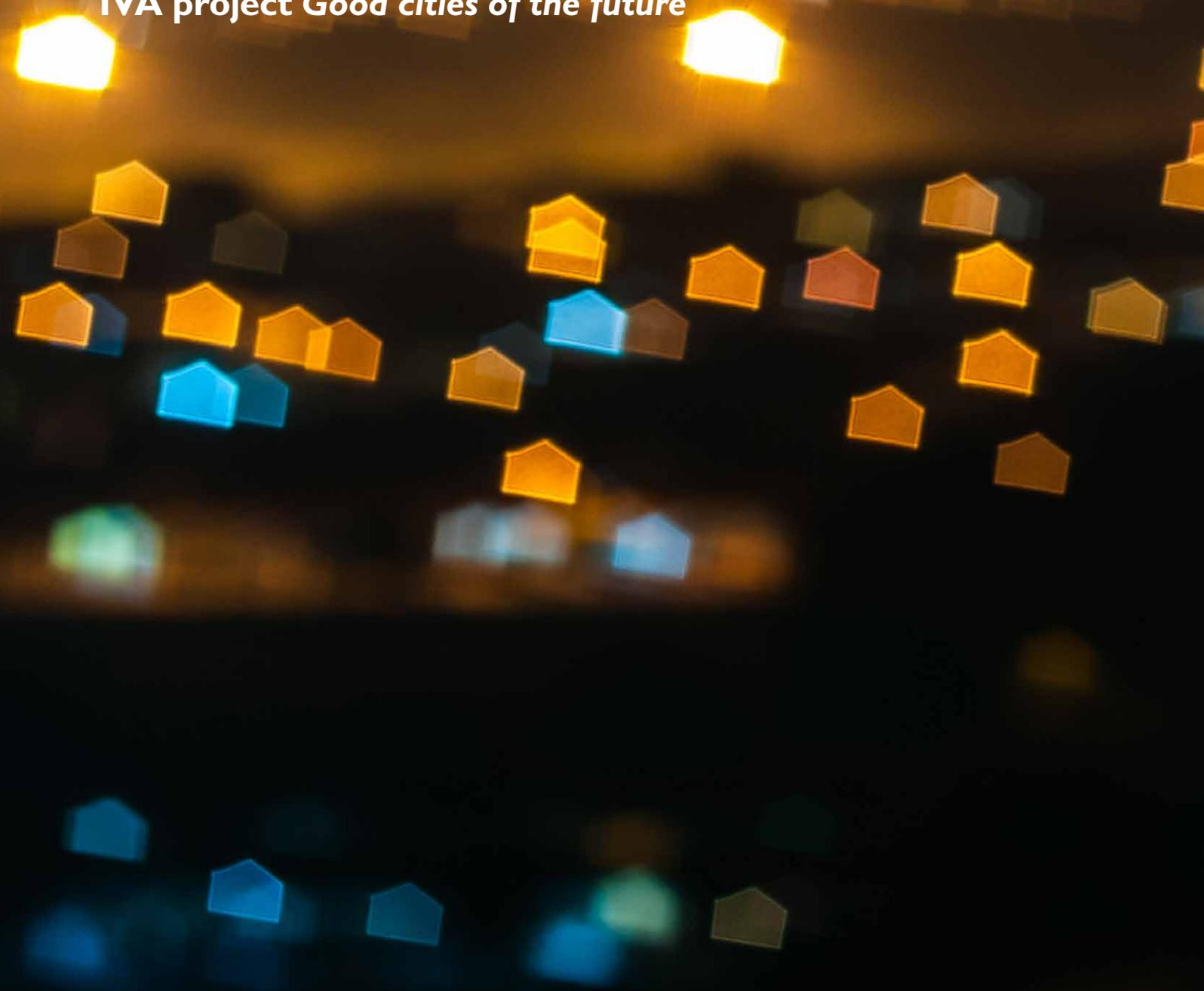




Attractive Living Environments and Flows

Eight themes in planning
good cities of the future

IVA project *Good cities of the future*



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Foreword

The IVA project Good Cities of the Future ran from 2015 to 2017. Attractive Living Environments and Flows is the name of a subproject within the Good Cities of the Future project. It explores a number of key urban development themes for today and the future. Combined with the work of the other project teams focusing on the drivers of urbanisation, positive development spirals and success factors in Swedish municipalities, and planning processes, we hope to be able to provide inspiration for future planning and development work by local authorities, the private sector, academic institutions and civil society.

This report is based on research and the combined experience of group members, and on discourse and discussions during the course of the project. While working on the project we have tested our ideas and gathered information from meetings and interviews with Borås Municipality, Lycksele Municipality and Botkyrka Municipality Multicultural Centre, the Stockholm County Council's Growth and Regional Planning Administration (TRF) and Ericsson. We would like to thank all those who have provided us with information and inspiration.

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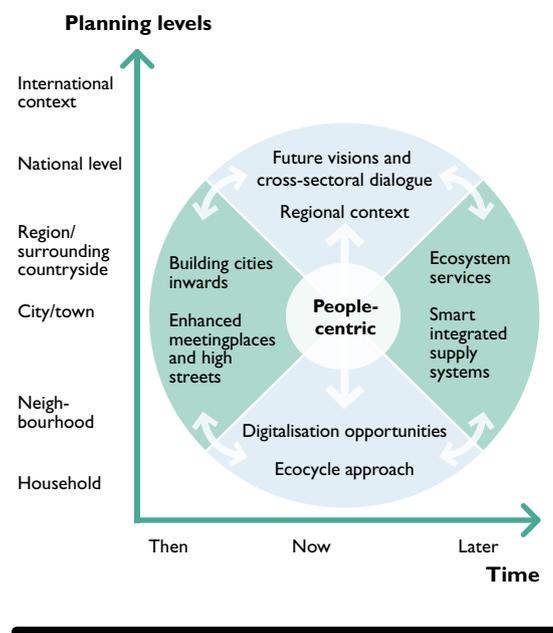
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I. Summary

The *Attractive Living Environments and Flows* subproject has a people-centric focus and has aimed to define important themes to find ways to face the challenges identified domestically and internationally in, for example, the UN's Global Sustainability Goals. All of the themes are relevant to achieving cities in the future that are attractive and sustainable – in ecological, social, economic, institutional and spatial terms.

Eight main themes were identified over time as being particularly pertinent to the design of cities of the future. Urban development is a complex issue and there are no obvious answers and solutions. Our first theme emphasises the significance of **constantly developing visions for the future in dialogue between actors** at all levels. Our second theme focuses on the need to look at **urban development in a regional context**, not least against a backdrop of the ongoing regional sprawl and the role of city regions as a hub for people's lives. The third theme is about the importance of **building cities inwards** to make them accessible and attractive. This type of strategy needs to be combined with **strong meetingplaces and high streets** in cities – our fourth theme. Urban development will change commuting behaviour and transport patterns and this is where theme five – **digital and climate smart communication** and mobility for transportation of people and goods – will play a key role in minimising the climate impact of transportation etc. Our sixth theme addresses the need to minimise resource use and **develop a recycling mentality based on an eco-cycle approach**. This is a key factor in creating a fossil-free society. The seventh theme, **smart integrated supply systems**, emphasises the importance of a system vision for technical infrastructure. Awareness of the significance of planetary boundaries is growing and our final and eighth theme, highlighting

Figure 1: People-centric planning is needed at all planning levels and in all timeframes.



the value of safeguarding green, blue and white spaces in cities, addresses this.

As illustrated in Figure 1, when planning future cities it is important to recognise the links between these themes in various combinations, while always maintaining the focus on people and social sustainability. This has been said many times, but bears repeating: avoid silos – promote collection channels and a comprehensive approach. It is important when planning the built environment to aim for an integrated work process incorporating in-depth exploration of these themes with an overall vision in which everything is interwoven.



2. Some challenges facing good cities of the future

Cities have often faced significant social and environmental problems while also being engines of economic development. But the concentration of functions in cities means there is excellent potential for solving these problems using advanced systems for public transit, energy, water, materials supply and socially attractive living environments in the form of multifunctional urban districts.

Increasing urbanisation has resulted in a growing interest in urban research across a number of disciplines and there is a rich international flora of studies, analysis and debate based on scientific foundations emphasising the importance of cities from an economic, sociocultural, ecological and spatial perspective. The famous town planner and urbanist Peter Hall pointed out, for example, that cultural factors, innovation and infrastructure have been fundamental in the development of cities over many centuries. Today economic globalisation and the emergence of knowledge-intensive organisations/businesses are increasingly affecting how cities are being restructured, and this is having both positive and negative consequences. Saskia Sassen, a prominent urban sociologist, launched the concept of the “Global City”¹ maintaining that globalisation is widening the gaps between sectors and districts. Meanwhile urban economist Edward Glaeser and others say that per capital income can be four times higher in countries where most people live in cities, compared to countries where most live in rural areas.² Another inter-

esting perspective comes from Christopher Kennedy³. He points out that cities need to be understood as complex, somewhat self-organising organisms and he compares cities to biological systems. Although conclusions from these types of studies are, of course, relevant in the Swedish context, there is a tendency in research and debate to overemphasize the problems facing big cities, probably because these have more ties to the international financial system. It is our aim to ensure that the eight themes described in this report are also applied to smaller and medium-sized cities in regional contexts.

To quote Jamie Lerner, former Mayor of the Brazilian city Curitiba: “The city is not the problem. The city is the solution.” Urbanisation therefore needs to be managed so that we can actually solve existing problems rather than create new ones.

There is currently a risk that we will only focus on the “housing crisis” and the argument that “we need to build a new ‘Million Programme’.” (The Million Programme was a housing construction programme to build a million homes from 1965 to 1974). If we do this we risk suboptimising the built environment and, as happened in the Million Programme, creating new “residential islands,” which is not the ideal way to build future communities. We instead need to take a very long-term perspective while looking at each stage in a short or medium perspective in relation to future visions and scenarios that present radical new and different approaches.

It is estimated that around 60 percent of the global population will live in cities in 2030 and

perhaps up to 70–75 percent in 2050. In just 16 years, in 2030, it is estimated that six out of ten people will live in one of the world’s many metropolises. This presents us with multiple challenges because these cities need to be sustainable, create jobs and growth while also being eco-friendly, fair, equal and safe. In 2025 just over 10 million people will live in Sweden, most of them within our three metropolitan regions. In 2050 the flow of people relocating into metropolitan areas will have resulted in more densely packed inner city areas and to more towns having their own nucleus within the metropolitan regions.⁴ This means that increasingly large job and housing markets will develop around larger cities, but they will also grow around smaller and medium-sized ones such as Umeå, Linköping and Jönköping.

The most significant challenges in creating good cities of the future are described in the UN’s Sustainable Development Goals (SDGs)⁵ adopted in September 2015. Of these goals for

2030, goals 7, 11 and 13 are particularly important in terms of urban development. But all of the other goals are relevant in one way or another as well. The goals also reflect the fact that the ecological, sociocultural, economic and spatial perspectives have become more intertwined. A transdisciplinary and integrated approach is needed to solve the challenges now and in the future.

The fast pace of transformation in society means that cities are facing constant new challenges. Change is the only thing that is constant in a changing environment, which means that cities of the future need to have a far greater capacity – greater flexibility – to deal with change. Just as today’s employers are increasingly demanding flexibility, adaptability and openness to new approaches than in previous generations, city dwellers of the future will require their cities to be adaptable and quickly able to handle and make the best of changing circumstances.

Figure 2: UN’s Sustainable Development Goals.



Goal 7 – Sustainable energy for all means renewable energy and improved energy efficiency, which has a key role in cities.

Goal 11 – Sustainable cities and communities means that cities and settlements need to be inclusive, safe, resilient and sustainable. This goal also addresses affordable, accessible and sustainable transport systems.

Goal 13 – Climate action means reducing emissions and climate adaptation in cities.

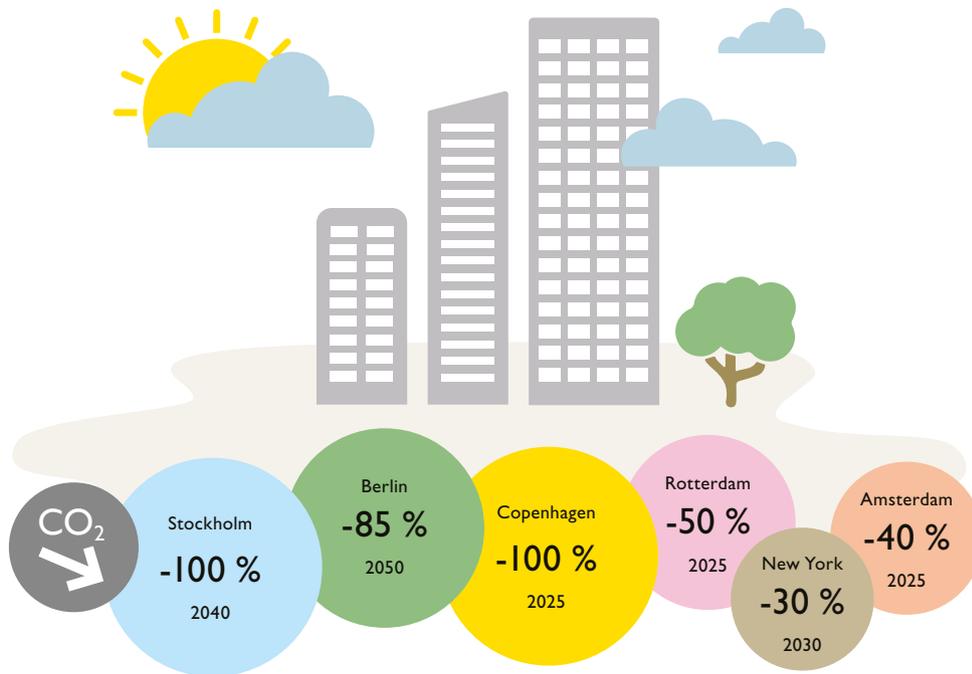


Figure 3: Targets for the reduction in the use of fossil fuels in urban transport systems.

Source: Innoz, Innovationszentrum für Mobilität und gesellschaftlichen Wandel.

The changes may involve growing or shrinking populations, adapting to climate change, growing and shrinking industries, an ageing population or a higher percentage of young people, increased or reduced transit needs or new ICT possibilities.

Populations may grow because of refugee flows and urbanisation, but may also decrease or remain unchanged due to people moving out or changes in refugee flows/asylum policies.

Adapting to climate change may require existing and new cities to equip themselves to face the consequences of higher temperatures and higher sea levels, as well as fluctuation in weather condition, storms and torrential rain. Preventative measures to minimise emissions are equally important in reducing the impact climate change.

Some industries, such as traditional industrial sectors, may stagnate when companies

decide to close down operations or when people move out of towns or cities. Other, perhaps unexpected, industries such as IT services or ecotourism may grow, sometimes in entirely new locations.

Transportation needs may increase as metropolitan areas grow larger and commutes get longer, but may also decline through the increased use of ICT and more flexible work solutions. Modal shift, for example between cars, public transport and bikes, may either be delayed or happen suddenly due to external factors, and it may be difficult to predict when and if it will happen.

These developments are not linear or evenly paced. They may not happen at all; they may happen later or earlier than expected and be much more dramatic. One challenge is therefore for cities to plan for the unexpected more they are doing today, and to build a culture

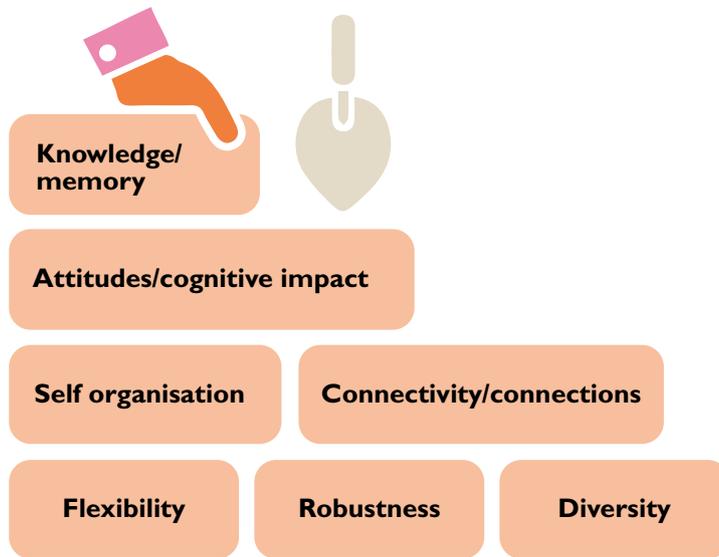


Figure 4: Illustration of regional resilience building blocks, TRF 2015.⁷

of flexibility in planning of housing, mobility solutions and flows such as energy, water and waste. This flexibility is needed in order to

avoid “knee-jerk reactions” that are not properly thought through and subsequently prove to be unsustainable in the long term.

EXAMPLES

Example 1: Regional development plan

In RUF 2050⁶ a regional planning platform is being developed jointly by the 26 municipalities in Stockholm county. It contains advanced definitions of sustainability, including *regional resilience*, to address how to meet future challenges. Regional resilience is defined as a region’s ability to handle both unknown and known disruptions and to continue to develop without the loss of fundamental functions. Being robust is about a region’s ability to withstand known or foreseeable disruptions and threats and is included in the concept of resilience. The Swedish Civil Contingencies Agency (MSB) has helped to further define the concept in eleven community-critical activities, including protection and security.

Example 2: Climate change

Addressing climate change (goal 13) requires urban planning for both the short and long term. In Gothenburg, which faces a significant threat of flooding, multiple projects have focused on creating strategies to deal with climate change. In a *Mistra Urban Futures* project, three scenarios have been developed: “attack, defend and retreat,” to present three combinable ways to handle the threat of rising sea levels by building banks, urban building on islands or allowing excess water to flow into wetlands. A project called *Stadens yttre portar* presents a coordinated protection strategy with a 200-year perspective to control the outflow of the two rivers Göta älv and Nordre älv into the sea with the help of giant opening floodgates, see figures 5 and 6.

Figure 5: Gothenburg is developing coordinated protection strategies in its community planning and built environment to deal with the threat of floods from rising sea levels.⁸

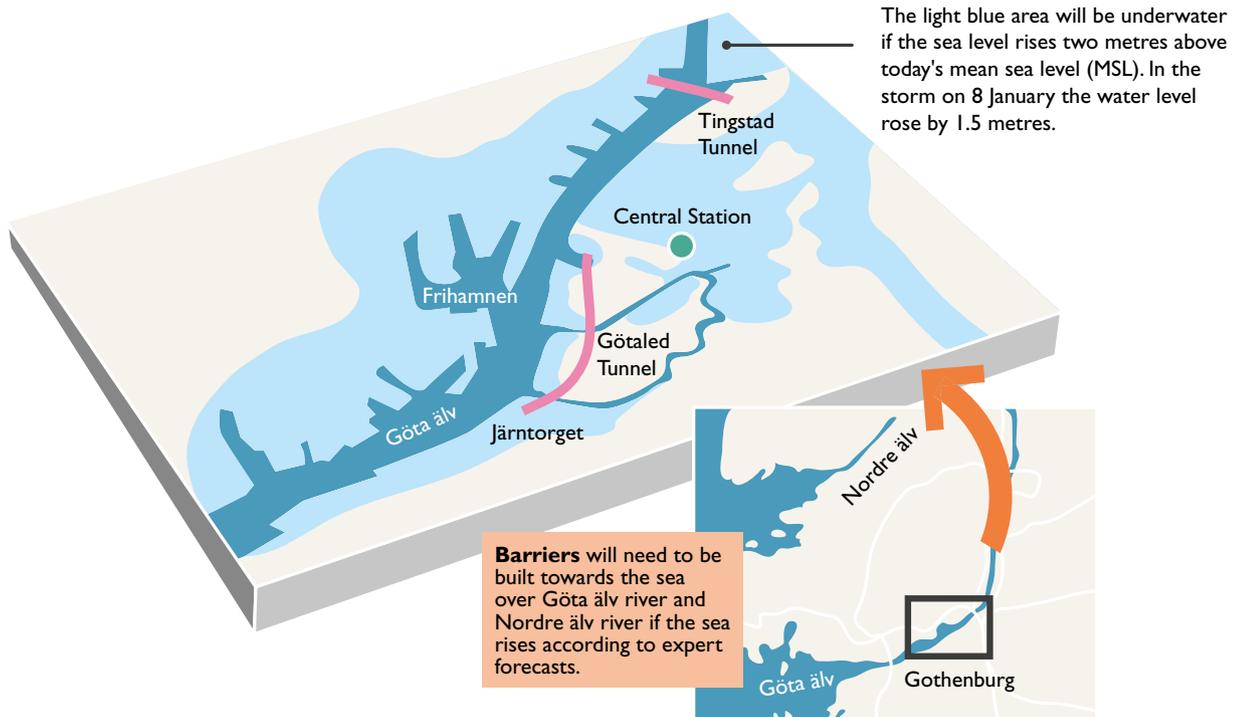


Figure 6: Engage citizens in developing future scenarios and visions using three types of scenarios:

- Retreat (Less building)
- Defend (Build protective barriers)
- Attack (Built out over the water)

Source: Mistra Urban Futures/Sweco Göteborg.



