



PLANNING INSTRUMENTS FOR SMART ENERGY COMMUNITIES

Report 2.2:
A preliminary toolkit of municipal
planning instruments



Authors: Brita Fladvad Nielsen, Eszter Juhasz-Nagy, Carmel Lindkvist,
Annemie Wyckmans, Inger Andresen, Daniela Baer

Reviewers: Åshild Lappegard Hauge, Siri M L Joli

NTNU, Trondheim | August 2017

Planning Instruments for Smart Energy Communities
Version 2.2 September 2017

Contact info:

www.ntnu.edu/smartcities/pi-sec

Design: synlig.no

Print: Skipnes

Photo: synlig.no / Shutterstock / private

PLANNING INSTRUMENTS FOR SMART ENERGY COMMUNITIES

Report 2.2:
A preliminary toolkit of municipal
planning instruments

Contents

Figures	4
English - Norwegian Dictionary	5



6	Introduction and starting point
---	---------------------------------



8	2 Background
8	2.1 About PI-SEC
10	2.1.1 Case studies
11	2.1.2 Approaches, hypotheses and choice of methods in PI-SEC
12	2.3 Conclusions from 2.1 and starting point for Task 2.2



14	3 Method overview
15	3.1 Design thinking workshops
17	3.2 Data analysis



- 18 : 4 Results
- 18 : 4.1 The successful planning of SECs: Ownership, commitment and return
- 19 : 4.2 The idea of a 'Core of community' agreement
- 19 : 4.3 Defining responsibilities through 'Suitcase' exercise
- 24 : 4.4 Tool needs in relation to project stage and earlier findings
- 27 : 4.5 Differences between the two municipalities



- 28 : 5 The SEC planning wheel
- 30 : Planleggingshjul for smarte energisamfunn
- 32 : Step 1: The development of a Smart Energy Community agreement
- 34 : Step 2: Core of Community fund (CCF)
- 35 : Step 3: Access to incentives
- 36 : Step 4: 'No-go' policy
- 37 : Step 5: Award/ENOVA flagship status
- 38 : 5.1 The connection between the SEC Planning Wheel (WP2) and Goals and KPIs (WP2)
- 40 : 5.2 A working definition of Smart Energy Communities



- 42 : 6 Next step: Testing of toolkit
- 46 : 6.1 Compliance with ZEN pilots
- 47 : 6.2 Remaining gaps and final comments

Acknowledgements	48
References	49
Appendix	50
Strategier, Hinder, Mål	54
Another example of smart energy planning: Ydalir i Elverum, Hedmark	56

Figures

- 14 : Figure 1: How did the SEC Planning Wheel emerge?
- 16 : Figure 2: Design thinking workshops set-up
- 17 : Figure 3: Example of suitcase from task 4
- 17 : Figure 4: Tools suggested by participants in task 2.1
- 20 : Figure 5: Tools suggested by participants in task 2.1
- 29 : Figure 6: SEC Planning Wheel
- 32 : Figure 7: Step 1 SEC Agreement
- 34 : Figure 8: Step 2 Core of Community fund
- 35 : Figure 9: Step 3 Incentives
- 36 : Figure 10: Step 4 'No-go' policy
- 37 : Figure 11: Step 5 Award/ENOVA flagship status
- 39 : Figure 12: The proposed connection between WP1 and WP2
- 40 : Figure 13: The complexity of communities, broken down in different dimensions (source: Annex 63 subtask C)
- 43 : Figure 14: Testing of toolkit

English - Norwegian Dictionary

In the report, the following translations are used¹:

English	Norwegian
Building applications	Byggesak
Central government land-use plan	Statlig arealplan
City/urban planners	Byplanleggere
Cities of the Future	Fremtidens byer
Core of community (CofC)	Samfunnskjerne
Core of Community Fund (CCF)	Samfunnskjerne-fond
County master plan	Fylkesplan
District	Fylkeskommune
Energy frame requirements	Energirammekrav
Municipal master plan	Kommuneplan
National Road Administration	Vegvesenet
Plan for land use	Arealplan
Planning and Building Act	Plan og bygningsloven
Prosumers	Plusskunder
Regional master plan	Regional plan
Regional Governor	Fylkesmann
Regulations on technical requirements for building works	TEK / Byggteknisk forskrift
SEC	Smart energy community
Sequence provisions	Rekkefølgebestemmelser
Smart Energy Communities	Energismarte områder
Utility companies	Kraftselskaper
ZEN	Zero Emission Neighbourhood
Zoning plan	Reguleringsplan

¹ A general English-Norwegian term list for the Planning and Building Act is available on <https://www.regjeringen.no/no/tema/plan-bygg-og-eiendom/plan--og-bygningsloven/plan/veiledning-om-planlegging/Bok-mal-nynorsk-ordliste/ordliste-norsk-engelsk-plan--og-bygning/id462717/>

1. INTRODUCTION AND STARTING POINT

PI-SEC addresses the thematic priority area Smart Cities and Communities and the challenge of developing effective planning instruments to improve the energy performance of built environments, and monitor corresponding progress made over time. The project will deliver efficient planning instruments for integrated energy design at the neighborhood scale, qualified for Norwegian planning context in cooperation with public stakeholders. The project will provide increased knowledge about:

- what parameters are essential for moving towards smart and sustainable energy use in Norwegian cities
- how these can be linked to the planning, operation and monitoring of new or renewed neighborhoods

The case studies in PI-SEC include two projects; Zero Village Bergen (ZVB) and Furuset Forbildeprosjekt. In the previous report 2.1 (Analysis of goals and KPIs in design projects) we described task 1.1 and 2.1; Analysis of goals and KPIs in design projects and municipal planning instruments. Participants included were municipality city planners and people working at the climate departments, the regional governor, researchers and architects involved in the projects, builders and utility companies.

The extensive data gathered and presented in report 2.1 led to the identification of 5 hotspots for tool development that can facilitate the improved implementation of Smart Energy Community projects in Norwegian municipalities:

1. Local renewable energy screening and integrative start-up tools : researchers, climate department, utility companies, city planners and the regional governor express a concern that renewable energy resource potentials are not investigated broadly enough at the start phase. Instead, the agreement between builder and property owner or stakeholder involvement influences the final design of the Smart Energy Community.
2. Visualization tools: to examine the relationship between energy use, energy production and energy emissions. Participants particularly call for tools that can help choose between different localizations and to visualize the potential impact of alternative actions on emissions.
3. Triple bottom line (economic, social, environmental) scenario building tools: to amplify the attractiveness for a SEC implementation
4. Tools to design for sustainable behavior in buildings and urban area
5. Stakeholder/incentive based understanding of system boundaries: tools that can help municipalities understand which stakeholders and incentives can benefit the planning and implementation of SECs.



The structure of the report:

- Chapter 1: describes the preliminary toolkit that has emerged from the detailing of identified hotspots in Report 1.2.
- Chapter 2: describes how we moved from five hotspots onto detailing and categorization in collaboration with stakeholders.
- Chapter 3: includes background information about the PI-SEC research proposal, earlier work and a brief introduction to the cases.
- Chapter 4: includes results from the collaborative design thinking workshops, which were categorized..
- Chapter 5: explains how the toolkit may be of relevance beyond the PI-SEC cases as well as how we foresee the testing of the toolkit with Oslo and Bergen municipality.

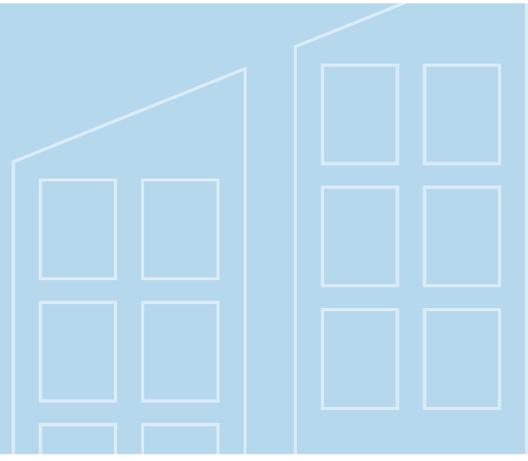
2. BACKGROUND

In task 2.2 (Preliminary toolkit of municipality PI) we have identified and collected examples of tools based on challenges, goals and strategies that we have categorized through desktop research as well as interaction with Norwegian and international PI-SEC partners. The PI-SEC partners refer to the involved stakeholders in the planning and implementation of two SEC projects in Bergen and Oslo. The interaction in Task 2.1 consisted of interviews with each stakeholder participant, while data gathering in Task 2.2 includes workshops applying design thinking tools in order to integrate the needs and contribution of each stakeholder. The workshops included tool matchmaking with researchers as well as further outlining the foundation for new tool development. The overall methodology of the primary data gathering is based on narrowing down and clarifying municipalities' needs identified in task report 2.1 (Analysis of goals and KPIs in design projects). We define a tool as device or an implementation used for carrying out a particular function. In order to decide which tools we need for the purpose of designing and implementing smart energy communities (SECs) in Norway, we need to understand which functions we are looking for. A function is an operation with a purpose. In order to understand which functions city planners need to fulfill to facilitate the implementation of SECs, we need to know more about the purposes of the stakeholders involved in the planning and implementation of SECs. In this way, the preliminary toolkit is a combination of tools, functions and purposes. Interviewees in the previous PI-SEC report 2.1 illustrated the range of the meaning of the term 'tool'. A tool does not necessarily have to be a technical or physical object but can also be a social construction. For example, the participants illustrated this clearly by adding 'experience' as a relevant tool. This means that a tool can also be a relationship between two people sharing experiences; in other words, a meeting place can serve as a tool.

2.1 About PI-SEC

PI-SEC couples planning instruments on different scales by applying a multidisciplinary approach through analyzing ambitious case study projects from the viewpoint of developers and designers and that of the municipalities. The planning instruments will be interrelated in a certain structure to enable transfer and aggregation of information between the private development, neighborhood and city, regional and national levels. This will also reduce the risk of sub-optimization. The knowledge acquired in PI-SEC will be a catalyst for achieving long-term political goals for reductions in energy use and greenhouse gas emissions, use of local renewable energy sources, and security of supply. Having specific, agreed upon goals and key performance indicators (KPIs) is important for development of new smart energy services and products by and for the construction industry, as well as for shaping policy and legislation for sustainable development of built environments. This knowledge will also give input to standardization, certification and regulations. The project is conducted by experienced researchers on energy use in the built environment in cooperation with a national resource group consisting of planners and decision makers of major Norwegian municipalities, as well as the Norwegian standardization organization, the Futurebuilt Program, and the Norwegian Green Building Council. The main target groups of the project are urban decision makers, municipal planning departments and other stakeholders that are developing targets, criteria, roadmaps and tools for sustainable energy use in Norwegian communities. In addition, the project uses a European reference group of central institutes and municipality representatives from the European Innovation Platform on Smart Cities and Communities as well as the EERA Joint Programme Smart Cities. Moreover, participation in IEA ECB Annex 63² forms a third resource group, including also non-European partners such as China and South-Korea.

² International Energy Agency, Energy in Building and Community Systems, Annex 63: "Implementation of Energy Strategies in Communities", project period 2013-2017, Objective to develop recommendations for effective translation of a city's energy and GHG reduction goals to the community scale, develop policy instruments, and models for cooperation and business.



2.1.1 Case studies

PI-SEC is developing a toolkit based on lessons from two case studies; the Zero Village Bergen (ZVB) project, and the Furuset Forbildeprosjekt.

ZVB consists of approximately 720 dwellings (80 000m²) and is expected to include innovative zero emission buildings with roof-mounted solar cells, local thermal energy supply and a first-of-its-kind parking garage built from wooden materials. Details can be found on <http://zerovillage.no/om-prosjektet/losninger/>. ZVB is located at Ådland, about 16 kilometres south of the centre of Bergen municipality.

Energy and greenhouse gas emissions have been central in the planning of this residential area. The greenhouse gas emission ambition levels are based on the Norwegian ZEB definitions (Sartori, Dokka, & Andresen, 2011). The plan is to have a set of different ambitions based on the scale and the time of construction (Risholt et al., 2014). The buildings built in the first stage of implementation have the lowest ambition level of ZEB-O÷EQ, which means that locally generated renewable energy have to compensate for energy use for operation (O) minus the energy use for equipment/appliances (EQ). Then, within two years, the ambition level for the next stage of implementation should improve to ZEB-OM, when the embodied emissions in the building materials also have to be considered; and the last stage, within 4 years, should have the highest ambition level of ZEB-COM – compensating for construction, building materials and operation, including equipment installed in the apartments.



The process of developing a plan for this neighbourhood started in 2009. In 2011, the private developer ByBo, was leading the process, together with Norconsult and the regulation process for the area began. In the same year, ByBo entered a partnership with the FME ZEB Centre, and Zero Village Bergen (then referred to as Ådland) became one of the FME ZEB pilot building projects. In 2013, a new projection for noise was made due to the planned expansion of Flesland Airport, resulting in a need for revision of the plans. Part of the original building site was now situated in a “red zone” according to the noise levels, and residential buildings were restricted. The rest of the site falls into a “yellow zone”, where buildings can be placed based on individual evaluation of the fulfillment of indoor and outdoor noise level requirements. At this point, new consultants have been involved, including Snøhetta as the architectural consultant, and SINTEF ICT and Multiconsult for the development of tools to solve the airport noise challenge. As a result of the difficulties relating to the noise level, “shadow mapping” has been developed by SINTEF ICT and Snøhetta for the purpose of this project. Shadow mapping is an innovative tool to calculate and visualize how buildings can work as sound barriers while ensuring sufficient solar irradiation.

Furuset is an existing neighbourhood; a satellite town built in the 1970s. The aim of the urban revitalization project is to change this satellite town into a vibrant downtown area, emphasising environmental, physical and social aspects (elements). The overall aim is to act as a role model for other sustainable urban development projects in Oslo and elsewhere in Norway. Oslo municipality started focusing on this area already in 2007, as a part of “Groruddalssatsingen”; an initiative based on cooperation between city and state, targeting

neighbourhood-level improvements in this part of Oslo. Further work was done through the planning process initiated in 2009 by the Planning and Building Services at the City of Oslo.

