

SPARCS

D5.15 Replication and Upscaling Plan Espoo

30/09/2024

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 864242
Topic: LC-SC3-SCC-1-2018-2019-2020: Smart Cities and Communities
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Deliverable administration

No & name	D5.15 Replication & Upscaling Plan Espoo		
Status	Released	Due	M60
		Date	2024-09-30
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Description of the related task and the deliverable. Extract from DoA	<p>T5.5 Project Upscaling & Replication in Light City (BABLE) M24 – M60</p> <p>The aim of this task is twofold: first upscaling of the pilot solutions within the LHCs and secondly identifying opportunities for replication in LHCs. The task will build on the business models mapped in WP7 and individual strategies for scaling-up and replicating the defined interventions in other parts of the city or in a larger scope.</p> <p>As is done with the FC in Task5.4, the LHCs will be supported through identifying suitable Solutions and detailed planning of a Solution (per LHC) up until securing investment (see subtask5.4.2). Activities in this task will also draw on the knowledge exchange with the SCC1community (WP6), in order to provide the basis to identify opportunities for replication across the lighthouse projects.</p> <p>Further, it will contain detailed plans for replicating one intervention within the city, including list of functionality suited to local needs, technologies to be implemented, costs of planned implementation measures, suitable funding and business models, key timescales, lead partners, risks & risk mitigation measures, Local governance & coordination structure. (R/PU, M60)</p>		
Participants	Espoo, BABLE		
Comments			
V	Date	Authors	Description
0.1	12/7/2024	WP Leader	Deliverable version 1 for review by LPZ and BABLE
0.2	13/08/2024	LPZ, BABLE	Review of the deliverable
0.3	05/09/2024	ESP	Deliverable version 2
0.4	18/09/2024	WP leader	Deliverable checked by WP leader and released to the Coordinator and the Quality Manager for quality check and subsequent submission to the EC.
1	30/09/ 2024	VTT	Coordinator submits the deliverable to the EC

Dissemination level

PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

About SPARCS

Sustainable energy Positive & zero cARbon Communities demonstrates and validates technically and socioeconomically viable and replicable, innovative solutions for rolling out smart, integrated positive energy systems for the transition to a citizen centred zero carbon & resource efficient economy. SPARCS facilitates the participation of buildings to the energy market enabling new services and a virtual power plant concept, creating VirtualPositiveEnergy communities as energy democratic playground (positive energy districts can exchange energy with energy entities located outside the district). Seven cities will demonstrate 100+ actions turning buildings, blocks, and districts into energy prosumers. Impacts span economic growth, improved quality of life, and environmental benefits towards the EC policy framework for climate and energy, the SET plan and UN Sustainable Development goals. SPARCS co-creation brings together citizens, companies, research organizations, city planning and decision making entities, transforming cities to carbon-free inclusive communities. Lighthouse cities Espoo (FI) and Leipzig (DE) implement large demonstrations. Fellow cities Reykjavik (IS), Maia (PT), Lviv (UA), Kifissia (EL) and Kladno (CZ) prepare replication with hands-on feasibility studies. SPARCS identifies bankable actions to accelerate market uptake, pioneers innovative, exploitable governance and business models boosting the transformation processes, joint procurement procedures and citizen engaging mechanisms in an overarching city planning instrument toward the bold City Vision 2050. SPARCS engages 30 partners from 8 EU Member States (FI, DE, PT, CY, EL, BE, CZ, IT) and 2 non-EU countries (UA, IS), representing key stakeholders within the value chain of urban challenges and smart, sustainable cities bringing together three distinct but also overlapping knowledge areas: (i) City Energy Systems, (ii) ICT and Interoperability, (iii) Business Innovation and Market Knowledge.

Partners





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EXECUTIVE SUMMARY

The City of Espoo has 5 city centres instead of the traditional one. This provides the city with wider opportunities for sustainable city development. Espoo is also one of the fastest-growing cities in Finland, and this is pushing the city and its stakeholders to work harder for sustainable solutions in energy and mobility. As we have learnt in SPARCS there is not one easy solution to this but several, preferably interoperable: developing the electricity grid itself is one part of the solution but there are many others, which all should be assessed to create a feasible combination of solutions such as electricity storages, demand response, smart energy management tools, to best address the challenge.

SPARCS has had a significant impact on Espoo: during the five years of the project sustainable energy and mobility solutions have been developed and tested at three demo sites, but other supporting projects too. The SPARCS demo sites were chosen carefully: they present different parts of the city and are in different phases of city development, thus giving us valuable information not just individually but through assessment and comparison to each other.

Looking back, SPARCS has made us learn not just about the latest technologies but also how to assess and implement them, and how important it is that the city with its stakeholders and citizens participate with an active role when new solutions are being developed. Through SPARCS the city has been able to recognise and develop its role, especially regarding energy in city planning. The City of Espoo does not own an energy company or utility, although energy plays an important role in city planning and in the city's climate work. Energy dialogue with energy companies is significant for a smooth city development and reaching climate targets, energy and mobility being currently the biggest emission entities.

In climate work, Espoo has developed an assessment framework with three lenses. The first lens is a well-known and understood **carbon footprint** that needs no further explanation. The second one is **carbon handprint**: being the home city for numerous innovative companies, universities and research institutes, there are many innovations in Espoo that can be exported to other cities, both in Finland and abroad to reduce emissions outside Espoo's borders. The third lens, **carbon heartprint** is unique for Espoo, we invented this approach ourselves to describe the co-creation and learning, change of attitudes, and increasing capabilities, which is the power of making the green transition possible.

In Espoo, we have vital innovation ecosystem with companies and research and educational institutes, whose role in creating new solutions to combat climate change is significant. Espoo is the largest technology and innovation hub in North Europe with a very active start-up community. Our residents are well-educated, over 50 % of Espoo residents hold university degrees. Our city is versatile, from the wilderness of the National Park of Nuuksio in the north to the densely built metro corridor in the south surrounded by green areas and detached house areas. Espoo has many opportunities to be forerunner as sustainable city, to become carbon neutral by 2030, to continue developing smart and sustainable urban solutions also in the future with stakeholders, and to continuously learn from each other and develop collaboration and also organisational skills and capabilities to support the sustainable future.

1. INTRODUCTION

The SPARCS project began in October 2019, with 2 lighthouse cities leading the development work with 5 follower cities concentrating on replicating, learning from solutions developed in Lighthouse cities. For Lighthouse cities Espoo and Leipzig the project structure for five years was set to first three years of developing and piloting, and then 2 years of monitoring. Right from the beginning of the project dissemination, replication and upscaling of SPARCS work has been in focus. We learned that replication is not just about technology, but also about acknowledging the current local circumstances, capabilities, attitudes and opportunities, as well as obstacles, risks and weaknesses. Sharing and learning from each other, coming from different point of views, has proven to be valuable for all partners.

1.1 Purpose and target group

The SPARCS Lighthouse Cities are committed to upscale one chosen solution. To ensure effective replication & upscaling, a structured project development process consisting of 6 phases has been conceptualised. The phases are project selection, preliminary assessment, detailed assessment & planning, securing funding budget, procurement & implementation, and monitoring & evaluation. Each phase is broken down into steps, with the goal, tasks, outputs, and best practices for each step outlined. This process has guided and supported the Lighthouse Cities to work on a project to be upscaled and design their overall replication strategy.

The objectives of this Replication & Upscaling Report are:

1. Provide a step-by-step overview of the process taken in the replication & upscaling of the chosen solution.
2. Outline the list of functionalities suited to local needs, technologies implemented, costs of planned implementation measures, business models, funding mechanisms, risks, and risk mitigation measures.
3. Demonstrate the contributions of partners both within and outside the SPARCS consortium and provide information on the local governance and coordination structure.
4. Inform and facilitate the replication & upscaling of the chosen solution beyond the SPARCS project.
5. Discuss briefly how the city sees the role of business models that support replication and upscaling.