Retreat = Less building

Defend = Build protective barriers

Attack = Built out over the water

IMPORTANT CONCLUSIONS

- According to SCB⁹, in 2053 just over 11.6 million people will live in Sweden and most of them will live in one of our three metropolitan regions. In 2013 more than 1.7 million people were living in Stockholm, Gothenburg and Malmö. By 2053 the populations will have swelled to 2.4 million.
- There is extensive research on cities in various disciplines with a focus on problems facing big cities, while smaller and medium-sized ones have not studied to the same extent.
- Growing/shrinking populations, climate change, growing/shrinking industries, an ageing population or a higher percentage of young people, increased or reduced transit needs or new ICT possibilities are all examples of changes that need to be addressed in urban planning for the future.
- It will therefore be necessary to increase the flexibility and ability of cities to quickly adapt to changed circumstances by planning for the unexpected to a greater extent than today and by building a culture of flexibility.

3. Develop visions for the future in dialogue between actors

Increasingly, people's desire for a good, secure and healthy life is a key consideration in future urban planning – from an ecological, sociocultural, economic and spatial perspective. There is great untapped potential in cross-sectoral development and in evaluating visions for the

future in dialogue between a broad range of actors to create attractive living environments for everyone, including a focus on flows of goods and passenger transport, energy, materials, waste and water.

STATUS TODAY – STARTING POINT

Various channels for dialogue involving citizens in community planning have emerged as critical success factors for sustainable urban development in the short and long term. Since 2006 the Swedish Association of Local Authorities and Regions has, for example, been involved in a comprehensive Citizen Dialogue project which builds networks to share knowledge and experience. For the past few years a cadre of researchers have started to show an interest in the topic. Two current anthologies published by the Arkus research foundation provide a comprehensive illustration of how the practical handling of dialogue and interactions between players in the planning process could be further developed and intensified.¹⁰ Even though the intentions for citizen involvement are often good, many examples in reports indicate that there are also significant problems making it work in practice.

Citizen dialogue often involves participant initiatives initiated from above. Since planning is

about the future, the actual problems addressed are never clear cut. Rather, there is a power privilege at play with respect to who gets to define the issue and, in doing so, decide which values will be allowed to shape the future.¹¹

Municipal civil servants are tasked by politicians with developing proposals that align with political decisions, but their task also involves a statutory consultation process to gather input from the public. One problem that is often pointed out is that meetings to confer and consult with the public often fail because the local authority only presents a single proposal and wants opinions on how to implement it. But when local residents come to these meetings they want to discuss e.g. whether or not to build with an open attitude to exploring multiple options. Citizens are often not engaged in the process early on enough in order to harness their knowledge and input and to integrate these into the development process.

THOUGHTS ABOUT THE FUTURE

People and their expectations need to be the focal point when we plan our cities. “If we build a city for children we will have a city that is good for everyone.”¹² We can see this statement as a metaphor and a way to ensure that planning is based on a deep understanding of the expectations of all user groups and their desire for an attractive environment in which to live. This is of course about fundamental values such as justice, inclusion, security, safety and health, but also ensuring that cities offer an attractive environment that inspires and promotes development. Urban dwellers need to be able to impact and change the content and shape of cities to match their needs and desires.

Good cities of the future will provide attractive living environments that are economically, socially and ecologically sustainable – for all citizens. Good cities will minimise the need for unnecessary transportation and transportation must be environmentally sound – primarily through a combination of public transit and pedestrian and bike traffic. Good cities require a people-centric approach when designing all infrastructure for transportation, buildings and flows of energy, water and materials. Urban design and urban functions – with meetingplaces as a key function – can incorporate this. Good cities of the future will be able to solve life’s daily challenges in a way that is sustainable in the long term and that can lead to positive development spirals.

Cities are always dependent on efficient interfaces with surrounding rural areas in order to survive. A global outlook shows us that cities come in many shapes and sizes – from small towns with a few thousand residents that interact directly with their rural surroundings, to megacities with tens of millions of residents, where the food supply is often a critical factor. Sweden is different in that we do not have megacities. The interplay between cities, towns and districts of various sizes in a regional context is increasing in importance.

A longer term perspective is needed in community planning, especially in light of the challenges that the climate, segregation, digitalisation and

urbanisation are presenting. Urban planning and design need to focus more on developing alternative visions for the future for regions, municipalities, urban districts and spaces. Up to now urban planning has been largely influenced by forecasting and trend prediction. Backcasting combined with a scenario methodology is useful in a planning context with a greater focus on future solutions based on prioritised sustainability goals.

Instead of forecasting the future based on the current situation, the backcasting method involves, at an early stage, outlining future solutions for cities, neighbourhoods etc. to present a long-term view of what they might look like. The time horizon is set far into the future when qualitative changes will have taken place. By being released from the deadlock that exists in acute situations or current development trends, it is possible to find solutions that would not have been identified using a more traditional approach. Possible alternative paths can then be analysed as well as the consequences of solutions in various time perspectives. Analysis of the current situation and the past needs to be included in order to incorporate important qualities in the existing urban environment.

Backcasting was introduced in the 1990s when municipal authorities were engaged in cross-sectoral dialogue, and involved some citizen dialogue as well. It has become clear that there is great potential to develop this approach because it unleashes the knowledge and creativity of the participants and inspires them to think in new ways.

Specifically, there is significant potential to combine backcasting with new digital tools. The possibility of building virtual urban models of the current situation as well as future visions facilitates the task of visualising and assessing the consequences of various alternatives. There have been great advances in virtual reality (VR) technology which has become better and cheaper. Compared to traditional tools, VR glasses enable us to move around in alternative future realities created on computers and then provide input and suggestions for changes based on a deeper experience of what the future environment might be like.

IMPLEMENTATION

One key question is how we can create institutional conditions and systems for planning and the built environment to enable us to organise and reorganise our cities in a gradual process, taking into consideration our planetary boundaries (the ecological dimension) but with a focus on social issues (people-centric) and using the economy as an instrument.

In Swedish community planning great trust has been placed in the municipal planning monopoly and power over land ownership in order to make change happen. But this does not offer sufficient success factors for planning good cities of the future. More proactive governance and planning methods are needed in community planning (dynamic urban governance) with active political leadership to facilitate the process of creating and evaluating future visions and strategies as a basis for creative dialogue with all relevant actors.¹³ Strategic planning can help to strengthen the role of local government as an active party in the development process. It is important to form strategic alliances between private and public actors at various levels to a greater extent than we have done in the past. This will reduce the focus that has existed up to now on formal zoning plans as the overriding format for successful implementation. The process of developing future scenarios and visions can be improved by including formal and informal, visible and invisible processes and decisions at different planning levels and with various degrees of tangibility. The forums-arena-court model launched by Patsy Healey expanded the vision of what planning actually to include all aspects of community and urban development. Very briefly, this model involves:

Forum: A meetingplace for a broad group of actors for open dialogue and communication.

Arena: An organised meetingplace where processes are designed based on the ideas that emerged in the forum.

Court: Where decisions are made in the formal planning process.¹⁴

Forums and arenas provide “soft” infrastructure to build relationships, social capital and mutual learning for more well-founded knowledge and insights as a basis for the formal planning process.

Example 1: Urban games

When planning for the future, a broader group of actors needs to be involved and allowed to express opinions, especially children and youth. Within Mistra Urban Futures¹⁵ in Gothenburg, five urban games and two other concepts were developed to allow children and young people to learn about planning: Venue Haga/Dialogue tool Urbania, iPad game: Bygg ditt eget Göteborg 2021 (Build your own Gothenburg 2021) camping site, symbiocity scenarios learning, the Hammarkullen game, network visualisation and the spatial layer toolbox.

Example 2: Projects for schoolchildren

Teaching architecture is a well-trying and tested tool used in urban planning, especially in Gothenburg. An initiative has been under way since 2000 to allow youth participation supported by a network of architecture educators. They work with teachers to share their ideas, methods and techniques for architectural and planning work. Every year since 2003 the results of the schoolchildren’s projects are displayed in a central location in Gothenburg with the theme of the city through the eyes of young people. The planning of the Södra Älvstranden development in Gothenburg involved a number of school classes participating in an urban development competition alongside teams of adult planners.

Figure 7: There are greater opportunities to use digital technology to visualise and walk virtually through future urban developments with the help of VR technology. The picture shows how optimal placement of solar panels in future urban neighbourhoods can be visualised in digital models.

Source: Sweco.



Figure 8: Minecraft can be used to encourage citizen participation in planning, see example 3.

Example 3: Computer games as tools

*How Minecraft is helping the United Nations improve the world.*¹⁶ Minecraft is a computer game that has also proved to be a powerful tool for engaging people, including those living in vulnerable locations. The game is popular among all ages but mainly with children and young people and, according to Pontus Westerberg who works within the UN Human Settlements Program, “it changes the relationship between professional architects, urban planners and ordinary people” and “gives power back to ordinary people.”

A city neighbourhood or location is recreated three-dimensionally in Minecraft and is then used as a model in workshops where the participants can develop solutions, move around and interact with other participants in jointly cre-

ated models, which are then delivered to local authorities for approval and completion.

Example 4: ÖP bus in Borås

In Borås municipality a unique, coordinated and transboundary general planning and energy planning process is taking place. 40 employees from various public agencies and companies are working together to develop visions for 2035 for land use and energy based on the method of 4/20 – 4 big and 20 small steps for sustainable planning. Planning is linked to citizen dialogue to gather input on the good and not so good aspects of Borås. The Municipality arranged a “bus tour” where a bus visited 14 locations for direct dialogue between politicians and citizens facilitated by civil servants.



Figure 9: Cross-sectoral work on creating future visions for the station-city connection in Borås as a part of the municipality’s general planning and development work within the Mistra Urban Futures project “The urban station community” (see also Chapter 6).

**Example 5:
Energy scenarios as music**

The Swedish Energy Agency's project *Four Futures – the energy system beyond 2016*¹⁷ illustrates scenarios to facilitate a discussion on what the energy system might look like in the future

depending on what society and people consider important in the area of energy. The four future scenarios were inspired by the world of music: *Forte* means forceful, *legato* means linked, *espressivo* is expressive and *vivace* is lively. The names illustrate the key priorities in each future.

IMPORTANT CONCLUSIONS

- The focus must be on people when we plan our cities to find ways of solving the daily challenges in "life's puzzle," not least in terms of minimising unnecessary transportation.
- Various types of dialogue involving citizens in community planning have emerged as critical success factors for sustainable urban development in the short and long term.
- A combination of backcasting, creating scenarios and using digital tools provides a useful method for future planning, mobilising the creativity and expertise of all actors.
- We need to create institutional conditions and systems for planning and urban management as this enables us to organise and reorganise our cities in a step-by-step process.
- When planning for the future, a broader group of actors needs to be involved, especially children and youth. The use of games like Spelplats Haga, Urbania and Minecraft have increased the inclusion of groups that otherwise would perhaps not have become involved in urban planning.

4. Looking at Good Cities of the Future in a regional context

In the future the regional level will be a more important foundation for people's lives – their work, housing and recreation. City regions and the interfaces within them will grow in importance. The trend towards polynuclear

regional and urban structures is important in terms of creating sustainable flows for the transportation of people and goods, and for energy, materials, waste and water.

STATUS TODAY

For several decades we have seen a rise in regional sprawl where, while job market-related relocation has declined, commuting has increased and has largely replaced relocation as a lubricant for regional job markets. In 1970 there were 187 local job markets in Sweden and 30 years later there are fewer than half that number.¹⁸ As an illustration of what this means, one of the criteria for an area not to become part of a different job market is that less than 20 percent of the population of the area should be commuting

out of it. Three regional patterns of relevance for Sweden¹⁹, can be defined in this regard¹⁹, see Figure 6.

- **Remote and isolated local job markets that can be characterised as single nucleus regions** because they are largely dependent on one or a few population centres in the peripheral parts of the country, mainly in the inland of northern Sweden (such as Lycksele).

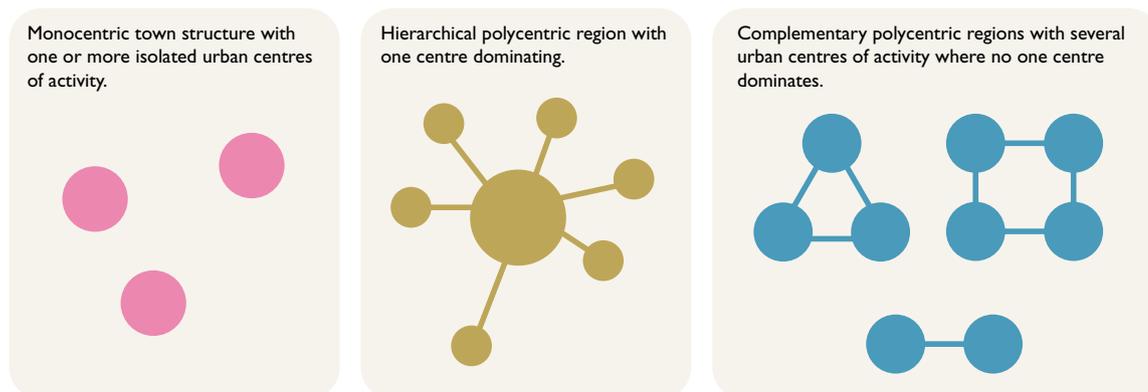


Figure 10: Three regional development patterns according to Johansson, M, 2008.

- **Large single nucleus or hierarchical polynuclear job markets** with polycentric residential patterns. Here a number of larger cities and population centres are integrated into a larger job market dominated by the big cities (such as Borås in the Gothenburg region).
- **Complementary polynuclear local job markets** with polynuclear residential structures in small and medium-sized towns and population centres outside the metropolitan areas of influence. No particular town/city dominates (for example the Växjö-Kalmar region).

There are many different types of regional planning taking place in Sweden. The Stockholm region is the only region in Sweden where regional planning is regulated by law in the Planning and Building Act (PBL). Regional development plans are produced in a process that involves the region's 26 municipalities and, in the current RUF5 2050 (Regional development plan 2050), cooperation is expanded into Östra Mellansverige (eastern part of mid-Sweden). Region Skåne has been working on regional development strategies for a long time. Skåne's structural model approaches regional development from a spatial perspective. Similarly, a structural model is being developed for the Gothenburg region under the regional association of Gothenburg municipalities with an emphasis on developing

high streets by connecting them to and strengthening urban station communities. In Sweden's other regions there are some interesting initiatives to manage regional sprawl in a sustainable way, e.g. Linnétråket and Mer Kalmarsund in Region Kronoberg, as well as Pärland på spåret in Region Gävleborg.

A reform of the current county division structure, which is several hundred years old, was proposed in a government commission report, SOU 2016:48.²⁰ Today more than half of Sweden's population lives in the three metropolitan counties, while less than half lives in the other 18 counties. The proposal is to create six strong counties all of which can help promote national growth and local prosperity in a climate of increased global competition and within the European integration. The proposal has sparked a lively debate. There are objections to the idea of putting the whole of northern Sweden into one northern county. We are not taking a stance on this issue in our report, but we would like to underscore that dynamic regional development is not entirely consistent with the administrative social structure subdivisions. In the existing counties – and especially if even larger counties are created – there is a need to promote cooperation between adjacent cities and towns to create mutual benefits in many areas beyond the administrative ones.

THOUGHTS ABOUT THE FUTURE AND FUTURE CONCEPTS

The regional planning process needs to be improved to create better accessibility among cities of all sizes but also to improve access to smaller population centres and rural areas. This is necessary but not sufficient to create a fossil-free society by 2045, economic growth, social inclusion and justice. We would like to see the trend towards so-called decentralised concentration continue. This will involve urban infill in cities and other localities, while also improving external connections to other cities and areas through robust public transit services in the

form of railways, prioritised bus lanes and regional bike paths.

There is great potential for more urban infill and more diversified construction around stations to create urban station communities, not only to facilitate commuting, but also to make regional rail travel combined with other modes of transport a natural alternative for leisure and business travel. Ensuing access to local tourism and local cultural events is becoming more important in a society where air travel needs to be limited due to its climate impact.

Developing polynuclear cities and communities in this way will be increasingly important to make urban sprawl more sustainable. RUFSS 2050 recommends both urban infill in larger regional hubs as well as in smaller nodes and centres in rural areas to compensate for the negative effects of the thinning out of cities and neighbourhoods. Read more on nuclei and nodes connected to urban station communities in the chapter *Attractive meetingplaces and high streets*.

Regional structural models need to be produced for regions and sub-regions throughout the country to focus on interfaces between neighbouring cities/districts and rural areas, coordination of built-up areas and transportation of goods and people, and eco-cycle systems. Regional structural models need to show how cities/towns and neighbourhoods, including those in sparsely populated regions, can better complement each other for collective regional strength combined with better public transport services and digital communication. This can also help to extend people's pride in their own city/neighbourhood to the region they live

in. Digital infrastructure will need to be more prominently featured in these structural models because significant development of ICT will be needed in the future to enable communication without physical travel around the globe. This could promote increased involvement in community development and make smaller cities more competitive in a global perspective.

But the regional structural models also need to be coordinated into visions that describe the spatial connections between all parts of the country and internationally. A national structural model is needed as a vision for development in Sweden as a whole in order to help overcome the barriers put up by the administrative divisions for different sectors (traffic, technical infrastructure, nature conservation etc.). One starting point could be Boverket's Vision for Sweden 2025 which is 12 visions that show options for physical community planning of the future. The visions show the changes in direction necessary to achieve a sustainable society by 2050.

IMPLEMENTATION

Traditional planning methods linked to the local level do not suffice for use in advanced regional planning according to the model outlined. Collaborative, creative work processes are needed among regional and local actors, involving civil society, the private and public sectors and academia – locally and internationally in a quadruple helix. Workshops focusing on the future need to be arranged in both spatial and digital arenas to enable creative construction of future visions at the regional level. Experimental formats for meetings and dialogue foster co-creation and mutual learning. A project of the Swedish Transport Administration called *Den attraktiva regionen* (The Attractive Region) provides a glimpse of collaborative methods that could in the future promote joint ownership of regional development based on regional structural models.