Furuset is chosen as a case for the FutureBuilt Programme that runs between 2010 and 2020 together with 49 other cases. There are in total four holistic “Forbilde” projects, one in each municipality, while the rest of the cases are single buildings. The area is unique as a FutureBuilt project, as it is their first project on a neighbourhood scale. The project has a steering committee with representatives from various municipal departments. The site is located in Oslo, to the east of Oslo centre, towards Lillestrøm. It is the eastern part of Groruddalen, with about 9000 inhabitants. The refurbishment area incorporates about 3800 residential units and 1500 workplaces. About 90 percent of the residential units are in apartment blocks built in the 1970’s, owned by 12 housing cooperatives, with 2 of the blocks being condominiums. The rest of the neighbourhood consists of smaller, older houses located in the part called “old Furuset”. The local real-estate prices are relatively low in comparison to the rest of Oslo. The neighbourhood has many indoor and outdoor recreational and green areas and is in close proximity to Østmarka (a popular woodland), and the residential buildings and outdoor areas have been upgraded in recent years. There is also a lively cultural life, but it is not very visible. There are good public transport connections, including two metro stops and different bus lines. On the other hand, there is little car traffic crossing the area. At the time of writing, a number of projects have been implemented. Early in the process, the Municipality of Oslo used a participatory approach in order to find out the needs of the residents, especially local women and youth. One of the wishes was to get meeting places outside. The planning of the Verdensparken started in 2008, and the last phase of the park was realized in 2016. The park has a variety of features, including fruit trees, new lighting and vegetation, water fountain, sculpture and a climbing wall. More recently, Granstangen school was opened as well as Ulsholtveien 31 which is ‘first home’ apartments serving an identified socioeconomic need in the Furuset project.

2.1.2 Approaches, hypotheses and choice of methods in PI-SEC

This report describes process and results of Task 2.2 Preliminary toolkit of municipality PI’s.

Task 2.2 is the second task of Work Package 2 in PI-SEC:

- Work Package 1: Cross Scale Indicators in Project Planning
- Work Package 2: Planning Instruments for Municipalities

Parallel to Task 1 2.2 is task 1.2 of WP1;

Preliminary toolkit of goals and KPIs in DP , which focuses on how the municipalities should design their planning instruments to facilitate the move towards smart energy communities. Together, they will answer the following main research question: Which targets and KPIs are essential for smart and sustainable energy use in Norwegian cities and how can these be linked to the planning, operation and monitoring of new or renewed neighbourhoods?

The main means to answer this research question will be the analysis of specific case studies in the two largest Norwegian cities (Figure 1). The case study projects have been pre-selected in cooperation with the project stakeholders. They are large (in Norwegian context) ongoing development projects with ambitious goals with respect to energy performance and related GHG emissions. Researchers from NTNU and SINTEF are already involved in the planning of these projects, which will facilitate access to information.

Project name and location	Energy/environmental goals	Type and size of development	Time frame	Special issues
Ådland, Bergen	Zero GHG emissions for area, www.zeb.no	New development with 6-800 dwellings and a community centre	2015-2020	Local renewable energy and electro-mobility
Furuset, Oslo	Climate neutral district centre, www.futurebuilt.no	Upgrading of suburb from the 1970’s with 9500 inhabitants	2010-2020	Energy strategy plan and GHG accounting analysis

Table 1: Case studies in PI-SEC

The other main methodology in PI-SEC will be interdisciplinary workshops between the researchers, international experts, and professionals from the municipalities and stakeholders in the case study projects:

- National workshops with the representatives from the municipalities and other organizations participating in the project. This will include a kick-off workshop to further specify sub-goals and distribution of work, and 3-4 workshops per year exchanging project results, knowledge and experiences between the researchers and members of the national resource group.
- European workshops in the City Advisory Board (municipal representatives) of EERA Joint Programme Smart Cities, to promote alignment and feedback of Norwegian results with European progress.
- International workshops within IEA ECB Annex 63: Implementation of Energy Strategies in Communities.

Each of the main research tasks will be divided into 4 subtasks:

WP 1: Cross Scale Indicators in Project Planning	Task 1.1 Analysis of goals and KPIs in design projects(DP)	Task 1.2 Preliminary toolkit of goals and KPIs in DP (DP)	Task 1.3 Testing of toolkit in case studies. Focus: Project planning	Task 1.4 Final toolkit and guidelines for design projects	
	↕	↕	↕	↕	
	WP 2: Planning instruments for Municipalities	Task 2.1 Analysis of goals municipality planning instruments	Task 2.2 Preliminary toolkit of municipality PIs	Task 2.3 Testing of toolkit in case studies. Focus: Municipality practice	Task 2.4 Regulatory and planning implications municipalities

Table 2: Illustration of the work packages and related tasks and work flows.

2.3 Conclusions from 2.1 and starting point for Task 2.2

Five hot spots for tool matchmaking and development were highlighted in the previous task report (1.1 Analysis of goals and KPIs in design projects):

- Local renewable energy screening and integrative start-up tools: the regional governor, researchers, climate department, utility companies, city planners and researchers express a concern that renewable energy resource potentials are not investigated broadly enough at the starting phase of a project. They think that the rest of the planning process will suffer from this in regard to fully exploiting the project’s energy potential. Instead, the agreement between builder and property owner or concession holders gains influence on the final design of the Smart Energy Community during the process while alternative sources such as thermal energy are easily overlooked.
- Visualization tools: to examine the relationship between energy use, energy production and energy emissions. Participants particularly ask for tools that can help choose between different localizations and to visualize the potential impact of alternative actions on emissions.
- Triple bottom line (economic, social, environmental) scenario building tools: to amplify the attractiveness for a SEC implementation
- Design tools to support sustainable behavior in buildings and urban areas.
- Tools that can help municipalities understand which stakeholders and incentives can benefit from the planning and implementation of SECs.

We concluded these five hot spots based on interviews with involved stakeholders in the ZVB and the Furuset project planning.

Task 2.2 collects a reference base of international tools for similar targets, challenges and drivers, evaluating how they are tackled, and whether these experiences are transferable to Norwegian context, specifically to the PI-SEC case projects.



3. METHOD OVERVIEW



Based on the descriptive case research presented in Report 2.1, combined with findings from design thinking workshops described in chapters 3 and 4, we developed a planning wheel which is described in chapter 5.

Figure 1 illustrates the combination of methods used in the data gathering in Task 2.1 and the data gathering in Task 2.2, which together resulted in the preliminary toolkit: the SEC planning wheel in Chapter 4.2. The starting point for task 2.2; Preliminary toolkit, were the hot spots for tool development which composed the conclusions in task report 2.1. In Task 2.1 Analysis of goals in municipal planning instruments, visual tools (graphic elicitation) aided the interviews where we asked each participant to draw a timeline of the SEC planning process while thinking aloud about the involved stakeholders, challenges and strategies. The analyzed interview recordings combined with the timelines that we asked each participant to produce, led to an overarching view of perceived bottlenecks and key issues. These findings helped elaborate and deepen our understanding of needs presented in the five hotspots. They further provided insights into which parts of the planning were more challenging, and where the most emphasized opportunities for tool development may be. However, more work was needed to understand how these needs might be transferred to tools that could fit within the daily planning routines of municipalities.

We chose a participatory ‘design thinking’ approach because energy integration into urban design involves multiple stakeholders and factors that are planned to work in conjunction with each other. Research shows that due to the difficulty to see the link between contribution and impact in sustainable city planning, stakeholders find other objectives that they can impact (Bulkeley, 2005). It was therefore important to further understand these and to try to align with them when creating planning instruments, In order to move from needs towards solutions, and to detail the tool needs, we therefore conducted one design thinking workshop (see 2.4.1 Design thinking workshops) in each case.

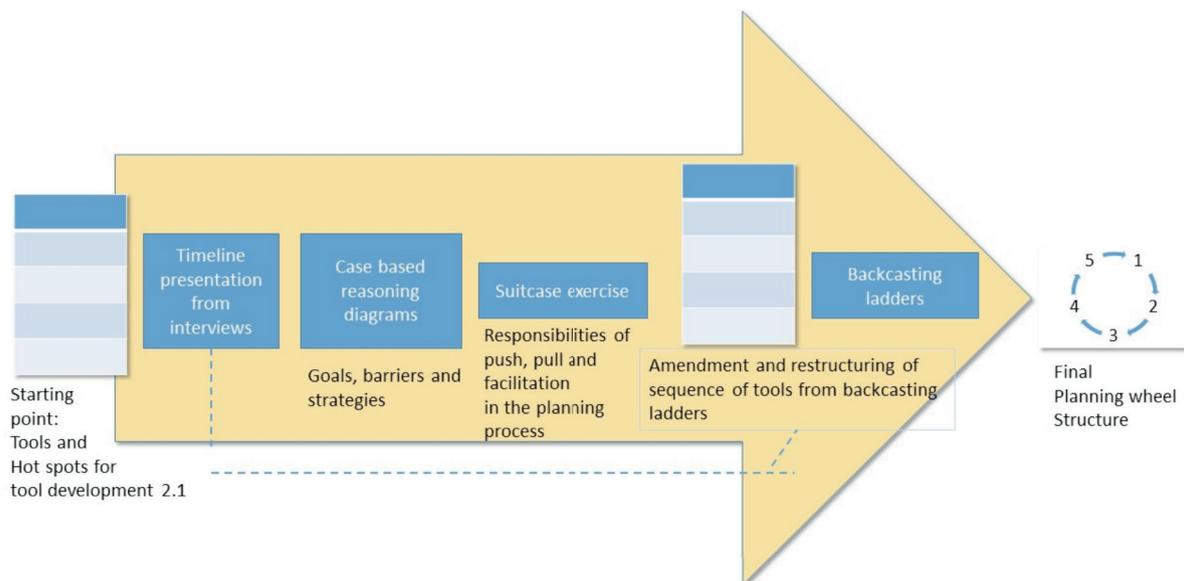


Figure 1: How did the SEC Planning Wheel emerge?

We invited all involved stakeholders to participate and to structure challenges, goals and strategies collaboratively. We did this through a ‘case based reasoning’ task (Kolodner, 2014) where experiences were analyzed and structured. The case based reasoning task helped categorize earlier findings into goals, barriers and strategies, before the ‘suitcase’ exercise gave an understanding of how the stakeholders would place responsibility for each strategy. Finally, the different data gathering exercises contributed to amendments and restructuring of the hot spots and ideas from backcasting ladders (Dreborg, 1996). Backcasting involves picking a common goal and moving backwards to find out how it can be achieved (see 2.4.1 Design thinking workshops). The output from the backcasting ladders advised the sequence of steps in the final planning wheel (See Section 4.2 The SEC planning wheel).

3.1 Design thinking workshops

The primary data was gathered through two stakeholder workshops in Bergen and Oslo. These workshops were developed with the purpose of better understanding the overarching, energy related goals of each case study, using a design thinking approach;

- To inform the design of a definition of Smart Energy Communities for Norwegian city planning
- To identify possible challenges and strategies to reach said goals;
- To understand what are the needs of the municipalities and which responsibilities belong to other stakeholders;
- To increase ownership within the municipalities and among the involved stakeholders towards a future oriented toolkit;

Participants that were included in the workshops are presented in Table 1.

The workshops took place in offices administered by the respective municipalities. Each workshop included 15 people on average, considering that some participants left during the workshop and others were added.

Participants that were included in the workshops are presented in Table 3.

Oslo	Bergen
Municipality: (7)	Municipality (4)
Futurebuilt (1)	Private interest groups (n) (1)
Utility companies (1)	Utility companies (2)
Researchers (5)	Researchers (5)
	Private enterprise energy (1)
	Politicians (1)
	Independent architect (2)
Total: 14	Total: 15

Table 3: Participants

The workshops in Bergen and Oslo were both designed in line with an identical design thinking process curve. During a design thinking approach, designers, or creative problem solvers dealing with complex problems, follow a process which includes alternating messy/diverging and structured/converging phases; this is illustrated through the blue wave in Table 2.

The purpose of design thinking is to bring problems and solutions closer together, so that they can be targeted more directly and efficiently. Design thinking is hence a relevant approach to connect different ideals during the city planning process, with multi-faceted and value oriented problem formulations (Dorst, 2011; Rowe, 1991).

Figure 2 provides an overview of the design thinking workshops which included 4 different creative problem solving tasks:

- case based reasoning
- what if
- back casting
- suitcases

We purposely interrupted these tasks by presentations and feedback. Breaks were placed strategically to ensure ‘full energy’ for problem solving among stakeholders. The exact time for each task was adjusted by making sure the participants could finish each task, and the facilitators discussed the timing of each task continuously by observing the participants.

