

D5.7: +Trondheim 2050 Bold City Vision and Guidelines

(Vision for Sustainable Urban Transition)

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Table of Contents

Table of Contents	3
List of Acronyms	4
Executive Summary	7
1 Introduction of the mission and vision	9
1.1 The description of action	10
1.2 Prerequisites	10
1.3 The scope of Bold City Vision Guidelines and KPIs	11
1.3.1 Corresponding key performance indicators	11
1.4 Structure of the deliverable	11
2 Background	13
2.1 History and origin	13
2.2 Connection to other tasks and work packages	14
2.2.1 Main work packages related to D5.7	14
WP3: CommunityxChange	14
WP4: +Limerick	14
WP5: +Trondheim	15
WP6: +Followers	15
WP8: Scaling-up, Replication and Exploitation	15
2.3 United Nations Sustainable Development Goals	15
3 Bold City Vision Framework towards a guideline	17
3.1 Explaining the Bold City Vision Framework	17
3.1.1 How to use the Bold City Vision Framework (attaining SDGs)	18
3.1.2 Use of the BCV Framework	19
4 Main principles and concepts	20
4.1 Evidence-based policy development	20
4.2 Political commitment	20
4.3 Norwegian Context - national commitment	20
4.4 SDG budgeting	23
4.5 Quintuple Helix Innovation Model, collaboration and multilateral partnerships	23
5 Working from LHC Trondheim	25
5.1 Trondheim Municipality as case	25
5.1.1 Digital guide used in LHC Trondheim	25
5.1.2 BCV workshops using MIRO in LHC Trondheim	26
5.1.3 Norwegian Municipal planning hierarchy and requirements	27



5.1.4 Pursuing evidence based SDG-policy making in LHC Trondheim	28
5.1.5 BCV and SDGs in the Planning Strategy for 2020-2023	30
5.1.6 BCV framework for sustainable society development	30
5.1.7 Trondheim Municipality - Societal Master Plan	31
5.1.8 Trondheim Municipality's Energy and Climate Plan 2030	33
5.1.9 Climate budget	35
5.1.10 SDG budgeting in LHC Trondheim	36
5.1.11 Multiple partnerships and collaboration in LHC Trondheim	36
6 Scaling up	38
6.1 Local level- Asker Municipality	38
6.2 Regionally - Network of Excellence and Trøndelag i pluss	39
6.3 Nationally - lowering the learning threshold	40
6.4 Internationally - and potential for further upscaling	41
7 Guideline on sustainable value creation	43
7.1 Voluntary Local Review as a tool for SDGs	43
7.2 Guidelines on the Sustainable Value Creation - Trondheim Municipality	43
7.2.1 The SCV methodology and BCV	45
7.2.2 The four pillars of Sustainable Value Creation	45
7.3 Use of the SVC guidelines in Trondheim Municipality	48
8 Guidelines to create an energy positive city by 2050	55
8.1 Why the SDG focus, and not just energy?	55
8.1.1 Setting the stage for developing and using a guideline	55
8.2 The four pillars of SVC and energy	55
8.3 Potential- energy goals, current situation, and forecasting	56
8.3.1 Assessing potential in collaboration with partners	60
8.4 Readiness - prepare to support implementation	63
8.4.1 Explanatory examples from Trondheim Municipality	63
8.4.2 Explanatory examples from LHC Trondheim and others	64
8.4.3 Readiness at city level and at national level	65
8.5 Opportunity - collaboration on shared goals	67
8.5.1 Partnership agility in LHC Trondheim	67
8.5.2 Innovations through collaborations	68
8.6 Impact- do the things that amount to something	71
8.6.1 Tools and models can be handy pinning down impact	71
8.6.2 Mobility solutions creates impact and focus	72
8.6.3 Energy focus and results leads to more impact	72
8.6.4 Innovations with impact	73
8.6.5 Regulation and legal framework making impact	73
8.7 Guideline and process description for the +Trondheim BCV - from vision to reality	74
9 Lessons learned, recommendations and reflections	77



Reflections	78
10 References	80
Annex	83
Trondheim Municipality Political Approval	83
Connection between tasks and deliverables	83
WP Connections of BCV work to main objectives or results	85
SDG Taxonomy	87
Recommendations for regulatory framework	88
Municipal initiatives targeting regulations and sector coupling	91



List of Acronyms

BCV	Bold City Vision
CO	Citizen Observatories
COE	Centre of Excellence
DSO	District Service Operator
DP	Demonstration Project
DPEB	Distributed Positive Energy Block
EEA	European Economic Area
EFTA	European Free Trade Association
EU	European Union
FC	Follower City
ITU	International Telecommunication Union
KPI	Key Performance Indicators
LHC	Lighthouse City
NGO	Non-governmental organisation
PEB	Positive Energy Block
PEC	Positive Energy City
PED	Positive Energy District
SDGs	Sustainable Development Goals
SVC	Sustainable Value Creation
SSB	Statistics Norway
SSC	Smart, Sustainable City
TK	Trondheim Kommune
UN	United Nations
U4SSC	United for Smart Sustainable Cities
UNECE	United Nations Economic Commission for Europe
UN SDGs	UN Sustainable Development Goals
VLR	Voluntary Local Review
VSR	Voluntary Subnational Review
WP	Work Package



Executive Summary

The work in LHC Trondheim, in Trondheim Municipality and the municipality's work with the UN Centre of Excellence on SDG City Transition, are overlapping, and for the purpose of the guidelines, it is recommended that it is seen as what the city has done through and together with initiatives sharing the same goal. The initiatives have reinforced one another and increased the positive synergies. That is why LHC Trondheim chose to share necessary information and preconditioning elements. Without showing the steps taken, the logic behind and how theory and practice coincides, this deliverable will fail at making complex matter understandable, adaptable and useful in further upscaling.

The Bold City Vision for LHC Trondheim is to become an energy positive city by 2050. In Norwegian the vision is called "Plussbyen Trondheim". It is a vision, and not a document or a strategy. The prevailing deliverable and report answers to how we plan on reaching the vision, with description of methodology reasoning and paving the way to a guideline.

In order to create an energy positive city by 2050, there are many aspects that need to be taken into account. The LHC Trondheim vision is energy specific, however, strongly connected to the UN Sustainable Development Goals (SDGs). This elevates the work, gives it an unarguable timeliness, and energy is by all means a pervasive factor within the SDGs and their targets. Having that approach implies involving other sectors relevant for the multi-level, multi-disciplinary and multi-angle sustainable transformation. The guidelines to get there are applicable for other areas, and thereby more universal than if it was purely energy related.

The award winning innovation +CityxChange Bold City Vision Framework (Tanum et al., 2020) is the origin to all the derived frameworks and methodologies. The framework, including the methodology design, and the variety of uses is what culminates into guidelines. By linking it to the SDGs and a Norwegian context, it became a framework for Sustainable Societal Development. LHC Trondheim has used it to develop the municipal steering documents and perform SDG-budgeting. It is also valued as a SDG Transition Framework in the unpublished "Guidelines on the Sustainable Value Creation-led Voluntary Local Reviews in Norway and beyond" (Krause et al., 2021).

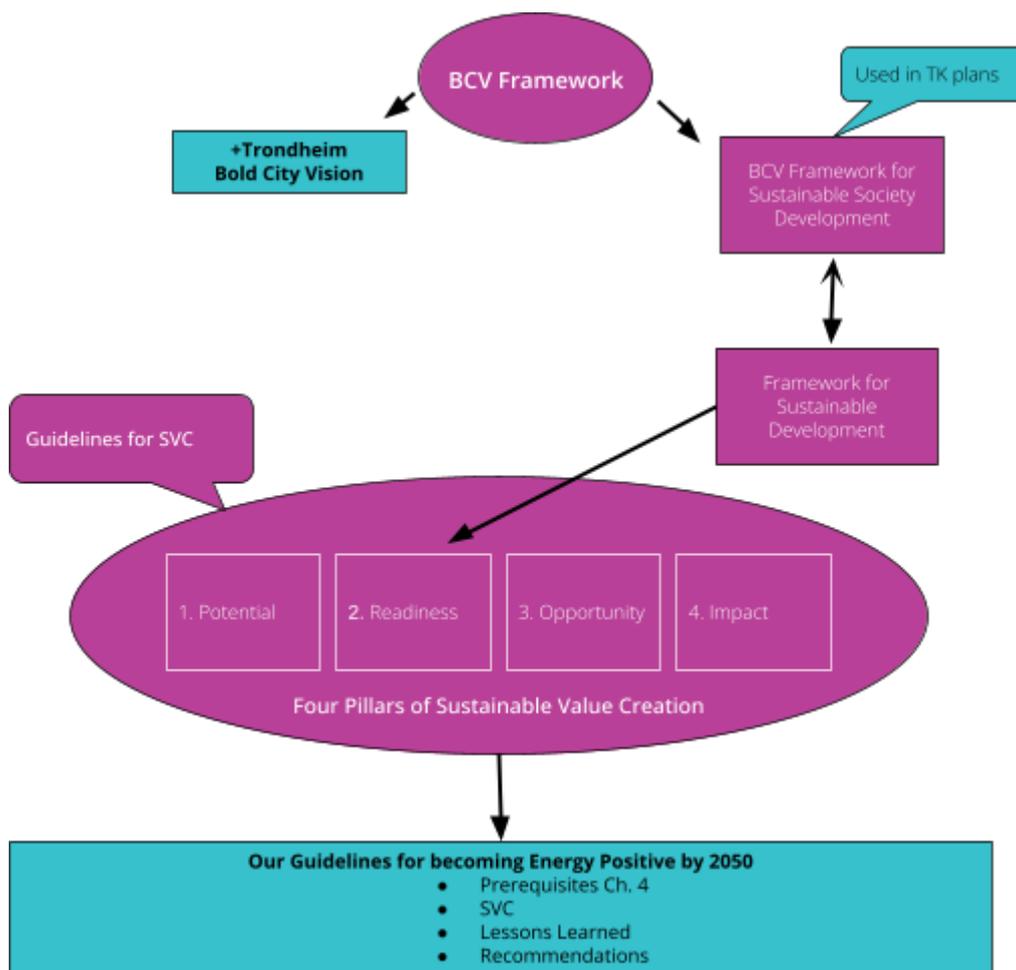
Trondheim Municipality received 3rd place as Icapital 2021, and that was much due to the systematics of the four pillars of Sustainable Value Creation (SVC). They demonstrate that taking stock of progress towards SDG is an opportunity to direct public and private partners towards mutually interesting and innovative opportunities for sustainable urban development. The four pillars of SVC; *potential*, *readiness*, *opportunity*, and *impact* are connected to the BCV framework by the second pillar, *readiness*. For all practical reasons it is the equivalent of the whole BCV framework. This is demonstrated within this deliverable, together with practical examples serving as guidance, and shown in the illustration below.

There are two guidelines presented in this deliverable; "Guidelines on sustainable value creation" and "Guidelines to create an energy positive city by 2050". They are both a result



of the four pillars of SVC, built around the logic that they represent, but the guideline for LHC Trondheims BCV has some additional prerequisites and future recommendations based on lessons learned. "Guidelines to create an energy positive city by 2050" is accompanied by a visualisation of the Trondheim BCV integrating activities, actions, and measures over the time span, and displaying relations between crucial steps and actions.

The guidelines will be useful for other cities and regions when exploring or expanding their scope and possibilities on archiving the SDGs and becoming an energy positive city. However there are necessary levels of gouvernance that must be paid attention to. Especially striving for evidence based SDG-policy, political commitment, SDG-budgeting and multilateral partnerships for collaboration. Without this as an established basis, the city's journey towards a greener, healthier, smarter and eventually climate neutrality may become cumbersome. The BCV framework has proven to be a valuable tool and methodology in the line of work in LHC Trondheim. Its continued enhancements have yielded results and knowledge vital to continue the progress of the city's journey. The process is described in this deliverable, and contains many valuable aspects and methodologies in regards to implement the SDGs and create value on the journey towards becoming an energy positive city.



1 Introduction of the mission and vision

To fully present the work done in Lighthouse City (LHC) Trondheim, and secure the transferral of value to other cities, the work must be presented and seen in context with the overarching goal; how to become an energy positive city by 2050. A Bold City Vision (BCV) is a vision of how to attain sustainable development for cities. When a BCV is supported by testing and use of different methodologies, analyses and evaluations, constantly adding layers and value on how to transform a vision into action and suggestions of needed actions, it takes the form in the direction of a guideline. It will not only give LHC Trondheim knowledge on what we need to do to enable the creation of a positive energy city by 2050, but also inspire and help other cities to create their own BCVs and guidelines.

The methods and results leading to +Trondheim Bold City Vision and Guidelines are both developed within and derived from +CityxChange. The work consists of documenting results and knowledge, combining lessons learned, extracting the essence, and drawing up the lines and connections in an adaptable way, representing guidelines. It includes structures and methods from partners, Trondheim Municipality, and external collaborations. The results have been fed back, not only to the municipality's master plan, but also to the extended collaborative work that Trondheim Municipality is involved in nationally and internationally. Worth mentioning is the work on sustainable value creation (SVC), which was developed at one of LHC Trondheims Citizen Observatories (CO), Bærekraftssenteret¹, as a contingency of the work in the BCV Framework² (Tanum et al., 2020). It strongly links the BCV methodology to the UN sustainable development goals (SDG), in terms of the triple bottom line.

It is important to understand that developing the BCV guidelines and enabling the overarching goal is a dynamic journey. The conditions may alter or change with time or geography, and new opportunities will emerge. When they do, a city should be agile and ready to seize those opportunities. Trondheim Municipality was recently selected as one of the 100 +12 Cities to participate in the EU Mission for 100 Climate-Neutral and Smart Cities by 2030³. Trondheim's application was based on the existing and planned efforts, measures, and strategies around its work on innovation and climate neutrality. The mission will involve local authorities, citizens, businesses, investors, as well as regional and national authorities. This is undoubtedly a reinforcement and continuance of LHC Trondheim's work, engagement, involvement with a focus on becoming not only energy positive by 2030, but also climate neutral. It is unambiguous that the results and documentation of the work originating or connected to +CityxChange has influenced and contributed to this ambitious status. Trondheim Municipality can assess the upcoming venture as both a continuation

¹ Bærekraftssenteret has hosted the UN Centre of Excellence on Sustainable Development Goals (SDGs) City Transition since 2019:

<https://www.trondheim.kommune.no/aktuelt/om-kommunen/bk/barekraft/barekraftssenteret/om-barekraftssenteret/>

² D3.1 Framework for Bold City Vision, Guidelines, and Incentive Schemes:

<https://cityxchange.eu/knowledge-base/framework-for-bold-city-vision-guidelines-and-incentive-schemes/>

³ EU press release: https://ec.europa.eu/commission/presscorner/detail/en/ip_22_2591



and a new start where the values and impacts from +CityxChange are harvested, refined, and recycled. It should be viewed as a means to apply and upscale results and experience.

1.1 The description of action

The Grant Agreement for deliverable D5.7: +Trondheim 2050 Bold City Vision and Guidelines, reads:

This deliverable demonstrates how to refine and develop the bold city vision into a fully integrated planning process, implementation, and replication. Citizens, community groups, NGOs, local leaders, and industry partners will be involved in the demonstration through the citizen observatories (T5.3) and the Playgrounds (T5.5). Evidence-based data and insights will be used to make informed decisions on urban, technical, financial, and social aspects guided by the Sustainable Development Goals 2030. The report will then demonstrate and document what TK as urban authority needs to do in order to enable the creation of a positive energy city by 2050, and a framework on how TK can develop this capability to last through generations, together with local stakeholders. The report further describes how to create well integrated innovative strategies with realistic implementation roadmaps that support each other, utilise open innovation, avoid duplication of effort and costs, and contribute to increased resource efficiency in the implementation phase. Finally, the report demonstrates how TK together with local stakeholders can co-create resourcing and funding mechanisms for the implementation, replication, and scaling out of solutions to social, economic, physical, and environmental issues. The Bold City Vision will correspondingly be supported by an adequate investment and resourcing plan (T5.11) (connected to Task 5.2).⁴

The Grant Agreement is instructive and detailed in one sense, but very open at the same time. It was built to provide LHC Trondheim with the needed degree of flexibility to conduct the work as a city journey, including all the needed societal levels and aspects.

1.2 Prerequisites

D3.1: *Framework for Bold City Vision, Guidelines, and Incentive Schemes* (Tanum et al. 2020), is the starting point for the work methodology. The prevailing deliverable represents the continuation of D3.1 in practice. BCV is a framework/matrix that contains a specific designed methodology. One could also say that the methodology is organised in a framework/matrix, and used by adjusting it to local conditions. When BCV is referred to in this deliverable, it is both the framework, the methodology design, and the variety of uses that culminates into a guideline (D5.7). When LHC Trondheim addresses the framework specifically, this will be noted.

The data and insights must be evidence based when making informed decisions on urban, technical, financial, and social aspects guided by the Sustainable Development Goals 2030. In LHC Trondheim the work executed has a strong connection and correlation to the SDGs, and the goals and work can be viewed as symbiotic initiatives. Working in alignment and supporting the SDGs is a premise for the work done, and the work to come.

⁴ +CityxChange Grant Agreement/DoA (p. 57)



The target groups for the work and the results are overarching, including citizens, community groups, NGOs, local leaders, and industry partners. The target group for this deliverable is primarily politicians, city officials, city planners, and others engaged in social and technological issues related to sustainable urban development and sustainable value creation.

1.3 The scope of Bold City Vision Guidelines and KPIs

The scope of the BCV Guidelines is to not only provide follower cities and member states with input and methodology which will function as a starting point and guidance on their journey towards sustainable value creation and enable them to become cities with surplus energy. It is also for other cities and regions to adopt and use as they see fit. It also provides documentation on what was tested and done in LHC Trondheim, as an example, and gives recommendations where it seems fit. The BCV Guidelines can be a catalyst and a trigger. The transferral value, adaptability and level of scaleup will depend on the recipient's entrance point and ability to utilise the available information in their local context. The level of overlap with member states and their local conditions, compared to the experience and examples from LHC Trondheim, will vary. That is why it is so important to emphasise that the BCV is not a rigid concept with predefined steps and protocols, but that there are flexibilities and possibilities to explore, regardless of the entry point. This is a needed attribute since it is a journey with feedback mechanisms enabling adjustments and innovations, as the journey rolls out. This will add value and experience, and ensure that if needed, the path can be redefined.

1.3.1 Corresponding key performance indicators

This deliverable meets the corresponding key performance indicator (KPI) number 6. The KPI is the number of politically-approved Bold City Visions with guidelines, roadmaps, and action plans. The KPI has a total target number of seven expected BCVs, consisting of one from each of the two Lighthouse Cities and the five Follower Cities (FC). LHC Trondheim meets its target number of one for this KPI, and is the first city to deliver on KPI 6. [The political approval](#)⁵ is found in chapter 6.3.1 in the linked document. It is written in Norwegian but an English translation is available in the Annex.

1.4 Structure of the deliverable

The deliverable is structured into 11 chapters including annex, where chapters 1-2 presents an introduction, correlations and dependencies, background and know-how. Chapter 3 contains work methods and methodologies important to the work done with the BCV guidelines, but also in connection with the overall agenda, how to become an energy positive city by 2050. Chapter 4 entails main principles and concepts. They are what we consider important knowledge, and a part of the guideline. Chapter 5 connects the content

⁵ Political approval:

<https://www.trondheim.kommune.no/tema/bygg-kart-og-eiendom/arealplaner/kommuneplanens-arealdelplaner/planstrategi-2020-2023/>



of chapter 4 to LHC Trondheim, and how they apply. Scaling up in a regional, national and international context is presented in chapter 6. Chapter 7 introduces the four pillars of Sustainable Value Creation (SVC), and how they have been used to pave out a guideline for SVC in Trondheim, with examples. The four pillars of SVC are then used to target how Trondheim can become energy positive by 2050, and leads out to the Guideline for our Bolad City Vision. Chapter 9 includes lessons learned, reflections and recommendations moving forward, and Chapter 10 comprises references.



2 Background

The deliverable can be viewed as the cumulative result of plans, designs, pilots, frameworks, solutions and the brain work of many parties, starting many years back. The outcomes of the co-creation processes are results such as deliverables, methods, solutions, networks, and tools provide one part. As important is the constantly evolving mindset of those directly involved, those in proximity, and those that are to come. This is a city journey, best travelled with a multi-angular approach. The argument for starting several processes at the same time lies within the diversity of responsibilities and roles a city has, and the magnitude of the needs and livelihood of civil society and government. Given the interdependencies of interactions and tasks, it is necessary to manage multiple initiatives simultaneously.

2.1 History and origin

This deliverable originates from D3.1: *Framework for Bold City Vision, Guidelines, and Incentive Schemes* (SDG City Transition Framework), (Tanum et al 2020). D3.1 has a strong connection to the draft from 2017 that formed the basis for +CityxChange +Trondheim Bold City Vision. The purpose, concept, complexity, interdependencies, responsibilities and roles of the municipality written in the draft are still valid. Revisiting connects the past knowledge and thinking with the processes, work and results accomplished, and work to be done.

In the draft it is written that: *"In the future, the Municipality of Trondheim as many other world cities will need to adjust increasing levels of complexity in order for us to have a well-functioning city in 2050. We must be better at utilising the resources we have and using technology in a completely different way. We must move towards a more sustainable society where we radically increase energy efficiency, reduce emissions, and where design, planning, technology and people go hand in hand. There is an understanding of digital technology being used to a larger extent in new areas in order to improve the quality of life, make the cities more climate friendly and productive, and facilitate business development. We also need to utilise existing skills, initiatives and opportunities in the municipality of Trondheim better and more efficiently than today. The municipality is a key, coordinating actor, and must be the driver."*

Revisiting connects the past knowledge and thinking with the processes, work and results accomplished, and work to be done. Hence assuring that the past, the present and the future are aligned.

In D3.1 (Tanum et al. 2020), the BCV framework is presented as a tool that helps cities identify and address key opportunities and actions on their way toward becoming smarter and more sustainable. More concrete, the framework presents a description of a multiangular process that is operating in several dimensions, connected or correlated to each other, and preparing the ground and necessities for creating energy positive cities.

The extracted essence from the draft and D3.1, addressing the needed complexity and the municipality as a determining keystone unit, has proven valid in the continuous work



performed since they were written. The ongoing work includes manifesting and executing the methodology and results through, and with the political steering documents, planning programme, and the municipal master plan within LHC Trondheim.

2.2 Connection to other tasks and work packages

The +Trondheim 2050 Bold City Vision and Guidelines are connected to a large number of tasks and work packages (WP) in the +CityxChange project (figure 2.1).

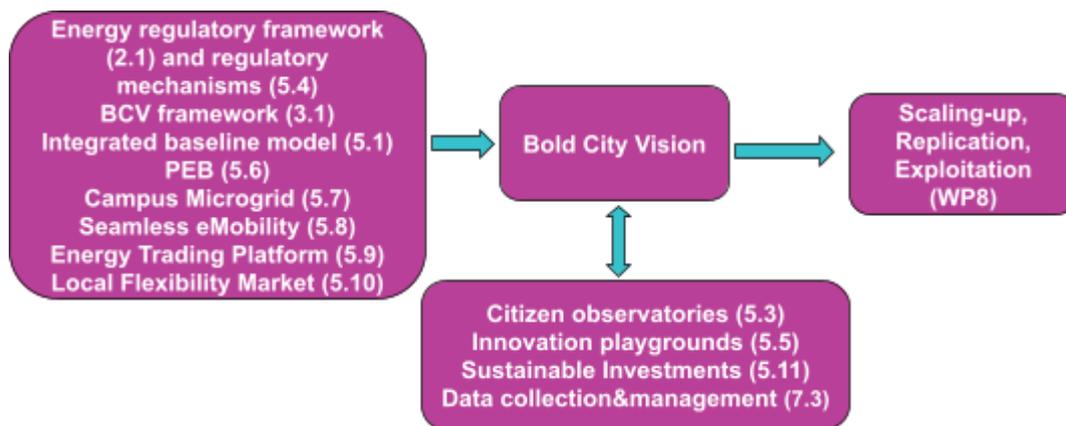


Figure 2.1. Co-project dependencies and interdependencies for the Trondheim Bold City Vision demonstrator; further detailed in table 2.1. (Source: TK)

For further details on the connection between this deliverable and other tasks, please see tables A1 and A2 listed in the Annex. Relevant input, as methodology and results from some of the connected tasks, will be further explained in chapters 3 and 4 in connection and with relevance to this deliverable.