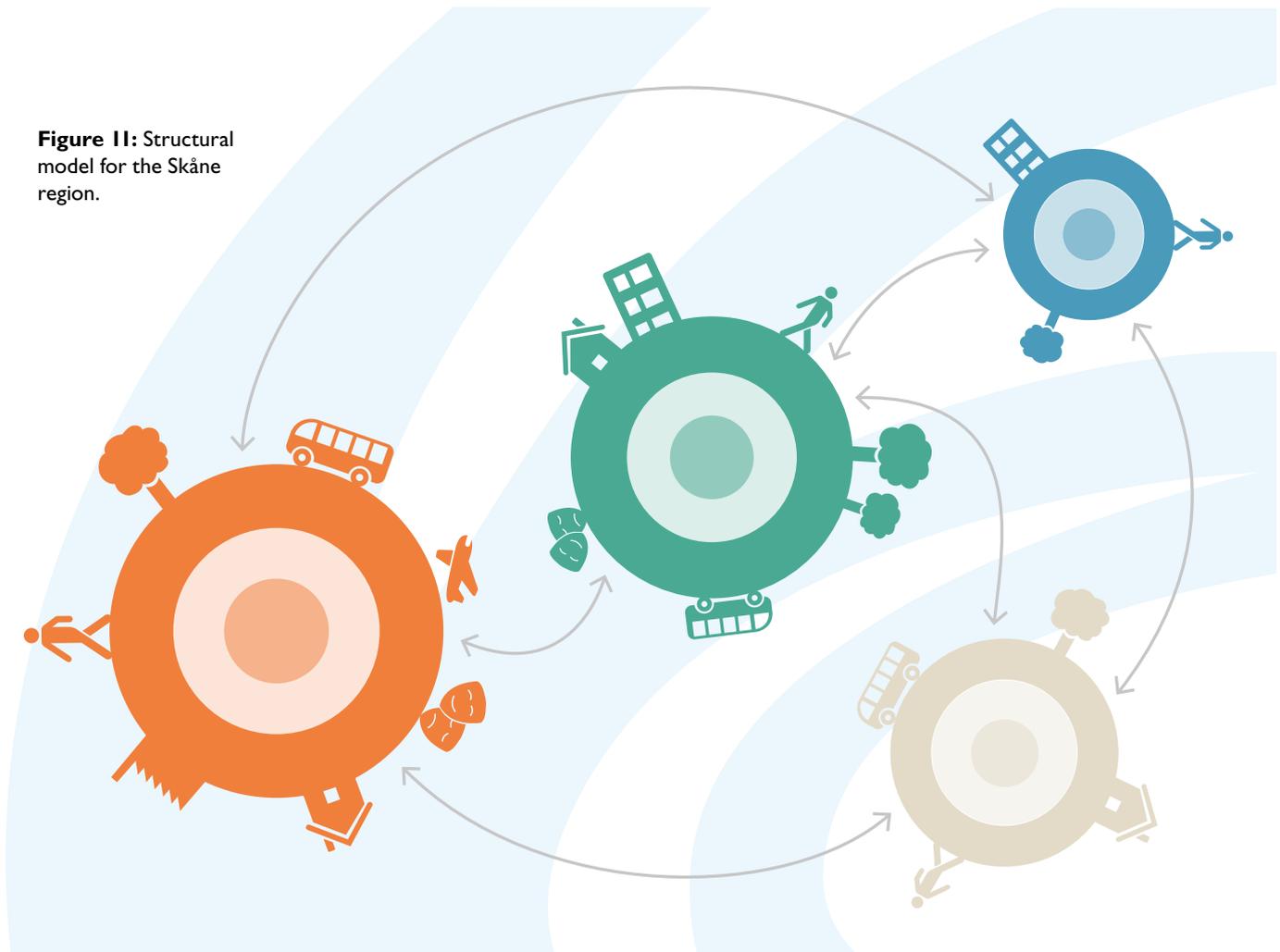
The following four examples that highlight the regional dimension may provide a more meaningful way of regarding cities and towns in a regional context in the future:

Example 1: Municipality and region

A project under way in Västerbotten is focusing on structures for the growth process with a spatial perspective to examine how to develop the interface between the regional growth process and municipal general planning in the county.

Could Lycksele be an engine for development in the inland of Västerbotten County through stronger connections to Åsele, Dorotea and Umeå?

Figure 11: Structural model for the Skåne region.



Example 2: Structural model for coordination

A structural model for the Gothenburg region is an agreement on taking joint responsibility for ensuring that the regional structure is sustainable in the long term. The objective is for member municipalities locally to take responsibility for the regional structure by basing their planning work on and following the structural model that focuses on the development of urban station communities along railway lines in four directions from Gothenburg City.

Example 3: From strategy to plans

A structural model for Skåne aims to link the regional development strategy for Skåne with the

municipal authorities’ general plans, and is an arena for dialogue about the challenge of having an advanced regional perspective in physical planning.

Example 4: Regional contracts

The regional development plan in the pipeline for the Stockholm region, RUF5 2050, will lay out a strategy for development of the Stockholm region over the next 35 years. RUF5 will set the course for the Stockholm region and function as a joint contract for the region. Three prioritised measures during the years 2018 – 2026 are:

- Connecting the region and building in a compact and varied way and close to public transport.

- Safeguarding value through climate-smart living, protecting natural resources and developing efficient systems.
- Improving competitiveness through smart, green and inclusive growth.

Can Norrtälje be a stronger hub for Roslagen by linking up with Rimbo, Hallstavik and Kappelskär, by also with Stockholm and its northern suburbs?

IMPORTANT CONCLUSIONS

- Regions will increase in significance in the future. Inter-regional activity will also increase in importance. Regional planning processes need to be improved to create better accessibility among cities/towns of all sizes, but also to improve access to smaller population centres and rural areas.
- The ongoing regional sprawl has resulted in fewer people relocating to other job markets. Commuting over longer distances has instead increased over the past couple of decades.
- There is great potential to establish urban station communities to facilitate commuting and make regional rail travel an alternative for leisure travel as well.
- Traditional planning processes focusing on the local level are not sufficient. A national structural model is needed as a vision for development in Sweden as a whole in order to help overcome the barriers caused by the administrative divisions for different sectors. Regional structural models need to be produced for regions and sub-regions throughout the country to focus on interfaces between neighbouring cities/districts and rural areas.



5. Building cities inwards

Building cities inwards is a way of making them accessible and attractive for everyone, but can also give rise to unhealthy conditions and encroach on cultural and natural milieus. It is important to make the right choices.

Creating more cohesive urban structures and using land more efficiently for new purposes will reduce the need for car travel and improves the efficiency of energy, materials, waste and water systems.

STATUS TODAY – DEVELOPMENT TRENDS

With so-called modernism and the car-centric society associated with it, a process of urban depopulation began which caused an accelerating trend towards the dissolution of the traditional urban model. Between 1960 and 1995 housing density was reduced in the larger Swedish cities by a third at the same time as the amount of land available for building on increased by 70 per cent. Since the beginning of the 1960s the number of neighbourhood grocery shops/supermarkets also fell sharply – from 21,000 to 5,300.²¹ The distance to shops increased, making them less accessible to people without cars. External and semi-external shopping centres dominated

increasingly and accounted for 7 percent of car travel and around 15 percent of greenhouse gas emissions from these vehicles. But this change also resulted in the creation of more or isolated built-up islands for many other purposes such as living, work, culture, recreation etc.

Alongside this was the reverse trend of urban concentration, i.e. a sharp population increase in city centres as a result of the knowledge-driven economy and a renewal of the attractiveness of city centres, especially in medium and large cities. This trend intensified the use of land in industrial, harbour, military and hospital areas for a mixed built environment.

THOUGHTS ABOUT THE FUTURE

Building cities inwards is an objective and a political desire which many municipal authorities are including in their general plans. Urban infill has both benefits and drawbacks. On the plus side is the possibility of developing multiple meetingplaces and making more efficient use of the infrastructure so that investments already made in the water and drainage system, waste, energy, streets and squares can be used

and supplemented. Infill helps to promote the creation of education and innovation clusters, as well as a concentration of commercial and restaurant activity and a more diverse cultural offering. It also provides opportunities to create more mixed-function milieus and a more vibrant community.

On the minus side, extreme urban infill can lead to health issues relating to air quality, light

and noise problems, as well as stress and overcrowding. There is also greater stress on green areas and waterways, and on cultural environments.

Infill also requires people to adapt to their surroundings to a greater extent and leads to tough conversations and complaints among neighbours. Urban infill often takes longer than building on virgin land. Nevertheless, it is important to fill in and build “more of the city” as this is the type of environment many want to have access to. We need to be better at finding a balance between different interests to achieve long-term, sustainable development and quality urban environments.

Residential construction is an urgent need in light of the current housing shortage. The new homes need to be in attractive locations where people want to live – often central or close to public transport services. It is also important for diverse groups of people to be able to afford to move into newbuild developments or to move back following renovation. As we build new homes, we also need to make much more efficient use of existing buildings. There are interesting proposals for the improvement of the “Million Programme” housing complexes that involve making use of the formerly largely unnoticed generic nature of the developments and create a more varied and attractive housing stock. There are many myths associated with the Million Programme and these have blinded people to the great potential that exists in developing these areas.²² The media image of the “impoverished suburb” is a strong one and has contributed to the general perception about the circumstances and capacity if those living there. When these kinds of preconceived notions spread there is a risk that the potential of building new homes, workplaces and services will not be realised.²³

A good example, which is presented in Chapter 6, is Fittja. Building the city inwards means continuing to meet the need for housing, workplaces and services and preferably with a mix of functions, because a new Million Programme is not something we should be striving for, despite the housing shortage.

Finding land to build on will in future still

involve reusing land where ports, industries and institutions are located or for infill between existing buildings. This applies also to smaller and medium-sized towns (such as those in our case studies, Norrtälje and Borås). It is challenging to use this, often polluted, land and to avoid the temptation of using up green areas when looking for new space. The alternative is to compensate by adding new green spaces.

The possibility of building cities inwards by placing roads, railways and power lines in tunnels is another way to achieve an attractive and sustainable living environment, particularly in large and medium-large cities and municipalities that have more resources (such as Stockholm, Malmö, Danderyd and Uppsala).

There is more competition for land in metropolitan areas. In smaller towns it may be easier to build outwards due to more land availability, especially in sparsely populated woodland areas. But there are reasons to be economical with land in smaller towns/districts as well.

Global warming and climate change will result in higher water levels and more severe weather conditions. In central locations special measures may be needed to adjust to new climate conditions, such as building sea walls, building on islands or using parkland for surface water runoff (see the Gothenburg example in Chapter 2). Urban ecosystems need to be developed and made visible when building cities inwards. This means making green spaces multifunctional in cities in their interfaces with buildings and infrastructure.

It is important to further develop solutions for compact, energy efficient and climate-smart development in locations close to public transit services. There is great infill potential around existing railway stations which, if exploited, could provide significant environmental and financial gains. One such example is the city of Bergen in Norway where one krona of public money stimulated 13 – 14 kronor of investments from other actors in the expansion of the light rail service. It is becoming increasingly important to improve infrastructure for pedestrians and cyclists. It should be easy for everyone to move around a city. A positive consequence of this would be that cars would be less dominant in city centres.

As pointed out earlier, external shopping centres are often developed as isolated, entirely car-dependent islands of buildings and “asphalt deserts.” There is instead a possibility of transforming these areas into mixed and multifunctional areas as part of a regional hub with good public transit services, and as logistics areas that supply other parts of the city.

IMPLEMENTATION

As mentioned above, urban infill requires careful consequence analysis to identify both positive and negative consequences. The benefits in the form of more vibrant environments need to be weighed against the drawbacks for people and the natural environment, as well as the negative aspects of gentrification. Gentrification is where urban infill can raise the social status of an area through newbuild or an influx of people with far higher incomes into neighbourhoods being upgraded. It may not be possible for the original residents to move back, thus triggering a vicious circle which would increase social segregation between different parts of a city.

To successfully build a city inwards, we need to improve coordination and cooperation between decision-makers at all levels in urban planning. We must reject the silo mentality from the global down to the local level. We need to stop “working in silos” and instead seek integrated methods and processes. Despite extensive experience in this area there are still many unanswered questions about how to coordinate new developments with good traffic solutions. Actors in the local and national public sector and the private sector are all involved in

In sparsely populated single-family home residential areas there is also potential for some careful infilling to provide more users for services and public transport in the area (e.g. the Mellanstaden project²⁴).

the process, but often have different financial capacity, time perspectives and legal aspects to take into account.

We need a conscious effort to improve cooperation and coordination between society’s *decision-makers at different levels*, i.e. within national, regional and municipal authorities. It is important to create common visions and remove legal obstacles.

It is also important for there to be cooperation and collaboration between property owners, retailers, tourism actors and the public sector (usually at the municipal level) in order to develop attractive city centres and neighbourhoods. Examples of good collaborative solutions could be found in the Swedish city centres that have been recognised through the *Årets stadskärna*.²⁵ (City Centre of the Year) award.

One example of cooperation is the renovation of Kungsgatan in Gothenburg. This was financed by imposing a fee per metre of facade on the street. Property owners and retailers paid 50 percent of the investment and the municipality covered the remaining half. The result was that the whole street was given a uniform and attractive appearance.²⁶

EXAMPLES

Storsjö strand is Östersund’s new waterfront district overlooking Oviksfjällen and Frösön. The municipal authority planned to build 800 homes,

commercial premises, cafés, restaurants and offices. The neighbourhood is a natural extension of the city centre and a unique area for residents

Figure 12: The old textile industrial area Simonsland in Central Borås is now home to Textile Fashion Center.



and visitors. Move-in for the first stage, which covers four blocks, was planned for 2017.

Älvstaden is one of the Nordic region's largest urban development projects and involves doubling the size of central Gothenburg. The goal is 25,000 flats and 45,000 new workplaces.

Mölnlycke is the centre of a growing municipality in the vicinity of Gothenburg. With strategic land ownership and the municipal planning monopoly, a suburban hub has been turned into mixed-use development.

Urban infill is important from a social, ecological and economic perspective, according to **Borås Municipality**. It can provide positive outcomes such as more people staying in their neighbourhood, less transportation and retained commercial services. One example that has attracted attention is Simonsland, a previously forgotten district in central Borås which has been renovated and rebuilt. The result was 60,000 sq. m. of space for a museum, an upper secondary school, a textile college, incubators, conference rooms, cafés and student housing.

Västra hamnen in Malmö has undergone big changes over the past few decades. From being an industrial area in decline, Västra hamnen has been converted into an attractive, waterfront district based on a sustainable, comprehensive approach.

Maria Park is a relatively new district in the northern part of Helsingborg built around the grounds of the former Santa Maria Hospital in an area previously called Senderöd. Construction on this district started in 1995 and it will grow in stages, stretching to Maria train station where the buildings will be closer together for a more urban environment.

Norrtälje is an attractive municipality close to Stockholm. The new municipal general plan emphasises growing the whole municipality and integrating it more with the Stockholm region. Demand for land has increased significantly. The Municipality's urban infill plan includes identifying "spare" space for better urban planning. The port of Norrtälje is undergoing a major transformation, with the old industrial area now becoming a place for both recreation and 1,500 homes. In Norrtälje's, construction

is taking place where infrastructure already exists. Norrtälje's politicians feel this is a way of reducing costs and climate impact.

Östra Sala Backe is an important piece in the puzzle of developing Uppsala's eastern neighbourhoods and will add something new in terms of content, functions and design. Homes, workplaces and services are being built in an area that used to be a power lane and connects the adjacent areas of Årsta and Sala Backe. This will result in a more intimate and mixed-function development with an inner city feel.

In **Rinkeby** an overbuild over the E18 will be completed in a couple of years. A 300-metre stretch of route E18 will be enclosed in a tunnel. The construction of several new homes has started and the plan is to add 600. Rinkeby's high street has been transformed into a vibrant commercial street. New footbridges and more bike paths and bus lines have been added. "This is a central and important street in this part of town, but also a street that people have often just bypassed," writes Stockholm Municipality on its website.

Botkyrka: Alby is in many respects a typical Million Programme development.

The Municipality is in favour of urban infill in general. The goal is, for example, to turn the classic Million Programme development of Alby into a new urban development, and the municipality has produced a planning concept for the area as part of its focus on sustainable development. Botkyrka municipality has identified "specific change areas." There are, for example, plans for high streets and development to connect the centres of Hallunda, Alby and Eriksberg.

Sjöterrassen in Fittja consists of 42 buildings on the hillside facing Albysjön lake. The development is a mixture of single family homes and smaller flats and townhouses, and is a "contemporary addition to the Million Programme development in Fittja." Large prefabricated elements have been used as a cost-effective way to provide more people with a chance to buy a home. Sjöterrassen in Fittja is one of four developments nominated for Architects Sweden's Housing Prize – a prize awarded by the association to encourage and raise awareness about good residential construction in Sweden.



Figure 13:
Rinkeby high street
– formerly a street
crowded with
traffic, now a vibrant
meeting place.

Source:
Familjebostäder.

Figure 14:

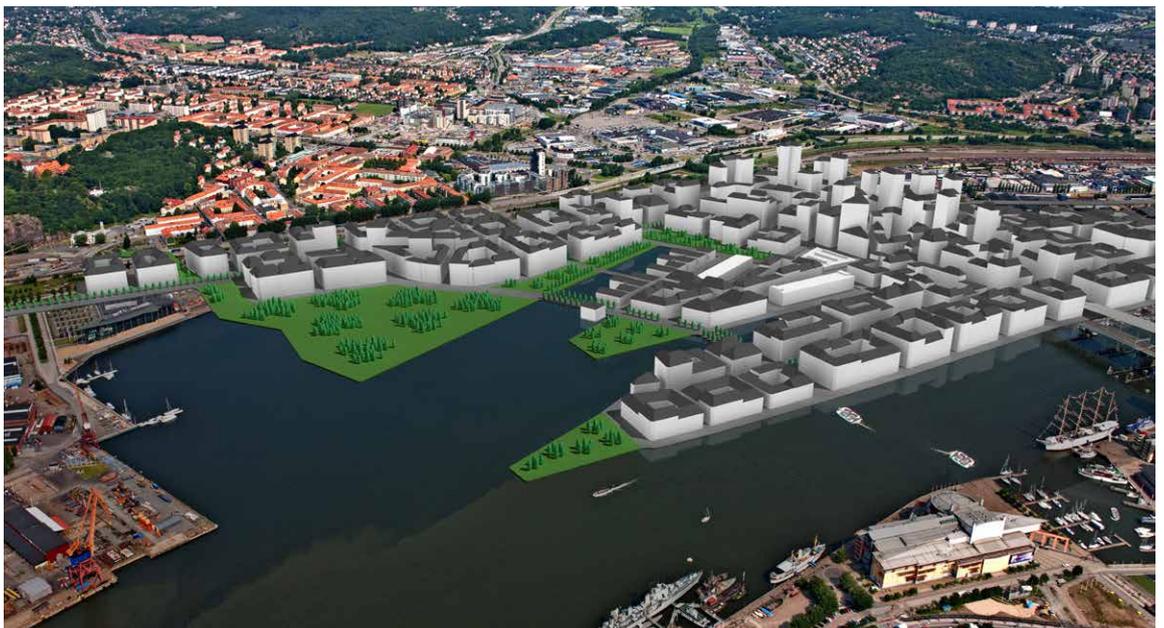
In Norrköping's industrial landscape an architecturally exciting residential project called Katscha has been built, combining flowing water and local history. The project is described in the magazine Arkitektur 2016:8.



Figure 15:

Frihamnen in Gothenburg was developed into a dense inner city area which is a part of the city centre. It is estimated that around 15,000 people will live there in the future and the same number will work there.

Illustration/
photo montage:
Göteborgs stads-
byggnadskontor.



Bo Tryggt 05 is a handbook for crime prevention and security in homes and residential areas. Bo Tryggt 05 was developed at the Police Authority's research and development unit in cooperation with building firms, housing companies and other stakeholders.

Täby, Arninge-Ullna: In Arninge a commercial area is being turned into a development that will include 2,000 homes with proximity to attractive countryside and a wide range of outdoor activities. A public transport hub is also being created here for northeast Stockholm through an expansion of the Roslagsbanan line and bus services.

According to the statistics, route E18 through **Danderyd** is used by 75,000 vehicles a day. There has been talk of placing E18 in a tunnel since the 1950s. A tunnel would free up land which could be used for new homes, workplaces, parks or areas for other outdoor activities. The town could be developed on top of the traffic route and complement the existing single family home neighbourhood with a mix of home types, workplaces and services.

A programme for more secure housing: The discussion about security and insecurity in society has for a long time mainly focused on what the police can do to reduce crime and increase security. Several actors worked together on this project. The private sector was thought to have played a crucial role by, for example, building safer residential developments and homes. Tryggare Sverige (a foundation for a more secure Sweden) and JM AB (a leading housing developer) worked in partnership to develop a security programme called *Trygghetsprogram*.²⁷

Frihamnen in Gothenburg: There are plans in Gothenburg to develop Frihamnen into a dense inner city area that will be part of Gothenburg city centre. Around 15,000 people will live in Frihamnen and the same number will work there. When Gothenburg celebrates its 400th anniversary in 2021, there will be 1,000 homes and 1,000 workplaces in Frihamnen. A portion of the new Jubileum Park will also be located there.

Safeplaces is an interdisciplinary network at the Royal Institute of Technology (KTH) in Stockholm and is a resource for all those working for a safer and more secure and inclusive environment.²⁸

IMPORTANT CONCLUSIONS

- Building cities inwards is a concept that more and more municipal authorities are including in their general plans. With sound planning it can lead to a more efficient use of infrastructure, more attractive city centres and more vibrant cities with better options for education, innovation and culture.
- There are some interesting proposals for the improvement of Million Programme developments, but there are also many myths preventing actors from seeing the great potential that exists in these areas.
- The possibility of transforming external shopping centres into mixed and multifunctional areas as part of regional hubs with good public transport options or as logistics areas that supply other parts of the city should be looked into.
- To successfully build a city inwards, we need to improve coordination and cooperation between urban planning decision-makers at all levels; between government authorities, regions and municipalities. The main focus should be on creating common visions and removing legal obstacles.
- It is also important for there to be cooperation between landlords, retailers, tourism actors and the public sector (especially at the municipal level) in order to develop attractive city centres and neighbourhoods.