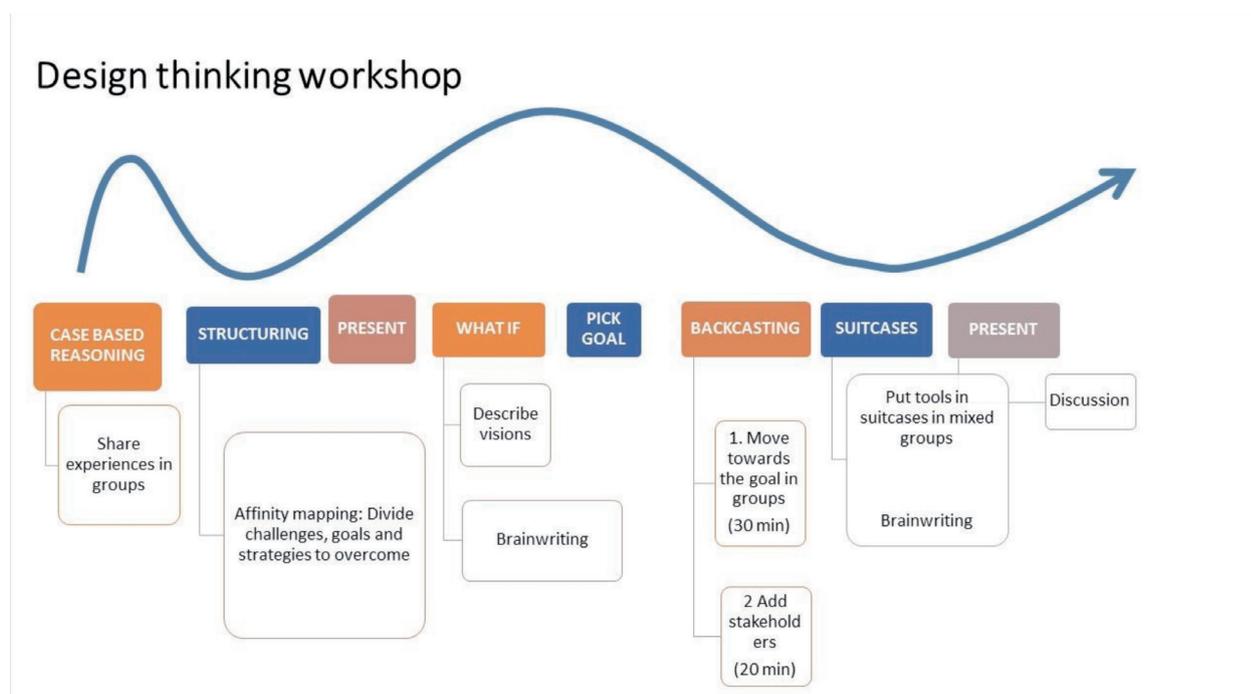


Figure 2: Design thinking workshops set-up

Workshop task 1: Case based reasoning (CBR):

Case based reasoning (Kolodner, 2014) inspired the first task in the workshops. In knowledge management, case based reasoning is founded on the idea that people from different disciplinary backgrounds best communicate through case sharing, or in other words, storytelling. From an experience, a case or a story, a team can pick out elements that are at the core of what needs to be targeted. We asked each participant to prepare a story that represented their experience with the topic of smart energy community planning, and gave each participant 5 minutes each to present their story in a plenary starting session.

We structured the experiences by dividing them into goals, strategies and barriers on a large sheet of paper. Pink post-its represented strategies, green post-its represented goals and blue were barriers.

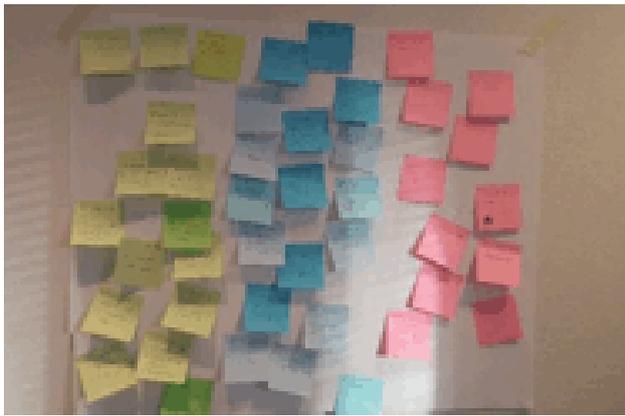


Figure 3: Categorization of goals, strategies and barriers

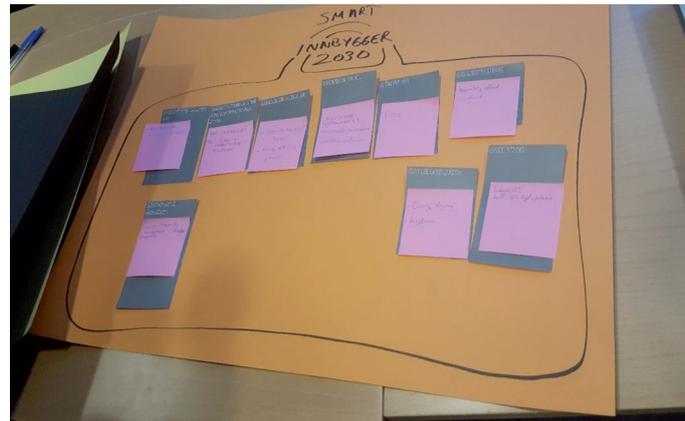


Figure 4: Example of suitcase from task 4

Workshop task 2: “What if”: Following the diverging experience sharing and the structuring phase, the participants were asked to move rapidly through scenarios of what they wished could happen in their city. The tool used is called ‘what if’ (Börjeson et al., 2006) and is well known from scenario builders such as designers or other disciplines using idea generation on a frequent basis. The ‘what if’ ideas were written down through a brainwriting sequence; each participant was given a sheet of paper where they started writing down ‘what if’ ideas. After two minutes, we asked them to swap this paper with the person sitting next to them. The next two minutes they needed to pick up on the ideas written on the new sheet and use association to expand by writing down new ‘what if’ scenarios. They swapped sheets of paper 6 times before this session ended. The sheets were attached to a wall and each participant had to mark the best ideas by drawing a star on the selected idea.

Workshop task 3: Backcasting: Backcasting is a well-known tool for participatory policy making involving multiple stakeholders. We instructed the participants to pick a goal that their group could agree upon, before they created a ladder of steps to reach that goal. The starting point would be today’s situation. The final backcasting ladder represented the ideal step-by-step process. We asked participants to dwell upon policies, collaborations and regulations that needed to be in place in order for them to reach the goal in the best possible way.

Workshop task 4: Suitcases: The use of personas (Blomquist & Arvola, 2002; Miaskiewicz & Kozar, 2011) inspired the fourth task. Personas is a method which designers use for gaining empathy and understanding user perspectives of different user groups. We asked participants to put the tools defined in task 2.1 into different suitcases according to responsibility or ‘who they would think needed that tool’. They were encouraged to add a description of the tool where they found it useful. The purpose of this exercise was to inspire discussion on tools, responsibilities and gain insight into responsibilities during planning of smart energy communities.

3.2 Data analysis

The output on the case based reasoning, the backcasting ladders, suitcases, and ‘what if’ ideas were written down and the data structured into diagrams. More importantly, the workshop discussions were audio recorded and transcribed verbatim. We analyzed the data based on the hot-spots for tool development (see Chapter 1. Introduction and starting point), and with a particular focus on finding energy-related obstacles as well as overlaps with the gaps identified in this report. The final key issues for tool development were deduced by removing redundant issues and categorizing the input in line with the hot-spots defined in Task 2.1.

4. RESULTS

Based on the results of the workshops described in Chapter 2, we narrowed the requirements for planning instruments down to the following categories:

- Tools that can increase the degree of collaboration and goal agreement
- Tools that can include citizen needs
- Tools that can improve alignment of implementation processes (sequencing of construction and development)
- Tools that can impact energy production and use
- Tools that can help lower emissions

During the design thinking workshops in Oslo and Bergen, it became clear how the participants from the public and private sector see the SEC challenges as a result of poor planning and a lack of collaboration (see Annex for examples of diagrammes produced during the workshops). A significant part of the discussion centred on the current situation where utility companies that deliver energy are involved very late in the project planning and that it would be beneficial to include these earlier. The utility companies explained that they depend on predictability that they will be involved in implementing the solution, so that they would benefit from being involved at an earlier stage. The workshop participants proposed to develop a Smart Energy Community agreement that includes also energy stakeholders (utility companies), including :

- Incentives, business models and scenario building to provide alternatives for decision making early in the planning process
- An insurance that good living environments and good neighbourhoods regarding health and safety are as important as climate and energy targets when planning Smart Energy Communities. This is expected to happen through the design and smart implementation of attractive public spaces or other connection points that can help integrate the different aspects of smart energy communities
- Engagement and involvement of citizens/end-users through design and training
- Added competencies for energy design within the municipalities. This includes which assessments are done, how these assessments can be assured in regulations as well as the sequence of order, as mentioned in the first two steps of the planning wheel (See 5.2 The SEC Planning wheel).

4.1 The successful planning of SECs: Ownership, commitment and return

During the back casting session, described in 3.1 Design thinking workshops, participants had to discuss the best route between a self-chosen objective and current starting point. All groups chose an objective that was some version of ‘better alignment and agreement’ between involved stakeholders when planning and implementing community projects. One group chose to have a time-oriented goal, with a strong focus on implementing plans about emission reduction faster; yet, the main discussions centered on the issue of how to ensure agreement more efficiently. During this task, private sector participants and public sector entered in long debates on how municipalities can require that stakeholders follow through with the intended municipal plans of a neighborhood. A lot of this discussion centered on who should have the role of the driving force of an ambitious plan.



This discussion supported the findings from interviews presented in task 2.1, where private investors want a clearer guiding role of the municipality, yet they are not coherent in whether they want this to be increased regulation or better incentives.

4.2 The idea of a ‘Core of community’ agreement

During the backcasting exercise, the participants developed a “Core of Community” concept as a driving force for the development of Smart Energy Communities.

Based on the workshop input we define the ‘Core of Community’ as the societal services, and particularly the built environment that enables them, that the involved stakeholders see as fundamental to creating the social composition of citizens for the said community.

The workshop participants agreed that in order for a community to be sustainable and contribute to the reduction of greenhouse gas emissions, it must be attractive for the people it is intended for, such as public places, transport connection points, schools, community houses, and short distance to the work place. The municipalities want to avoid gentrification and avoid buildings being built without sufficient access to societal services and public transport. There was consensus within the groups that the municipality should have increased authority to require agreement on a ‘core of community’ plan. Such a plan should be developed early in the planning process. Private developers may subscribe to a “core of community” plan, for example by paying a fee, and enjoy incentives during the planning and implementation stages such as swift municipal decision-making processes for this area. Which stakeholders would be included in the community would need to be defined through the use of collaboration tools which we have proposed for the testing phase.

4.3 Defining responsibilities through ‘Suitcase’ exercise

Following the backcasting exercise, the participants were asked to develop different suitcases with tools and match them according to which group of stakeholders they thought the tool should be relevant to. The suitcases were named ‘Citizen 2030’, ‘Utility company 2030’ and ‘City planner 2030’. The tools used in this exercise were collected from the input of interviews in PI-SEC Task 2.1. The tools are depicted in Figure 2 below. More detailed descriptions are illustrated in Table 2 in the Appendix.

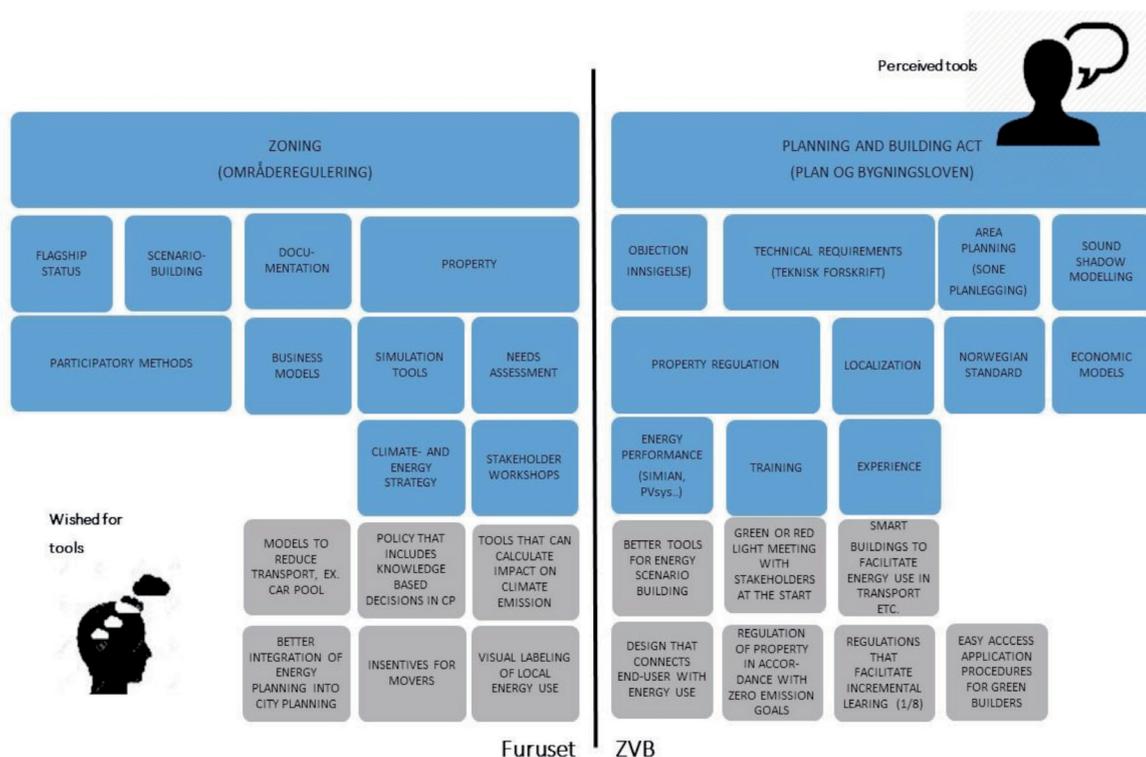


Figure 5: Tools suggested by participants in task 2.1

We printed the tools illustrated in Figure 5, on small notes for the participants to place in the mentioned 'suitcases' according to who they thought would carry the said responsibility in an envisioned 2030 scenario. The notes with tool descriptions also contained space enough to add a description. Participants added descriptions that they saw relevant, which led to an extended list of perceived tool needs and responsibilities in each suitcase.

The tool descriptions that were placed in suitcases were collected and categorized in two steps;

- by dividing them into push and pull strategies with added responsibilities in line with the process of Annex 63 strategic measures categorization (IEA/EBC, 2017. In Annex 63, identified measures for sustainable energy in buildings and communities are called 'strategic measures'. Strategic measures can be either pushing (by producing a certain product or service to enforce a said scenario, or making regulations that will 'punish' actors that act in conflict with the wanted scenario. A 'pull' strategy typically includes incentives, or measures that encourages rather than enforces a wanted reaction..
- by viewing them in relation to the planning timeline combined with earlier identified hot spots from Task 2.1 for tool development (see Introduction chapter).

Irrespective of the 'Suitcase' exercise, participants added enablers that they perceived would increase the chances that the push and pull strategies would impact the objective.

During the suitcase exercise, the participants were asked to identify tools useful for groups of stakeholders such as "Municipality" (M), "Builders" (B), "Utility Company" (U) or unknown (marked by a question mark).

