

THE CARING CITY

NORRA KYMLINGE



INTRODUCTION

INTRODUCING TEAM LINK

Team LINK consists of several international specialists in sustainable urban development. Although we have different professional and cultural backgrounds, we complement each other with experience and interests. Above all we are all truly dedicated to sustainable development, and strongly believe that the future of our world lies in our actions today. Thus, all development and redevelopment today should be driven by a multidisciplinary and cooperative approach, and guided by high sustainability and resilience goals, strong partnerships, stakeholder involvement, business models and based on evidence derived from experience and research. Throughout the project, we worked with great enthusiasm, equal forces and strong engagement. Several of our colleagues were involved in finalizing the report: Emil Martinec, LINK (visualisations), Ragnar Os, LINK (illustrations), Regine Eikenæs, LINK (landscape), Per Lindberg, Multiconsult (energy), Madeleine Larsson, LINK (illustrations), Malena Norlin, LINK (illustrations), and Frida Hagdahl, LINK (graphic design).

We are grateful for the opportunity to prototype Norra Kymlinge as the most sustainable city district for the world, and at the same time challenge and develop our knowledge and way of thinking. We hope that the result we show in this report will be useful for the next steps in the development of Norra Kymlinge, as well as any other city district of the future.

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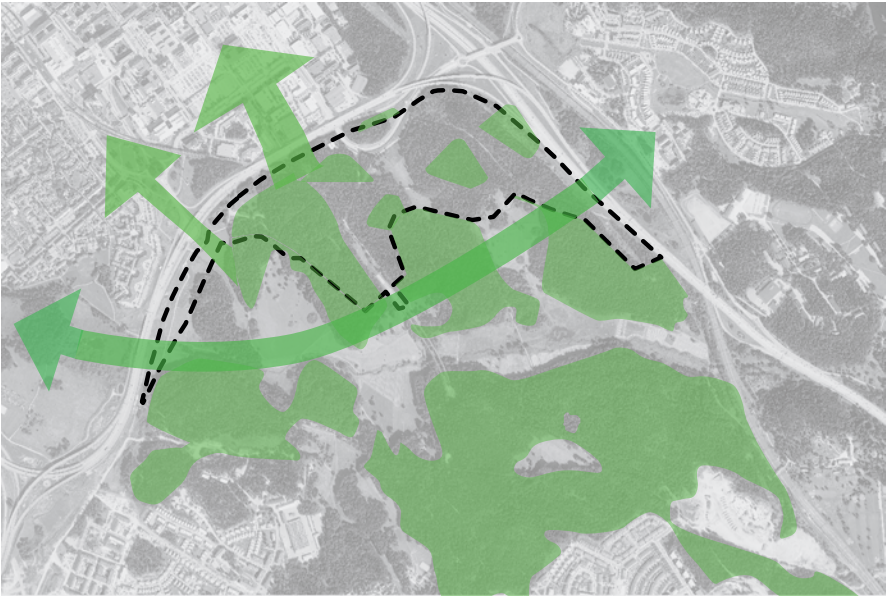
EXPERIENCING NORRA KYMLINGE

ENVIRONMENTAL, SOCIAL AND ECONOMIC VALUES AND POTENTIALS

We were very curious about Norra Kymlinge, a greenfield and forested site, defined with heavy roads towards the east, E4, and north, E18, and a nature reserve towards the south and west. Our analysis of the site was based on the available documents, on the previous site analysis, provided by the employer and available on the internet, site visits and discussions with visiting lecturers during the workshop. Our major impression was site's existing green and blue structures and how they fit with the ambition for developing the most sustainable city district for the world. The most important question we faced was, how to develop the site, that, in many people's eyes has high ecological and recreational values, to be a *Doughnut* district, with high quality of life, for minimum 10 000 people living and working in the area, and that serves as an example for the world in sustainable city development? We had to start from scratch and, with the help of the available analysis, analyse site's environmental, social and economic current conditions, strengths, weaknesses and identify opportunities and potentials.

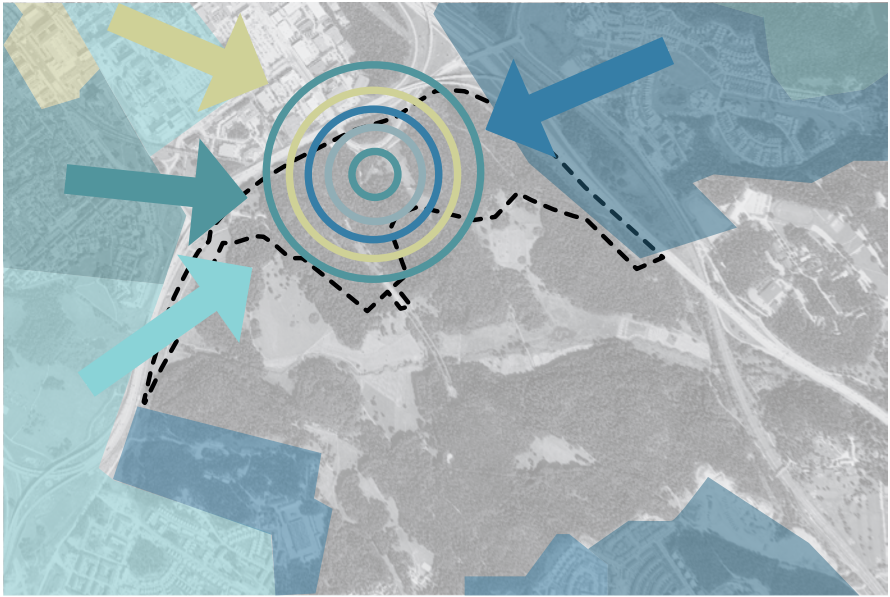
The 20 or so aspects that were assessed and presented in the document Site analysis gave a good foundation for our analysis. Several site visits were important to develop a feeling for the site's terrain and character of the landscape, and experiences mobility routes, space, scale, noise and views. We summarised our analysis into five topics:

- Green structure
- Blue structure
- Pollination links
- Mobility routes
- Socio-economic conditions



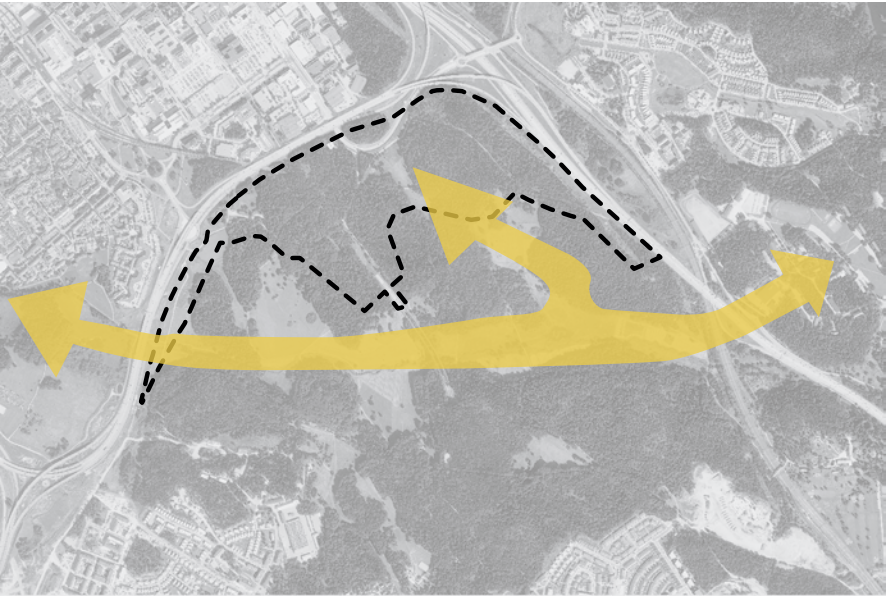
PRESERVING AND ENHANCING GREEN STRUCTURES AND CORRIDORS

- CONNECTIONS TO KISTA
- GREEN CORRIDOR
- GREEN AREAS

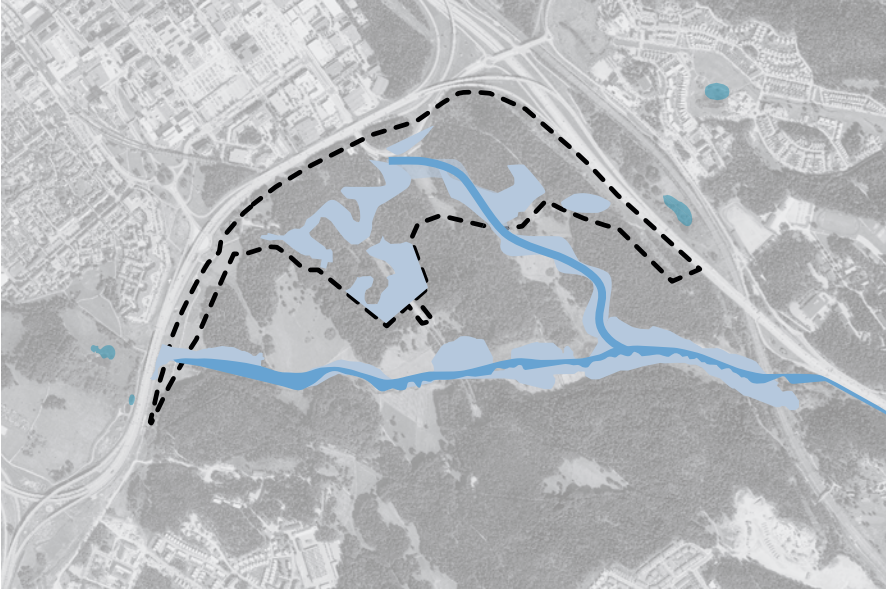


REDUCING SEGREGATION BETWEEN THE SURROUNDING AREAS

- MIDDLE INCOME (SEK)
- 449 000 TO 802 000
 - 389 000 TO 449 000
 - 249 000 TO 389 000
 - 185 000 TO 249 000
 - 57 000 TO 134 000

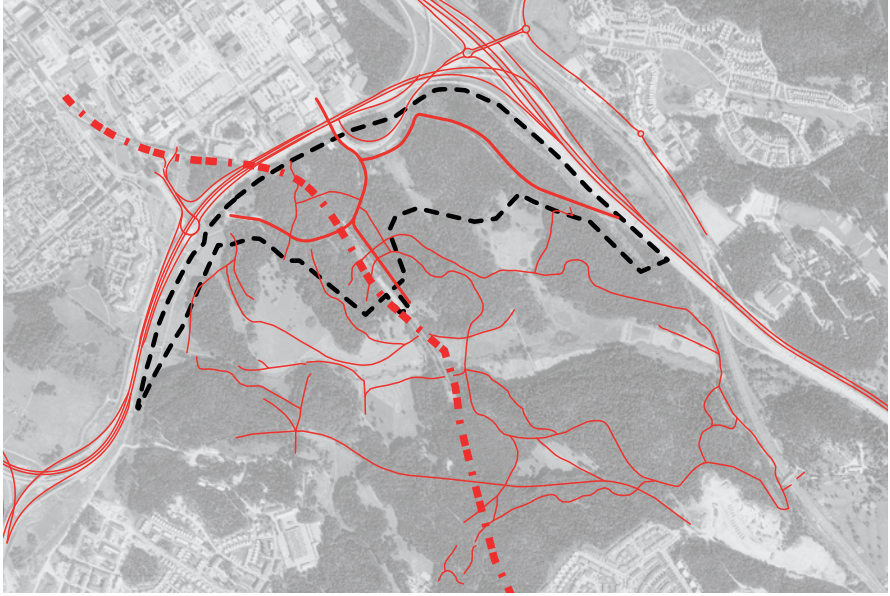


PRESERVING AND ENHANCING POLINATION LINKS



PRESERVING AND CONNECTING BLUE STRUCTURE

- WATERCOURSE
- WET LAND
- EXISTING BLUE INFRASTRUCTURE



PRESERVING MOBILITY ROUTES

- SUBWAY
- REGIONAL ROATES
- LOCAL ROUTES
- PEDESTRIAN AND BIKING ROUTES

***“Norra Kymlinge is
the most resilient and
sustainable city district
for the world”***

Long-term environmental, social and economic well-being are complex systems that require multidimensional approach and thinking. Both sustainability and resilience are concepts that have many dynamic variables and interdependencies, which, in order to be successful, rely on implementation to the site-specific conditions. Overall, sustainable city development puts people, nature and our planet into focus. According to Kate Raworth and the status of today's environmental, social and economic conditions, this means that all future development should be within the Doughnut. The Doughnut defines two limits that should not be exceeded, the planetary boundaries defined by Johan Rockström and Will Steffen, and the social foundations, derived from internationally agreed minimum social standards, as identified by the world's governments in the Sustainable Development Goals in 2015. The ambition for Norra Kymlinge to be “the most sustainable city district for the world” requires analysis and development of specific criteria that would ensure that Norra Kymlinges development fits into the Doughnut, as well as analysis of prototypes and test beds that could be used as good examples for other developments in the world. In our opinion, in order to develop a city district that fits into the Doughnut, sustainability should be accompanied with resilience. A sustainable city doesn't necessarily mean that it is resilient, and a resilient city doesn't mean that it is sustainable. Thus, our vision is to develop Norra Kymlinge as a sustainable and a resilient city district for the world. Norra Kymlinge, should be a dynamic and flexible city district, for everyone, that gives more than it takes, and is environmentally, socially and economically sustainable and resilient for future development. It is a living lab as well as a long-term testbed - a platform for innovation, innovative thinking and new business models.

To realize our vision, we worked with both concepts, resilience and sustainability. We identified overarching environmental, social and economic resilience goals as well as project specific sustainability goals. These resulted in design criteria and solutions for developing a sustainable and resilient Norra Kymlinge.

