how a creation of station area is progressing in relation to the plan and how does it influence the socio-economic and environmental setting of the area by impacting various processes at the level of the station area and beyond (context evaluation). Monitoring the progress and the activities carried out is key for the ability to adapt and make improvements in management, and also helps when judging priorities in light of the progress made and changed conditions (Nared & Ravbar 2003, Nared & Pipan 2014).

The monitoring system is composed of collecting and analysing financial, statistical, and project data using appropriate indicators as a means of measuring the success of carrying out activities and measures, establishing suitable supervisory bodies and their operation, and all types of reporting. The data collection system must be included in the planning and implementation system to enable regular monitoring. Here it is possible to rely on the data that are already being collected, but it must be ensured that they suit their purpose.

The monitoring system is based on a selection of indicators that are used to measure changes. These changes reflect general development tendencies and conscious influence on development via various development measures and instruments. If changes occur in a specific structure, this can result from spontaneous processes or planned development activities that should lead to a desired state in the station area, its surrounding and its relation to a nearby employment centre or another station area. A good indicator should therefore detect the performance of any activity and make possible analysis that shows the degree to which the goals set have been achieved.

An indicator can be defined as a measure of planned goals realized, sources mobilized, and effects planned that provides quantified information in order to help plan activities, make decisions, and guide those responsible in carrying out activities (Selection ... 1999). It is a sum of measures of a specific variable in space and time.

Indicators must have a good methodological basis, often characterized as SMART indicators (Nared & Ravbar 2003; *Managing Natural World Heritage* 2012):

– Specific: selected indicators should be adapted to the activity and suit the purpose they were selected for;

– Measurable: they must be measurable, which can be most easily achieved if they are quantified; it is also important to ensure adequate measurability of qualitative indicators;

– Accessible/Achievable: they must be accessible either at a specific time or for a specific territorial unit;

– Relevant: they must be based on realistic assumptions both in terms of the goal set and the indicator's suitability; they should be methodologically solid and closely connected to the field they measure; they should reflect long-term changes rather than short-term or localized fluctuations;

– Time-specific/time bound: they must reflect developments over a specific period.

In order for data collection to achieve its purpose during monitoring, the data must be appropriately analysed. This creates important information for decision-making and a basis for evaluating the activities and processes carried out. Evaluation is an ongoing interactive process that makes it possible to plan activities prudently and carefully and to adapt them to changing conditions and needs. The evaluation concept must rely on the structure of the plan, whose definitions of urgently needed development tasks proceed from issues detected in a specific field or station area. Based on these issues, detailed and, ideally, quantified objectives and the strategy for realizing them must be drawn up. An indicator must be assigned to every objective in order to verify the success of carrying out the activities set. Objectives are reached through various activities that are defined in detail and financially evaluated in the development program. It is important to know whether the path selected is the only one possible or the most effective for reaching the objective set and what the costs of this path are compared to the alternatives. Therefore, it makes sense to examine the effects of individual measures and select the most appropriate ones (Armstrong & Taylor 2000).

The purpose of evaluation is to ensure effective use of public funds, check the reasons for public intervention, analyse success stories, and prevent wrong decisions in the future (Evaluation Design ... 1999). In addition, evaluation defines the reasons for the success or failure of a specific program or policy, which ensures that the measures and instruments selected are adapted to the circumstances.

While creating a station area, the plan should be evaluated prior to its implementation (ex-ante evaluation), during its implementation (on-going evaluation) and after the realization of the plan (ex-post evaluation). The ex-ante evaluation should examine whether the plan prepared suitably responds to the challenges of the area, ongoing evaluation should analyse the course of activities and form guidelines for future operations, and ex-post evaluation should be carried out after the plan is realized in order to study all the results achieved in relation to those planned. In connection to context indicators, ex-post evaluation is also an opportunity to define new goals and strategies for realizing them.

Evaluation primarily focuses on the following:

– The relevance of the plan, which shows whether the goals set reflect the needs and priorities of station area creation;

– The effectiveness of the plan, which reflects its financial effectiveness in the sense of the ratio between expenses and profit, and reveals how inputs change into effects;

– The success of the plan in achieving the goals set;

– The usefulness of the plan, which reveals how the plan has affected the target group or population in terms of its needs; and

– The sustainability of the plan, in which the anticipated duration of the effects of activities carried out is analysed (Indicators ... 1999).