1.2 Relations to other activities

In SPARCS the demo districts in Lighthouse City Espoo are chosen to present different stages of district development: The Sello block in Leppävaara being a ready-built entity, the Lippulaiva block being built during SPARCS and the Kera district being a developing district as a demo of city development. This 3-stage view has provided us with a framework for how to collect crucial information for sustainable city development and decision-making: what should be done and when, and who should be engaged, resulting, e.g. in the co-creation model and toolbox created during SPARCS.

As Espoo as a city has 4-year council terms, SPARCS spans over two council terms with the City Strategy Espoo Story written for both terms. The Espoo Story, the related cross-administrative development programmes and the goals for the council term are always updated at the start of a new council term. The current council term runs from 2021 to 2025.

Long and impactful projects like SPARCS are not just meant to bring new technology to the city but to enhance processes and thinking, increase knowledge, change attitudes and working/collaboration methods, increase courage to participate in development work and implement new technology. A twofold effect can be seen as the strategy guides the city to participate in certain projects with certain topics of the city's interest.

Dialogue begins when the strategy initiates projects which then can feed ideas and develop the thinking and mindsets so that the city can work more efficiently, utilize more sustainable solutions, promote sustainable lifestyles and solutions with success stories of the projects etc. SPARCS had its effect on what was emphasised in current Espoo story e.g., regarding local renewable energy production.

In addition to the ambitious target of reaching carbon neutrality by 2030, Espoo as a forerunner city already has the target to achieve **SDGs** already by 2025. Both themes are strong in Espoo Story, too. The SDGs have been linked to SPARCS activities of WP3 with two workshops that utilized SDG a sense-making tool developed for the six largest cities in Finland. The SDGs provide both support and valuable structuring for understanding and communicating not only the work done but also the replication and upscaling potential.

Sustainable Espoo Programme has been running now for its third council term, beginning first with the name Sustainable Development Program in 2013. Energy has been a key theme of sustainability even though the city does not own any energy utilities but those integrated into city-owned buildings. As the current council term is coming to an end next year the outlining for the new council term is starting soon.

The carbon neutrality target was established already in 2017 and as Espoo has been chosen for European Commission's 100 climate neutral and smart cities mission, leading to the approved Climate City Contract in March 2024, Espoo is continuing as a forerunner of climate cities in Europe. Applying first to the mission and then preparing the CCC has been significant processes considering co-learning and collaboration both within the city and with partner organizations. In Espoo, sustainability work has always been about partnerships and collaboration with multiple stakeholders through development projects. Climate work is being built on this firm ground of collaboration, and SPARCS is one way to communicate, disseminate and assess the activities made in the project.

Also in SPARCS project connections to this replication and upscaling have been recognised:

WP1: Work towards Espoo City Vision 2050 is one way to communicate and support the upscaling and communication of SPARCS solutions, as the vision provides a picture of Espoo being developing and growing fast and the urgent need for new solutions for not just energy and mobility but more widely to sustainable city

development. The final version of City vision will be published in deliverable D1.12 by end of September 2024 in SPARCS website¹.

In WP2 most significant learnings come from how to create suitable impact assessment framework and how to utilize it in leading the project from planning to execution and monitoring.

In WP3 T3.9 Replication and exploitation preparation has been actualized for example in in demo-specific replication workshops both for Lippulaiva Espoonlahti and Sello Leppävaara demo districts with Espoo SPARCS partners. The results of the workshop are reported in D3.7, to be published at SPARCS web site¹, submitted in September 2024.

WP6 and WP7 provided us with aspects to collaboration and business model development that can play significant role in upscaling and replication.

WP8 reminded us about importance of communications. It is not enough that you do great things, you have to be able to communicate, declare, sometimes even louder, what you have achieved and what others could learn from it. This becomes a lot to Finnish mentality: quiet and humble we are not so keen to advertise our achievements, although we should.

WP9 project coordination team has continuously supported us in proceeding on time with project activities, providing us valuable insight also to replication and upscaling, starting from clear definitions of the key words: replication, upscaling and exploitation.

WP10 (Ethics) has taught us how important in engagement activities, especially when concerning minors, the proper working methods, permissions and collaboration with different stakeholders is.

1.3 Local Governance & Coordination Structure

Currently, there are 7 persons working on the project, located in the Mayor's Office, Strategy and Development unit, the Centre of Excellence for Sustainable Development, where the team of Climate, Energy and SDGs is directly involved. Project manager Jani Tartia was recently leading WP3 (until 31 May, 2024) whereas Development Manager Elina Wanne has been responsible for this deliverable and taking the project manager role for WP3 and Espoo for the remaining months of the project.

The Project Office supports project work in many ways providing tools, education and support to fulfil the requirements both by European Commission and the City of Espoo. We have a special tool for project portfolio management which is there not just for projects but also for city leadership. The project office also has developed guidelines for international projects, where SPARCS has been an example case, and Espoo SPARCS team knowledge has been utilised.

During SPARCS sustainable development work in Espoo was organized by the Centre of Excellence for Sustainable Development with 3 teams:

- Climate, energy and SDGs
- Circular economy and sustainable urban development
- Sustainable Transportation (Mobility)

¹ <https://sparcs.info/en/deliverables/>

SPARCS team has been acting as sustainable energy team when suitable, although the project itself covers also other themes than just energy.

The fruitful collaboration between 3 teams on sustainability but also with other units of the city organisation, especially in Urban environment's City planning centre and Premises department has supported the work significantly. SPARCS has been a great tool to deepen collaboration and to get to know each other better. Buddy class concept planning and permitting was done in collaboration with growth and learning sector.

The Espoo consortium in SPARCS consists of seven partners who plan, execute, research, communicate and supporting the goals of the projects and seven associated partners who are connected to project work providing information and/or support for the project, but not receiving funding or having obligations for the project.

Finnish partners working in Espoo WP3 are Adven, Citycon, KONE, Plug-it Finland, Siemens, RIL and project coordinator VTT. Associated partners are Fortum, Kiinteistö Oy Kauppakeskus Sello (owner of Sello shopping centre), Helsinki Regional Transport Authority HSL, Helsinki Metropolitan Smart and Clean Foundation (temporary, ended June 2021), Helsinki Uusimaa Regional Council and Helsinki Region Environmental Services Authority HSY. In addition to Finnish partners also BABLE and CiviESCo has been partners in WP3.

All WP3 partners were invited to participate in the process and as we works through use cases developed in SPARCS, the use case owners had a special role providing the basic information for workshop to upscale pilot solutions. BABLE representatives also visited WP3 monthly meetings several times to inform and update about the progress of the process.

1.4 Replication & Upscaling Process

To support LHCs in their upscaling process and the FCs with their replication process, four steps were undertaken before by BABLE. First, a preliminary desktop research was carried out to gain a better understanding of the SPARCS project and how it could best support the cities, followed by a virtual workshop with city representatives from the 7 cities to get their perspective on what the project development process of public projects looked like to them. Individual interviews with replication managers from other SCC projects were then held to learn from their experience in managing the LHCs and FCs for their respective projects, and then finally, following the analysis of all the inputs and further desktop research, the project development framework was formed. For the SPARCS project, some steps were skipped depending on the city's status and its position in the process.

The process developed for the replication & upscaling phase was also based on the GrowSmarter project, the IVL Swedish Environmental Research Institute; given its work with the City of Stockholm in developing an Excel-based standard process/toolkit for scaling up pilot projects in Swedish cities and its approach that guides cities from identification of scale-up opportunities to full implementation, and many other Horizon 2020 SCC projects as well. Before the commencement of the steps, a responsible person with time, mandate, and the means to get those with decision-making power to kick-start scale-up was appointed to take an active role in leading and driving the upscaling process.