RESILIENCE AND SUSTAINABILITY IN COOPERATION

ABOUT CITY RESILIENCE INDEX

"City resilience is the capacity of individuals, communities and systems to survive, adapt, and grow in the face of stress and shocks, and even transform when conditions require it".

(Source: Rockefeller Foundation)

A Resilient City

Cities are complex web of institutions, infrastructure and information. Many city systems have to work together to make a city function to make it 1) liveable for people, 2) peaceful and cohesive, 3) safe and connected, 4) a hub for knowledge and strategies for the future.

City Resilience Index

The City Resilience Index (CRI), created by Arup/Rockefeller Foundation, is a holistic framework that combines the physical aspects of cities with less tangible aspects associated with human behaviour, social stability, economic prosperity, and is structured around 4 dimensions and 12 goals that are critical for a resilient city.

City systems are facing an array of challenges worldwide. Rapidly increasing urbanization, accelerating resource depletion, evolving expectations for liveability and resilience must all be considered in the planning and development of resilient cities. The role of cities in this respect is central in debates around our planetary boundaries, economic futures, social stability and climate change.

The CRI was used as baseline to articulate city resilience for Norra Kymlinge. The aim is to understand what matters most to making Norra Kymlinge resilient, and to guide the development of the project goals and design responses. CRI can be used as evidence of value that resilience building initiatives can bring to the future of Norra Kymlinge.

The CRI was used in Norra Kymlinge to guide the design process, understand the external factors affecting Norra Kymlinge, and define the contribution that Norra Kymlinge can make to the city and the world.

NORRA KYMLINGE, A RESILIENT CITY DISTRICT

A high level and preliminary resilience diagnostic was undertaken to formulate and shape Norra Kymlinge goals and design response, both spatial and non-spatial. The diagnostic was framed by identifying the strengths and weaknesses facing Sweden, Stockholm and Kista, and the potential opportunities that will help address them in Norra Kymlinge using coloured post it notes; green indicates opportunities. Understanding these urban scales will help define the development guidelines for Norra Kymlinge, and the contribution of Norra Kymlinge to Kista, Stockholm, Sweden and the world. The output was mapped on the CRI.

The following pages include the output from what matters most for making Norra Kymlinge resilient, highlighting key resilience goals, and resilience building opportunities for the future design and operation of Norra Kymlinge that extend beyond the site boundary.

Figure 2 indicates that the dimensions Health & Wellbeing, and Infrastructure & Ecosystem are where resilience building opportunities are concentrated, followed by Economy & Society and Leadership & Strategy. Based on this diagnostic analysis, we have formulated five overarching goals that Norra Kymlinge needs to demonstrate to unlock and catalyse its development potential and become the most sustainable and resilient city for the world. For Norra Kymlinge to be resilient, it needs to address the challenges (both the physical and non-physical) of the site, near site (immediate surroundings) and off site.

THE FIVE OVERARCHING GOALS FOR NORRA KYMLINGE ARE:

1. Demonstrate environmental responsibility
2. Promote diverse and inclusive community
3. Enable a healthy, active and responsible lifestyle
4. Incentivize economic partnerships
5. Co-create a participatory approach to decision making, design and operation

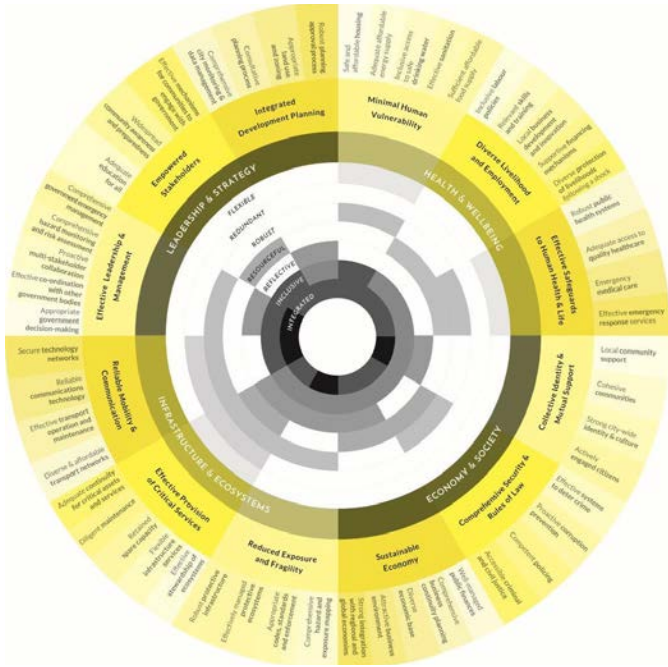


Figure 1 City Resilience Framework, Arup/Rockefeller Foundation



Figure 2 Output from the preliminary resilience diagnostic, identifying strenghts and weakness facing Sweden, Stockholm and Kista, and the potential and opportunities that will help address them in Norra Kymlinge

NORRA KYMLINGE, A SUSTAINABLE CITY DISTRICT

A resilient Norra Kymlinge should be sustainable to meet present needs without compromising the ability of future generations to meet their needs, but it cannot be successful without enabling societies to be resilient to shocks and stresses, and ensuring that future development does not increase vulnerability (UN commission on sustainable development, 2002). In addition, Goal 11 in the Sustainable Development Goals demonstrates this interdependency between sustainability and resilience.

Sustainability is not a steady goal or a blueprint, it is a dynamic process that develops over time. It is based on and implemented to the environmental, social and economic site specific conditions, which are developed to their full sustainability potential. High complexity and interdependency of different sustainability aspects require careful analysis of synergies, multiple benefits, or possible con-

flicts. We have defined sustainability themes that complement the overarching project goals for the project to enable us to shape the design response. The 13 sustainability themes include; Energy, Materials, Waste, Water, Green Infrastructure, Climate adaption, Identity & Equality, Mobility, Health, Long-term value, Circular economy, Employment, Function & Use.

In order to understand the interdependency between the project goals and the sustainability themes, we have undertaken an analysis that highlights the most important goals for the project as shown in Figure 3 below.

The analysis shows that the projects goals Demonstrate environmental responsibility should be one of the top priorities for Norra Kymlinge, followed by Promote diverse and inclusive community and Co-create a participatory approach to decision making, whilst Identity and equality, Long-term value and Energy are on top of the sustainability themes are should be addressed by Norra Kymlinge.

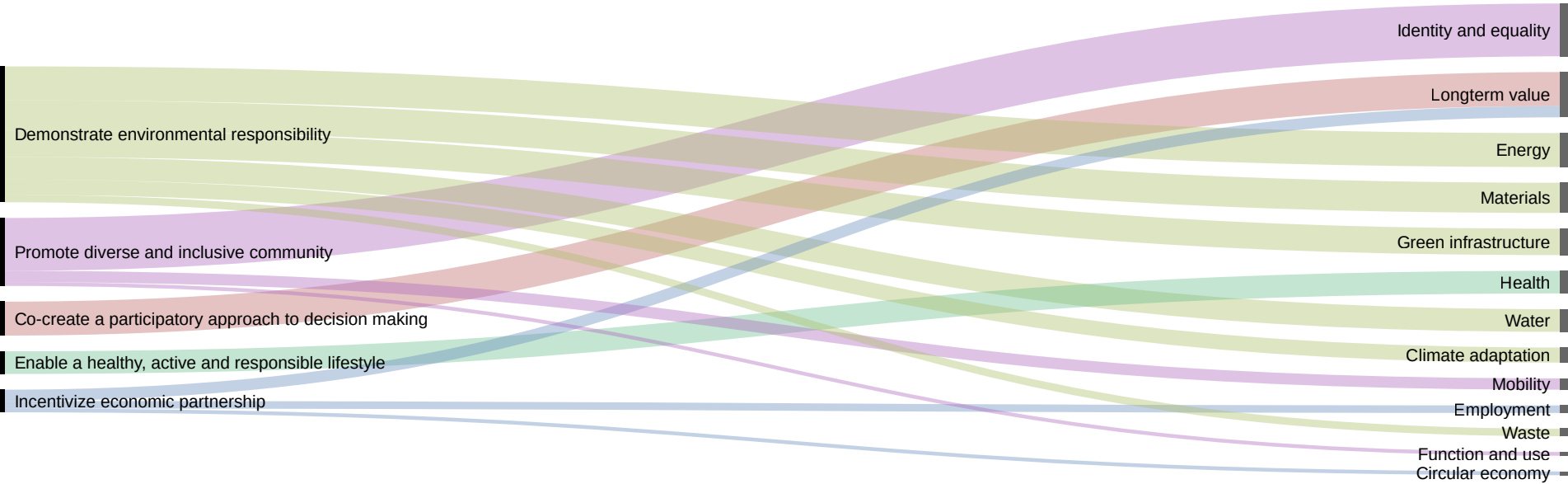


Figure 3 Interdependencies between the project goals and the sustainability themes.

SUSTAINABILITY THEMES

- ENERGY
- MATERIALS
- WASTE
- WATER
- GREEN INFRASTRUCTURE
- CLIMATE ADAPTION
- IDENTITY & EQUALITY
- MOBILITY
- HEALTH
- LONG-TERM VALUE
- CIRCULAR ECONOMY
- EMPLOYMENT
- FUNCTION & USE

RESILIENCE AND SUSTAINABILITY IN COOPERATION

PROJECT SPECIFIC GOALS

The previous analysis helped us define the project specific goals see table below. These we have also analysed against the overarching goals and sustainability themes to understand interdependency and multiple benefits. The analysis shows that Plus energy neighbourhood, digital technologies, sharing economy, and developing business partnerships are amongst the highest in the number of interdependencies for Norra Kymlinge. Mixed tenure or affordable housing however is the lowest, and this is due to the complexity around the provision of affordable housing in Sweden. This however does mean that it is a project goal that still needs to be addressed if Norra Kymlinge was to be the most resilient and sustainable city for the world that *Promotes diverse and inclusive community*.

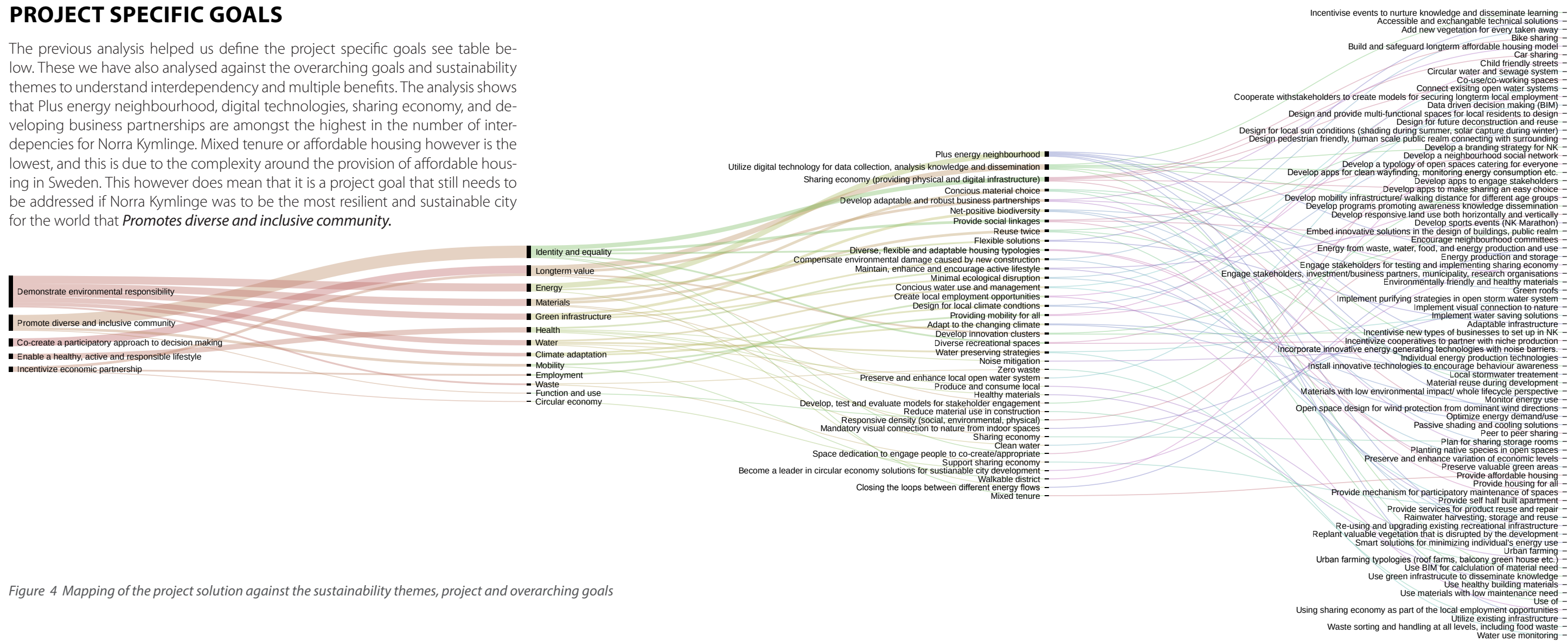


Figure 4 Mapping of the project solution against the sustainability themes, project and overarching goals

PROJECT SPECIFIC GOALS		
Plus energy neighbourhood	Compensate environmental damage caused by new construction	Diverse recreational spaces
Closing the loops between different energy flows	Net-positive biodiversity	Produce and consume local
Flexible solutions	Design for local climate conditions	Maintain, enhance and encourage active lifestyle
Use wise and reuse twice	Adapt to the changing climate	Healthy materials
Conscious material choice	Diverse, flexible and adaptable housing typologies	Noise mitigation
Reduce material use in construction	Mixed tenure	Mandatory visual connection to nature from indoor spaces
Zero waste during development and operation	Responsive density (social, environmental, physical)	Develop adaptable and robust business partnerships
Low environmental impact from waste handling	Sharing economy (providing physical and digital infrastructure)	Develop adaptable and robust partnerships
Water preserving strategies	Space dedication to engage people to co-create/appropriate	Become a leader in circular economy solutions for sustainable city development
Conscious water use and management	Provide social linkages	Create local employment opportunities
Preserve and enhance local open water system	Walkable district	Develop, test and evaluate models for stakeholder engagement
Clean water	Providing mobility for all	Develop innovation clusters
Minimal ecological disruption		Utilize digital technology for data collection, analysis knowledge and dissemination

DESIGN CRITERIA

To be able to work with the urban design for Norra Kymlinge we developed specific design responses and solutions. These were used to develop and analyse our approach throughout the design prosses and, in the end, define the preferred scenario, presented later in the document. We also mapped the solutions against the project specific goals, sustainability themes and the overarching goals, refer to Figure 4. The aim is to show how a project such as Norra Kymlinge can deliver local implementable solutions within overarching goals that resonate globally with the world.