The main focus must be on success and effectiveness because both of these factors are suitable for analyzing the state at any stage of the activities being carried out. They also provide useful information to decision-makers and their evaluators for making the best possible decisions (Indicators ... 1999).

13.1 Recommendations

The recommendations in the field of monitoring and evaluation could be grouped in the following steps:

1. Prepare a monitoring plan: defining the objectives to be reached and the way how they are constantly followed and assessed. It should define how much detail the monitoring should go into to adequately respond to the needs of the stakeholders, and what the basic principles of monitoring are in terms of the indicators selected (basic characteristics of indicators, methodology for their calculation, source, institution responsible for collection of indicators, etc.), data to be used and frequency of their renewal, and connection of data with specific steps in the evaluation process (Indicators … 1999).

When developing a monitoring plan, the following should be considered:

"– Define objectives to clarify why monitoring is being carried out.

– Link objectives to indicators to be monitored and, where possible, identify thresholds for each indicator.

– Gather relevant material (publications, reports on previous activities including monitoring).

– Identify collection methods for existing data (e.g., archive consultation) and data from new sources (e.g., sampling, interviews, observation) and define frequency of data collection.

– Standardize and simplify procedures to limit drain on resources and optimize safety procedures in these three areas:

- Data collection;

- Data analysis;

- Data management which must include past results, current trends and future forecasting and record changes in approach to monitoring over time.

– To understand trends that emerge from monitoring and the appropriate management response and its timing, identify the timeframe of the occurrence (one-off or rare; intermittent or sporadic; frequent or ongoing/repeating monitoring), the area affected and the gravity of their impact on attributes critical to station area development.

Apart from this, a monitoring plan should clearly define the institutions responsible for data collection and the protocols for maintaining the monitoring databases.

To fully use existing resources, development of a monitoring plan should carefully consider data sources that already exist, alternative methods to ensure cost-effective monitoring, involvement of the local community in monitoring, and so on (Nared and Pipan 2014).

2. Ensure Long-Term Monitoring: To allow evaluation of long-term processes, each station area or individual processes in its development should be monitored continually because data can help track trends effectively when gathered and assessed systematically over a long period of time. To this end, strong commitment of involved institutions and a permanent source of funding are needed. At the same time, long-term monitoring processes enhance capacity-building at all levels (individuals, institutions, communities, and networks) and broader engagement of all stakeholders and communities in the monitoring process (Nared and Pipan 2014).

3. Provide an Optimal Set of Indicators: A set of indicators, which may include quantitative or qualitative indicators, should fully address the idea of the station area and the activities performed, thus providing a basis to monitor the state of a area, its surroundings, and the relationship with stakeholders and identifying any changes. Indicators should ideally (*Managing Cultural World Heritage* 2013, 96; Nared and Pipan 2014):

– Be limited in number.

– Be sensitive to change and thus able to illustrate whether management actions are having an effect.

– Have a clear and measurable relationship to the trend being monitored.

– Reflect long-term changes rather than short-term or local variations.

– Address diverse areas subject to change and known pressures that can have direct implications for the station area, including social, cultural, economic, environmental, and political trends.

– Detect new pressures.

– Require monitoring procedures that are as simple and cost-effective as possible both in terms of approaches to information collection, information analysis, interpretation, and management and in terms of ease of access for data collection, and as far as possible using data that are already being collected.

– Be associated with clear baseline data, referring to the starting condition of a particular element to be measured/monitored); for example, the number of visitors at the beginning of the project implementation).

– Be associated with clear thresholds that, when reached, trigger an action in the decision-making system.

– Be identified and monitored in a participatory way, especially when the process can improve the performance of the management system and its outcomes in a way that can benefit those interest groups.

Adapted steps of using indicator system in urban mobility can be checked at World Business Council for Sustainable Development study on Methodology and indicator calculation method for sustainable urban mobility (WBCSD 2015).