Each LHC was supported with a guided process to upscale pilot solutions. The process consisted of the following stages:

1. Project selection: All the cases implemented during SPARCS were analysed to choose one that will serve as *lighthouse project* to continue with the legacy of SPARCS during and after the end of the project.
2. Preliminary Assessment: At this stage, LHCs were provided with guidance to assess the potential for upscaling of the chosen solution, evaluate the cost and benefits and develop an action plan for implementation.
3. Action Plan Development: In this stage, the scope of the project along with the business model was finalized. Depending on the outcome of earlier stages.
4. Securing Investment: A part of the budget provided to LHCs was leveraged to attract various private and public sector investments. The investment was used to secure first loss and thus empower the city to be part of a larger public-private investment.

The project idea to upscale for the LHC of Espoo was chosen to be City 3D-model and Co-creation model, these two elements to be the back bone of new project proposal. The two chosen themes would be easily connected to partners and technological solutions, while the city's interest to develop digital tools and citizen engagement would be served.

The Demonstration at City Espoo, both the work of the city and its local consortium, aimed at developing solutions and services for future positive energy blocks (PEB) and districts (PED). Meanwhile, this work was expected to meet the development goals of sustainable Espoo program², city strategy Espoo story³, and support the achievement of two main sustainability targets of the city: carbon neutrality by 2030 and the UN SDGs by 2025. Replication and upscaling opportunities have been the driver for the actions: how our city could become more sustainable in wider sense than just by implementing SPARCS work.

To ensure effective replication & upscaling based on the Smart Energy Solutions agreed upon in the Implementation Plan, each LHC was supported in different activities to replicate and upscale one project by the BABLE Team primarily but also in consultation with other project partners Adven, Citycon, KONE, Plug-it Finland, Siemens, RIL and project coordinator VTT. The diagram in Figure 1 shows the timeline and described phases for the process:

² <https://www.espoo.fi/en/city-and-decision-making/espoo-story/sustainable-espoo-development-programme#goals-of-the-sustainable-espoo-development-programme-36000>

³ <https://www.espoo.fi/en/city-espoo/espoo-story>

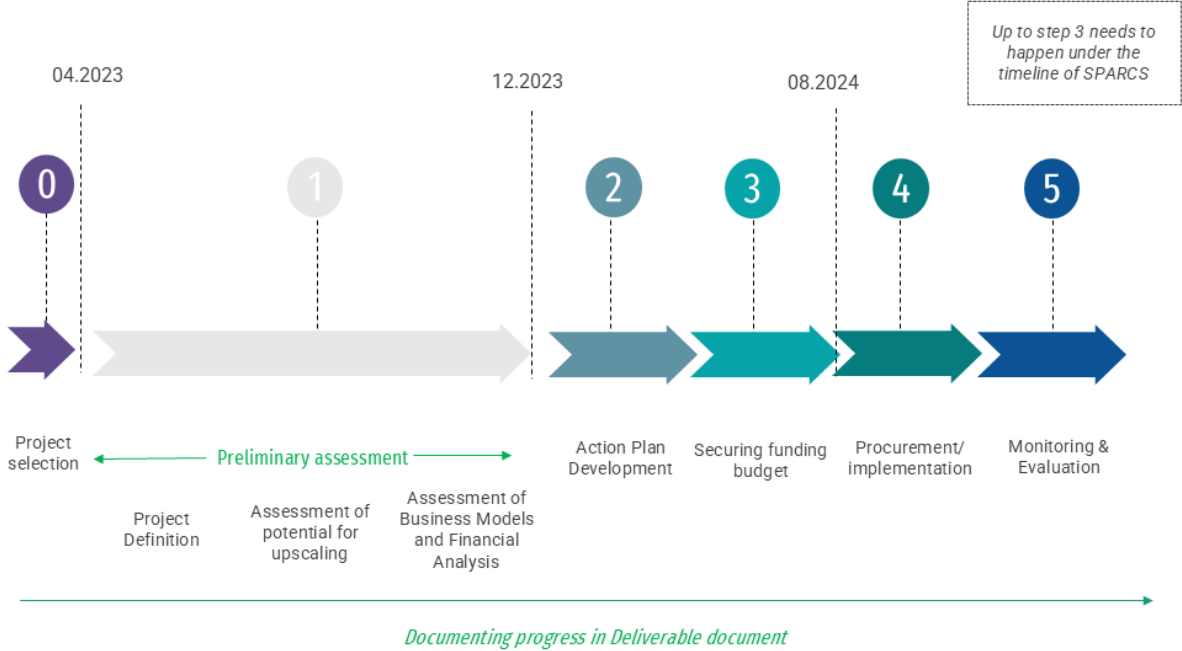


Figure 1. Timeline and phases of process to upscale pilot solutions.

2. “CO-CREATION AND 3D TOOLS SUPPORTING CITIZEN ENGAGEMENT AND SUSTAINABLE URBAN DEVELOPMENT”

2.1 Upscaling methodology: from idea to implementable project

All the interventions implemented during SPARCS were analysed to choose one that serves as a lighthouse project to continue with the legacy of SPARCS during and after the end of the project. This phase included the following activities presented in 2.1.1 – 2.1.3.

2.1.1 Evaluating project ideas

This activity was aimed at analysing and identifying all the project ideas that could be implemented, this included: (1) all interventions were listed and reviewed, (2) further project ideas, already created by the city, were analysed, (3) an initial analysis of the replication potential was done - measured by the alignment with city strategies and the impact the project idea could have if replicated in the city, and (4) Espoo’s role was defined. The activity was facilitated by BABLE and completed by Espoo and its local consortium. Workshop work documents are presented in Figures 2-4.