Table 5: Push and pull strategies according to workshop discussions: M=municipality, B= building sector, U= Utility company

OBJECTIVE	PULL STRATEGIES	PUSH STRATEGIES	Enablers (what may strengthen the impact of the suggested push- and pull strategies)					
				M	B	U	?	
INCREASED DEGREE OF COLLABORATION AND GOAL AGREEMENT			Increased competency: alternatives presented OBOS (Oslo Housing and Savings Society) as energy advisor Develop a separate energy company within municipality?					
			Visualization of alternative areas for SECs					
		<i>Lignende løsning som "graveklubben"</i> (interpreted as 'bid and bundling' where smaller projects can be bundled to calculate reduction in CO2 emission: a way to get SMEs onboard)		Bundling as in CO2 carbon quota projects?				
				Develop standards for cost calculations (of what?)				
		Quicker proceedings						
			Tilknytningsplikt / attachment duty?					
		Flag ship status		Flag ship companies must share certain parts of experiences				

CITIZEN			Core of community: Transport and public areas 1 st Mobility: Public transport Public areas in early planning agreement and financing Short cuts (Innovations) example bike tunnels				
			Design for sustainable behaviour: Design of buildings: example facilitate for bike use. Common space for guest rooms, parties, repair workshops etc. Design in buildings: example smart TV connected with electric car pool, overview of energy prices and energy use etc.				
	Taxes and fees for unsustainable transport use						
		Increased energy fee					
			Simplification of technical issues: functionality is the most important for end-users				
			Increased responsibility and authority on citizen and contractors				
			Participatory methods				
			Training for dwellers: manual on how to use energy system and reduce energy consumptions when moving in				
	Tax reduction for living on smaller space.						
		Tax increase when using more living space					
	Incremental energy cost						
		Visualized measurement of amount, effect and time of energy use					

BETTER ALIGNMENT OF IMPLEMENTATION PROCESS	Strengthen regulation on energy demands					
			Strategic property use: Ex. that public buildings should be front runners by approximating zero emission before others, and all buildings on public property should lead the way and ensure that the municipality's vision is clear.			
			Property regulation/ Eiendomsstrategi			
ENERGY PRODUCTION AND USE	Increased economic incentives for own produced energy sold to grid					
	Visualized measurement of amount, effect and time of energy use / or parameter in aggregate					
		"tilknytningsplikt"				
			Bringing in researchers to the area to consider different energy resources before deciding on one solution			
		Reduce number of parking spots				
LOWER EMISSIONS		Increased energy fee				
		Incremental energy cost				
	Tax reduction for living on smaller space	Added tax for taking a lot of space				
			Mobility: Public transport Public areas in early planning agreement and financing Short cuts (Innovations) example bike tunnels			
		Add community space to reduce apartment sizes.				
		"No go" policy for builders that do not commit to 'core'				

4.4 Tool needs in relation to project stage and earlier findings

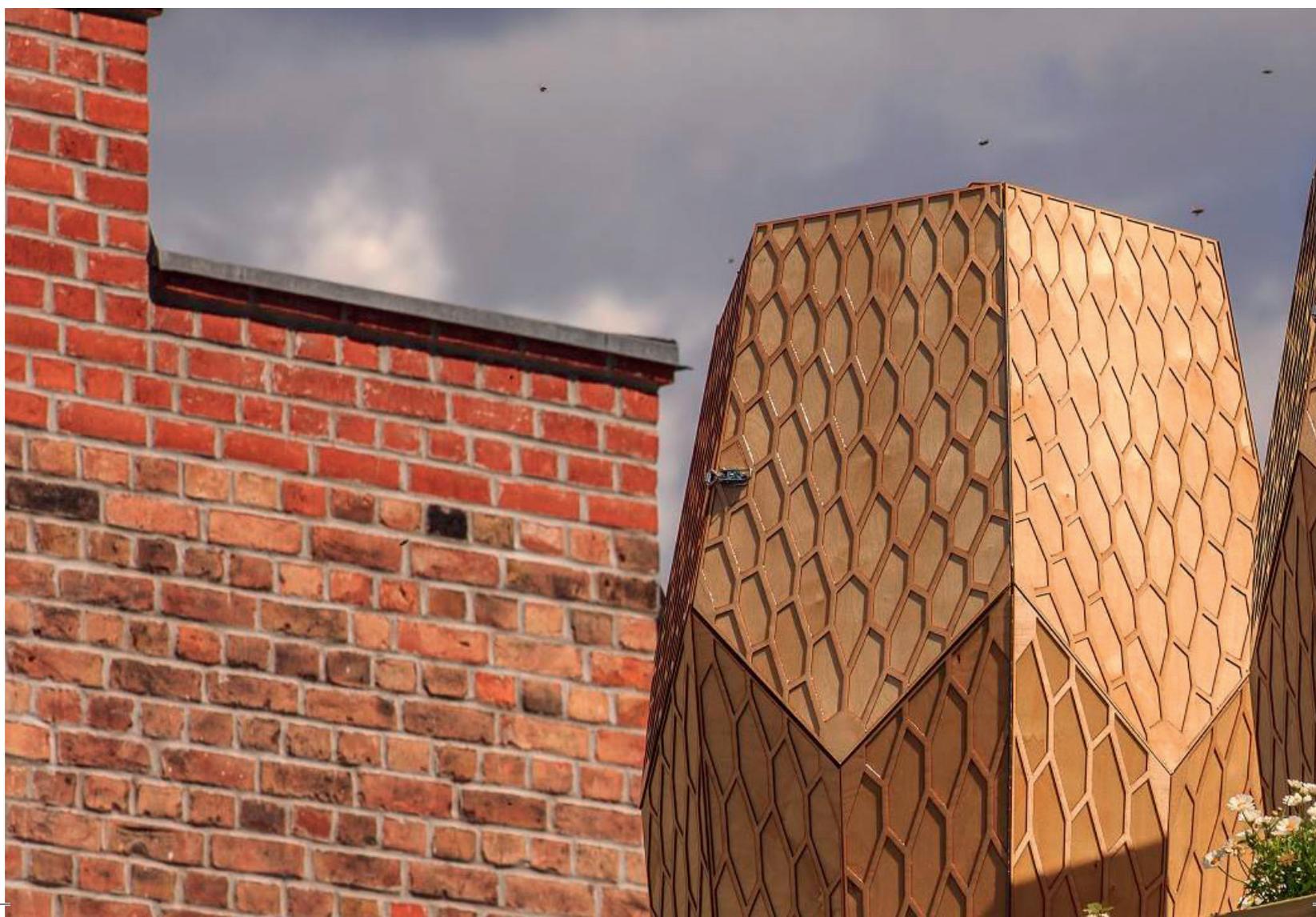
Contributions during workshop discussions were added to earlier created 'hot spots' for tool development in task 2.1. The following table is presented in accordance with the different project planning stages to improve readability.

Table 6: Hotspots identified in report 2.1 with amendments from findings in workshop

HOT SPOTS IDENTIFIED IN 2.1	Comments and edits from workshops	STAGE IN PROJECT
<p>Stakeholder/incentive based understanding of system boundaries; tools that can help municipalities understand which stakeholders and incentives can benefit the planning and implementation of SECs. They would like to have access to an experience base or a user-friendly network/ experience base to allow this.</p>	<ul style="list-style-type: none"> • Tools that can monitor the efforts on SEC implementation of each partner • Tools to learn from earlier plans • Visualization • Increase awareness of area plans and goals, in correlation with contractors' goals • Reference base must include and be updated on new Norwegian projects and focal points for contact between municipalities • Review and experience of stakeholders to be found there (including competency level on different issues?) • Participants are hoping for examples that are transferable, preferably experiences from Norway <p>Early integration of utility companies in planning process is wanted</p>	<p>PRE PLANNING AND EVALUATION</p>

<p>Researchers, regional governor and city planners express a concern that renewable energy resource potentials are not investigated broadly enough at the start phase, for example before selecting property and set design. More flexibility is needed. Instead, the agreement between builder and property owner or stakeholder involvement influences the end SEC design. Better selection of ground and consequences should be taken into account earlier and this requires a broader integration of renewable energy experts and tools that ensure alignment with regional and city policy from the beginning.</p>	<ul style="list-style-type: none"> • Agreement on 'core of community': • Infrastructure • Public transport/mobility core • Innovative shortcut work • Avoid 'freeriders' • Financing public core in order to get incentives <p>Incentives for builders:</p> <ul style="list-style-type: none"> • Faster process and earlier start-up • No building fee • Higher profit due to higher marketability(Implied) • Sustainable user behavior design of buildings and urban area can be included in these meetings as a part of the 'core of community' and joint partnerships <p>Incentives for citizens:</p> <ul style="list-style-type: none"> • Solve mobility/access innovatively • Example bike short cuts • Electric bikes and bike tracks with roofs 	<p>EARLY PLANNING</p>
<p>They also want to include building design/built environment design that enables sustainable behaviour from building level to community/neighbourhood level</p>	<p>ENERGY CORE WITHIN CORE OF COMMUNITY:</p> <ul style="list-style-type: none"> • Thermal/energy storage • Simpler water-borne systems • Control systems on neighbourhood level • Compare heat solutions • Heat and energy plan on neighborhood level • Local energy delivery, example 'rent free roof spaces' • Utility company: we are willing to take the cost of planning neighbourhood scale and start up if someone is taking the leading role to guarantee that the planned building will take place. If two partners around a table have customers, and get something, utility companies also 'want something' • Required increased collaboration between different parts of the municipality (as the role of Futurebuilt has been) • Less power to politicians, as they only work on 4-8 month perspective • Visualization tools of alternative areas for SEC building • Oslo: make a separate 'energy agency' within the municipality? • Energy solutions/local resources combined with central control <p>Ambitious on citizen level: example roads from solar cells, energy sharing between cars and buildings.</p>	<p>EARLY PLANNING</p>
		<p>EARLY PLANNING</p>

<p>City planners ask for more efficient knowledge-based tools for future city planning: how can participatory and knowledge-based city planning approaches be scaled and made more time effective, i.e. quicker planning processes for ZECs? (problem: urgent need for new housing. City planners see that there is a risk to move directly from plan to building without the inclusion of common visions and participatory processes, since these are seen as obstacles to timely implementation)</p>	<p>Living labs (ZEN). Visualization Learning</p> <p><i>“It is typical Norwegian to think that we can reinvent the wheel every time”</i></p> <ul style="list-style-type: none"> • “It was difficult because it had such a mixed population”: Many modern areas are gentrified due to lack of transport and high costs because of high technical standards. Social aspects must be considered and agreed upon in core. • Property strategy 	<p>PLANNING</p>
<p>Visualization tools of relationships between energy use, energy production, and greenhouse gas emissions</p>	<p>PILLORY OR PEDESTAL TOOL (gapestokk og pidestall) Visualise progress in rehabilitation and building of smart houses. Web based and/or put in public place to increase public engagement and link between city planning and expectations. Visualize private partners, and Visualization of alternative areas for SEC building</p>	<p>EARLY IMPLEMENTATION</p>
<p>Training</p>	<p>Manual and training for end-users. Create training material for planners and private sector on basis of experience.</p>	<p>PLANNING, IMPLEMENTATION AND MAINTENANCE</p>



4.5 Differences between the two municipalities

Based on the workshops with public and private sector stakeholders in Bergen and Oslo, we can distinguish several perspectives to inform tool requirements in the two municipalities:

Views on bureaucracy and collaboration: In Oslo, the participants perceived it as particularly challenging that the municipality is composed of too many entities; this makes it cumbersome to follow up ambitious plans. City planners also found it difficult that plans take so long to implement that the citizens lose interest due to the lack of fulfilled expectations. In Bergen, participants were focused on bringing up examples from other areas in Bergen which they perceived as 'successful' or 'failed' neighbourhoods. Common to both cases is the issue of making sure stakeholders are on-board early in the process in order to achieve a smooth planning and implementation process for this, they need ownership to the process, commitment and a return for this commitment.

Expropriation/Property strategy: the issue of expropriation and property strategy was brought up frequently as an important tool in the Oslo workshop, while in Bergen the workshop participants frequently mentioned both in interviews and workshop that one of their challenges is that they do not own property for strategic property management in SEC planning.



5. THE SEC PLANNING WHEEL

A planning wheel is an iterative process tool, suggested as a support for municipalities for managing the planning of Smart Energy Communities. The tool is suggested as a step-by-step guide to plan and monitor a SEC project. The wheel suggests a process from the early planning phase, through incentive based steps towards an evaluation process that will increase the competency among stakeholders in their efforts to meet the multiple objectives of city planning in regards to SECs.

The SEC Planning wheel, is the result of contributions regarding needs and possible solutions suggested during the workshops. As explained in detail in chapter 3. Method overview, the resulting concept is a combination of identified tool needs, suggested strategies in the design thinking workshops, and possible tool matches..

The planning wheel with its step by step suggestion for how to structure the application of different tools in relation to the identified needs. The SEC agreement (Step 1) calls for increased stakeholder involvement, while city planners need for new ways to ensure that social goals are met in building projects are manifested in the second step, Core of Community Fund (Step2). The private sector participants in workshops highlighted how increased expectations of stakeholder inclusion and commitment needed to be followed up by incentives (Step3). Further, the commitment should be followed up by a 'no go' policy (Step 4) where municipalities reject other stakeholders from building in the SEC area, and finally the commitment and implementation should lead to an evaluation/award process (Step 5) where successes and failures are documented and applied in future SEC processes. Each step is described in more detail in 4.1 The successful planning of SECs: Ownership, commitment and return.

The SEC Planning wheel may be applied to other urban cases than ZVB and Furuset, but should be tailored for each specific project. The planning process is presented as a wheel to illustrate that agreements, incentives, goal achievement and learning must be planned as an iterative approach. For example, a vision must be supported by a common agreement. In order to achieve continued stakeholder engagement, the path forward must be ensured through incentives, 'whips' or other reasons to participate. Some steps will in be repeated or moved to a different stage. It is beneficial to iterate the steps on the wheel multiple times in order to increase competency among stakeholders.



