



PI-SEC

TOOLKIT FOR THE PLANNING OF SMART ENERGY COMMUNITIES:

PI-SEC REPORT 2.3:
Challenges and best practices from
testing of the PI-SEC Planning Wheel

Authors: Brita Fladvad Nielsen, Savis Gohari, Åshild Lappegard
Hauge, Kari Sørnes, Harald Taxt Walnum, Taru Uusinoka, Karen
Byskov Lindberg
Reviewers: Dave Collins, Siri Joli

Oslo/Trondheim, October 2018



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Contact info:

www.ntnu.edu/smartcities/pi-sec

Design: synlig.no

Print: Fagtrykk

Photo: synlig.no / Shutterstock / private

Forord/sammendrag

For at vi skal nå nullutslippsambisjonene, må de viktigste aktørene jobbe tettere sammen. Dette er fordi ulike virkemidler må settes inn i kombinasjon for å nå de høye målsetningene som de norske bykommunene har satt seg. PI-SEC er et norsk forskningsprosjekt som varer fra april 2016 til oktober 2019. Prosjektet er finansiert av EnergiX-programmet i Norges Forskningsråd. I dette prosjektet har vi studert planleggingen av to smarte energisamfunn, et i Bergen og et i Oslo. Prosjektet er delt inn i to arbeidspakker (WP), hvor WP1 tar utgangspunkt i utviklingsprosjekter (bottom-up), mens WP2 tar utgangspunkt i kommuneplanlegging (top-down). Arbeidspakke 1 ledes av SINTEF Byggforsk, Arbeidspakke 2 av NTNU. Sammen utvikler vi en verktøykasse for planlegging av smarte energisamfunn som inneholder både overordnede planleggingssteg og måleverktøy for energieffektivisering. Verktøykassen er tolket bredt og omfatter mange typer virkemidler, fra lovverk til erfaring og kontaktnett.

De to smarte energisamfunnene eller også kalt casene, består av Zero Village Bergen (ZVB) og Furuset forbildeprosjekt. ZVB er et pilotprosjekt hvor utbyggeren ByBo sammen med Snøhetta har designet et område bestående av 800 nullutslippsbygg på Ådland utenfor Bergen. Furuset Forbildeprosjekt er et fortettingsprosjekt i en eksisterende drabantby i Oslo, som har store sosiale og miljømessige målsetninger.

En ny måte å jobbe sammen på krever en ny type planleggingsprosess hvor flere aktører finner en grunn til å være med. Energiaspekter må inn tidligere i planprosessen enn det som er vanlig, reguleringshindringer må diskuteres og løftes tidlig. Energiselskaper forklarer at de trenger et insentiv for å være med tidlig, en grunn til å skulle være med på tidlig planlegging. Hva kan dette bestå av fra kommunens side?

Alt avhenger av en god start, derfor er det essensielt å ha fokus på å forbedre konseptutvikling og få til gode avtaler tidlig i planleggingsfasen. Dette har vi forsøkt å drøfte i delkapitlene A-Z. For å få til den tverrfaglige innovasjonen det legges opp til og som kreves for å nå bærekraftig fremtid, må vi se videre på bruken av alternative reguleringssoner som går langt utover energi i bygg. Disse demo-sonene må ha vilkår for bedre og oppdaterte måter å involvere sluttbrukere/innbyggere på, profesjonelle 'koordineringsteam' og en god visjonssetting som inkluderes i alle ledd. Identitet kan skape en sterk drivkraft i pilotene, men også mangel på samarbeidsvilje mellom regionene. Og hvem eier egentlig visjonen? Dette er et viktig spørsmål å svare på.

For mer om verktøyene, se rapportene på nett: <https://www.ntnu.edu/smartcities/PI-SEC/publications>

Stor takk til prosjektgruppa for innspill:

Helene Egeland (Klimaetaten, Oslo Kommune)
Mathias Carl Mangor Bjornes (Plan- og bygningsetaten, Oslo Kommune)
Elisabeth Sørheim (Klimaseksjonen, Bergen Kommune)
Ingunn Renolen (Byplan, Bergen Kommune)
Anders Nohre-Walldén (NGBC)
Miimu Airaksinen (VTT)
Guro Grøtterud (NVE)
Jens Gran (Standard Norge)
Asgeir Tomasgard (NTNU)
Gerhard Stryi-Hipp (Fraunhofer ISE)

Stor takk også til alle informanter som har stilt opp til intervju om verktøyene!

Trondheim, April 2019

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English - Norwegian Dictionary

In the report, the following translations are used¹:

English	Norwegian
Building applications	Byggesak
Central government land-use plan	Statlig arealplan
Cities of the Future	Fremtidens byer
County master plan	Fylkesplan
District	Fylkeskommune
Energy frame requirements	Energirammekrav
Key Performance Indicator (KPI)	Nøkkelindikator
Licencing	Konsesjon
Municipal master plan	Kommuneplan
Municipal coordinator	Kommunal saksbehandler
Plan for land use	Arealplan
Planning and Building Act	Plan og bygningsloven
Regulations on technical requirements for building works	TEK / Byggteknisk forskrift
Smart Energy Communities (SEC)	Energismarte områder
The Norwegian Water Resources and Energy Directorate	Norges Energi og Vassdragsdirektorat (NVE)
Urban Environment Agreement	Bymiljøavtale
Waterborne heating / cooling	Vannbåren varme/kjøling
White paper on energy policy towards 2030	Energimeldingen
Zoning plan	Reguleringsplan

¹A general list of English-Norwegian terms related to the Norwegian Planning and Building Act is available on <https://www.regjeringen.no/no/tema/plan-bygg-og-eiendom/plan--og-bygningsloven/plan/veiledning-om-plan-legging/Bokmal-nynorsk-ordliste/ordliste-norsk-engelsk--plan--og-bygning/id462717/>

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1. PLANNING INSTRUMENTS FOR SMART ENERGY COMMUNITIES – BACKGROUND

PI-SEC er et norsk forskningsprosjekt som varer fra april 2016 til mars 2019. Prosjektet er delt inn i to arbeidspakker (WP), hvor WP1 tar utgangspunkt i utviklingsprosjekter (bottom-up), mens WP2 tar utgangspunkt i kommuneplanlegging (top-down). Denne rapporten beskriver et prosesshjul for planleggingen av smarte energisamfunn, hvor en rekke utfordringer som slike prosjekter støter på er plassert i rekkefølge i forhold til sted i planleggingsprosessen. For hver planleggingsfase beskrives det en verktøykasse av virkemidler som kan brukes til å løse utfordringer som typisk oppstår i disse fasene. Planleggingshjulet er en verktøykasse som møter utfordringene funnet hos kommunale planleggere.

1.1 Description of task 2.3

Methodology and testing of the toolkit is described extensively in the parallel publication 1.3/2.3.

This report explains the output from task 2.3 in PI-SEC from the perspective of municipal planning.

Task 2.3: “Testing of planning instruments toolkit in case studies” tests how the chosen planning instruments perform when implemented into the PI-SEC cases of neighbourhood development projects, in cooperation with PI-SEC researchers and municipalities. The main tool is an action research method, i.e. co-generation of new information and analysis with resulting actions producing insight both for researchers and participants with the aim of improving practice (Greenwood and Levin, 1998). Researchers and stakeholders work together in knowledge development and implementation of practical problem solving, aiming to extract “lessons learnt” and build and replicate successful practice within and beyond the project.

Design thinking, transformative and comparable to action research, is a complex method as it not only involves researchers being immersed in their field work; they must also take a reflective examination of what they are doing. Thus, researchers from NTNU have participated in ongoing processes in the municipalities related to development of plans and documents related to the case studies, including secondments/internships, interviews with stakeholders, testing of tools/approaches and document analysis to coordinate tacit and explicit knowledge. The work includes preparation and adaptation to local context; implementation in the PI-SEC cases, and monitoring of results. The results are used to adapt the planning instruments from task 2.2 for better performance in each PI-SEC case, and in Norwegian context in general. The outcomes provide the basis for the development of a common definition and assessment framework for smart energy communities in Norway.



2. METHODOLOGY



2.1 Co-designing a process for smarter municipal planning

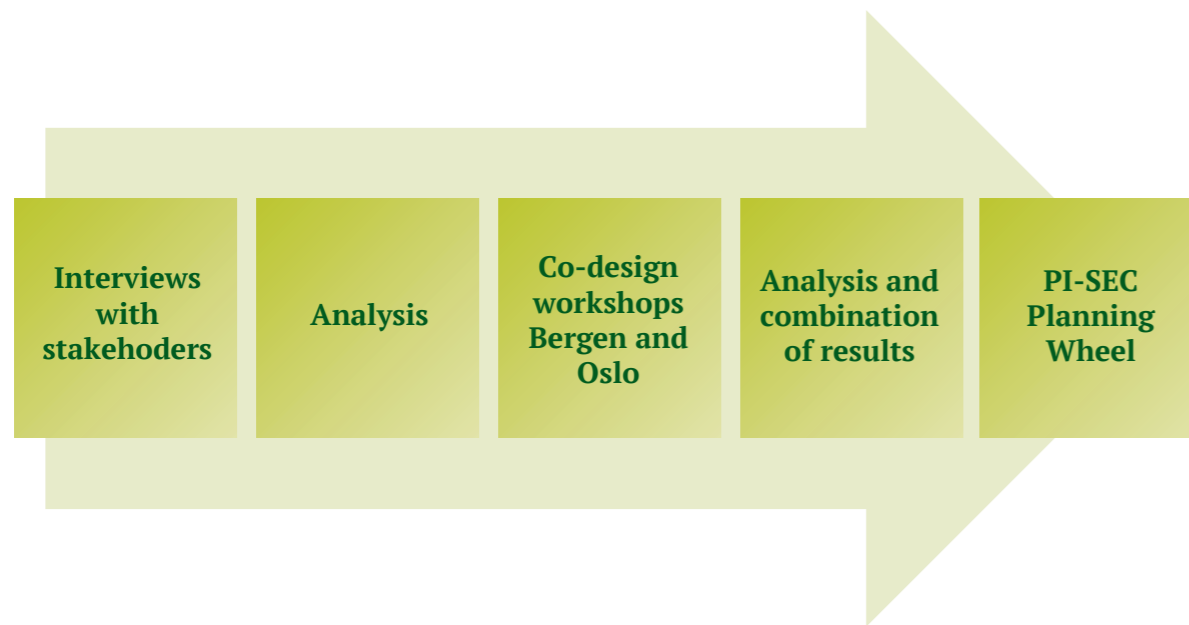


Figure 1: Project process

The PI-SEC-planning wheel laid out a process, co-designed with stakeholders from Furuset forbildeprosjekt and Zero Village Bergen. Municipal planners are the target groups of this new process, that suggests a more integrated and holistic process in which energy utilities and other private stakeholders are involved at a much earlier stage in the planning of a new neighbourhood. The central elements in this planning process were:

1. A Smart Energy Community agreement, in which all involved stakeholders are invited to decide upon the goals and define an integrated delivery plan. The Scenario Calculator is one of the tools that could help define this agreement.
2. A Core of Community design, in which citizen participation and exploratory processes are used to define the qualities of the neighbourhood. This Core of Community design should be of equal importance to the planning as the energy and emission reduction goals.
3. The development of a processual “highway” for integrated projects that can show how the order of sequence can be financed and implemented in line with both the environmental and neighbourhood qualities.
4. Anchoring that can show coherence in the processing of constructions in the same area of the city, in which the projects that show that they can meet higher standards environmentally, socially and economically get precedence.
5. Evaluation and a plan for learning within the municipality.



Figure 2: PI-SEC Planning Wheel



2.2 Testing of the PI-SEC Planning Wheel

The evaluation of the planning wheel was done through a decision-making theatre with project stakeholders and international experts, simulating the process of planning neighbourhoods using the PI-SEC Planning Wheel and the Scenario Calculator. The final analysis included:

- Definition of challenges in relation to each step of the PI-SEC Planning Wheel
- Desk research to explore the relevance of identified challenges
- Comparison with challenges in 9 ZEN municipalities

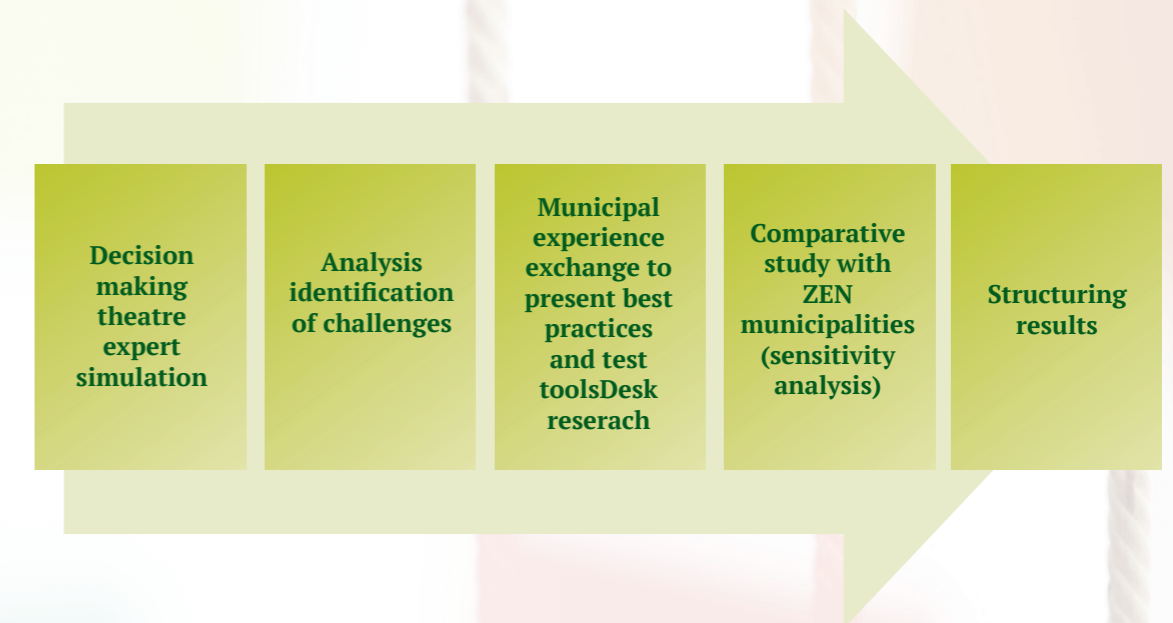


Figure 3: Testing the PI-SEC Planning wheel

3. FINDINGS: CHALLENGES AND BEST PRACTICES FOR MUNICIPAL PLANNING OF SMART ENERGY COMMUNITIES, A TO Z

The result of the testing of the planning wheel was that each step of the process needs improved tools, measures or ways of applying existing tools. These challenges can be divided into:

1. (PI-SEC Agreement) VISION SETTING AND POLITICAL ANCHORING
2. (Core of Community) TARGET SETTING
3. (Incentives) LACK OF INTENTION AND FINANCING MODELS
4. (Coherence and no-go) KEEPING STAKEHOLDER COMMITMENT
5. (Evaluation) PROCESSES FOR MONITORING AND EVALUATION

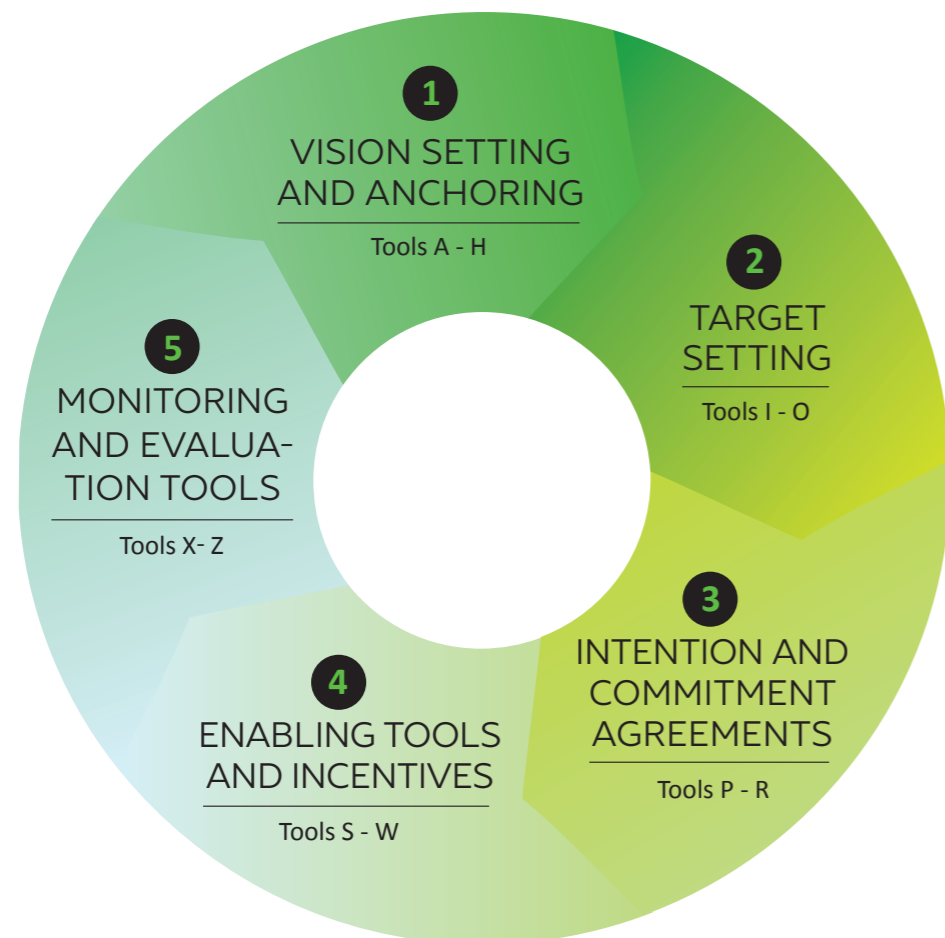


Figure 4: The five steps-challenge

These categories could further be divided into A-Z. In each of the challenges, we have tried to identify who is the problem owner, and to suggest some best practices as to how these challenges can be solved.

3.1 Reader’s guide to the chapter “Challenges to smarter municipal planning”

We present the challenges identified during the testing in the following way: first, the challenge categories are explained, and under each challenge category, there is a set of sub-categories that belong to this challenge. We then describe the typical problem-owner of this sub-category, before we present the best-practices that have been identified through interviews, meetings, workshops, comparison with ZEN municipalities and researchers, and international tool review.