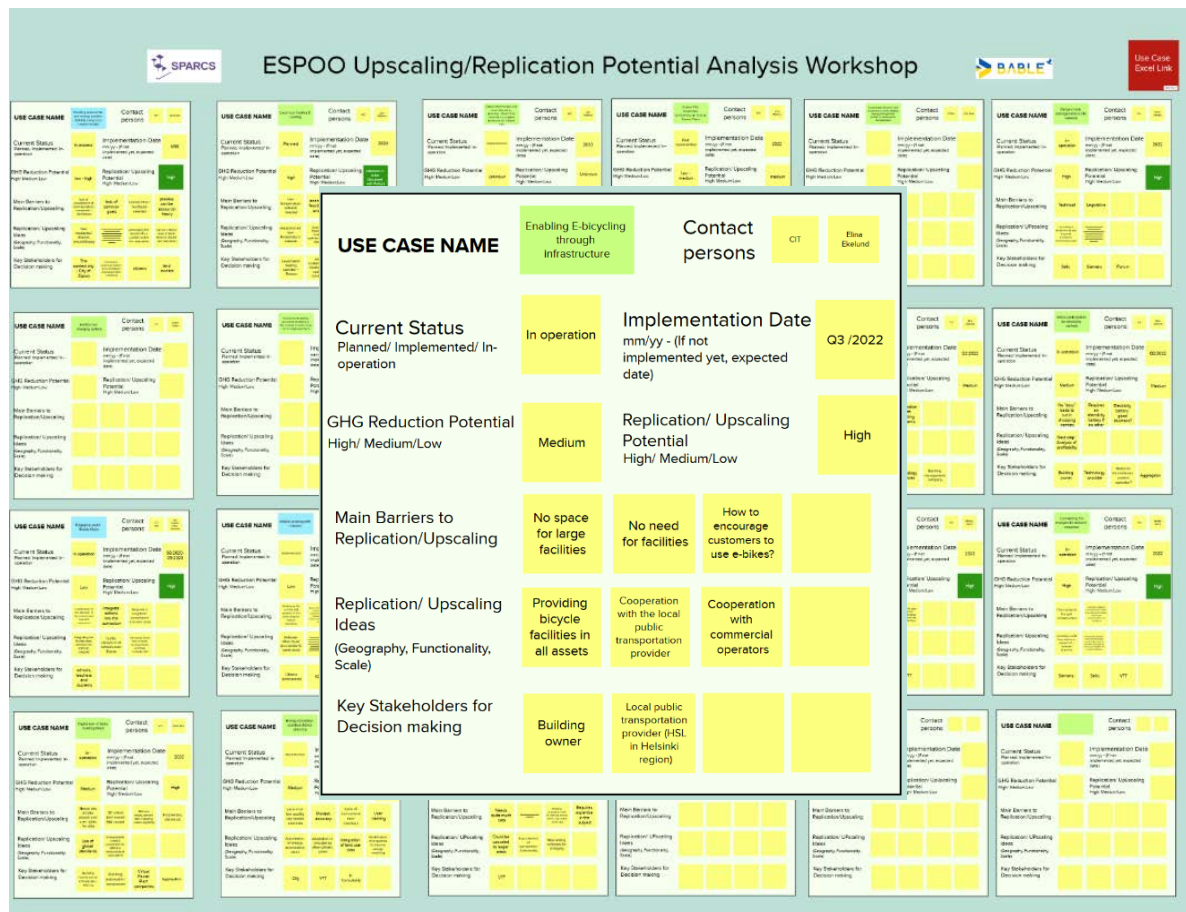


Figure 2 - Use Case Evaluation Sheets with evaluation sheet example. Each sheet was completed by each responsible partner to evaluate each use case thoroughly.

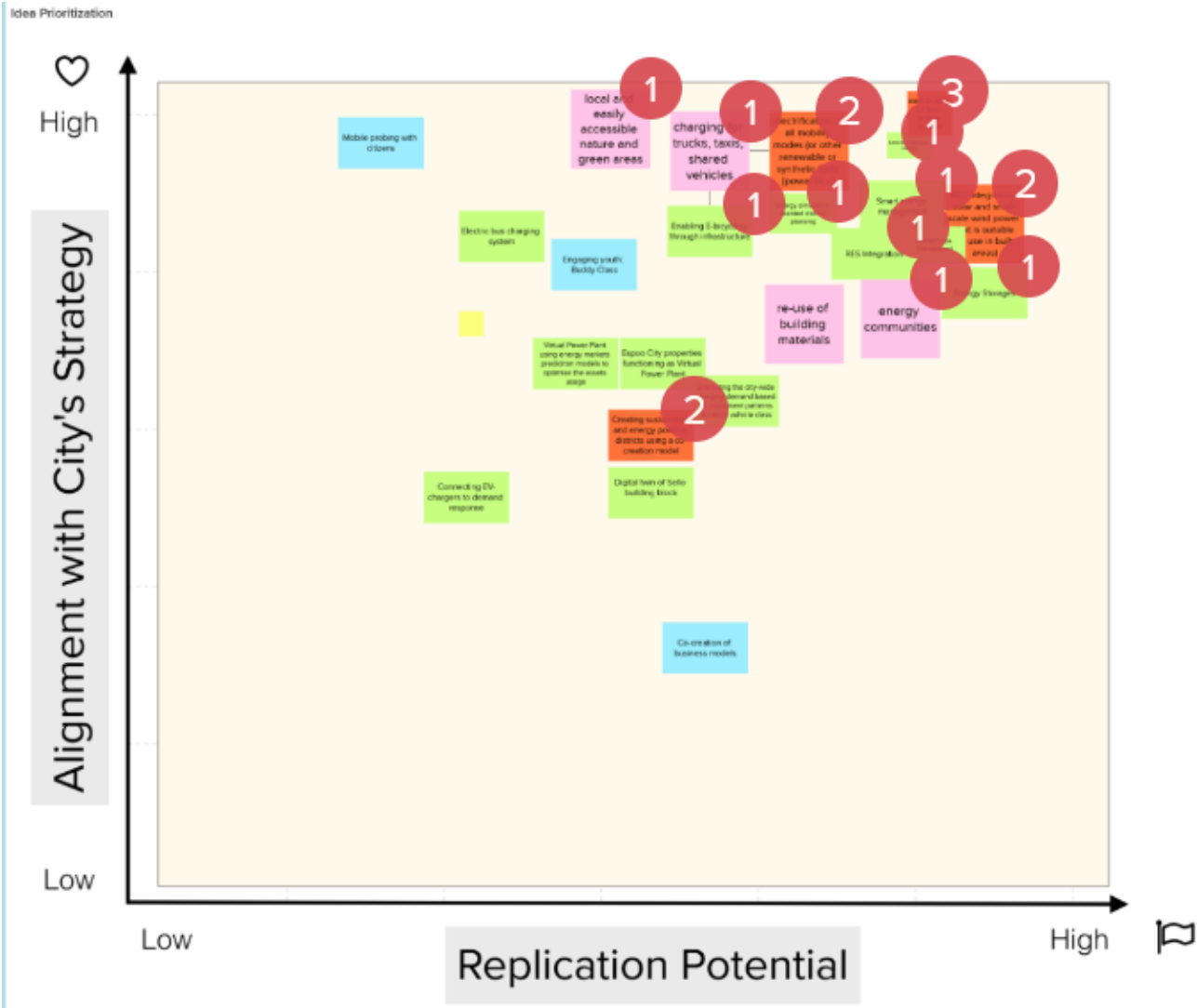


Figure 3 - Joint evaluation of priorities based on alignment with local strategies and replication potential