2.2.1 Main work packages related to D5.7

To fully predict and interpret all the connections and interconnections between the different work packages might be considered presumptuous, knowing it will vary with the vantage point, time and place, and the possible utilisation and refinement of the results and lessons learned. We have, however, listed connections to WPs within +CityxChange as input, output, both or none. The main WPs, with the strongest correlations, are mentioned below. The overall chart can be found in the Annex.

WP3: CommunityxChange

WP3 has contributed with input, by developing the BCV frameworks, which is the source to the prevailing work. The other developments in WP3 have supportive and enabling abilities interacting both directly and indirectly with input.

WP4: +Limerick

The two LHCs share, learn and harvest knowledge and experiences from each other, adding and refining the knowledge pool, and the WP contribute with both input and output.

WP5: +Trondheim

In WP5 LHC Trondheim leads the implementation of 11 demonstration projects (DPs) within integrated planning and design, common energy market, and community exchange within the city. The work within LHC Trondheim is interacting and mutually beneficial to D5.7 with input and output, considering it is a city journey where lessons learned are fed back to the ongoing journey.

WP6: +Followers

Primarily D5.7 will form input to WP6, but other results and lessons learned from and with FCs can feed back to the overall knowledge pool. A number of joint exchange and learning sessions took place through WP9.

WP8: Scaling-up, Replication and Exploitation

In WP8 the focus is on scaling up and replication of demonstrated solutions, which are factors that are part of the BCV Guidelines. The steps outlined in the BCV guidelines pave the way for an easier replication and facilitators of frameworks. By using the framework and reflecting upon the guidelines, other cities and regions can see the lessons learned in LHC Trondheim as either tentative recipes, examples, and inspiration to their own city journey. This deliverable is a tool to both implement, move forward, and scale up processes. The BCV Guidelines also represent a flexible way to replicate a solution in cities with different perspectives or starting points.

2.3 United Nations Sustainable Development Goals

The +Trondheim 2050 Bold City Vision and Guidelines is strongly connected to the United Nations (UN) Sustainable Development Goals (SDGs) ratified from [Agenda 2030](#)⁶. LHC Trondheim acknowledges the SDGs as an overarching premise for the work within +CityxChange and work within the municipality. This is in line with the expected intent of the framework (D3.1) and a continuation of processes to facilitate a vision for the future city, guided by the overarching goals and ethical standards in the SDGs. A substantial part of the work has been, and still is, preparing the grounds for implementing innovations leading to a sustainable city and indirectly instituting the SDGs at different societal levels. This means local, regional, and national authorities, civil society, the private sector, and other stakeholders. The deliverable, and much of the work presented, are about the SDGs. This is performed, without making continuous references to the goals in the DOA, since becoming an energy positive city by 2050 is undeniably deductive to the realisation of the SDGs.

One of the citizen observatories in LHC Trondheim, Bærekraftssenteret, is Trondheim Municipality's Centre for Sustainable Development. It is also the project office for +CityxChange, and has the status of being a Geneva UN Charter Centre of Excellence on Sustainable Development Goal City Transition in Trondheim. In many ways the centre represents a policy innovation laboratory, providing input into policy processes at all levels

⁶ Agenda 2030:

<https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>



with governance. Much of the work is to develop and test approaches, concepts and methodologies that support SVC to speed up progress towards the SDGs. There is more information in the upcoming chapters of work that has been done in the Centre for Sustainable Development, by itself or in collaboration with LHC Trondheim and others, and the contribution towards a guideline approach.



3 Bold City Vision Framework towards a guideline

The use of the word *bold* for describing a city vision, is an allusion, a figure of speech. It gives associations to a brave, confident, daring, strong and fearless vision. Bold also means requiring or exhibiting courage, and this allusion is contradicting if seen with the biased impression of “classical bureaucracy”. This is genius and confusing at the same time because it challenges the established assumption of reduced agility within the public entity municipality. The BCV is the structuring and suggestion of processes needed to move forward in an expedient and sustainable way.

Philosopher Heraclitus said: “No man ever steps in the same river twice, for it's not the same river and he's not the same man”. The BVC, in many ways, is the embodiment of that because there is no theoretical, everlasting one-size-fits-all solution to be found. The BCV is multilevel innovation with testing and implementation of new ways of thinking and collaborating, in addition to all the technological innovations. It embraces society involvement and engagement, combined with continuous evaluations and refinement of methodology and results to adjust and adapt to a changing environment and context. It is an ongoing constructive arms race, moving forward.

Our Bold City Vision is “Plussbyen Trondheim”, an energy positive city by 2050. Though our vision is energy specific, it includes the SDGs, other sectors relevant for the multi-level, multi-disciplinary, and multi-angle sustainable transformation, and the guidelines to get there are applicable in other areas, and thereby more universal.

3.1 Explaining the Bold City Vision Framework

D3.1 (Tanum et al., 2020) presents the BCV Framework as a matrix (figure 3.1) with six horizontal levels of governance that intersect with five vertical processes. This unfolds the BCV processes in 30 confluent dimensions. Preferably the framework should be read moving from left to right from the process “engage” when starting a multi-step city journey. The framework is organised with an intended structure, showing the needed steps or processes to pay attention to, listed in the surrounding boxes. This comprises the dimension aspect stretching over governance levels and processes. It should be viewed moving forward, as in what should be the next step, but can also be seen retrospectively, as in securing that needed considerations and work are done or to backtrack and evaluate.



	Engage	Design	Activate	Accelerate	Support
 Standardisation	Evaluation	Visualisation	Simulation	Funding	Sharing
 Policy development	Review	Revision	Planning	Budgeting	Analysis
 Innovation partnerships	Appointment	Linking	Collaborating	Prioritising	Portfolio management
 Organisational development	Identification	Leadership	Intrapreneurship	Self organisation	Twinning
 Citizen engagement	Acknowledgement	Deliberation	Localisation	Connection	Amplification
 Project development	Pitching	Prototyping	Delivering	Capitalising	Storytelling

BOLD CITY VISION FRAMEWORK FOR 2050

Figure 3.1: The Bold City Vision Framework (Source: D3.1)

3.1.1 How to use the Bold City Vision Framework (attaining SDGs)

For a system to be ready for implementing smart and sustainable solutions, multiple processes need to be activated at different levels of governance. The framework's five actions or processes are to: *engage, design, activate, accelerate* and *support*. They are to be used at the different organisational levels to help guide and ensure the necessary elements are in place to carry out efficient processes, informed decision making and achieve the desired impact.

A city journey, targeting smart and sustainable solutions also known as attaining the SDGs, must activate several levels of governance. The BCV framework supports a multi-step approach and hence, helps organisations optimise their operational work-frame to attain the SDGs through evidence-based policy making, SDG budgeting and resource management, as it facilitates multilateral partnerships and network approaches.

Though it is theoretical when viewed as a matrix, it is adjustable to practical execution and local conditions which are usable for a variety of subjects. The results and the lessons learned from implementing the BCV framework in a municipality is a crucial part of the LHC Trondheim BCV guidelines. For further explanations and details regarding the framework

please see D3.1: [Framework for Bold City Vision Guidelines and Incentive Schemes](#) (Tanum et al., 2020).

3.1.2 Use of the BCV Framework

The Bold City Vision framework has been introduced and used at different levels and contexts. The use of BCV can be at a city, regional, national and international level, and sets the grounds for mapping project development and is applicable at various stages and levels of governance. The framework can be handled and used in many ways, by itself or supported by tools, thematics and knowledge. It is adaptable to local conditions. The work done in achieving the goals in +CityxChange is with a strong connection to the SDGs. For that reason, much of the SDGs work is intertwined in the upcoming work leading to BCV guidelines. The theory and practice presented must be seen in the light of this.



4 Main principles and concepts

There are some general principles and concepts that are important perspectives to the deliverable. Understanding their value, and then seeing how they resonated with the work done in LHC Trondheim in the next chapter, will bridge theory and practice and add value when construing the BCV guidelines. To understand the bigger picture on why LHC Trondheim did what, and for which reason, it is useful to present a short insight into the Norwegian government's linkage to the SDGs and EU. It can provide other member states with advanced knowledge on the national status-quo, and hopefully simplify their work. It will also give more logic, in the end, seeing this "ensemble of actions" with so many tunes, finally making music when put together in accordance. Working with SDGs as a means to become an energy positive city, the general rule of thumb is that everything is connected to everything.

4.1 Evidence-based policy development

The concept itself is by its mere words self-explanatory, but still important to bring forth. The value of an evidence-based approach is accountability, and it reinforces the possibility of taking measures and actions to achieve desired outcomes. Evidence-based policy development, as a concept, revolves around the notion that political decisions should be founded on established objective evidence, as opposed to decisions based on ideology, anecdotes, intuitions and assumptions.

4.2 Political commitment

The importance of political commitment, acceptance and execution abilities is crucial when working with SDGs, or any topic that challenges the established practice or paradigm. To be able to spend time and resources in investigating, testing and gathering knowledge and practice is important when a topic or field requires leeway. Without commitment and genuine interest, there will eventually be trust issues and decision aversion, often resulting in big words more than actions. For a municipality, traditionally operating as a service provider, taking on the role as a transformation agent, innovator and a driving force for societal change, is not done in a split second. Political commitment - national as well as regional and local, however, magnifies the likelihood and will often speed up the process, and help the city's readiness to implement smart and sustainable solutions.

4.3 Norwegian Context - national commitment

Norwegian UN connection

Norway has a history as one of the founding members of the United Nation in 1945. The first Secretary-General of the United Nations was Norway's former Minister for Foreign Affairs, Mr. Trygve Lie. The relevance and importance of being part of a global organisation working to end war, increasing the collective good globally and being a platform for dialogue were as important then as it is today.



During the UN Summit in New York⁷ in 2015, all member states committed to supporting [The Agenda 2030 For Sustainable Development](#)⁸. In Norway the 2030 Agenda, with the SDGs, constitutes the overarching political structure for the government's work nationally and internationally. The Norwegian government also lists the [Addis Ababa Action Agenda](#)⁹, which provides a new global framework for financing sustainable development by aligning all financing flows and policies with economic, social and environmental priorities, and the [Paris Agreement](#)¹⁰, as a framework for international collaboration on sustainable development (regjeringen.no¹¹).

The national commitment is thoroughly accentuated in Norway's [National expectations to regional and municipal planning 2019-2023](#)¹², that was adopted by Royal Resolution on 14. May 2019. The government points out the following four main challenges:

- To create a sustainable welfare society
- To create an ecologically sustainable society through, inter alia, an offensive climate policy and accountable resource management
- To create a socially sustainable society
- To create a safe society for all

The government points out that the SDGs are the political mainstay solving the greatest of challenges of our time, and therefore important that the SDGs become a part of the basis for community and spatial planning in municipalities and regions. The logic behind is obvious. County municipalities and municipalities are key players to realise sustainable social development and realisation of the SDGs in Norway. They are closest to the population, local businesses and organisations. At the same time, they are responsible for much of the social and physical infrastructure that affects the living conditions and development opportunities for the population.

In Norway the municipalities with political attention to the SDGs have typically come further with implementing the SDGs in the municipalities plans and management processes ([Voluntary Subnational Review - Norway](#)¹³, Hjort-Johansen et al., 2021).

Norwegian EU connection

Norway is not a member of the European Union but has a strong connection to the union through formal agreements regulating many aspects. Norway's most important affiliation

⁷ UN Agenda 2030 Summit: <https://www.coe.int/en/web/programmes/un-2030-agenda>

⁸ Agenda for Sustainable Development: <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>

⁹ Addis Ababa Action Agenda: https://sustainabledevelopment.un.org/content/documents/2051AAAA_Outcome.pdf

¹⁰ The Paris Agreement: https://unfccc.int/sites/default/files/english_paris_agreement.pdf

¹¹ Norwegian Government on the Agenda 2030 and SDGs: https://www.regjeringen.no/no/tema/utenrikssaker/utviklingssamarbeid/bkm_agenda2030/id2510974/

¹² National expectations to regional and municipal planning 2019-2023: <https://www.regjeringen.no/contentassets/cc2c53c65af24b8ea560c0156d885703/nasjonale-forventninger-2019-bm.pdf>

¹³ Voluntary Subnational Review - Norway: <https://www.ks.no/contentassets/d01c61089c294915bc1c4be4d73ae1ff/Rapport-Voluntary-Subnational-Review-Final.pdf>



with the EU is the [EEA Agreement](#)¹⁴, but Norway also cooperates with the EU in policy areas that are not covered by the agreement. For instance the [Schengen Agreement](#)¹⁵ on justice and police cooperation, and co-operation on foreign and security policy. In addition, there is extensive informal contact.

Through the EEA Agreement Norway and Norwegian R&D institutions, municipalities, and private actors are part of a large number of EU funding programmes such as Horizon 2020 and Horizon Europe. There are, however, a large number of programmes and funding instruments Norway and Norwegian actors cannot apply funding from, e.g. European Structural and Investment Funds (ESIF). Norway lacks other funding instruments that EU member states can seek financial support from, as Norway has not a parallel to the European Investment Bank (ESB) either. Substantial sustainable action/intervention funding may and will be more challenging in Norway for this reason.

When the EU adopts legal acts within a policy area in the EEA Agreement, Norway has the right of reservation, but no veto rights with EU legislation. In case of a reservation, the EEA Agreement gives the EU and the European Free Trade Association (EFTA) six months to reach an agreement. If no agreement is reached and the legislation will not be incorporated, the consensus principle leads to the affected area being suspended from the EEA Agreement for all the countries within EFTA. The right to completely opt out of new laws has potentially high political costs. However, EEA members can negotiate adaptations to new EU rules.

- Through the EEA agreement, Norway has participated in the EU's climate quota system (EU-ETS) since 2008.
- In 2019, Norway entered a climate agreement with the EU to meet the previous goals Norway and the EU had signed up to in the Paris Agreement on how to reduce greenhouse gas emissions by at least 40 % from 1990 to 2030.

Through the EEA agreement Norway is also part of the EU inner energy market. Norway has incorporated a large number of energy related directives and regulations related to the internal market. These are incorporated in Annex E of the EEA Agreement. Norway has implemented the first energy market package from 1996-1998, and the second energy market package from 2003. The third energy market package from 2009, which further develops the internal market for electricity and gas, has also been incorporated into Norwegian legislation through the EEA agreement, but in fact not until 2018. A full and final Norwegian yes to the 3. energy market package, including the Acer affiliation, has also been further postponed and hampered due to a Norwegian NGO pulling national authorities to court for the implementation of the market package including Acer. It is fair to predict that Norway will adopt all or most upcoming EU legislations with relevance to energy, SDGs and more. However, lawsuits may both hamper, delay, and hinder the inclusion of core EU regulations and directives into national legislation. Thus there is a certain risk of Norwegian non-alignment with the EU concerning important legal development within the energy sector, as well as within other sectors.

¹⁴ EEA Agreement: <https://www.efta.int/eea/eea-agreement>

¹⁵ Schengen Agreement: <https://www.schengenvisainfo.com/schengen-agreement/>



4.4 SDG budgeting

As a principle, SDG budgeting is when domestic budgets are aligned with the SDGs. Without political commitment, following through with SDG budgeting can be difficult.

When SDGs are ratified as part of the national policy framework, integration into the budgets are crucial. The reasoning is that it is the strongest domestic legal basis assuring the commitment and prioritises when expressed in budgets. according to [UNDP Budgeting for the sustainable Development Goals, Guidebook 2020](#)¹⁶. For a city that involves integrating the SDGs in the public budgets, often identical to the municipal social and economical budget, since they are economical, legal and political tools. It also connects and asserts SDGs to sustainable value creation. A conscious relation between local resources and global goals contributes when carving the path to sustainable value creation. SDG budgeting in layman's terms, for all nations that have ratified the UN SDGs, implies putting your money where your mouth is.

4.5 Quintuple Helix Innovation Model, collaboration and multilateral partnerships

The need for multilateral partnerships is evident, recognising the complexity of the work, and the need for innovations incorporating the SDGs. This is supported by the established innovation models, starting with the triple helix innovation model that advocates interaction between academia/R&d-sector, business/industry and the public sector as a foundation for economic and social development. Then the quadruple helix innovation model includes civil society and thereby encourages perspectives of society and democracy for knowledge production and innovation. The quintuple innovation helix model includes the environment as a fifth element. An article going ten years back, [Carayannis et.al 2012](#)¹⁷, addresses innovation models in the context of global warming. They identify that the triple helix innovation model presumes higher education explicitly for innovation. This, they suggest, *can* be interpreted as the model placing emphasis on knowledge production and innovation in the economy, making the model compatible with the knowledge economy. They bring forth the sustainable development of a knowledge economy that requires coevolution in addition to the knowledge society. In understanding the concept of the quintuple innovation helix model, it points out that drivers for knowledge production and innovations should include the natural environments of society and the economy, and defining the opportunities for the knowledge economy.

Fast forward to the present time, their view that sustainable development needs to be seen in context with global knowledge, economy and society makes sense, in moving and evolving from a triple to a quadruple helix innovation model working towards reaching the

¹⁶ Budgeting for the SDGs: https://sdgfinance.undp.org/sites/default/files/UNDP%20Budgeting%20for%20the%20SDGs%20-%20Guidebook_Nov%202020.pdf

¹⁷The Quintuple Helix innovation model: global warming as a challenge and driver for innovation: <https://innovation-entrepreneurship.springeropen.com/articles/10.1186/2192-5372-1-2>



SDGs. Today, we work on enhancing the general knowledge and execution of the SDGs, with focus on the triple bottom line impact measurements that require multilateral partnerships and entries to problem-solving, innovations and sustainable value creation. We see the work in LHC Trondheim as the equivalent of using the quintuple innovation helix model in practice.



5 Working from LHC Trondheim

Using the BCV framework at a city level requires preparations on how to start a multi-step process, which implies activities stretched over several levels of governance. Preparations like anchoring the work at the top level within the organisation, ensure that the work and effort yield results. In a city that implicates both political and administrative approval and commitment to the necessary work. By using the BCV framework as a starting point or a mapping tool, a city can start their journey or build on already existing knowledge/work to approach the SDGs, supported by evidence-based policy development, SDG budgeting, collaboration, and multilateral partnerships.

5.1 Trondheim Municipality as case

In LHC Trondheim, the BCV framework matrix emerging from D3.1: The Bold City Framework (Tanum et al., 2020) was used to map readiness toward reaching the SDGs. The use and lessons learned in the follower cities (FC) and LHC Limerick cannot be addressed in this deliverable, since it is a work in progress. We are thereby interpreting and using LHC Trondheim as an example, explaining how it was done here, understanding that the value is suggestive and must be seen in a local context to increase adaptability.

The BCV framework has also been used in Asker Municipality, a smaller city in the south of Norway, and their use will be mentioned, as an example of local adaptation.

5.1.1 Digital guide used in LHC Trondheim

To secure a valuable outcome and to work more tangible with the BCV framework, different pedagogical approaches were necessary. This includes more than just using different arsenals on meeting forms, but also the development of supporting tools and establishing a knowledge basis that contributes to a strong foundation.

An important part of the BCV work in LHC Trondheim was developing the Bold City Vision digital guide. [ARUP](https://www.arup.com)¹⁸, a project partner in +CityxChange, played a key role in the development. The BCV framework was connected to the digital board MIRO, an ARUP development.

MIRO functions as a digital whiteboard. Its user interface allows flexible and interactive participation in many ways and combinations. It allows tagging, writing, chatting and can be used as a shared whiteboard in a digital presentation, with a designated presenter. It can divide meetings into sub-meetings with different tasks, and reconnect them, and share the separate work in the same frame.

Having the BCV framework as a digital guide with MIRO enables workshops to be digital, semi-digital and physical, with real-time interaction in the same digital space. Groups of

¹⁸ ARUP: <https://www.arup.com>



stakeholders and interested parties can be guided through the BCV planning process/matrix. They can work on specific SDGs, their plans and strategies etc., whilst interacting and learning from each other. For LHC Trondheim the BVC framework became tangible in a new sense. Figure 5.1 shows an illustration of BCV mapping activity. Examples of the tool use are found in the solutions section of the deliverable.

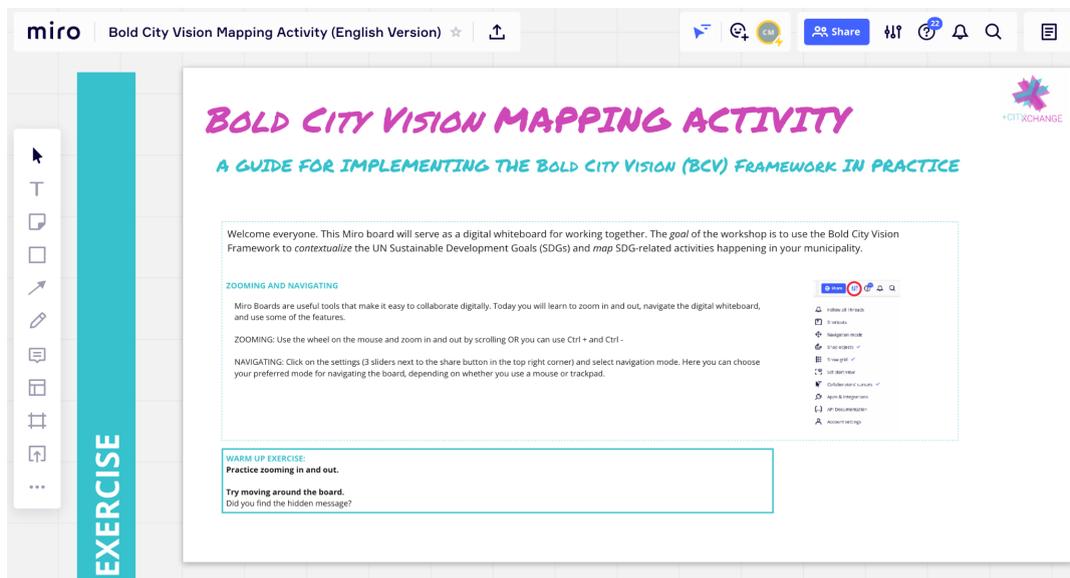


Figure 5.1: BCV mapping activity, as designed in the Miro digital whiteboard tool (Source: TK)

5.1.2 BCV workshops using MIRO in LHC Trondheim

One way of sharing and learning is through meetings or workshops, with transparency and generosity to also be on the receiving end of the table. The process, described as a journey, requires plasticity to what is a template, and what it should be. Even if there is a general understanding of the method and template, it will never be static, and must always be flexible enough to adapt to input, foreseen and unforeseen changes and new knowledge. It is an ongoing reform and improvement process, much like an evolutionary process.

Table 5.1 lists the BCV workshops and their designated topic and use. They all took place between February and March 2021, in the Midtbyen innovation playground. For details please see [D5.10: Trondheim Innovation Lab Solutions Catalogue](#)¹⁹, (Grabinsky, Riedesel and Haugslett, 2021).