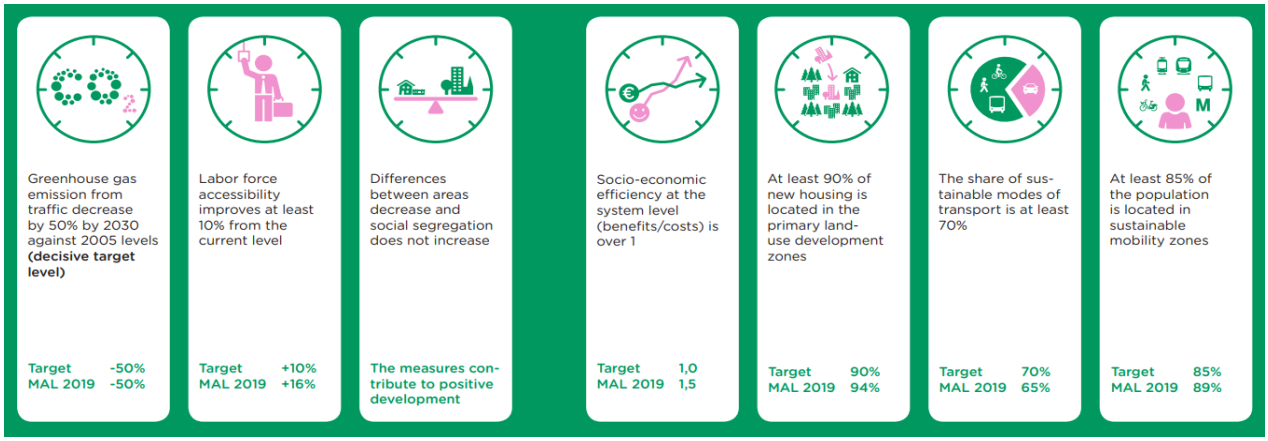
4. Take Evaluations Seriously: Evaluations that are based on a good monitoring system are an efficient tool for developing a station area in terms of its everyday activities, and above all in terms of long-term development of station area and its surrounding area. Evaluations should give clear indications on what to improve and how to improve, as well as directions for future activities at the station area. Ex-ante evaluations enable further adaptation of the activities to the specific situation at the station area, ongoing evaluations can correct/reshape insufficient measures, and ex-post evaluations could give clear directions on how to continue and what to do differently based on past experience (Nared and Pipan 2014).

Monitoring system of the Helsinki Region Land Use, Housing and Transport Plan
In the Helsinki Region it is estimated that the region will be home to 2 million people in 2050. The increase of population is rapid from the current 1,5 Million inhabitants. In order to achieve sustainable growth in the region the 14 municipalities in the Helsinki region have joined forces to take charge of the future. The region grows sustainably and emissions are effectively reduced.

The achievement of the goals of the Helsinki Region Land Use, Housing and Transport Plan, MAL 2019 plan is monitored through an extensive assessment framework and seven core indicators. Target levels

have been set to 2030. The key goals can be achieved by deploying all of the measures set out in the plan. The parts of the plan concerning land use and housing were developed in cooperation groups formed by the region's municipalities, while Helsinki Region Transport HSL is responsible for transport system planning and Helsinki Region Environmental Services Authority HSY provides regional data for monitoring. During the course of the work, interaction sessions were held with state and regional experts, elected officials and representatives of various organizations. Surveys and research were conducted to understand Helsinki region residents' travel habits and needs. The impacts of the plan were extensively assessed using a traffic model, spatial data analysis and expert evaluated throughout the planning process. The measures were further refined following each impact assessment round. In this way, it has been possible to identify the measures to effectively achieve the goals set. (HRT 2019).

Figure 43: Seven core indicators describe the target level for 2030 in the Helsinki Region Land Use, Housing and Transport Plan, MAL 2019. (HRT 2019).



SOURCES

Alfarè L., Nared, J. 2014: Environmental planning recommendations. In: Nared, J., Razpotnik Visković, N. (ed.), Leading a participatory process. In: Managing cultural heritage sites in Southeastern Europe. Ljubljana.

Armstrong, H., Taylor, J. 2000: Regional Economics and Policy. Oxford.

Bole, D., Bigaran, F. 2013: Introduction. In: Bole, D., Šmid Hribar, M., Kozina, J. (ed.), The synergy of culture and tourism for the development of rural areas. Ljubljana.

Chatty, D., Baas. S., Fleig, A. 2003: Participatory processes towards co-management of natural resources in pastoral areas of the Middle East: a training of trainers source book based on the principles of participatory methods and approaches. FAO, Rome and Palmyr.

CIVITAS Vanguard. Reaching the Citizen: Toolkit on Effective Communications and Marketing, CiViTAS Initiative, 2011. Internet: http://www.civitas.eu/content/reaching-citizen-toolkit-effective-communications-and-marketing-0?_ga=2.268289678.1684804293.1539935224-1521954661.1539779035 (18. 10. 2018).