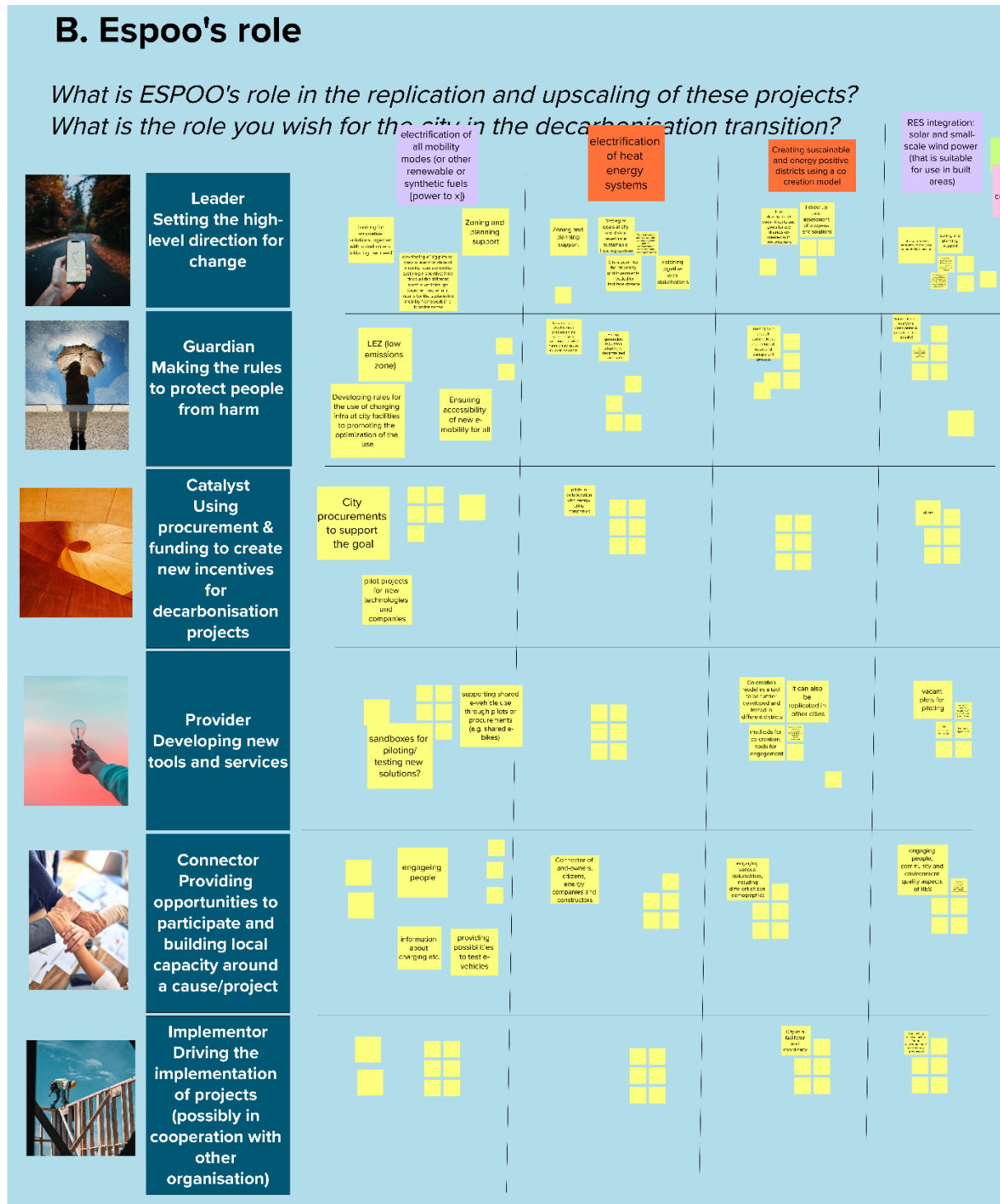


Figure 4 - Assessing Espoo's role in replication and upscaling.

2.1.2 Deep diving into two core project ideas

After the preliminary assessment and prioritisation, a second workshop was organised. The ideation process was focused on answering specific questions regarding the two selected projects such as the place where to replicate, the technology or system to use, the stakeholders to involve, the type of upscaling, the options of funding or financing considered, and finally but not least, the potential impact of the project.

The goal was to obtain relevant information on the projects and discuss with the project partners whether and how they could contribute to realise them.

The workshop structure provided platform for SPARCS colleagues for deeper discussions, presenting the work done in SPARCS to colleagues and having them co-create the potential new project ideas, utilising widely their expertise e.g. in other sustainability projects. This served as an intentional opportunity to discuss with the local project partners future joint projects, that could build on the SPARCS experience. More on the other projects and Espoo general replication process can be found in Deliverable 3.7 Replicating the smart city lighthouse learnings in Espoo: technical, social and economic solutions with validated business plans.

2.1.3 Regular coordination and alignment

Without being a linear process, the different workshops supported the from the City of Espoo, to better understand the role of the city in the upscaling process and where most potential and impact holds. These concrete activities were complemented by monthly meetings between the core team from the City of Espoo and BABLE, where different topics were addressed: strategic elements in the agenda of the city, discussions with strategic partners, coordination with other departments, etc.

The meetings serve to provide the City of Espoo's team with guidance, methodologies, and advice on how to address critical aspects related to the projects and help navigate the complexities that a pilot project to scale implies. A series of guiding questions were utilised to guide the discussions and the project maturation process in all its phases, from its conception to securing its budget.

2.1 Preliminary Assessment

2.1.4 Solution impact assessment / Project definition

In Espoo, most of the sustainable development-related work is done in collaboration with multiple stakeholders, including citizens. Funding for this work is gathered from various funding sources including both national and European instruments, while a very small share comes from the city itself. When defining the projects, the following aspects are thought of first:

- evaluating how the project connects and supports city strategy
- Thinking of project potential for creating new and useful development, replication potential for other cities is the approach truly unique
- investigating how it could develop the city's internal collaboration and capabilities
- recognising right from the beginning the partners and stakeholders who should be involved, and how many of them are new to us

In recent years, we have concluded that systemic change is the approach we choose in Espoo when developing sustainability and climate neutrality in the city. We believe that technological innovation cannot succeed unless systemic thinking is utilized. In addition to new technology, implement new ways to collaborate, and communicate with citizens and other stakeholders. We, as a city, would like to be able to entice the best partners in city development, and also empower our citizens.

The general challenge for Espoo is **how the city together with its stakeholders can build a sustainable, future-proof urban environment**, especially now that the city is growing fast. Another challenge very specific to Espoo is private land ownership and what are the tools for the city to enhance collaboration with private landowners for sustainable urban development.

For systemic change we are looking for **tools and models to support long-term development towards more sustainable and inclusive city**. The chosen working methods and tools (e.g. for *co-creation*) or platforms (*3D model*) from SPARCS are also to **support the feeling of togetherness, increasing knowledge of urban development processes and result in making a sustainable lifestyle easy and mainstream**. This aims to engage current and new citizens better in urban development of Espoo, and also to tackle the challenge of developing neighbourhoods: how old and new citizen communities of an district could more easily form a community together.

For future projects we decided not to look at an individual technology or solution, but more general topics, guiding lights to support long-term development work in Espoo. We were thinking not just energy theme but wider, also, and to develop further something that different units in the city organization could utilize from their own point of view.

The chosen topics can be found in current city strategy, Espoo Story, as enhancing use of digital tools and collaborative urban development are mentioned as goals for current council term.

Co-creation models

A first version of the co-creation models has been published but we have been recently learning a lot about how it could be developed when presenting the model and toolkit both internally in city organization but also at conferences and in the SPARCS community. Co-creation Model is a tool and a model for initiating and facilitating a collaborative co-creation process for district-level development and its various systems (energy, mobility, green infrastructure). The model – which has been developed through co-creation process – provides practical steps, methods and role definitions for multi-stakeholder development of urban districts or other areas towards sustainability and smartness, including PED solutions. SPARCS co-creation toolbox⁴.

The co-creation toolbox has drawn the key learnings and insights from those Kera processes, and also from Finnoo area development (Espoo) and other national and international examples. Figure 5 presents the phases of co-creation process.

⁴ <http://www.co-creatingsparcs.fi/en>

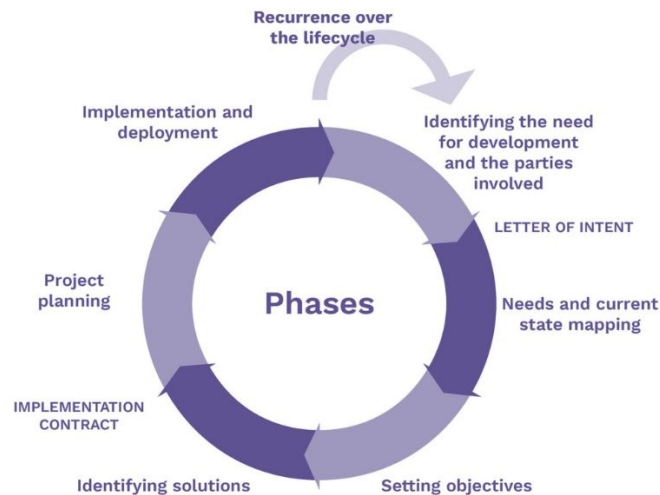


Figure 5. Different phases of co-creation process.

Co-creation is being utilized in developing especially Kera district, to which the City of Espoo has set very ambitious targets regarding sustainability, circular economy and digitalization. Kera has been a pilot area for co-creation but also what comes to co-creation with stakeholders: landowners' agreement, Kera Development Commitment⁵.

The commitment is also to ensure that in case a landowner sells the land, the signed commitment is binding also for the new owner. It is stated in our city strategy that the Kera development commitment type collaboration is to be utilized when developing new areas. This means that although the co-creation model and tools were created in SPARCS we have to continue the development of the model, but also support the utilisation of the models in as versatile a manner as possible in the city organisation and collaboration with stakeholders. Co-creation is not something you do once and then you can tick the box. On the contrary, co-creation should be a self-developing way of doing things, utilizing collaborative methods wherever and whenever it is suitable.