Figure 5: How to read this chapter

CHALLENGE 1: VISION SETTING AND ANCHORING

“In order to create a linkage between urban planning and energy planning, a municipality must develop a community-based vision identifying the main goal and possible pathways by which to get there” (Annex 63 Volume 2)

One of the key success factors and one of the greatest challenges in PI-SEC planning is the vision setting stage. The vision can be defined as following: “A community vision is an actor network (and facilitation) tool, to a large extent aimed at holding the different actors together” ...” without a vision, a transformation effort can easily dissolve into a list of confusing and incompatible projects” (Kotter, 1995)

Within this vision setting stage, key persons need to work strategically and intensively with stakeholders from grassroots to top level, to ensure that visions are shared, driven and anchored. Based on experiences from other municipalities in the ZEN project, international experiences from Annex 63 and interviews and workshops with the two PI-SEC case studies, the following list (A-G) has emerged as advice for Step 1:

A. DEFINING VISION HOLDER

Challenge description: Energy ambitious pilot projects fail if the vision holder is unclear or not well defined, or if the involved stakeholders do not agree who the vision holder of the project is. In some projects, politicians can seem to be vision holders at one point, yet they don't have the mandate to ensure the projects' anchoring locally. Sometimes one vision holder is not enough, but the vision holder needs to be able to keep the vision at multiple levels (bottom-up and top-down' from start to finish).

Best practices: if there is no clear vision holder, the project coordinator or project team should work on developing a plan to ensure that there is a vision holder and to make sure that the vision holder is equipped to follow through. It is important to realize whether there is one vision holder that follows the project through or whether it is a collective vision triggered by an external demand. For some projects, one actor drives a good idea from start to finish. Other projects start with a competition or an external demand, triggering an internal process inside the municipality or the company. This discussion centers on what the vision and targets can be. These two starting points demand different approaches. The latter approach, with an external demand triggering a planning process, needs clear coordination and mapping of responsibilities and directed work to increase capabilities.

B. EVALUATE ORGANIZATIONAL/MUNICIPAL PLANNING AND PROJECT BASELINE

Challenge: International research on energy ambitions, stakeholder led planning supports our findings in Bergen and Oslo that municipalities often don't have the available data to know what the baseline of energy consumption patterns, energy production, or emissions related to sector is. It is important to ensure that the organization is aware of the starting point and is well equipped or has a plan to improve their ability to deal with innovative developments.

Best practices: Municipal assessment tool, Annex 63 + Scenario calculator for baseline

It can be helpful to conduct a municipality assessment (see Annex 63) to ensure that the municipality is prepared for planning for smart energy use in communities and buildings. This should be an activity to do at least once a year to discuss and understand how the municipality as an organization is advancing to ensure that they have the capacity to manage smart (energy) community projects. The municipal assessment can help finding the gaps that need to be filled in order to drive a project successfully from the beginning to the end.

The PI-SEC Scenario calculator can help the project owner calculate energy use and emission on neighbourhood scale. It might be necessary however to hire consultants for this process, to ensure access to the right data sets.

C. DEVELOPING A RENEWABLE ENERGY STRATEGY (RES)

Challenge: Annex 63 Energy in Buildings and Communities recommend that municipalities make sure the Renewable Energy Strategy at the municipal or regional level are reviewed and up-to date. National energy plans are of a visionary character, setting general GHG reduction targets, with delineated connections to supranational grids. Regional plans are often presented as a coordinating function of local activities. Municipal RESs, by contrast are concerned with the spatial implications of energy demand and areas for energy supply infrastructure, such as photovoltaics or thermal grids. Their focus on spatial needs implies that the RES must include specific directives when downscaling national level targets to community level applications.

Problem owner: Mayor, Climate section, urban planners, utility companies, researchers

Best practice: Renewable energy strategies (RES). For example, a Sustainable Energy Adaptation Plan (SEAP)

“The transition of society towards sustainability and a more circular material flow requires not only a shift in energy supply from fossil fuels to renewables, but also a shift in the perception and use of energy.”

Facilitate for renewable energy production within the municipal planning.

From the Norwegian government perspective, it is clear that the national authorities think that energy should be a regional matter and that municipalities should contribute to the development of local and small-scale power production:

“For development of wind power and small hydro power plants it is important that regional evaluations and priorities are considered to contribute to the most appropriate localization of power production. Regulations guide planning and construction of wind power and encourage regional wind power plans. Similarly, there are guidelines for the development of regional plans for hydro power. The department (of environment) mean that the masterplan's area plan should be applied actively to facilitate a sustainable development of small power plants in areas of the country where this is relevant. This can for example happen by identifying such areas as 'area for spread industrial property'” ((jf. § 11-7 b)) and that would be a, § 11–11 nr. 2) ²

Key recommendations from STEP-UP:

Prioritize SEAP actions as early as possible: a prioritization exercise of this level of detail can help to decide on the implementation timeframes of specific actions, if conducted early enough in the SEAP implementation process. Therefore, it is worth carrying it out once all SEAP actions have been agreed, allowing sufficient time and resources to conduct a thorough analysis.

Allow time to gather data and use estimates where data is unavailable: whilst data gathering is time consuming, it is valuable for understanding the costs and impacts of actions and can help with the prioritization process. If data is not available, make estimates based on similar projects or known averages, and follow up whether the estimated data matches reality during the implementation phase.

Consider the key criteria for the local context: the template covers seven key criteria for cities to consider, and gives the option for others to be added. It would be worth considering other key criteria unique to a city's local context and including them in the analysis, so that the scores and priority levels achieved by specific actions reflect all key criteria for a city.

Learn from, and strengthen, low scoring actions: actions that achieve low scores against certain criteria highlights areas to focus on as the actions are developed further, especially where the actions have achieved low scores against criteria which are seen to be key for the city.

Consider implementation and monitoring plans further: it would be valuable to use the findings of the prioritization exercise to develop more detailed implementation, monitoring and review plans to ensure that actions are successfully implemented, and their potential environmental, economic and social benefits are fully realized.

The strategy presents a series of distinct characteristics:

- RES can be used as a guiding document or a strategy that should be integrated into municipal and private stakeholders' plans and in ongoing development projects to achieve desired energy targets.
- The RES does not explain how to implement energy targets; it proposes a framework of measures that contribute to the implementation of renewable energies.
- The RES should be under constant and simultaneous development, implementation and critical reassessment.
- The RES defines the roles, mandates, responsibilities, and competencies of the municipality and private stakeholders. It requires an understanding of both possibilities and restrictions arising from the RES.
- The RES is a strategic document that can be understood as a platform to contextualize and coordinate the measures needed to attain the GHG reduction targets.

²For utbygging av vindkraftanlegg og små vannkraftanlegg er det viktig at det foretas regionale vurderinger og prioriteringer for å bidra til den mest egnede lokaliseringen av slike anlegg. Det vises til at det er vedtatt retningslinjer for planlegging og utbygging av vindkraft hvor det oppfordres til utarbeidelse av regionale vindkraftplaner. Tilsvarende er det laget retningslinjer for utarbeidelse av regionale planer for småkraft. Departementet mener at kommuneplanens arealdel også bør brukes aktivt for å tilrettelegge for en bærekraftig utbygging av småkraft i områder av landet der dette er relevant. Dette kan f.eks. skje ved at aktuelle områder for slik utbygging vises som "areal for spredt næringsbebyggelse" (jf. § 11-7 b), og at det knyttes en planbestemmelse til formålet, jf. merknaden til § 11–11 nr. 2.)

One of the BREEAM Communities criteria, energy strategy offers varied assessment criteria that can be utilized when designing the renewable energy strategy RES. This BREEAM Communities criterion includes following characteristics:

- Energy strategy should include a estimation of a baseline energy demand; recommendations for reducing energy use and associated emissions; and opportunities to both energy reduction through the use of decentralized energy and through the installation of local energy sources aiming to zero carbon. Furthermore, the summary of CO2 savings that are the results of the different energy efficient measures should be included to the energy strategy.
- Using independent energy specialist to write the energy strategy.
- Using energy modelling software to predict the baseline energy demand and associated emissions.
- The baseline energy demand should include both estimations of regulated and unregulated emissions
- Renewable and low carbon installations

D. CREATING A COORDINATION TEAM

Challenge description: It is difficult to ensure cross-sectoral collaboration between departments within a municipality. This makes it challenging to plan projects that integrate emission reduction goals, private development, energy utilities, researchers and citizens.

Problem owner: project owner

Best practice: It has been proven useful to create a separate team of body for coordinating; facilitating and managing legal aspects and framework during innovative energy planning projects such as PI-SEC (see Figure 2). It is central for a good process that the project owner decides on who should be the participants in each team.

Good rules for developing a team:

In Oslo, the Futurebuilt project played this role for working across sectors. Based on ZEN experiences, important stakeholder components for a 'good' process are:

- A "support team" that can balance legal conditions, market conditions, intentions and incentives. A "support team" may consist of
 - A municipal coordinator
 - A concept developing consultancy
 - ENOVA advisors or other support institutions
 - Real estate actor(s)
 - Lawyer (s) or legal advicors to develop agreements
 - Researchers (some municipalities include researchers for proposal writing, innovation and to increase chances of accessing research funding)
- Private developers and utility companies

E. DEVELOPING A CORE OF COMMUNITY VISION WITH CITIZEN PARTICIPATION

Challenge description: A citizen inclusion plan must be developed, to ensure citizen centred design, sustainable behaviour in accordance with citizen needs and that the plan is in line with political expectations. Currently, cities fail to implement the visions developed with citizens in technically advanced projects, showing that citizen participation and citizen centred design must be an integrated part of early planning.

Best practice: There are numerous tools and processes available for place-making. BREEAM communities give some general guidelines on minimum criteria to be included in a consultation plan. Typically, a demographic

analysis should be done in collaboration with the city's statistical office before a stakeholder analysis is conducted. The purpose will be to determine who are the existing (if it is an upgrading or densification area), potential and intended future inhabitants of the planned ZEN.