Dearden, P., Jones, S., Sartorius, R. 2003: Tools for Development. A handbook for those engaged in development activity. University of Wolverhampton, Wolverhampton.

Delclòs-Alió, X., Miralles-Guasch, C. 2017: Suburban travellers pressed for time: exploring the temporal implications of metropolitan commuting in Barcelona. J Transp Geogr 65:165–174. https://doi.org/10.1016/j.jtrangeo.2017.10.016

Dionnet, M., Daniell, KA., Imache, A., von Korff, Y., Bouarfa, S., Garin, P., Jamin, JY., Rollin, D., Rougier, JE. 2013: Improving participatory processes through collective simulation: use of a community of practice. Ecol Soc 18(1):36. https://doi.org/10.5751/ES-05244-180136

Directorate of the Republic of Slovenia for Infrastructure 2019: Traffic measurments. Ljubljana.

ESPON Evidence brief, 2013. Internet: https://www.espon.eu/main/Menu_Publications/Menu_EvidenceBriefs/EEB4_Services-General-Interest.html (8. 3. 2016).

Evaluation Design and Management. Evaluating Socio-economic Programmes: Volume 1. Luxembourg, 1999.

Gabrovec, M., Razpotnik Visković, N., Bole, D., Hrvatin, M., Repolusk, P., Tiran J., Volk Bahun, M. 2019: Analysis of accessibility to public passenger transport and identification of main gaps in its supply. ZRC SAZU, Ljubljana.

George, M. V., Smith, S. K., Swanson, D. A., and Tayman, J. 2004. Population Projections. Chapter 21 in Jacob Siegel and David Swanson (eds.), The Methods and Materials of Demography. San Diego: Elsevier Academic Press, 2004.

GR 2019: Location indicators for sustainable travel habits. Gothenburg Region. Gothenburg.

Hong, Y. 2018: Resident participation in urban renewal: focused on Sewoon renewal promotion project and Kwun Tong Town Centre Project. Front Architectural Res 7:197–210. https://doi.org/10.1016/j.foar.2018.01.001

HRT 2019: Helsinki Region Land Use, Housing and Transport Plan, MAL 2019. Helsinki.

Hunjan, R., Pettit, J. 2011: Power: A practical guide for facilitating social change. Dunfermline: Carnegie United Kingdom Trust.

Indicators for Monitoring and Evaluation: An Indicative Methodology. The New Programming Period 2000–2006: Methodological Working Papers. Working Paper 3. Brussels, 1999.

Kotter, J. 1996: Leading Change. Harvard Business School Press. Boston.

Lehmann, S. 2015: Transit-oriented development. Previously unpublished.

Maguire, B., Potts, J., Fletcher, S. 2012: The role of stakeholders in the marine planning process—Stakeholder analysis within the Solent, United Kingdom. Marine Policy, 36(1), 246-257. DOI:10.1016/j.marpol.2011.05.012

Managing Cultural World Heritage. World heritage resource manual. UNESCO. Paris, 2013. Internet: http://whc.unesco.org/document/125839 (1. 4. 2014).

Managing natural world heritage. World heritage resource manual. UNESCO. Paris, 2012. Internet: http://whc.unesco.org/document/117412 (1. 4. 2014).

Meijers, E. 2007: From central place to network model: theory and evidence of a paradigm change. Tijdschrift voor economische en sociale geografie 98-2. DOI: https://doi.org/10.1111/j.1467-9663.2007.00394.x

Mentula, A. 2020: Malmi centre vision ppt presentation. City of Helsinki.

Nared, J. 2016: The interplay of institutional actors for achieving better governance of metropolitan regions. In: Knowledge, policymaking and learning in European metropolitan areas: experiences and approaches. Geography of Research in Europe and Territorial Policy Innovation, GREAT PI, Brussels, 25–26 Jan 2016

Nared, J. 2020: Participatory transport planning: the experience of eight European metropolitan regions. In: Participatory research and planning in practice. Springer. DOI: 10.1007/978-3-030-28014-7_2

Nared, J., Bole, D., Breg Valjavec, M., Ciglič, R., Goluža, M., Kozina, J., Razpotnik Visković, N., Repolusk, P., Rus, P., Tiran, J., Černič Istenič, M. 2017. Central settlements in Slovenia 2016. Acta geographica Slovenica, 57 (2). DOI: http://dx.doi.org/10.3986/AGS.4606Noguera-Tur, J., Martínez, A. F. 2014: Accessibility and provision of services of general interest in rural areas of the European Union: an analysis of the eurobarometer. Boletín de la Asociación de Geógrafos Españoles 64.