A good tool is not good if it is not fully utilized. What we'd like to see here is that especially district project leaders could learn to utilize the co-creation model in their everyday work. And this is not to say that project leaders don't do it at all. They all do in some way, but what we are looking for here is a more precise, process-like working method. Also, ways to educate both civil servants and residents regarding co-creation is one approach we see that would be significant to assess. The main questions and the next step for scaling this process is **how we ensure that both relevant colleagues in the city organisation and residents have enough information about both urban development processes, where and how they can have a say and how co-creation can help in general urban development processes.**

⁵ <https://www.espoo.fi/en/kera-development-commitment>

3D Model

Espoo was, some years ago, a true forerunner, being the first city in the world to open its 3D model⁶ and making it free to use through a WFS interface as open data.

In SPARCS, the Espoo 3D model has been investigated together with VTT to assess how, in particular, energy data of buildings could be included and visualized using the tool. This assessment was completed for the city owned buildings located at or near the Espoonlahti sports park district. Energy data, garnered from the internal building management software, was combined with data from the 3D model to simulate how the block could reach energy positivity. Also, how the 3D model could serve as a platform and visualization tool for co-creation and engagement has been analysed. As a platform, the 3D model can be used to picture and discuss possibilities between different stakeholders and define the final pathway, the model can then be updated based on the evolving plans and actions. Maybe, in the future, the development takes us towards the metaverse: how any stakeholder could provide its data to the common platform.

Within the energy sector, city 3D models could aid in several ways. Models can serve as a tool for engagement and visualisation. Opportunities such as PV potential can be concretised by a digitized model for residents, or whole energy systems can be visualised into a more understandable model. In parallel, 3D models can be utilized to garner feedback on city spaces similar to pilot activities already completed in Leppävaara.

In addition, 3D model can be a support tool for city planning and scenario work, considering the concrete need to make use of the 3D functionalities. In some cases, these functionalities can only be an additional burden. The plans for further development is under discussion, and research of next steps has been made. It is recognized that development work needs resources: both work time but also educational support for better understanding and skills for utilizing 3D model.

Another project “KETO” took steps to develop 3D model further in Kera in 2023⁷.

Conducting R&I work related to the city 3D model can also be connected to other research conducted on so called digital twins on the energy and mobility sectors. Within SPARCS, VTT developed a digital twin of the Sello demonstration area, based on a BIM model developed of old architectural drawings of the building. This could also serve as an interesting option for public buildings.

The Espoo 3D model, already developed and openly available to use, combined with the pilots conducted during SPARCS, while utilising knowledge already accumulated within the city and by other relevant partners, provides an interesting avenue for further upscaling activities. Upscaling project could significantly support the city to find the path how 3D model should be developed in the coming years, and what kind of resources are needed budget-wise.

⁶ https://kartat.espoo.fi/3d/index_en.html

⁷ <https://www.espoo.fi/en/articles/6d-information-model-tested-kerä-brings-opportunities-assessing-regional-carbon-neutrality>

Integrating co-creation and the 3D city model

The City of Espoo aims to provide new tools for collaboration and co-creation within urban development, working towards sustainability. The complex challenges of climate change and its mitigation require new tools for engaging local stakeholders in developing the city and its districts. The co-creation model developed in SPARCS supports the co-creation of urban areas towards sustainability targets. The 3D Model can serve as a foundation for collaboration, based on the co-creation model, while also providing a new tool for urban energy and mobility planning on the city and district levels.

The co-creation model and the 3D model both can have a real impact on Espoo's future. Municipal elections are coming next spring (2025) which also means updating the city strategy. Regarding energy, work has started to make a report "Espoo energy – big picture", to draft and plan the future of energy development in Espoo with stakeholders. Espoo's strategy and development director Pasi Laitala has outlined that "Espoo energy – big picture" work is significant for the city and is to include e.g. carbon neutrality target 2030, fast electrification, population growth, SMRs and hydrogen.

We had a collaboration workshop of the two projects SPARCS and KETO in April 2023 to co-learn of the connection between 3D model and co-creation model, the result summary is presented in Figure 6.

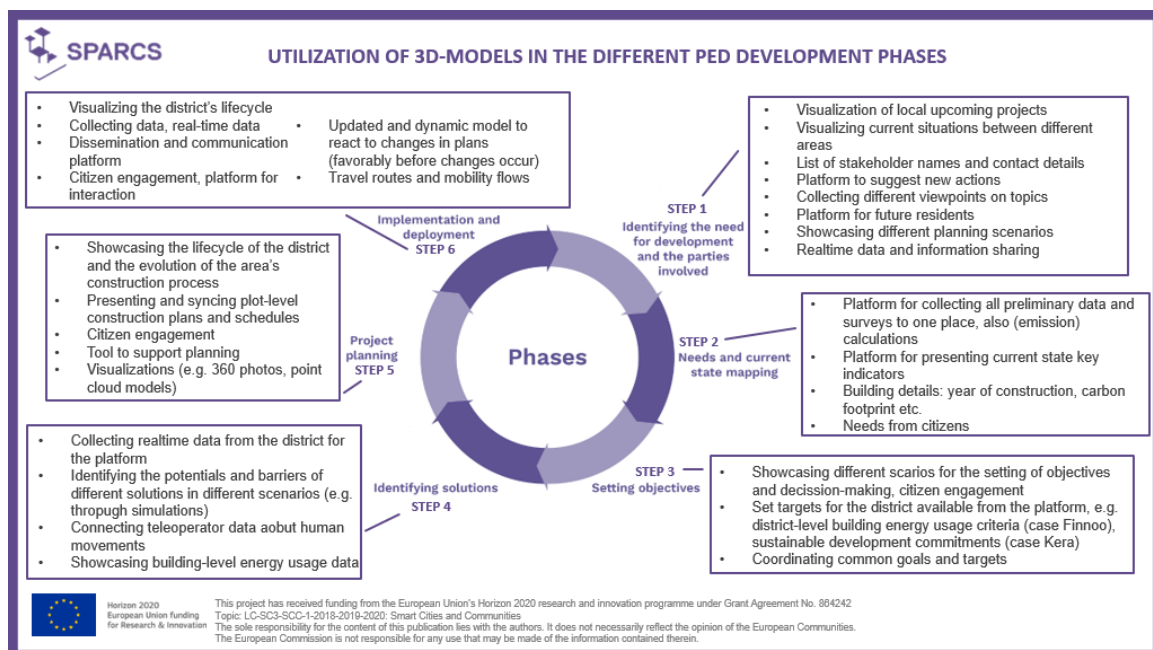


Figure 6 - Result summary of workshop connecting 3D model and co-creation model.

3D model and co-creation work for Espoo Master plan 2060

Currently Espoo's new master plan for 2060⁸ is under process, being open for comments during summer 2024 and then after revision heading to decision making process first to City board and from there to be decided at city council meeting.

⁸ <https://www.espoo.fi/en/projects/espoo-master-plan-2060>

Masterplan 2060 will provide guidelines for the development of the entire city during the coming decades. The Master Plan 2060 is a strategic reservation plan. It sets a broad outline for development.

The main purpose of the master plan is to prepare for the growth of the city and make it a sustainable part of the urban structure. In line with the master plan, growth will be concentrated along the current and new public transport connections, mainly by densifying and enhancing the structure. The master plan will also help preserve the important ecological network and create good conditions for developing local recreational opportunities as part of further planning.

With the help of the master plan, the city will prepare for new rail transport connections between the city's urban centres. The new connections (Kauklahti-Kivenlahti, Matinkylä-Espoon keskus-Jorvi, Matinkylä-Leppävaara, Tapiola-Suurpelto and Leppävaara-Viiskorpi) will boost the vitality of the urban centres and improve the accessibility of the entire city. Northern Espoo will develop thanks to the Espoo-Salo railway line and the trunk lines that run south and east from Kalajärvi.

The master plan will also guide the development of the urban centres in functional and qualitative terms. Commercial activities, services and jobs will be heavily concentrated in the centres, and further planning will need to pay particular attention to the quality of the urban environment and the number of urban green areas.

Both co-creation model and 3D model can be utilized to make Master plan 2060 more tangible for residents, resulting better understanding of zoning processes and schedules and ways for citizen to have their say.