SPECIFIC DESIGN RESPONCES AND SOLUTIONS

- Energy efficient buildings and infrastructure
- Energy production and storage
- Utilize existing infrastructure
- Optimize energy demand/use
- Monitor energy use
- Individual energy production technologies
- Smart solutions for minimizing individual’s energy use
- Utilize waste energy from waste, water, food, and energy production and use
- Accessible and exchangeable technical solutions
- Adaptable infrastructure
- Design for future deconstruction and reuse
- Material reuse during development
- Use of “second hand” materials and products
- Materials with low environmental impact from a whole lifecycle perspective
- Environmentally friendly and healthy materials
- Use materials with low maintenance need
- Use BIM for calculation of material need
- Plan for sharing storage rooms
- Waste sorting and handling at all levels, including food waste
- Provide services for product reuse and repair
- Implement water saving solutions
- Water use monitoring
- Rainwater harvesting, storage and reuse
- Circular water and sewage system
- Connect existing open water systems
- Implement purifying strategies in open storm water system
- Data driven decision making (BIM)
- Preserve valuable green areas
- Replant valuable vegetation that is disrupted by the development
- Add new vegetation for every taken away
- Planting native species in open spaces
- Green roofs
- Urban farming
- Open space design for wind protection from dominant wind directions
- Design for local sun conditions (shading during summer, solar capture during winter)
- Passive shading and cooling solutions
- Local storm-water treatment
- Provide self half-built apartment
- Provide housing for all
- Provide affordable housing
- Develop land use both horizontally and vertically responsive to its context
- Peer to peer sharing
- Bike sharing
- Car sharing
- Co-use/co-working spaces
- Develop apps to make sharing an easy choice

- Design and provide multi-functional spaces for local residents to design using local resources/materials (e.g. ‘Design your square’)
- Develop a neighbourhood social network
- Encourage neighbourhood committees
- Provide mechanism for participatory maintenance of spaces
- Design pedestrian friendly, human scale public realm connecting district to surrounding neighbourhoods, and landmarks
- Develop mobility infrastructure and locate key nodes based on the walking distance for different age groups (i.e. children, youth, elderly etc.)
- Child friendly streets
- Develop a typology of open spaces (neighbourhood squares, stream linear park, Forest park etc.) catering for everyone who lives, works and lives in Norra Kymlinge
- Incentivize cooperatives to partner with niche production
- Urban farming typologies (roof farms, balcony green house) that bring residents together around a healthy lifestyle
- Re-using and upgrading existing recreational infrastructure (biking, running, ski track, training, nature trails...)
- Develop sports events (Norra Kymlinge Marathon)
- Use healthy building materials
- Incorporate innovative energy generating technologies with noise barriers.
- Implement visual connection to nature
- Engage stakeholders: investment partners, municipality, research organisations, business partners etc
- Preserve and enhance variation of economic levels
- Build and safeguard long-term affordable housing model
- Engage stakeholders for testing and implementing sharing economy: product as a service, sharing platforms, space sharing, give away services etc
- Cooperate with other stakeholders for creating models for securing long-term local employment
- Using sharing economy as part of the local employment opportunities
- Develop apps to engage stakeholders (e.g.Peak SMS alert)
- Embed innovative solutions in the design of buildings, streetscape, public realm
- Incentivise new types of businesses to set up in Norra Kymlinge. (e.g. Norra Kymlinge holiday planner (a local business planning low impact holidays for residents and visitors)
- Use the public realm and landscape as a way to disseminate knowledge (e.g. Energy garden)
- Develop programs and digital apps for awareness knowledge dissemination (e.g. Eco-credentials / residents can compare their consumption against their neighbours)
- Apps for clean wayfinding, monitoring energy consumption/and impact of residents
- Incentivise events to nurture knowledge and disseminate learning (e.g. data visualisation biennale (artists invited to develop innovative ways of visualising the environmental data - the whole district becomes a showcase for this.
- Install innovative technologies to develop awareness on behaviours (e.g. recycling scales (rubbish weighted and energy saving calculated)
- Develop a branding strategy/certification for Norra Kymlinge for products that adhere to low carbon production

RESILIENCE AND SUSTAINABILITY IN COOPERATION

FITTING INTO THE DOUGHNUT

Reflecting on the 0.7 specification, we have analysed how the specific goals and design criteria we identified for Norra Kymlinge address the specification and fit into The Doughnut.

Our proposal and 0.7 specification

The analysis in Figure 5 shows that the goals, themes, and interventions in our proposal address all of the 0.7 specification. This is further described in our proposed solution outlined in the Table 1 on the opposit page and illustrated in our plans and visualisations. We have also identified additional specifications which we believe will strengthen the position of Norra Kymlinge as the most resilient and sustainable city for the world, and unlock its development potential. This include; stakeholder engagement, circular economy, mixed tenure (affordable housing) and sharing economy.

Our proposal and the doughnut

For us, the planetary boundaries are specific outcomes of interventions and actions undertaken by individuals, organisations, cities, countries. Our goals, and solutions proposed for Norra Kymlinge are only enhancing, respecting and re-inforcing the boundaries. Our solutions will alter the social foundation ‘boundaries’ positively and will in turn reinforce the environmental boundaries of the doughnut to deliver multiple benefits for Norra Kymlinge, Kista, Stockholm, Sweden and the World. For example, access to renewable energy proposed around the boundary of the development will reduce air pollution, contribute to the protection of the ozone layer depletion, and help mitigate climate change. Provision of affordable housing will make Norra Kymlinge an inclusive district for all and demonstrate unprecedented examplar social equity in Sweden. Additionally, solutions proposed such as ‘Connect existing open water systems’ will contribute to increasing biodiversity, promoting environmental educational opportunities around the native flora and fauna, whilst at the same time creating recreational corridors for cycling and running to lead healthy lifestyles. These examples demonstrate that our solutions are embedded in the complexity and interdependency of the doughnut and its components.

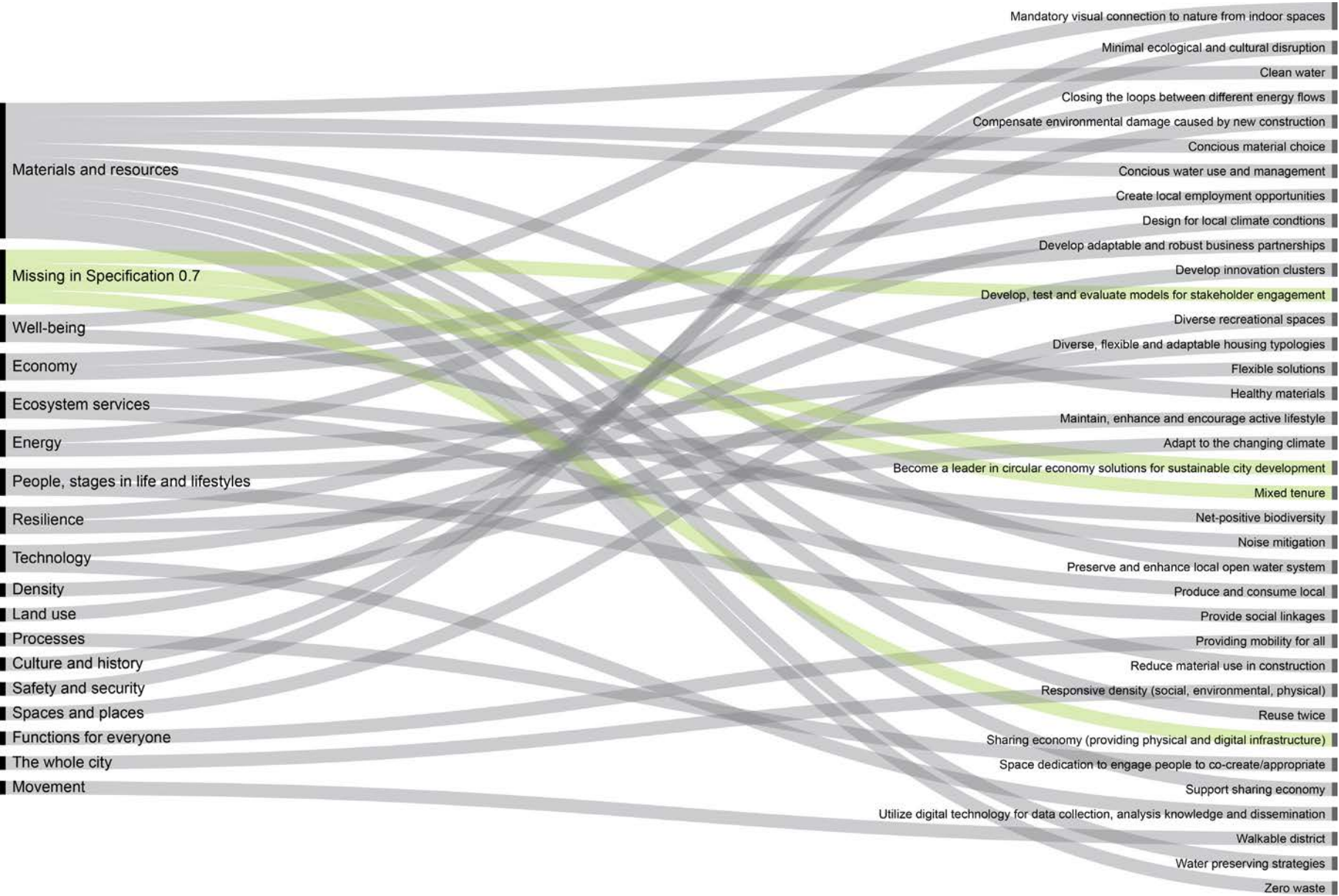


Figure 5 Mapping of our specific goals to the 0.7 specification

Vasakronan specifications		Proposed solutions	
Energy		Energy efficient buildings and infrastructure	Open space design for wind protection from dominant wind directions Design for local sun conditions (shading during summer, solar capture during winter) Passive shading and cooling solutions Local stormwater treatment
		Energy production and storage	
		Optimize energy demand/use	
		Monitor energy use	
		Individual energy production technologies	
		Smart solutions for minimizing individual's energy use	
		Utilise waste energy from waste, water, food, and energy production and use	
Materials and resources		Accessible and exchangeable technical solutions	Provide self-half built apartment Provide housing for all Develop land use both horizontally and vertically responsive to its context Design and provide multi-functional spaces for local residents to design using local resources/materials (e.g. 'Design your square') Develop a neighbourhood social network Encourage neighbourhood committees Provide mechanism for participatory maintenance of spaces Design pedestrian friendly, human scale public realm connecting district to surrounding neighbourhoods, and landmarks Child friendly streets and infrastructure for ageing population Develop a typology of open spaces (neighbourhood squares, stream linear park, Forest park etc.) catering for everyone who lives , works and lives in NORRA KYMLINGE Incentivize cooperatives to partner with niche production Re-using and upgrading existing recreational infrastructure (biking, running, ski track, training, nature trails..) Develop sports events (NORRA KYMLINGE Marathon) Incorporate innovative energy generating technologies with noise barriers Implement visual connection to nature Mandatory visual connection Engage stakeholders: investment partners, municipality, research organisations, business partners etc. Preserve and enhance variation of economic levels
		Adaptable infrastructure	
		Design for future deconstruction and reuse	
		Material reuse during development	
		Use of “second hand” materials and products	
		Materials with low environmental impact from a whole lifecycle perspective	
		Environmentally friendly and healthy materials	
		Use materials with low maintenance need	
		Use BIM for calculation of material need	
		Waste sorting and handling at all levels, including food waste	
Culture and history		Plan for sharing storage rooms	
		Implement water saving solutions	
		Water use monitoring	
		Connect existing open water systems	
		Implement purifying strategies in open storm water system	
Land use		Use healthy building materials	
		Data driven decision making (BIM)	
Ecosystem services		Replant valuable vegetation that is disrupted by the development	
		Add new vegetation for every taken away	
		Planting native species in open spaces	
Green roofs		Urban farming typologies (roof farms, balcony green house) that bring residents together around a healthy lifestyle	

Table 1 Analysis of how our design criteria relate to the 0.7 specification

DEVELOPMENT SCENARIOS

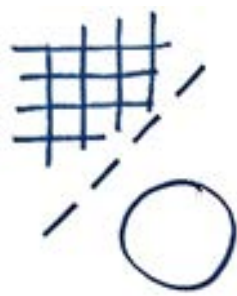
The complexity of the task with multivariable challenges as well as our ambitious goals led us to defining three possible scenarios/approaches for the development. Norra Kymlinge could develop as an isolated city district (Isolate), interconnected with the surroundings (Connect) or as an extension from Kista (Embrace). All three scenarios have their advantages and disadvantages but above all they helped us, in a focused manner analyse consequences of each, and identify the most optimal way forward. In order to be able to compare the effects of each scenario, some of the parameters were fixed, like average housing area per person (30 m²) and average area for services per person (20 m²). In services, we include everything else but housing, such as office space, commercial areas, schools, libraries, green houses, etc. Other parameters that we used for our calculations were: average number of people in apartments 1,9 (Statistics Sweden), percentage of the outdoor area from the total block area – 40% (Spacescape), percentage for the mobility and traffic from the total site built-up area – 25% (Spacescape), percentage of the total area for public space – 15% (Spacescape). These were important to calculate the total site occupancy/development of the area and compare it to the available space.