Community participants should include but are not limited to:

- Actual and/or intended occupants
- Neighbours that may be affected by, or influence, the final design
- Representatives of nearby communities: If the site is a new development, representatives are sought from surrounding communities or from a similar type of project
- Potential users of any on-site or shared facilities. This should include a selected sample based on the intended mix of people in the future PI-SEC
- Periphery users: Spokespersons for marginalized populations including user organizations for people with disabilities, minorities or elderly. It is a strength if these are represented also through a universal designer/ universal design researcher. Representatives of the local authority
- Institutions that may represent, gather and have a large impact on end-users awareness, such as schools, sport clubs, churches, mosques
- Local or national historic/heritage, ecology, cultural, residents, business groups etc.
- Specialist service and maintenance contractors
- Representatives for distributors of services to the area (for example home nurses or garbage truck companies) that may impact the infrastructure and accessibility aspects

The plan must take as a starting point a description of the baseline, from the participants' perspective. Lynch mental mapping, as applied on Furuset, is an example for creating an overview. A particular approach for children and youth should be taken (example Barnetråkk, Bergen). (1-3) Further, citizens wishes must be represented into the design review, inclusion in the plan for delivery of services, facilities and amenities and public realm, local parking and landscape, community management, pedestrian pathways, cycling facilities and transport facilities. The plan must also include input from citizens on how to raise awareness on sustainable behaviour, particularly energy and emissions, among inhabitants during and beyond implementation. This can include the testing of eco visualizations (4, 5) and promotion of public transport to evaluate if this impacts the citizens choices.

The plan must include the development of scenarios that are visual, and documented, that well present the citizens needs and wishes and ideas on how to encourage zero-emission living from household to neighbourhood design(6, 7). Further, the project plan and agreement must include a plan for how explored visions with local stakeholders and citizens will be transferred to the implementation stage.

F. STAKEHOLDER MAPPING AND PATHWAY

Challenge description: One of the significant challenges in cities implementation of energy ambitious neighbourhoods, lies in their ability to implement the scenarios developed with stakeholders, including citizens. This is largely due to the fact that the implementing stakeholders (the ones constructing the final buildings and infrastructure) are not the same that initially developed the visions and goals (Nielsen et al., 2018). The successful implementation of urban energy planning strategies (applied as a set of measures to improve energy efficiency and carry out distributed renewable energy generation to reduce CO2 emissions) depends on the satisfaction of the stakeholders, involved in future implementation process. Mapping can start with identifying macro-categories regarding and representing the specific area and moving down to smaller categories.

Stakeholder participation offers cities several key benefits. It will ensure that decisions taken with stakeholder input are based on a broader knowledge base, and stakeholder engagement from an early stage can improve the quality, acceptance and effectiveness of projects and proposals. Discussions with key stakeholders may open up further opportunities for collaboration and joint projects, and stakeholder buy-in helps secure long-term support for strategies and actions in the city. Participatory decision making is more robust and transparent.

Best practice: Design a stakeholder engagement pathway. Successful stakeholder engagement emphasizes a two-way exchange of information in an early, regular and ongoing process. The following engagement pathway that planners of all stripes could apply to their projects can help to build consensus, improve the outcomes of planning efforts and build support for implementation:

- Identify the lead person / organisation for the plan or project initiative -who is responsible and under what authority does that lead person operate? Is there a similar role in the energy delivery sector? Is there a critical technical or political champion that should be engaged?
- What are the driving principles and goals of the plan or project in terms of energy / emission related benefits for the community?
- What stakeholders share the project territory, have related expertise, have interests, and/or have power that can influence the outcomes of the project or plan?
- What impact could the project bring to each of the stakeholder groups and where are the contact points?
- In what ways can stakeholders and the public contribute expertise, knowledge of the local context, and resources that can help to enhance the plan or project?
- What role will the stakeholders play in your project; what are the possible ways to interact with them and when should that interaction begin?
- How and when should ongoing interactions and results be documented and shared?

Make sure citizens are regarded as an included part of the stakeholders. This will not only create an attractive and high quality project but will also help ensure political commitment for the vision. The Glasgow STEP-UP team have also developed a step-by-step guide to undertaking stakeholder analysis that can be used for those looking for detailed information on how this can be done.

G. CO-DESIGN VISION WITH IDENTIFIED STAKEHOLDERS, INCLUDING CITIZENS

Challenge description: For a vision to be clear, and to ensure commitment, the qualities of the smart energy community or neighbourhood must be developed with all stakeholders. Ensuring a common vision that includes all aspects of the design, is perhaps the most difficult challenge of creating a holistic community where energy use will be more sustainable than what is the situation today.

Problem owner: municipality and project owner

Best practice: Use of scenario building tools in combination with decision support tools. A vision is a bold description of where the city wants the selected area to have developed socially, economically and/or environmentally, and should have a time limit.

The vision must consider and document how the needs of the citizens identified from the citizen involvement plan is met by reaching the vision, and stakeholders invited based on the stakeholder mapping, representing the community aspects and the energy & emission scenario building and monitoring. The vision must be aided by stakeholder inclusion, citizen inclusion and an updated renewable energy strategy.

The vision setting should also include statements on the view of things that have particular importance. For example, how to deal with existing buildings? In some cases, greenfield projects are chosen with the argument that renovating or tearing down existing buildings will increase emissions. This is a question of calculation and have many variables attached to the discussion. It is also a political question. As we know that spatial planning measures have larger impact on emissions than building type or energy supply, it is important that the municipality state clearly if and how they wish for older building stock to be evaluated before these are torn down and new ones are built.

H. VISION ANCHORING

Challenge: Municipalities see that it is difficult to ensure agreement on vision both on municipal and national

level. Check that the plans do not conflict with any larger, overarching goals of municipality, region or national government.

Best practice: If the municipality is the project owner and main vision holder, it is vital that the vision is shared by the following stakeholders:

- *Politicians* who also want the project to be realized. Politicians must be one of the drivers of the vision. If the municipality is the project owner, it is particularly central that politicians agree with the municipality early on and continuously (ref: participants in PI-SEC).
- *Management* in the involved municipal units, meaning that these see the possibilities that an ambitious project can represent.
- *A project leader* who is able to create a positive commitment internally and externally, preferably supported by a team (see D. *Creating a Coordination team*)
- *Vision holders in different municipal units;* that a team that shares the same vision can collaborate with this project leader to ensure that collaboration between different units within and outside the municipality will work.

CHALLENGE 2: TARGET SETTING

With target setting, we mean breaking down previously created visions to more project specific and measurable targets. The targets should be *specific, measurable, assignable, realistic and time-related (SMART Criteria)*. This means that the vision has to be broken down into feasible entities. In case studies within Smart Energy Communities and Zero Emission Neighbourhood we have seen that it becomes difficult to achieve goals that do not have particular responsibilities attached to them, and therefore the 'assignable' aspect might be of particular importance. In addition, the 'time-dependent' element is a factor as time changes political focus and visions. Therefore, time should be an element when discussing targets.

"A target has to be accepted by all stakeholders. This can only be achieved when the stakeholders are involved in the definition process. In order to be able to monitor success they should be measurable. This includes quantitative (e.g. kW, kWh or MJ energy, m2 ground floor public use, etc.) as well as qualitative criteria (e.g. design of attractive public area, marketing of energy and mobility measures, etc.)." (IEP, 2017)

For target setting, we suggest a combination of qualitative/spatial qualities and quantitative/emission and energy focused target setting, together with scenario building tools to discuss different options within entire PI-SEC definition:

I. DEFINE THE 'CORE OF COMMUNITY'

Challenge: Often, energy ambitious neighbourhood planning can lead to gentrification or unsustainable city development because it is difficult to balance the cost of higher technical ambitions, with the cost to cover the spatial qualities, services and holistic design. Thinking about sustainable behaviour by defining distances to and comfort of public transport, and to make sure people want to spend time within their own community, is key to urban sustainability. The stakeholders in Bergen and Oslo emphasized the need to design 'good living environments', as a key factor to ensure the right order of sequence, where the quality of the neighbourhood attract the right mix of people for a sustainable and engaged community. Urban planners emphasize the need of designing a community where people participate, where they can access jobs, necessary services and sustainable mobility choices

Best practice: By "Core of Community" it is meant the factors that, according to planners and citizens, make the Smart Energy Community attractive. Failing to include this aspect from the beginning may result in a failure to complete the project implementation, because a misalignment with overall citizen and city planning needs in an area may result in a failure to get political approval (see the challenges of ZVB). Describing the "Core of Community" will also make it possible to foresee financing needs related to spatial quality, access

and mobility. The “Core of Community” describes the qualities of the neighbourhood needed to ensure liveable and attractive neighbourhood planning integrating mobility aspects and sustainable behaviour. This plan with clear targets, must transfer insights derived from the Citizen Involvement plan (See Vision setting and anchoring). The key stakeholders should be involved, something that depends upon a clear stakeholder pathway.