Figure 6: SEC planning wheel

Planleggingshjul for smarte energisamfunn

Planleggingshjulet viser hvilke faser et SEC-byggeprosjekt ideelt sett bør gå gjennom for å oppnå målene som er satt. Planleggingshjulet for smarte energisamfunn er bygget på analysen av mål, strategier og utfordringer fra ZVB og Furuset (se kapittel 4), og kan tilpasses hvert enkelt prosjekt. Grunnen til at prosessen er satt opp som et hjul er for å illustrere at avtaler, insentiver, måloppnåelse og læring må planlegges i sammenheng med hverandre. For eksempel må en visjon støttes av en felles avtale, men for å oppnå engasjement bør veien frem støttes av insentiver, 'pisker' eller andre grunner til å delta. Noen steg må gjerne gjennomgås flere ganger som illustrert i Figur 3 over, og det er fornuftig å gjennomgå sirkelen eller deler av verktøyene i flere runder for å øke kompetansen blant de ulike aktørene og spesielt innad i kommunen.

Steg 1: Samarbeidsavtale

For å sikre god planlegging og saksgang i et smart energisamfunn-prosjekt, må det inngås bred og tydelig enighet om hva som skal inngå i prosjektet. Deltakerne i PI-SEC er enige i at denne avtalen må innebære: Én klar og tydelig SEC-visjonsbærer. Den tydelige visjonsbæreren kan i de fleste tilfeller være kommunen, mens private aktører i noen tilfeller kan være visjonsbærere. Det viktigste er at disse er tydelige og at det er enighet iblant aktørene. Kommunen er ansvarlig for at det finnes en SEC-plan, som inkluderer to deler:

- a. En direkte energiscenarie-plan basert på scenarieutviklingsforslaget i Rapport 1.2. som er utviklet parallelt med:
- b. En plan for hva Samfunnskjernen (Core of Community) skal bestå av i utbyggingen. Det er enighet om at det må ligge et sosialt attraktivitetselement i kjernen av planen, som alle aktørene som vil være med på SEC-avtalen må enes om. Dette er fordi 'gode bomiljø' er formålet med byplanleggingens arbeid. Aktører både fra byggsektor og energi-selskaper bør inviteres til å samarbeide om å få til denne kjernen i fellesskap, og energisystemer bør utvikles med denne kjernen i tankene. Mobilitetsløsninger og sluttbrukerelementer må knyttes til denne kjerneområde-avtalen. I denne første fasen finnes det mange verktøy i referansebasen, som vi anbefaler og vil prøve ut i de ulike prosjektene.

Steg 2: Opprettelse av et Samfunnskjerne-fond (Core of Community Fund CCF)

For å skape en inngangsport til smart planlegging av både energi og samfunnsdelen i smarte energisamfunn, bør det finnes en inngangsport. Denne inngangsporten kan bestå av at alle de involverte aktørene i samarbeidsavtalen må bidra til et kjerne-fond for å sikre at utviklingen av knutepunkt i området utvikles tidlig nok. Denne inngangsporten kan bestemmes i hver kommune, men det kan styrke avtalen at den leder mot en gevinst som i pkt. 3.

Steg 3: Tilgang til Skattekiste av insentiver

Inngangsporten leder til en rekke fordeler. De fleste aktører er mest opptatt av forenklet saksgang og økt forutsigbarhet med hensyn på utbyggingsrekkefølge og endelig resultat, heller enn reduserte avgifter/direkte økonomiske insentiver. Sentrale tema for insentiver er hvordan man kan skape insentiver både for rehabilitering og nye bygg/områder.

Steg 4: 'No-go policy'

Insentivene for å være med på en SEC-avtale bør hjelpe til med å innfri mål og forventninger i samarbeidsavtalen, spesielt for å oppnå gunstig rekkefølge på implementeringen av planen.

Steg 5 Erfaringsinnhenting og prisutdeling/forbildestatus.

Bergen og Oslo ser for seg ulike måter å innhente erfaringer og hva disse kan benyttes til. Forslag som har kommet er en pris, som en SEC Forbilde-status, smart innbyggerdesign-pris og tilgang til erfaringsbase (Bergen), eller en gapestokk/pidestall-skjerm i bymiljøet hvor energibruk og energiproduksjon illustreres for innbyggerne (Oslo)

Steg 5: Erfaringsinnhenting og prisutdeling/forbildestatus.

Bergen og Oslo ser for seg ulike måter å innhente erfaringer og hva disse kan benyttes til. Forslag som har kommet er en pris, som en SEC Forbilde-status, smart innbyggerdesign-pris og tilgang til erfaringsbase (Bergen), eller en gapestokk/pidestall-skjerm i bymiljøet hvor energibruk og energiproduksjon illustreres for innbyggerne (Oslo)



Step 1: The development of a Smart Energy Community agreement

Participants of the PI-SEC project agree that the municipality, for the majority of cases, must be the driving force for a visionary SEC project. Yet, the driving force may also be a private stakeholder. In either situation, the municipality needs to make sure that there is a 'master plan', which includes a 'core of community' plan but also a chosen energy scenario based on different alternatives created in collaboration between municipality, utility company and private developer. Participants in both Furuset and ZVB agree that the agreement should include a strong vision holder. By vision holder, they mean that one stakeholder should have the responsibility and interest of 'pushing' the project forward and making sure it's on the political agenda. This role can be filled by the municipality, a private developer or similar, but this role is seen as central for the progress.

This means that a SEC Agreement should include a combination of a scenario approach developed by SINTEF Byggeforsk, and a 'Core of Community' Plan:



Figure 7: Step 1 SEC Agreement

- 1. Scenario development** for directly energy related targets, as designed in Task 1.2 Preliminary toolkit for goals and KPIs.
First, the 'baseline', or status must be described. The neighborhood description is divided into the following categories: buildings, infrastructure, local energy plants, district heating and transport. For buildings, the existing buildings must be defined related to size, usage or purpose (?), energy consumption, energy carriers and energy production. Energy related data can be difficult to obtain for existing buildings, and therefore normative numbers based on building category and regulations on technical requirements for building works valid at the year of construction may be used. Buildings can be described individually, or as a group of buildings with the same properties (full description in task report 1.2, Nielsen et al 2016). When the current situation is generated, a baseline scenario can be created. The baseline scenario should be based on the current situation, but planned renovations and new buildings should be included. Renovations and new buildings must be defined with energy consumption according to prevailing regulations on technical requirements for building works. The transport data must be updated based on the change in activity, but other factors should be kept constant. After this step, 'development scenarios' must be created. For the development scenarios, the new buildings and renovation projects should be described with the planned energy performance levels. In addition, other factors such as installation of renewable energy systems (solar collectors, PV) on the buildings could be implemented. Planned installation of local energy plants must be described. Data on the district heating system should be altered if there are plans for improving the energy efficiency or changing the share of different energy sources. Transport input data can be altered based on development of transport hubs or other relevant measures. Several scenarios can be generated to investigate the effect of different measures and ambition levels.
- 2. A 'Core of community' description** explaining which socioeconomic design aspects should be in place at the beginning of the project implementation:

Societal issues, particularly in physical planning, are considered as preconditions for attracting the 'right' citizens and a precondition for sustainable user behavior. For example, access facilities for bikes and electric vehicles should be designed within public spaces. This physical planning can also include dashboards to illustrate energy use for citizens. In Bergen, they see the sequencing of building infrastructure that can attract families and a balanced mix of social class citizens as a holistic planning

issue to ensure sustainable communities. They believe that a significant challenge to sustainability is that private developers begin building before societal services and public space are in place. Managing the sequence of building steps, they think, will in the end ensure increased public transport access and bike use (example from Bergen participants) because a successful community will mean increased population, increased economic activity and finally increased public transport access.

During the urban stakeholder workshops in Bergen and Oslo, participants suggested that a “Core of Community” agreement be developed including such societal issues.

With the municipality as the driving force, the municipality is responsible for inviting partners to collaborate in the creation of the SEC Agreement. The initial objective of the ‘Core of Community’ agreement together with the Scenario based agreement, is to make sure the directly energy related parts of the SEC are implemented in balance with socioeconomic design factors for the community. The Norwegian legal framework may allow for such an agreement: in the regulation plan ‘Sequence provisions’ (rekkefølgebestemmelser) 12.7 demands a particular order of implementation of “actions according to plan, and that development of an area cannot take place before technical systems and societal services such as energy delivery, transportation and road network, health and social services, kindergartens, play areas and schools, are sufficiently established”.

Suggested tools for Step 1:

During the Bergen and Oslo workshops, stakeholder agreement and commitment were emphasized as significant challenges and will be key issues to successfully implement Step 1 in the SEC Planning Wheel. We therefore suggest that the municipalities test the ‘Stakeholder Analysis and Engagement tool Step up Smart Cities’⁴. This tool can help identify and prioritize stakeholder’s goals early in the process and has been tested in Ghent, Glasgow, Gothenburg and Riga. It proposes a stakeholder identification and engagement process which leads to a common agreement. To strengthen this tool, the Gothenburg Energy Strategy Mapping can be useful for understanding energy issues earlier in the planning process and has been useful for Gothenburg to follow energy goals more clearly⁴. “Energy issues are most often not our first priority in planning, so this has been a good way to raise these topics”, says Anna Svensson, Project Manager at the strategic department at the City Planning Office in Gothenburg. “You get a new kind of overview of the energy flows; both at district level and in terms of the whole town. I also think that by using the energy matrix, we will be able to work more clearly towards the goals contained in the SEAP.”

Mobility aspects make up another clear part of the proposed SEC definition in line with input from the PI-SEC stakeholders. For the SEC Agreement, we propose that the municipalities look at the ElectriCity⁵ Integration of Mobility aspects tool project for inspiration on how to integrate mobility aspects in the SEC agreement. The ElectriCity project, comprising 14 partners, has established a demonstration area for electrified public transport in Gothenburg. Between June 2015 and 2018, the city’s new bus line 55 is served by three all electric vehicles and seven plug-in hybrids produced by Volvo. ElectriCity is a cooperation framework financed from separate budgets and run by a steering committee and a partner group. It is open to new partners interested in contributing to innovative electro-mobility development.

Additional wishes from participants for Step 1:

Participants from the Bergen workshop explain that they would like the municipalities to require at least 3 alternative developed scenarios for decision making support. Further, the workshop participants in Bergen proposed a “Bid and bundling’ process; an inclusive process directed at large and small private sector partners. This could be an approach to increase the involvement of small and medium scale enterprises in the agreement process. “Bid and bundling’ means that smaller private sector partners can add up smaller projects in order to achieve a certain CO2 emission reduction together; and that smaller solar cell companies, for example, should be able to combine several building projects in order to compete for emission reduction incentives. We have not been able to identify any similar tools within our international research but this wish can be integrated into task 2.3 Testing. An alternative to this approach is to look for business models for the citizens instead. The ManagEnergy project explains that ‘Community finance means money raised from the local community: including individuals and households, businesses and customers (e.g. of a cooperative venture). Community finance may be coordinated with leadership from the local authority. The new initiative

⁴ <http://www.stepupsmartcities.eu/> Gothenburg - Energy Strategy Mapping

⁵ <http://www.goteborgelectricity.se/en>

under the Intelligent Energy Europe programme will start in June 2017, to continue assisting actors working on sustainable energy at the local and regional level. Energy agencies will have the unique opportunity of enhancing their role as project developers, aggregators and facilitators for public authorities. In the next 3 years the “new ManagEnergy” initiative will organize Master classes and peer-to-peer coaching to raise the skills of local and regional energy agencies in energy efficiency, financing and project development. This can be an option for municipality planners to increase their competency within renewable energy financing.

Step 2: Core of Community fund (CCF)

The second step is a ‘gate’ for the SEC partners, in the sense that some demands will be set for the participants to access the incentives that follow. The gate should integrate energy and societal target commitment in order to ensure a decided sequence of building steps. This idea is based on a challenge that municipalities face when planning new areas; where the wrong sequence of construction often result in an unintended citizen type mix and consequently a less sustainable and holistic community lifestyle than they wanted. Workshop participants proposed that this gate takes form as a fund that ensures that a core of elements necessary to create the envisioned community depend upon. It is hence called a “Core of community fund” (CCF) in the preliminary planning wheel. In the Furuset project, this ‘core’ focuses on socio-economic interests such as the public transport hub and the public space, park and walking street. From Bergen, they mentioned examples of new building areas with expensive low emission housing, built before there was access to playgrounds and social services; resulting in gentrification and only elderly or private car users moving to an area intended for new families.



Figure 8: Step 2 Core of Community fund

Gentrification and increased social differences was seen by both municipalities as a threat to sustainable community planning. The ‘Core of Community’ plan could include participatory approaches for citizen involvement. The invited stakeholders to the SEC Agreement should hence have an idea of sequencing the building steps that focus on this type of ‘Core of Community’. Developers from the private sector who wish to be a partner from the beginning of a development, will be obliged to contribute financially to the common fund. This fund is meant to ensure the development of core objectives such as public meeting spaces, playgrounds etc. This is due to their experience with projects that were planned to be socioeconomically balanced, yet ended up being gentrified due to poor sequencing of private development steps. This core of community fund can be decided in each municipality and it can strengthen the agreement if it leads to the said incentives in step 3. Participants of the workshop agreed that if the path with a core of community agreement is a successful one, it will lead to increased investment/lower risk for the utility companies, which again leads to higher predictability of the sequence and outcome of the (overall) planning. With increased attractiveness to the community, their profit will accumulate.

Step 3: Access to incentives

In order to achieve commitment to the CCF, the contributing stakeholders must access appropriate incentives. The purpose of the incentives is for the municipalities to be able to achieve stakeholder commitment to environmental goals and stakeholder agreements beyond what they can currently require through building technology standards.

Examples of incentives that were proposed by private developers include:

- a. Builders and utility companies want to significantly speed up case processing,
- b. the 'core of community plan' can be a gate keeper; private developers and utility companies want the municipality to manage a 'sub plan' or an informal area plan for SECs that will allow these to start building sooner than the municipal master plan(KDP) is conventionally ready
- c. It was important for the stakeholders to ensure that incentives for energy renovation of buildings are thought of in the incentive program, as the lack of incentives for renovation affects the impact on emission reduction as well as the site selection process.