6. Enhance meetingplaces and high streets

Enhanced meetingplaces and high streets help improve living environments, both in and around cities. One hypothesis is that polynuclear meetingplaces, so-called nodes, have a greater intrinsic capacity for flexibility and adaptation than larger, single-node meetingplaces. An urban structure with a system of meetingplaces and high streets of various types provides the necessary conditions for efficient transport flows of goods and people. It also facilitates the placement of decentralised functions for a small-scale supply of energy, waste management and surface water.

A node is where flows converge and are coordinated, and where synergies are created between different functions. The concept of place dictates how nodes are designed and their social and public content. In a good meetingplace these qualities can be combined to improve social cohesion and create proximity to various types of places. In order to create a good city, it is also necessary for meetingplaces to be connected to urban thoroughfares that encourage people to use public transport, walk and bike.

STATUS TODAY – DEVELOPMENT TRENDS

The complex interplay between node and place has been an important theme in town planning and development in an historical perspective. Villages and later on larger towns and cities were created at the intersection of paths, roads and later railway tracks as places for trade, cooperation and meetings. Cities and towns were developed as cohesive spatial systems with distinct nodes, spaces and squares where people gathered. Although industrialism changed things to some extent, industries continued to locate their operations close to city centres, facilitating the movement of people and goods, but inevitably creating serious environmental problems.

This big shift led to the disintegration of spatially cohesive villages, or small nodes, of the past. Since the beginning of the 1900s there has been an ongoing thinning out of our cities and

this has resulted in the decline of the bustling city centres of the past. This is in part due to the construction of large-scale external retail parks (see also Chapter 5). This more or less splintered urban landscape around the city centre often made up only a few percent of the city's total area, but was home to most of the residents and workplaces.

Many towns today say that they find it difficult to coordinate, develop and finance the development of squares, streets and central locations. This is a serious issue because being attractive requires an inviting urban space in which people want to gather. In many places there is instead increasing competition between the city centre, suburbs and external retail parks. People are therefore now embracing the historically well-founded and therefore special

qualities of their own town/neighbourhood. One challenge is also to support cities in their ability to create social contexts in all living environments. Meetings between people with different backgrounds are becoming increasingly rare. This segregation is reflected in both mental and physical barriers between city neighbourhoods and suburbs.

A large housing construction requirement with an increasing number of units that are af-

fordable, especially for recent arrivals to Sweden, needs to be matched with urban planning that does not repeat old mistakes, such as segregated residential islands. This requires urban planning that offers good public transit services, a mix of functions, meetingplaces, high-quality outdoor spaces and a diverse range of housing of good quality and in various price ranges.

THOUGHTS ABOUT THE FUTURE – FUTURE CONCEPTS

Enhancing meetingplaces and high streets to create an attractive living environment starts at the regional level. In Chapter 4 we highlight the fact that strong regional planning involving dialogue about regional structural visions is essential in order to create attractive meetingplaces and high streets. Many regions have a strong single nucleus structure and need to counterbalance this by strengthening other cities/neighbourhoods than the regional hub through mixed urban developments that promote urban quality, urban life and vibrant meetingplaces.

Each city and neighbourhood has a historic central area that needs to regain its role as a social, cultural and commercial gathering place to counteract the depletion that happened when commercial activities and services were moved out to external areas. City centres and nodes need to be enhanced with more places for people to gather and inviting public spaces that attract people back to the city. This requires people to be able to have their home, work, recreation and actually *live their lives* centrally in the city. City centres and nodes could thus be the main meeting place in every city/district in the future, which means that the external retail parks could be reduced in size significantly and those areas turned into mixed urban districts as recommended in Chapter 5.

We need to make urban spaces more attractive and create more public places, streets and squares that are for everyone and used at all times of the day. Retaining and bringing in resi-

dents and companies into city centres is a key issue. One solution could be to invite several actors to participate in developing a unique brand for their particular city, suburb or small town. This could involve property, retail and restaurant owners arranging events in cooperation with municipal authorities and community associations, but could also involve them expanding or co-financing joint projects. It is also in the interest of all actors to create attractive parks that are integrated into built-up areas, but also larger green areas/wedges to promote good health, better air quality and less noise.

A good design for a city's public spaces, including sustainable mobility, is one of the most important factors in building pleasant and attractive cities (see also Chapter 7 *Promoting digital communication and mobility*). One success factor is carrying on a dialogue with those involved/affected.

It is important to develop community cohesion by creating multiple types of meetingplaces for everyone, especially in unexpected locations. A network of public spaces and meetingplaces linked to vibrant urban high streets and thoroughfares could be developed at the general planning stage. This would then be a foundation for fruitful and inspiring creative processes in the later urban planning stages. We need to succeed in building a social context in all living environments, and one way to achieve this could be to create a safe and accessible city with plenty of meetingplaces for everyone during all

the hours of the day and night. The meetingplaces could have richly diverse architectural styles and a mix of functions and content. The use of sensors in urban spaces can help to create a safe and secure milieu through varied and dynamic illumination, digital information and art. This would make the city more dynamic, resulting in increased diversity, integration, creativity and innovation.

Although there is great potential for expansion and infill, there are, however, limits to how much building can take place in city centres in any given type of city, see Chapter 5 *Building cities inwards*. It is therefore important to improve meetingplaces/nodes in suburbs and towns surrounding the big city. An example of an interesting way this was done in the past is the so-called ABC districts in Stockholm, where district nodes were created around metro stations. This solution attracted a lot of international attention. These types of nodes now require renewal and a better mix of functions to create a rich urban environment.²⁹ Several such projects have already been launched.

In suburban areas with large residential neighbourhoods there is a great need to convert ground floors into workspaces, flats and space for social/club activities, and to develop new meetingplaces connected to high streets and urban thoroughfares. These areas also need small-scale residential and commercial developments, e.g. in the form of townhouses, in order to be more attractive for people who want to work their way up the housing ladder in their own neighbourhood instead of relocating outside of the city.

The great need for residential construction to increase the number of affordable units, especially for recent arrivals to Sweden, should be addressed through urban planning that does not repeat old mistakes, such as segregated residential islands. A diverse range of housing of good quality and in various price ranges should be able to be offered. We need urban planning that includes good public transport, a mix of functions, meetingplaces and high-quality outdoor spaces.

Towns and large villages surrounding medium-sized and smaller cities also need improved

services and a small-scale mix of functions so they can survive and become attractive living environments. Smaller towns in the vicinity of cities could be developed into attractive places to live by, for example, taking advantage of digitalisation opportunities combined with building attractive new homes and re-using existing structures around train and bus stations, see Figure 6:1. This would bring a renaissance and renewal to existing urban station communities³⁰ along our railway lines.

Shops could expand their offering by providing a service where people can pick up online orders and by having a combination of digital and physical options to view products in “showrooms.” Employers could offer flextime workplaces using the opportunities offered by advanced ICT communication (4D/holography). Virtual learning opportunities for professional development and university programmes could be integrated into student housing solutions. Medical clinics relying heavily on telemedicine make healthcare – and preventive care – available in new ways. The sharing economy can also see a breakthrough if digital services are used to facilitate swapping, sharing, selling, reusing furniture, tools and other goods/products through re-use centres (see also Chapter 9 *Smart, integrated supply systems*.) A good idea would be to set up a recycling station adjacent to one of these re-use/sharing centres.

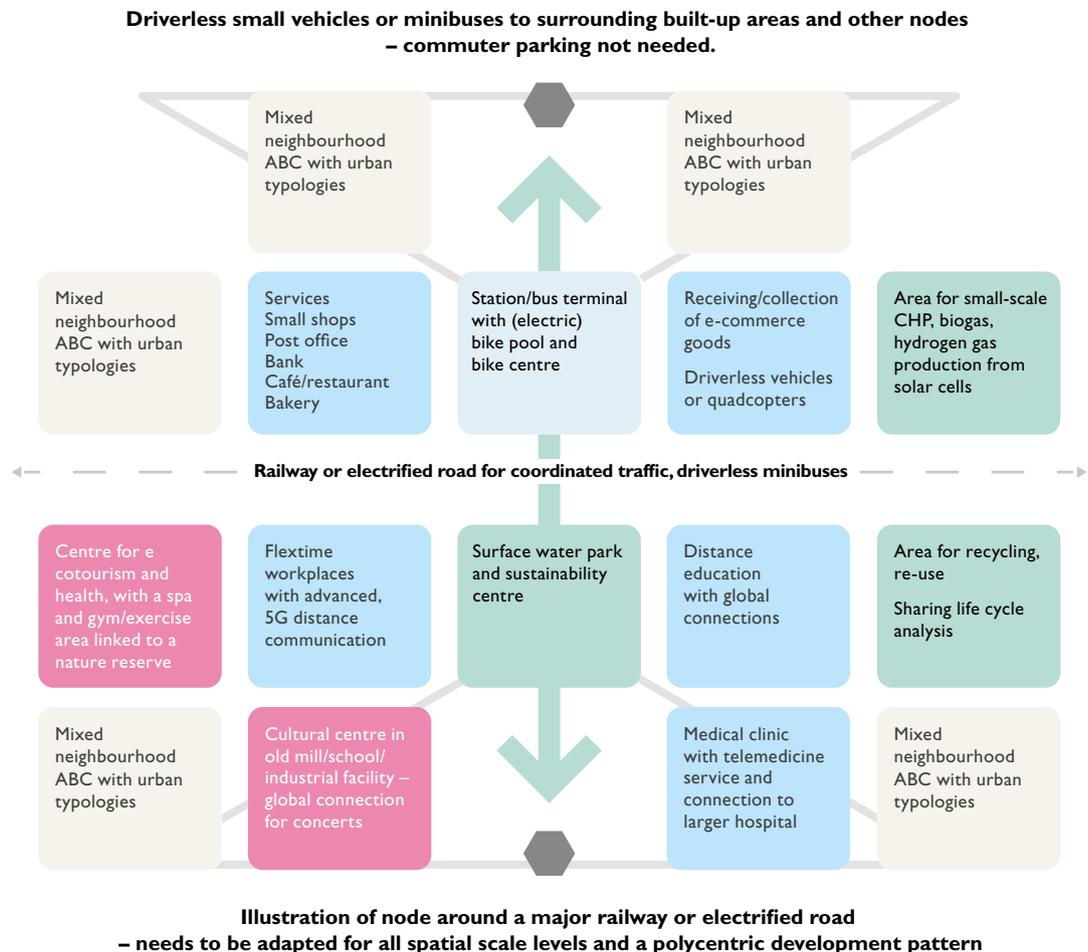
The digital functions need to be combined with a mixed-function housing development that includes residential facilities for the elderly, schools and preschools and other workplaces. There are many opportunities for eldercare facilities³¹ and schools to share spaces such as dining halls, clinics and sports halls. Older buildings could be re-purposed and used for cultural activities in internet cafés with flexible opening times. Small train or bus stations with vibrant and well-designed public spaces can strengthen the identity of a place. In the future, in addition to convenient paths for bikes and pedestrians, there will also be a fleet of self-driving, shared vehicles that can be used for trips between nodes. This will reduce the need for commuter car parks which currently take up a lot of valuable space in important areas around stations.

IMPLEMENTATION IDEAS

Creating good meetingplaces requires intense cooperation between a variety of actors: regional, municipal, land-owners, civil society organisations and residents. Collaborative and implementing organisational structures that span sectors and interests need to be established

based on common visions and with active citizen participation. An expansion of the physical infrastructure and built environment needs to be carefully coordinated with an expansion of the digital infrastructure.

Figure 16: Illustration of a meetingplace/node where the potential of digitalisation will be combined with spatial renewal focused on re-use, a mix of functions and vibrant meetingplaces and high streets.



EXAMPLES

Urban station communities

The Urban Station Community – towards resource-efficient travel is a knowledge-gathering process within the framework of Mistra Urban Futures in Gothenburg. Various projects and activities are being initiated to increase knowledge about the complex process of planning developments around railway stations. Projects are focusing on things like land safety and noise levels in the urban station community, the station's role in the development of smaller towns and their surrounding areas, and sustainable and attractive station communities. The focus for these station communities is on a service and incentive platform for sustainable local mobility around stations in Lerum and Ale.

A project focusing on *Climate-Smart and Attractive Transport Nodes* is studying stations in relation to their urban surroundings. The goal is to achieve an urban structure that is both energy-efficient and attractive with the help of case studies in Borås, Uppsala and Lund. The project is studying the possibility of achieving a so-called station proximity effect at a distance of more than 600 metres through spatial structures and designs. It builds upon Danish research of 30 or so commuter train stations in the Copenhagen

region. That research shows that the percentage of people using public transport for commuting increases significantly if these options are at a maximum distance of 500 – 600 metres from train stations.

Placemaking

Placemaking is a way of planning, designing and maintaining public spaces and milieus. One of the basic criteria is “attractive places.” An organisation called Project for Public Spaces (PPS) has produced a “manual” that explores the thesis that all cities should have at least 10 attractive places (the power of 10+) with each space having at least 10 attractive ingredients.

Flemingsberg

Development of the regional centre in Flemingsberg in Huddinge is continuing. With the addition of new homes it is possible to develop a mixed-function town that also has a hospital and a university. The goal is to create “a competitive innovation environment” in Flemingsberg. New shops in Flemingsbergsdalen will be located in between a sports centre, cultural centre, Södertorn University, a travel centre and an urban park.



Figure 17: Examples of how to reduce space for car traffic by using it for other activities, pedestrians and bike traffic etc.

Photo: Better Block

Bollnäs

People are saying that Bollnäs has its heart back.³² There were plans to build a large shopping arcade at Brotorget square in Bollnäs, but after much political discussion the plans were scrapped when the new municipal leadership bought back the land. After an architectural competition and a lengthy construction process the square is now finally ready and has become a much appreciated meetingplace. Brotorget is relevant to many other towns as an example of how to take back public spaces. One central meetingplace is of course not enough; there needs to be a network of smaller small-scale squares and meetingplaces in different parts of a town/city.

Botkyrka

In the Fittja neighbourhood in Botkyrka south of Stockholm a multicultural centre³³ has been established as a place for meetings and conversation. The centre is a meetingplace for diversity where national and international R&D projects with links to intercultural issues take place. It is located in the old Fittja Gård which dates back to the 17th century and in a new cultural centre with spaces for artistic and creative activity. There is also a restaurant, café, library and shops. It is adjacent to a recently opened activity park which provides a green space for meetings and activities across generational lines.

City Centre of the Year

Every year an association called Svenska Stads-kärnor (Swedish City Centres) honours a Swedish city by naming it City Centre of the Year (*Årets stadskärna*). The winner is a city which, according to the association, has successfully and optimally renewed its city centre in a collaborative process between private and public sector actors. Varberg was named City Centre of the Year in 2016. The municipal authority was praised for succeeding in improving existing aspects, but also for having welcomed “the new and unknown.” “The creative mid-point of the west coast” was the vision for Varberg and this guided the local authority in its reorganisation executed a few years ago with the goal of creating an attractive city and city centre where culture, commerce, tourism, business and the public sector all work together.

Rosengård urban pathway in Malmö

The Rosengård urban pathway (*Rosengårdsstråket*)³⁴ links Malmö’s Rosengård district with the Västra hamnen industrial area. Rosengård is a pathway for pedestrians and cyclists from Rosengård to the Station Triangle linked to bike paths that lead to Västra hamnen and to Malmö’s eastern suburbs. New spaces have been created along the pathway to increase security and make it more convenient for Malmö resi-



Figure 18: Brotorget was transformed into a central meetingplace when the plans for a large indoor shopping centre were halted.

dents to choose Rosengård pathway as a meetingplace and transport link.

Next to Bennet's Bazaar a former car park has been converted into Örtagårds Square. It functions as an everyday meetingplace, marketplace

and venue for special events. Another space along the pathway is Rosens röda matta (red carpet) – an activity space created in cooperation with local young people, most of them girls.

IMPORTANT CONCLUSIONS

- There is a significant need for the construction of affordable housing, especially for newcomers to Sweden. We need to make sure that we do not repeat old mistakes such as segregated residential islands, but instead improve service nodes and develop meetingplaces around them with a mix of small-scale functions.
- Many towns today say that they find it difficult to coordinate, develop and finance the development of squares and streets in central locations. This is a serious issue because being attractive as a town depends on having inviting urban spaces where people want to gather. In many places there is instead increasing competition between the city centre, suburbs and external retail parks.
- Creating good meetingplaces requires intense cooperation between a variety of actors: regional, municipal, land-owners, civil society organisations and residents. An expansion of the physical infrastructure and built environment needs to be carefully coordinated with an expansion of the digital infrastructure.



7. Promote digital and climate-smart communication and mobility

Societal development will lead to changed travel and transport patterns. We will make fewer trips out of necessity and when we travel we will do it in a sustainable way using a combination of individual and collective modes of transport. Digitalisation will change our pur-

chasing behaviour and enable a vitalisation of urban centres where shops will become showrooms and purchases will be made online. This will be supported by new, smart solutions for the reliable and sustainable distribution of goods to our door.

STATUS TODAY – A PERIOD OF TRANSITION

On the surface little has changed since the 1960s. We have witnessed similar levels of the car sales and more and more external retail parks being opened. People like to travel. But we are travelling more on long-distance leisure trips, than commuting or taking work-related trips.

This trend is being driven by the low cost of capital, more efficient vehicles and low fuel prices, which has also resulted in a sharp increase in new car sales, which reached record levels in 2016. Economic growth over the past 20 years has manifested itself in increased mobility.

Urbanisation – people relocating to big cities and their surrounding municipalities – is causing congestion in some parts of the transport system, which is also becoming increasingly sensitive to disruptions. In a 24-hour perspective, however, these bottleneck locations still offer plenty of capacity.

The large logistics hubs that are emerging today around large and medium-sized cities reflect the current trend. The transport system is gradually being divided up into rail and road transport, and logistics hubs in peripheral locations

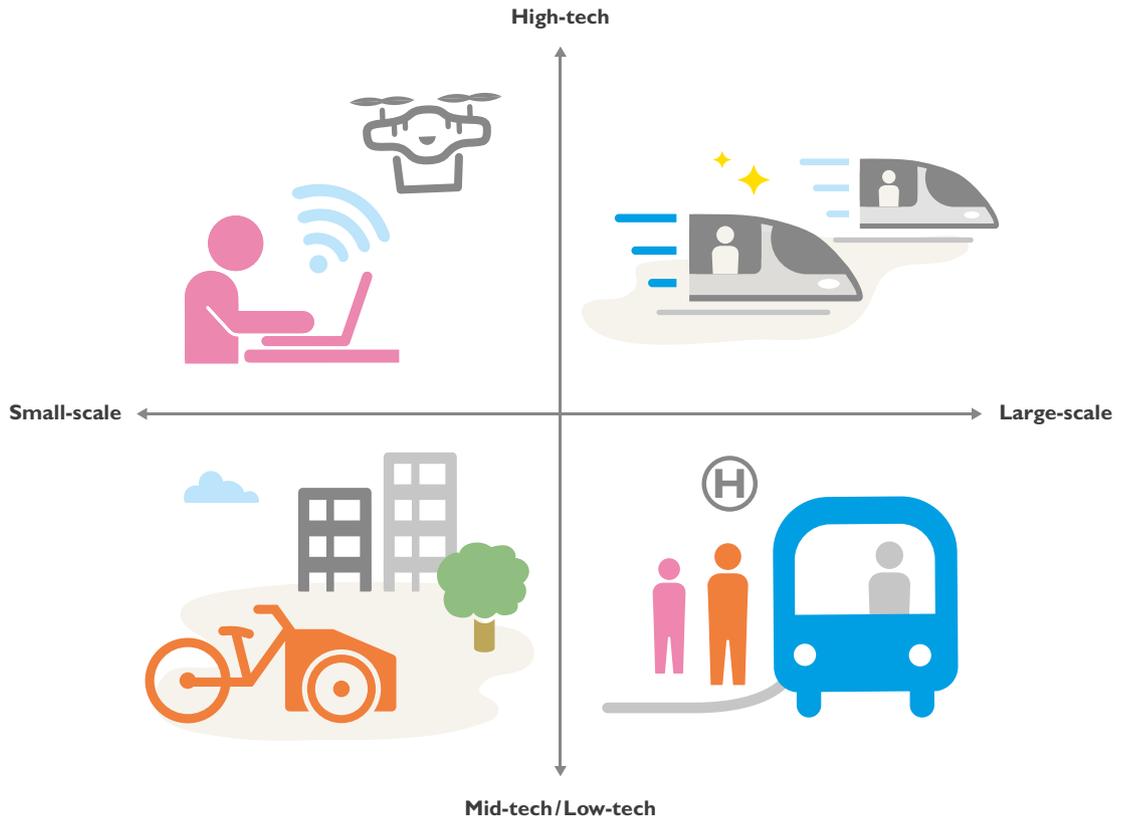
are key dry ports for reloading between modes of transport, and for coordination of goods forwarding, e.g. by lorry to population centres. Increased investment in short sea shipping will have the same effect. Digitalisation will improve opportunities for intermodal transport³⁵ as it will facilitate the reloading process. Meanwhile the last remaining shunting yards and rail freight management from central locations in population centres are disappearing and these spaces will become valuable and attractive as commercial and residential areas. We have seen this happen before in central dock areas.