Table 5.1 Bold City Vision Workshop Solutions (Source: D5.10)

BCV for Mobility case	Midtbyen	February 2021
BCV Presentation and Workshop	Midtbyen	March 2021

The BCV was used to build a “Mobility Case” for LHC Trondheim, supported by the digital guide. The outcome of this workshop led to the development and testing of the [Mobee Mobility App](#)²⁰.

¹⁹ D5.10: <https://cityxchange.eu/knowledge-base/d5-10-trondheim-innovation-lab-solutions-catalogue/>

²⁰ Mobee: <https://www.mobee.no/>

+CityxChange presented its second year of BCV development for both Lighthouse Cities and Follower Cities. The LHCs and FCs shared their knowledge and experience on implementing the BCV framework. Local challenges were discussed and experiences shared. LHC Trondheim led the group through an SDG-mapping activity to demonstrate the potential of the [Miro digital platform](#)²¹ and BCV mapping activity.

BCV workshop for Trondheim Municipality Leader group	Midtbyen	March 2021
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The testing and showcasing of the BCV workshop with the Trondheim Municipality leader group connected the BCV framework and the SDGs. The leaders were challenged to localise the designated SDGs within their respective departments. The Miro digital platform was used, and participants were guided through the BCV mapping activities.

The workshops were aimed at specific topics with specific target groups and included elements of brainstorming, learning, testing and sharing. Even if the tools and framework overlapped, these workshops, content, and outcome had a diverse range that illustrates the opportunities within the BCV framework.

5.1.3 Norwegian Municipal planning hierarchy and requirements

By law, all Norwegian municipalities must develop and constitute a Planning Strategy within a year after an election and constitution of a new city council. In addition all municipalities must have a Municipal plan, divided into a societal and spatial plan, which includes goals, expectations and guidelines for twelve year periods. There are other plans and strategies needed, as shown in figure 5.2. Figure 5.2 shows the hierarchy within the Norwegian municipalities planning documents and budgets. It also illustrates where the Planning Strategy is directed. This hierarchy is valid and legally binding for all Norwegian municipalities.

In 2019 the Norwegian government constituted the SDGs as the lead track in solving the planet's greatest challenges, and followed that up with national expectations to regional and municipal planning, as addressed in section 4.3.

²¹ MIRO: <https://miro.com/online-whiteboard/>



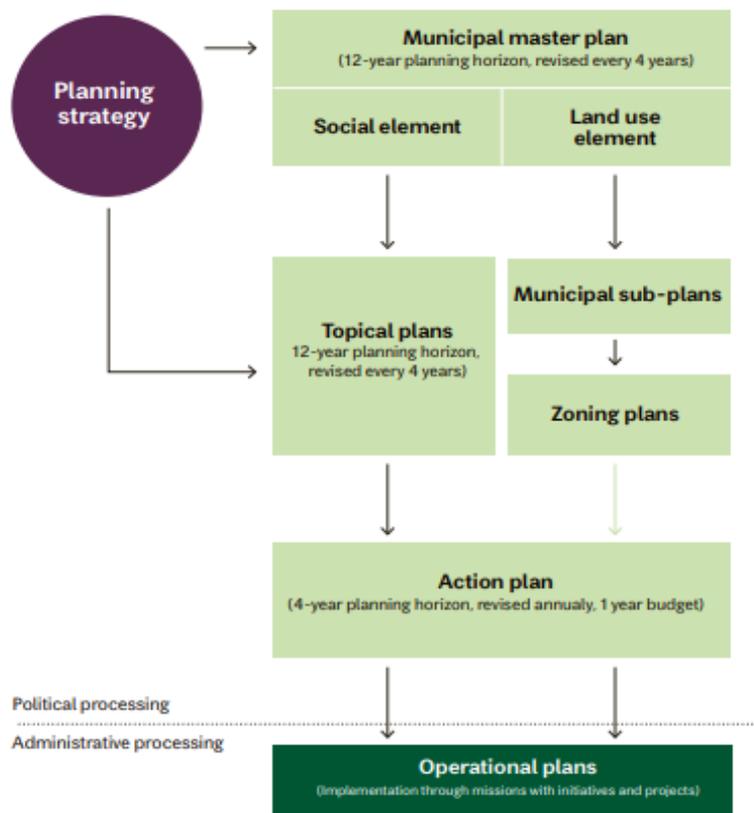


Figure 5.2: Norwegian planning system hierarchy (Source: Asker Kommune)

5.1.4 Pursuing evidence based SDG-policy making in LHC Trondheim

Trondheim Municipality has included the SDGs in the city's plans and steering documents, to assure the needed political commitment. Although this is a prerequisite for SDG budgeting, it is also the embodiment of taking a strong stand on the responsibility and possibilities a city, and its inhabitants, have in reaching the SDGs. By including the SDGs as the foundation for all societal and spatial planning in the municipality, acknowledge the municipalities as key actors in realising the SDGs locally and nationally.

Table 5.2. lists which steering documents and public frameworks in LHC Trondheim where the SDGs are present and accentuated. The Planning Strategy for Trondheim Municipality, and the two most predominant plans; The Societal Master Plan; and Energy and Climate Plan will be further explained and summed up. The rest will only receive honourable mentions concerning their relevance to this deliverable. Since the documents are written in Norwegian, a back-to-back translation is not done, only relevant extracts are made.



Table 5.2 Relevant plans and objectives in Trondheim Municipality

Municipal Plans and objectives	Connection to BCV and/or SDGs
<p>Planning Strategy for Trondheim Municipality 2020-2023: Planstrategi for Trondheim kommune 2020-2023²²</p>	<p>The SDGs are set as a premise for the work and plans for the municipality. The adjusted BCV framework is emphasised as one a methodology for sustainable societal development.</p>
<p>The Societal Master plan for Trondheim Municipality 2020-2032: Trondheimsløftet (Draft)²³</p>	<p>The BCV framework has been translated and adapted to the Norwegian context, and used actively in the process of developing the new plan. It is described, on page 27, as a framework for sustainable societal development, and is strongly linked to the SDGs.</p>
<p>Municipal action and financial plan 2023-2026²⁴, budget 2023 including Climate budget 2021-2024: Klima Budsjett²⁵</p>	<p>Municipal action and financial plan links money to activities and visualises the priorities. SDGs are . Further; the integration of a climate budget in the Municipal action and financial plan contributes to achieving several SDGs.</p>
<p>Energy and Climate Plan 2017-2030²⁶ The plan is currently being revised, and the following link is to the landing page for the planning program²⁷ for the new plan.</p>	<p>The document is prior to +CityxChange, but has strong emphasis on several SDGs. The revised plan, prone for implementation during 2023, is likely to further reinforce the SDGs.</p>
<p>Thematic Plan for Technology and Modernization (Temaplan for teknologi og modernisering, og Arbeidsgiverpolitikken)</p>	<p>Based on national expectations, the plan is committed to all the SDGs, in relation to enablers like digitalization, modernisation and technology.</p>
<p>Politically approved objectives on co-creating the city: https://sites.google.com/trondheim.kommune.no/samskaping/veien-videre</p>	<p>Many of the activities and tools used and described, are also a part of the work in LHC Trondheim in regards to citizen engagement and involvement.</p>

²² Planning Strategy for Trondheim Municipality 2020-2023: <https://www.trondheim.kommune.no/globalassets/10-bilder-og-filer/10-byutvikling/byplankontoret/kommuneplan/planstrategi-2020-2023/vedlegg-1-planstrategi-2020-2023.pdf>

²³ Preliminary Master societal plan 2020-2032: Trondheimsløftet: https://drive.google.com/file/d/1M9581buf_Guzj7hZ_Ahhg5gzSHzwLB_0/view

²⁴ Municipal action and financial 2023-2026 for Trondheim: <https://sites.google.com/trondheim.kommune.no/vedtattbudsjett-hoep-2021-2024>

²⁵ Climate budget: <https://sites.google.com/trondheim.kommune.no/kommunedir-forslag-til-hoep/3-klimabudsjett?authuser=0>

²⁶ Energy and Climate plan 2017-2030: <https://www.trondheim.kommune.no/globalassets/10-bilder-og-filer/10-byutvikling/miljoenheten/klima-og-energi/kommunedelplan-energi-og-klima130618.pdf>

²⁷ Landing site planning program for the revised Energy and Climate Plan: <https://sites.google.com/trondheim.kommune.no/klimat trondheim/start>



5.1.5 BCV and SDGs in the Planning Strategy for 2020-2023

The Planning Strategy for Trondheim Municipality 2020-2023 captures the national, regional and local expectations and guidelines, and defines what plans and strategies the municipality needs for the next four years to meet future needs and challenges. Trondheim Municipality thereby connects and contributes to international expectations, and emphasises in the planning strategy, that through; *operationalising* the SDGs; municipal *collaborations* and using the *framework* for sustainable societal development, sustainability and the SDGs will be at the core of the municipal activities. They will foster social, environmental and economic sustainability, known as the triple bottom line of sustainable development. The mentioned framework is the cumulative result of work done in +CityxChange and LHC Trondheim, directly extended from the matrix in D3.1: Framework for Bold City Vision, Guidelines, and Incentive Scheme (Tanum et al., 2020). The adjusted framework is explained in the following section.

5.1.6 BCV framework for sustainable society development

The framework for sustainable societal change is directly built on the BCV framework, and has the same six processes as in D3.1: Framework for Bold City Vision, Guidelines, and Incentive Scheme (Tanum et al., 2020). The six processes and the matrix are found in [The Planning Strategy for Trondheim Municipality 2020-2023](#), in section 6.3.1. It is translated into Norwegian and adapted to Norwegian conditions with a focus on the SDGs and social development in Norway. The Norwegian version is then translated back to English for practical reasons in this deliverable. Please note that the underlined headline in the description of the processes are the same six as seen horizontally in figure 3.1.

The framework is accessible for other municipalities, as it constitutes a holistic approach to smart and sustainable societal change. It explains important activities and processes, and thus provides the municipalities with a useful management tool when they have to decide what can happen when, and which activities and actors create favourable conditions for each other. The goal is to increase the speed of restructuring work in the municipalities.

The sustainable society development framework describes six main processes:

Main processes	Key words
<u>Standardisation</u> Use available international standards to evaluate sustainability work and make potential for collaboration on sustainable development visible.	Evidence based approach
<u>Policy development</u> Ensure that policy formulation, solutions and budgeting are based on knowledge and data.	Evidence based policy making and budgeting



<p><u>Innovation partnerships</u> Cooperation with the business community, innovative procurement and innovation partnerships.</p>	<p>Collaboration and multiple partnerships</p>
<p><u>Organisational development</u> Ensure that management and organisation pull in the same direction to support sustainable development.</p>	<p>Top-anchoring and awareness</p>
<p><u>Citizen engagement</u> Understand the local context and the needs of residents. Mobilise resources and support local initiatives.</p>	<p>Adaptation and flexibility</p>
<p><u>Project development</u> Secure relevant projects and initiatives.</p>	<p>Quality assurance</p>

This framework was used by Trondheim Municipality in the process and work of shaping the new societal master plan for the municipality. Several objects were already in place, for instance: policy, plans, strategies, activities, and resources. In Trondheim Municipality the continuous work isn't necessarily developing a whole new political direction, it is just as much a question of making necessary and important adaptations and adjustments, and preserving continuous coordination of political goals and plans.

5.1.7 Trondheim Municipality - Societal Master Plan

The Societal Master Plan is the superior strategic plan for Trondheim Municipality valid for 2020-2032. The Societal Master Plan provides guidelines for all planning within the municipality and points out the main economical allocations within the Municipal action and economic plan. When writing this, the [draft](#) is ending its hearing procedure, and the new Societal Master Plan, named "Trondheimsløftet", will likely be admitted in the fall of 2022. Trondheimsløftet has a dual meaning; "The city promise" and "The amelioration of the city", and both apply well to the ambitions and direction of the municipality as seen in the plan.

Trondheimsløftet has three main goals, all supported by subgoals. The subgoals are set with responsibilities and actions for the municipality, and suggestive actions for the inhabitants. The suggested plan has a strong focus on citizen involvement and citizen inclusion in long-term planning and city management. The SDGs and the triple sustainable bottom line are emphasised and have a strong link to activities and future city development. The city has focused on green transition and sustainable value creation, and the SDGs will continue to be prioritised and operationalized. The municipality will be connected to local, regional, national and international work regarding the SDGs. The overview below presents the three main goals of the suggested new master societal plan for Trondheim Municipality, translated to English. The plan is comprehensive, and the main goals will therefore function as captions to the summed-up content of all the subgoals and intentions that follows. Further, the recap will mainly focus on content with linkage to the SDGs. Be aware of the disclaimer; this plan is not finally ratified, its recap is not exhaustive



and the translation and interpretations when summarising content and recapping the SDG relevance are subject to the author's capabilities.

Main targets in Trondheimsløftet

1 Trondheim takes responsibility for a greener society

This captures becoming climate neutral without damaging nature or contributing to pollution. Economic growth and development must be within the carrying capacity of the planet. The city shall take an active role in the green transition through multiple angles like; forefronting contributing and enabling innovations, sensible consumption, increasing resource circularity, reducing direct and indirect emissions, securing and maintaining biodiversity, and more.

Key words, instruments and incentives

Green energy, carbon capture and storage, green mobility, circular economy, nature restoration, multidimensional partnerships and collaborations, awareness, education, knowledge, political, juridical and economic instruments.

Key SDGs

- #7- Affordable and Clean Energy
- #8 - Decent Work and Economic Growth
- #11 - Sustainable Cities and Communities
- #12 - Responsible Consumption and Production
- #17 - Partnerships for the Goals

2 Trondheim is a city with strong fellowships

The caption is that the city must be socially sustainable, and a place where people live good lives and experience belongingness through all stages in life. Welfare services like kindergartens, schools and health services must be sustainable, prevent social exclusion, improve quality of life and prevent gender, race and age discrimination from happening. Focus on improved living and housing conditions, through improved common areas, and facilitating art, cultural events, sports, leisure and access to nature experiences. Securing and integrating citizen involvement in plan and steering systems.

Key words, instruments and incentives

Social entrepreneurship, adaptable learning and education systems, multidimensional partnerships and collaborations, policy development, establish new standards supporting belongingness and involvement and co-creation.

Key SDGs

- # 3 - Good Health and Well-Being
- #4 - Quality Education
- #5 - Gender Equality
- #10 - Reduced Inequalities
- #11 - Sustainable Cities and Communities



#12 - Responsible Consumption and Production
#17 - Partnerships for the Goals

3 Trondheim, as the capital of knowledge and technology, is a power hub for a better world

The main focus is that Trondheim, with the largest university in Norway, a noticeable private and public R&D sector, several tech industries etc., has the potential to make contributions to solving societal challenges and reaching the SDGs, whilst making sustainable value creation. Knowledge must be gained and shared, nationally and internationally. The municipality must contribute, facilitate, coordinate, initiate, inform and be a catalyst and an enabler.

Key words, instruments and incentives

Digitalisation, innovation, triple sustainable bottom line, new green business models, sustainable food production, sustainable value creation, circular economy, co-develop society, social entrepreneurship, collaboration, digitalization, innovative technology.

Key SDGs

#8 - Decent Work and Economic Growth
#9 - Industry, Innovation, and Infrastructure
#11- Sustainable Cities and Communities
#17- Partnerships for the Goals

The Societal Master Plan for Trondheim Municipality 2020-2032 is a plan with a strong alignment with and integration of the SDGs, as implied in the Planning Strategy. Its governing role for all other plans within the municipality, and through that core priorities and economic allocations, is a solid steering tool nailing Trondheim Municipality to aiding the needed green transition and reaching the SDGs.

5.1.8 Trondheim Municipality's Energy and Climate Plan 2030

The Energy and Climate Plan is currently 6 years into its 13 years duration and is being revised at the moment. The revised plan is set to be politically approved in June 2023. There is an ongoing process where the Dept. of Environment in Trondheim Municipality has established a [landing site](#)²⁸ for citizens and others to follow the planning process, and to make contributions/suggestions. There are open meetings and open office hours for the public and the political meeting documents are publically available, maintaining citizen engagement.

The prevailing plan is the same plan as when +CityxChange was applied for, and will probably last until the end of this project. However, the work done in +CityxChange has, in the most positive way, invaded and influenced how the municipality focuses and works with climate and SDG related topics. The adjusted BCV framework is already mentioned, but just

²⁸ Landing site Klimatondheim: <https://sites.google.com/trondheim.kommune.no/klimatondheim/start>



as important is the change in methodology, approaches and willingness to challenge cultural conditions of the way that the municipality works and is organised.

The vision of the plan is for Trondheim Municipality to be a pioneer municipality developing quality solutions for climate and environmental challenges. This is written with reflections on the needed green transition, and the possibilities and responsibilities Trondheim has as a knowledge and technology city. The plan is structured with 5 outward and 5 inward goals for the city. Goals 1-5 represent the whole municipality, where the results can only be reached with collaboration and contributions from the whole societal spectrum. Goals 6-10 target the municipality's own activities. The goals from 1-10 are translated into English, but as the document is under revision, comprehensive and written in Norwegian, no ponderings are made.

Main targets in Energy and Climate Plan 2017 - 2030

Energy and climate goals for Trondheim city

- 1 By 2020 Trondheim is a role model, and a collaborative platform for green value creation and development of climate friendly technologies and ways of living.
- 2 By 2020 the direct emission of greenhouse gases will be reduced by 10 % compared to emissions in 1991.
- 3 By 2025 Trondheim is prepared to meet future climate changes.
- 4 By 2030 stationary energy consumption in buildings and installations will be at the same level as in 2013 (~ 3,5 TWh). This is equivalent to a 20 % consumption reduction per capita.
- 5 By 2030 the direct emission of greenhouse gases will be reduced by 80 % on a 1991 baseline.

Energy and climate goals for Trondheim Municipality's activities

- 6 Trondheim Municipality will start buying large climate neutral vehicles as soon as they become available.
- 7 By 2020 the municipality has reduced its own energy consumption by 7 % compared to a 2017 baseline.
- 8 When revising the plan, the reduction of indirect greenhouse gas emissions (Scope 2 and 3 emissions) will be determined.



9 The carbon footprint in large building investments shall be reduced by 30 % compared to reference buildings, provided that lifecycle costs are not significantly increased.

10 By 2030 the municipality, as an enterprise, is climate neutral.

Key words, instruments and incentives

Reduce climate footprint, build climate friendly buildings and areas, use wood as building material, reduce fossil fuel as energy source, reduce energy consumption, recycle and sort the waste, facilitate for public transportation, bicycles and green mobility, initiate carbon capture and storage, local renewable energy production and energy efficiency, infrastructure needed due to climate adjustments and more. Instruments and incentives are primarily laws and regulations, procurement as a strategy for innovation and national funding mechanisms supporting the green transition.

Key SDGs

- #7 - Affordable and Clean Energy
- #8 - Decent Work and Economic Growth
- #9 - Industry, Innovation, and Infrastructure
- #11 - Sustainable Cities and Communities
- #12 - Responsible Consumption and Production
- #13 - Climate Action
- #17 - Partnerships for the Goals

More knowledge, innovations and experience has surfaced since the plan was written. Trondheim Municipality, being in the middle of revisioning the plan, strives to include and make a responsible, relevant and ambitious plan moving forward. The work within +CityxChange and all the affiliated work with the SDGs in the municipality, in collaborations nationally and internationally, has an indisputable impact on the process and result.

5.1.9 Climate budget

Trondheim Municipality was one of the first municipalities in the world to introduce a climate budget in 2018. The climate budget is seen as the main tool in order to succeed with the city's ambitious energy and climate goals. The climate budget is fully integrated with the ordinary budget process. It addresses greenhouse gas emissions, how to reduce them, and the financing of this. The greenhouse gas emission reduction goals set by Trondheim Municipality are a reduction by 30% within 2023 and by 80% within 2030. When the climate plan becomes fully integrated in the Municipal action and financial plan (in Norwegian: Handlings- og økonomiplanen), Trondheim Municipality wishes to further strengthen the climate budget as a management and decision-making tool to reach the energy and climate goals for Trondheim Municipality. The Trondheim Municipality climate budget for 2022 is 9.5 M€.



5.1.10 SDG budgeting in LHC Trondheim

The Norwegian Association of Local and Regional Authorities (KS) has published a report [Voluntary Subnational Review - Norway](#), (Hjort-Johansen et al., 2021), on the implementation of the UN's SDGs in Norwegian local and regional government and the progress they have made towards Agenda 2030. Trondheim Municipality is one of the members providing a Voluntary Local Review (VLR) used in this report, and the following information on the SDG Budgeting in this subsection is partially extracted from the report.

Trondheim Municipality used SDG budgeting to integrate the SDGs into local finance structures, based on [KOSTRA](#)²⁹, the accounting standard for Norwegian municipalities. The method was developed through a series of workshops in 2019 and 2020, where the municipality collaborated with the European finance network European Cities for Sustainable Finance (previous CEFG Group). The correlation to KOSTRA makes the application easy for other Norwegian cities, but the logic has also been duplicated and tried in Barcelona and London.

As mentioned, when connecting the SDGs to the municipal plans and budgets, the SDG logic has an impact on the planning, use and prioritisation of the financial resources within the city. When this is combined with key performance indicators (KPIs) for SDGs, it reinforces the link between resources and impact and can reveal the advantages of allocating resources through cost-benefit analysis. An example is the climate budgets created for Norwegian cities. It can also identify partnerships and projects with potential synergies toward shared objectives. For more information, please read [KS Voluntary Subnational Review - Norway](#).

5.1.11 Multiple partnerships and collaboration in LHC Trondheim

+CityxChange is a solid example of work and innovation with collaboration and multiple partnerships, in alignment with a quintuple helix innovation model. That is also the case for LHC Trondheim in regard to +CityxChange, but also within other engagements, especially the highly overlapping work with operationalising the SDGs.

[Nordic Edge](#)³⁰ is an innovation cluster on smart cities and communities. During their annual conference in Stavanger in 2019, the Stavanger declaration was made, initiated by the CEO of Trondheim Municipality. The declaration is a shared noble set of values in regard to sustainability, and can be translated to "The Sustainability Promise". It can be viewed as a response to the national expectations, previously mentioned in 4.2.1. The declaration was signed by several municipalities and county municipalities and is the precursor for the [Network of Excellence on SDG City Transition](#)³¹.

²⁹ KOSTRA: <https://www.ssb.no/en/offentlig-sektor/kostra>

³⁰ Nordic Edge: <https://nordicedge.org/>

³¹ Network: https://www.ks.no/fagomrader/barekraft_Geneva_UN_Charter_Centre_of_Excellence_on_Sustainable_Development_Goal_City_Transition_in_Trondheim:_smalene/barekraftsnettverket/om-barekraftsnettverket/



In Norway, local and regional authority collaborates on different topics. Network of Excellence on SDG City Transition represents a relevant example. The network was initiated by the [Geneva UN Charter Centre of Excellence on Sustainable Development Goal City Transition in Trondheim](#)³². This status was granted to Trondheim Municipality in 2019. The UN Centre is located in one of the citizen observatories and innovation playgrounds in LHC Trondheim, Bærekraftssenteret, and shares office space with +CityxChange. The centre initiated a collaboration with regional authorities, organisations, KS and United for Smart and Sustainable Cities ([U4SSC](#)³³), establishing the Network of Excellence on SDG City Transition in 2020. The Network is a learning and collaboration arena for Norwegian municipalities and county municipalities, with the goal of collaborating nationally, and acting regionally and locally to accelerate needed sustainable societal changes, and contribute to achieving the SDGs by 2030. Its steering group is led by the CEO of Trondheim Municipality.