Nared, J., Bole, D., Černič Istenič, M., Drobne, S., Foški, M., Kozina, J., Mrak, G., Razpotnik Visković, N., Repolusk, P., Rozman, U., Rus, P., Tiran, J., Trobec, A., Volk Bahun, M., Zavodnik Lamovšek, A. 2019: Celovita demografska analiza s projekcijami za podeželska in urbana območja. Končno poročilo, september 2019. ZRC SAZU, Geografski inštitut Antona Melika, Univerza v Ljubljani, FGG. Fin. MOP, ARRS.

Nared, J., Pipan, P. 2014: Monitoring and Evaluation in Managing Cultural Heritage. Managing cultural Heritage sites in Southeastern Europe. Ljubljana.

Nared, J., Ravbar, M. 2003: Starting points for the monitoring and Evaluation of regional policy in Slovenia. Acta geographica Slovenica 43-1. Ljubljana. DOI: 10.3986/AGS43102

Noguera-Tur, J., Martínez, A. F. 2014: Accessibility and provision of services of general interest in rural areas of the european union: an analysis of the eurobarometer. Boletín de la Asociación de Geógrafos Españoles 64.

Nordström, T., Swartz, S., Ståhle, A. 2017: Sustainable Density in Station Communities. Stockholm.

Nostikasari D (2015) Representations of everyday travel experiences: case study of the Dallas-Fort Worth Metropolitan Area. Transp Policy 44:96–107. https://doi.org/10.1016/j.tranpol.2015.06.008

ODA 1995: Guidance Note on how to do Stakeholder Analysis of Aid Projects and Programmes. London: Overseas Development Department (ODA). URL: http://www.sswm.info/sites/default/files/reference_attachments/ODA%201995%20Guidance%20Note%20on%20how%20to%20do%20a%20Stakeholder%20Analysis.pdf (21. 10. 2017)

O'Neill, B.C., Balk, D., Brickman, M. and Ezra, M. 2001. A Guide to Global Population Projections. Demographic Research vol. 4, art. 8, pages 203-288. DOI: 10.4054/DemRes.2001.4.8

Özkazanç, S., Sönmez, FNÖ. 2017: Spatial analysis of social exclusion from a transportation perspective: a case study of Ankara metropolitan area. Cities 67:74–84. https://doi.org/10.1016/j.cities.2017.04.013

Pacione, M. 2014: The power of public participation in local planning in Scotland: the case of conflict over residential development in the metropolitan green belt. GeoJournal 79:31–57. https://doi.org/10.1007/s10708-013-9477-y

Programme Manual: Designing Your External Communication Strategy, 2017. URL: https://interreg-med.eu/fileadmin/user_upload/Sites/Programme/Toolbox/Reference_documents/24.-Designing_your_communication_strategy.pdf

Pütz, M. 2011: Regional environmental governance: interdisciplinary perspectives, theoretical issues, comparative designs (REGov) power, scale and Ikea: analysing urban sprawl and land use planning in the metropolitan region of Munich, Germany. Proc Soc Behav Sci 14:177–185. https://doi.org/10.1016/j.sbspro.2011.03.034

Sagaris, L. 2014: Citizen participation for sustainable transport: the case of “Living City” in Santiago, Chile (1997–2012). J Transp Geogr 41:74–83. https://doi.org/10.1016/j.jtrangeo.2014.08.011

Sagaris, L. 2018: Citizen participation for sustainable transport: lessons for change from Santiago and Temuco, Chile. Res Transp Econ 69:402–410. https://doi.org/10.1016/j.retrec.2018.05.001

Sarzynski, A. 2015: Public participation, civic capacity, and climate change adaptation in cities. Urban Climate 14:52–67. https://doi.org/10.1016/j.uclim.2015.08.002

Sayce, K., Shuman, C., Connor, D., Reisewitz, A., Pope, E., Miller-Henson, M., Poncelet, E., Monié, D., Owens, B. 2013: Beyond traditional stakeholder engagement: public participation roles in California’s statewide marine protected area planning process. Ocean Coast Manage 74:57–66. https://doi.org/10.1016/j.ocecoaman.2012.06.012

Selection and Use of Indicators for Monitoring and Evaluation. Evaluating Socio-economic Programmes: Volume 2. Luxembourg, 1999.