Promote digital and climate-smart communication and mobility

It is, however, difficult, for new ideas and models to break through: The planning system that controls infrastructure development is based on old forecasting methods and as a result, substantial resources are being invested in new but traditionally designed roads and railways, even though the authorities in charge have clearly expressed that this is not consistent with estab-

Figure 19: Promote digital and climate-smart communication and mobility.

Source: Ulf Ranhagen/
Jonas Sundberg.



lished environmental goals. Attitudes to taxes and old guild systems are slowing down progress for emerging sharing economy concepts, such as Airbnb and Uber Pop. The current business models for public transit present an obstacle to renewal as well.

Society has an out-of-date vision of infrastructure whereby it takes responsibility for road and railway maintenance but expects the digital infrastructure to be developed without or with very limited public funding.

The signals from the political sphere have, however, been clearer over the past few years. The Paris Agreement of 2015, the Marrakech Climate Change Conference in 2016, Sweden's All Party Committee on Environmental Objectives and the decision to aim for a fossil-free transport system by 2050 are very strong drivers of change in a new direction.

Alongside peripheral logistics hubs we will in the future see the emergence of smaller distribution nodes close to population centres. At these

nodes freight will be reloaded onto smaller distribution vehicles which supply different parts of the city through coordinated transportation to delivery destinations. These vehicles will be system-adapted and pioneers in the use of electric motors and various types of automation.

This transition will be driven by rapid development in e-commerce, virtual office and education solutions and increased bike and pedestrian traffic in metropolitan areas. Young urban residents are postponing getting their driving licence and car ownership, and driving is mainly increasing among the older population. New vehicles that break old patterns are being produced. Electric bikes enable regional commuting up to 20 km and removal firms that use bikes have emerged. Electrification is resulting in new road user behaviour, lighter and smaller vehicles run on batteries, and fuel cell solutions. Automation has just begun and will, over time, blur the lines between individual and public transport, supported by a rapidly growing sharing economy.

for it? The Swedish Post and Telecom Authority (PTS) and the Swedish Civil Contingencies Agency (MSB) are responsible for the digital infrastructure, but lack the concrete ability to impact it. The actual digital infrastructure is largely in the hands of commercial actors. Fast and secure connections are needed in order for the real benefits of digitalisation to be utilised and transport needs reduced. Remote health-care and advanced home office solutions with disruption-free internet connections are helping to reduce the need for unnecessary trips and transportation.

We also need to be prepared for digitalisation to change our purchasing behaviour. If poorly managed or uncoordinated, e-commerce can result in chaotic and inefficient home delivery systems that are not much better than today's individual travel. But if well-planned and organised, delivery services can be made effective and resource-efficient. It is pointless to assume that market forces will find the optimal solution; clear ground rules are needed. A good example is that well-functioning e-commerce requires homes and residential areas to be planned and equipped to receive goods and products easily and securely. Taking a system approach to this will enable electric, lightweight vehicles from distribution centres to quickly and easily deliver goods to the recipients.

It is also clear that there is great capacity in

the transport system if we consider the collective potential of all of its parts over different time periods. Even Essingeleden in Stockholm, which is sometimes completely jammed, has enormous free capacity which can be utilised if we can fill up vehicles and spread demand over a 24-hour period. But this requires incentives for people to offer space in vehicles and to be a passenger, and it will not work if taxi permits are required for everyone carpooling or offering an option to pay for a seat.

There are big expectations that automation in the future will “solve all of the problems” of transport systems. More efficient use of automation will enable a significant reduction in the number of vehicles needed to meet our transport needs, and large areas will be freed up as less parking space will be needed. In addition all vehicles will be quiet, cheap, emissions-free and also entirely safe for the environment. This future vision is controversial however. It is not supported by vehicle manufacturers who would rather see a significant increase in individual transportation. It will also drive the creation of new control mechanisms. In any case we should not expect any radical changes resulting in changed urban planning over the next 20 years. Today's automotive technology will dominate sales for another 5–10 years and these vehicles will have a significantly extended life.

IMPLEMENTATION

There is clearly great potential to change the transport system, even if the pace of change is slow in a system with a slow turnover of both vehicle components and infrastructure. But consistency is needed, and the tools we need will not appear on their own. We need a palette of measures to drive development in the desired direction:

- Integrating the new models for goods transportation in strategic urban planning from the regional level to the city block level.
- Society's planning systems need to be changed in a way that puts investments in digitalisation's possibilities on the same footing as traditional investments in roads and railways, for example by investing in intelligent transport systems and services.
- Give the public sector direct responsibility for developing the digital infrastructure, for example a nationwide fibre-optic network.



Figure 22:
Ericsson is testing driverless buses in Kista.

Photo: Ulf Klingström

- It is possible to develop new business models where travel with a combination of individual and public modes of transport is paid for as a common service (Mobility-as-a-Service, UbiGo). This requires today's operators – often public sector actors – to open their systems to these types of services and to work with third-party actors on mobility solutions.
- Support development and regulations to create incentives for coordinating goods distribution in population centres, both at the regional level and inside city centres. This can be combined with solutions for the collection and removal of various types of waste.
- Develop technology and solutions for receiving goods in homes and in existing residential areas.
- Change the laws and legislation at the international and national level so that the sharing economy can lead to renewal in the transport sector – for both passenger and goods transportation, including remote communication.
- Gradually tighten the tax rules for certain modes of transport and fuel to incentivise phasing out fossil fuels. This will facilitate a faster and more obvious technology shift, allowing new technology to be put to use earlier. Base decisions in the urban planning process on an analysis of financial consequences.

EXAMPLES FOCUSING SPECIFICALLY ON ICT-ITS

- Examples of distance learning: Lycksele lärocentrum (learning centre) enables Lycksele residents to study academic courses offered at Umeå University through distance learning. There are several vocational college courses available for distance learning as well.
- Pilot programmes in Stockholm or Gothenburg for coordinated goods distribution through Go:smart and Sendsmart.
- Driverless buses. Ericsson is testing driverless buses in Kista.

Figure 23:
Cable cars
as a modern,
metropolitan
transport system.
The example shows
a 3D rendering of a
cable car over Göta
älv and towards
central Gothenburg.

Photo: Gothenburg
City



EXAMPLES OF INTEGRATED TRANSPORT SOLUTIONS IN BUILT-UP AREAS WHERE ITS IS AN IMPORTANT COMPONENT

- Gothenburg is planning to introduce cable cars into its public transit system. They will be able to cross over barriers such as the Göta Älv river and traffic routes.³⁹ This will be the first new form of public transit to be launched in Sweden since the underground system was opened in Stockholm in the 1930s. The first stretch, "lila stomlinbana," could be ready by 2020. The Urban Transport Administration in Gothenburg is proposing establishing urban cable cars in Gothenburg. The cable cars will be an integrated part of the public transit system.⁴⁰
- Karlstad is planning the first Bus Rapid Transit (BRT) system in a mid-sized Swedish city.
- IKEA service and pick up.

IMPORTANT CONCLUSIONS

- Economic growth in recent decades has resulted in increased mobility. Urbanisation is causing congestion in some parts of the transport system which is also becoming increasingly sensitive to disruptions.
- Signals from politicians (Paris Agreement of 2015, the Marrakech Climate Change Conference in 2016 and the Environmental Objectives Council, and the decision to achieve a fossil-free transport system by 2050) are very strong drivers of change.
- Digital infrastructure needs to be elevated to the level of an issue of national importance and given the same investment priority as traditional infrastructure.
- Intelligent transport systems (ITS) enable the more efficient use of resources, i.e. fewer vehicles will be needed to meet our transport needs, and large areas will be freed up as the need for parking space will be reduced.
- Digitalisation will improve opportunities for intermodal goods transport as it will facilitate the reloading process. In addition to peripheral logistics hubs we will see the emergence of smaller distribution centres close to population centres.

8. Focus on circularity and circular material flows

Improving resource efficiency and circularity in a life-cycle perspective will become increasingly important in all activity within cities

to meet the ecological, social and economic challenges.

CURRENT STATUS AND FUTURE CHALLENGES

Today the construction sector accounts for 40 percent of annual material use in the world. Urbanisation is taking place in Sweden and around the world and resulting in a big demand for new buildings and facilities in growth regions.

One of the consequences of a growing population is an increased demand for materials. The earth's finite resources need to be stretched further and further. We often hear that we are living many times beyond our means and that several biophysical thresholds are being exceeded.⁴¹ We therefore need to grow more sustainably. Significant changes are needed as well as new resource-efficient business models and a transition to a circular economy.

A circular economy is based on eco-cycle systems and involves the value of resources being used on more levels and being preserved as far as possible. It also aims for the elimination of waste by waste being seen as a resource that can be re-used in more areas. This means that a product will have continued use in the production of something new in a long lifecycle perspective, creating further value. Waste is prevented in a circular economy by reducing both waste volumes and the content of hazardous substances that prevent waste from being used as a resource. In the circular economy products can be disman-

tled, repaired and upgraded for greater sustainability and a longer life. Disposal in landfills of recyclable waste will be phased out and material recycling, or secondary energy recovery, will increase. We are moving up the waste hierarchy⁴² and gradually closing the cycle.

To make a circular economy possible, more product information is needed, such as any harmful substances and how the products can be re-used through repair and upgrading, or in second-hand material recycling. This information will enable consumers and others to make eco-friendly choices. The more information we have the better able we will be to re-use products and to recycle them to produce materials of good quality and free from harmful substances.

The big challenge in the building and construction sector is to find ways (including technologies and business models) to create new, innovative products that use what was previously discarded as waste. Important considerations here are both the nature and quantity of waste, the current and potential demand in the market for such products, their environmental impact and the cost of recycling processes. It is also important to ensure that end-products are not harmful to the environment, that solutions are

Figure 24:
In a circular economy waste is minimised and sorted but is also seen as a resource that can be recycled and re-used more times.



robust and that the quality of recovered materials/products can be controlled. Another challenge is how to create circular material flows that are financially competitive to reach the point at which resource efficiency is profitable. Many initiatives are under way, but a more integrated and holistic approach is needed, taking into account life cycle cost (LCC), life cycle analysis (LCA), health aspects and financial systems to support a circular economy.

1. How can we move towards a circular economy?

The prices of raw materials and oil have plunged recently, which has unfortunately slowed down progress towards a circular economy. There are also no control mechanisms in place to incentivise recycling and re-use. This is something the EU strongly promotes in its Circular Economy Action Plan.⁴³ The circular economy will require new systems, methods and initiatives on several levels, including:

- New methods for production and use of materials to reduce the amount of raw materials and energy used and increase the percentage of bio-based and fully recyclable products.
- Methods for extending the user phase for products by redesigning them for simpler maintenance, repair, reconstruction, renovation or demolition and recycling.
- Reduce the use of materials that are harmful or difficult to recycle.
- Develop markets for secondary raw materials.
- Incentives to reduce waste.
- Incentives for separating waste fractions and collection systems to minimise recycling costs.
- Development of new models for leasing or sharing rather than buying.

Resource efficiency should preferably be included at the design stage. For example, dismantling tests could be introduced as part of the production development process to achieve more resource-efficient recycling when products are worn out, by avoiding mixing materials and by using screws instead of adhesives. An increase in selling services and the sharing economy are expected to become more and more significant in the capital goods sector. The service of “moving people and things” will be sold instead of the “car” as a product. This will, however, require new business models, shared responsibility and insurance solutions.

Digitalisation and a new vision for homes, offices and modes of transport, where ownership and sole rights are not important, could in the future open the way for a very advanced “sharing economy.” New ways of thinking about what we need, how we live and how we use space are crucial and require new business models and new methods for joint planning of buildings, office space and activities: Instead of renting out a number of square metres, functions are rented out, such as a meetingplace for a half day a week shared by four businesses. Occupancy specification in terms of time-frames and types of activity/organisation will be important to ensure an efficient use of space. Digitalisation puts our office in our pocket and enables us to receive realtime information on where to find vacant office space. More and more people are also choosing used office and building materials.

Property owners could be incentivised to manage existing – and plan new – properties in a more innovative and resource-efficient way. *Tenants* could find ways of using space more efficiently, reducing their costs and developing their business/activities. Companies/organisations that *currently do not have access to office space* could use digital services to find potential rental options. There is increasing interest within municipalities to coordinate space used for education, healthcare and care facilities.

A shift is taking place from selling goods to selling services, where private ownership is gradually disappearing and consumers are instead using services to have access to a certain

product by borrowing or renting it. This makes it more profitable to repair good quality products and reduces the need for individual storage. Countless examples of services, intermediaries and forums have emerged based on this trend: Klädotek – a library but for clothes, clothes exchange days, bikes for rent as an extension of the public transit system, such as Styr och Ställ, in Gothenburg (abo-goteborg.cyclocity.fr) and companies that arrange private home rentals as an alternative to hotels, such as Airbnb (www.airbnb.se) and Couchsurfing (www.couchsurfing.com).

Equipment could also be used more efficiently. Furniture and equipment are seldom thrown away because they are worn out but because they are outdated. Fashion trends and technical development are creating change faster than the time it takes to wear out products. By offering rental space with shorter leases we can reduce the risk associated with committing to a three-year lease, which is the standard length on the rental market today. This lowers the threshold for starting a business, which in the long run would help improve equality in the private sector. By mixing functions in different parts of cities there is potential to create more activity at different times in a 24-hour period, thereby promoting a more vibrant urban environment.

Other examples of sharing space are pop-up stores, pop-up opera, food trucks and office hotels. Coffice is what it sounds like – a combination of a coffee shop and an office, and Hoffice is a mix between a home and an office, where people invite others into their homes to work there. Both of these phenomena are alternative to the tradition of working in an office and are clearly the result of digitalised work processes and a generally more open attitude towards sharing.

IMPORTANT CONCLUSIONS

- A growing population with increasing material demands means that the earth's finite resources need to be stretched further. We therefore need a transition to a circular economy with new systems, methods and initiatives on several levels, such as including resource efficiency in the design of products, buildings and urban districts.
- We are moving up the waste hierarchy and gradually closing the cycle. Disposal in landfills of recyclable waste will be phased out and material recycling/energy recovery will increase.
- The sharing economy is expected to become more and more important in the capital goods sector and will involve new ways of thinking about what we need, how we live and how we use premises, transportation and tools.
- There is a shift taking place from selling goods to selling services, where private ownership is declining and consumers are using services to have access to a certain product by borrowing/renting it.
- This new approach requires new business models in the form, for example, of having our office in our pocket and using digitalisation to receive realtime information on where to find vacant premises/office space. There is increasing interest within municipalities in coordinating the use of space for education, healthcare and care facilities.

9. Smart integrated supply systems

Smart and integrated supply systems need to have a legitimate place in cities to make use of synergies between energy, water and waste

processes. The systems need to be designed to be both robust and flexible to meet strict climate requirements and hard-to-predict risks.

CURRENT STATUS AND FUTURE CHALLENGES

It was not until the middle and end of the 1800s that expansion of Sweden's technical infrastructure began. This dramatically changed the urban living environment. All of the above-ground infrastructure in the form of fire hydrants and gutters for runoff and sewage was replaced by water main and sewage systems. The energy supply was revolutionised by the expansion first of the urban gas supply system and then electricity with a nationwide electricity distribution and power grid. These systems have since been improved in multiple stages through the development of advanced sewage treatment plants in the 1950s, municipal refuse collection in the 1970s and district heating from the 1950s and later with the breakthrough of combined heat and power (CHP) in the 1990s. Although the systems have been developed extensively they are still managed in many cases on the basis of past decisions. The existing systems also need continuous maintenance and need to be adapted to interface with new system, especially now in the era of digitalisation.⁴⁴

1. How can we create smart energy systems in cities?

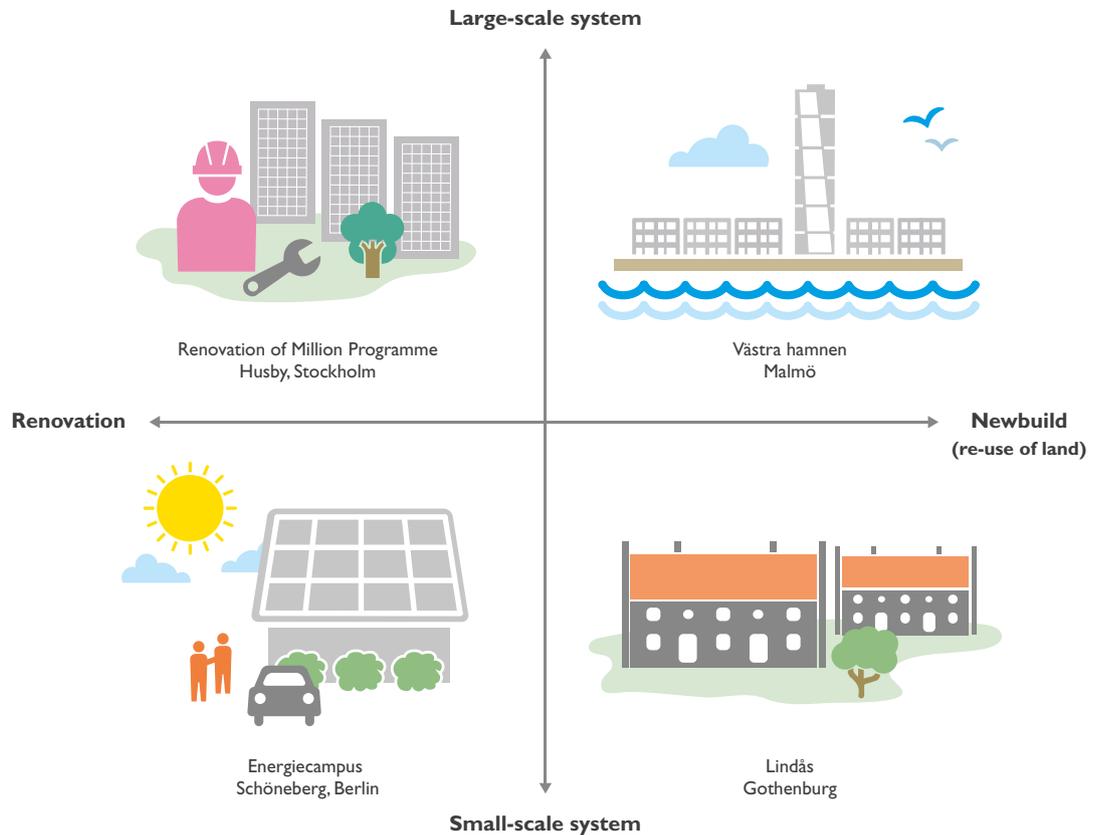
Sweden is facing a paradigm shift in the way we approach the energy system. For a long time it was dominated by large-scale facilities and services, with district heating as an obvious

element. Energy efficiency improvement and development towards zero-energy buildings, in combination with falling prices for renewable energy sources such as solar panels has resulted in the growth of small-scale systems to make smaller areas self-sufficient. But we will also see hybrid solutions that combine large-scale and small-scale systems in a variety of ways.