BREEAM Communities explain that it is important to consult the local authority about the plan and align it with requirements for citizen consultation in the official planning procedure. Consultation should take place early enough in the process for the community and stakeholders to influence key decisions. This may be during the pre-application stage of the planning system. The plan includes timescales and methods of consultation, clearly identifying:

- at which points the community and other stakeholders could usefully contribute
- how they will be kept informed about progress on the project
- how and when feedback will be provided about how consultation input will be taken into account
- a named person who is responsible for delivering the consultation activities and represent the outcomes in the project team. This person should be given, or preferably have already authority to influence in situations of priority selection
- the approach that will be taken to target and provide for minority and ‘hard to reach’ groups (e.g. elderly, youth, disabled and those with limited time to participate)

The consultation plan should detail the level of consultation for different stakeholders, when consultation will take place, and the methods that will be used. The consultation plan should consider the following as a minimum:

- stakeholders inclusion in design review, plan for delivery of amenities and public space, local parking and landscape, community management (velforening), pedestrian pathways, cycling facilities and transport facilities
- impacts of the development upon the surrounding community during construction and following completion (including the protection of areas of historic/heritage value)
- design quality, meaning that the consultation plan is completed in a coherent manner and with accountability, by people who are trained in human centred and/or participatory design processes. With accountability means that the input from the community are handled in an open manner and decisions regarding what is implemented of citizens’ ideas and needs are openly discussed with the citizens of involved end-users. The responsible for the consultation plan and the rest of the stakeholders have accountability for ensuring that the needs defined in the consultation plan are considered at all defining stages of the planning process. A coherent plan for the community consultation and planned process for ensuring impact of the consultation on final design must be available and publicly shared on a location that is well-known, easy to access and written in a language that everyone can understand.
- The design input should not only include the design of the neighbourhood in hand-over state but also include work on needs and expectations regarding management, maintenance or operational issues seen from the citizens’ viewpoint as well as secondary users (such as cleaners, food distributors, healthcare assistants, visitors, etc.)
- opportunities for shared use of facilities and infrastructure with the existing or adjacent community

The consultation of the users of the neighbourhood must include a facilitated community consultation method to engage the community on specific aspects of the design. There are many methodologies available to engage communities about the formulation and design of development proposals. The following principles must be adhered to:

- the consultation exercise has a clearly communicated purpose
- participants understand how their views will be used in plans for the development
- expectations are set as to which options are open for discussion and revision
- reasonable advance notice is given to potential participants of the consultation exercise
- efforts are made to include hard-to-reach groups
- specific attention must be taken to ensure clear language (“klart språk”) and no use of sociolects/discipline

- specific wording during the consultation exercise (this is the responsibility of the facilitators)
- the consultation is facilitated by a person or organisation that is independent from the project owner

Social equality in energy ambitious neighbourhoods is also a target that municipality planners share. Social equality requirements can be put into the zoning plan with the purpose of balancing the amount of social housing, family housing, etc. Yet the pressure on pilot areas for building innovatively makes it difficult for the municipalities to require low cost apartments in the middle of upgrading areas. However, bringing this aspect in early is crucial in order to avoid gentrification and socially unsustainable development. According to BREEAM Communities, economic study identifying needs and opportunities should be completed. The focus should be in future occupants thus this fit well with one of the objectives of *PI-SEC: ensuring life cycle view of the neighborhood*. The economic study shall also seek that the urban development enhances the existing economic activity in the area. Infrastructure and facilities including for instance transport and communication infrastructure are related to the economic study since these can potentially foster new investments to the area. Thus, this category and corresponding assessment criteria also related to circular economy and design for sustainable behavior. Economic impact should set the focus on how the new development could enhance the economic wellbeing of future residents and other occupants highlighting the potential employment opportunities. One of the issues and corresponding assessment criteria that goes into this category is Demographic needs and priorities including but not limited to housing mix, community facilities and employment opportunities. According to BREEAM Communities, community should be consulted regarding the local needs and requirements. Assessment criteria Housing provision builds up and is based on the criteria demographic needs and priorities. Local authority and developer should agree on number of affordable/social housing that reflect the local requirements. Developer shall commit on these. The affordable housing should be integrated to other dwellings and distributed across the whole site.

J. MAKING A CORE OF COMMUNITY FUND THROUGH INTEGRATED PROJECT DELIVERY

Challenge: As the costs of higher building standards and sustainable neighbourhoods expand, it becomes challenging to finance the qualities described in the “Core of Community”. The cities find it difficult to keep the good neighbourhood standards when pushing for increased energy effectiveness and incentivising private sector. Transition from Core of Community design into action plan and financing together with stakeholders. “Frameworks for spatial planning – utilized for energy planning: Clear regulations increase the planning security for investors and building owners and ensure their synergistic use. The involvement of all relevant stakeholders is seen as a success factor.” (Annex 63)

Balancing the responsibility for meeting citizen’s needs with private sector, is seen as key to achieve liveable cities. Accountability can be incentivised through the creation of a fund where all stakeholders must contribute. Private sector, including private developers and utility companies, provided the feedback that the creation of an incentive that ensured more predictability in the implementations sequence would increase the chances that these stakeholders could invest in the project. The Fund would be one factor, where as if the stakeholder contributed to the fund, and ensured good order of sequence, they could expect a better, faster, and more predictable implementation of the concept.

Best practice: Participants in the PI-SEC studies described the need for an Integrated project delivery (see figure) that balances the responsibility for spatial qualities and attractiveness issues between public and private sector. IPD principles can be applied to a variety of contractual arrangements and IPD teams can include members well beyond the basic triad of owner, architect, and contractor. In all cases, integrated projects are uniquely distinguished by highly effective collaboration among the owner, the prime designer, and the prime constructor, commencing at early design and continuing through to project handover³. Further, IPD is strongly linked to the Stakeholder Pathway, as it depends upon:

1. Identify, at the earliest possible time, the participant roles that are most important to the project
2. Pre-qualify members (individuals and firms) of the team

³Integrated Project Delivery, the American Institute of Architects: http://info.aia.org/siteobjects/files/ipd_guide_2007.pdf

3. Consider interests and seek involvement of select additional parties, such as building official(s), local utility companies, insurers, sureties, and other stakeholders.
4. Define in a mutually understandable fashion the values, goals, interests and objectives of the participating stakeholders
5. Identify the organizational and business structure best suited to IPD that is consistent with the participants' needs and constraints. The choice should not be rigidly bound to traditional project delivery methods, but should be flexibly adapted to the project.
Develop project agreement(s) to define the roles and accountability of the participants. The project agreements should be synchronized to assure that parties' roles and responsibilities are defined identically in all agreements and are consistent with the agreed organizational and business models. Key provisions regarding compensation, obligation and risk allocation should be clearly defined and should encourage open communication and collaboration.

The purpose of the Core of Community fund will be to hold the stakeholders accountable and to keep trust within the team of stakeholders.

The integrated project delivery model from LEAN can offer such a process. An IPD solution for spatial qualities including design for sustainable behaviour, can help determine how stakeholders finance the different elements described in the 'Core of Community', ensuring the balance of the socioeconomic and environmental aspects of the smart energy community design. The project owner and/or the vision holder must ensure broad stakeholder consensus for this. Financing institutions for enabling new technology innovations such as ENOVA can be important dialogue partners in this process. If the neighbourhood is to be liveable, attractive, safe, secure and sustainable seen from the citizen perspective, the different aspects and interrelated community criteria must be a central part of the discussions between different stakeholders. The community criteria will furthermore:

- Decrease the risk that the project will run into processing/political difficulties and conflict of interest
- Speed up the time-to-implementation by ensuring that energy design, the built environment and the citizen aspects can be agreed upon, defined and tested parallel to each other.
- Reduce overall costs as sequencing becomes easier and unforeseen issues don't interrupt the planning and processing times
- An agreement on these parallel issues increase the interest of private investments as they make the process more transparent and predictable independent of interest
- Ensure that different aspects and disciplines are integrated together (tverrfaglighet)

Ensuring that the Community Criteria and the BREEAM Communities criteria are taken into account may help the projects increase the chances of compliance with national guidelines.

K. DESIGNING A SMART ENERGY COMMUNITY BASED ON TARGETS OF ENERGY IN BUILDINGS AND MOBILITY

Challenge: Once the team is decided, the stakeholder plan is done, and the vision is set, and we know the needs of the citizens, the energy targets for the smart energy community needs to be determined. The challenge then is, to bring the emission reduction goals and visions down to the sectors of energy demands of buildings and transport. Transport and mobility are challenging yet an important link to localization strategies and policies that is the strength of municipal planning. Yet even more challenging, is to bring the energy demands into good neighbourhood planning.

Best practice: A Finnish study of designing low-carbon districts show a process for how districts can be designed to include energy demands and mobility. Within this study, statistics from national transport institutes are used to evaluate different options of location. It is clear from this study that the municipality needs to bring in energy and integrated energy planning experts to propose different solutions. In PI-SEC, the added challenge of including the spatial qualities and sustainable behaviour in Core of Community will be added to step 3.

"The Finnish Way" of designing a low-carbon district



Figure 6: Steps for analysing total district energy alternatives from Finnish planning of low carbon neighbourhoods

To be able to follow up energy demand and resources of a certain neighbourhood, the PI-SEC Scenario Calculator has been developed. The municipalities' climate section sets goals and targets in accordance with the climate plan. Municipalities should, together with private developers and utility companies, participate to suggest and balance available options to accomplish the goals and related targets. PI-SEC Indicator Tool can be used to do see the starting point in relation to the goals set and monitor if the goals are met.

The Scenario Calculator sets up scenarios to have a starting point for discussions on building interventions and emission impact. Enabling technologies should be included in the discussion: For example, smart metering systems can decrease the electricity consumption on an average of 8% corresponding to an average electricity saving (Neenan & Hemphill, 2008).