Norway was the first country to apply the [U4SSC KPIs](#)³⁴ for smart and sustainable cities. The KPIs support the cities with self-assessment, evaluation and benchmarking in relation to the SDGs. It identifies and visualises areas where city action is needed. When seen in context with current policy and economic allocations, eventual gaps will be recognised. Benchmarking and collaboration with other cities and regions can lead to fast-track solutions and improvements. Identifying and sharing knowledge of possibilities and challenges can save resources, amplify work and lead to valuable collaborations and partnerships.

Another collaborative initiative is the development of a [taxonomy to classify SDG-related indicators](#). It is developed by Statistics Norway ([SSB](#)³⁵) in partnership with KS and operationalised by Trondheim Municipality through Bærekraftssenteret, The Geneva UN Centre of Excellence on Sustainable Development Goal City Transition in Trondheim. This is also a work that will be most effective when used with a focus on learning and sharing through collaboration and partnerships.

³² Geneva UN Charter Centre of Excellence on SDG City Transition in Trondheim: <https://sdg.iisd.org/news/unece-trondheim-establish-centre-of-excellence-to-promote-sdgs-at-local-level/>

³³ U4SSC: <https://u4ssc.itu.int/>

³⁴ U4SSC KPIs: <https://u4ssc.itu.int/u4ssc-kpi/>

³⁵ SSB: <https://www.ssb.no/en>



6 Scaling up

The BCV framework with its methodology has been adjusted and adapted to different needs and has led to new forms of it. This is partly planned scaleups, or naturally deriving from the degree of open innovation. Hopefully, this is only the beginning.

6.1 Local level- Asker Municipality

[Asker Municipality](#), located southwest of Oslo, Norway's capital, has used the BCV framework in their municipal planning.

In their report "[From Global Goals to Local Action: How we implement the UN Sustainable Development Goals \(SDGs\) in Asker Municipality](#)" (Asker Municipality, 2020), they describe the use of the BCV framework as a holistic approach to smart sustainable societal change. They recognise that it accounts for important activities and processes, and thus provides the municipalities with a useful management tool when deciding what can happen when, and which activities and actors are each other's prerequisites. The goal of the use is to increase the speed of the transition work in the municipalities. Asker Municipality also addresses their use of the BCV framework in [Asker Kommunes Voluntary Local Review](#)³⁶ (Asker Municipality, 2021).

When reading their documentation on their use of the BCV, it demonstrates that the framework has proven to work outside LHC Trondheim. The best testimonial from Asker Municipality is their notion of being confident that the municipality has a systematic approach to reaching the SDGs, due to the use of the BCV framework implementing the SDGs. Figure 6.1 is an illustration of how Asker Municipality structured and used the BCV framework. They structured the five levels of governance in a hierarchy and identified their own status by using the BCV framework. It visualises what they have accomplished and what still needs to be done. This also makes an example of the flexibility of the BCV framework and a local adaption.

³⁶Asker Kommune VLR:

<https://www.asker.kommune.no/contentassets/e243303f2a1249ccb4b55f64240b72ff/rapport-om-barekraft-for-asker-kommune.pdf>



Modell 1

Bold City Vision:
Data - Policy - Action

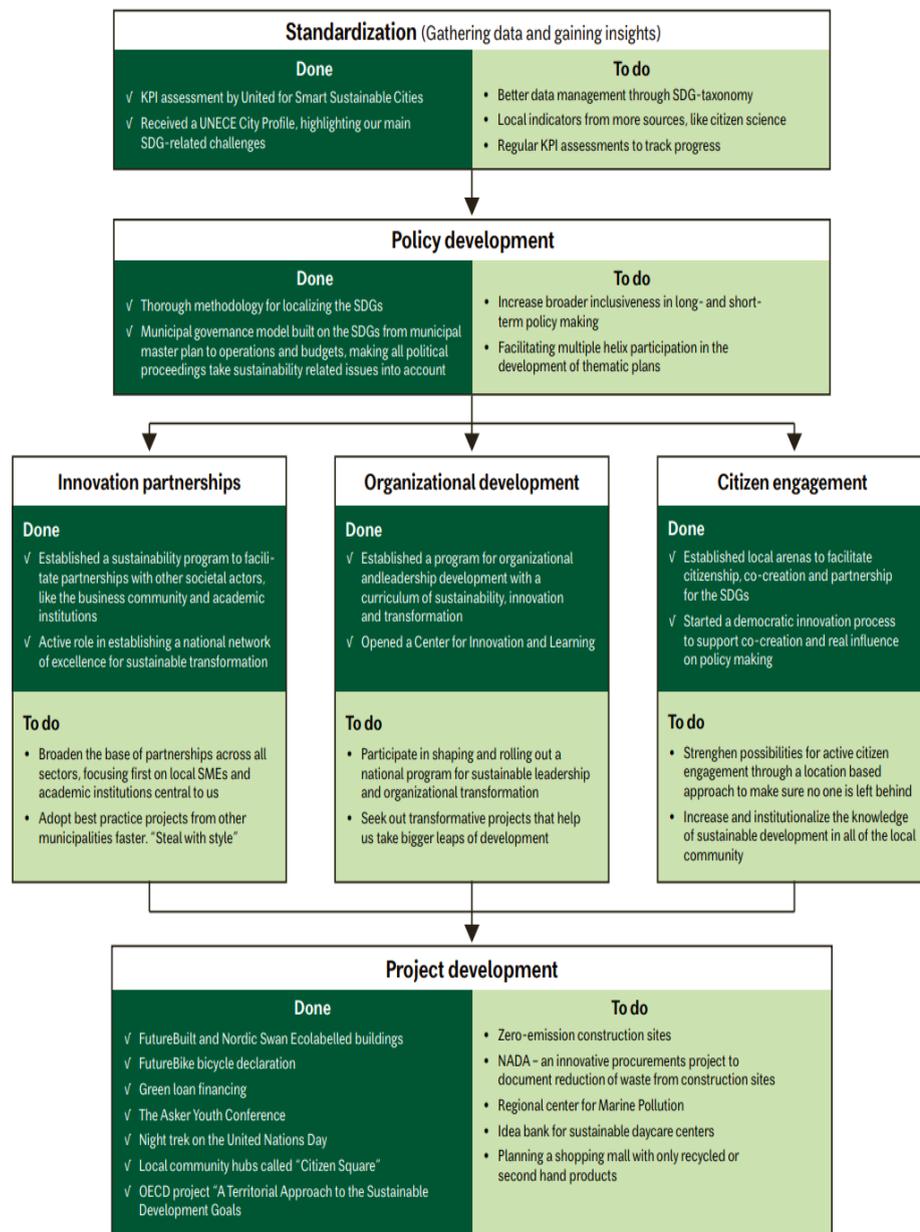


Figure 6.1: Asker Municipality structure when using the BCV framework (Source: Asker Municipality)

6.2 Regionally - Network of Excellence and Trøndelag i pluss

Local and regional authorities collaborate extensively, such as in the mentioned Network of Excellence on SDG City Transition. The network consists of 15 municipalities and 4 county municipalities which focus on local SDG initiatives across Norway. Asker Municipality credits the functionality of the network to the BCV framework, thus the network is an illustrator of a partly national and regional approach to implementing the BCV framework as a way of approaching the SDGs.

According to the [Voluntary Subnational Review - Norway](#) the network sets out to do the following:

1. Spread knowledge about the status to the community
2. Develop plans for community development that illustrates how to meet the SDGs
3. Mobilise and support citizens, businesses, organisation and academia that contribute to sustainable development
4. Measure and evaluate the effort, through the U4SSC Implementation program and other methods

The network is seen as an ongoing prototyping of a multilevel and multi-stakeholder approach to sustainable development. Collaboration and sharing knowledge on local adaptations, linking it to regional, national and international partners and funding, can accelerate the impact but also catalyse new and ongoing processes.

Trøndelag County, representing a larger geographical region in Mid-Norway with 38 municipalities, has an agreement with Trondheim Municipality and Bærekraftssenteret to collaborate on obtaining the SDGs. The agreement, based on the Stavanger declaration, includes a network for all municipalities in Trøndelag County. The network is known as [Trøndelag i pluss](#)³⁷ (translates to Positive Trøndelag). The network serves as an arena in which to build competence and develop strategic and operational work methods in the four following areas;

- Collecting and sharing data
- Social development
- Business development
- Leadership training and organisational development

The chosen areas are seen as important for implementing SDGs and maturing a greater geographical region to welcome innovations and solutions becoming energy positive and more sustainable.

6.3 Nationally - lowering the learning threshold

A spin-off from +CityxChange work is a short introduction roadmap made for municipalities, sharing knowledge on how to create smart and sustainable societies (in Norwegian: [Veien til bærekraftige samfunn](#)³⁸). It addresses three main steps including the mentioned adaptations of the BCV framework used in LHC Trondheim, a methodology and innovation tools. The methodology for citizen involvement is based on D3.2 [Delivery of the citizen participation playbook](#)³⁹ (García and Mora 2020), and set in a Norwegian context. The tools

³⁷ Trøndelag i pluss Network:

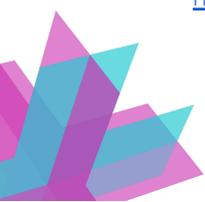
<https://www.trondelagfylke.no/contentassets/bdb5922ae17043ab95a29587de99f2e0/barekraftnettverk-i-trondelag.pdf>

³⁸Veien til bærekraftige samfunn:

<https://www.trondheim.kommune.no/globalassets/10-bilder-og-filer/17-barekraft/veien-til-barekraftige-samfunn-1-1.pdf>

³⁹ D3.2: Delivery of the citizen participation playbook:

<https://cityxchange.eu/wp-content/uploads/2020/02/D3.2-Delivery-of-the-citizen-participation-playbook.pdf>



for innovation are based on D3.3: [Framework for Innovation playgrounds](#)⁴⁰ (Mee and Crowe, 2020), but again adapted to Norwegian context and language. The roadmap is funded by the Dept. of Environment in Trondheim Municipality.

In a national context, the roadmap can support municipalities on their journey by introducing results from +CityxChange in a Norwegian context. This is also an example of national adaptations and communication of the possibilities with using the BCV framework. Figure 6.2 shows the front side of the roadmap, with reference to +CityxChange, Trondheim Municipality and the designer, and the BCV framework adapted to Norwegian municipalities and named framework for sustainable society development (see section 5.1.6). It also explains that Trondheim Municipality used the framework to map out the existing policies, and then revise the plan and budget, whereas Asker Municipality used it to map out innovation partnerships, create projects and other processes in the city.



Figure 6.2: Illustrations taken from the “Roadmap to sustainable societies” made for other municipalities (Source: TK)

6.4 Internationally - and potential for further upscaling

At an international level one could say the BCV framework and its branching abilities, played a role in why Trondheim Municipality was granted the status of being a UN Centre of Excellence on SDG City Transition. Being a Geneva UN Charter means being subject to periodic reporting and documenting achievements against agreed action plans. One reports to the Committee at its annual sessions, and in between sessions, one is accountable to the Committee Bureau⁴¹. Bærekraftssenteret (Centre for Sustainable Development) published an [Annual Review 2021](#)⁴² as a documentation of achievements, including work done in +CityxChange. This is a way of connecting and reaching further out with useful knowledge and methodology.

The [Memorandum of Understanding between UNECE and Trondheim Municipality](#)⁴³ (MoU), recognises Trondheim Municipality as the partner who hosts the Centre of Excellence

⁴⁰ D3.3: Framework for innovation playgrounds: <https://cityxchange.eu/wp-content/uploads/2020/03/D3.3-Framework-for-Innovation-Playgrounds-5.pdf>

⁴¹ UNECE Character: <https://unece.org/housing/charter-centres>

⁴² Bærekraftssentert Annual Report: <https://www.trondheim.kommune.no/contentassets/b25f1d1be6e04eb9b54c11ce91d68415/trondheim-annual-report-23-02-2022.pdf/>

⁴³ Memorandum of Understanding: https://unece.org/sites/default/files/2021-06/MoU_CoE_Norway-Trondheim.pdf

(Bærekraftssenteret). As a partner Trondheim Municipality has agreed to the following three activities:

MoU	Level
Work closely with the UNECE and its Centre of Excellence on Smart Sustainable Cities in Vienna (OIER) to collect data and assess the practices, performance and potential of Norwegian municipalities in accordance with U4SSC KPIs	National
Build on the U4SSC KPIs and work with relevant government entities, cities, and research and development partners, to develop and offer the UNECE standards and best practices by way of an Open Source SDG City Transition Framework for cities and city partners in the UNECE Region working to align policies, resources and actions to SDGS	International
Host the Centre of Excellence in Norway and establish cooperation with associated research and development Partners, offering such Partners access to the city as a testbed	Local

The scaleup potential represented in this MoU is one thing, but seen in relation to being a UNECE Centre of Excellence (CoE), which connects Trondheim and Norway to a bigger system within the UN⁴⁴ opens a whole new ballgame. The CoE in Trondheim is closely linked to the International Telecommunication Union (ITU), United Nations Economic Commission for Europe (UNECE) and UN-Habitat. These organisations with their work areas and impact potential will be helpful in the process of scaling up.

The BCV framework has also been recognised by the European Commission⁴⁵ and published at [The EU Innovation Radar Platform](https://www.innoradar.eu/)⁴⁶ as an innovation that has “Market Maturity, Market Creation Potential and Women-led innovation”. Market Maturity refers to innovations that support partner engagement and support business plans and market-oriented ideas, in addition, market creation potential is about addressing the needs of existing markets and customers. The last category of women-led innovation means that within this innovation there is at least one key innovator who is a woman. The Innovation Radar is an initiative to identify high potential innovations and innovators in EU funded research and projects. It allows others to discover the outputs of EU innovation funding and use the results and the knowledge as they see fit. This is open innovation in practice.

⁴⁴ UN Organisation System Chart: https://www.un.org/en/pdfs/un_system_chart.pdf

⁴⁵ European Commission Recognition: <https://www.innoradar.eu/innovation/36657>

⁴⁶ The EU Innovation Radar Platform: <https://www.innoradar.eu/>



7 Guideline on sustainable value creation

The work in LHC Trondheim, in Trondheim Municipality and the municipality's work with the UN Centre of Excellence on SDG City Transition are overlapping. For the purpose of the guidelines, look at it as what the city has done within and together with initiatives sharing the same goal. The initiatives have reinforced one another and increased the positive synergies.

This chapter presents the guideline for sustainable value creation by explaining the four pillars of SVC, then practical examples as to how it played out in LHC Trondheim. The strong relations to the SDGs and value creation, and how that can foster opportunities are important knowledge, because without forgetting the seriousness behind the SDGs, they also represent a tremendous opportunity for sustainable value creation for anyone eager to be part of the solution. The steps taken, the logic behind, and how theory and practice are linked, will contribute to making the guidelines understandable at a functional level. If LHC Trondheim were to jump straight to the BCV guideline, it would be premature, leaving out important information.

The SVC guideline is aiding the guideline to create an energy positive city by 2050, and therefore it is presented first. The guidelines are connected and both originate from the BCV framework and serve many of the same purposes.

7.1 Voluntary Local Review as a tool for SDGs

A Voluntary Local Review (VLR) is an analysis and an important tool for exploring and monitoring the achievements of cities implementing the SDGs. There is no set format: each city or region is free to choose its own indicators, based on what it perceives as its own priorities, hence *voluntary*. It can be summarising a city's actions in relation to one or all of the SDGs. However, the UN has set an [elements guide](#)⁴⁷ for developing a VLR. The VLR is *local* due to the level being analysed, and it is a *review* because it aims to identify all the processes leading to reaching the SDGs. By developing a VLR a city can take stock of where they stand on their journey toward becoming more sustainable.

7.2 Guidelines on the Sustainable Value Creation - Trondheim Municipality

The unpublished report "The Guidelines on Sustainable Value Creation-led Voluntary Local Review" (Krause et. al 2021) is one of the deliverables from Trondheim Municipality to the UNECE. The work originates from Bærekraftsenteret, the UN Centre of Excellence on Sustainable Development Goal City Transition. It is a VLR for Trondheim Municipality, and it embodies SVC as a prerequisite for achieving SDGs and climate neutrality. The SVC guideline paves the way for cities to map their progress towards the SDGs and value

⁴⁷ The elements guide for developing a VLR are set by the UN:
https://sdgs.un.org/sites/default/files/2020-10/GlobalGuidingElementsforVLRs_FINAL.pdf



creation. The overarching goal of the SVC-led VLR guidelines correlates with the journey towards becoming energy positive by 2050.

According to Krause et al. (2021) the purpose of the SVC guidelines are to;

- induce job creation
- improve access and availability of social services and infrastructure
- enhance the quality of the environment
- contribute to implement the 2030 Agenda
- accelerate the progress towards SDGs
- [Building Back Better](#)⁴⁸
- achieving climate neutral cities and communities

The report further documents how the BCV framework has been evolved into a fully integrated process by following the four pillars of SVC.

The four pillars of SVC contributed to [Trondheim winning the 3rd place](#)⁴⁹ in the The Rising Innovative City category in [The European Capital of Innovation Award](#)⁵⁰ 2021 for the city's proposal on "Trondheim's systemic transition towards a sustainable and resilient future".

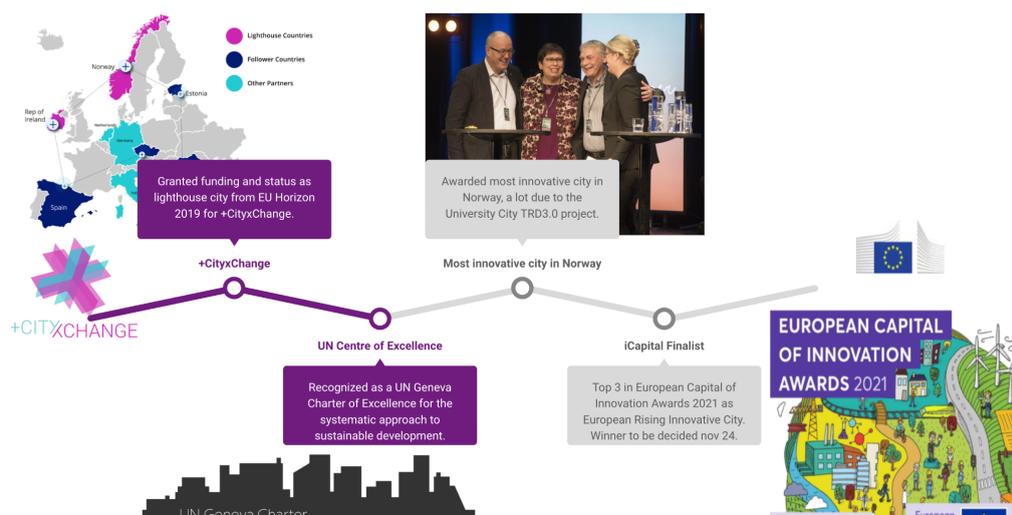


Figure 7.1: Roadmap on LHC Trondheims City journey (Source: TK)

The reasoning for the 3rd place lists the innovation on the approach to the SDGs leading to opportunities for SVC. The approach is then given credit for the status as UN Centre of Excellence on SDG City Transitions. Trondheim is also referred to as a city where the municipality acts as the local innovation ecosystem facilitator by fostering synergies among different innovation ecosystem players, such as public, industry, civil society, citizens, and

⁴⁸ Building Back Better: <https://www.undrr.org/terminology/build-back-better>

⁴⁹ 3rd place IcapitalTrondheim: https://eic.ec.europa.eu/eic-funding-opportunities/eic-prizes/european-capital-innovation-awards/meet-winners-2021-european-capital-innovation-awards/third-place-trondheim-norway_en

⁵⁰ The European Capital of Innovation Awards: https://eic.ec.europa.eu/eic-funding-opportunities/eic-prizes/european-capital-innovation-awards_en

academia. This contributes to the development of an innovation ecosystem within the city, and thus it acts as a living test lab.

7.2.1 The SCV methodology and BCV

The four pillars of SVC are a result of working with and evolving the BCV framework, and is credited to Bærekraftsenteret/The Centre for Sustainable Development. The SVC process connects the actors referred to in the quintuple helix models of innovation. They are an evidence-based approach that enables resource mobilisation, cross-sectoral engagement and cooperation to create value and direct city visions to achieve the sustainable development goals and support Trondheim Municipality in what it needs to create a positive energy city by 2050.

7.2.2 The four pillars of Sustainable Value Creation



The four pillars of SVC are *Potential*, *Readiness*, *Opportunity*, and *Impact*. They can overlap and will each play a supporting role in the continuation of the SVC cycle as the arrows in the model illustrates. The SCV cycle can have multiple rounds circling forward, gaining knowledge and progress. The model is flexible and can start at different points. In other words, any of the four pillars can be a starting point, depending on the entry point, area and target. They allow exploring the city's potential and readiness to accelerate progress toward SDGs and the opportunities to leverage additional resources to deliver urban projects that generate positive synergies and impacts across the triple bottom line.

The following subsections will explain where different steps of mapping a cities progress fall within the pillars of SVC. When explained, it is easy to see that this is a lot of common sense, structured and put in connection with the triple bottom line of sustainability. That is a valid point to remember when adapting it to local context and needs.

Potential - current status and potential improvements

Before one sets out to solve the SDGs, it is important to understand the current status in relation to the SDGs. Using data and for example the KPIs from U4SSC, which are the evidence-based UN standards for assessing potential at the local level, it is possible to have an overview of the city's performance, as it highlights the areas of potential improvements.

If the same KPIs are used by other cities and regions, a benchmarking can be done without too many amenities. Comparing city profiles can lead to constructive conversations on resource mobilisation, and sharing of the best practices and innovative solutions. It is resource and energy efficient, not to mention more sustainable, to avoid inventing the

same wheel. The mentioned SDG taxonomy and ontology are also tools that can be used to measure potential.

The data collected during assessment and benchmarking should be open source. This allows for transparency, providing accountability and able replication or cohorts. In addition it is available for the different segments of the society - public, private, academic and civil society - to build on and use for research and creating innovative solutions. A visual factor, like a digital twin, KPI chart or other forms of simulation, will help the pedagogical presentation and communication.

Readiness - prepare to support implementation

Readiness comes down to preparations done to support the implementation of smart and sustainable solutions. This can be done through a multi-step city journey at multiple levels of governance. This second pillar, readiness, is the whole BCV framework targeting the SDGs. It consists of 30 dimensions, as the BCV framework process, and these dimensions collectively form the readiness pillar. Yet, elements from all four pillars of the SVC are integrated within the BCV processes. Mapping the readiness of a city to accelerate towards the SDGs can be measured in various ways.

Krause et al., 2021 states that the readiness of the city and its ecosystem depends on the changes in legal, administrative and policy setting emerging from the implementation of the SDGs, and how this is reflected in local processes and practice. For example, the SDGs connection to the municipal planning strategies and the societal masterplans (section 5.1.4 to 5.1.8), as a response to the national expectations to regional and municipal planning (section 4.3) in accordance with this line of argument as well as the arguments for why budgeting for the SDGs must be done by aligning the budgets with the SDGs (section 4.4).