- Today our goal is **smart, integrated, energy supply solutions** and energy efficiency improvement in the built environment. Much of this can be achieved using ICT.
- **Many cities have large newbuild plans.** But have they had time to come up with the smartest solutions to supply new developments with heat and electricity? Do we need to build new CHP plants or can we use the energy that already exists in a smart way by optimising the system? It is not necessary to heat buildings at the times when people want to shower or make coffee. We can store heat underground and in the carcasses of buildings, and electricity in batteries.
- **Some buildings need to be cooled and others heated. How can we optimise this?** We talk about using low-temperature residual heat to heat buildings. We have also connected

Figure 25: Test combining large-scale and small-scale energy systems for both newbuild and remodelling.

Source: Ulf Ranhagen.



washing machines to the district heating grid to avoid using electricity to heat water when there is already hot water in the district heating grid. In Gothenburg one of the large ferries in the port is heated by district heating when in dock, instead of by diesel. A new technology has also been developed to recover heat from waste water, both in large central systems and smaller local systems that can be used for showers. The MKB⁴⁵ housing company in Malmö tested a technology to wash clothes in cold water. The question is: Will we need as much hot water as today in cities of the future?

2. Circular resource flows in cities

The circular economy could be a fundamental way of developing more advanced eco-cycle models for regions, cities, districts and neighbourhoods. Minimising the need to add new resourc-

es in the form of materials, energy and water is seen as a basic requirement to connect and make use of synergies between different systems. The now well-known Hammarby Model illustrated how the smart connection of resource flows for the Hammarby Sjöstad district in Stockholm has helped to cut environmental impact in half.

The Hammarby Model was a pioneer project to demonstrate an integrated systems thinking model. The model was upgraded to Eco-Cycle Model 2.0 during the planning of the Norra Djurgårdsstaden (Stockholm Royal Seaport urban development). The purpose was to create a climate-neutral and in some parts also a climate-positive district. In a future perspective – 2030 looking towards 2050 – Eco-Cycle Model 2.0 presents various local functions and flows in the Stockholm Royal Seaport development linked to systems in the surrounding areas. The model addresses material, waste, energy and water flows.

The arguments made in the previous chapter on circular material flows are also relevant to the development of these types of eco-cycle models.

An important function in Eco-Cycle Model 2.0 is the recycling centre enabling residents to drop off, exchange, sell and share used goods. On the energy side, the systems thinking aspect is manifested in energy efficient buildings in combination with a CHP plant based on bioenergy and sorted waste, district cooling, energy storage, local renewable solar energy and smart power grids. In the future, sorting at source for waste water, whereby waste water is separated into urine, blackwater and greywater, will be as important as solid waste sorting. This will enable nutrients to be used more efficiently in

agriculture and forestry, and more efficient production of biogas from treated sludge and food waste. Treated wastewater is also an important resource in energy production for both district heating and cooling. Separating traffic-polluted surface water will help us manage environmental pollution from road surfaces and land.

These are just a few examples of systems and flows in the model. The idea is that a visualisation of all possible synergies can be a basis on which to develop various system solutions that can be integrated into the district. The model includes a concept for flow analysis as a basis for both simulations of future flows and environmental impact, and annual calculations of key parameters for ecological sustainability for

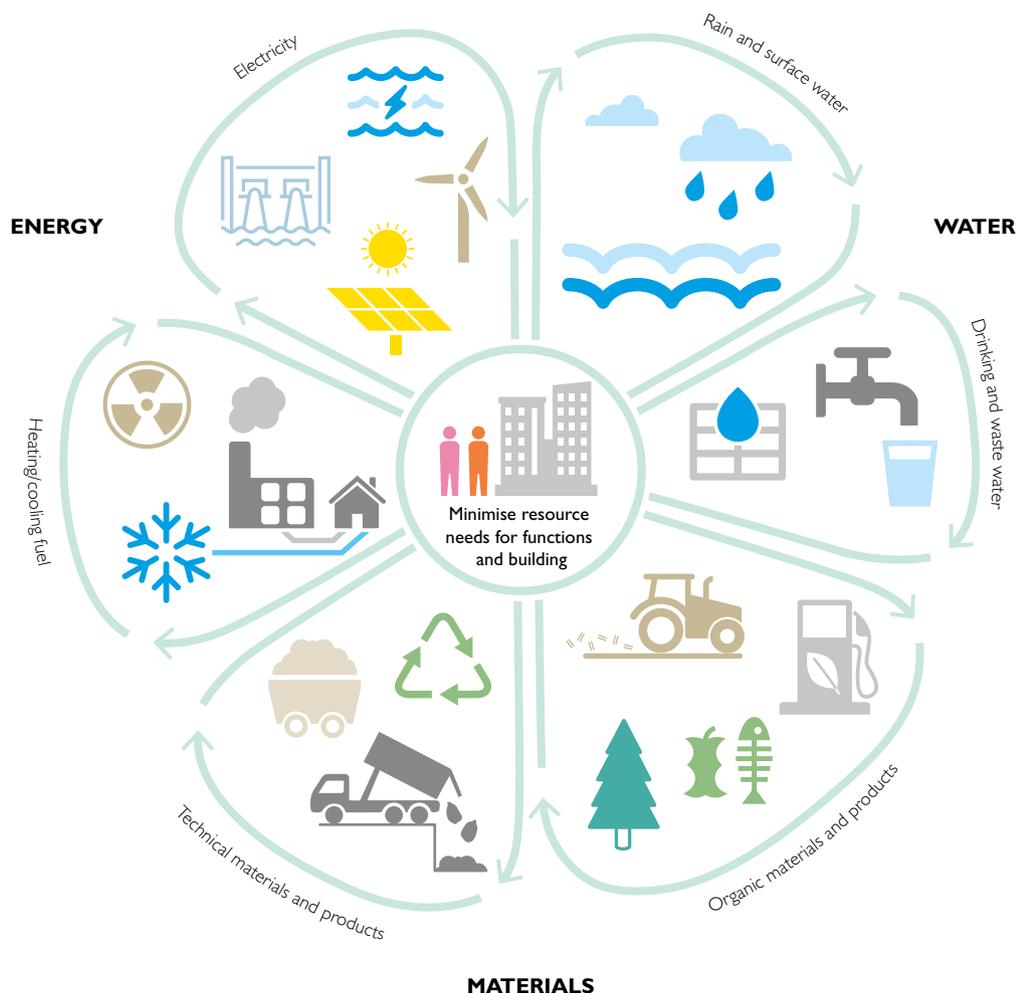


Figure 26: Eco-Cycle Model 2.0 (Reflow) was developed in connection with planning Norra Djurgårdsstaden and builds on the Hammarby model.

Source: Ulf Ranhagen.

energy use, carbon equivalents and water consumption.

Eco-Cycle Model 2.0 is the basis for an educational presentation about future resource flows in the district called Reflow.⁴⁶ The idea is to facilitate communication with residents through dialogue on future cycles, from individual housing units to the district as a whole.

Eco-Cycle Model 2.0 was produced in cross-sectoral dialogue between the city, recycling companies, researchers and civil society representatives. It should not be seen as a finished solution but as a platform for continuous development of future solutions – open to new technology and new approaches with the involvement of residents.

HOW CAN WE FIND SPACE FOR THE TECHNICAL INFRASTRUCTURE OF THE FUTURE?

The trend of building cities inwards as described earlier is resulting in the ability to use and upgrade existing infrastructure more efficiently. A resource-efficient and cohesive built environment requires shorter cables and pipes and the ability to place cable/pipe systems into networks. At the same time, *on the energy side,*

it will always be challenging to find space for pipes and grids.

- A power system of 70–400 kV could involve significant competition for land at facilities above ground, but underground systems in culverts could be combined with urban infill (for example



Figure 27: Envac is a supplier of a sustainable technology for vacuum waste collection.

Source: Envac.

Sala Backe in Uppsala which is described in a previous chapter). Visionary and artistic design will increase acceptance for power lines as a component of the built environment.

- Electricity distribution of 0.4–20 kV, so-called retail distribution, needs to be allocated sufficient overhead wires, cables and stations.
- District heating pipes made from new materials and with improved insulation need to be buried in a way that makes them easy to be maintained with minimal excavation.
- CHP plants and energy and fuel storage need to be integrated into the urban structure.
- Solar power plants and solar panels on roofs and walls will be a natural feature in future cities.

The future water supply will be characterised by water-efficient equipment and more advanced

treatment at treatment plants and in water supply networks. Waste water sorting at source, as described above will result in a system of pipes for different types of waste water in cities and buildings. This will require coordination of pipe systems. Local management of surface water will increase the importance of various types of green spaces in the management of fluctuating water flows (see also Chapter 10 *Preserve green, blue and white value in cities*).

Within waste management dimensioning for and placement of large recycling centres and smaller recycling stations will need to be based on a system perspective and compared with an expansion of sorting at source at the household level, as well as coordinated transportation to larger facilities. The latter alternative will reduce waste transportation in individual vehicles.

In dense cities the removal of waste in underground pipes using a vacuum process is one way of reducing the number of trips by waste collection vehicles and of creating more attractive pub-

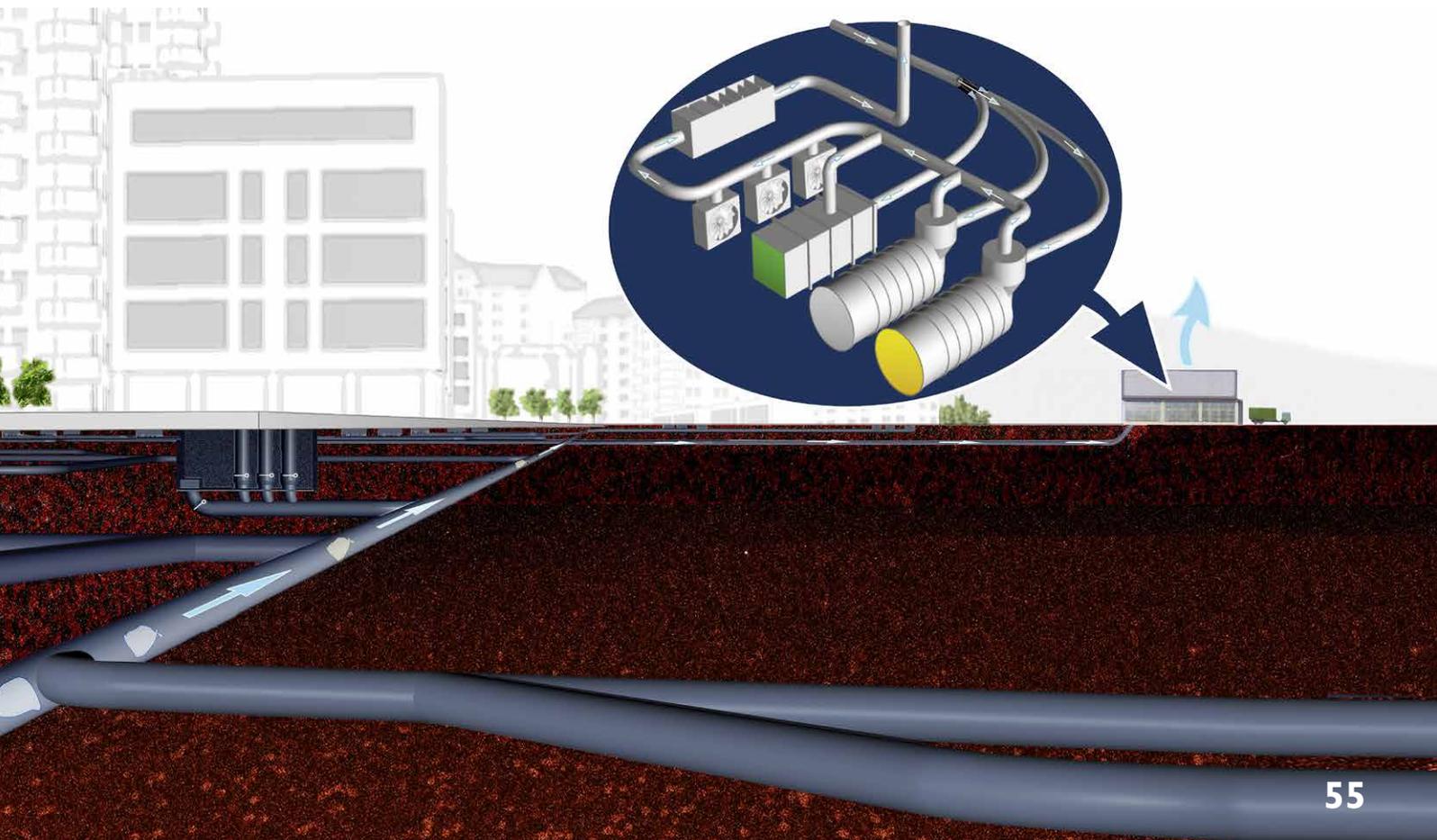
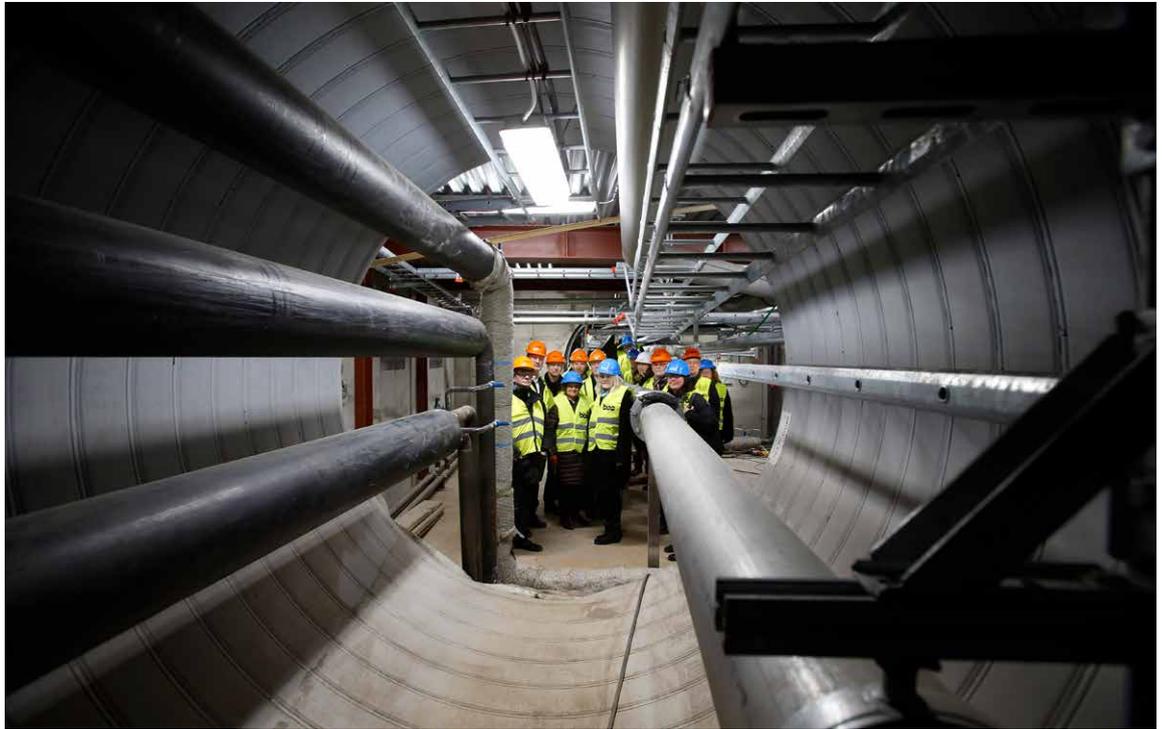


Figure 28: Vallastaden in Linköping where an innovative solution has been developed in the form of a culvert system for new infrastructure solutions. All cables/pipes – electric, optic fibre, district heating, sewage, water and a waste vacuum system – are placed in one large culvert which is 2.5 metres in diameter. The only system outside the culvert is the surface water system. With this solution the cable/pipe infrastructure takes up less space and is also 100 percent recyclable.⁴⁸

Photo:
Lasse Hejdenberg



lic spaces. This will also enable more ground floor space in buildings to be used for a variety of functions – shops, workplaces, recycling and student accommodation. The waste terminals from which waste transported through pipes is collected could be designed as attractive components in the built environment.⁴⁷

An integrated and coordinated system of all of the pipes and cables required in cities of the future is crucial. Various actors need to work in close cooperation on designing streets and parks. Streets need to be designed to facilitate their maintenance in the future. In order to gradually adapt and rebuild the technical infrastructure based on resource efficiency requirements and eco-cycle adap-

tation, the way in which issues in existing systems are diagnosed needs to be refined. There will be more advanced methods used in the future involving mobile robots that can be sent down into pipe and cable systems to diagnose maintenance needs, and determine position and depth underground.

One interesting way to integrate recycling facilities in cities of the future is the use of resource management centres that combine CHP plants, waste water treatment plants, biogas and material recycling/re-use centres. This will probably only be fully possible to implement when building new cities, but could also serve as a practical vision for integrating these types of facilities into existing cities.

IMPLEMENTATION

In order for the new approaches needed to achieve a more circular economy to have an impact, we need to overcome the often inherent

resistance and inability of decision-makers and other key actors to changing unsustainable habits and methods. There is often path depend-

ence⁴⁹ where we continue along a familiar, unsustainable path because so many past decisions and investments have already been made and are difficult to break away from. What is often called “sunk cost” is significant here. Sunk cost results in being tied to solutions that exist due to past investments. This can easily contribute to a short-term mentality with respect to finances. A significant breakthrough for the life cycle environmental perspective and a life cycle economy also requires putting a price on factors such as the climate impact of products and systems, but also the climate impact generated by the urban development process itself.^{50,51} This could provide incentives and arguments for decision-makers in the public and private sectors, as well as citizens, to choose the types of systems and solutions we have described in Chapters 7 – 9.

Examples

- The Eco-Cycle Model for the Stockholm Royal Seaport development.⁵²

- Recycling centres and logistics centres in Stockholm Royal Seaport.
- Fortum’s bio-fuelled CHP plant. Fortum and Stockholm City opened the Fortum Värme bio-fuelled CHP plant in Hjorthagen in May 2016. The plant produces enough renewable energy and heat for 190,000 residences. This is an important step in reaching the goal of 100-percent renewable and recovered energy.

The Stokab Model

Aktiebolaget Stokab is a Swedish urban grid company that was launched in Stockholm in 1994. Its mission was to build a competition-neutral fibre-optic network.

One of the reasons for forming the company was to coordinate the need that various companies and agencies in the city had of modern communication solutions and a desire to reduce the amount of excavation needed to lay cables in the city.

Today the grid spans a large part of the inner city areas, residential areas, office and business



Figure 29: The amount of cable excavation when expanding fibre-optic networks in existing neighbourhoods needs to be minimised.

Photo: Peter Phillips for Stokab

Figure 30: There are plans to make Vallastaden in Linköping a dense and mixed-function district with an “urban feel and vibrant atmosphere.”

Source: Vallastaden 2017/Okidoki Arkitekter.



Figure 31: A centre where modern digital technology is used for realtime monitoring of a city can prevent and mitigate disasters and other undesired events such as traffic jams etc.

Source: Rio de Janeiro's Operations Center.



centres, and most schools, universities, museums, libraries and other municipal operations.

Vallastaden in Linköping

Just west of Linköping's inner city area is a new neighbourhood called Vallastaden, close to the university and Linköping city centre. Vallastaden will have around 1,000 homes in the form of multi-dwelling buildings, townhouses and small detached houses.

Important considerations in building Vallastaden have been creativity and social sustainability. The neighbourhood is divided into blocks and plots in a concept inspired by how land was divided up in farming villages in the Middle Ages. Pedestrians and cyclists have been prioritised throughout the area, although cars are permitted.

The only parking spaces provided next to homes are for vehicles with handicap permits. The parking spaces along the streets are mainly for carpool vehicles.

Rio de Janeiro's Operations Center

When he was Mayor of Rio de Janeiro in 2010, Eduardo Paes decided to build an Operations Center after a devastating storm resulted in the death of 68 people. In the past the fire, police and ambulance services were divided up between more than 20 different authorities. These authorities are now integrated in one central command

centre where they can watch in realtime what is happening around the city and quickly coordinate solutions to problems. Sensors throughout the city and advanced forecasting systems provide support and continuous information. The result is a 30-percent reduction in response times. Coordinating this type of central facility with a city's technology supply would be beneficial, especially in terms of resilience and supply reliability.