SiStat database - Demography and social statistics. https://pxweb.stat.si/SiStatDb/pxweb/en/10_Dem_soc/

SMART-MR 2019: Transforming European Metropolitan Regions: Smart mobility for better liveability. Ljubljana.

SMART-MR 2020: Newsletter 9. Internet: https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1608288831.pdf

Statistical office ... 2019. Internet: https://pxweb.stat.si/SiStatData/pxweb/en/Data/-/0723405S.px/ (22. 12. 2020).

Swapan, MSH. 2014: Realities of community participation in metropolitan planning in Bangladesh: a comparative study of citizens and planning practitioners' perceptions. Habitat Int 43:191–197. https://doi.org/10.1016/j.habitatint.2014.03.004

The Low Carbon District (LCD) concept for station areas 2020. Helsinki Region Environmental Services Authority. Internet: https://lowcarbondistrict.com/ (22. 12. 2020).

UN Habitat 2015: International Guidelines on Urban and Territorial Planning. Nairobi. Internet: https://unhabitat.org/books/international-guidelines-on-urban-and-territorial-planning/ (1. 2. 2019).

WBCSD 2015: Methodology and indicator calculation method for sustainable urban mobility. Internet: https://www.eltis.org/sites/default/files/trainingmaterials/smp2.0_sustainable-mobility-indicators_2ndedition.pdf (14. 11. 2020).

What is a Stakeholder? How to Identify, Analyze and Manage Project Stakeholders. Internet: http://www.projectmanagementdocs.com/blog/what-is-a-stakeholder.html#ixzz4FXsUWzvz (10. 10. 2017).

WSP 2019. Analyysi asemaseutujen kehittämisestä liikepaikkoina erityisesti vähähiiliselle liiketoiminnalle (Report of developing station areas as business places for low-carbon businesses). Helsinki. Internet: https://www.hsy.fi/globalassets/projektisivustot-ja-hanke-esittelyt/tiedostot/fiksu-assa/fiksuassatp1_asemanseudunpalvelut20190426.pdf (19. 3. 2021).

ANNEXES

Annex 1: How to make a demographic projection.

Case of calculation of the simple extrapolation method, which requires data for only two dates and for which we discuss three approaches, linear change, geometric change, and exponential change (M. V. George et al. 2004).

Linear Change

This method assumes that in the future a population will change by the same amount over a given period (e.g., a year) as occurred during the base period.

Average absolute change during the base period can be computed as:

$\Delta = (P_l - P_b) / (y)$

Δ = average absolute change
P_l = the population in the launch year
P_b = the population in the base year
y = the number of years in the base period (i.e., the number of years between the base year, b, and the launch year, l)

A projection using this method can be computed as:

$P_t = P_l + [(z)(\Delta)]$

P_t = the population in the target year
P_l = the population in the launch year
z = the number of years in the projection horizon (i.e., the number of years between the target year, t, and the launch year, l)
Δ = the average absolute change computed for the base period.

Geometric Change

This method assumes that a population will change by the same percentage rate over a given increment of time in the future as during the base period.

The average geometric rate of population change during the base period can be computed as:

$r = [(P_l / P_b)^{(1/y)}] - 1$

r = the average geometric rate of change
P_l = the population in the launch year
P_b = the population in the base year
y = the number of years in the base period

A projection using this method can be computed as:

$P_t = (P_l) [(1 + r)^z]$

P_t = the population in the target year
P_l = the population in the launch year

r = the average geometric rate of change
z = the number of years in the projection horizon

Exponential Change

The exponential change approach is closely related to the geometric, but it views change as occurring continuously rather than at discrete intervals.

The exponential rate of population change during the base period can be computed as:

$r = [\ln (P_l / P_b)] / (y)$

r = the average annual exponential rate of change
ln = the natural logarithm
P_l = the population in the launch year
P_b = the population in the base year
y = the number of years in the base period

A population projection using this method can be computed as:

$P_t = (P_l)(e^{rz})$

P_t = the population in the target year
P_l = the population in the launch year
e = the base of the system of natural logarithms (approximately 2.71828)
r = the average exponential rate of change computed for the base period
z = the number of years in the projection horizon