Opportunity - listen, link and learn

If there is no opportunity, there's little use in moving in that direction, but some opportunities are hiding in plain sight. Connecting relevant stakeholders to find innovative sustainable solutions, in an open and inclusive manner to support a resilient and circular economy, can manifest opportunities. Recognising available opportunities requires an open mindset and willingness to cooperate. To create a common ground and ownership; start by pinning down shared or overlapping goals and standards that connect the parties. This will increase the possibility of exploring and demonstrating the local potential for shared value creation supported by for example innovating tools that are relevant in a knowledge economy. To create opportunities, 3 processes are seen as necessary:

1. Listening: Prior to offering help or binding collaboration, listen to the stakeholders or partners. Reflecting on information shared and clarifying bilateral expectations will unveil possible deflecting interests at an early stage, and prevent disagreements and misconceptions in the proceedings. Solvable issues can be handled early on,



and collaboration conditions are set to explore the collective impact possible as a society.

2. **Linking:** After listening to different community segments and stakeholders, relevant stakeholders, with shared values and goals, can be linked and start new dialogues and collaborations.
3. **Learning:** The learning mindset is open, curious and willing to take on new knowledge and use it to tackle the challenges at hand. The stakeholders will leverage each other's knowledge and brainstorm to design and redesign innovative smart and sustainable solutions that create value.

In sum, collaboration and mobilisation of stakeholders is a key point in accelerating opportunities across dimensions. The roles the stakeholders hold are not indifferent. A public entity, for example, a municipality, must know the benefit and trust that lies within the perception of being a neutral party looking for the greater good. The municipality is not competing for business opportunities or intangible assets, and will not be opportunistic at the expense of other parties involved. This role gives possibilities as it is easier for the municipality to congregate stakeholders and interested parties, that otherwise would not sit around the same table discussing the topics at bay.

Impact - quality and risk assessing

To do things without any impact is poor resource management and questionable when it comes to sustainability. Assessing the impact on solutions provided is part of the quality control and risk management procedure that can ensure the desired impact.

Not all sustainability-related solutions and projects leave the desired impact. Hence, it is important to unpack the criteria for leaving an impact across the triple bottom line of sustainability: society, economy and environment.

To leave an impact, the solutions/projects must:

1. Solve or at least mitigate the problem
2. Be future oriented; innovative and integrating available technologies
3. Create new business opportunities
4. Be based on a multilateral approach; partnerships and citizens engagement
5. Be scalable, transferable and open source

The SVC-led VLR describes that city actions should be focused on the SDGs with a strong reference to the medium-long term effects of the actions across various dimensions. It is important to note that cities should focus on mapping their impact within the bounds of their access and availability to resources. Measuring the impact must be based on both qualitative and quantitative data which allows for analysis of the quality of relationships and other social characteristics that play a large role in a city developing a sustainable transition. A final note in tracking potential is, "Accounting on the synergy effects in the city actions for



SDGs is one of the steps towards breaking institutional silos and addressing sustainable development challenges in a comprehensive and integrated manner.” (Krause et al., 2021).

7.3 Use of the SVC guidelines in Trondheim Municipality

This section will exemplify how Trondheim Municipality used the four pillars of SVC, and connect it to chapters 4 (Main principles and concepts) and 5 (Working from LHC Trondheim). It will unpack what the elements of SVC look like in practical terms, and thereby demonstrating how it can be adapted and used by other cities. Remember that the BCV framework does not fit within all four pillars of SVC, but is a stepping stone along the way, and a methodology that will display the level of readiness, as in the second pillar of SVC. The innovations and solutions presented within the four pillars of SVC will not be elaborately presented since they are native to other deliverables within +CityxChange or presented in previous chapters in this deliverable. Neither are the listed examples representing an exhaustive retelling of activities within LHC Trondheim. The specific energy related examples will be brought forward in the guideline for how a city can become energy positive.

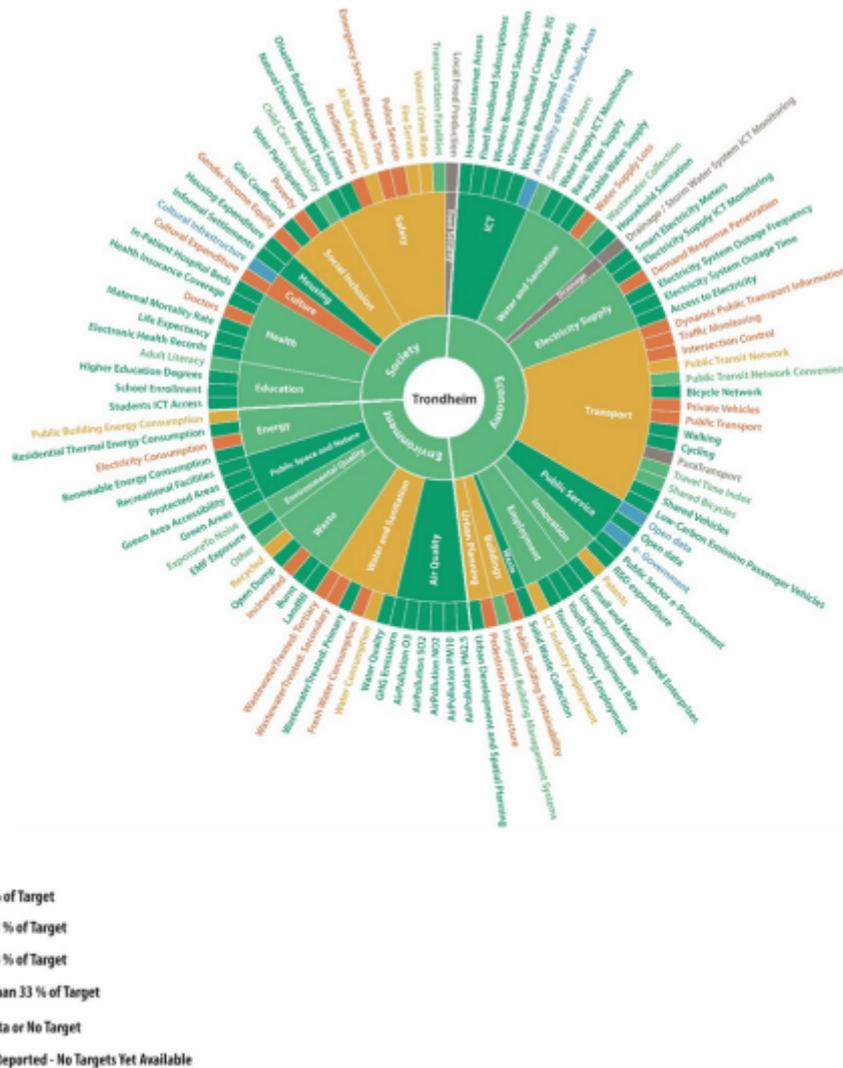
Potential → using tools to map the city

Potential boils down to seeing a city's potential through data. LHC Trondheim used the U4SSC KPIs, which are “The KPIs for SSC is a public, free-of-charge standard, developed by UNECE and International Telecommunications Union (ITU) in the context of the United for Smart Sustainable Cities (U4SSC) Programme to assess cities' progress towards SDGs” (Krause et al., 2021). The [Trondheim U4SSC KPIs from U4SSC Verification Report](https://www.itu.int/en/ITU-T/ssc/united/Documents/U4SSC%20Publications/Verification%20Reports/September%202020/U4SSC_Tronheim-Norway_Verification_Report.pdf?csf=1&e=eKrauA)⁵¹ presents the city's benchmark progress diagram, pictured below in figure 7.2. The diagram outlines the areas where LHC Trondheim has met targets and where they need more work, using traffic lights logic. Transport makes up a large area where many targets are not met, which implies the need for more efforts in the mobility sector. +CityxChange has used these indicators to provide meaningful projects and development such as the mobility initiatives, Mobee and V2G chargers, discussed in the impact section.

⁵¹ Trondheim Verification Report:

https://www.itu.int/en/ITU-T/ssc/united/Documents/U4SSC%20Publications/Verification%20Reports/September%202020/U4SSC_Tronheim-Norway_Verification_Report.pdf?csf=1&e=eKrauA





Note: Performance Benchmark Targets apply to all sections of the graphic. Starting from the centre: Dimensions, Categories and KPIs

Figure 7.2: KPI Benchmark diagram (Source: Trondheim Verification Report)

SDG Taxonomy

Another “potential example” is the use of the [SDG Taxonomy](#)⁵² mentioned in section 5.1.10. The Taxonomy uses a system of classification and organisation to sort various sets of data, such as the 17 SDGs and the 169 targets of the SDGs. The taxonomy is systemised in 3 dimensions; goal, perspective and quality:

- 1) The goal refers to the indicators topic, i.e., which SDG goals and targets, and which triple bottom line it may be related to.
- 2) The perspective clarifies why or in which context the indicator is used (the user’s perspective).
- 3) The quality measures how useful the indicator is, i.e., if it is fit-for-purpose.

⁵² KS Taxonomy: <https://www.ssb.no/en/natur-og-miljo/artikler-og-publikasjoner/a-taxonomy-for-indicators-related-to-the-sustainable-development-goals>

The sorting of the data in this fashion makes it easier to decipher the indicators usefulness. More information on the taxonomy use can be found in the Annex.

Students at Bærekraftsenteret, the Centre for Sustainable Development in LHC Trondheim, have used the taxonomy to sort about 1,000 different indicators. Sorting is necessary to organise the hundreds of random indicators into one unified structure and helps an end user to navigate the data. As a result of the work, we can compare sorted indicator sets and see what areas of development need more attention, and what actors should take action toward SDGs.

For a better understanding figure 7.3 provides an example that deals with indicators from the perspective of evaluation. The OECD indicator set lacks indicators that evaluate input and process. There are 80 indicators evaluating output, 17 on outcome and 18 on impact. Comparing this set to the Norwegian set, there are similar patterns found; most of the indicators focus on evaluating output while process evaluation is neglected in both sets. Without sorting it would be difficult to illustrate the results of the work. Results like this can disclose a bias in what's focused on in evaluations, and if there is a need to reconsider the current practice.

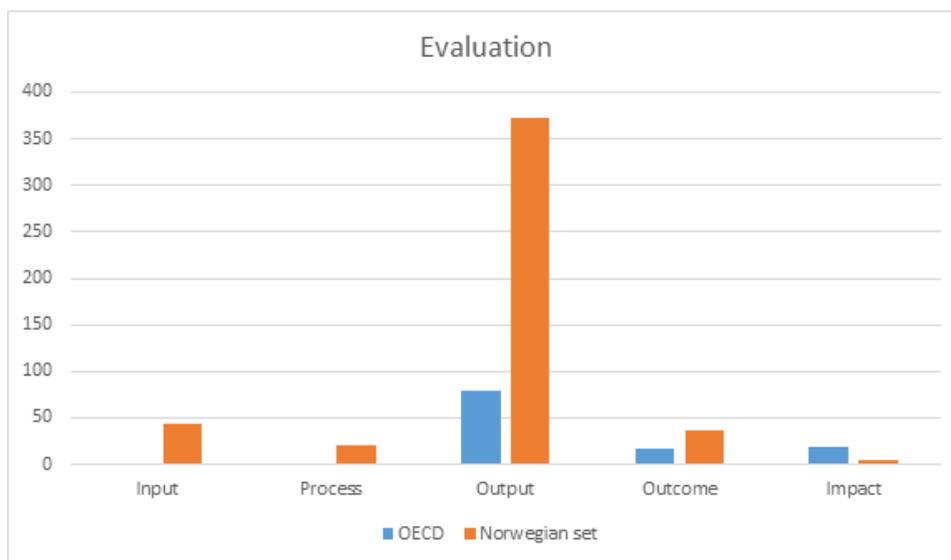


Figure 7.3: Illustration of student led work done at Bærekraftsenteret in Trondheim Municipality

From Taxonomy to Ontology

The SDG Ontology⁵³ is a step up from the taxonomy. It covers the visual aspect and further explanations of the taxonomy. An ontology is not a hierarchy, but a web of nodes with explanatory relations. By using an ontology one is able to visualise the SDGs and their relations to various topics that anyone, like a city or region, wants to connect. The correlation between areas not directly linked to each other are possible to discover. The impact on one target can be the result of associations and magnifying effects through several linkages, not always easily foreseen without the ontology that illustrates how far ripple effects can reach when there is a linkage. It resembles a complex food web, where

⁵³ Video on how to use the ontology:
Norwegian: <https://www.facebook.com/barekraftssenteret/videos/1080985255862735>

impact/change at one trophic level with one particular organism, maybe assumed irrelevant within the ecosystem, proves to have significant effects at different trophic levels through cascading effects. When an ontology concept, or web, is fed with all the available correlating information, data, and tested with simulations, compared to “live” events, it will be a powerful tool to predict an otherwise unforeseen chain of events leading to negative impact, aka cascading effects. It can also be “trained” through backtracking unforeseen events, disclosing hidden correlations and more.

Ontology

A taxonomy is the practice of classification and categorization. In the example below it is with SDG in focus. In this small section taken from the SDG ontology, you can see how things are linked together, starting with SDGs, then individual SDGs, then on to the specific goals within each of the SDGs.

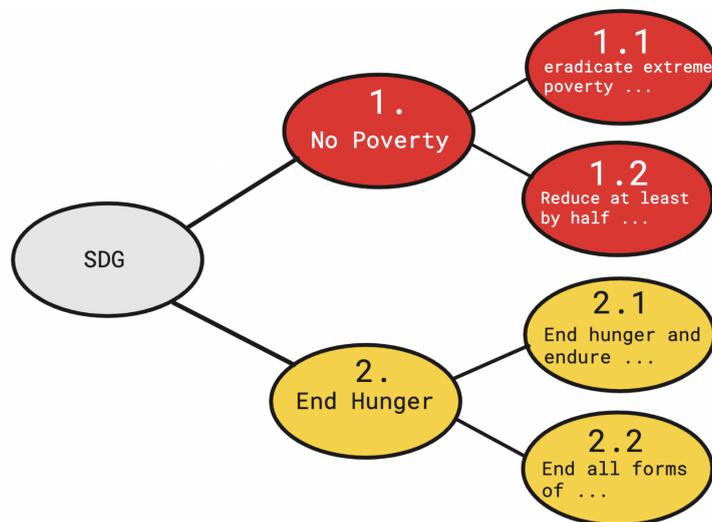


Figure 7.4: SDG Ontology snippet (Source: TK)

So far, as of April 2022, the ontology has connected the SDGs and its subgoals, triple bottom line, the KPIs from U4SSC and the categorization between them. Furthermore Trondheim Municipality is partially implemented and divided into directories and unit areas. Relations between the KPIs and unit areas are mapped in order to get an overview over where the KPIs belong. The SDG ontology can be seen in figure 7.5. and can be found online as an [interactive map](https://sdgga.trondheim.kommune.no/)⁵⁴.

⁵⁴ SDG Ontology: <https://sdgga.trondheim.kommune.no/>



Trondheim Municipality. Some of the mentioned examples below target SDGs with the public and private sector;

- Workshops for mobility; presenting BCV; localising SDGs
- The establishment of SDG-clinics connecting students and businesses
- The Youth Sustainability Workshop connecting high school students to work on sustainable solutions for the upcoming World Ski Championship
- Open Calls for connecting citizens to the municipal activities
- Chlimathons for citizens
- Development of partnerships with SDG commitments; business; NGOs; start-ups; institutions; organisations
- Leadership development programme with practical advisory on SDGs
- Formalised collaborations with the Norwegian University of Technology ([NTNU](https://www.ntnu.edu/)⁵⁵)
- Formalised collaborations with [SINTEF](https://www.sintef.no/)⁵⁶, a research institution
- [Miljøpakken](https://www.miljopakken.no/)⁵⁷, a collaboration for better transport, less emissions and traffic jam

The ongoing work with revising Trondheim Municipality's Energy and Climate Plan is reaching out to all segments of the municipality in order to engage, but also to collaborate on SDGs. There are open meetings, a landing page for ideation, meetings and workshops targeting business and industry and more. Dept. of Environmental in Trondheim Municipality actively initiates meetings with companies with large CO₂- emissions to collaborate on possible solutions.

Impact → using mobility as an example

Impact is about the lasting effect of projects that provide a solution. Various factors such as citizen engagement and innovative partnerships can do exploits with an impact across the triple bottom line.

LHC Trondheim has worked on positive energy solutions within the mobility sector, and it serves as a valid example of how LHC Trondheim has created an impact. This includes:

- Vehicle to grid (V2G) electrical charger developed by [ABB](https://global.abb/group/en)⁵⁸
 - with new improved V2G technology (faster and better)
 - enables [ABG](https://www.abggroup.com/)⁵⁹ to sell energy to the grid and improve their business model
 - pioneers in integrating the V2G in a PEB and a local flexibility market
- Electrical Vehicle (EV) sharing scheme
- [Mobee](https://www.mobee.no/)⁶⁰ - a realtime green mobility app

In the honeycomb model below, you can see the synergies of investing in innovations within the mobility sector. Trondheim Municipality has set policy goals that enforce sustainable transitions regarding climate and mobility. By investing in green mobility, a city creates positive synergies in all of the areas outlined in the honeycomb model in figure 7.6.

⁵⁵ NTNU: <https://www.ntnu.edu/>

⁵⁶ SINTEF: <https://www.sintef.no/en/>

⁵⁷ Miljøpakken: <https://miljopakken.no/>

⁵⁸ ABB: <https://global.abb/group/en>

⁵⁹ Avis Budget Group: <https://avisbudgetgroup.com/>

⁶⁰ Mobee: <https://www.mobee.no/>

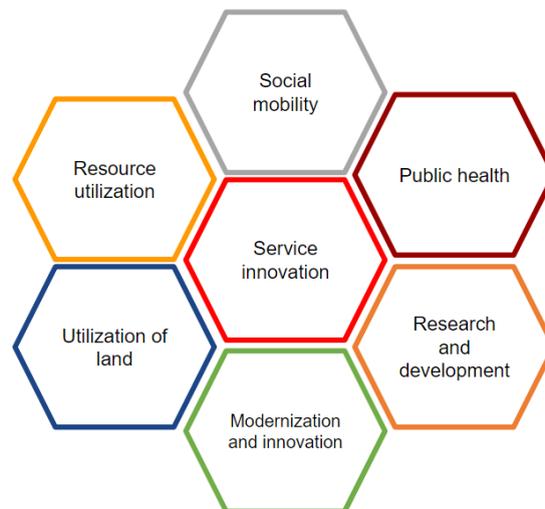


Figure 7.6: Mobility HoneyComb Model (Source: TK)

In D5.13 [+Trondheim eMaaS Demonstration](#)⁶¹ (Sørum, Berthelsen, et al., 2022), the authors describe examples of the “continuous scaling and replication that is occurring as part of the Seamless eMobility Project” with examples such as adding a fleet of 15 shared EVs available to the public in the city centre. According to Sørum, Berthelsen, et al. (2022): *“Discharging of the EVs will contribute with energy, capacity, and flexibility to the local markets and PEBs at Sluppen and Brattøra, and the EVs may perform opportunistic charging - when electricity prices are low, and for instance when locally produced electricity is available at favourable prices”*.

This is the embodiment of impact across different dimensions by these implementations.

The mobility app Mobee is a frontend application that has the potential to attract a large number of users by including various forms of transportation, such as bikes, cars, public transport and E1-scooters, and showing their locations in real-time. Mobee represents a full-scale “Mobility as a service” (MaaS) product and exceeds its original scope of the project (Sørum, Berthelsen, et al., 2022).

⁶¹ D5.13 +Trondheim eMaaS Demonstration:
<https://cityxchange.eu/knowledge-base/d5-13-trondheim-emaas-demonstration/>

8 Guidelines to create an energy positive city by 2050

The vision for LHC Trondheim is to become an energy positive city by 2050. In Norwegian, the vision is called "Plussbyen Trondheim", directly translated to "The Plus City Trondheim". To create an energy positive city by 2050, many aspects need to be taken into account. Some are societal, political, technical, financial, and legal. To handle different aspects simultaneously, in other words: working with multiangular approaches, has been a journey where parts of the road are created while walking. Other deliverables in +CityxChange have focused on specific areas, methodologies, legislations, and enabling technologies that are important to succeed with the Bold City Vision for LHC Trondheim; becoming energy positive. This deliverable presents the development and use of the BCV framework. It displays the utilisation, adaptations, possibilities and concrete examples related to SDGs and how it has been a key building block in making the work of +CityxChange have a lasting impact - in LHC Trondheim and beyond.

8.1 Why the SDG focus, and not just energy?

Why the focus has been on implementing systematics to approach the SDGs is, simply put, that arguing a mere energy focus, when the world struggles with several severe issues, would not get the urgency and focus needed. Particularly in Norway where large shares of the energy are renewable and have, until recent years, been low-cost. The SDGs elevate the work, gives it unarguable timeliness, and energy is, by all means, an important factor within the SDGs and has pervading abilities on the SDGs and SDG targets. Solving SDG #7: affordable and clean energy, will have a massive global cascading impact.

8.1.1 Setting the stage for developing and using a guideline

With reference to chapters 4 and 5, it is crucial to have a political commitment and target evidence-based approaches and policies. Without integrating the SDGs or the desired goal of a city to its steering and planning documents, aka connecting it to budgets and allocation of resources, a guideline will take you thus far. Understanding that the municipal, social, and economic budgets are the legal binding documents, and thus the economic, legal, and political tools ensuring commitment and prioritising, is crucial. Trondheim Municipality has integrated SDGs into the steering documents and budgets, but also various policies, such as in the area of transport and mobility, and climate where the city sees considerable potential for investment in the coming years.

8.2 The four pillars of SVC and energy

Through the prevailing deliverable, the city's journey has been documented and explained in relation to frameworks and methodology. LHC Trondheim's guideline on sustainable value creation follows the four pillars of SVC. We will use the same pillars; *potential*,



readiness, opportunity and impact concerning energy, as logic to describe our guideline on becoming energy positive by 2050.

8.3 Potential- energy goals, current situation, and forecasting

The following is needed for a BCV on energy positive city to make sense, leading to an inventory and figures for the potential:

- Current, detailed energy consumption for the city distributed on different energy carriers and sources
- As much information and facts as possible for the existing building stock
- As detailed as possible: the plans for urban development, new building stock located where in the city; at least assumptions on energy class of new buildings
- Forecasts for electrification of the transport sector
- Baseline forecasts (development without any interventions) for the development in the consumption at 5 or 10 year intervals up till the target year
- Analysis of possible measures, interventions and intervention packages at different time stages towards the target year
- Detailed knowledge and insights into important factors influencing energy consumption on a city level
- Expected increase (numbers) in new renewable integration
- Cost/benefit analyses of the different measures

This work has to be continuous, with updated numbers, plans, strategies, etc. as we proceed towards the target year. Also, although not equally important, is to have defined and concrete goals for energy consumption and greenhouse gas emissions.

Viable analytical/prediction/forecasting/modelling tools with designated functionalities and precision are a precondition. LHC Trondheim has two available and important modelling tools developed through the +CityxChange project:

- IES 3D model and Decision Support Tool (DST)⁶²
- IES and Volue PEB Design Tool⁶³

The IES Energy Model and Decision Support Tool is a solution created to help decision-makers and key stakeholders understand potential energy reduction interventions across the Positive Energy Blocks (PEBs) in Trondheim and across the city. The software can be used to visualise and simulate potential energy reduction interventions. The potential for local supply (e.g. solar panels) and energy sharing between buildings can be modelled. By adding new local production and analysing how this can be used within the PEB, a new community grid can also be modelled and designed. Using the baseline forecasting, the software modules can then be used to simulate a large number of energy scenarios over time and for specific years up till 2050.

⁶² <https://cityxchange.eu/knowledge-base/d5-2-trondheim-dst-including-training-manuals-videos/>

⁶³

<https://cityxchange.eu/knowledge-base/d2-2-toolbox-for-design-of-peb-including-e-mobility-and-distributed-energy-resources/>



The IES and Value PEB Design Tools are for the design of PEBs where you can make use of a variety of energy and system sources. These tools allow the local municipality end users to view the results of their required scenarios to 2050 in 3D map view dashboards overlaid with selected visual KPIs.