Sputify (Synchcity/Stockholm/Sweden Platform in Urban Transport)

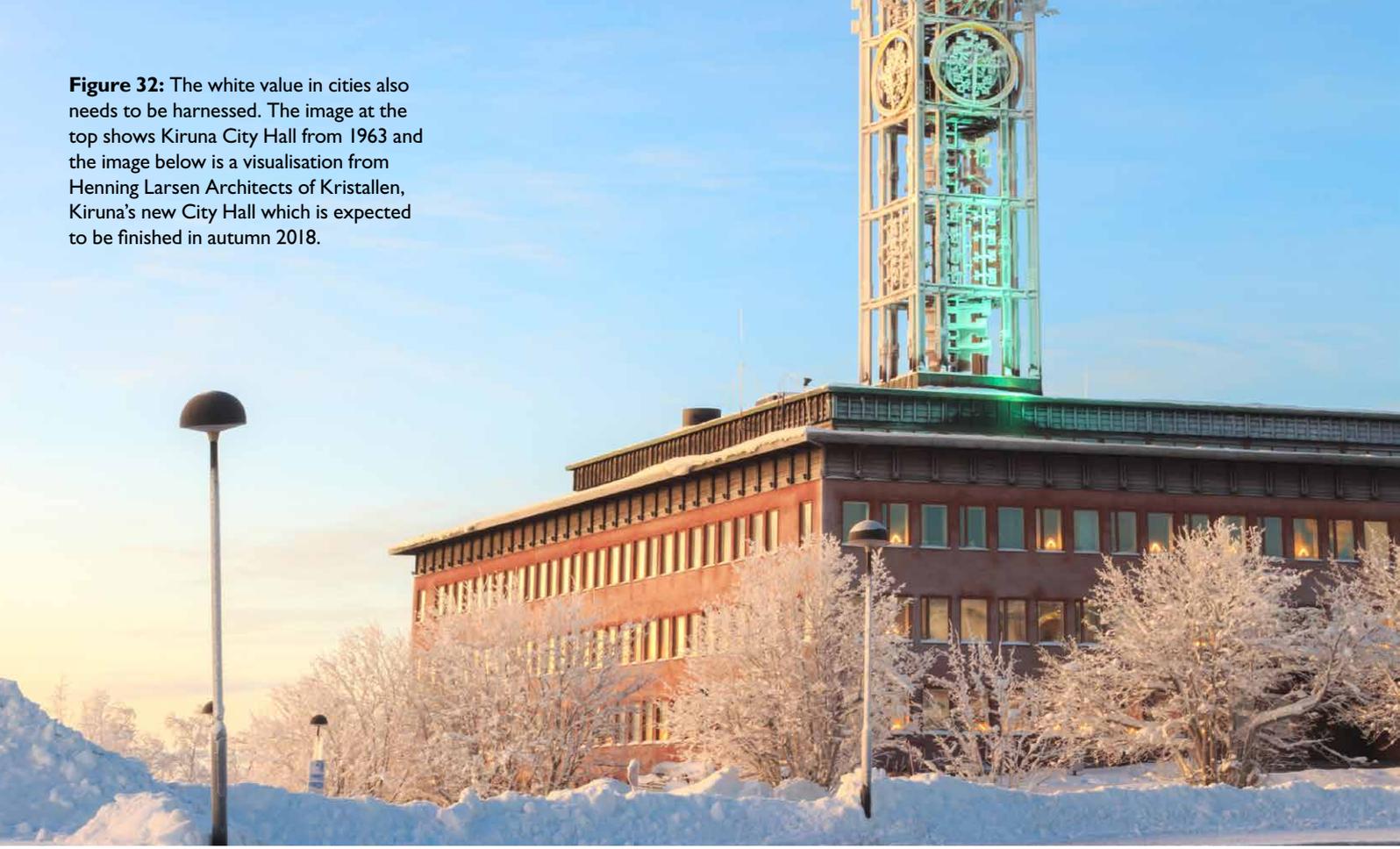
The basic idea of Sputify⁵³ is to connect several sub-systems and services to an integrated urban transport system with the help of a digital platform. The platform works as a type of broker for supply and demand for mobility services and is available to all passengers, carriers, transport providers and third-party suppliers.

By logging user behaviour it is possible to proactively update short-term forecasts, which become increasingly accurate the more times the platform and its services are used. User data increases predictability in the transport system and enables providers to guarantee travelling times. Business models for these services are being changed so that payment for use incorporates factors such as environmental impact, congestion, fairness and other external effects. Prices vary according to time, space and vehicle type.

IMPORTANT CONCLUSIONS

- Expansion of technical infrastructure began in the 1800s resulting in a dramatic change in the urban living environment. Although the systems have been developed over the years, they are still governed in many cases by past decisions. One threat to development is so-called path dependence where we continue on a familiar, unsustainable path because so many past decisions and investments have been made and are difficult to break away from.
- We are facing a paradigm shift in the way we look at the energy system, where large-scale solutions are facing competition from small-scale systems and hybrid solutions.
- The circular resource flows in cities could in the future be a fundamental factor in the development of more advanced eco-cycle models, as a basis for supply systems for regions, cities, districts and neighbourhoods.
- In the technical infrastructure of the future we will see a resource-efficient and cohesive built environment with shorter cable and pipe systems placed together in networks.

Figure 32: The white value in cities also needs to be harnessed. The image at the top shows Kiruna City Hall from 1963 and the image below is a visualisation from Henning Larsen Architects of Kristallen, Kiruna's new City Hall which is expected to be finished in autumn 2018.



10. Protect green, blue and white value in cities

In the future we will no longer perceive green space and water in cities as merely an attractive backdrop. Instead we will develop an understanding of the biological elements as a life-sustaining resource, requiring attention and advanced diagnostic instruments. Seasonal and weather variations will increase and

we will incorporate snow and ice (white value) in our built environment. Protection and development of ecosystems in cities and urban-rural connections will have great significance in maintaining sustainable flows in transport, water, energy and materials in cities.

STATUS TODAY

Swedish municipal authorities have been prepared to take a systematic approach to urban biological systems for many years now. It is not unusual to see woods, parks, urban trees, green wasteland, gardens and window boxes around cities, constituting and overall aesthetic, cultural, social, biological and economic value.

In planning and building new neighbourhoods we are not paying enough attention to surface water management and access to quality green outdoor environments. The theory of ecosystem services has in recent years given us more precise biological models to explain our environment.

THOUGHTS ABOUT THE FUTURE

Cities of the future need to be equipped for climate change, where green and blue spaces reduce the effect of large quantities of water, add to biodiversity and improve the noise environment, health and green urban environments. There are several trends indicating that we will need to take an even more active approach to green, blue and white structures in cities in the future. In the wake of climate change, urban green value will be a matter of survival rather than well-being. To achieve an attractive living environment it is important to maintain

connections with the surrounding countryside, with wedges or veins of green and blue reaching all the way into crowded inner city areas. These should be protected for ever from being built on so that people will always have access to green spaces and water. The green and blue sections need to be supplemented with a system of various types of green parks and spaces in the fabric of the city to create “more green in crowded cities.” A historical perspective is also key when planning future green structures in cities.

The term ecosystem services has been used a lot

in recent years – both in research and among public and private sector actors. These services are usually divided into four categories: provisioning (food and raw materials), cultural (experiencing nature, beauty), regulating (water purification and pollination) and supporting (biological diversity and the hydrological cycle). It will become increasingly important to integrate these perspectives in all urban planning and throughout the built environment in the future. They provide a way to create resilient regions and cities.

As a result of climate change, urban greenery and water systems in cities are being subjected to greater stress with longer periods of heat in the summer, more irregular precipitation patterns with more powerful rain in between longer dry periods. Torrential rain releases and rinses away land pollution and milder winters result in an increase in pests/vermin. In a more concentrated urban built environment, parks will gradually become smaller (the edges will be chipped away at) and at the same will be used more intensely for more activities. Park management services in larger cities are seeing an increase in demand to for events in public spaces⁵⁴ and in parks, such as festivals and markets.

To handle increased precipitation and intense torrential rain, interfaces are needed between the grey, green and blue spaces. Drainage through impervious and asphalt surfaces, better tree planting and an increased use of rain gardens and surface water storage are among the solutions that could reduce the risk of future flooding and prevent polluted surface water from reaching receptors.

When the natural milieu and ecosystem services are not adequate there is a need for refined and highly precise technical systems that deliver ser-

vices and mitigate stress-related harm and shortages. There are new concepts for planting urban trees that at the same time reduce the pressure on the surface water network and clean surface water. Many urban trees suffer from too little water and nutrients. Using pervious surfaces that permit drainage allows water to be channelled down into the ground to provide water for trees, while trees also remove nutrients from water, which benefits treatment plants and receptors. Something that has become popular over the past 10 – 15 years is skeletal soil which is highly permeable and can often store large amounts of water, and in some cases can even clean the water. Skeletal soil is placed underneath plants to give their roots space to continue to grow. It is becoming increasingly common to mix biochar with skeletal soil used for planting as a way of cleaning the surface water flowing through plant beds.

Another solution is rain gardens which are vegetation covered pieces of land that are often sunken into the ground and built to create a “delay zone” for surface water. The water filters slowly from the rain gardens down into the ground. Correct construction optimises the delay and purification process. Rain gardens have been used extensively in Canada. One challenge, however, is to keep the draining structures open over the long term.

Today the surface of streets and squares is often so impervious that rain cannot get through and 95 percent of all water therefore runs down the drain, placing an unnecessary strain on surface water and pipe systems. New concepts have been developed for drainage of impervious surfaces that not only relieve the pressure on urban water and drainage systems, but also allow the water to be used in the ground and by tree root systems.

FOOD PRODUCTION

Urban farming is transitioning from being a hobby to become part of the urban food supply.

Temporary parks and guerrilla gardening come about when architects, residents, entrepreneurs and property owners join forces to create

something together. Several cities are taking a step further from citizen dialogue as a consultative and advice-gathering process to grassroots initiatives where citizens are invited to more actively participate in the design of urban spaces.

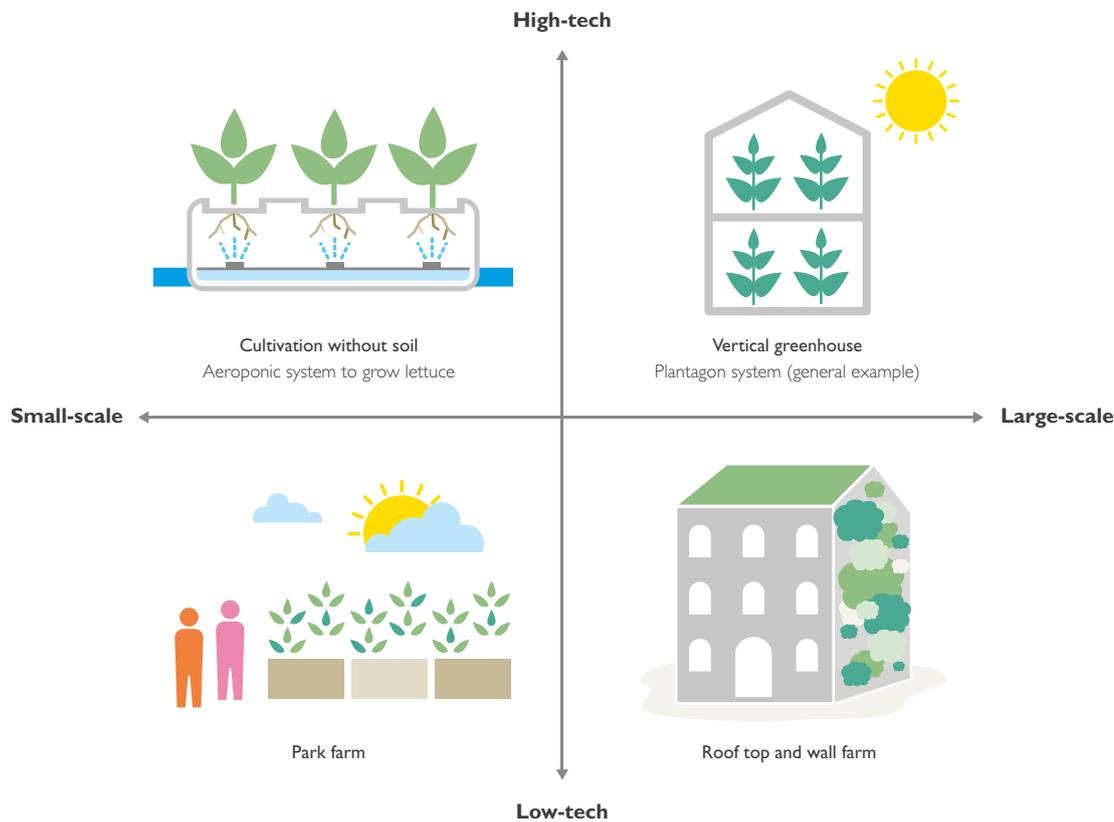


Figure 33: The matrix illustrates the value of both small-scale and large-scale urban farming in combination with low-tech solutions.

IMPLEMENTATION – ACTIVITIES AND CHALLENGES

Landscape architecture, which has always been a field at the intersection of aesthetics, biology, sociology and engineering, will increase in significance when cities of the future are built and renewed. In the future, high-tech aspects will provide precise knowledge about necessary characteristics. Garden engineering will become increasingly high-tech but will also be an important element in the landscape architecture aesthetic.

One challenge is that diversified environments need to be taken care of. Having sufficient economic resources for the construction and administration stage is a challenge. The split responsibility for green structures between street management agencies and entrepreneurs is another challenge.

Examples

- The report from Stockholm Resilience Center on planetary boundaries describes the seriousness of the situation and emphasises incorporating ecosystem services in the planning process.
- The planning of the new Norra Djurgårdsstaden development in Stockholm and the expansion of Albano is based in part on a scientific and conceptual approach on how new green spaces can contribute to a robust ecosystem.
- Kungsträdgården park in Stockholm is an example of a highly utilised park that experiences intense wear and tear.

- The first example of industrial food production in cities is the Plantagon vertical multi-storey greenhouses built next to the Linköping heating plant. They use waste water from the plant for fully automated food production.
- An example which, at the time of writing, is at the concept stage is architecture firm Belatchew's insect farm. It will be able to be built on barren land and produce protein-rich food for an urban population that can no longer eat meat from free-range chickens and cloven hoof animals.
- In the expansion of the Västra hamnen district in Gothenburg, the city has used the long timeframe of the development process to establish and test temporary solutions, including urban farming.
- Green, blue and white structure plans for Gällivare. With the first plans of this kind in Sweden, Gällivare Municipality wants to create a common vision for the use, management and design of snow, water, greenery and roads. The vision for Gällivare is "a world-class arctic town" where it is possible to be outdoors year round and where snow is seen as an asset, including in the city centre.

IMPORTANT CONCLUSIONS

- Cities of the future need to be equipped for climate change, with green and blue spaces reducing the effect of large water volumes, adding to biodiversity and improving the noise environment, health and green urban environments. To handle increased precipitation and intense torrential rain, interfaces are needed between the grey, green and blue spaces.
- When the natural environment is not sufficient we need refined and highly precise technical systems that deliver services and mitigate stress-related harm and shortages.
- The term ecosystem services has been widely used in recent years – both in research and among public and private sector actors. It will become increasingly important to integrate these perspectives in all urban planning and throughout the built environment in the future.
- Urban farming is developing from a hobby and lifestyle marker into an important part of the urban food supply.
- Landscape architecture and garden engineering will increase in significance when cities of the future are built and renewed.

II. Closing words/flight plan

While working on Good Cities of the Future and the subproject on attractive living environments and flows, our aim has been to outline an overall vision based on people's expectations for a city that is safe and secure, developing and inspiring, and that encourages participation and dialogue on change and improvement for the future. The fast pace of change in society as a whole and the urbanisation process are perhaps the main challenges in the realisation of this vision. Dramatic changes in our climate and populations are important issues in urbanisation, as is our ability to manage these and other challenges when planning and designing urban systems – urban functions, buildings, ecosystems, transport solutions and supply systems. Our ideas and suggestions for the future are summarised here:

- There is great untapped potential in taking a **cross-sectoral approach to development and evaluation of visions for the future in dialogue involving a broad range of actors** to create attractive living environments.
- **Metropolitan regions and their interior interactions/interfaces will grow in significance** in people's lives.
- **Building cities inwards** provides a way to make them accessible and attractive for everyone in a cohesive way. We need to find new ways to avoid urban sprawl altogether and instead re-purpose more of the land being used for other purposes such as industry and ports. Urban infill is important but must be done thoughtfully and not on valuable natural land. There is, for example, great potential to convert external commercial areas/retail parks into mixed-function developments and to carefully insert new developments into existing areas.
- **Enhanced meetingplaces and high streets lead to attractive living environments both in and around cities.** It is crucial to develop a well-functioning life puzzle for urban dwellers by creating a *multifunctional, mixed urban environment* with a rich blend of homes, work, culture, social activities and commercial services, both in existing and new urban developments. Public spaces also need to experience a renaissance in cities of the future. Developing dense, mixed urban environments around stations and creating urban station communities provides a possibility to drastically reduce dependence on regional commuting and leisure travel.
- **Digitalisation can be used to change travel behaviour and patterns**, which could revitalise city centres and peripheral areas. Substantial investment is needed in digital infrastructure to facilitate communication with the help of ICT and improve quality so that it is easier to work, learn and receive care virtually/remotely. But it is also important to have physical meetings while at the same time reducing travel through climate-smart mobility. Pedestrian and bike traffic, as well as modern public transit solutions incorporating a large measure of ITS, must be the norm instead of cars.
- We could take better advantage of **biological elements as a life-sustaining and health-promoting resource** to promote both biodiversity and good health.
- Improving **resource efficiency and circularity in an eco-cycle perspective** will become increasingly important in planning and designing cities and urban functions.

- **Smart and integrated supply systems need to have a legitimate place in cities** to make use of synergies between energy, water and waste systems. The systems need to be designed to be both robust and flexible in order to meet strict climate requirements and hard-to-predict risks.
- **Protect green, blue and white value in cities.** In the future, green and blue in cities could be more than just an attractive backdrop. We need to develop an understanding for biological elements as a life-sustaining resource. Developing ecosystems in cities and in the urban-rural connection will have great significance for sustainable flows in transport, water, energy and materials in cities.

These are of course only a few examples of possible hypotheses/concepts that need to be con-

sidered in ongoing and future efforts to plan, design, build and manage our existing and future cities, and how they interface with surrounding rural areas in a national and international perspective.

It is only the real change processes within municipalities and the private sector that will make the imprints to give us “good cities of the future.” It is important to ensure that all of the talent and knowledge that actors in the public and private sector, academia, industry and civil society possess is put to use and mobilised to create positive forces of change.

We need experimentation and design-oriented methods at all stages in the complex urban planning and building processes to bring forth good ideas and solutions. Coordinating all ideas in a transparent and democratic way is, of course, a key success factor.

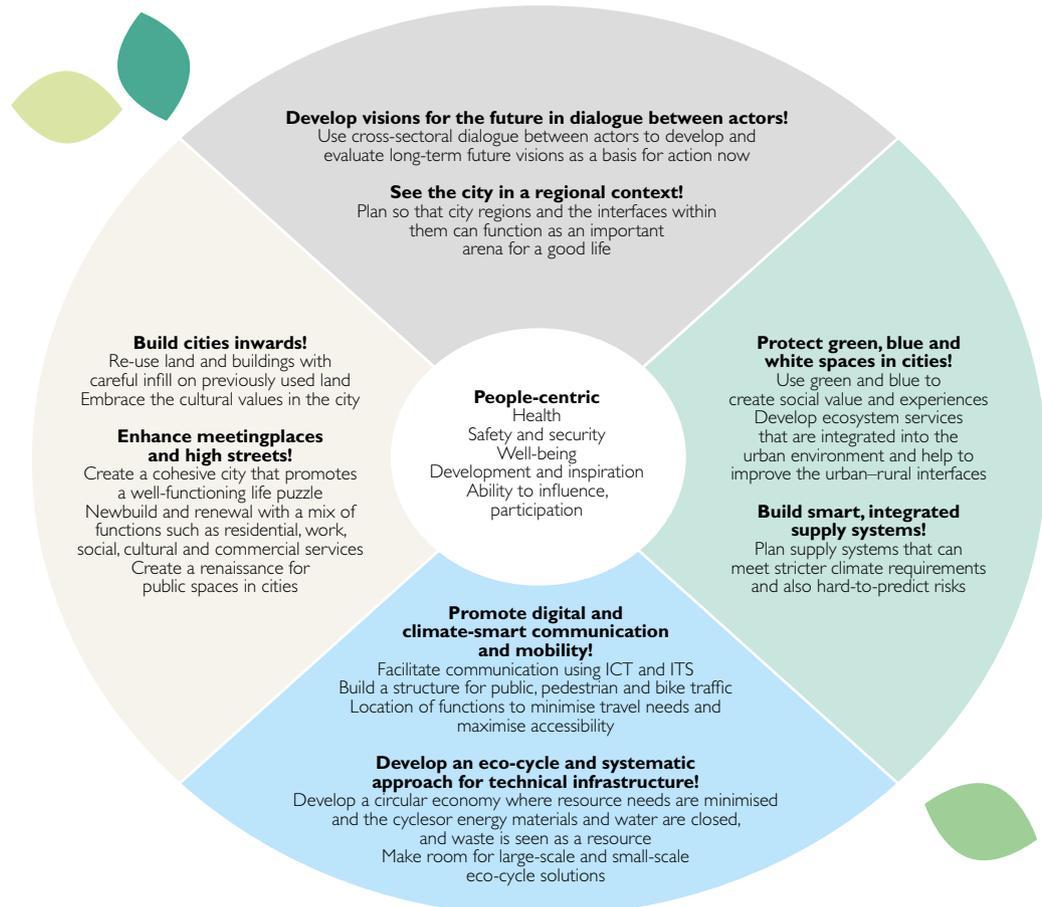


Figure 34: A summary of eight themes for planning attractive living environments and flows in good cities of the future. We hope you will be inspired as you make plans for your own city!