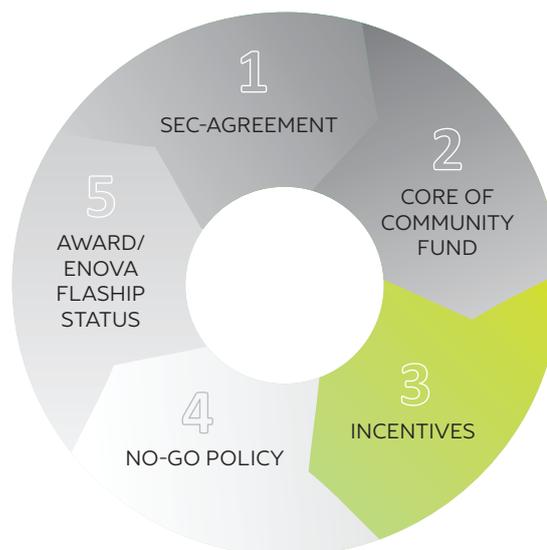


Figure 9: Step 3 Incentives

Suggestions from workshop participants for incentives:

Many of the suggestions for incentives can be met through the already available (in Oslo) Futurebuilt-programme⁶:

“Those who build a flagship project in FutureBuilt must contribute extra, but in return awaits honour and prioritized processing, reduced fees and professional assistance. You receive advice from hand-picked experts; you will be offered participation in specifically developed study trips, experience exchange with other relevant flagship projects and the right to market the project as a FutureBuilt Flagship project. All these projects are presented in the most extensive Norwegian database for environmentally friendly architecture and are frequently profiled through our newsletters.” In Futurebuilt, three municipalities already offer reduced building fees for Futurebuilt projects, and these municipalities have project leaders that “facilitate a smoother and solution oriented process” within the municipality (ref FutureBuilt). Regarding energy renovation of buildings, best practices for renovation of buildings The Buildings Performance institute Europe⁷ offers Best practice examples of voluntary and mandatory initiatives across Europe (Buildings performance institute Europe).

⁶ <http://www.futurebuilt.no/English>

⁷ bpie.eu/publication/renovation-in-practice

Step 4: 'No-go' policy

Private developers and utility companies call for municipalities to enforce stricter rules on developers who do not contribute to the sequence provision, or to the ordering of steps decided in the SEC Agreement. They explain that if others were prevented from building until the Core of Community contributors had started, this would be an added reason to commit early, and the utility companies explain that this would make it more predictable for them to join the first step of the planning wheel. This is because they need to know that the community will be realized as it is planned before they can take the risk of planning an energy system in detail.

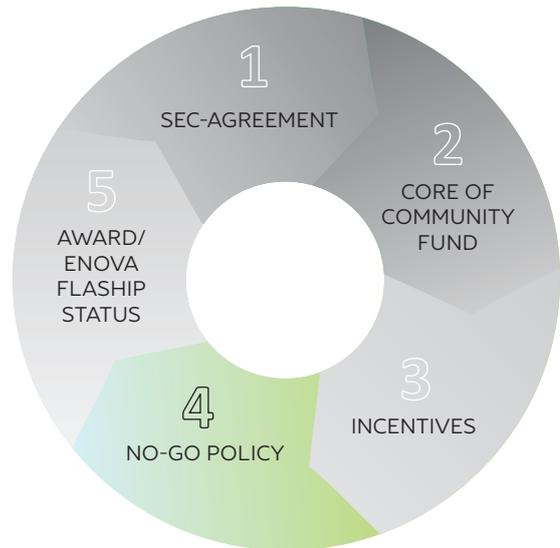


Figure 10: Step 4 'No-go' policy



Step 5: Award/ENOVA flagship status

An evaluation of the project planning and implementation should follow the four described steps of the wheel. This should be in line with the goals decided in the SEC Agreement, and participants suggest that this evaluation could lead to some sort of reward as well as access to a municipal or inter-municipal SEC experience base.

Oslo municipality is interested in the development of an Energy dashboard. This dashboard will present successful and non-successful stories to the public - a.k.a. a pedestal - pillory tool, which can show citizens and other stakeholders the success of energy and emission reduction publicly. In Bergen municipality, they would rather see an ENOVA award or flagship status. The minimal requirement for step 5 however, as wished by both Oslo and Bergen municipality, is the existence of a plan for evaluating SEC experiences that will improve the planning of future SECs.



Figur 11: Award/ENOVA flagship status

Suggestion of tools from international tool review:

The development of an Austrian system based on Salzburg examples for the evaluation of settlements based on the Swiss concept of the -Site⁸ (strategic measure: Design of urban competition processes), includes a continuous reduction of primary energy consumption from 6,500 watts today, to an average global energy consumption of 2,000 watts per capita (1, 2000-Watt 500 watts renewable and 500 watts non-renewable energy). In addition it resulted in a cut in Global Warming Potential from 8.7 tons to 1 ton CO₂-equivalents in the next 100 to 150 years. This concept is derived from a global view and applied on a European, national, cantonal and communal level. This tool is also introduced in Switzerland where “the quantitative assessment of measurable indicators like primary energy and other environmental impacts in building, development sites or neighborhood labels will play a more important role in future. The published guideline “Site development for the 2000-Watt-Society”, together with the calculation tool, may be good basis for this assessment or can serve as an inspiration for the development of an evaluation tool for competition purposes. The approach of the 2000-Watt-Society is only feasible in the context of a comprehensive sustainability when the economic and social dimensions are included. This has partly already been implemented in the new Swiss certificate “2000-Watt-Site-Development” which has been released by the supporting association of “Energienstadt» (Kellenberger, 2013)

⁸ <http://www.2000-watt-society.org/>

5.1 The connection between the SEC Planning Wheel (WP2) and Goals and KPIs (WP2)

The planning wheel is developed alongside bottom-up key performance indicators (KPIs) that are developed by SINTEF Byggforsk in Task 1.1 (Sørnes et al, 2016) Analysis of goals and KPIs in design projects (DP) of the PI-SEC project. These indicators are to be an integrated part of the planning wheel, particularly to support the decision making in the scenario development of a SEC Agreement (the first step of the planning wheel) as well as the final evaluation (the last step of the planning wheel). The detailing of the integration of the two toolkits into one is further an objective that we see essential in task 2.3 and 1.3.

In task 1.2 Preliminary toolkit of goals and KPIs in DP (Nielsen et al, 2016) we defined the goals in each case projects, and the pilot cities relevant for SECs have been collected and structured. We further categorized the goals into five main categories:

1. CO2-reduction
2. Increased use of renewable energy
3. Increased energy efficiency
4. Increased use of local energy sources
5. Green mobility

Based on relevant KPIs collected from literature, a final list of 21 main indicators was generated through a structured selection process. The indicators are divided into subcategories and sectors. A full list of the indicators is available in the task report 1.2 (Preliminary toolkit of goals and KPIs in DP).

The goals and KPIs can be considered as an independent toolkit for planning and monitoring smart energy communities. However, to facilitate the implementation, it is advised to use the goals and KPIs together with supporting tools. The supporting tools of task 1.2 are structured as a planning and follow-up tool utilizing the goals and KPIs, to evaluate the effect of different measures and choices.

The proposed planning tool can be an important part of Step 1 in the planning wheel presented above. The tool can be useful in setting ambitious but realistic goals, and link the achievement of goals to specific measures. This can help concretize necessary initiatives and place responsibilities within the project group.

The tool can be integrated into step 3 of the Planning Wheel, for evaluation of incentives, and in Step 5, for evaluation of flagship status or award. Contractors can use the tool to demonstrate the performance and ease evaluation for the municipality. With all partners utilizing the same tool for planning and demonstrating the effect of their efforts, the evaluation and decision making processes will be simplified and more efficient.

The tool should follow the project through the planning wheel and further into the construction and operation phase. Figure 12 illustrates the connection between the indicator based planning and follow-up tools developed in WP1 and the planning wheel developed in WP2. To improve the understanding of the interactions, the WP2 planning wheel has been folded out to a straight line planning process. Generally the goal and indicator toolkit developed in WP1 can be seen as a set of utility tools to aid the planning process described in WP2.

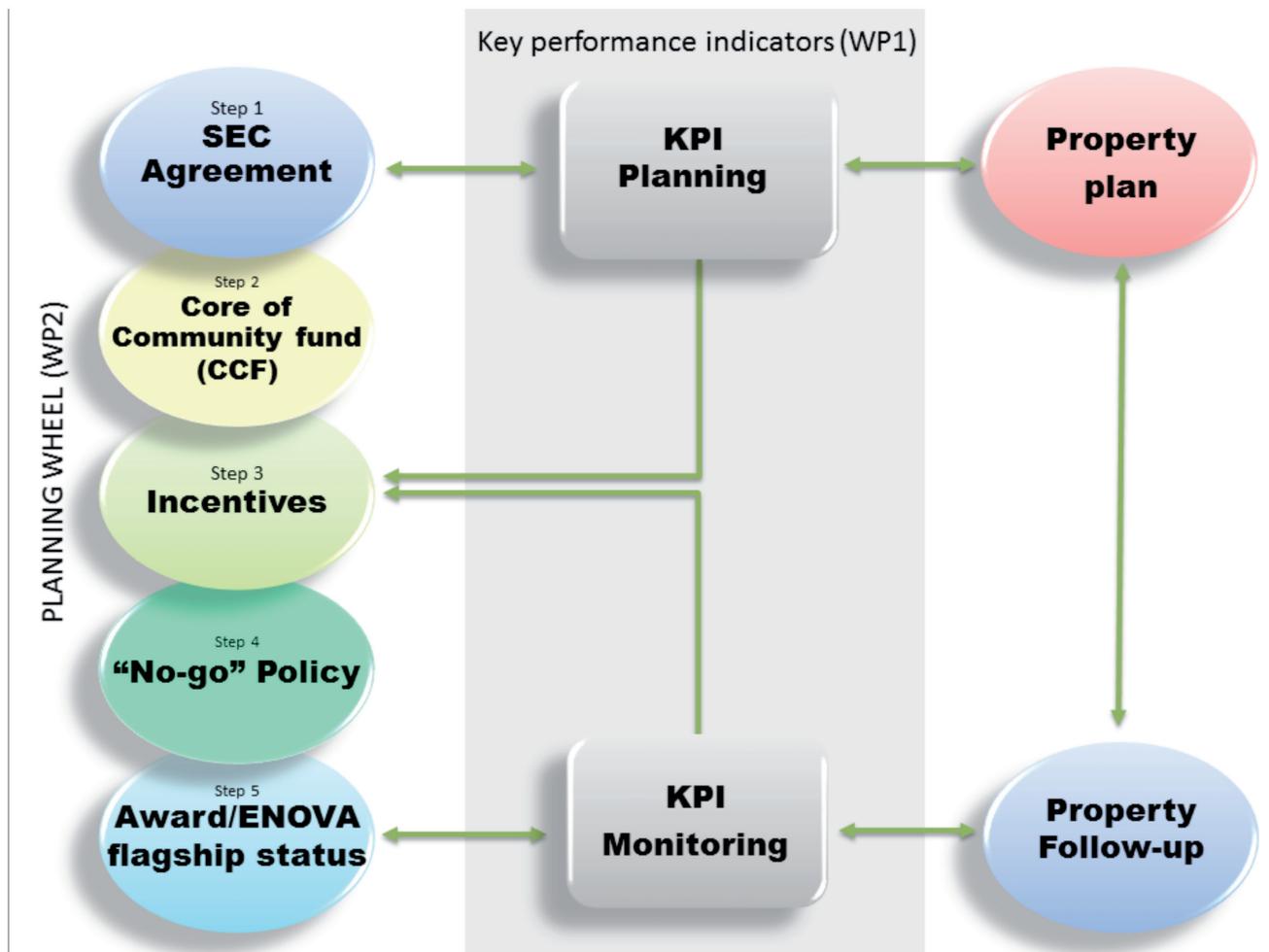


Figure 12 Our proposed connection between WP1 and WP2

The first stage of the planning wheel is the development of a SEC agreement. The WP1 indicator tool will be an integral part of this stage, by enabling definition of realistic, but ambitious, goals both on neighbourhood and individual building owner level. The use of indicator analysis on development scenarios can result in a property plan, as a part of the SEC agreement. The third stage of the planning wheel is access to incentives. The scenarios from the indicator tool and the resulting property plan will act as decision basis for choosing the incentives that best support the SEC development. Incentives can be tailored based on the goal achievement of the individual builder. The fifth stage in the planning wheel is the evaluation of the SEC planning and implementation process. Through monitoring of KPIs, the indicator toolkit will aid the evaluation both by comparing the planned scenarios with the real development of the indicators, and by enabling comparison between different SECs. Degree of goal achievement for individual building owners and properties can be directly compared with the property plans in the SEC agreement, and influence the disbursement of incentives. The results can as an example be visualized through a local screen or a city dashboard.

5.2 A working definition of Smart Energy Communities

An important result of the interviews and workshop discussions in PI-SEC is a working definition for Smart Energy Communities. There is currently no clear definition of a Smart Energy Community; yet the interviews and workshops identified a need for clear definitions to guide the decision making. We have proposed a working definition for the PI-SEC project (reference). The definition will be further refined during the testing of the toolkit in task 2.3. The definition was presented to all participants of the PI-SEC project and the municipalities of Bergen and Oslo, to ensure that all have a common understanding of what SEC means within the parameters of the project.

The long-term vision for a final definition is that it will live on beyond the project life of PI-SEC and be applied in the planning of future SEC projects. Below is the outline for the definition of SEC developed by NTNU and SINTEF Byggforsk, and edited after receiving input from 6 experts in IEA EBC Annex 63:

'A Smart Energy Community is an area of buildings; infrastructure and citizens sharing planned societal services¹⁰, where environmental targets are reached through the integration of energy aspects into planning and implementation. The Smart Energy Community aims to lower dependency on fossil fuels by becoming highly energy efficient and increasingly powered by renewable and local energy sources. Its spatial planning and localization considers reduction of carbon emissions also through its relationship with the larger region, both through the design of energy systems and by including sustainable mobility aspects of the larger region. It further encourages sustainable behaviour through its overall design from building and citizen scale to community scale. The application of open information flow, a large degree of communication between different stakeholders and smart technology are central means to meet these objectives.'