Roadmaps to create PEBs can be made, whilst taking into account potential changes and impacts on technical, financial, as well as socio-economic aspects. These models, dashboards, outcomes and results will be a useful tool for politicians, decision-makers, planners and citizens to understand the significance of energy as a core topic. The easily accessible results and outcomes are important to display and benchmark the results in the city development in LHC Trondheim, towards the 2050 vision, in an uncomplicated way. There are, however, a large number of other tools than those described above that can be used to achieve the same purpose. Trondheim Municipality chose to use tools developed in our organisation for the energy forecasting and inventories.

Figure 8.1 shows that if no action is taken in Trondheim we will foresee great challenges in meeting the demand for energy consumption in Trondheim in the years to come. With an expected growth in energy consumption, these facts illustrate the need for novel energy solutions in Trondheim.

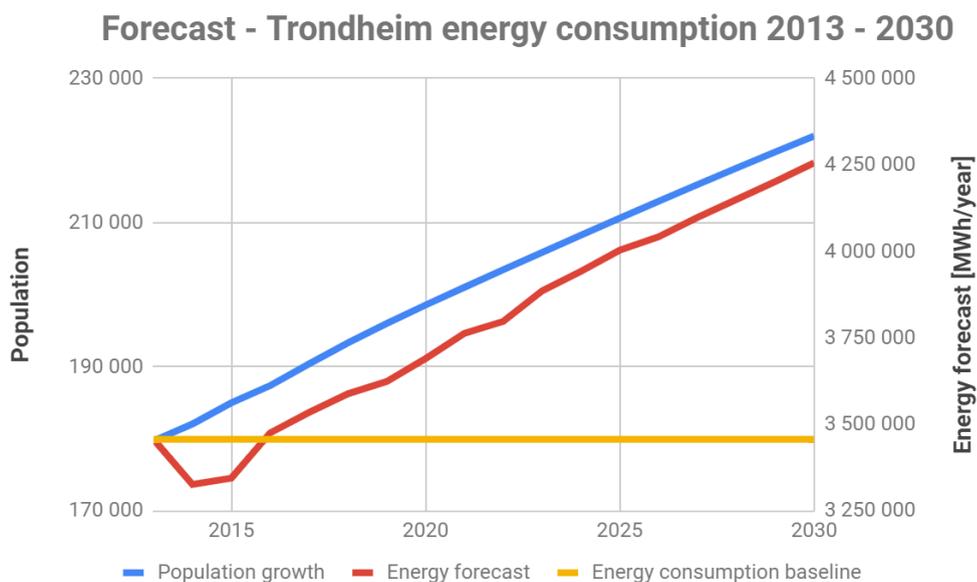


Figure 8.1 Red curve shows Trondheim's predicted energy consumption (electric and thermal) 2013-2030. The blue curve is estimated population growth. The yellow curve is Trondheim's main energy goal in the Energy and Climate Plan 2017-2030: No increase in the energy consumption 2013-2020. The energy target means in fact a 20% decrease in the energy consumption per capita. (Source: TK, TE and SV)

The figure below (8.2) displays the expected growth in energy consumption by light electric vehicles and % share of EVs till 2050. A strong increase in the EV share and EV energy consumption is expected in 2020 - 2040, and a slow increase 2040 - 2050, when the EV share is supposed to be 95%. Given EU goals on a strong increase in the electrification of the transport sector, it is highly important to include the increased electricity demand for

EV charging in the total predicted energy demand. On top of this adds additional electricity consumers (which needs to be mapped out and quantified as well as possible).

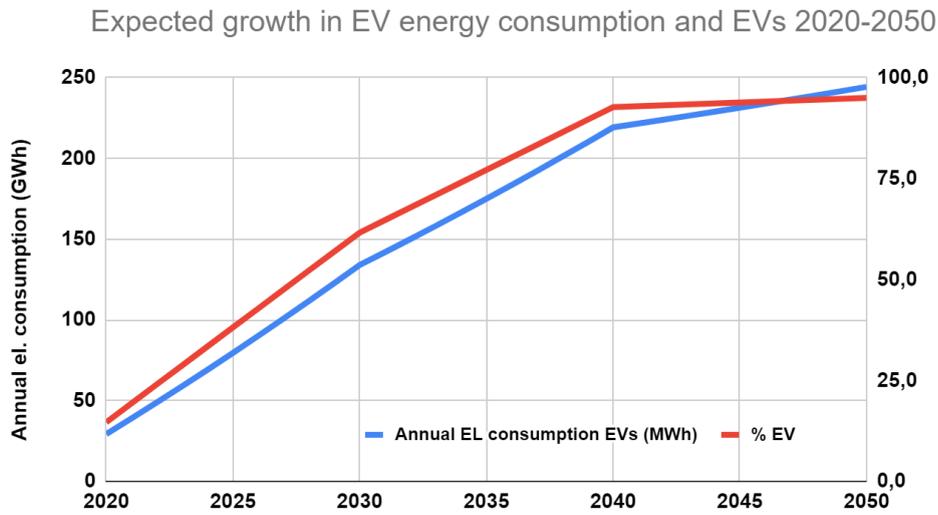


Figure 8.2 Expected growth in EV energy consumption (blue line) and percentage share of light EVs of the total light vehicle fleet (red line) 2020-2050.



The figure below is part of an unpublished article with the purpose of energy and climate mitigation strategies at local level. The analyses on our building bodies are part of Trondheim Municipalities forecasting of the energy demand until 2050 and also a tool to help figure out what measures need to be taken to reach our vision of a energy positive city by 2050.

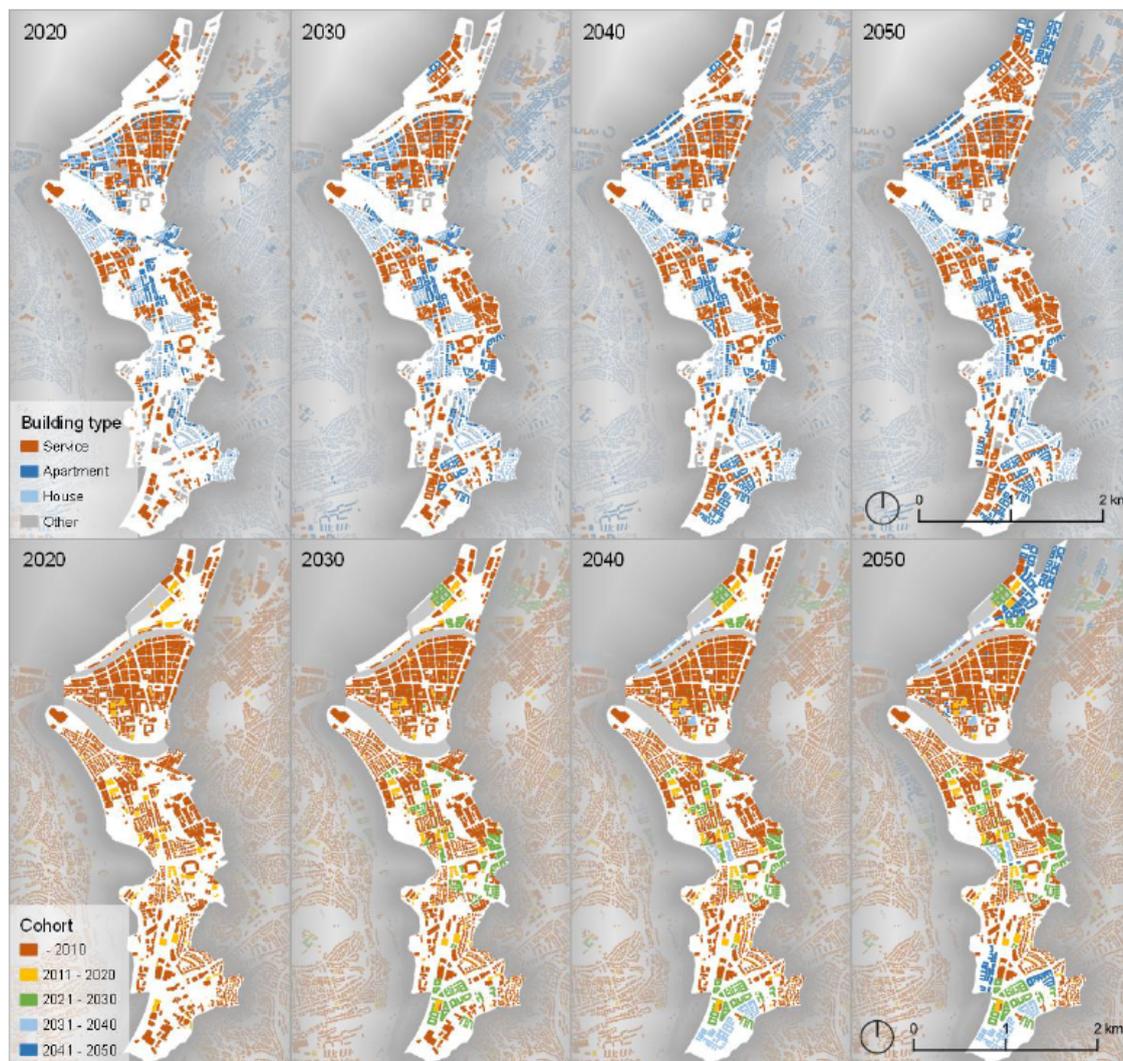


Figure 8.3 Building stock displayed by building types and cohort in the Trondheim Knowledge Axis, the +CityXChange Demonstration District (source: Lausset, Carine - "Geo-referenced building stock analysis as basis for energy and climate mitigation strategies at local level"; unpublished article ⁶⁴)

The Trondheim Knowledge Axis energy forecasting till 2050 (figure 8.3) is powerful and provides a viable backdrop for the Trondheim Bold City Vision as well as an important tool and means for necessary actions to be taken in order to fulfil the +Trondheim BCV. The figure displays predictions based on the now-situation and includes the composition of different building types/categories and building year (cohorts), and development plans for 2030, 2040, and 2050. The forecast, in addition, includes different scenarios for; refurbishment and upgrading, new buildings and energy supply solutions. The energy supply solutions include both electricity use and district heating in all buildings, heat pumps

⁶⁴ Find the unpublished article here: <https://fmezen.no/>

in all buildings, PV production, and a variety of other solutions. Energy flexibility and reduced outtake of capacity (kW) are not included in the forecasting and analyses.

Based on the forecasting and following analyses, it is pretty clear that if we are to reach the target only on maintaining the stationary energy demand on a 2013 level (figure 8.1) even in a strongly growing city, this will claim that all renovation and refurbishment must be performed highly efficiently, energy wise. In addition, substantial local, renewable energy generation will be needed.

The most important actions and measures needed to obtain no growth in the stationary energy demand by 2030, is probably the claim for a certain energy performance/standard beyond the minimum claim in the National Building and Planning Act, and the type of energy source (National Energy Act); e.g. urban (district) heating. This in combination with energy wells, rock heat and heat pumps (including seawater heat pumps) are appropriate. This is applicable to where you operate outside urban heating concession areas - where urban heating networks are found of course - or where there is no urban heating network.

In addition to renewable local generation (i.e. PV), energy sharing and redistribution plus capacity and user flexibility solutions may contribute significantly. The +CityxChange project bases its PEB approach on significant contributions from local flexibility, and open, local trade of energy/flexibility/capacity, based on expected contributions of 20 % of the total building energy demand to the overall local energy inventory. If we, in LHC Trondheim, are able to utilise local user flexibility to this extent, the whole expected increase in energy demand in 2030, on a 2013 baseline, could be covered through this. This also means that additional measures and interventions may contribute to a *de facto* decrease in the future energy demand. This is of course crucial in order to at least contribute to fulfilling the BCV.

The analysis above clearly shows that renewable energy alone is not sufficient in order to either establish and obtain PEBs, let alone obtain BCV as the "Positive Energy City 2050" in Trondheim.

We define a positive energy city as displayed in the equation below:

$$\Sigma \text{ stationary (building) energy demand} - (\text{energy efficiency} + \text{improved energy performance and utilisation} + \text{impact of local trade of energy/flexibility} + \text{urban heating}^{65} + \text{new RES}) < \text{original (pre-intervention level) electricity supply from large grid}$$

8.3.1 Assessing potential in collaboration with partners

LHC Trondheim made a survey in 2021 to have input from partners and to investigate what they consider as potential in becoming energy positive, from their vantage point, and with sustainable value creation in mind. The partners and their line of work are listed in table 8.1.

⁶⁵ According to the EU Horizon 2020 call identifier LC-SC3-SCC-1-2018-2019-2020 which +CityxChange is founded in, Urban Heating is considered renewable.

Table 8.1: Partners that participated in survey

Company name	Type of business	Relation to +CityxChange
ABB	Technology company	V2G-chargers OPTIMAX ® system and asset integration solution
TrønderEnergi	Energy system operator	Flexibility market development and deployment
ATB	Public transportation	Public transportation provider in Mobe
ABG	Mobility solutions	EV sharing scheme
Statkraft Varme	District heating	Sluppen DPEB
Kjeldsberg Eiendom	Real Estate developer	Sluppen DPEB
NHP now RELOG	Real Estate developer	New sustainable and green business and investment models
Volue	Technology company	Energy Trading Platform including Algotrader and Digital Marketplace
FourC	Technology company	Mobe mobility backend and frontend

The partners were asked eight questions, and the essens is listed below.

The main take out from the survey was;

1 What potential do you see in the sustainable energy transition? (for the company, industry, and Trondheim)

- Optimization of the electrical market, cheaper energy, more renewable energy, more EV, production, zero emission, cars as power banks, energy storage, flexibility use, reuse of surplus heat, more opportunities generally, a mobe app, better air quality, energy security, added company value through energy certifications, growth, energy transition, TK as frontrunner, spin-offs.

2 What should the goals be for a sustainable energy future for Trondheim?

- Energy efficiency, reduced CO₂-emissions, zero emission, good livelihood, electrify all that can be electrified, fewer private cars, more EV infrastructure, climate neutrality, energy neutrality, free trade of energy, support new energy initiatives, maximise value of assets, must be tangible.

3 What are the barriers to enabling a more sustainable energy future (technical, political, organisational, financial, other)

- Lack of coordination across silos, lack of leadership and understanding the complexity of the energy system, regulations, old building management systems (BMS) hard to integrate, finance, lifespan on utility/assets, access to central EV-parking places, district



heating rules prevent spill heat investments because it is priced equal to electricity, making everyday life inconvenient, no incentives to invest in energy assets, economic risk, financial support, lack of attention/knowledge, lack of IT-resources, lack of communication, legal framework, identifying the business opportunities.

4 To what degree is the ecosystem ready to support a more sustainable energy future?

- Ready for action and to participate but barriers constituted high risks. Technical readiness is high.

5 What are the opportunities for your company in a more sustainable energy future?

- Optimise use of renewables, more hydro power, new solutions, new products, new markets, be a part of the green transition, integration of services, sustainable transportation, more car sharing, use of renewable resources, invest in renewable assets, produce/sell PV, financial, optimise assets and energy sources, digitalised infrastructure, reduce climate risk, grid upgrades, new jobs.

6 What partnerships and resources and funding mechanisms can be exploited?

- Public funding mechanisms, enable local energy production, risk reduction to participate in projects, pilot projects, energy certifications, EU, leapfrogging technologies, green loans, new standards for investments/loans.

7 What are the key performance indicators (KPIs) for you in the sustainable energy transition?

- Added value to products/customers, power production per m², reduced CO₂ emissions from internal transport, SDG evaluations on contracts/projects, emission budgets, EV share in total carpool, zero fossil cars, energy finance, climate measurements, company value.

8 Which KPIs are most important for the Trondheim kommune to focus on in the sustainable energy transition?

- Be a catalyst, purchase prototypes/solutions, smart investments and procurements, link KPIs to climate changes, less emissions per capita/per business/building, more local energy production, optimised energy consumption, increased value creation, high quality service, zero emission, energy neutrality, more EV-cars/car sharing, more public transportation, look at ecosystem or global approaches, reassess how things are calculated, measure happiness, behavioural changes, cross sectoral partnerships, well being of society, share knowledge/make changes.

The answers vary with the company's line of work and ownership, but they all see potential, share their knowledge and point TK in a direction to be an enabler and contributor in finding sustainable energy solutions. Not only for the purpose of the city, or their self-preservation, but also for the greater good. This survey, or reality check, amongst a diverse group of stakeholders is a quick fix to spot potential, readiness, opportunity and possible solutions/impacts. Had the answers revealed too much discrepancy towards the foundation of the collaboration, project, roles and incentives, it would also have been valuable. That would have been a clear indicator to step back, and re-fundament the shared grounds.

8.4 Readiness - prepare to support implementation

The readiness of the city and its ecosystem depends on the changes in legal, administrative and policy setting emerging from the implementation of the SDGs, and how this is reflected in local processes and practice. There are different levels of social segments, representing an ecosystem, to address when it relates to readiness on how to become an energy positive city by 2050. It can be divided into; public sector; citizens; partners within +CityxChange; business and industry; academia; R&D sector and national authorities.

8.4.1 Explanatory examples from Trondheim Municipality

The SDGs and energy related topics are present in the core of the municipality, and it is continuously branching out, influencing various groups of stakeholders within and beyond the municipality, to prepare to support implementation of smart and sustainable solutions. Here are some explanatory examples towards readiness;

- Trondheim Municipality has aligned the SDGs and has specific energy related topics in steering documents, budgets and plans (see chapter 5 and 7). As to why the SDGs are aligned, and not energy specific targets, is addressed in section 8.1.
- The municipality established a new, fused sector in 2021, that connects business, environment and mobility under the same municipal CEO. This was done to support synergies between the departments and to assure the integration of the SDGs in business development and mobility.
- The Municipality is member in a Renewable Energy Cluster: [Renergy](#)⁶⁶
- The Municipality applied and was approved to join the [EU mission](#)⁶⁷: 100 climate-neutral and smart cities by 2030.
- There is a strategy for innovative public procurements in development, to further support environmentally and socially responsible urban services and urban infrastructure projects.
- There is a strategy for Entrepreneurs, and the startup community receives funding for activities. They are seen as an important part of the ecosystem driving the sustainable transition.
- There is collaboration with academia (NTNU) and research institute (SINTEF) with formal agreements. SDGs, climate and renewable energy are research areas represented in their portfolio, and collaborated on.
 - [Universitetskommune TRD3.0](#)⁶⁸ is a strategic collaboration with NTNU
- Citizen engagement was included by the city council in 2019, to co-create the municipality. "SDGs-talks", made and produced by the municipality, are open access and streamed.
- Regular top CEO and political meetings between Trondheim Municipality, Trøndelag County, the regional Chamber of Commerce, NTNU, SINTEF, Student Welfare

⁶⁶ Renergy: <https://renergycluster.no/en/>

⁶⁷ 100 Climate-neutral Cities by 2030: https://ec.europa.eu/info/publications/100-climate-neutral-cities-2030-and-citizens_en

⁶⁸ Universitetskommune TRD3.0: <https://i.ntnu.no/wiki/-/wiki/Norsk/Universitetskommune>

Organisation (SIT) and [Trondheim Tech Port](#)⁶⁹ (innovation organisation) in a “Strategic collaboration Forum” have focused on energy, and they backed the decision to go forth with the political case and endorsement listed in A3, found in the Annex. The idea came from LHC Trondheim.

8.4.2 Explanatory examples from LHC Trondheim and others

LHC Trondheim has also targeted all of the mentioned segments to enhance readiness on becoming energy positive. Here are some explanatory examples;

- Citizens, partners within +CityxChange, other businesses, academia and R&D sector have been included and targeted through a broad range of activities and events, listed in [Trondheim Innovation Lab Solutions Catalogue](#), (Grabinsky, Riedesel and Haugslett, 2021). Several of the events were conducted in collaboration with the city's ecosystem. Activities like workshops, information sessions, seminars, webinars, animation films, festivals etc.
- Collaboration with [Newton Energy room](#)⁷⁰ to include +CityxChange topics in the energy related teaching they provide to all primary schools in Trondheim.
- Partners within +CityxChange have used their networks and platforms to reach out nationally and internationally, in addition to their project deliverables.
- Academia, represented by NTNU, is main coordinator for +CityxChange and aligned with the vision. They have several other initiatives targeting energy, and becoming energy positive, in addition to this engagement;
 - Partner to the New European Bauhaus initiative, [NEB](#)⁷¹
 - Coordinates a project within EU Mission: 100 Climate-Neutral and Smart Cities by 2030
 - Research Centre on Zero Emission Neighbourhoods in Smart Cities, [FME ZEN](#)⁷²
 - [National Smart Grid Laboratory](#)⁷³
 - Multiple other projects on smart sustainable cities, local electricity markets, energy transition, and climate.

Others supporting and reinforcing readiness :

- Public sector, represented by Trøndelag County, is connected to The Centre for Sustainable Development, Network of Excellence and Trøndelag i pluss (section 6.2), and much aligned with our vision.
- R&D - sector, represented by [SINTEF](#)⁷⁴, has renewable energy, climate and more as research areas.
- Business and industries are represented within the project, in the Renewable Energy Cluster and with the [regional Chamber of Commerce](#)⁷⁵ (NiT).

⁶⁹ Trondheim Tech Port: <https://www.trondheimtechport.no/>

⁷⁰ Newton Energy room: <https://newtonroom.com/no/newton-rom/newton-energirom-trondheim>

⁷¹ NEB: <https://www.ntnu.no/nyheter/en/ntnu-becomes-partner-to-the-new-european-bauhaus-initiative/>

⁷² FME ZEN: <https://fmezen.no/>

⁷³ National Smart Grid Laboratory: <https://www.ntnu.edu/smartgrid>

⁷⁴ SINTEF: <https://www.sintef.no/en/>

⁷⁵ NiTR: <https://www.nitr.no/>

- NiT has used their national chamber of commerce network to engage and front the need for new energy regulations in Norway, see table A3 in the Annex.
- NiT has councils with members from business and industries that targets energy and SDGs, where +CityxChange has been invited.
- NiT has collaborated with LHC Trondheim in the matter of energy regulations

8.4.3 Readiness at city level and at national level

The readiness of LHC Trondheim, its partners within +CityxChange, and the actors listed above, to implement and demonstrate how a functional PEB can lead us towards becoming energy positive by 2050, is unquestionable “there”. The technology and the elements needed to be a PEB is proven both in deliverables and in innovations within the project.

The national readiness, with Norway's energy regulations and legislations, is not optimal. The regulations and legislation represent a barrier for creating PEBs and subsequently energy-positive cities. The green energy transition is an ongoing global process that will increase the readiness level significantly through innovations, disruptions, new technologies, digitalisation and human concerns about climate change. Policymakers will respond to this and secondly to regulatory frameworks significantly, but it takes time. That is why continuance in raising the issues connected to becoming energy positive through “push and pull”, with help from a growing support ecosystem, is important to speed up the political process needed at the national level. The push and pull are documentation of innovations, linking results to national interests and goals, and represent continuous rotations moving forward in the “circle” that the four pillars of sustainable value creation represent.

LHC Trondheim has raised this issue on energy regulations in a multi-collaborative initiative at a local, regional and national level, in addition to the EU Smart Cities Marketplace Initiative on Regulatory Framework. Table A3 in the Annex lists the initiatives on regulations led by LHC Trondheim. There are ongoing meetings and processes targeting national authorities on this urgent topic. The ecosystem, represented by the actors mentioned in this section, has also raised the issue, and lobby the urgencies through their channels and networks.