12. Appendix

FOOTNOTES

1. Saskia Sassen, 2005, The Global City Introducing a Concept. Brown Journal of World Affairs. Winter/Spring, Volume XI, issue 2.
2. Edward Glaeser, 2011, The Triumph of the City.
3. Christopher Kennedy, 2011, The Evolution of great world cities. Urban wealth and economic growth.
4. Boverket, En vision för Sverige 2025 – en urbaniserad värld.
5. UN's 17 Global Sustainability Goals, see www.un.org/sustainabledevelopment/sustainable-development-goals/
6. RUF5 2050 – the next regional development plan for the Stockholm region.
7. TRF, 2015, Seven perspectives on Sustainable development. On how the sustainability perspective can be more prominent in a new regional development plan for the Stockholm region. Working materials 2015:1
8. Göteborgs stad, Yttre portar mot havet.
9. Statistics Sweden's national forecast.
10. Lindholm, Oliveira & Wiberg, 2016, and Bornemark, 2016.
11. Bornemark, 2016, page 13 of the book Medborgardialog – om det svåra i att mötas. Praktikers reflektioner om ett av demokratins viktigaste verktyg.
12. Enrique Penalosa, forma Mayor of Bogotá, Colombia.
13. Engström C-J & Cars, G, 2013, Planning in a new reality – new conditions, demands and discourses. Published in Planning and Sustainable Development in Sweden, Lundström, M et al. Föreningen för Samhällsplanering.
14. Fredriksson, Charlotta, 2011, Planning in the “New Reality”. PhD thesis. Planning and decision analysis at Royal Institute of Technology (KTH).
15. Mistra Urban Futures – tre strategier för att möta havsnivåhöjningar.
16. The UN Habitat programme has produced the report “Using Minecraft for Youth Participation in Urban Design and Governance.” The purpose of the report is to present UN Habitat's method of using ICT to get young people more involved in urban planning.
17. Different driving forces in society lead to different types of energy systems. In 2016 the Swedish Energy Agency released the report *Fyra framtider – energisystemet efter 2020*, a comprehensive analysis presenting four possible scenarios for the future of Sweden's energy system. <http://www.energimyndigheten.se/nyhetsarkiv/2016/fyra-mojliga-framtider-for-svenska-energisystemet>.

18. Local labour markets – characteristics, development and functions, Statistics Sweden’s unit for business and register-based employment statistics, 2010.
19. Johansson, M, 2008, Polycentrisk utveckling och regionförstoring i Sverige. Royal Institute of Technology, School of Architecture and the Build Environment.
20. SOU 2016:48 Regional indelning – tre nya län.
21. Konsumenterna, matpriserna och konkurrensen, Konkurrensverket, 2004:2.
22. In a report which outlines 15 myths about the Million Programme and presents simplifications and preconceived notions that affect planning and renewal, social analyst Carlos Rojas analyses and reflects on a number of visions and notions that might impact small and large decisions in conversion work in the Million Programme areas. Arkus report #1 2016.
23. Carlos Rojas, *15 myter om miljonprogrammen*. Chapter ”Alla är fattiga” (Everyone is poor).
24. With Stockholm as the starting point, the Mellanstaden project looks at how design and more development in residential suburbs can be a way forward for growing cities. www.mellanstaden.se.
25. Årets stadskärna (City Centre of the Year) is an award for successful development of city centres. It is awarded to the Swedish city that has made the most progress in recent years in its renewal of its centre through partnerships between public and private sector actors. Progress here means that there are several measurable results from the city centre development.
26. <http://www.bidsweden.se/utveckling-av-stadskaumlrnor-i-sverige.html>
27. <http://www.boverket.se/sv/samhallsplanering/uppdrag/avslutade-uppdrag/tryggt-och-jamnt/projekt-om-tryggt-och-jamnt/stockholm---trygghet-i-boende/>
28. <https://www.sakraplatser.abe.kth.se/>
29. Bertolini & Split, 1998, *Cities on rails: The redevelopment of railway station areas*. London: E&FN Spon.
30. Dahlstrand, Ramstedt, & Ranhagen, 2016, *Det urbana stationsområdet – vägen mot ett resurssnålt resande*. Annual Report 2015. www.mistraurbanfutures.se.
31. The number of Swedes who are 65 years or older will increase by around 2.5 million, compared with around 1.85 million today (PRO, 2012a). There are, however, significant regional differences and it is mainly in the metropolitan regions that growth is the greatest. In suburban municipalities outside big cities, big cities and suburban municipalities outside bigger cities the number of older people is growing faster than in the country as a whole (WSP Analys och strategi, 2014).
32. Wilhelmson, A, 2016, *Bollnäs har fått sitt hjärta tillbaka*. (Bollnäs has its heart back). Article in *Arkitekten* 2016:9.
33. Multicultural centre. mkcentrum.se.
34. Malmö City and the delegation for sustainable cities. Rosengård.
35. Intermodal transport, or intermodality, is a term used in transportation science. It involves the use of more than one mode of transport for a journey for goods or passengers. Source: Wikipedia
36. UbiGo is a Gothenburg-based pilot programme www.ubigo.me.

37. MaaS – Mobility-as-a-Service, is a relatively new term describing the transition from individual transport solutions to mobility being seen and consumed as a service. This is achieved by different transport solutions being integrated into an on-demand service. Source: maas-alliance.eu.
38. Innoz, Innovationszentrum für Mobilität und gesellschaftlichen Wandel.
39. Bergström, P, 2016, Linbana planeras i Göteborg – kan bli en del av kollektivtrafiken. Reflexen 2016:1.
40. Feasibility study: Linbana över älven 2021 – att etablera linbanor i Göteborg, Dnr 2367/15, Trafikkontoret, Göteborgs stad.
41. Johan Rockström et al. 2009.
42. According to IVL Swedish Environmental Research Institute our objective for today's waste management is to reach the upper stages in the so-called waste hierarchy. This means that we first avoid creating waste, secondly we re-use it, recover materials from it, recover energy from it and lastly send it to a landfill.
43. On 2 December 2015 the European Commission made an presented a statement about the circular economy. It was in two parts: an action plan for a circular economy and a new waste management package containing proposals for revisions to the six waste directives.
44. Source: Johansson, Birgitta, 1997, Stadens tekniska system. Byggforskningsrådet T17:1997.
45. Tenants in Nydala are the first in the world to have technology that washes laundry in cold, deionised water without laundry detergent.
46. Reflow is a model that in a simple way tries to describe the flows of energy, water and materials through cities and how these can be made more efficient in a cycle. This is a project of Stockholm City.
47. Envacs terminal in Stora Ursvik in Sundbyberg.
48. Tekniska verken Linköping.
49. Path dependence in the economy has been analysed by, among others, researcher Puffert Douglas, 2008.
50. See for example Sherman, Roger, 2008, Market Regulation. Pearson/Addison Wesley.
51. Liljenström et al., 2014, Byggproduktionens miljöpåverkan i förhållande till driften. Life-cycle calculation of climate impact of newbuild multi-dwelling buildings of concrete with a low energy profile.
52. Ranhagen & Frostell, 2014, Kretsloppsmodell 2.0 for Norra Djurgårdsstaden. Feasibility study – concluding report.
53. Gullberg & Nolmark, 2016, SPUTIFY – Combined system and service innovation for the transport sector.
54. Report: *Evenemangseffekter*. Tourism research institute ETour in Östersund commissioned by Jämtland County Administrative Board.

REFERENCES

- Arkitektur 2015:6, Landet utanför. Så byggs det där Sverige växer som mest.
- Arkitekturgalan, Architecture Gala 2016, Sveriges Arkitekter.
- Bergendahl Norell A, 2016, Den ohållbara resan mot det hållbara resandet. Licentiatavhandling i planering och beslutsanalys. Stockholm: Kungliga Tekniska högskolan.
- Bergström, P, 2016, Linbana planeras i Göteborg – kan bli en del av kollektivtrafiken. Reflexen 2016:1.
- Bertolini, L & Split, T, 1998, Cities on rails: The redevelopment of railway station areas. London: Spon.
- Bornemark, J, 2016, Medborgardialog – om det svåra att mötas. Praktikers reflektioner om ett av demokratins viktigaste verktyg. Stockholm: Arkus.
- Boverket, 2010, Mångfunktionella ytor. Klimatanpassning av befintlig miljö i städer och tätorter genom grönstruktur. Karlskrona: Boverket.
- Boverket, 2012, Vision för Sverige 2025. Karlskrona: Boverket.
- Boverket, 2016, Rätt tätt. En idéskrift om förtätning av städer och orter, mars. E-book. Karlskrona: Boverket.
- Boverket, Nationell plattform för hållbart stadsliv. Karlskrona: Boverket.
- Chalmers Arkitektur. Mind the gaps, Tillfällig karaktär och samutnyttjande i en strategi för effektiv lokalanvändning, Anna Gustafsson och Sofia Park, examensarbete på masterprogrammet: Design för hållbar utveckling, Vårterminen 2015, Chalmers Arkitektur.
- Dahlstrand, A, Ramstedt, A & Ranhagen, U, 2016, Det urbana stationssamhället – vägen mot ett resurssnålt resande. Annual Report 2015. www.mistraurbanfutures.se.
- Decode – Community Design for Conflicting Desires, Tyréns.
- Energimyndigheten, 2016, Fyra framtider. Energisystemet efter 2020. Explorativa scenarier. ET 2016:04.
- Engström, C-J, red, 2016, Den attraktiva regionen. Antologi 3. Resultat, reflektioner och rekommendationer. Boverket m fl samarbetsaktörer.
- Ekelund, B, 2010, Rumslig legitimitet. När hållbar utveckling medvetandegörs. Luleå: Luleå tekniska universitet.
- FN:s 17 globala hållbarhetsmål, <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>
- Gullberg A, & Nolmark, H, 2016, SPUTIFY – kombinerad system- och tjänsteinnovation av transportsektorn.
- Göteborgs stad, Yttre portar mot havet.
- Göteborgsregionernas kommunförbund. Strukturbild för Göteborgsregionen.
- Hidalgo, A, 2016, Hållbar renovering är det möjligt? Hållbart Byggnade, Branschnyheter.
- IVA-rapport, 2015, Resurseffektivitet. Fakta och trender mot 2050. Rapport 455. Stockholm: Royal Swedish Academy of Engineering Sciences.
- Johansson, B, 1997, Stadens tekniska system. Byggnadsrådet T17:1997. Stockholm: Byggnadsrådet.

Johansson, M, 2008, Polycentrisk utveckling och regionförstoring i Sverige. Royal Institute of Technology, School of Architecture and the Built Environment.

Jönsson, Bodil, 1999, Tio tankar om tid. Stockholm: Brombergs bokförlag.

Kaijser, A, 2001, Redirecting infrasystems towards sustainability. What can we learn from history?

Kaijser, A & Gullberg, A, 2004, City-building regimes in post-war Stockholm. Journal of Urban Technology.

Kaijser, A & Gårdfeldt, Volvo Research and Educational Center of Excellence – mid term evaluation.

Kling, A, 2016, Växtverk. Söderförorten Farsta är det första stora exemplet på hur Stockholm förväntas växa inåt i olika knutpunkter och noder.

de Laval, S, 2015, Bygga stad för barn – en kunskapsöversikt om barn och ungdomar, täta stadsmiljöer och metoder för delaktighet och barnkonsekvensanalys. Arkus skrift 73.

Lundström, MJ, Engström, C-J & Ranhagen, U, 2016, Energismart samhällsplanering. Stockholm: FF/KTH.

Malmö City and the delegation for sustainable cities. Rosengård.

Mattson, K, 2015, Förtätning av städer – trender och utmaningar, februari. Stockholm: Sveriges Kommuner och Landsting.

Mistra Urban Futures – tre strategier för att möta havsnivåhöjningar.

Multicultural centre. mkcentrum.se.

Naturvårdsverket: <http://www.naturvardsverket.se/Miljoarbete-i-samhället/EU-och-internationellt/EUS-miljoarbete/EU-och-resurseffektivitet-EU-2020/Cirkular-ekonomi/>

Placemaking, Project for public spaces, www.pps.org.

PLAN, 2016, tidskrift nr 4.

Ranhagen, U, 2012, 4 big leaps and 20 small steps. Conceptual guidelines on sustainable spatial planning. Energy Agency ET 2012:14.

Ranhagen, U, 2012, Att integrera hållbarhets- och energifrågor i fysisk planering – metoder och verktyg etapp 2. Stockholm: KTH.

Ranhagen, U & Frostell, B, 2014, Eco-cycle model for Stockholm Royal Seaport City District. Feasibility study – concluding report. City of Stockholm and KTH.

Ranhagen, U & Groth, K, 2012, The SymbioCity Approach. A Conceptual Framework for sustainable urban development. Stockholm: SKL International.

Ranhagen, U, Troglia, E & Ekelund, B, 2015, Klimatsmarta och attraktiva transportnoder. Stockholm: KTH/LTU.

Ranhagen, U, Dahlstrand, A & Ramstedt, A, 2017, Co-creation in urban station communities – findings from working seminars involving the collaboration of transdisciplinary agents, 2015–2016. Mistra Urban Futures Report 2017:2.

Region Skåne, Avdelningen för regional utveckling, 2010, markanvändning, tillgänglighet och flerkärnig ortstruktur – Strukturbild för Skåne.

Region Västerbotten. Strukturer för tillväxtarbete med ett rumsligt perspektiv.

- Rojas, C, 2016, 15 myter om miljonprogrammen. Förenklingar och förutfattade meningar som påverkar planering och förnyelse. Stockholm: Arkus.
- SCB Statistiska centralbyrån, 2012.
- SOU 2016:48 Regional indelning – tre nya län.
- Stenberg, E, 2016, Förslag för miljonprogramsområden. Hidalgo.
- Stockholms läns landsting. Regional utvecklingsplan för Stockholmsregionen, RUF5 2050. Europas mest attraktiva storstadsregion.
- Stockholms läns landsting, 2012, Svaga samband i Stockholmsregionens gröna kilar, rapport 2012:5.
- Stockholms läns landsting, 2013, Regionala stadskärnor. Rapport 2013:1.
- Stockholms läns landsting, 2013, Ekosystemtjänster i Stockholmsregionen. Rapport 2013:3.
- Stockholms stad, Rinkebystråket, bygg. stockholm.se.
- Stähle, A, 2008, Compact Sprawl. Stockholm, Kungliga Tekniska högskolan.
- Svenska stadskärnor, Årets stadskärna – för levande orter och livfulla städer. www.svenskastadskarnor.se.
- Sweco Architects, 2009, Tangshan Bay Eco-City.
- Tell, J, 2008, Träd kan rädda världen. Stockholm: Bokförlaget Max Ström.
- Trafikverket och Engström, C-J et al, 2007.
- TRF, 2015, Seven perspectives on Sustainable development. On how the sustainability perspective can be more prominent in a new regional development plan for the Stockholm region. Working materials 2015:1
- TRF, 2015, Resan mot stärkt hållbarhet. Analys, slutsatser och rekommendationer för det fortsatta arbetet med RUF5 2050.
- Wangel, J, 2012, Making futures. On Targets, Measures & Governance in backcasting and Planning. Stockholm: Kungliga Tekniska högskolan.
- Wilhelmson, A, 2016, Bollnäs har fått sitt hjärta tillbaka. (Bollnäs has its heart back). Article in Arkitekten 2016:9.
- Wingren, A, Vattnet kommer – iscensättning för att förändra människors medvetenhet om klimatutmaningen.
- Vinnova – UDI-52, 2016, Södertörnsmodellen. Slutrapport 2016-08-25.
- Vinnova, Vinnovaprojektet Grågröna systemlösningar för hållbara städer.
- Yngström, L, 2016, Grön-, blå- och vitstrukturplan för Gällivare. Aktuell plan i tidskriften PLAN 2016:3.
- Åsbrink, B, 2012, Holger Blom – dynamisk stadsträdgårdsmästare i Stockholm. Stockholm: Carlssons Bokförlag.

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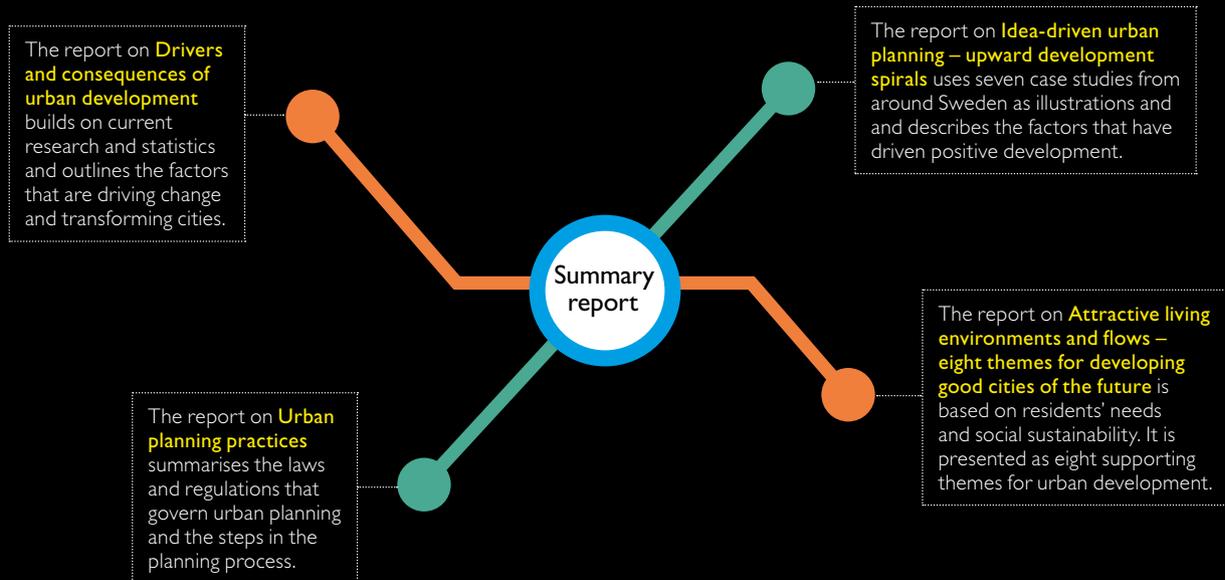
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During 2016 and 2017, the Royal Swedish Academy of Engineering Sciences has been running a project on **Good Cities of the Future**. The objective of the project is to provide a growing population with attractive environments in which to live and work, in both growing and shrinking regions. The project is expected to result in improved common methods and processes for urban planning, as well as to increase knowledge and for new findings to be disseminated to those who are responsible for urban planning in cities and regions.

Four work groups have been investigating different aspects of the Good City of the Future and the results of their work are now available, partly as published reports (see below).

Urban planning is a broad and complex task that reflects current societal values. As an independent body, IVA wishes to develop new knowledge, stimulate debate and a provide platform for stakeholders to meet and test new methods of collaboration.



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