Several other parameters for comparing the scenarios were used, like:

- Housing/services ratio – which should be optimal for each scenario, towards achieving a liveable sustainable city district.
- Density of the population, which varied between 100 – 180 person/ha between the scenarios (as reference we used other parts in Stockholm, like Södermalm with 156 pers/ha, Kungsholmen 130 pers/ha and Manhattan in New York that changed from over 1000 pers/ha in the 1920s to cca 400 per/ha in 2010).
- Average building height, which varied from 4- 7 floors high (our design goal for human scale results in an optimum average height is not more than 4 storeys high)

The analysis of the defined parameters gave us comparable results for: the number of inhabitants, number of people living and working in the area (relevant for the possibility to open the Norra Kymlinge station) and total occupied space, which varied from 18% - 41% in different scenario. Our guiding principle was to preserve the valuable green and blue structures, but the three scenarios have different spatial interventions, occupying different areas of the site.

Our earlier analysis of the interdependencies of our goals showed that the highest number of interdependencies and multiple benefits has *Plus energy neighbourhood with conscious material* use and reuse twice close behind. Thus, closing the loops was an important aspect to analyse in more depth and see what kind of consequences to the system solutions the three scenarios might have. The comparison between the three scenarios is summarised on the opposite page.



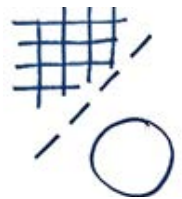
ISOLATE



CONNECT



EMBRACE



ISOLATE

Isolate is a district for itself, a city in a forest, self-sustaining, with an optimal balance of functions, and an identity of its own. Isolate has no or very few cars, where mobility within the area is achieved with walkable and bike friendly streets.

In this scenario, we explore the city as a separate ecosystem and what it takes to make it self-sustaining. We also analyse social, environmental and economic potentials for developing the most sustainable city district for the world, that is not influenced by the conditions in the surrounding city districts. Thus, Isolate has the most potential for testing and implementing solutions that could be used as an example for many other places in the world. A precondition for developing this scenario is that the Norra Kymlinge station opens, which requires minimum 10 000 people to use it daily. Valuable green and blue areas are preserved, which gives limited space for the development. Thus, average building height is higher.

For developing the Isolate scenario, close cooperation is needed with Sundbyberg but also other stakeholders and strategic partners.

Parameters

% HOUSING/SERVICES	70/30	60/40
HOUSING AREA/PERSON	30	30
COMMERCIAL AREA/PERS	20	20
DENSITY (PERSON/HA)	100	
AVERAGE FLOOR HEIGHT	6	7
TOTAL OCCUPIED SPACE %	18	18
NUMBER OF INHABITANTS	5 500	5 500
TOTAL NUMER OF PEOPLE	9 500	11 700

Consequences

CITY IN A FOREST
CLOSED ECOSYSTEM
TEST BED(S) FOR THE WORLD
NO CARS
TALL BUILDINGS
LOW VARIETY OF BUILDING TYPOLOGIES
STATION OPENS
OWN IDENTITY/NEW TO THE AREA
ADDS TO SEGRAGATION



CONNECT

Connect is a city district that interconnects with the surrounding city districts and is influenced by local social and economic conditions. It works as a bridge and a mediator between the ecosystems. Thus, physical connections to the surrounding areas are established and enhanced, by overbridging E4 and E18, towards the north and east, and having better mobility connections to the west and south.

Connect is a place which people gladly visit, where everyone feels like home. It has a human scale, is walkable and easily accessible for people with special needs. The building structure melts into the available space, preserving and enhancing most valuable green and blue structures. As it connects with the surrounding areas, some of the development stretches along the motorways, exposed to traffic noise and pollution. Functionally, Connect has an optimal balance between different functions, supporting a sustainable lifestyle for the local inhabitants.

For developing the Connect scenario, close cooperation is needed with both Sundbyberg and the surrounding municipalities, as well as other stakeholders and strategic partners.

Parameters

% HOUSING/SERVICES	70/30	70/30
HOUSING AREA/PERSON	30	30
COMMERCIAL AREA/PERS	20	20
DENSITY (PERSON/HA)	120	
AVERAGE FLOOR HEIGHT	4	4
TOTAL OCCUPIED SPACE %	41	33
NUMBER OF INHABITANTS	8 250	6 600
TOTAL NUMER OF PEOPLE	14 200	11 400

Consequences

INTEGRATED WITH THE SURROUNDINGS (PHYSICAL/SOCIAL)
TEST BED(S) FOR THE SWEDEN/WORLD
VARIATION OF BUILDING TYPOLOGIES
HIGHER DENSITY
HUMAN SCALE
NOISE & AIR POLLUTION
STATION OPENS
INTEGRATED IDENTITY
REDUCES SEGRAGATION



EMBRACE

Embrace is a city district that is strongly interconnected with Kista in the north. By overbridging E18, the building structure extends from Kista, over the bridge into the Norra Kymlinge area. In return, green structure from Norra Kymlinge offsets into the open spaces in Kista. Embrace supplements Kista with function, like housing and local services. The identity is to a large extent affected by the conditions in Kista, whereas the connection to the other city districts, in the east and south, are limited.

Connect allows for gradual development of Norra Kymlinge. In the first phase the overbridging with first housing structures can be done. A green corridor can be extended from Norra Kymlinge into Kista. In time, as the need for more built-up space grows, the development can continue towards the south, integrating into the green structure towards the Norra Kymlinge station. The station could open in the second or third phase.

For developing the Embrace scenario, close cooperation is needed with both Sundbyberg and Stockholm, as well as property owners in Kista and other stakeholders and strategic partners.

Parameters

% HOUSING/SERVICES	80/20	80/20
HOUSING AREA/PERSON	30	30
COMMERCIAL AREA/PERS	20	20
DENSITY (PERSON/HA)	180	
AVERAGE FLOOR HEIGHT	4	5
TOTAL OCCUPIED SPACE %	33	34
NUMBER OF INHABITANTS	7 700	8 800
TOTAL NUMER OF PEOPLE	11 000	14 100

Consequences

INTEGRATED WITH THE NORTH (PHYSICAL/SOCIAL)
ADOPTED STRUCTURE
TEST BED(S) FOR THE STOCKHOLM/SWEDEN/WORLD
ENVIRONMENTAL OFFSETTING
HIGHER DENSITY
HUMAN SCALE
NOISE & AIR POLLUTION
POTENTIAL FUTURE DEVELOPMENT
STATION DOESN'T OPEN IN STAGE 1
JOINT IDENTITY

DEVELOPMENT SCENARIOS

USE WISE AND REUSE TWICE

Any new development must relate to its surroundings. When most developments increase the strain on existing infrastructure, technical and social, our fundamental goal for Norra Kymlinge is that the new city district shall not put excessive strain on the existing infrastructure in the city. We achieve this by being self-sufficient and/or by ensuring all flows out of the area being purely high quality resource for the next step in the circular economy. To help push for this, one of our goals is , “use wise and reuse twice”, or more.

All districts have different qualities and can supplement each other to achieve sustainability and resilience. This demands some integration and cooperation. In our three development scenarios, we have explored different degrees of integration with the surrounding infrastructure. Some solutions are however the same in all scenarios, listed in the Table 2 below.

	- distributed local mini reuse stations in Norra Kymlinge - larger reuse station for larger items as building materials, interior fittings, kitchens etc - when no more reuse or local recycling is achievable within the district, solid waste is handled by external supplier (ex. municipality) for further recycling and finally energy recovery
	- local storm water treatment minimizing strain on external infrastructure (infiltrate, retain and delay before entering open floodway) and creating local attractive biotopes - equipment with low water use and strong efforts to motivate water efficiency (drinking water quality reserved for cooking and drinking) - smart supply, storage and discharge of water and waste water - heat recovery from grey water - extensive local grey water and rain water treatment and reuse - black water separation, preparing for quality feed-stock for energy and nutrient recovery
	- emission free construction sites - energy efficient buildings, all “smart ready” - energy flexibility through low temperature heating and high temperature cooling grid between all buildings enabling heat recovery - capture solar energy (power production included in noise barriers along major roads, roofs and facades, thermal solar collectors) - energy and nutrient recovery from waste - local electricity and heat production over the year is larger than local consumption - heat recovery and heat production from grey water, ground heat, air, compressors - energy storage, thermal and electricity, for peak shaving

Table 2 Waste, water and energy solutions that are the same for all the scenarios

The scenarios however differ in many aspects.

In the *Isolate* development scenario, our pursuit of autonomy is the greatest and we strive to close the loops tighter within the district. Compared to the *Connect* and *Embrace* scenarios, Isolate demands more local electricity production and energy storage, more comprehensive and costly energy and nutrient recovery from waste streams and more local food production. In Isolate we do not connect to the citywide district heating and cooling network but make the district self-sufficient with these energy qualities. Total disconnection from water, wastewater and electricity system is however not a plausible option since the cost of ensuring sufficient security of supply will be too high. Further, self-sufficiency of food and consumer goods is not regarded as sustainable in a small district scale.

The *Isolate* local energy system includes more long-term energy storage, as seasonal storage, to reduce the interaction with the energy system outside. In the *Connect* and *Embrace* scenarios the energy storage is more short- and medium-term, not only to alleviate any strain on the external system but also controlled to perform services to the system. In Isolate, we picture a locally controlled smart electricity distribution grid optimizing the local production, storage and demand. In *Connect* and *Embrace*, the smart grid operation utilizes the local production, storage and demand not only to ensure high degree of self-sufficiency but equally aiding the energy system outside the area.

District heating and cooling connected to citywide system is the chosen option in the *Connect* and *Embrace* scenarios. Both district heating and cooling is available in close proximity to the Norra Kymlinge site, and the energy mix in these systems are to a very high degree renewable. Design criteria for local heating and cooling systems will ensure low temperature heat distribution and high temperature cooling distribution. Norra Kymlinge will with new heating and cooling design criteria and system design enable enhanced system performance outside the district. The result is better utilization of existing bioenergy plants in the larger system, extracting more energy from flue gases, energy that otherwise is lost. The connection also enables heat delivery from Norra Kymlinge to the city. Locally produced and recovered heat is utilized, either locally, stored locally or distributed to the city through the utility. In Isolate, we picture local heating and cooling grids, not connected to the citywide grid. Locally produced and recovered heat is stored and utilized locally, only. Local cooling production is also supplemented by local storage. Smart grid features apply to thermal energy production, storage and demand as it does for electricity.

Energy, water, food and any goods and objects have some value after use. These streams will in Norra Kymlinge be refined into valuable resources and further utilization. Food waste, black water, agricultural waste from local food production and even manure from local animal farms are valuable resources for energy production and recovery of nutrients. We picture a local process plant located in a “technical area” close to the highway, E4. This will treat all locally produced organic waste and produce energy, electricity and heat, as well as fertilizer for local farming. It will even produce CO2 that, fed into local greenhouses, enhances plant growth. Carbon Capture and Utilization will then be part of the “Norra Kymlinge”-solution. The process plant might even include treatment of surface water from the highway adding a service to the city. This extensive local processing is

possible in different scales and with different degree of availability. In *Isolate* we would focus on only treating locally produced waste but with a very high availability and minimum discharge to the municipal systems. In the *Connect* and *Embrace* scenarios local recovery of nutrients and even energy are achievable by less expensive means, either by allowing more processing to be done outside the area or by utilizing economy of scale and treating waste originating from outside the area aswell. Norra Kymlinge shall only discharge high quality waste, as separated black water, that is a good resource for the municipality’s process plant, effectively producing heat and power, and biofuel for transport. The latter having the largest effect on climate gas emissions.

Norra Kymlinge has good qualities, and can have even more qualities after the district development. The subway station, nature experiences, biodiversity and locally produced food add value. There are however limits to area that can be occupied by food or energy production before it conflicts with bio diversity and other ecosystem services. The area is not the very best suited for farming or large-scale energy production however integrating food and energy production adds value more than on one scale. Further local surface or ground water will not be sufficient to serve the expected number of inhabitants. To achieve a sustainable city district, sustainable lifestyle must come naturally without making the inhabitants feel they are sacrificing anything at all. What very few are willing to sacrifice is reliability in services like energy supply, water supply and waste and wastewater handling. To secure reliable supply of services a back-up system must step in in case of failure of primary solution. A one hundred percent energy autonomy is not regarded an option because of the cost.

High degree of autonomy on district level comes with costs. Reduced connectivity and collaboration with existing systems can have negative effects on the citywide systems, e.g. undermining potential economies of scale, having flow profiles unfavorable to existing flow patterns and reduced focus on the quality of exported streams.

Our sustainable city district integrates into the city so that any streams in and out of the district lifts the efficiency of the citywide systems.

So how do we effectively close the loops in Norra Kymlinge?

In Norra Kymlinge all design enables low consumption. The loops are closed by extensive local solutions but also by connecting to existing infrastructure that contributes to closing the loops, like renewable energy distribution, waste handling and processing that effectively produces energy and recovers nutrients and reintroduces them to the loop. Energy is produced and stored locally and all waste streams are treated locally, but to the extent that gives the best resource efficiency on the city scale. In Norra Kymlinge the ecological values are preserved in combination with area demanding urban farming and solar energy production. The energy system, waste system, food production and nutrients cycles are all integrated in Norra Kymlinge, using robust and highly automated technology all adding to a sustainable and resilient city district. Resource efficiency and quality in all exported flows by refining, smartness and system services enables a district that gives more than it takes from the city around it.