The main purpose of the Scenario Calculator is to aid the process of energy planning in communities. This is accomplished by compiling energy and emission relevant data for the community and combining it with calculation routines for selected KPIs. The tool is designed to follow the project from the early planning stage, through the design and construction phase and as a monitoring and follow-up tool after the project. Its main advantage is in the planning phase, where it can work as a decision support tool. The Scenario calculator utilizes scenarios to evaluate the effect of strategic measures on the overall goals and targets of the community. By linking measures on individual building scale to overall community targets, it increases the planners' knowledge of what is necessary to reach the goals for the planning area. The tool is built in Microsoft Excel and has been designed to enable quick and easy evaluation of new scenarios, and thereby aid discussion through the planning process.

For full description see Appendix.

L. TRANSPORT SYSTEMS AND ENERGY DEMAND

Challenge: Mobility is a key aspect of planning smart energy communities. While the scenario calculator includes ways to calculate the emission scenario of the PI-SEC as a closed issue, integrating this issue into the PI-SEC planning was shown to be challenging as the system borders of planning a neighbourhood belongs to the city municipality while larger road networks are at regional (Fylkeskommune) level.

Best practices: The finish studies of planning low-carbon districts points to the need to integrate the use of different data sources and combine this with holistic planning. Again, the combination of decision support tools and holistic, stakeholder-led, planning is best practice in international cases.

The amount of passenger transport depends on the location and type of district. Important attributes:

- Average area density
- Typical residential types
- Distance to the nearest bus stop or daily services
- Type and location of the area
- Design of built environment to support the choice of walking or biking
- Promotion of public transport

Important distances to consider:

- Distance to daily services, mostly grocery shopping that take up half of the transport needs of Norwegian citizens
- Distance to workplaces
- Distance to the city centre
- Distances to transport hubs

The lowest emissions will be generated if the distance to the city centre (“sentrumskjerne”) is reduced. Important data can be found from Transportøkonomisk institutt, Vegvesenet, SSB, Plan og bygningsloven, GIS modelling etc.

In Norwegian travel statistics, citizens travel to ‘local central areas’ or ‘sentrumområder’. These attract the most travels in daily life, because of daily grocery shopping. People travel to the city centre for other purchases, but mostly for cinema, theatre and other cultural activities because they perceive these as having higher quality than the local centres. A way to measure this is then to measure the distance from the planned neighbourhood/dwellings to the nearest central area.

The impact of certain mobility patterns for a neighbourhood or district can be evaluated by the PI-SEC Indicator Tool. See more information about the tool under tool J and in the PI-SEC report from task 1.2: *Preliminary toolkit for goals and KPIs*.

M. ENSURE COMPLIANCE WITH AREA PLANS

Challenge: At the point that the targets for the area are defined, as who will live there, what is their energy needs, what will be their emissions in relation to going to work, grocery shopping and services/leisure, the area plans need to be considered to see if the community can achieve this energy use and emission reduction.

Best practice: The findings of our interviews with participants show that when one chooses the pilot area for an energy ambitious neighbourhood, one must consider for energy concerns:

- Location in relation to plans for urban sprawl
- Location in relation to the national road administration’s plans for highways, public transport nodes
- Topography in relation to walking and biking possibilities
- Population size in relation to national guidelines for adapting bike lanes and pedestrian pathways
- Location in relation to current and future plans for district heating and other energy infrastructure
- Plans for charging stations

If the concept has not been agreed upon early and included in regulations, including costs connected to the construction phase, it is common that the project runs into a ‘trade-off’ phase where public and private sector negotiate terms when they run into challenges. If the energy ambitions for the area have not been integrated into the area regulation plan, the municipalities need to use private law agreements to negotiate this in retrospect. However, PI-SEC task 2.4 will deal with the adaptability to the Norwegian Planning system and will target this issue more specifically.

N. DESIGNING ENERGY SUPPLY OPTIONS

Challenge: In one of the PI-SEC cases, the property for neighbourhood development was chosen only based on solar energy potential. Other researchers and regulatory bodies commented that other energy supply options should have been evaluated earlier and that a mix of approaches is needed to make the design of energy supply options fit with densification strategies and regional expertise and regional renewable energy strategy. This process is complex and require significant attention at the beginning of the PI-SEC planning.

Best practice: Based on visions and target setting in A, a cross sectoral team should look at the options for decentralized and central energy systems.

A renewable energy assessment should be done. The PI-SEC intention agreement includes a plan for evaluating the local energy resources before the energy system design phase is started. The selection of energy resources should be based on:

Considerations that can affect energy supply decisions

- City planners different priorities
- Regional capacities
- Citizen needs and proposed solutions
- Financing such as upgrading, time horizon
- Life cycle view of the neighbourhood in relation to the larger district/city region

O. DECISION MAKING AND RISKS

Challenge: in (energy) ambitious and innovative neighbourhood planning, there is more risk involved than in conventional projects, and this will most likely lead to increased conflict along with the planning and implementation. Utility companies also explain that risk reduction, through clear integrated planning delivery contracts, will be a significant incentive for them to be involved earlier in the design phase of a smart energy community.

Best practice: Based on available information and decision support tools a cross sectoral team should make qualified decisions for the community.

Decision support tools, such as the PI-SEC Scenario Calculator, are useful tools to help to make well founded decisions. However, with such tools, there is always a risk of misuse and sub-optimization. A lot of input must be given (energy consumption, travel habits, etc.), and a lot of presumptions must be made (CO2 factors, efficiencies, and future development). The quality of the input data and decisions on the presumptions can have large consequences on the final decisions. Different stakeholders that participate in the decision making process might also have different agendas and incentives to apply different presumptions (e.g. district heating companies vs. electric power companies).

To minimize the risk of making decisions based on the wrong grounds, it is recommended to evaluate the scenarios with different values for the most debated presumptions, such as CO2 emission factors for electricity and waste incineration. Such evaluation is also a requirement in the forthcoming new Norwegian standard for GHG-emission calculation for buildings (prNS 3720).

To reduce the risk of sub-optimisation of the community development compared to the surroundings, it is important the people with an understanding of the external systems and the interfaces to the community are part of the decision-making team. This includes climate department, urban planners, utility companies, transport providers.

CHALLENGE 3: INTENTION AND COMMITMENT AGREEMENTS

Stakeholders involved in early planning and design, are often easy to engage because they see the pilots as a place to be for networking and innovating. It is easy for companies and the public sector to see the benefit of the scenario building phase, as they know they can bring innovation capital back to their organization afterwards. However, researchers agree that keeping commitment of stakeholders into the implementation phase, is more challenging. During the co-design process of the PI-SEC Planning Wheel, it was clear that for private developers and utility companies the main incentive that is lacking, is predictable processing of the plans by the municipality, and perhaps even faster processing times. Further, there is a need for stronger

incentives early on to facilitate stakeholder collaboration and innovative approaches across the organizations and municipal departments.

P. DEVELOP COST ROADMAP

Challenge: One of the challenges presented that can result in a projects' failure to implement the explored scenarios, is that the scenario building in the design stage has not included a cost and benefit analysis.

Best practice: when cost and benefit being assessed together with the involved stakeholders, the following should be considered (Annex 63):

- What are the relevant investments?
- Who can make the cost/benefit analysis?
- Who is responsible and which are the funding gaps?
- Which are the financing options and which incentives and subsidies are available?
- Make a Financing SWOT Analysis that considers sequencing

There are stakeholder support tools available that can help stakeholders build scenarios together of differing objectives. An urban energy planning support system provides different stakeholders with specific answers to their view-points. A way to determine priorities amongst different stakeholders is to use "weighing tables" together with a building timeline plan, as used by Ydalir, one of the ZEN projects:

FACTORS	DESCRIPTION /OUR INTERPRETATION	WEIGHT
Overall rating of the area	Center of gravity - should happen "at the lower level" and first closest to school/centre	10
Areas ready to be build	The area must be built in accordance with the order requirements (rekkefølgekrav) in the regulation plan /landowner agreement/VVS/terrain formation	5
Relation to masterplan	Developer's concept should be emphasized	25
Economic/business type most favourable for ETS	Large sub-areas are prioritized because ETS has a lot of capital burden	20
Market consideration - what is the most interest for buyers (areas / residential concept).	Different builders have different housing types, different areas are suitable for different housing types. Variation in supply. Must also be seen in conjunction with paragraph 1.	20
Time to signing the letter of intention	Interest should count	2
Time for signing the purchase contract	Interest should count	10
Developer's wish to start	Developer's wish to start	8
		100

Table 1 : Weighting the priorities among different stakeholders, for example



Q. INTENTION AGREEMENTS

Challenge: It can be difficult to reach agreement on what the intention of the project is amongst all stakeholders.

Best practice: Intention agreements can be framed as the entry point to a co-design effort with implementation champions. Implementation champions are stakeholders in the municipality who take the initiative to lead and facilitate implementation processes. Intention agreements can grant the private developers exclusive rights, but the intention agreement can also be a part of a competitive strategy.

R. CONSIDER DISPENSATIONS AND ALTERNATIVE REGULATION NEEDS:

Challenge: Innovating cross-disciplinary and across departments within urban planning projects can challenge existing regulations. Integrated project delivery contracts and new business models for trading energy are examples of issues that will require dispensation.

Best practice: Evaluate if the design is depending upon a dispensation from regulations, for example from the feed-in regulations. There are ongoing discussions on how to change the planning and building act to stimulate more local and renewable energy production, however very ambitious plans will still run into challenges with the energy sectors/ NVEs regulatory framework.

In November 2016, the relationship between Norwegian concession procedures and plan procedure of energy production in planning was changed. The new regulations mean that concession can be given and power plants built without considering the status of the plan, that one does not have to make regulation (detailed) plan or dispensation for such plants or declarations.