Two leading PI-SEC researchers of WP1 and WP2 who have been working directly with Furuset and ZVB initiated the development of this definition. They have used their experiences in data collection, development of PI-SEC reports and review of relevant literature to define key aspects of what is a Smart Energy Community. Added to the definition is Oslo and Bergen municipality's perspectives of SEC who see it as tying together three elements: the community aspect, the citizen perspective, and the energy resource perspective. Input to refine the definition has also been received through feedback from 8 experts of urban energy sustainability who are part of the IEA Annex 63 Energy in Buildings and Communities Project. (EBC, 2017) Furthermore, the definition support ideas presented in Annex 63 that community involves variable amounts of factors. It supports that these can be divided into four entities of physical, technical, organizational and socio-economic contexts (see figure 5).

The definition of Smart Energy Community serves as a frame for the toolkit, but can also be regarded as a tool in itself. The definition provides the involved stakeholders with a common understanding of what defines the SEC planning and implementation. A common understanding can facilitate communication and collaboration. The definition will be part of the toolkit and it will be refined based on feedback from participants Analysis of goals and KPIs in design projects during tasks 2.3 Testing of toolkit.

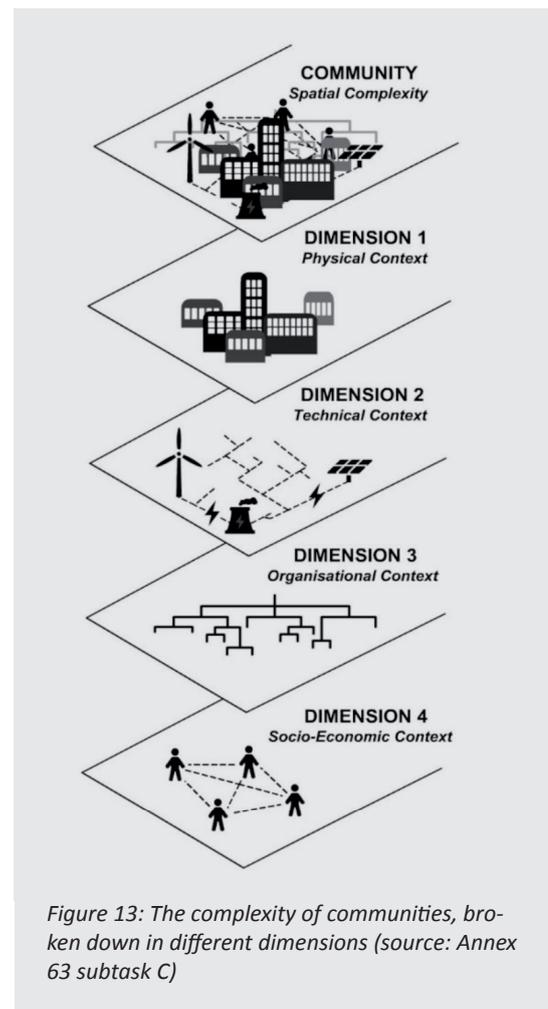


Figure 13: The complexity of communities, broken down in different dimensions (source: Annex 63 subtask C)

¹⁰ By societal services is here meant 'samfunnstjenester' as in the Norwegian Planning and Building Act 12.7 : such as energy delivery, transportation and road net, health and social services, kindergartens, play areas and schools



6. NEXT STEP: TESTING OF TOOLKIT

All steps of the SEC Planning Wheel will need to be further tested with Bergen and Oslo municipalities and be discussed with other municipalities to understand best practices and to add glorious failures or unforeseen consequences of this strategy.

The PI-SEC Toolkit will be tested in task 2.3 to see how the tools chosen in workshops perform when implemented into the PI-SEC cases of neighbourhood development projects.

Feedback from the reference group (see Acknowledgements) has provided the following expectations to the testing and redesign of the wheel, expecting that the testing will detail:

- Compliance between the planning wheel and existing planning processes
- Who is going to use (different parts of) the wheel
- SEC agreement: who is involved, who is leading it, is it legally binding, does it add financial obligations, alignment between the wheel and law. Today, legal frameworks are to contribute and ensure democratic rights through hearings, a professional evaluation and final political treatment. This agreement therefore has to be more specified.
- An evaluation of the relationship between the area, the city and the state
- Who will own and develop the energy plan?
- Elaboration on the Core of Community fund

Furthermore, particular interest has been shown from the municipalities

This will be done in close cooperation with PI-SEC researchers and municipalities. Testing will include 2 iterations for redesign of the planning wheel:



Figur 14: Testing of toolkit

Design iteration 1 (May - August):

The summer of 2017 will be spent to retrieve feedback from the participating stakeholders. These insights will be achieved through discussion with the stakeholders. This part will include:

- Identification of areas where each tool can be tested directly and indirectly; in the case studies as well as beyond. Creation of time plan together with the municipality of Oslo and Bergen.
- Discussion of practicalities and legalities of implementing the suggested tools
- Presentation and interview input from participants
- Surveys
- Discussion of legal framework. Particularly, the testing must include a legal consideration of the Core of Community agreement. It will be important for further work to consider how this 'core of community' (CCF) fund complies with sequence provisions ('rekkefølgebestemmelser') Does the CCF come in addition to this or is it complementary? Sequence provisions in short means that the property developer is responsible for certain actions before receiving the admission to build or before the certificate of completion (ferdigattest) is provided. These actions might include infrastructure, for example exits to the main road network, roundabouts or crossroads. During this part, the description of relevant legal framework in the PI-SEC report for task 1.2 chapter 2 must be taken into account as well.

Finally, this input will be applied to a restructuring and idea generation, and first redesign of the toolkit – planning wheel and tool suggestions.

Design iteration 2: (September-December) Co-redesign

Co-design effort: First redesign of wheel: replace or make amendments to recommended tools. Collaborative efforts: combined workshop Bergen/Oslo.

- Analysis of material and final detailing of design.
- Publication and review with participants.

Design iteration 3:

review of findings and final toolkit detailing. Application description.



6.1 Compliance with ZEN pilots

The Centre for Zero Emission Neighbourhoods in Smart Cities (ZEN), a recently established research Centre at NTNU and SINTEF, is comparing the experiences of five Norwegian municipalities beyond Bergen and Oslo. The research project includes an interview study with relevant stakeholders in these municipalities and the interview guide from PI-SEC has been applied as a part of the data collection.

It will be of relevance to the PI-SEC testing phase to see how the proposed SEC planning wheel and SEC definition comply with the lessons from the ZEN planning processes.

The Ydalir project in Elverum (see full case description in Appendix) is well suited for a comparison. Based on 8 qualitative interviews and a literature study of relevant documents, 5 major challenges could be identified in the planning process so far:

1. Demand for housing: The size of the Ydalir project covers the estimated demand for housing in Elverum for the coming 10-15 years. The recently designation of another building zone in the eastern part of the city could jeopardize the implementation of the project within the contemplated timeframe.
2. Setting of appropriate system boundaries
3. Planning of an energy system based on several natural energy sources (sun, ground heat, district heating based on wood) which are combined in an appropriate way without being too complicated
4. Continuation in process management: The land development agency in Elverum (Elverum Tomteselskap) is the project owner and normally their responsibility ends when selling the ground. The further management of the process is not yet decided.
5. Disagreement between the private landowners could jeopardize the project goals
6. A predictable sequence of construction and timeframe

As we read from this list, several issues in the planning of Ydalir are aligned with the ZVB and Furuset challenges. The issue of need for housing affecting the planning process is similar to the Furuset challenge; the misalignment of different building projects could make it difficult to guarantee a sufficient demand for the established residential buildings. The second challenge of system boundaries is one that we have attempted to approach in report 2.1 and 2.2; first through the discussion and analysis of system boundaries and secondly through our proposed definition of SECs; which hopefully will help the research and planning communities to reach an agreement on system boundaries. The third challenge; combining different resources, is particularly present at ZVB, but also at Furuset they are having challenges with this. The number of stakeholders and steps in the SEC agreement we propose, should be discussed with the ZEN case municipalities. The fourth issue with the question of who leads the process, was raised in both the Oslo and Bergen workshop. In Oslo suggestions were made that Oslo municipality should construct their own in-house energy bureau. In order to achieve this, the municipalities could look to Denmark and the Netherlands, which both have in-house energy planning wall-to-wall with urban planners (see Annex 63). Fifth, the landowner issue is particularly an issue in municipalities who do not own land, which makes it difficult for them to have a clear property strategy for SEC planning.

Finally, a predictable sequence of construction and timeframe is important for the development of an appropriate energy system and minimizes the risk for the involved stakeholders. Like Ydalir, several landowners (public and private) who could tend to follow personal interests characterize the Furuset development, and this multi-stakeholder situation makes it more difficult to follow a predictable sequence of construction. This is different in Bergen, where there is a single land owner.

Regarding tools helping to establish a ZEN, the Ydalir case has in addition to the referred tools in chapter 5.6 used one tool worth to highlight. A series of 5 common workshops about different topics related to ZEN was attended by all the involved stakeholders in the early planning phase. The interviewed partners highlighted these workshops as an important measure to build up a common understanding for ZEN and to discuss different solutions for the energy- and infrastructure system and the design of the whole neighborhood. Besides that, the regular meetings created a commitment and ownership to the project as well as trust

between the stakeholders. This could be an important resource for the further planning and implementation phase. The workshops were financially supported by ENOVA¹¹.

6.2 Remaining gaps and final comments

The findings from studying the two cases has shown that the creation of Smart Energy Communities is a complex issue covering many disciplines. Smart Energy Communities, as any other parts of urban planning, need to take into account people's need for good living environments as a fundament for reaching environmental targets. This is because people's behavior is key to lowering emissions. Public and private sector stakeholders' understanding is therefore that the sustainability and feasibility of the final design is depending on integrative thinking including good living environments, energy and emission aspects and cost/benefit for the involved stakeholders.

In order to integrate energy into urban planning, we have therefore suggested a planning process which begins with a core of community agreement and the proposal that utility companies, builders and municipalities work diligently to realize this core together. It remains to the testing phase to ensure that the final toolkit is practical and useful.

A few issues are not sufficiently described in this report or sufficiently covered by the tool. This is partly because they go beyond the scope of the SEC definition and beyond the limits of the planning practice of SECs, and partly because they would need additional research efforts to those covered by the PI-SEC proposal. These are:

Citizen participation and design for sustainable behavior were raised as important issues by participants. Yet, the planning wheel does not yet fully include how the gap between participatory methods and stakeholder involvement in the first steps of the planning can be bridged. The involvement of the early planning phase suggests to include the utility companies' interests for a synchronization of incentives and targets, yet this approach does not solve the issue of citizen participation. This issue can however be a good topic for the extended ZEN or other wider reaching research projects within NTNU and elsewhere.

Mobility: Furthermore, **external factors that affect the planning** and particularly affect the mobility issue: many of the conflicts in the project planning of the two cases were linked to decisions above the municipal level. Particularly, this includes the regional mayor, decisions by the ministry of environment and the national road administration (Vegvesenet). However, these issues remain outside the concluding definition of Smart Energy communities and will therefore remain as research projects to come or will be covered by the wider ZEN research project.

This concludes the PI-SEC report 2.2.

¹¹ Enova SF is owned by the Norwegian government and supports financially projects for reduced greenhouse gas emissions, development of energy and climate technology.

Acknowledgements

Thank you to the national and international experts giving valuable input and comments to this report:

Helene Egeland (Klimaetaten, Oslo Kommune)

Mathias Carl Mangor Bjornes (Plan- og bygningsetaten, Oslo Kommune)

Elisabeth Sørheim (Klimaetaten, Bergen Kommune)

Kjersti Folvik (NGBC)

Miimu Airaksinen (VTT)

Guro Grøtterud (NVE)

Jens Gran (Standard Norge)

Asgeir Tomasgard (NTNU)

Mathias Bjornes (Oslo kommune)

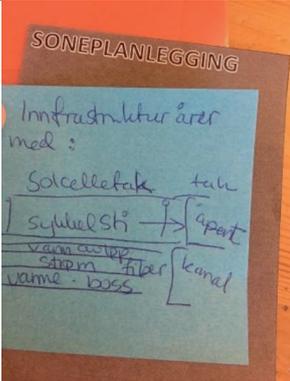
Henrik Madsen (DTU)

References

- Blomquist, Å., & Arvola, M. (2002). *Personas in action: ethnography in an interaction design team*. Paper presented at the Proceedings of the second Nordic conference on Human-computer interaction.
- Börjeson, L., Höjer, M., Dreborg, K.-H., Ekvall, T., & Finnveden, G. (2006). Scenario types and techniques: towards a user's guide. *Futures*, 38(7), 723-739.
- Dorst, K. (2011). The core of 'design thinking' and its application. *Design studies*, 32(6), 521-532.
- Dreborg, K. H. (1996). Essence of backcasting. *Futures*, 28(9), 813-828.
- Kolodner, J. (2014). *Case-based reasoning*: Morgan Kaufmann.
- Miaskiewicz, T., & Kozar, K. A. (2011). Personas and user-centered design: How can personas benefit product design processes? *Design studies*, 32(5), 417-430.
- Nielsen, J.-N., Wyckmans, Andresen *Planning Instruments for Smart Energy Communities: Report 2.1*
Retrieved from https://www.ntnu.edu/documents/21392748/0/PI-SEC_Report+2_1_FINAL+%281%29.pdf/059ff5d9-6eef-4431-a5ed-996e4ebfd7be
- Risholt, B., Thomsen, J., Kristjansdottir, T., Haase, M., Liean (Ceoto), K., & Dokka, T. H. (2014). *Energikonsepter for Ådland boligområde*. ZEB Project report 15. Retrieved from Sintef Academic Press, Norway:
- Rowe, P. G. (1991). *Design thinking*: MIT press.
- Sartori, I., Dokka, T., & Andresen, I. (2011). Proposal of a Norwegian ZEB definition: Assessing the Implications for Design. *College Publishing*, 6(3), 133-150.
- PI-SEC Planning Instruments for Smart Energy Communities. Report 2.1 'Analysis of goals and KPIs in design projects'