In Norra Kymlinge the citizens are not feeling they are sacrificing because of “the closed loops” system and solutions. Contributing to closing the loops is the best available option and it is perceived rewarding, e.g. by finding inexpensive resources locally that meet their demand or participating in urban farming.

Connecting saves on investments and enables effective use of resources in more cost efficient larger plants. We propose investing in solutions that treat and store so that anything that leaves the area is of high quality for further processing before the loop is closed, delivering resources rather than waste.

All solutions are flexible and exchangeable with a high level of built-in “smartness”. In time this opens up for introducing new and even more efficient solutions, when made available, big data utilization and thereby high level of effective system integration. This makes the district sustainable and resilient over time. Norra Kymlinge will then “fit into the doughnut”, not only the first years but forever.

Even though the autonomous solutions make interesting examples, we find that optimized local systems integrated with sustainable citywide systems are most relevant for the world.

By closing the loops, we contribute to Norra Kymlinge fitting into the doughnut, not exceeding the planetary boundaries and achieving social foundation. Our solution enhances security of supply of food, energy and waste handling. Closing the loops further require local labor, and local employment benefits social networks, income and work. Strong local participation in the testbeds and pilots lifts education locally, while dissemination of the results lifts knowledge on solutions and processes to the world.

Norra Kymlinge will produce more energy than it uses, recover and reintroduce phosphorus and nitrogen into the cycle, ensuring using only renewable energy by smart systems and local energy production, only importing renewable energy. Materials for construction are chosen to have low climate impact both in construction and as waste in end of life.

A summary of the analysis of the differences between scenarios for the identified aspects is presented in Table 3.

Figures to the right illustrate flows crossing the district border. A few comments:

Norra Kymlinge is a plus energy neighbourhood, which means that local energy production exceeds local consumption in all scenarios. Due to the integration and storage set-up, we anticipate more import and export of energy in Connect and Embrace than in Isolate. The exported energy in Connect and Embrace coincide better with external demand and thus have higher value.

Local food production is larger in Isolate. This reduces the demand for imported food but also reduces the export of fertilizers.

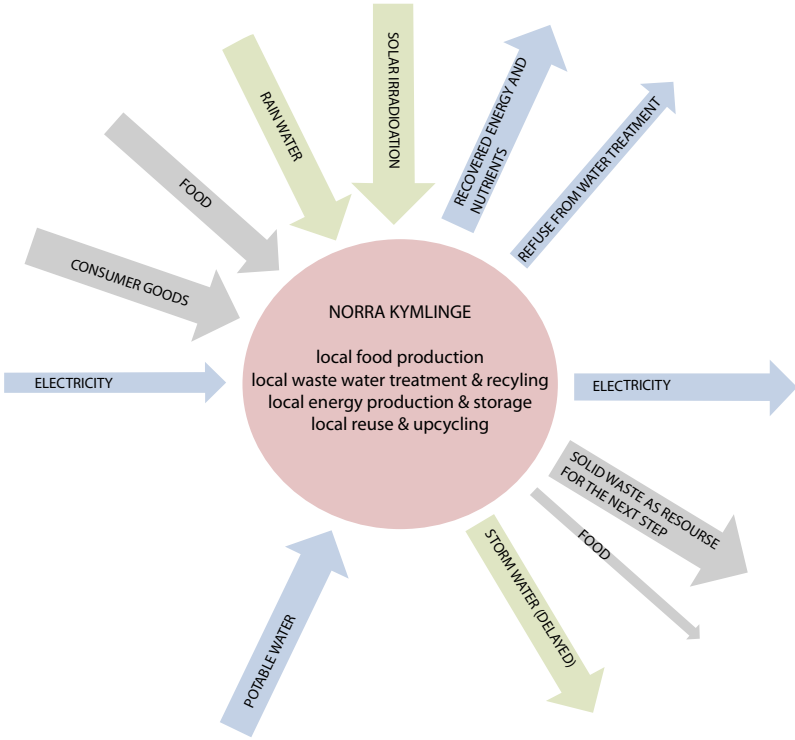


Figure 6 Waste, water and energy flows crossing the district border in the Isolate scenario

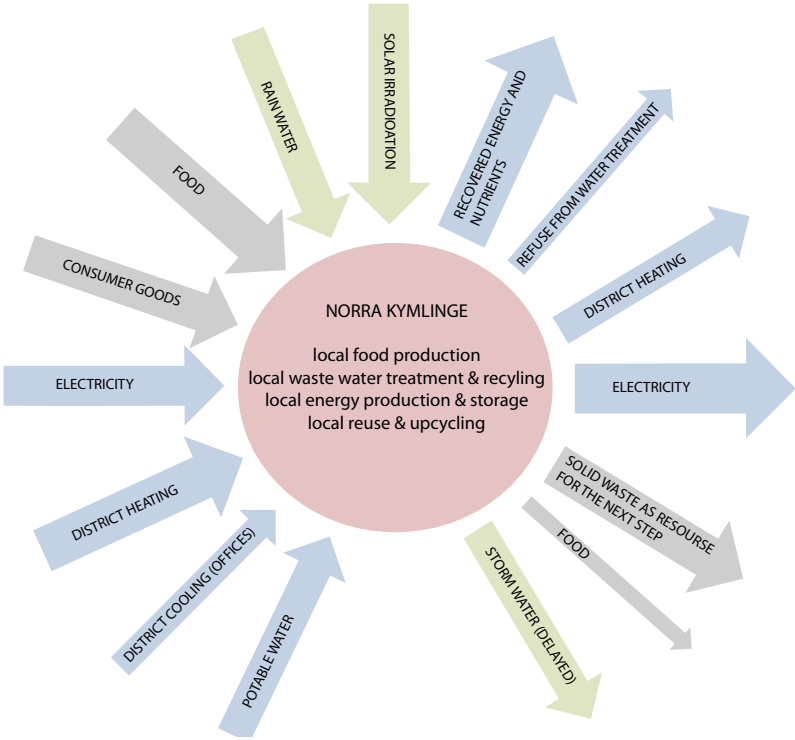


Figure 7 Waste, water and energy flows crossing the district border in the Connect and Embrace scenario

Isolate	Aspect	Connect & embrace
Connected but local ownership of smart grid (new business model required)	Electricity grid	Connected prosumers in smart grid
Internal smart system	District heating and cooling	Connected to city wide systems enables export of surplus heat New design criteria make the larger systems more efficient
Optimising local performance	Energy storage and demand side management	Mitigating challenges locally and in the region
Solar PV and heat Bioenergy power and heat	Local energy production	Solar PV and heat Reuse and upcycle with heat pumps
Reuse and upcycle with heat pumps Energy recovery locally with heat and power production	Energy in food waste, agricultural waste and black water	Energy recovery locally for heat and power. Any discharge is high quality for central production of biofuel. Scale flexible to accommodate challenges outside the district. Large emission reductions in transport
Closed loop in Norra Kymlinge Large and controversial process plant High Capex and Opex	Nutrients in food waste and black water	Closing the loop and connected to closed loop in the city Local production of high quality resource

Table 3 Summary of differences between scenarios for the identified aspects

THE PREFERRED SCENARIO

CONNECT BY EMBRACING

After the analysis of the three scenarios and the systems solutions we have concluded that the most appropriate scenario for the development of Norra Kymlinge is Connect by embracing. It utilizes the qualities of both the Connect and the Embrace scenarios. It solves the main physical challenges in the area (noise pollution, the road as barriers, missing green corridors and mobility) and develops further the resources within Norra Kymlinge (the green area, the station and the system of walking and biking/skiing paths). At the same time this solution will solve some of the challenges occurring in the surrounding areas, Silverdal and Kista. Following is a summary of important development parameters.

THE GREEN AND BLUE CONNECTION

With Norra Kymlinge we intend to connect Kista, Silverdal and Urliksdal with each other. With Kista the connection is with strong and broad green corridors over and under E18 where both humans, vegetation and animals can move through an (nearly) unbroken greenery:

- The two existing connections under the road west of Norra Kymlinge consists mainly of lawn / cut grass. We facilitate these to be more biodiverse and stronger, with emerged trees, bushes and natural grass, without ruining the sightline for the traffic. Trees that need to be cut down during the development of Norra Kymlinge are “replaced or outsourced/offset” outside Norra Kymlinge, mainly in Kista.
- The new northward green viaduct substitutes the pedestrian tunnel to make a better and safer connection that invites Kista to Norra Kymlinge and Silverdal, and the other way around. This is the most important mobility route for the people in and between the areas. Furthermore, it gives a better quality to Kista where there is a lack of green space.
- The new eastward green viaduct invites Silverdal to Norra Kymlinge and Kista, and at the same time, opens the pollination barrier above the main road.

By this intervention, all the green areas relate and support each other.

We connect existing wetlands in the east area with Igelbäcken by a new integrated open rain and storm water solution, which slings through the landscape southwards. This improves and enhances water biotopes, and collects and connects all the storm water in the eastern part of the area. In the western part rain and stone water will be collected and infiltrated in the ground.

LANDSCAPE AND BIODIVERSITY

We preserve the landscape with the most valuable natural vegetation, while creating new biological values through the processing of an existing forest landscape, and at the same time removing several biological values that exist today. Additionally, we construct new biotopes through our targeted interventions, for instance; we create farmland, oak forest and pastures. Furthermore, delay ponds, aquatic plants, urban farming and food production plants, woodland baits and animal farming in nature also change the existing biotopes in the landscape. All together we generate added value to the area.

FOOD AND ENERGY PRODUCTION

Noise pollution from the motorways must be kept outside the area. It disturbs the fauna, and reduces the quality of the green area. Our solution to this challenge is to develop an energy producing embankment with an integrated urban farm and greenhouse. This would be a prototype for other noise polluted areas in the world. The noise embankment will be built alongside the motorway as an “energy bank” where the energy is both produced and stored with solar panels and solar thermal collectors. The embankment is at the same time a wall for buildings with functions that are not noise sensitive, like:

- Green houses, for instance “Urban feed” that can produce vegetables, fruit and fish
- Bee hives
- Micro farms for cheese and yoghurt.
- Barns and pastures for livestock.
- Sheep are a preferred and robust livestock. They withstand noise and are not that sensitive. They can produce milk for yoghurt and cheese, wool, meat and manures. Muscovy ducks are another preferred species. Both sheep and ducks are well adapted to careful grazing cultural landscape, and can easily be moved. At the same time, they contribute to human well-being. They can also keep the grass low under solar panels.
- Storm water treatment (from the roads)
- Energy and nutrients recovery process plant using e.g. black water, food waste and agricultural waste as feedstock.
- Composting
- Reuse central for large goods as building parts
- Education and demonstration facilities focusing on sustainable small scale food production
- Car-pool parking with integrated solar panels, energy storage and charging stations for electric vehicles

Carefully selected vegetation along the roads function as biofilm and mitigate pollution effects on the area. In addition to the large greenhouses, an agricultural area for open field cultivation area is developed by the new stream, collecting storm water. This is also a perfect spot for the ducks. We also use dome greenhouses for local herb production in the residential area, and prepare for parlour gardens by the little farm in the west of the area. This will also be developed for cultural purposes.

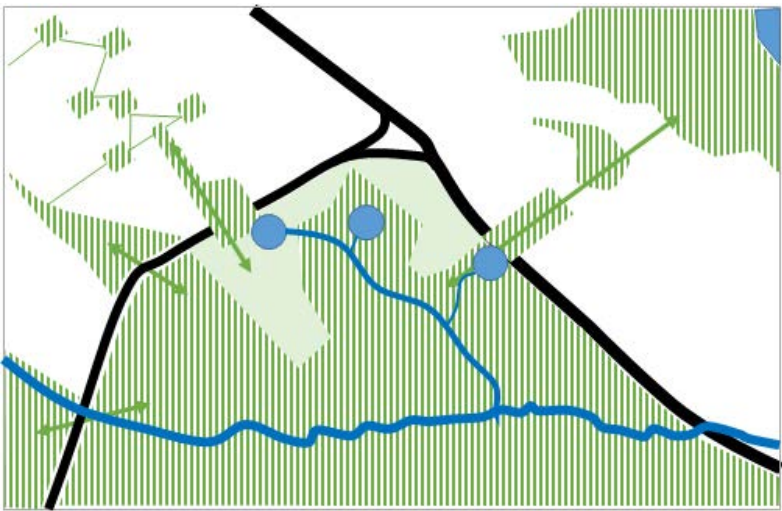


Figure 8 Green and blue structure. Preservation and establishing green corridors to Kista and Silverdal as well as connection of existing wetlands with a new integrated open storm water treatment system

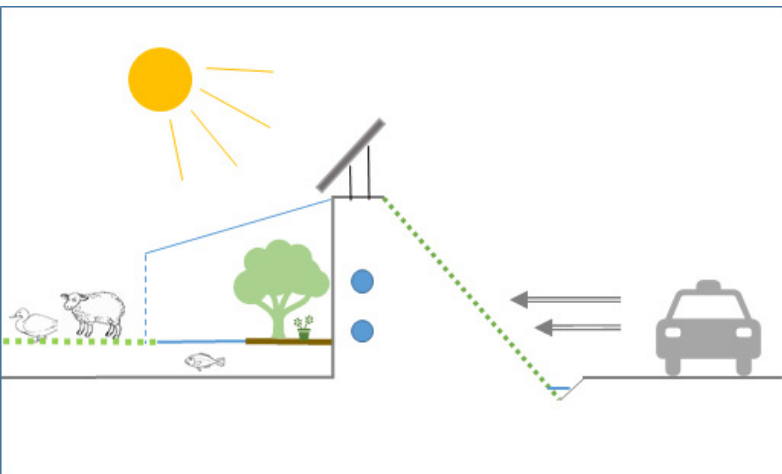


Figure 9 Urban feed, energy and noise. Three in one - noise embankment with solar energy capture and storage and storm water treatment; integrated green houses with micro farms with sheep, fish and ducks.