Keeping up the focus on the need for changes within the energy regulations, backing it up with knowledge based results, innovations, emphasising societal incentives, ripple effects and possible opportunities lost has led to a recent announcement from the national environment and energy committee. [The following proposal has been adopted](#)⁷⁶:

The National Assembly asks the government to remove regulatory barriers that hinder local energy production, local energy storage and the sale of energy between buildings.

⁷⁶ Government publication on the proposal : <https://www.stortinget.no/no/Saker-og-publikasjoner/Publikasjoner/Innstillinger/Stortinget/2021-2022/inns-202122-446s/?m=1&c=False>



The committee elevates this by adding that they expect the government to follow up on this, and points out that it is crucial that regulatory barriers are removed quickly if we are to trigger a major development of, among other things, solar energy.

In addition the committee front the following proposals:

The National Assembly asks the government to:

- *review the regulations and the policy instruments to stimulate the use of solar energy, among other things to stimulate area developments with solar energy and neighbourhood electricity.*
- *introduce a requirement that grid companies must register and report how long they spend on processing simple applications for connection of small solar power plants.*
- *to expand the current plus customer scheme so that it also includes residents in multi-family homes, apartment complexes and commercial buildings during 2022.*

The adopted proposal is, in Norwegian context and for LHC Trondheim, very positive news, and a gamechanger to reach our vision. The additional proposals, if they don't fall or are altered beyond recognition, represent even more positive news targeting the readiness at national level.

Being able, legally, to have PEBs functioning as described in the D5.9: [Playbook of regulatory recommendations for enabling new energy systems](#), (Myrstad, Livik and Haugslett, 2021) will be a contributing factor in becoming energy positive by 2050. To use the available energy resources in a "fit for purpose sense", here pointing back to becoming energy positive, include how different energy sources are optimised through for instance sector coupling, where thermal and electrical energy is optimised. The recommendation from D5.9 is to have an energy system approach, to clarify how local energy resources will be beneficial in a post-energy transition phase. Increased local energy production and power-sharing, as well as power flexibility solutions, could make a major contribution.

Other factors will act together, and contribute as well. Several of them are addressed in +CityxChange. This includes targets like green mobility and building more energy-efficient to keep the energy consumption as low as possible. The existing buildings represent possibilities when it comes to how they are renovated. The municipal climate and energy plan for the city, described in section 5.1.8, targets amongst other things reduced energy consumption and carbon footprints in relation to buildings, stationary energy consumption levels and reducing greenhouse gas emissions.

Knowing LHC Trondheim has a growing population and increased electricity consumption, energy efficiency, flexibility and establishing optimal energy solutions must be targeted by urban planners and city developers. However, energy is not targeted in the National Planning and Building Act (PBA) in a matter that will lead or help Trondheim to reach the energy goal set. The PBA regulates public and private spatial area planning and building regulations. The lack of energy "ambitions" makes it challenging for the municipalities to impose energy requirements within building plans for developers. If present, energy could be a strategic element within urban development. Municipalities could impose requirements on energy performance, in addition to technical regulations, to reach climate



goals and also relieve grid stress. This represents two options for cities wanting to become energy positive;

- 1) Instigate necessary changes to the PBA to include energy as a strategic tool. The current PBA has been effective since July 2009.
- 2) The municipal urban planners must plan and decide on green sustainable energy solutions for all future projects, and incorporate them.

The PBA has not been a primary target in LHC Trondheim. But to reach the goal of becoming energy positive, energy performance; optimal energy use through sector coupling; local energy production, etc. must receive attention when it comes to urban planning and development. Municipalities must be given the strategic tools. Based on the experience with regulations, if the PBA shall be challenged, it is wise to collaborate with stakeholders, the energy ecosystem, regional authorities, other cities and treat it as a national affair and interest to be revised. Such an initiative must be backed with facts and demonstrate the impact and possibilities, and address the development, the SDGs and energy change that has manifested since 2009.

8.5 Opportunity - collaboration on shared goals

+CityxChange is designed to have and foster several partnerships. In LHC Trondheim the "concept" partnership model has started to grow outside of the +CityxChange team. With different partners and stakeholders, possibilities and shared interests and goals have been brought to light. Establishing a sense of common grounds, roles and responsibilities has been done with dialogue, meetings, workshops, negotiations and legally binding contracts.

8.5.1 Partnership agility in LHC Trondheim

The solution to complex problems often requires the involvement of several actors and stakeholders in developing partnerships. They all represent different knowledge and that gives a capacity for diversity within the group. Actors in the scheme, their roles, responsibilities, contributions, and the necessary agreements and contracts needed for such a scheme, will often change when the solutions are maturing. That is why the original setup will look different over the timespan when working on a solution. It is a natural part of the process that shouldn't be opposed.



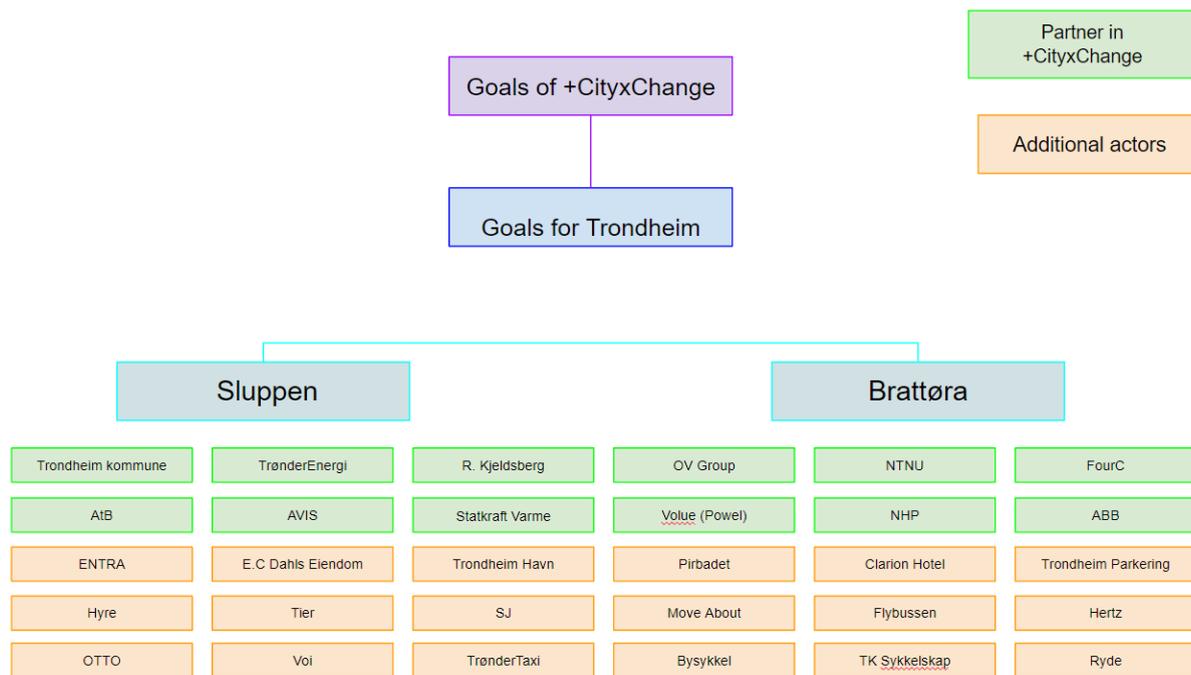


Figure 8.4: Overview of original and added partners in LHC Trondheim connected to the demonstration areas (Source: TK)

Figure 8.4 shows the stakeholders involved in working with the two PEBs in Trondheim. The original set and partners are seen in green. Innovation projects often experience unforeseen challenges, and that was the case in LHC Trondheim as well. There was a change in the solutions, enforcing different competence and skill sets to the project. New partners were included, altering the original collaboration setup, and the additions are seen in orange. The ability to be flexible and “opportunistic” in a sense, proved to be important. Crucial functions were covered and thus a viable scheme, also in commercial terms, was established. The engagement and involvement of the partners/actors are also contributed as a successfactor.

8.5.2 Innovations through collaborations

+CityxChange can tie innovations on methodologi, work methodologies, technologies, and more during the project phase. LHC Trondheim would like to highlight some of the contributions that will prevail energy positive cities ;

- **The BCV Framework**
 - Thoroughly described in this deliverable
 - BCV framework made into a digital guide (MIRO)
- **PEB design**
 - Two designated demonstration areas with two different PEB approaches and designs; one focussing mainly on electricity (Brattøra), the other (Sluppen) with extensive sector coupling electric - thermal, and virtual input of energy from a remote PV plant and remote seawater heat pump

- Extensive PV, large heat pumps, waste heat recovery, and large battery storages in both PEBs; use of seawater heat pumps (Brattøra)
- Special grid tariffs for the battery storages
- New dynamic pricing model for district heating decoupled from the electricity spot price
- V2G as an energy flexibility asset
- ICT and energy management system energy efficiency interventions and solutions as opposed to traditional measures (e.g. insulation and change of windows)

- **Campus Microgrid Model Prototype**⁷⁷ (Guldbrandsøy et al., 2021)
 - Framework plus theoretical foundation for flexibility potential and benefits of smart building and energy control
 - Automated optimisation model connected to live data sources and regional energy market connected with forecasting features (rolling horizon approach for scheduling)
 - Open source software optimisation models for easier replication
 - Requirements and methods to enable smart control of assets, combining new software model with ABB OPTIMAX ® and buildings' existing ICT management system

- **Energy Trading Solution and Local Flexibility Market**
 - Two-module Energy Trading Platform with Algotrader and Digital Marketplace allowing trades of energy/capacity/flexibility/System services at 15-minute time resolution
 - Local Energy and Flexibility Market solution with self-learning and self-improving algorithms
 - Trade system based on blockless blockchain for secure third party trade verification and storage of immutable trade data
 - Decentralised, multi-stakeholder energy system architecture
 - Model for trade between PEBs (development of the inter-PEB market), described in Guldbrandsøy et al. (2021)

- **Green Mobility**, results presented in +Trondheim eMaaS Demonstration (Sørum and Berthelsen et al., 2022)
 - Vehicle to grid (V2G) electrical charger developed by ABB
 - with new improved V2G technology (faster and better)
 - enables ABG to sell energy to the grid and improve their business model
 - pioneers in integrating the V2G in a PEB and a local flexibility market
 - Electrical Vehicle (EV) sharing scheme
 - Mobe - a realtime green mobility app interacting with scalable, and flexible mobility platform (backend) that integrates mobility modes through APIs

⁷⁷ Campus Microgrid Model Prototype:
<https://cityxchange.eu/wp-content/uploads/2021/04/D5.3-Campus-Microgrid-Model-final-submitted.pdf>



- **Energy system and regulations**, results presented in the Playbook of regulatory recommendations for enabling new energy systems, (Myrstad, Livik and Haugslett, 2021)
 - Energy system design including assets, local production and consumption
 - Recommendations on post energy transition regulations
 - Sector Coupling as energy transition enabler
- **New green investment and business models** (pending results from T5.11)
 - Financing Risk Sharing Model (FRSM) with multi stakeholder and actor interactions and individual actor revenue streams
 - Green Investment Evaluation Tool (including visual model) creation for all products and services in decentralised, sustainable energy ecosystems
 - Pricing models for and pricing of energy products and services in decentralised energy systems
 - Indicators for classification and benchmarking of PEBs based on degree and share of RES, including new simple payback period
- **Citizen participation playbook** (Burón Garcia and Sánchez Mora, 2020)
 - Development of roadmap of citizen participation processes to co-design PEBs: 1) Co-design of urban processes, 2) collaborative legislation, 3) participatory budgeting, 4) citizen proposals
- **Framework for Innovation Playgrounds** (Mee and Crowe, 2020)
 - Framework made up of three parts: System, journey, localised Innovation Playground
 - System: Places, activities, data, enabling mechanisms
 - Journey: Observation, sense-making, co-design, prototyping
 - Localised Innovation Playground: Facilitate collaboration, citizen empowerment, addressing challenges that matter in new ways, integrate virtual and physical places/activities into coherent structure

There are of course other innovations, actions and planned activities done outside +CityxChange, that will be a part of the energy transition in Trondheim. To simplify the predicament; to become energy positive we must use less, use smarter and produce more renewable energy within the city. At the same time, the city has an energy baseline targeting no increase in stationary energy consumption above the 2013 level. That is equivalent to a 20 % reduction per capita when taking into account a growing population. The baseline target might need to be challenged to disregard locally produced and consumed renewable energy from the equation since energy consumption reduction by itself will not make the city meet the target. We live in a country with low winter temperatures, and the buildings stretch in age, quality and thereby energy performance. The investments needed to build and renovate all buildings and installations to the designated technical standard is not sustainable. In addition, will the ongoing replacement of fossil energy with electrical energy (industries, ferries, boats, buses, cars and more) add to the overall electrical needs within a city. This should incentivise enabling local energy markets.



8.6 Impact- do the things that amount to something

The impact must be seen in regard to the triple bottom line of sustainability. That is one of the reasons why the green shift and energy transition must preserve all societal segments. SVC lists the following “requirements” for a solution or project to leave an impact; It must solve or mitigate the problem; be future oriented and innovative, and integrate available technologies; create new business opportunities; be based on a multilateral approach, be scalable, transferable and open source. The list makes sense, but can the risk of failing to have an impact be reduced?

Retrospective it is easy to bring forth the successes, but getting there is a process. That is why many methods and models are founded upon experience, and returning issues or questions one finds to be relevant, as a reminder, process initiator, process shaper or result preserver.

8.6.1 Tools and models can be handy pinning down impact

Once there is a solution, or a suggestive solution, there are some questions that can be wise to pay attention to. The circle, represented in figure 8.5 can be used to draw focus to assess and evaluate impact. As it circles around, improvements or knowledge needed for additional impact can be gained. The questions are relevant for all innovations or solutions, and by addressing them and connecting them to progress, a necessary awareness will prevail. They can also be used to identify where you are in the circle, and what to do next, and the circle can probably fit within all the pillars of SVC just by tweaking the questions to a topic or a pillar.



Figure 8.5: Questions to foster impact (Source:TK)

[Stanford University](#)⁷⁸ in the USA developed the *Need, Approach, Benefit, Competition* method ([NABC](#)⁷⁹). The method puts the needs of the user in the centre. It was originally devised for business purposes, but can be embedded in other areas, and used in all phases of development. Ideas will be pinned to the need, and the methodology helps develop and assess them with this in perspective. To simplify the method, identify the *need*, then come up with *approaches* to fit the need. By addressing the *benefits* or impact/purpose, in relation to the need, secures relevance or a market. When the benefit (or impact) is identified, identify the *competition*. These steps will be helpful to not lose focus on who or what is on the receiving end.

In the line securing the impact of solutions to become energy positive, there are many needs. The questions to foster impact and the NABC-method are two, not completely unrelated methods, that can be helpful in the line of work together with other impact measurements or methods.

8.6.2 Mobility solutions creates impact and focus

The result of implementing green mobility is a gift that keeps on giving. There has been public interest, news articles, technical and EV magazines, new reports on TV and more. The focus creates attention that generates more opportunities, not only within the municipality as an organisation, but also outside locally and nationally. This goes for the V2G-charger, EV car sharing scheme and Mobee. One example of a spin-off from green mobility as a service is in connection to events in LHC Trondheim. The international fishery expo (Nor-Fishing) is held in August at Trondheim Spektrum, and will be the pilot event. The expo area has strict rules for transportation, as it is on a peninsula with only one way in and out, conflicts with neighbours, and the surrounding area has rush hours almost every hour. Cars are not allowed entry, besides drop-off. The closest parking place is a 10 min walk away, and if you add the time driving in que, getting there takes an unnecessarily long time. We can help with alternative solutions, and at the same time meet the green ambitions of the organisation and Trondheim Spektrum. We will use solutions created in +CityxChange (Mobee) with both new and existing partners, and some local adaptations.

8.6.3 Energy focus and results leads to more impact

Trondheim becoming one of 100 +12 Cities to participate in the EU Mission for 100 Climate-Neutral and Smart Cities by 2030 is an impact by itself that will give even more impact. The mission involves local authorities, citizens, businesses, investors, as well as regional and national authorities, and is undoubtedly a reinforcement and continuance of LHC Trondheim's work and vision. The four pillars of SVC will be turning new circles and moving the city closer to its goal for each turn. The "movement" on energy regulations, mentioned in connection to national readiness (section 8.4.3), is also a result of focus on energy regulations that has started to have an impact.

⁷⁸ Stanford University: <https://www.stanford.edu/>

⁷⁹ NABC-method: <https://innovationenglish.sites.ku.dk/metode/plan-the-pitch-with-nabc/>



8.6.4 Innovations with impact

There are solutions from +CityxChange that, when fully set in use, will have a lasting impact on the local energy production, consumption and trade. It will be a spearhead for the paradigm shift where decentralised energy systems will provide substantially to the clean energy demand and need. In Mystad, Livik and Haugslett (2021), it is brought forth that clean energy lies mainly in decentralised and distributed renewable energy solutions, whereas laws and regulations are customised solely to large-scale centralised energy systems.

8.6.5 Regulation and legal framework making impact

When the regulations and legislation allows for it, actionable and impactful solutions (see previous chapters) from +CityxChange will be the result, and in that sense has the work and effort created lasting value for the cities and local communities. Scaling and mainstreaming what works in practice, will generate even greater, and more tangible impacts locally, regionally, nationally and internationally. Knowledge sharing, mutual learning and capacity building among cities are essential to expand the impact. And as a lighthouse, we will, by supporting the dissemination and replication of tested solutions in other cities, boost the transfer rate of innovations.



8.7 Guideline and process description for the +Trondheim BCV - from vision to reality

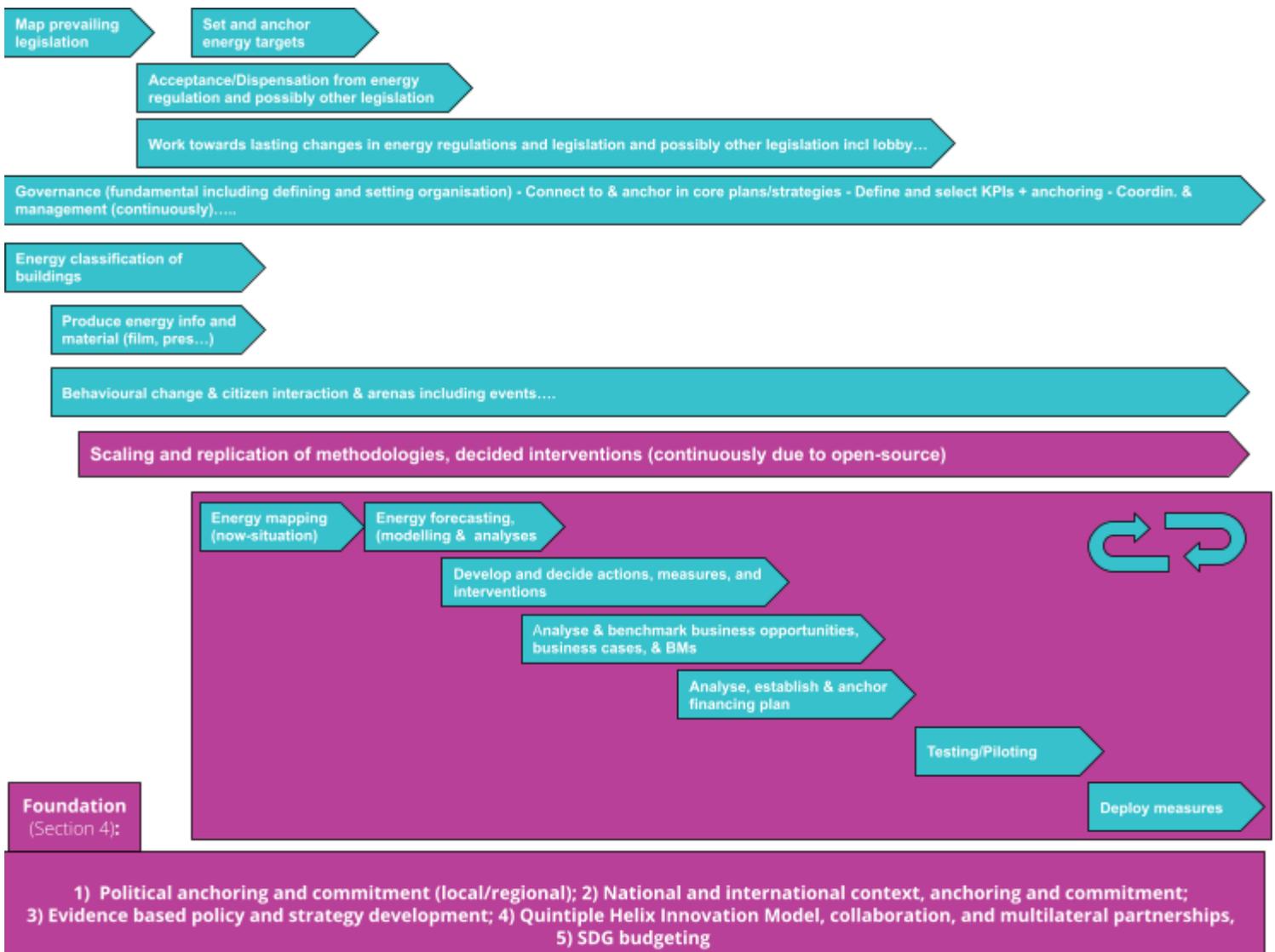


Figure 8.6: Guideline for +Trondheim BCV part 1. The activities and subtasks in the rectangle is integrated with and follow the Municipal Action and Finance Plan including the TK budget, and has a one year timeline (Source:TK)

In LHC Trondheim the BCV is a part of the overall Municipal Action and Finance Plan (HØP in Norwegian), and the BCV activities and subtasks within the rectangle in figure 8.6 is in fact an integral part of the HØP and will follow that plan’s annual schedule.

The timeline for activities in the rectangle in figure 8.6 is one year. During the last part of the year, BCV work will also involve a three-step process as also visualised in figure 8.7. It was made two separate figures due to restricted space.

- Evaluation of activities and work including achieved results (measured against the defined BCV KPIs)
- Development, selection, and decision on measures, activities, and interventions for the next year
- Based on obtained results and cost/benefit analyses of performed activities and deployed interventions, define and anchor (also in TK budget) interventions and measures for 1) scaling and 2) replication

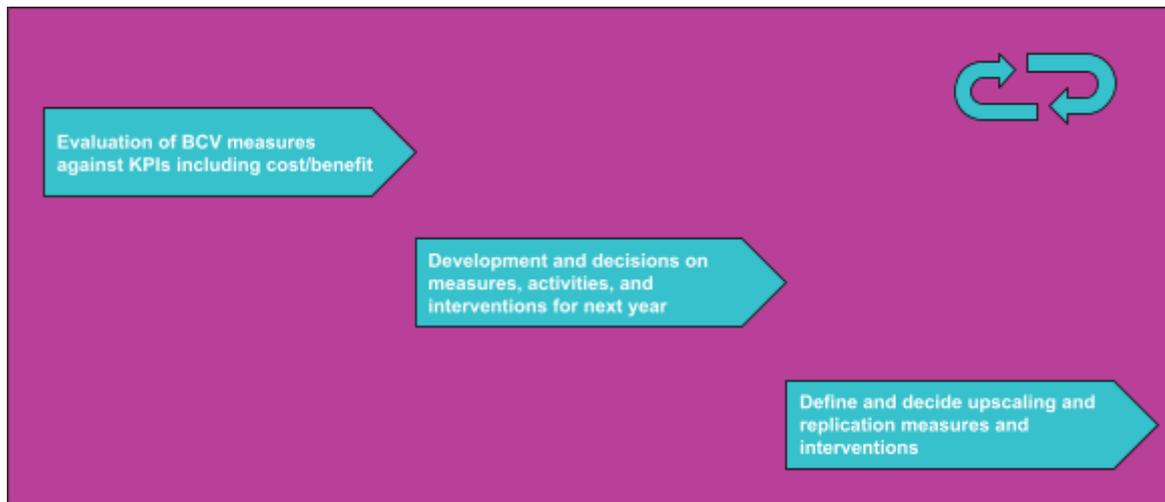


Figure 8.7: Guideline for +Trondheim BCV part 2 and part of the Municipal Action and Finance Plan and its annual schedule (Source:TK).