2.1.5 Assessment of potential for upscaling

As the co-creation model has been developed in SPARCS, it is a direct result of the project. The model is based on the key learnings from Kera area development that many development projects in the city have supported in the co-creation and ecosystem-level development, including SPARCS. The model has been created for Kera, and its utilization in different types of areas in Espoo (and beyond) have been examined on paper. The model has not been utilized in practice yet outside Kera. Kera type co-creational working method for urban development is goal of current city strategy and a ongoing project is working on replicating the Kera Commitment to other districts. The co-creation model and toolbox have been found useful but support for full utilization is still needed. Potential for upscaling is found high for Espoo as a rapidly growing city with several urban development projects.

The 3D model of the city existed long before SPARCS as open data, available for free public use. The model has been used in different services and development projects as a foundation, on top of which new services, visualisation frameworks and other solutions have been built on. In SPARCS, a small-scale demo was conducted by VTT on energy efficiency visualization and e-mobility charging scenarios. 3D-model development towards Espoo metaverse is very interesting and ambitious path from city developers point of view, providing multiple ways for utilization. From citizen engagement and participatory point of view the 3D model itself could provide views and platform for discussion of future Espoo.

Choosing pilot/demo areas for future projects beforehand has been found crucial for building successful projects. In collaboration with the city planning unit from the City's Urban Environment we have recognized several new or complementary construction

districts in Espoo. SPARCS team has been actively participating in collaborative discussions with urban development unit about energy solutions in new development areas e.g. northern Leppävaara centre, Viiskorpi and Kiviruukki.

All districts are different in many ways, as there are many aspects to assess in a district regarding energy development:

- who owns the plot
- developing potential, zoning phase
- development targets
- interested stakeholders
- proximity to existing energy infrastructure
- potential for local sustainable energy production
- demographics in general etc

Espoo as a city has a very unique city structure, 5 city centres. This means that development work can take place in multiple locations at the same time. District directors are key people for urban development in their area as they are responsible for the dialogue with stakeholders. The amount of Project directors has increased recently.

For upscaling, main target is the new project to support City's carbon neutrality target through facilitating the uptake of sustainable urban solutions (energy, mobility, circular economy, data and digitalization etc.) in Espoo in different kinds of districts and areas. Carbon footprint and carbon handprint, and heartprint, all three aspects should be considered.

Special focus should be on those sustainable urban solutions – energy efficient buildings, shared e-mobility vehicles, RES solutions integrated into the built environment, regenerative use of materials, public transportation information systems etc. that support the development of an area towards a shared goal/vision on sustainability. These solutions are not necessarily solutions that are fully planned and operated by a single stakeholder but require collaboration throughout their lifecycles, from planning to operation. Such solutions should be seen as part of a system, contributing to a larger whole than the solution alone. We believe that depending on the case and district scale the local upscaling potential is from medium to high. The 3D model could be utilized also for policy experimentation and the development may lead Espoo towards digital twin of the city.

2.1.6 Assessment of Business Models and financial analysis

All SPARCS use cases including co-creation model can be found on BABLE website⁹.

Business model canvases for both have been made as part of SPARCS WP1 work. Business models have been discussed e.g. in D1.17 Scaling Up and Replication Guideline.

Business model canvases for both Co-creation model and 3D model has been made as WP1 work. Further development, including KERs and PESTEL analysis of both have

⁹ <https://www.bable-smartcities.eu/explore/use-cases/use-case/creating-positive-energy-districts-with-a-co-creation-model.html>

been done in WP7, and reported in D 7.8 and D7.11. This work has provided Espoo with deeper knowledge of business models but also about city's own role.

Funding mechanisms have been assessed, e.g. BABLE organised for Business Finland and Finnish cities and companies workshops where Horizon calls were investigated and assessed. Espoo recognised 3 top calls from future Horizon calls, currently we are preparing one that is discussed in this document and another one with consortium forming. Espoo has acknowledged that 30 partners in SPARCS all are in Espoo's interest to continue collaboration with.

The solution strongly contributes to the sustainability goals. A project combining the development of both the co-creation model and the 3D model would have great potential to enhance sustainability work in the city, working as a catalyst for other development entities to be encouraged to evaluate the potential of the two solutions.

If this project would not happen, business as usual would be continuing unharmonized leadership models, unique for each district project director. And utilization of 3D model would also be slower and unfocused. This could mean that current strategic target of spreading the way Kera has been developed with co-creation would not happen or at least not in as many other new districts as planned.

Since the plan is to replicate and upscale the costs of development would be covered mostly by project, and then working time from stakeholders would be needed. After actualization of the new ways of utilizing co-creation model and 3D model the maintenance part would fall for the city.

This is important part for the city as the development plans and needs for the 3D model are being mapped. Five years ago Espoo was forerunner with worlds first city 3D model with open interface. After that no significant steps have been made, which means Espoo is no longer a forerunner in this field. The two solution upscaled in the future project would mainly provide city of Espoo more tools for its basic work: city planning and citizen engagement.

2.2 Action Plan Development

Action plan is being drafter taking account different aspects reviewed shortly in following subtopics.

2.2.1 Legal/Regulatory Framework

Main aspect of legal and regulatory framework is GDPR. Personal data, for example electricity consumption data is not available as such but the information must be anonymized and handled in conglomerates. In co-creation work collaboration with minors and their families one must be extremely cautious. Agreements on data handling may need update for the 3D model.

2.2.2 Technical Assessment

In Espoo we did some piloting for 3D model development in another project and from that we have good partner options who already know the city and it 3D model environment. Espoo city planning office uses 3D model in their daily work but how this could be made more visible to citizen. The final decision on what and to which detail is to be done may be made by first piloting and assessing options with different units of city organisation. Main focus should be in integration of different departments, partners and tools, to support smooth operation.

One interesting opportunity is to combine BIM data to 3D model: could we provide a model to support sustainability of urban environment with detailed building material data.

Access to the needed data depends on the future use case and ownership of the building in the chosen area. If buildings are owned by the city, relevant data can be accessed by city personnel. If data is utilised by an external party, such as a research organisation, agreement from the relevant city department, such as the facilities department, is needed to share data. When dealing with privately owned buildings, access to data depends a lot on ownership structure. In case of large commercial or industrial buildings with a single owner/operator, agreements can be handled between the operator and the city. In case of apartment buildings or other similar structures, agreements would have to be made with all tenants to access information such as electricity consumption data. A lot of the needed data, such as energy or location data, can be accessed openly from services such as Helsinki Region Infoshare (HRI) or through data provided openly or for permitted personnel by the Helsinki Region Environmental Authority (HSY), Helsinki Region Transport Authority (HSL), Finnish Transport Infrastructure Agency, National Land Survey of Finland and Fingrid, among others.

2.2.3 Cost Assessment

Upscaling of co-creation model cost for the city is estimated at 80 000 euros for procurement and 100 000 for personnel. 3D model development has more options and estimated cost from 200 000 -300 000 euros with personnel cost of 80 000 euros. Plus project personnel for 80 000 euros. For engagement activities 50 000, communications and dissemination 35 000 euros.

2.2.4 Business Model Identification & Financial Analysis

Horizon projects have been found most enticing but also national funding options have been looked at, to support the development phase. Maintaining and updating of the tools must come from city budget. To be considered is if stakeholders would pay for some services provided by the new tool.