Figure 10 The urban connection with Kista and Silverdal

MOBILITY AND CITY DISTRIBUTION

Norra Kymlinge station and a coordinated smart mobility system with well-developed routes for walking, biking, and a local self-driving electrical transportation system creates a great opportunity to have a city district without privately owned cars. We connect Kymlinge station with Kista, Silverdal, and Sundbyberg by establishing good walking and biking routes. To give the experience of shorter distances, the paths are curved and connect to nature. Along the pedestrian and bike routes there is high variation of building types and heights, activities at the bottom floors, as well as dense, high, low or open woods and gardens.

In Norra Kymlinge mobility is a service, a coordinated solution for seamless mobility, access and payment. Your mobile phone is a platform to find the most efficient mode of transport at any required moment of time. The streetscape is developed to accommodate new kinds of mobility and logistics solutions. Smarter mobility and city logistics solutions open the possibility for people to live without a privately-owned car. It gives residents the opportunity to move efficiently and freely with a lower environmental impact, which also has a positive socioeconomic impact, eliminating all the expenses associated with private car ownership. Also, smart mobility solutions give more groups of people the possibility to live in Norra Kymlinge.

The biggest advantages are quieter, cleaner and safer street environments when vehicles are becoming fewer and smaller. It also opens the possibility of building denser building structure, which with shared space solutions provides better accessibility for all. Bikers, autonomous busses, taxis and also distributors of goods can take a quick stop close to the target destination. Autonomous busses are also good in another aspect, they don't need a turnaround in a cul-de-sac when they can drive safely in both directions.

The costs for smarter solutions have a quick pay-back time in a denser city with higher exploitation. The value increases in the long term as well as when the street environments become safer and give greater opportunities for shops and restaurants to operate. Delivery and waste handling solutions is handled in a consolidation center for goods and service, located in the outskirts of the site (Figure 11).

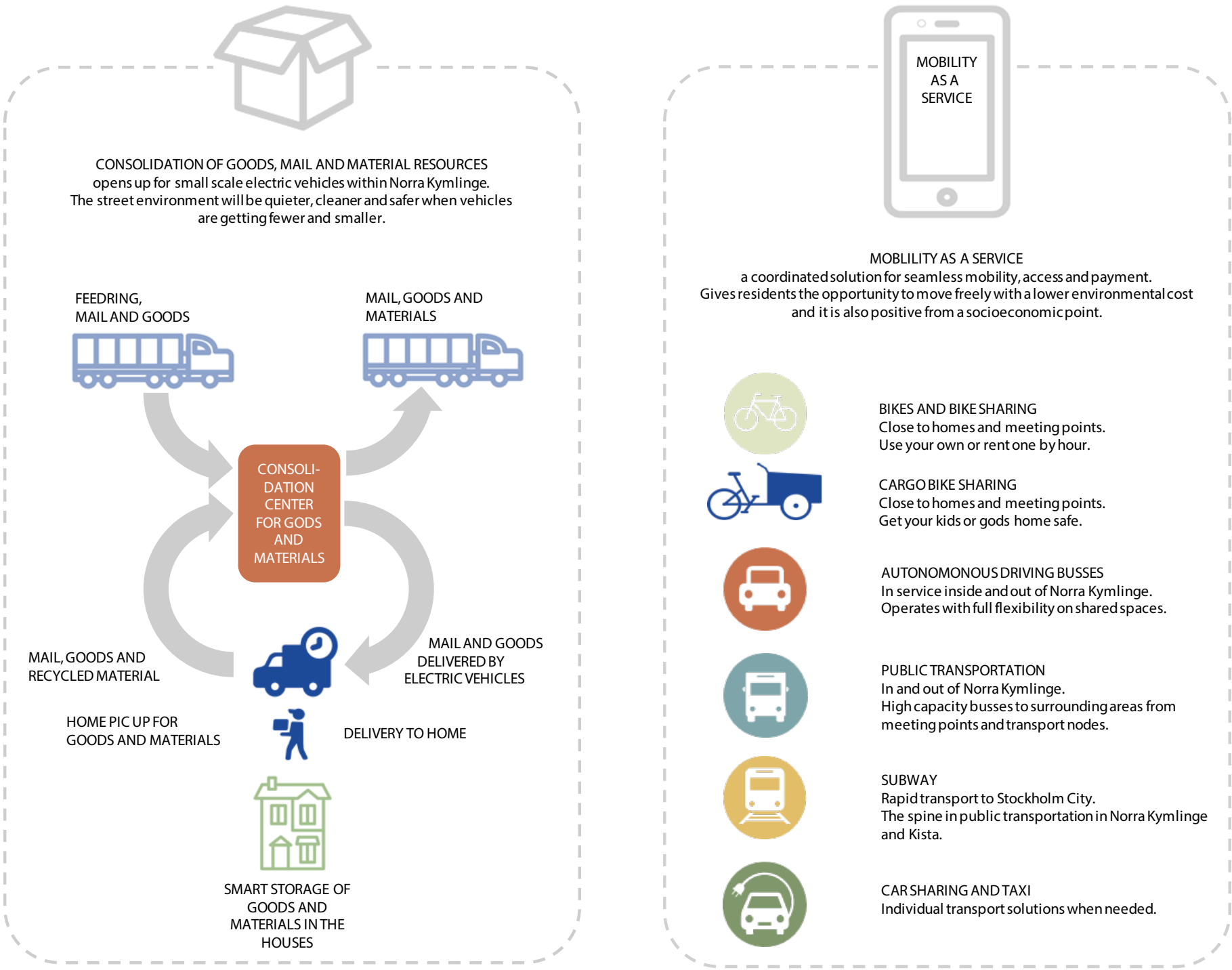


Figure 11 Smart mobility system solution

THE PREFERRED SCENARIO – CONNECT BY EMBRACING

INFRASTRUCTURE FOR SHARING ECONOMY

The concept of Sharing Cities is emerging exponentially, driven both by market and business model innovation and development but also by public awareness and policy change. It has been recognised that sharing economy can benefit the economic, environmental, social, and democratic dimensions of an urban community. In order for sharing economy to function and develop, the most important is to create a supportive infrastructure, such as ICT platforms with digital technologies that can make sharing easier and that allow for efficiency, scalability and transparency of the sharing systems. Sharing economy models also result in changing physical infrastructure of cities. For example, in transportation and mobility, car and bike sharing platforms require parking places and charging mechanisms, often placed in attractive places to motivate sharing instead of private ownership. Tool and item sharing on a neighbourhood level require bigger common storage space, at the expense of private storage. Other examples, like solar sharing networks require preparing infrastructure for installation and monitoring on various buildings and infrastructures. Space sharing (home or office) require architectural planning in early project stages. In parallel, collaborative business models and services are needed from both private and public actors. For example, all common electricity could be charged with pay-per-lux principle. Finally, for all of this to work, an important factor is social inclusion, acceptance, collaboration and engagement, as well as policy development and governmental support.

We think that our society is mature for taking up sharing economy to a city district level. Norra Kymlinge could be a pilot area for sharing economy on all levels. It should develop to support different sharing models, like peer-to-peer, business-to-consumer, business-to-business, and consumer-to-business. All from materials, products, spaces, services, well-being, as well as capability could be shared. The city district should also be flexible for future developments and occurrence of new models.

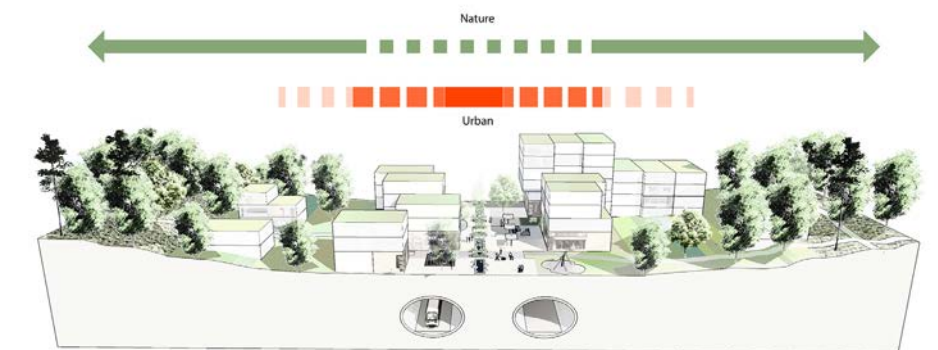
THE URBAN CONNECTION

The settlement structure in the urban area, with a variety of functions and activities, buildings with active frontages, makes a good, open and safe neighbourhood with a place for everyone. The urban structure connects the blue and green areas. It generates added value and quality for both blue and green structure, for instance, with temperature regulation, reducing smog, cleaning the air and increasing the uptake of particles and nutrients.

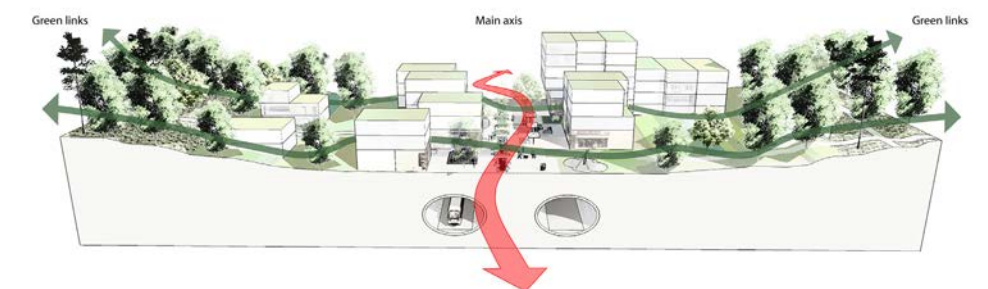
In Norra Kymlinge it is important to create and keep a variation of housing typologies and structures. A truly sustainable city district is available for everyone. This means that both multifamily housing, row houses, individual housing, student housing, and housing for the elderly should be present. A variation of private, rental, and affordable housing as well as short term rentals should be developed and kept over a long period of time. Affordable housing is a new form being tested in Gothenburg and is needed even in Norra Kumlinge to secure the socio-economic balance in the area. Other sorts of affordable housing, like self-built apartment buildings could also be tested and evaluated.

An optimal blend of functions makes life easier in Norra Kymlinge; schools, cultural buildings, offices, local markets, up-cycling and repair centres, a variety of recreational opportunities and meeting places. (Figure 16) The roofs are used both as a green area to strengthen green corridors, and as a social space, as well as for local energy production.

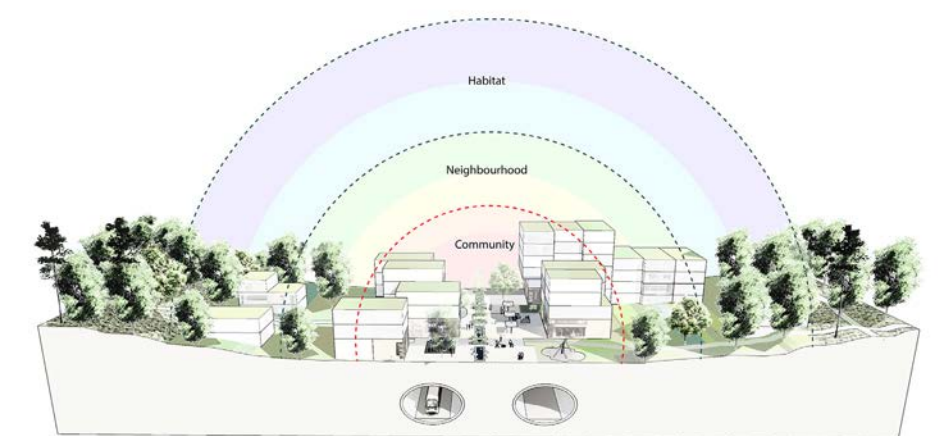
In Norra Kymlinge one can camp in a hut on a tree or a left-over sewage pipe transferred to a concrete tent. One can also go tree top hiking throughout the area, where trees that were cut down due to the development are used for connecting and building the hiking route. Sometimes the rout ends on a roof top, just to continue to the next tree.



Figur 12 Green and urban space



Figur 13 Green and urban corridors



Figur 14 Scale community, neighbourhood and habitat

CENTRE FOR CIRCULAR ECONOMY

In Norra Kymlinge we have a “use wise and reuse twice” goal which means that all materials that are used for developing the area are carefully assessed and chosen with the aim to reuse them again sometime in the future. This means that all materials and products are free from hazardous and harmful substances, processed and produced with minimal environmental impact and designed for reuse. Buildings are local infrastructure are designed for deconstruction. Trees that are cut down for the development are used for benches, and tree top hiking structure.

Norra Kymlinge station is Sweden’s first upcycling center. Here people can come and fix their items or buy an upcycled product, locally produced by people living in Norrqa Kymlinge or the surrounding areas. In the Business case we describe how Norra Kymlinge can become a pilot for downstream CSR for large retail companies. Sustainability work of many retail companies focuses on upstream CSR, but in recent years, some have also started focusing on downstream environmental responsibility, having take-back and remake projects, as well as recycling initiatives. Norra Kymlinge has an opportunity to further develop the downstream process, contributing to both lower environmental impact and local CSR. By hiring local inhabitants, that have troubles integrating in the society, but have competences in repairing things and handcrafting one contributes both to keeping the materials in the cycle and creating long-term socio-economic stability for the local community. More about this is available in the following chapters..