BCV work will happen over a very long time span and must include a huge array of activities, measures, actions, and interventions. However, there is a huge difference between different measures and their extension and lasting time. Activities at the top in figure 8.6 are fundamental ones, and some of them will not be repeated either, such as work on energy regulatory topics. However, activities such as “set and anchor energy targets” must be evaluated and re-defined, albeit frequently. TK performs this process when revising the Energy and Climate Plan, as well as evaluating and revising other basic targets and KPIs.

Activities and actions within the rectangles in figures 8.6 and 8.7 are part of the same one-year cycle and annual schedule of the Municipal Action and Finance Plan. Scaling and replication measures and interventions (described in figure 8.7) will be performed and occurring continuously over time until the target year of the BCV, indicated high up at the right side of figure 8.6.

The five activities at the bottom of figure 8.6 are fundamental for TK and will provide criteria and anchoring for the BCV work and processes. They may undergo revision over time, but they are considered close to mandatory pillars for the continuous BCV work.

The frameworks and tools described and detailed in earlier sections may and will, in some cases, be used for the activities and measures happening over the long time span when appropriate and relevant. These include, but are not restricted to, BCV framework (see section 3.1), the digital BCV framework + guide (section 5.1.1), the honeycomb model

(figure 7.6), the four pillars of Sustainable Value Creation and Voluntary Local Review (see chapter 7). The frameworks and tools are, however, crucial for work and in securing progress, and receive and evaluate results, within the one-year time span of the Municipal Action and Finance Plan. It is within the annual cycle of the TK HØP that these tools really find their value and use. In addition to this, TK utilises and will utilise other tools, approaches and methodologies in order to obtain a continuous improvement and development towards the BCV 2050.

TK integrates our BCV with the Municipal Action and Finance Plan for several reasons. Important reasons include necessary integration with fundamental plans and strategies. The BCV needs to be integrated with the work in the line organisation, and the necessary connection to the annual budget and longer time span economy and finance plan for the financing of necessary activities and interventions.

In other cities and regions, domestically or in other countries, things and systems may work and be organised differently than in Trondheim. Outside, as TK sees it, a BCV may be anchored and organised wherever appropriate and best for the specific city.



9 Lessons learned, recommendations and reflections

Each city and nation have their distinct challenges, resources and opportunities. Our lessons learned, recommendations and reflections may, or may not, bear value to all. By sharing what we consider important information, beyond what's already presented, we aim to lower the threshold of taking actions towards implementing the SDGs and working towards becoming energy positive.

Start early with dispensations if they are needed:

The +Trondheim BCV is specifically targeting a sustainable energy future. Such a vision focus in Norway claims an, as a minimum, dispensation from national energy legislation (where municipalities have no authority), and on a longer term lasting changes in energy legislation. Experiences from LHC Trondheim show that these are tedious and extremely challenging processes. It took LHC Trondheim, with the efforts from a large number of actors, 4.5 years in order to get a dispensation/accept for necessary adaptations and solutions concerning energy legislation that TK considers necessary in order to be able to move towards the +Trondheim BCV. This is why these activities need to start immediately, at the mere beginning of the work.

Work parallel with innovations and solutions:

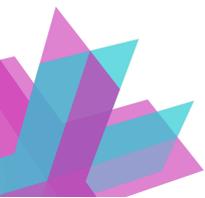
Another important finding is that one cannot wait with developing and testing innovative energy solutions and interventions until a dispensation or exception is granted by national authorities. This of course increases the risk of the whole project and work, since one may be at risk of not getting any dispensation or exempt from national legislation, and much resources and time is lost. However, it must be pinpointed that an early start of both energy interventions and work towards national energy authorities is absolutely necessary. The energy interventions will reinforce the reasoning for being granted dispensation, and eventually the needed change in regulations.

Recognise and harvest the value from solutions as they present themselves:

Both inputs and learnings from solution and intervention development need to walk hand in hand with anchoring in and concrete work and engagement by the municipality management. In the Trondheim case, both the administrative and the political management in the municipality has been very active in the work for regulatory changes and adaptations. In the Trondheim case, also the county/region administration and its administrative and political management have been strongly engaging; which has been a success factor for necessary dispensations, in order to work and move towards the +Trondheim BCV 2050. The solutions provide evidence and incentives to engage.

SDGs elevates the energy work:

In LHC Trondheim the vision is "Plussbyen Trondheim", but it is the SDGs that are the legally binding commitment and the enabler to work on energy specific solutions. If LHC Trondheim were to accentuate becoming energy positive and align plans and steering



documents towards energy exclusively, it's not sufficient, since the barriers and thereby possibilities are completely dependent on national authorities paving the way for the wanted green energy transition. In general terms, the vision to become an energy positive city must be accentuated in the overarching plans and steering documents of a city and the step is shortened significantly if the cities align themselves with the SDGs since becoming energy-positive will tick off several SDGs on the journey.

Review, evaluate and target commitment and alignment to steering documents:

The cities must review their current policy objectives and evaluate them against the cities' performance on KPIs targeting the SDGs or energy, if that is the only target in question. Are the policies, focus and budgets in line with achieving the SDGs/becoming energy positive, or are there discrepancies? This exercise can be a valuable eye-opener. When political commitment is present, SDGs/becoming energy-positive are aligned in steering documents and plans and SDG/energy budgeting is established, the stage is set for the four pillars of SVC, or other methodologies, that pave the way for a better understanding of opportunities.

Map out stakeholder and partners and start collaboration:

Mapping which actors, stakeholders, resources and activities will gain results towards becoming energy positive must be done. The task is formidable, and must be done in collaboration.

Seek knowledge and networks:

Establishing networks, or seeking networks with overlapping thematics is useful so that knowledge and solutions are shared. It is also resource-efficient if it can prevent duplicate work.

Do not let set frames stop the initiative:

For a BCV targeting a massive, green energy transition, as in the LHC Trondheim BCV, dispensations or exemptions from national energy legislation are needed; for instance the National Energy Act has several clauses hampering a green energy transition and thus achievement of the Trondheim BCV. To get dispensations or exemptions is an extremely time consuming process that needs well coordinated work and efforts from a variety of stakeholders, including energy experts and municipal/regional administrative and political management. For a sustainable energy focussed BCV, the work on this issue needs to start very early. In the longer term, lasting changes in national energy legislation is needed; at least in Norway. This is even more resource intensive work that will take years to fulfil.

Reflections

With the current energy situation in Europe and the act of war in Ukraine, the increasing need for stable, predictable and sustainable energy access and sources, should motivate all of Europe to take actions on enabling local energy production and trade through expedient policy work on energy related legislation and regulatory weaknesses. Doing so will not solve all energy related issues, but it will be a substantially contributing factor. The by-product being reduced CO₂ -emissions, sustainable value creation, reduced need for infrastructure



investments and interference, increased level of energy self-sufficiency, job creation, business opportunities and synergies should prompt the necessary paradigm shift within the energy sector. Time will show, but we see positive signals concerning a willingness to change national energy legislations in Norway. EU regulations and directives have been and are already being implemented, and more may come in the coming years, that will address this and contribute to legally seen better frame conditions for a - highly necessary - green energy transition in Europe.



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Annex

Trondheim Municipality Political Approval

Translated political approval from Trondheim Municipality, case PS 0275/20, :

6.3.1 Framework for sustainable social change

Trondheim has, in collaboration with research environments and partners in other countries, systematised sustainable system transformation through a new framework for sustainable societal transformation. The framework was later adopted by the UN Global Program for Smart and Sustainable Cities, U4SSC. In the development of the framework, it was important to make visible how existing actors, activities and resources influence each other, so that these interactions will be as effective and to the point as possible. The purpose of the framework is to speed up social change towards 2030.

The framework describes six main processes:

1. Develop standards and indicators to be used to measure results.
2. Clarify the need to adjust existing policies, planning and budgets.
3. Find relevant external partners.
4. Develop appropriate organisational and management methods.
5. Involve citizens in planning and implementation to be able to prioritise projects that are critical to succeed.
6. Develop quality projects with relevance and context.

For all the planning work within the municipality, it is important to see several of these processes and activities in context so that we are better equipped to achieve the goals we set. Activities located in proximity to each other in the framework must be connected and taken into account in regards to the practical work. The framework will have a central role in developing the future municipal plans. By applying the framework to Trondheim municipality, it shows that there is already a lot in place concerning policies, plans, strategies, activities and resources. In many ways it is a need for adjustments and coordination of political goals and plans, as much as a need for a new political direction.

Connection between tasks and deliverables

In table 10.1 the boxes with grey shading are the ongoing tasks and deliverables yet to come. All the submitted deliverables are linked to the +CityxChange knowledge base.⁸⁰ The table corresponds with figure 2.1 in this deliverable.

⁸⁰ <https://cityxchange.eu/article-categories/deliverables/>



Table A1: BCV task dependencies and interdependencies

Task	Deliverable	Connection
T2.1: Enabling Regulatory Mechanism for delivery of the innovative DPBDs	D2.1 Report on Enabling Regulatory Mechanism to Trial Innovation in Cities	Input; the importance of regulations initiating and incentivise the green energy transition is crucial to reach the overarching goal within D5.7
T3.1: Support Framework for Bold City Vision, Guidelines, and Incentive Scheme	D3.1 Framework for Bold City Vision, Guidelines, and Incentive Schemes	Input; D5.7 has its ancestry from the BCV framework.
T5.1: Creating the Integrated Baseline Model for Energy/Mobility/Socio-Economic Trondheim	D5.2 +Trondheim DST including training manuals/videos	Input; 3D model of PEB including Decision Support Tool used in the work connected to D5.7.
T5.3: Citizen Observatories	D5.8: +Trondheim Citizen observatory	Input and output; results and impacts from engagement and involvement arenas. T5.2 processes utilising T5.3 arenas.
T5.4: Enabling Regulatory Mechanisms	D5.9 Playbook of regulatory recommendations for enabling new energy systems	Input; both dispensations and lasting regulatory/legislative changes.
T5.5: Implementation of an Innovation Playground	D5.10: Trondheim Innovation Lab Solutions Catalogue	Input and output; Innovation Playgrounds and open innovation as mediator and enabler of BCV.
T5.6: Deployment of solutions for Distributed Positive Energy Blocks in Trondheim	D5.11 Trondheim DPEB Demonstration	Input and output; All PEB outcomes are significant; and the work is shaped by BCV strategies
T5.7: Microgrid balancing and optimization	D5.3 Campus Microgrid Model Prototype	Input; outcomes from Campus MicroGrid optimization.
T5.8: Seamless eMobility	D5.13 + Trondheim eMaaS Demonstration	Input; outcomes, implications, and impact from Seamless eMobility.
T5.9: Deployment of the Energy Trading Platform	D5.5 Energy Trading Market Demonstration	Input; outcomes, implications, and impacts from Energy Trading Market.
T5.10: Local Flexibility Market	D5.6 +Trondheim Flexibility Market Deployment Report	Input; outcomes, implications, and impacts from Local Flexibility Market.



T5.11: Sustainable Investments	D5.16 +Trondheim sustainable investment and business concepts and models	Output and input: Inputs to business models and processes to improve BMs; outputs from BMs developed and verified in T5.11.
T7.3: Data Collection and Management	D7.3 Data Collection Management and Analysis Methodology Framework	Input; data, outputs, and impacts from Monitoring and Evaluation.
T8.1: Replication Assessment of +CityxChange solutions	D8.3 Report on replication assessment and profiles for each +CityxChange demonstration project	Output; replication and scaling up in Trondheim.
T8.3: Market and stakeholder analysis to understand exploitation potential of +CityxChange solutions	D8.1 Report on market and Stakeholder analysis	Input; results from market and stakeholder analyses etc.

WP Connections of BCV work to main objectives or results

Table A2: WP connections of BCV work to main objectives or results from other WPs

WP	Main objective	Connection to D5.7
1	Integrated planning and design	Input; the data and decision support tools from WP1 give insight and enable knowledge based approaches. Interactions and visualisations tools enable a citizen-centred approach.
2	The Common Energy Market	Input; a toolbox of physical infrastructure, technologies and regulations are essential for developing and testing microgrids, DPEB, e-mobility and more.
3	CommunityxChange	Input; WP3 gave a framework for innovation playgrounds, creation of the BCV framework and more, which was crucial for this BCV.
4	+Limerick	Input and output; the two LHCs share, learn and harvest knowledge from each other, adding and refining the knowledge pool.
5	+Trondheim	Input and output; the work within LHC Trondheim is interacting and mutually beneficial with input and output, considering it is a city journey where lessons learned are fed back to the process.
6	+Followers	Input; primarily at this time, but other results and lessons learned from/with FC can feed back to the overall knowledge pool.
7	Monitoring and Evaluation	Input in regard to refine solutions based on evaluations, and output in the sense that D5.7 is a subject of scrutiny in WP7.



8	Scaling-up, Replication and Exploitation	Output; results, methodology and lessons learned will provide knowledge, and can be adapted "as is" or used as base line or inspiration.
9	Inter-Project Collaboration and Clustering	Output; interactions and collaborations with other EU H2020 smart cities projects. WP9 will give input to the continuance and refinement of the city journey.
10	Dissemination and Communication	Output through communication and dissemination of results.
11	Administrative and Financial Project Management	-



SDG Taxonomy

A TAXONOMY FOR INDICATORS RELATED TO THE SUSTAINABLE DEVELOPMENT GOALS

The taxonomy was developed with the purpose of sorting, evaluating and comparing different SDG indicators and indicator sets related to the Sustainable Development Goals (SDGs).

Strategic priority
Can be formulated dynamically according to the user needs, e.g.:

Development sector
A 14-category structure (Digitaliseringsdirektoratet, Norway) which is a common glossary for categorising and describing public services and resources.

Evaluation
The 5-category typology originates from the well-known input-output model in econometrics.

Distribution
Relevant when the same indicator is needed more than once, either over time, across geographical areas or subpopulations.

QUALITY
Based on version 2.0 of "Quality Assurance Framework of the European Statistical System (ESS)".

Class 1
Standard quality framework of ESS.

Class 2
If the indicator neither belongs to class 1 nor class 3.

Class 3
If the indicator is unavailable, because one or several of the following features are missing.

GOAL

The Sustainable Development Goals (SDGs)
consists of 17 goals and 169 targets

Triple bottom line (TBL)
Triple bottom line accounting expands the traditional reporting framework to take into account social and environmental performance in addition to financial performance.



Taxonomy from:

<https://www.ssb.no/en/natur-og-miljo/artikler-og-publikasjoner/a-taxonomy-for-indicators-related-to-the-sustainable-development-goals>

Recommendations for regulatory framework

Changes in energy regulatory framework is required

The purpose of this inquiry is to address needs for changes to and adaptations of the framework that regulates implementations and usage of local renewable energy resources, including trade of flexibility among consumers. We want to contribute with proposals for how a flexible future-proof regulation will provide incentives for electrification and decarbonization in line with climate goals. The target group for this inquiry is governments and politicians at the national level.

As a result of the ongoing energy transitions in EU member states, it is obvious that this will stimulate the development and implementation of new technologies, new players, new energy systems and an overall change from centralised to more local focused energy systems. This synergy between energy transition and value creation is extremely important and will lead to new commercial opportunities for member states. In addition it will stimulate increased use of renewables and development of energy communities. However, in order to contribute to this development, there is a significant need for a future-proof and flexible regulatory framework in the energy sector.

The national energy act⁸¹ regulates the traditional generation, transport and the customer side of electricity. This framework, with its regulations and precepts, have an urgent need to be revised with the purpose to favour the transition towards an electric, low-emission society. Experiences from ongoing pilot- and R&D projects, with development of new technologies and large scale demonstrations, documents that regulatory changes are required. If such changes are legislated, our opinion is that the probability to reach climate goals and value creation, such as new jobs, will increase significantly.

Within the new energy system in a post transition phase, the power generation from renewables will be dominating on a local scale and close to the consumer. This will cause changed use of the power grid, and the local supply of energy will more commonly be managed by smart cities and energy communities (EC). A critical factor of success in this realisation is a regulatory framework providing future oriented and predictable incentives. The key must be that the regulations give the grid a role as a catalyst and enabler for the shift. If the grid companies operate within a regulatory framework with this focus, it will as an example be normalised to apply and utilise flexibility with the purpose to reduce grid operation cost. Secondly it will strengthen incentives to electrification and implementation of local energy resources.

In the development of cities – and city districts – it is all over Europe with an emphasis on applying future-proof and innovative energy supply solutions. Through close cooperation between buildings and local energy resources (including batteries) this local system will remedy peak demand periods and contribute with feed in of local renewable power.

⁸¹ The National Energy Act: <https://lovdata.no/dokument/NL/lov/1990-06-29-50>



Cooperation in innovation projects between the public sector, private businesses and universities is given high priority in the EU. This represents a strong driving force for the transition phase. Changes of the regulatory framework must keep this in mind to ensure that such triangular cooperation may deliver the required technologies, knowledge and implementation of the transitions. Secondly, implementations will result in successful commercialization and new jobs.

Coordinated use of batteries, thermal storages, and smart planning of power generation will help to reduce grid constraints and investments. However to realise the benefits of this flexibility and sector coupling, it is required a suitable regulatory framework and a market design that supports local flexibility. Given these prerequisites and incentives, cities and energy communities will develop in line with the transition goals.

A global observation is that electrification, digitalization and growth of locally connected energy resources develop fast. Innovation is in focus and new commercial entrants and new business models are registered daily. Such a positive industrial development is experienced to face regulatory frameworks as barriers for commercialisation, implementation and scaling. It is obvious that with a more flexible regulatory framework, the development of efficient and future oriented local energy systems will evolve faster. The result will be cheaper energy and an increased share of renewables. However, the time window for member states to achieve positions as global leaders in energy transition generated technologies, solutions and knowledge is limited. This reality underlines the need for fast and constructive renewing of the regulatory framework which today is experienced as barriers.

Existing regulations and rules makes it difficult to carry out demonstration and pilot projects within the flexibility area, local power generation, and storage. Such projects must apply for dispensations – processes which are experienced as demanding and time-consuming. This is critical for our state in its plan to increase the participation in EU programs which support innovation projects in the energy transition. This is an additional and important argument to why the regulatory framework must be updated and made more flexible.

The energy transition is observed in many areas to challenge existing rules and practices. This situation creates demanding processes for all involved parties (public, universities, businesses) and it is essential that clear and future-proof political guiding is established. Summarised, the political guiding must deliver a future-proof and agile regulation that favors:

- Incentives and framework that motivates to invest in local renewables and flexibility.
- Cities and communities with strong incentives to realise the transition.
- Coordinated and energy transition perspective in the administration of national laws such as: Energy act, planning and building law, grid regulation, sector coupling, and electricity security.
- Local power generation with efficient sharing principles within the community, neighborhood, or local market.



- Cost based use of local grid with energy transition friendly tax regimes.

The reality of 2021 is that the public sector, universities and businesses involved in the energy transition, state that they are prohibited to choose preferred solutions and technologies due to legal issues at governmental level. At the same time it is a significant mobilization within the EU to include a wide range of realized and planned stimuli including updated regulations. For us as a nation it is extremely important that we renew our energy regulatory framework in line with the EU – and not end up with delays that reduce our innovative power and prohibit an efficient energy transition in our country.

The demand for new, smart and local renewable energy is obvious and deserves that all possible opportunities for innovation, demonstrations, implementations and operations are supported. More precisely, it is our recommendation that the regulatory framework facilitates the following:

1. Distribution and community grid operators given the authority to establish solutions and tax regimes based on local conditions.
2. All local energy resources are easily and efficiently connected with conditions that favor the green transition.
3. Energy blocks, districts and Energy Communities with incentives for efficient and reasonable energy exchange and energy sharing – including the development of solutions making it efficient to realise flexibility.
4. Energy blocks, districts and Energy Communities are allowed to optimize their internal interactions with common batteries or capacity reducing actions to reduce cost inclusive taxes.
5. Incentives to develop and set up local marketplaces and development of new energy services/products and support for sector coupling (electricity, heat, cooling).
6. Experiencing the regulatory framework as predictable and agile.

An updated regulatory framework, in line with the recommendations discussed and proposed in this inquiry, will accelerate the green energy transition and will increase our possibilities of having success. The results will also become more positive for our businesses, and will add value to our society as a whole.

The intention with this inquiry is, through its proposals, to contribute to the shift and additionally to address what is required of efforts – including having a future-proof local grid with a significant share of its load coming from local renewable resources.



Municipal initiatives targeting regulations and sector coupling

Table A3: LHC Trondheim led initiatives targeting regulations

Municipal initiatives targeting regulations and sector coupling	
What	Main content
Juni 2020: Presentation for local politicians in the committee for environment and business	- Presentation of +CxC and the need for changing regulations
Juni 2020: Presentation in EU Sustainable Energy Week	- Addressing the need to change the regulations
Oktober 2020: Launching in EUs Smart Cities Marketplace Initiative	- Launched initiative regulatory framework
September, 2021: Debated in Strategic collaboration forum in Trondheim (CEO level political and administrative)	- Debating regulatory issues and how to address this locally, regional and nationally.
September, 2021: A joint local and national policy proposal - Connected to D5.9 ⁸² <i>The proposal was granted political support.</i>	- informs local and regional authorities on existing regulations and their implications. - addresses the need for a national initiative signed and supported by the politicians. - asks for permission to move forward and reach out to other cities to mobilise for a new regulation scheme.
Oktober, 2021: A private-public-political signed endorsement ⁸³ - Connected D5.9 <i>The proposal was sent to minister of state for petroleum and energy; the national parliament committee on energy and the environment; the government appointed board committee (Strømnettutvalget⁸⁴)</i> <i>The national collaboration for Chambers of Commerce, representing 6 city regions, added a consenting document</i>	- informs national authorities, explaining the legal and practical issues and consequences with today's regulations - presents arguments to foster a regulation in pace with the technological and societal development that has taken place since the legislation and regulations were made.
November, 2021: Pitching for Strømnettutvalget during open day event	- Targeting the need for regulation changes TK, Skanska and Entra, NTNU
November 2021, Nærøysund: Participating at Business conference	- Presenting results and possibilities within +CxC, addressing regulation issues
Juni 2022: Presentation for the Energy Commission <i>Invited by the Energy Commission</i>	- Targeting issues with energy regulations and the National Planning and Building Act in relation to energy
Pending:	- Topic in a meeting for the biggest cities in

⁸² D5.9: Playbook of regulatory recommendations for enabling new energy systems: <https://cityxchange.eu/knowledge-base/d5-9-playbook-of-regulatory-recommendations-for-enabling-new-energy-systems/>

⁸³ Translated version of the endorsement can be found in the Annex.

⁸⁴ Strømnettutvalget: <https://stromnettutvalget.no/>

KS⁸⁵ - storby meeting	Norway
In addition the topic has been raised by Trondheim Municipality and partners in several meetings, webinars, seminars, in Newspapers, in energy journals, in technical journals, University magasin and local broadcasting news and more.	
Others: partners and collaborators address this in their networks and different local, regional and national platforms.	

⁸⁵ The Norwegian Association of Local and Regional Authorities