Appendix

Output from suitcases exercise in Bergen and Oslo

	KATEGORI	BESKRIVELSE
BYPLANLEGGER	BEHOVSANALYSE	Ingen privatbiler i Bergen sentrum, alle biler er en kollektiv ting, ikke en privatsak
	DATAMODELLERING	MÅLBILDE: bygging, område
	SJEKKLISTER	Blå-grønn infrastruktur, energiløysinger
	OPPSTARTSMØTE	
	OPPSTARTSMØTER MED GRØNT, GULT, RØDT LYS	
	PLAN OG BYGNINGSLOVEN	Mer 'svensk' modell. Bi ekspertene mer makt. Mindre makt til politikere, fordi de bare har 4-8 års perspektiv
	SAMARBEID MELLOM	Byforvaltning og offentlige funksjoner ifht målforståelse
	REGULERING AV TOMTER	Kommunen!
	FORBILDESTATUS	Kommunen
	KOLLEKTIV	Løsninger
	TRANSPORTREDUSERENDE TILTAK	Elsykler og sykkeltraseer under tak
	ØKONOMISKE MODELLER	
	BUSINESSMODELLER	
	OPPLÆRING	Finn suksesshistoriene og kopier disse! Eks Drammen kommune
	BÆREKRAFTIG BRUK AV BYGG	Med områdeperspektiv
	KOST/NYTTE ANALYSE	Krav ifht å nå mål
	FORENKLET ADGANG TIL SØKNADSPROSESSER FOR PRIVATE BEDRIFTER	
	ERFARING	Etterprøve reguleringsplaner og sjekke om mål blir oppnådd. Lære av tidligere planer. Plan 2-2 virkelighet
	DELTAKENDE PROSESS	
	EIENDOMSREGULERING FOR NULLUTSLIPP	
	VISUALISERING	
	SONEPLANLEGGING	
	EKSPPRIERING	
	KOMMUNAL BOLIGUTBYGGER	
	KLIMA OG ENERIGSTRATEGI	

INNBYGGER	OPPLÆRING	<ul style="list-style-type: none"> • I bruk av energieffektive bygg for beboer ex. Byggmanual som følger bygget • Utvidet kunnskap om eget energiforbruk • Tiltak solceller, solfangere etcc.
	BEHOVSANALYSE	Ingen privatbiler. Alle biler er en kollektivløsning. Delingsøkonomi
	TEKNISK FORSKRIFT	Egenprodusert energi. Egen lagring av energi/ batteri
	MÅLING AV	CO2avtrykk i valg av 'alt'
	TRANSPORTREDUSERENDE TILTAK	Sykkel
	INSENTIVER	Skattefordeler ved å bo mindre. Skatteulempet ved å 'breie seg' Dyrere energi ved høyere forbruk Smart energihus er kult (store bad eks)
	MÅLING AV	<ul style="list-style-type: none"> • Energibruk • Omfang • Effekt • Tid • Strømforbruk • CO2utslipp
	DESIGN AV BYGG SOM LEGGER TIL RETTE FOR BÆREKRAFTIG ADFERD	
	PLAN OG BYGNINGSLOVEN	
	EIENDOM	<ul style="list-style-type: none"> • Kollektive løsninger (eie/leie) • Nye eierskapsformer
	INSENTIVER	<ul style="list-style-type: none"> • ENOVA • Husbanken • Salg av energifrenklet adgang til søknadsprosesser for private
	OPPSTARTMØTE	
UTBYGGER	OPPLÆRING FOR	Utbygger i bærekraftig utbygging og energieffektive bygg
	FORBILDESTATUS	Utbygger bygger forbildebygg
	BÆREKRAFTIG BRUK AV BYGG	I en områderegulering
	PLAN OG BYGNINGSLOVEN	
	DESIGN AV BYGG SOM LEGGER TIL RETTE FOR BÆREKRAFTIG ADFERD	
	OPPSTARTSMØTE	
	ERFARING	Finn suksesshistoriene, kopier disse, ikke finne opp hjulet på nytt
	KOLLEKTIV	Løsninger
	UTVIDE KUNNSKAP OM	Planprosess
	INSENTIVER	
	VISUALISERING	
	KOST/NYTTE-ANALYSE	Av alternative områdevalg
	SMARTE BYGG: ENERGI FOR TRANSPORT FRA BYGG	Og energi fra transport til bygg. Veiene er laget av solcellepaneler. Bilene er kun elektriske
	DATAMODELLERING	
	OPPSTARTSMØTER MED GRØNT, GULT, RØDT LYS	
	DELTAKENDE PROSESS	
	DATAMODELLERING	
UTVIDE KUNNSKAP OM	Energieffektive boligområder	

KRAFTLEVERANDØR	DATAMODELLERING	
	OPPSTARTSMØTE	
	MÅLING AV INSENTIVER	Energibruk, parameter i aggregat Økonomisk, betalt for egenprodusert energi som selges til nettet, som er høyere priset enn om man kjøper energi (som i Tyskland)
	BÆREKRAFTIG BRUK AV BYGG	Med områdeperspektiv
	DATAMODELLERING	
	KOST/NYTT-ANALYSE	Lokale ressurser i samspill med sentralt system
	TEKNISK FORSKRIFT	Privat, egenprodusert energi. Egen lagring av energi/batteri
	UTVIDE KUNNSKAP OM	Plan fra kommunal forvaltning Plannleggermål og utbyggermål
	DATAMODELLERING	Eks <ul style="list-style-type: none"> • Energiløsning • Lokale ressurser • Sammen med sentral styring
	FORBILDESTATUS	Forbildene må også kunne dele hvordan de har løst utfordringene
	ENERGIMODELLERING	
	KOLLEKTIVE	Løsninger
	PLASSERING AV	Infrastruktur

STRATEGIER

- Varme/energilager
- Enklere vannbårne systemer
- Styringsystemer på områdenivå
- Sammenligne varmeløsninger
- Varmeplan/energiplan på områdenivå
- Felles/nye eierskapsmodeller
- Leie takflater
- Lokal energileveranse
- Mer effektiv teknologi, smartere løsning?
- (Juridisk) Åpne for strengere krav i planer for områder
- Felles energiløsning
- Enkelt: ting må være enkelt for sluttbruker
- (ref bil) for sluttbruker
- Opplæring for sluttbruker
- Myndiggjøre utbyggere og sluttbrukere
- (Vollebekk) tilpasse etatene til nye energiløsninger
- Forankre felles mål
- Kommunale bygg går foran
- Bedre samhandling mellom etater
- (Vollebekk) Synliggjøring av problemstillinger
- NBBC som rådgiver
- OBOS som energirådgiver
- Investeringstilskudd
- Tilknytningsplikt
- Økt energiavgift?
- Plusskundeordning
- Skatte og avgiftspolitik

HINDER

- Ingen overordnet energiplan i Oslo sammen med Hafslund
- Bygges enkelt og billig (=panelovner)
- Ikke krav utover TEK
- Lokale bestemmelser ↔ sentrale bestemmelser
- Ofte endring i politikk (uforutsibarhet)
- Kjøper bryr seg ikke om energimerke
- Lave energipriser
- (Juridisk) hvordan bruke de rammene og regelverket som er
- (Energi) Lokale optimale løsninger vs. optimale kollektive løsninger
- Sluttbrukere: borettslagsstrukturen krever enighet om beslutninger
- Eiendomsforvalter: hvordan få eks. Eier til å oppgradere (rehab)
- Fremmedgjøring av tiltak (mobilitetsanlegg)
- Kostnadsforedling/finansiseringsavtaler
- Sikre at utbygger oppfyller ambisjoner
- Dårlige erfaringer med komplekse løsninger
- Sluttbruker: få sluttbruker til å bidra
- Mangel på kompetanse
- Beslutningsvilje
- Timing
- Rettslig risiko
- Skepsis til nye ansvarsområder
- Mangel på gjennomføringsevne

MÅL

- Risikofordeling
- Mulighetsrom i regelverk
- Fleksibilitet i rutiner og utbyggingsavtaler
- Løsninger enkeltbygg ↔ område
- Økt kompetanse
- Engasjement
- Gode prosesser i borettslag
- God dialog mellom kommune og Hafslund
- Lavere risiko
- Bedre bygg
- Bedre samspill
- Energistrying
- Gode områdeplaner
- Nullenergi-bygg
- Ny energiløsning basert på avløp
- Sluttbruker og utbygger bidrar til å nå klima og energimål

STRATEGIER

- Snarveier eks Sykkeltunell
- Energilagring
- Lokal energiproduksjon (**)
- Redusere energibehov
- Tiltak for å redusere effekttopper
- Utnytte energien bedre for et område (**)
- Bedre samspill mellom politiske virkemidler og lovverk
- Bedre utnyttelse av tilgjengelig varme
- Installere solcelleanlegg
- Energi må inn tidlig i planprosess!
- Planleggingsprosess må kunne ta meir tid også diskutere energi
- Tydelighet mellom utbygger og plansaker
- Lage standard praksis for kostnadsberegning
- Eierskap til prosess
- Lignende til renovasjonstankegang (?)
- Gjøre det fornuftig økonomisk å handle miljøvennlig
- Kommersielt perspektiv må inn
- Få til en samlighet i planlegging (*)
- Sette konkrete krav til planlegging TIDLIG
- Gjøre energikrav til premiss/pålegg
- Lignende løsning som "graveklubben"
- Raskere saksbehandling (gulrot)

HINDER

- Fossil energibruk
- Arbeidsplasser kort avstand
- Folkehelse
- Bilbruk krever stort areal
- Motvilje mot høye hus
- Overdimensjonering av nettkapasitet
- Typografi
- Energi går til spille
- Kombinere energikilder på en mer effektiv måte
- Energisystem som tåler variasjon i energitilgang
- Lite fleksibilitet til lokale tilpasninger i plan og bygningsloven
- Uforutsigbarhet ved bruk av varmekilder lokalt
- Kostnad for PV anlegg
- Økonomi i plansaker
- Energi skal tiplases for seint i prosessen
- Separat planlegging: Areal 1 - energi 2
- Forutsigbarhet i saksbehandling (eks innsigelse fra fylkesmann)
- En som ikke blir involvert før i slutten av søknadsprosess
- For mange instanser involvert i hele prosessen
- Forstå behovsbegrepet på overordnet planlegging
- Den økonomiske gevinsten er ikke fordelt mellom partene i prosessen
- Kjøper av tomt må akseptere gitte premisser
- Byråkrati
- Tørr ikkje planlegge tomtene fordi kostnader blir for høye
- Struktur ikke egnet for raske prosesser
- Ikke satt av tid til helhetstenkning energi i tidlig fase (*)
- Næringsutvikling for realisering av klima-energimål

MÅL

- Energieffektivitet
- Livskvalitet
- Luftkvalitet
- Samfunnsøkonomi
- Økt energifleksibilitet i lovverket
- Redusere energibehov for et område - IKKE bare et bygg
- Energiselvstendighet / uavhengighet
- Energi må være premiss
- Avklaring i prinsipp saker
- Tidlig fase energi
- Energiplanlegging tidlig i prosess
- Kommunen må være drivere (*)
- Infrastruktur avklart i tidlig fase (*)
- Forutsigbarhet
- Økonomisk lønnsomhet
- Fornøyde og miljøvennlige kunder!
- Tidlig målavklaring
- Premiss/krav for energi på lik linje som avfall og parkering etc.

Another example of smart energy planning: Ydalir i Elverum, Hedmark

The Ydalir project aims to develop a new neighbourhood with high energy and emission ambitions in the town of Elverum in Hedmark. In an estimated timeframe until 2030, 800 to 1000 housing units should be developed (approx. 100.000 qm). The housing units are planned as a combination of detached houses and block buildings, built around a school for approx. 300 students (approx. 5.000 qm) and a kindergarten with 8 units (approx. 1.500 qm).

Status: Between autumn 2016 and spring 2017 a masterplan for the neighbourhood was developed in cooperation between the project owner, a land development agency (Elverum Tomteselskap), and the involved stakeholders. 5 workshops over the period of 6 months were dedicated to different aspects of the project development like Aims and Vision, Energy, Building and Infrastructure, Transportation and ended with a summary workshop in April 2017. The construction of the school will start in 2017 and will be completed in 2019, so that the first students start school in autumn 2019. After signing an intention agreement (intensjonsavtale) in 2016, the contractual negotiations between the landowners and developers started in spring 2017. The construction of the first residential buildings is estimated for 2019.

The **goal** of the project is to plan and develop a major new development area in a new way to reduce mobile and stationary energy demand and greenhouse gas emissions (Asplan Viak 2016:4). Ydalir is also seen as an environmental forerunner project for the city. The first construction in the area - the school - is planned as a Zero Emission Building (ZEB) with ZEB-COM standard.

The goals are tried to be fulfilled by **measures** in 5 thematically areas:

- A planning and design process which transfers the methodology of "Integrated (Energy) Design" from



the building to the neighbourhood level (Asplan Viak 2016:9). The planning phase is characterized by a corporate development of a masterplan for Ydalir.

- The demand for energy should be minimized within the building stock and the energy production should be based on local sources (sun, groundwater, wood and sewage). Energy shall be stored in batteries or within the bedrock.
- The used building materials shall have a long lifetime, consist of a high amount of recirculated materials and have a low carbon footprint. The preferred building material is local wood or recycled materials. In general, the amount of building materials shall be reduced and optimized.
- The traffic infrastructure enables the residents to use public transportation or individual transportation by foot or bicycle. Investment in a good public transport with 4-6 bus rides per hour, good walking and cycling paths, and a restricted car policy with community parking space far away from the houses shall make transport alternatives with low emissions more attractive.
- The planning of a public space which supports an emission-friendly lifestyle

The involved **stakeholders** are the projectowner Elverum Tomteselskap (landdevelopment agency), a public organisation which intends to enable population grow by developing land for housing and businesses to a reasonable price in Elverum. 80 % of the land in Ydalir is owned by the development agency and two private landowners count for approx. 20 % of the area. Other stakeholders involved are Elverum municipality, seven local developer, consultant agencies, transportation agency (Hedmark Trafikk), energy agency (EIDSIVA) and researchers from NTNU and SINTEF.