NUMBERS

% HOUSING/SERVICES	70/30
HOUSING AREA/PERSON	30
COMMERCIAL AREA/PERS	20
DENSITY (PERSON/HA)	150
AVERAGE FLOOR HEIGHT	4
TOTAL OCCUPIED SPACE %	67
NUMBER OF INHABITANTS	8 170
TOTAL NUMBER OF HOUSING UNITS	4 300
TOTAL NUMER OF PEOPLE LIVING AND WORKING IN THE CARING CITY	14 100

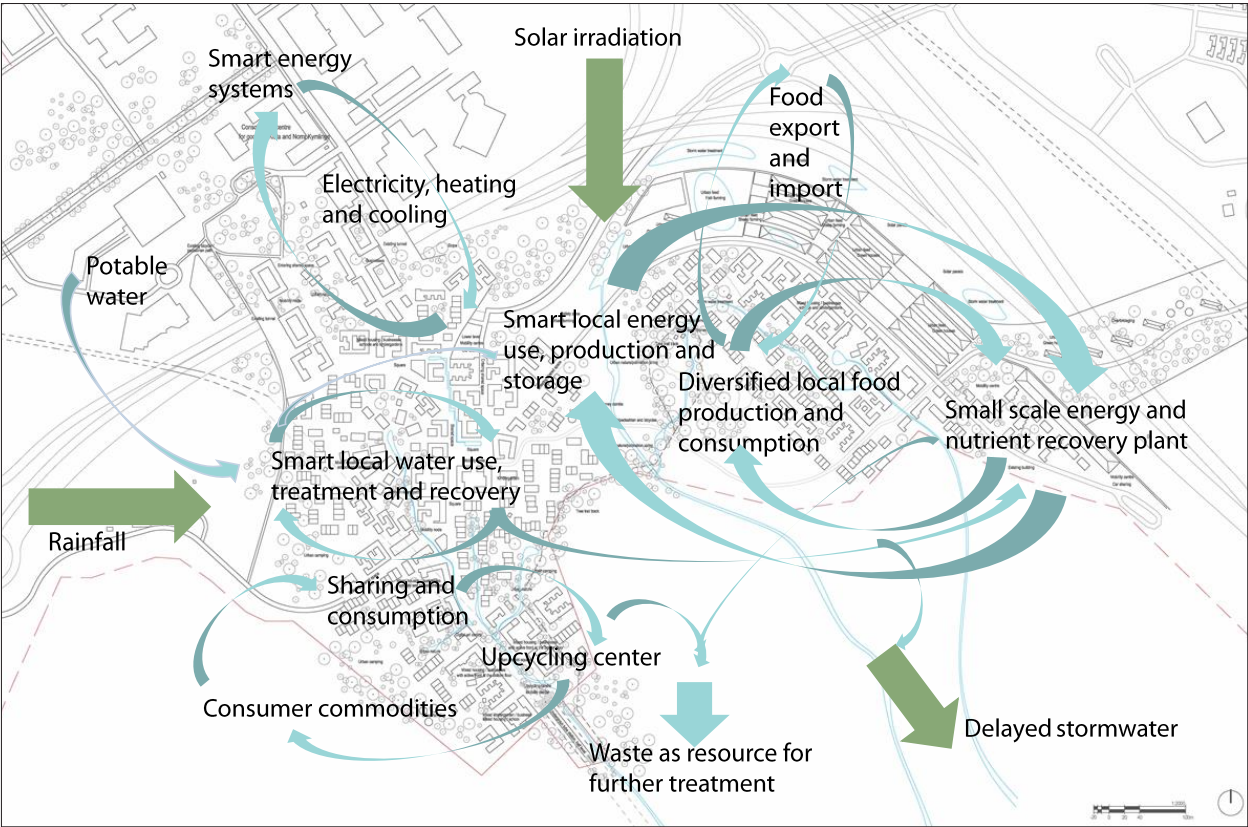


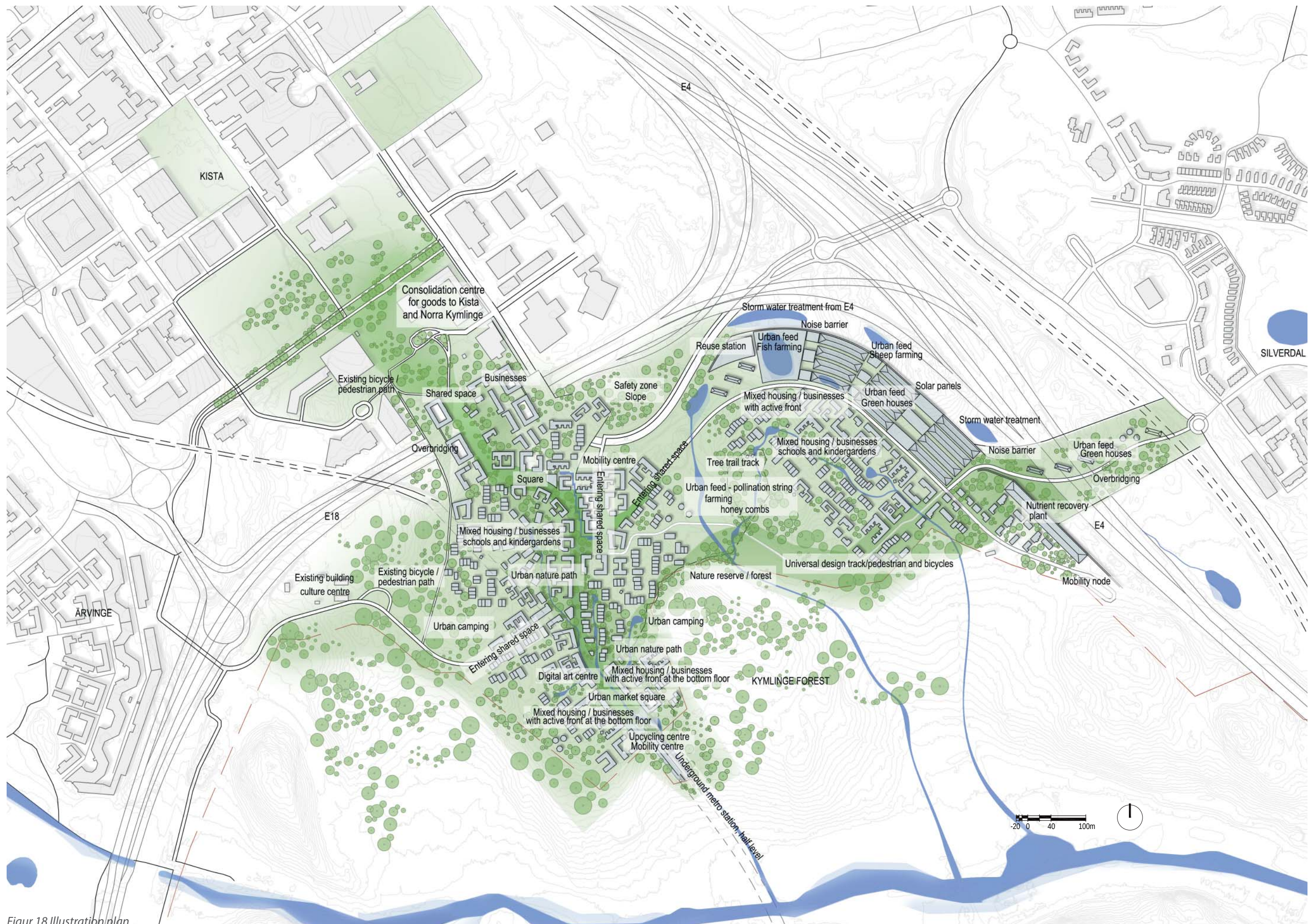
Figure 15 Norra Kymlinge flow map, “use wise, reuse twice” model



Figure 16 Zoning plan



Figur 17 The Caring City



Figur 18 Illustration plan

SECURING NORRA KYMLINGE

AS THE BEST CITY DISTRICT FOR THE WORLD

NORRA KYMLINGE IN A GLOBAL MOVEMENT

Norra Kymlinge is part of a global movement that wants to contribute to strong sustainable cities. It has a great opportunity to be an important piece of the global puzzle, as it has high ambitions to be a test bed for, and to contribute with knowledge about, strong sustainable cities. However, it requires more of Norra Kymlinge than other city districts, when Norra Kymlinge says that it will be best city district for the world. Norra Kymlinge must therefore ensure that all the pieces of the puzzle that are needed for strong sustainable city district are included in the global movement.

Contributing to sustainable development by being a test bed instead of contributing with ready developed solutions is a trend in the work with innovative developments, at this moment. There is a lack of test beds and living labs in urban environments, which gives Norra Kymlinge a unique opportunity. This requires a long-term, dedicated organization. Being a test bed in an urban environment requires a working method and a multicompetent organization, both in the development and construction phases, when the test bed is built up, but even more when the test bed is in operation and contributes with knowledge to the whole world.

We are aware that no city district can be a test bed or prototyping area for all global challenges. It is important for Norra Kymlinge to participate in the global and national dialogue about sustainable urban development and initiate strategic partnerships with other actors who are sharing the same vision and goal. Visualizing the target image in a simple and recognizable manner such as "The Donut" or the UN Sustainable Development Goals is very useful, but models and goals must be sharpened, concretized, prioritized to be feasible. However, this does not mean that any parameter or aspect may be ignored, we must put the whole puzzle together if we really want to create strong sustainable cities.

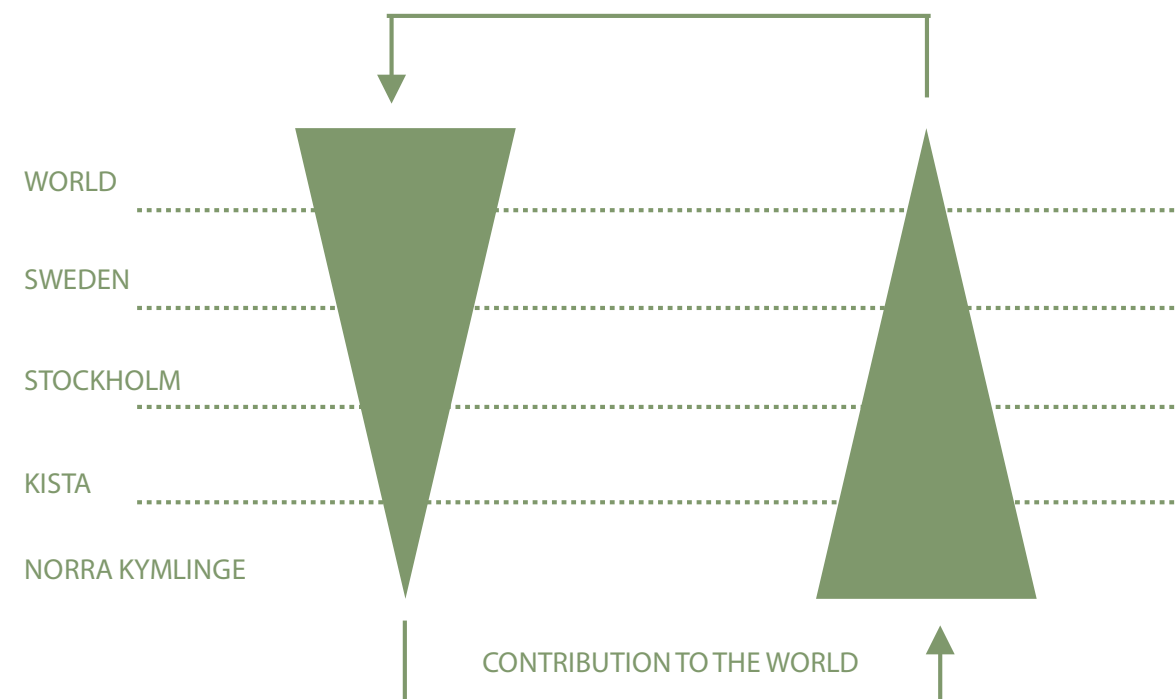
From our experience, if you set up ambitious goals in a roadmap for innovation, communicate them, and if you are transparent about both challenges, processes and results, you will attract partners that share the same values and have the same ambitions as you do. Together, you can become stronger, more competitive and you can accomplish a big change!

THINK GLOBALLY, ACT LOCALLY – CONTRIBUTE TO GLOBAL LEARNING

The challenges facing North Kymlinge are often global, even though the solutions are local. In many areas, we move from the global scale into the local and vice versa. The examples of global challenges that have local solutions are several, the climate challenge is of course one of them. Even social challenges are global but effects are felt in a local context. Segregation is a problem in all major cities but the solutions to break this negative pattern are local, regional and national. Norra Kymlinge is located in between major socioeconomic differences and if this challenge is not dealt with, we will contribute to more segregation instead of contributing to the solution. The same applies to global issues such as health, lack of physical activities and disturbing and stressing noise. They are examples of global issues but they do have many local solutions.

Norra Kymlinge needs to move through different prototyping scales, and identify those that are relevant from the global challenges to solutions in the local context. Then when we reverse the process we contribute to the solutions moving up the scale, from specific solutions in the local context to general ones that contribute to global knowledge about sustainable city development. (f.19)

The whole process must be transparent so everyone can see which choices have been made, which limitations and opportunities have been identified, what results have been achieved and what can be learned. If the process is transparent and understandable Norra Kymlinge can contribute both to its own development and be an example for the development of other city districts.



Figur 19 Prototyping scale

ORGANISATION FOR INNOVATION

The high complexity and ambitious goals for developing Norra Kymlinge requires a well-defined process for driving the development and making sure that the goals are met and ambitions fulfilled.

The process in Norra Kymlinge needs to be organized to run on several levels. It is important that North Kymlinge uses the knowledge that already exists and involves stakeholders at all levels from local citizens to global actors. The local process that Norra Kymlinge must have of great importance, since it is at the local level most of the prototyping will take place.

Prototypes and test beds also need help, involving stakeholders and organizations with deep knowledge and experience, as innovation partners. It is important to broaden the knowledge platform and to get access to tools and methods, but also to ensure implementation in the process. Everyone needs to take joint responsibility for Norra Kymlinge’s success.