It is however likely that a Smart Energy Community that intends to produce its own electricity will need to apply for alternative regulation if the municipality does not apply for trading licence "omsetningskonsesjon"⁴.

CHALLENGE 4: ENABLING TOOLS AND INCENTIVES FOR REALIZING THE SCENARIO

"Targets can only be reached if the people are involved to the maximum. The question is here how to get the link between the target and the commitment in order to reach a personal involvement for the targets. One has to find measures to translate/transfer targets to the level of action and stakeholders. There is a need to find a way to have stakeholders, citizens, politicians and engineers at the same table to assess the options."

Annex 63, Volume 2 Strategic measures

S. ENSURE AND MAINTAIN STAKEHOLDER ENGAGEMENT

Challenge: ensuring and maintaining stakeholder engagement is a continuous effort centering on trust.

Best practice: STEP-UP explains that ongoing stakeholder engagement and collaboration is essential to effective planning. Different communication tools and approaches may be relevant to different stakeholder groups, such as:

- Information and Education - Brochures, newsletters and advertisements.
- Information and Feedback - Websites, surveys and questionnaires and public meetings.
- Involvement and Consultation - Workshops, focus groups and open house sessions.
- Extended Involvement - Community advisory committees, and citizens' juries.

In addition, multi-stakeholder decision support tools can help engagement and synergies, for example realizing sustainable energy districts by supporting multi-stakeholder decision & policy making and providing insight into the spatial integration of sustainable energy measures, in terms of energy (reliable), CO2 (sustainable) and costs/benefits (affordable).

Examples:

"PICO Tools" for interactive process stakeholder support, (web-based) open data & model platform.

Another tool that can help project managers maintain the commitment of stakeholders, is the Annex 63 Energy Design Game. The Energy Design game is a collaboration tool that can be used when implementing energy strategies in communities. It was developed by a group of experts from urban planning and energy planning in Denmark. The game is based on the findings from 23 ANNEX63 case studies from different countries thus the cultural and legislative context was varying. The cases had diverse scales varying from city scale to communities and building level, with different goals e.g. reduction of CO2 and energy consumption. The Danish research group, who developed the game, found out one common success factor from the cases they analysed: in most successful cases, there was always one person, named *implementation champion* that put all the pieces together. The presence of this *implementation champion* enabled success in the implementation of the vision. As the energy design game is very illustrative and visual, it helps the planners to see the project from different perspectives. By now, the game has been tested once with 18 different Danish small and medium sized municipalities located in Jutland. All the municipalities are located in the countryside.

T. THE MUNICIPALITY AS A ROLE MODEL

Challenge: Ambitious pilots get stuck instead of moving forward because nobody wants to take the risk of doing the first innovative/costly move to test an innovation. Some of the participants describe how like this:

"Everyone is sitting on the fence, so the municipality has to move first!"

Best practice: municipalities that have property that can be used as role models, seem to advance faster and achieve their goals more successfully. Applying the ambitious parts of the PI-SEC plan on public property first, to show direction and leadership is,, therefore, a best practice.

U. REACHING HIGHER GOALS

Challenge: Municipality planners explain that it is difficult to get project developers to aim at higher standards than the lowest tech standard.

Best practice: Urban competitions can be an entry point to encourage stakeholder collaboration across sectors that otherwise remain traditionally separate, and to get them to reach further.

ENOVAs concept development tools to increase participation and innovation was used in Trondheim as competition based contracts. In the Saupstad pilot project in Trondheim, the municipality applied what they refer to as 'a competition based dialogue' model. The regional municipality (Trøndelag Fylkeskommune) announced a concept competition for private developers divided into 2 phases:

1. By pre selecting 8 teams, consisting of private developers, architects and consultants. Giving 200 000 NOK to each team for detailing their concept. During this phase workshops were held between regional municipality, developers and researchers on zero emission buildings to exchange experiences and learn how to design the best concepts.
2. Selecting 2 teams from the 8 and intensifying dialogue. This second phase also included end-user involvement, where staff in the school were end-users.
3. Selecting a winner and signing a NS8407 contract* with "avbruddsklausul", a legal clause that allowed the regional municipality to stop the implementation., During this pre project phase, the stakeholders conducted more end user workshops, before the construction phase started.

⁴Integrated Project Delivery, the American Institute of Architects: http://info.aia.org/siteobjects/files/ipd_guide_2007.pdf

This process increased both intentions and commitment amongst the implementing stakeholders.

“People think this is a fun way to work, and that is very important when setting high goals!”

- Marit Sollien, Trøndelag Fylkeskommune

ENOVA has funding for conceptual development available that for example can be applied for this purpose. Mentioned challenges: a competition based model moves quickly and project owner explains that this gives little time to reflect on what the right solutions are within the team.

How should these competitions be evaluated? Evaluation of urban competitions(Annex 63) recommends the following:

- Role of “sustainability expert”
A professional adviser is key to a successful competition: as a consultant to the sponsor (municipality), the adviser is the individual directly responsible for planning, organizing and running the competition. The adviser’s responsibilities fall into four key areas: program development, organization and structure, assistance in selecting a highly qualified jury capable of exercising sound judgment, and in conducting the competition so that all competitors receive fair and equitable treatment. This requires the adviser to be an impartial liaison between sponsor, jury, and competitors. To ensure a sustainable result, the adviser must be an independent entity who is capable of objectively approaching a competition and combine design quality with sustainability.
- Requirements for competition program
In the early stages of the development process for a community, it is important to define the requirements in such a way that the projects are developed under certain aspects of sustainability. The full report in the appendix includes standard clauses that can be utilised within documentation for a competition program (e.g. Request for Proposal).
- Weighting of the energy and carbon requirement
An urban design competition should publish the assessment rules in the request for proposal. This provides all participating project teams advance knowledge of just how their project will be assessed. Besides energy, carbon and other sustainability parameters, urban design and architectural and exterior space quality, functionality, mobility and price play important roles. To assure that sustainability aspects such as energy, carbon and other indicators will play an important enough role in the “best” project, it is important to assign weights to these aspects. Alternatively, minimum requirements for the most important criteria could be defined as mandatory. If these criteria are not fulfilled then the whole project will not be evaluated further. This creates a GO / NO-GO checkpoint with sustainability on the one side and negotiable criteria on the other.
- Jury composition
The composition of the jury of urban design competitions affects strongly the outcome for the sponsor and the sustainability strategy. Based on the specific national and/or municipal requirements it is important to decide together with the municipality on how to compose the jury. Often clients or institutions form the jury from their own stakeholders, with board members, staff, local community leaders, or local politicians on the selection committee. In this case, they are favouring specific understanding of the particular project and its community in picking a winner. Moreover they bring in outside experts or designers of some renown to give greater importance to sustainability and visibility to the competition and to pick the winner based on larger trends and ideas in the greater design community. More details regarding this strategic measure can be found in the Annex 63 Volume 2, appendix A-4.

V. CITIZEN PARTICIPATION

Challenge: Design citizen awareness campaigns and public transport promotion as an alternative to public information meetings (Example visualization, NyBy Bylab, Urbanetic⁵), Barnetråkk

Best practice: Many cities establish “citizen involvement laboratories” meaning that there is a public arena where citizens can interact with the municipality in city planning. Bodø launched their ByLab the 4th of April 2018. They decided to engage their citizens and stakeholders in the NyBy smart city project through a CityLab model. In this model, they divide their portals for engagement and citizen contact into three:

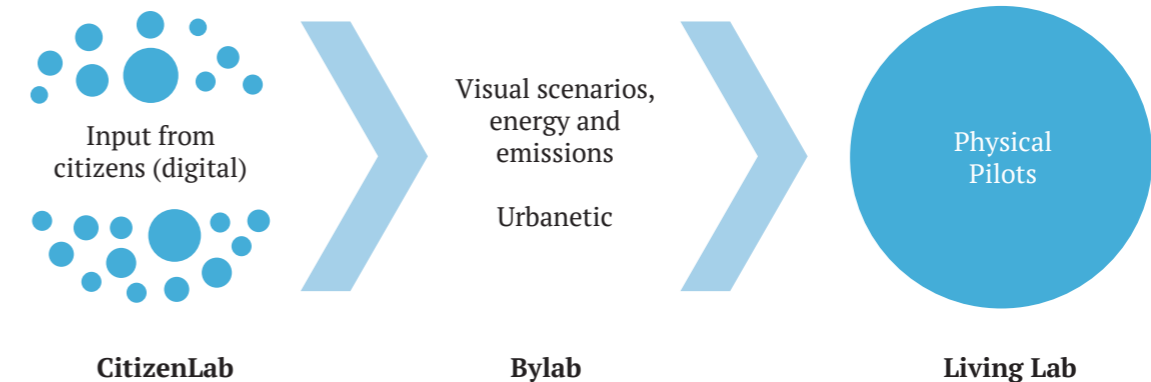


Figure 7: Best practice example Competition Based Dialogue

- Digital: a citizen portal where citizens will be noticed about new plans and developments in their area through an app, and where they can post ideas and concerns.
- Visual/augmented: an urban fabric (Urbanetic⁵) screen where people can plot in different scenarios regarding energy, emissions, building quality etc. in a scenario tool. Fabric is designed to understand the relationships between parcels. This tool also has the option to be experienced through VR lenses. This augmented reality tool is located within the public library in downtown Bodø.
- Physical: Bodø will exemplify the ideas given through the digital and visual portals in a living lab project.

Engagement in the implementation phase, tools examples needed.