Strongly linked to the local level is the national level, many policies and regulations affecting the local level are designed nationally. Linking Norra Kymlinge to national research institutes such as RISE and IVL is important for both access to knowledge, but also for dissemination of results. Norra Kymlinge should also be linked to national authorities and initiatives such as sustainable urban platforms, run by, for example, The National Board of Housing and the Swedish Energy Agency. Connecting to other ongoing development project is also important for knowledge exchange and development. And finally, if Norra Kymlinge wants to become the best city district for the world, it needs to be linked to the global movement in progress. Many national platforms are linked to international initiatives.

Norra Kymlinge must drive innovative processes in all these levels and co-create with different partners and stakeholders. But co-creation is not enough, all partners and stakeholders must feel a joint responsibility to create a sustainable city for a sustainable world.

TESTBED VS ARENA FOR PILOT PROJECTS?

What do we mean by prototyping in Norra Kymlinge? Should we prototype in a long-term testbed or should we create an area filled with pilot projects by using prototypes in various stages of the development process? This choice affects the kind of organization and process for developing Norra Kymlinge.

a) A testbed needs an infrastructure for test and evaluation. The content in the testbed changes over time depending on tests, evaluations, results and analyses. The infrastructure makes the testbed flexible. It can be an open testbed where different organizations deliver solutions and evaluate technique or services. A testbed can also be a living lab, if stakeholders and citizens are involved. A testbed is a long-term commitment that the development must commit to in order to organize and allocate resources.

b) In an arena for pilot projects several projects produce and build-up knowledge and solutions successively, step by step. An evaluation of results take place after every step. Every step brings knowledge to the developing process but the product itself does not change afterwards like in a testbed. However, changes will take place in the next step in the developing process and each pilot can and will be a step along the path leading to strong sustainable cities.

In our opinion if Norra Kymlinge really wants to be the best city district for the world it needs to be both a testbed with living labs and an arena for pilot projects.

ORGANISATION FOR LEARNING

If Norra Kymlinge wants to be a city district which is best for the world it need to have an organisation that is strongly dedicated to the goals, a master in follow-up and analysis, that is agile, and is well connected to other ongoing global initiatives. Being best for the world also means that one drives open innovation, where global actors can participate. But the most importantly, Norra Kymlinge must rig an organization that works with business to business communication to disseminate results for global learning.

In the innovation cycle it is very easy to focus on the first steps, generating ideas and conducting tests. Project oriented organizations often fail in neglecting to evaluate, document and disseminate results, which is the most important focus area if Norra Kymlinge wants to become a city district that is best for the world. It is important to organize the work so that all parts of the innovation cycles are well represented with different skills, partners and organizations. It is rare that the same person is good at being creative while being equally good at documenting, reflecting, analysing and spreading experiences in a structured form. Every competence is needed to succeed with Norra Kymlinge.

THE FIFITI PROCESS

As earlier stated, in order to fulfil the goals the development process is very important. We identified a number of guiding principles for the development process, that we call FIFITI.

FEASABLE
Break down the process in steps that are possible to implement but do not stop by implementing only proven solutions! The target goal should be high in order to contribute to solutions that are good for the world - the goal must be opportunistic and not forecast-driven.

IMPLEMENTABLE
Best for the world means that Norra Kymlinge needs to focus heavily on a process that brings us faster towards implementing sustainable solutions on a large scale. The challenges we face require us to take higher and faster steps towards highly sustainable neighbourhoods. Choose, develop, test, evaluate, analyse, adjust - implement on a large scale!

FLEXIBLE
Working with innovation means that you must always be flexible because you rarely know where the next loop in the innovation cycle will bring you. In sustainable urban development, structures and solutions also need to be resilient and flexible because the city is constantly evolving – the city is never completed.

INCLUSIVE
A city development process with Norra Kymlinge’s ambitions affects many, from global partners to local citizens and associations. Norra Kymlinge must have an outreaching activity with the intention to include all the stakeholders in its development. An invitation is not enough! To gain stakeholder engagement, they must be included and they must have the possibility to influence the process.

TRANSPARENT
A transparent process is not only open with positive results and marketing. To become best for the world, it is even more important to spread negative results and failures. Equally important is to show how the process was designed and performed to achieve these results. A transparent process can be examined which is important for assessing the results, but also for sharpening the process so that all participants take joint responsibility for the outcome.

INNOVATIVE
Innovation is something new that creates value to many and it opens, or is spreading to, new markets. It is not enough to invent. An innovative process is creative but it includes even more hard work to achieve the goal to find new solutions. The process is often driven by a multi competent team who constantly has stakeholder involvement to be sure the focus is on creating higher values to many.

SECURING NORRA KYMLINGE

AS THE BEST CITY DISTRICT FOR THE WORLD

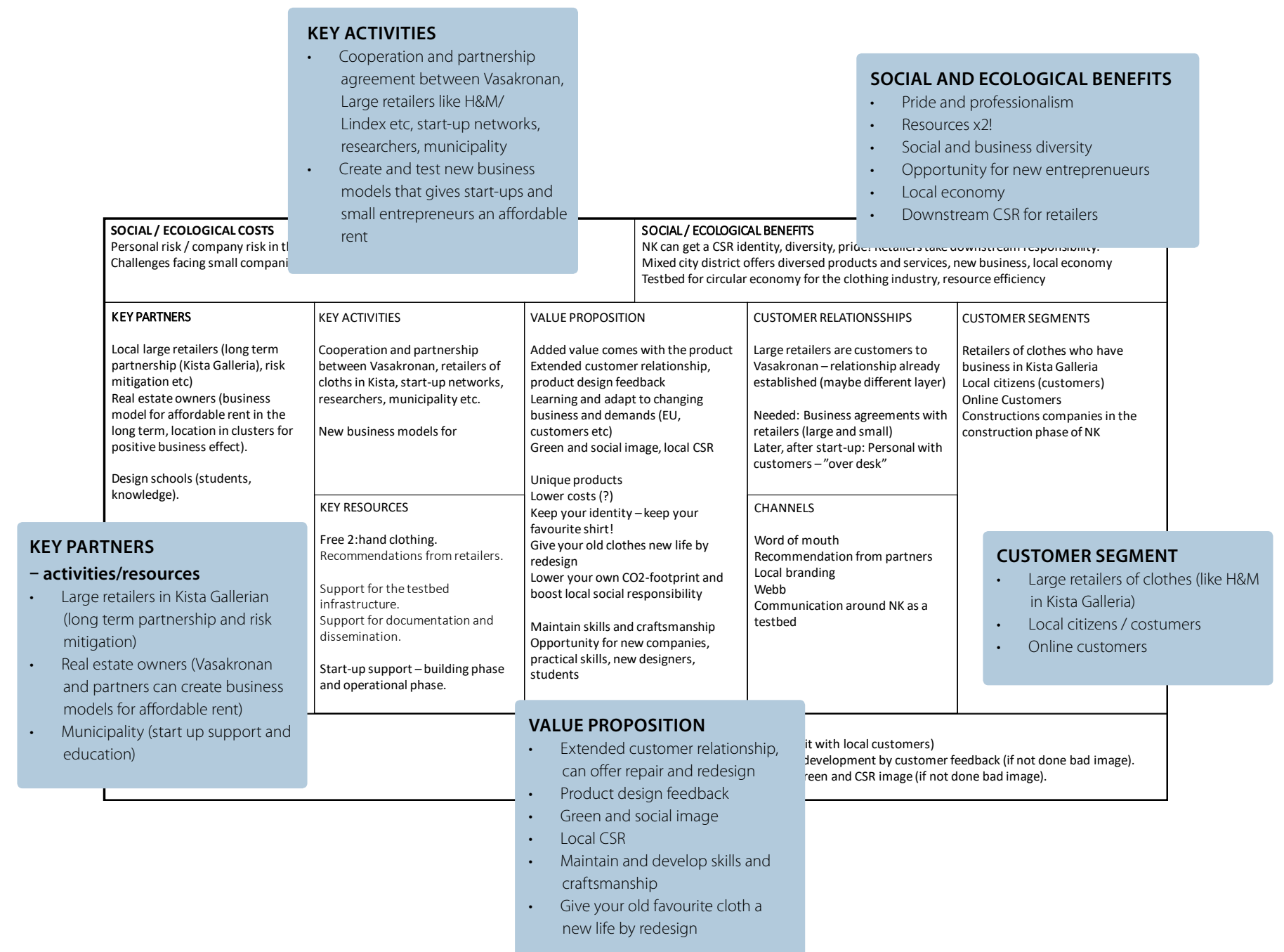
CASE STUDY: BUSINESS MODEL FOR CIRCULAR ECONOMY IN NORRA KYMLINGE

During the workshop, we tested a tool to prototype an idea that emerged during the process. We wanted to investigate how we could close the loops by redesigning a linear process, which uses a lot of virgin resources, into a circular process. At the same time, we wanted to create local jobs and opportunities for small entrepreneurs. The case was *“Can we find a business model to increase the repair and redesign of clothes? Are there any business opportunities for tailors and designers in Norra Kymlinge?”*

The method we used was the Business Model Canvas (BMC) supplemented with two additional fields for social and ecological costs and benefits.

We are aware that it is not Norra Kymlinge's or Vasakronan's responsibility to close the clothing industry's resource-solving linear process, but we see this as an opportunity to create a highly unique profile, and at the same time we wanted to test how to work with different business models in order to identify possible ways towards highly sustainable neighbourhoods. The BMC shows that both social benefits can be achieved when we are creating jobs, but also with ecological benefits when we are using resources more wisely. In addition, the Business Model will boost the local economy and gives large retailers an opportunity to work with downstream CSR locally.

The most important results from the BMC is that we identified key partners and key activities that are associated with this business model. It makes it possible to investigate if there are any ongoing initiatives in the area in which Norra Kymlinge can be engaged in, support or only gain results from.



Figur 20 Analysis of a business model for circular economy in Norra Kymlinge

REFERENCE PICTURES



TESTBEDS IN NORRA KYMLINGE

Examples of testbeds and pilot projects, from a Swedish perspective, that can be part of Norra Kymlinge. Exactly what will be tested needs to be agreed with international partners working towards the same goal, to be the best for the world.

- Swedish relevance
- Global relevance

- Process for developing and maintaining the most resilient and SCD for the world
- Resilience measurement on a city district
- Organization, partnerships and funding of test beds
- Infrastructure for the collection and publication of open data

Green offset

Use wise and reuse twice model

Mitigation of the gentrification process -
Business models for mixed
businesses

Noise reducing system solution:
energy producing embankment with
an integrated diversified food produc-
tion combined with closed loops for
nutrients and energy recovery

A cohesive city - affordable housing

Ecosystem services
on district scale

Small scale energy plant from
biological waste

Sharing economy at district scale

4th generation district heating

Upcycling center
Socio-economic integration

EPD on city district level

Controlled gentrification -
Business models for mixed businesses

Mobility as a service – sustainable
and fair last mile mobility





HOW TO PROCEED?

RECOMMENDATIONS FOR THE FUTURE

We have developed a process and laid out the trajectory that we believe will unlock the development of Norra Kymlinge and steer it towards becoming the resilient and sustainable district that it aspires to become. We therefore propose a series of recommendations to take this proposal forward including a number of test beds that will make Norra Kymlinge a pioneer for the world. The recommendations are divided into strategic recommendations, design recommendations and potential test beds.

STRATEGIC PROJECT RECOMMENDATIONS

- Recommendation 1:** Start from refining and prioritising the goals for the project that communicate locally first, and globally second. This will create long-term engagement and ownership of the goals
- Recommendation 2:** Identify the stakeholders and engage with them to bring everyone on board the project
- Recommendation 3:** Identify the different engagement methodologies that will put in place with the stakeholders
- Recommendation 4:** Reach out and connect with the national initiatives that exist today, such as SGBCs, Citylab, Decode, Mistra Urban Futures, etc.
- Recommendation 5:** Identify and develop partnerships with the stakeholders, by identifying the project's strengths and complement your weaknesses with strategic partnerships to accomplish your goals
- Recommendation 6:** Identifying the value that Norra Kymlinge will bring and link up with global players in a transparent process
- Recommendation 7:** Develop business models for Norra Kymlinge for different scenarios. Test on small scale already today, before scaling up on large scale once Norra Kymlinge starts developing

DESIGN RECOMMENDATIONS

- Recommendation 1:** Start a process of building knowledge through your engagements, partnerships, and the possible test beds
- Recommendation 2:** Start the FIFITI process by mapping the networks and initiatives that are already taking place elsewhere in the world, where Norra Kymlinge can play a role in helping solve global challenges, and map the areas where it can contribute to, based on its unique conditions
- Recommendation 3:** Become a pioneer in initiating affordable housing and solutions for district scale sharing economy in Sweden
- Recommendation 4:** Implement resilience thinking in all the prototypes
- Recommendation 5:** Pioneer
- Recommendation 6:** Evaluate in every step of the way, and disseminate knowledge, both positive and negative experiences

TEST BEDS

- Recommendation 1:** Process for developing and maintaining the most resilient and sustainable city district
- Recommendation 2:** Resilience measurement at city district scale
- Recommendation 3:** Organization, partnerships and funding of test beds
- Recommendation 4:** Infrastructure for the collection and publication of open data
- Recommendation 3:** Noise reducing system solution: energy producing embankment with an integrated urban farm and greenhouse
- Recommendation 4:** Small scale energy plant from biological waste
- Recommendation 5:** 4th generation district heating system
- Recommendation 6:** Sharing economy at district scale
- Recommendation 6:** Affordable housing
- Recommendation 7:** Upcycling centre, socio-economic integration
- Recommendation 8:** Mobility as a service
- Recommendation 9:** Use wise and reuse twice model
- Recommendation 10:** EPD on a district level
- Recommendation 11:** Business models for mixed businesses
- Recommendation 12:** Ecosystem services on a district scale and green offsetting

LINK ARKITEKTUR

OÄNDLIGA MÖJLIGHETER