Researcher getting introduced to Urban Fabric

⁵<http://www.urbanetic.net/>

W. CITIZEN CONSULTATION AND INFORMATION

Challenge: at the end of the line, if citizens are not willing to upgrade existing buildings or to reduce energy use, the work of designing smart energy communities is in vain. When working on citizen engagement, it is difficult to know who has this responsibility, and what is the aim of the work to engage citizens. In Oslo and Bergen, municipal planners want to include citizen in the knowledge about how local energy is used, by informing them through visualization.

Best practice: Citizen participation can range from pure tokenism to citizen control. Discussing the purpose of citizen engagement is the first step for the stakeholders to do. If the aim is to convince, consult and inform inhabitants to appreciate their neighbourhood, eco visualization and awareness activities can be of use.

Eco-visualizations (EVs) are any kind of interactive device targeted at revealing energy use in order to promote sustainable behaviours or foster positive attitudes towards sustainable practices and awareness raising. There are different types of eco-visualization tools that can be used to increase the energy awareness varying from residential sector to heat and waste heat mapping in the city level. Some of these EVs can also be used to increase citizen's energy awareness. As awareness raising can mean different thing to different people, The EVs used depend on the chosen perspective. In the following few examples of the EVs.

Different energy mapping tools, usually based on GIS, can be used as visual instruments to inform and create awareness among citizens to encourage participation. The EVs can also be utilised to enhance collaboration between the city and its citizens. One example of this collaboration can be found from Ghent, Belgium where interactive workshops help citizens to raise their ideas and discuss challenges and thresholds they are facing. Prior to the workshop, the city had mapped the energy consumption and potential effects of the sustainable energy solutions in one urban district that has been chosen to test the different approaches where top-down objectives can meet the bottom-up actions. (Stepupsmartcities, 2015)

Another example of EVs is a decision-making and awareness raising tool for consumers that guide the consumer through some targeted questions with the aim of finding the best available renewable heating and cooling solutions. An animated video that comes with the tool provides information about different heating and cooling options. (FRoNT, 2016)

Social Electricity is an online social application where citizens can collaborate with one another either in the same country or in Europe. The overall aim is to manage one's own electricity consumption by comparing consumptions with others, play energy related games and see statistics. Comparisons can be made between the people living in the same neighbourhood, or users sharing similar house characteristics. (Social Electricity, 2015)

If the aim is for people to share services, spatial design and smart technology to integrate services into the smart energy community can serve the purpose. However, one of the big challenges to lower emission in existing neighbourhoods, have to do with incentivizing the inhabitants to upgrade their buildings to a lower emission standard.

EPC/energy performance contracts can serve such a purpose, and depend on local and information work with residence:

ENOVA suggests energy saving contracts in municipal buildings to address the difficulty of upgrading existing buildings. Energy performance contracting may also be relevant in housing cooperatives if: (Hauge et al., 2014)

- EPC is applicable to older and newer buildings that are poorly maintained, but only if there is a large enough potential for energy efficiency. EPC will provide less extensive energy saving projects in housing cooperatives because EPC-providers typically focus on the improvement of technical systems. This is positive in cases where the buildings are in quite a good condition, but there is a great risk that EPC projects will stand in the way of greater structural renovation measures where the housing stock is in poor condition.

- The housing cooperatives should have shared facilities and shared settlement for heating, hot water and/or ventilation. This stands in contrast to the recommendations of individual settlement as incentives for energy efficiency.
- The housing cooperatives should also be of a certain size. EPC in small housing cooperatives will be vulnerable to individual variations in energy use. Large individual variations may be more decisive of the total energy consumption, thus increasing the risk for the EPC provider.

In order to connect visions and targets with actions, a logframe method (see appendix) can be useful in stakeholder processes. This can be used in specialized workshops following the vision/diverging phase.

Other useful tools include back-casting and forecasting.

This shows the importance of having a good support team possible including legal advice for drafting agreements, market knowledge to know how to balance what is asked with the market potential, and experienced concept developers to guide the process together with the project owner.

If the process from the beginning has had included incentives that are inviting to flexible and ambitious stakeholders, for example through 'mini-competition' or sign-up fees that lead to special contract agreements, this can lead to less problem and 'trade-off' situations.

SINTEF Building and Infrastructure has had two research projects on how to convince residents in housing cooperatives to vote for energy renovation of the buildings. Based on the results from this qualitative research, case studies and interviews, a user guide for housing cooperative boards was made (Hauge, 2015).

CHALLENGE 5: MONITORING, EVALUATING AND LEARNING

As a municipality, you should choose if they want to make your own monitoring and evaluation, or if you want to outsource these services. For example, BREEAM Communities is one such certification tool that could be chosen and paid for. Norwegian Green Building Council can help you in this aspect.

X. MONITORING ENERGY AND EMISSION ON NEIGHBORHOOD LEVEL

Challenge: It is challenging for municipal planners who are responsible for numerous projects and city plans, to focus on monitoring the emissions and energy use of each neighbourhood.

Best practice: To be able to monitor the goals in relation to energy demand and carbon emissions, the PI-SEC Scenario calculator can be used. A connection between GIS, improved data accessibility and Scenario calculator, would be useful for the city to monitor whether the PI-SEC Goals are being reached regarding energy.

The municipalities climate section sets goals and targets in accordance with the climate plan. Municipalities should, together with private developers and utility companies, participate to suggest and balance available options to accomplish the goals and related targets. PI-SEC Indicator Tool can be used to do see the starting point in relation to the goals set and monitor if the goals are met.

The PI-SEC Scenario calculator sets up scenarios to have a starting point for discussions on building interventions and generated emissions. The scenarios can be followed up by updated numbers at any time to see the development. In this way, the goals and targets can be easily monitored by the municipality them self or other project owners. See more information about the PI-SEC Indicator Tool under tool J and in the PI-SEC report from task 1.2: Preliminary toolkit for goals and KPIs.



Y. CONSIDER EXTERNAL EVALUATION OR CERTIFICATES

Challenge: while the energy and emissions on neighbourhood level can be monitored by using the Scenario Calculator, the qualitative aspects of the PI-SEC Agreement require a broader approach.

Best practice: The projects could also be evaluated by BREEAM/The Norwegian Green Building Council. By using the BREEAM certification system, the project could potentially get scored that tells how sustainability has been taken into account in the neighborhood. As the BREEAM Communities is a holistic evaluation system, all the compulsory criteria should be evaluated. The certificate gives an overall estimate of how sustainable the zoning plan is. The evaluation is done by external BREEAM assessor, and there are six different levels in the classification system: outstanding, excellent, very good, good, pass; and unclassified. (NGBC, 2016)

According to the study (master thesis) made by Venou (2014), one of the advantages of using BREEAM Communities certification system is that it can move the sustainability issues forward and facilitate early decision-making. Furthermore, these kinds of certification systems can help the developers to make the goals clearer and increase the attractiveness of the certified neighborhood. The same study (master thesis) discussed challenges that the BREEAM certification system has. Using external evaluation (BREEAM Communities assessor) costs a significant amount of money. What is more, since the BREEAM Communities is based on the British planning system, and as planning systems differ in different countries, the BREEAM should always be adjusted to the specific local context (Callway, Dixon, & Nikolic, 2016) (NGBC, 2016). Regarding stakeholder engagement, the standard lacks the description of processes on how to identify and engage various interest parties (Callway, Dixon, & Nikolic, 2016).

Masthusen, Malmö

One of these is Masthusen, an old harbour area in Malmö that was also the first neighborhood in the Nordic countries that was certified under the BREEAM Communities. Since the BREEAM Communities was developed for the British context, the English [BREEAM] manual was adopted to the Swedish context and furthermore to circumstances that are specific to Malmö. Masthusen area is an approximately 160,000 square-meter area of the Western harbour in Malmö. Here, one of the largest real estate developers in Sweden was the initiator for the use of BREEAM Communities certification system, with the aim to maximize the sustainability benefits of the area. One of the advantages of using BREEAM Communities was that it helped the authorities and developers to review on how to develop sustainable communities in Sweden, such as taking climate adaptation measures, and vehicle-free transport solutions more into account in an earlier phase. Going through all the issues at BREEAM Communities helped the developer and the city of Malmö to establish a sustainability programme for the area. Furthermore, developing “safety plan” that took into account accessible, attractive and safe streets, public spaces and urban greenery was influenced by the BREEAM Communities scheme. It has also been argued that using the BREEAM Communities enhanced the collaboration between developers and authorities. (Venou, 2014) (BREEAM, 2018)

Z. DID WE REACH OUR VISION?

Challenge: Municipalities in PI-SEC and ZEN explain that there is hardly ever any final evaluation phase, where the cities can know to which degree they reached their (holistic) visions. They lack tools for this.

Best practice: Research is lacking on holistic evaluations. Further research could for example focus on using the planning wheel to decide an evaluation framework, where the core of community description and the goals set in the target setting phase are evaluated at different stages. This toolkit has presented several methods for setting targets and these can also be used to evaluate the holistic vision. This could benefit from engaging an evaluation and knowledge manager, that oversees the knowledge management process in the project.

4. FURTHER WORK

Within the Norwegian urban planning system, the different key components that influence emission are affected by mandates on a different governance level. The agendas identified and explained in report 2.1 illustrate that system boundaries should be set differently regarding:

- Mobility issues; for example highways being under the national road administration and safe walking paths under municipal urban planning
- Energy resource assessment and plans on a regional level
- Energy resource assessment on a city district level
- Energy awareness measures
- Financial incentives



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