The benefits can be found:

- Leadership/management: better view on city development and citizen engagement
- City planning: wider understanding of planning process both in the city organization and among citizens, supports better decision-making with less complains.
- Sustainable development: tool makes it easier to assess different aspects on sustainability and to communicate it.
- with up-to-date tools the best partners collaborate with Espoo

Value proposition is that with better processes and tools for city planning and citizen engagement, the city gets the best of best to collaborate and invest in Espoo. City's role would be more like enabler, providing solid platform for different actors to develop solutions and services that enhance wellbeing and engagement of citizen. Ambitious goals and engaging activities build trust and common understanding for well-above average results. Enhancing the dialogue between city and citizen may result in concrete savings: when citizen file less complaints

In current Sustainable Espoo development program, one of five long-term goals is for Espoo to be the best development partner, and there are indicators also dedicated to each goal with annual assessment, currently final assessment is under way as the current city council term ends in spring 2025. In general the city uses regular citizen questionnaire to assess how happy citizens are with city services in different categories.

2.2.5 Supporting Factors & Barriers & Risks

Aim is to create methods and tools to support sustainable urban development and sustainable lifestyle in Espoo.

Espoo discussed barriers for citizen engagement development in the city in its Climate City Contract (approved leading to Mission Label in March 2024):

- Engaging the most vulnerable groups of citizens to not leave anyone behind in the transition to climate neutrality is a challenging task as those groups are as well often hard to reach or “passive” participants. Citizens might also lack knowledge about the sustainability themes in order to being able to participate in a meaningful way and make informed statements that have a real positive impact.
- Facilitating social innovation by the city is desirable but often requires a shift in mindset and changing official processes to enable innovations borne in the local community. The city organization has a multi-faceted role towards its citizens as it increasingly wishes to be a partner and enabler but at the same time has the role of regulator to admit permits and supervising the state of the environment and land-area.
- Limited citizen engagement resources and capacities within the city organisation.
- Participation and social innovation do not always have real impact on decision-making but might instead result in token participation without substantial impact.
- Data collected from citizens in surveys, queries, workshops or meetings by one city unit is not distributed to other units and therefore has limited impact.

From partnership and collaboration view in Espoo we have found the following risks:

- partners remain passive, stakeholder participation fades along the project because of clear common target is missing
- the value proposition is weak or is not understandable for key stakeholders

There are great opportunities in building capacity on citizen engagement and stakeholder management. This project could empower citizens and stakeholders to collaborate easily and more with city of Espoo.

Espoo has many benefits which support the succeeding of the project:

- we have both political and operational high-level support for taking sustainable city development and sustainable lifestyle to a new level in Espoo
- our strategy Espoo story backs this kind of development
- Espoo has educated smart citizens who can make investments in sustainable lifestyle themselves
- Espoo as a city has experience of citizen engagement ja sustainable city development, this project would be building on top of that solid base

2.2.6 Project Implementation Planning

Road mapping and timeline of implementation (key timescales):

- M1 – M6 Preparation phase for detailed planning of co-creation model enhancement, stakeholder engagement and 3D model development
- M6 – M18 Engagement and implementation phase: parallel development of models and co creating with citizens and stakeholders to choose concrete steps.
- M19 – M36 Monitoring and dissemination phase

A project is needed as the development steps towards better more impactful engagement. If done by City employees without the project it would take longer with less engagement, and concrete developments of tools would not happen. This project would significantly accelerate the development of engagement model in different stages of land use planning.

2.2.7 Stakeholder Management and Citizen Engagement Strategies for Project Development

Overview of engagement strategies for citizens/stakeholders directly affected in the project development is to be assessed thoroughly in the project. To work in various ways would be connected to the Espoo participatory climate model, presented in Figure 7.

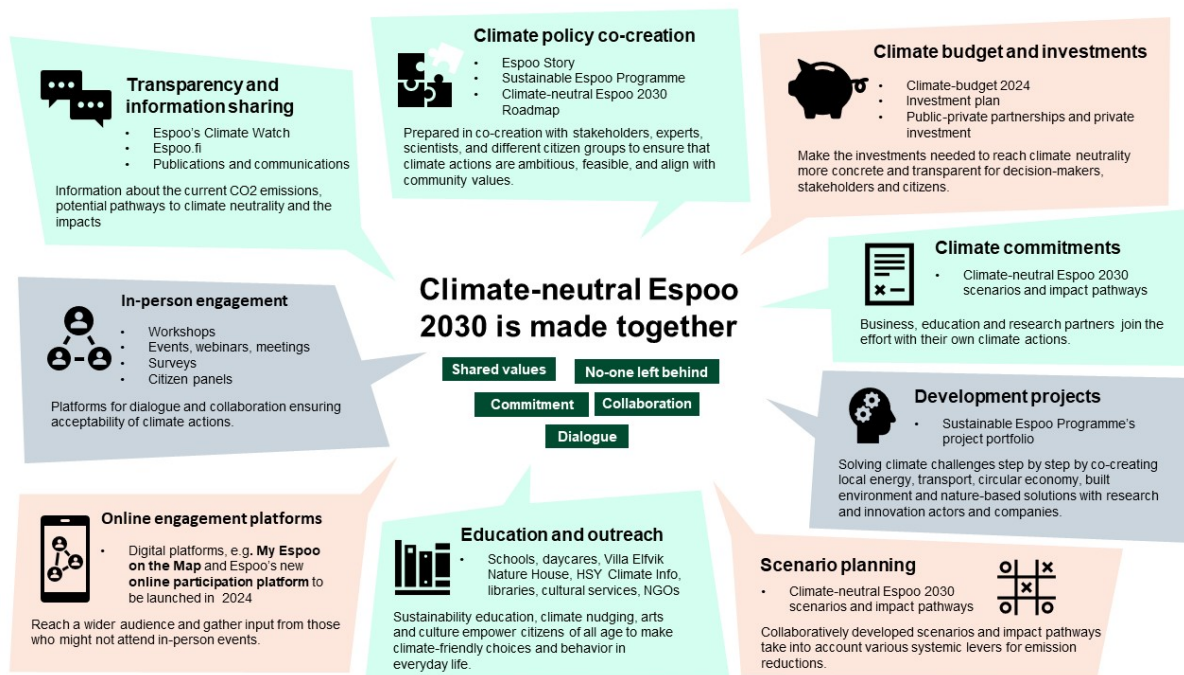


Figure 7. Espoo participatory model for climate neutrality,

Espoo has strong background of sustainability projects with multiple stakeholders. In recent project over 100 partners were identified to work with Espoo towards sustainability and climate goals. For Climate city contract Espoo has 25 committed partners, including some from SPARCS (VTT, Siemens, Fortum). Building climate partnerships is about working together with concrete goals, we see that through new projects like this at hand Espoo would be able to build new and even stronger existing partnerships.

Engagement activities include workshops, interviews, pilot groups, educational activities and plenty of communications and reaching especially to vulnerable groups.

2.2.8 Risk Management Plan

Currently, the greatest risks are seen in the participation of stakeholders and citizens. Trust building and co-creating common goals is a key to manage this challenge.

Following risks have been recognized with preventing measures, risk levels being on scale low, medium, high, very high:

- Risk 1: Difficulties in integration with other existing tools, owned both by the city and its partners could prevent collaboration and data flow. Risk level: high
 - Prevention measures: Ensure compatibility of different tools at all stages, pay attention to communications and training, and ensure data flow with agreements and follow-ups.
- Risk 2. Interest in applying new tools from other departments. Risk level: medium
 - Prevention measures: Strong communications and training, support from the management level to support the process.
- Risk 3. Risk in engagement and engagement fatigue. Risk level high.
 - Prevention measures: Planning well ahead and then co-creating together with citizens and stakeholders the work, being flexible to changes and listening and reacting to messages from stakeholders. From the beginning principles of trust and openness to be applied.
- Risk 4. Partners do not find the tools useful. Risk level low.
 - Prevention measures: Co-creation from early stage is crucial to find solutions or tools that are useful to all.

Risk management in general will be done two times per year. Also deviations from project plan will be assessed.

2.2.9 Quality Management Plan

Quality assurance regards here mainly to procurement processes and subcontractors. In Espoo our procurement process is well-defined following, in addition to EU and local regulation, guidelines of the city.

2.2.10 Key Performance Indicators (KPIs)

So far we have identified following KPIs for the project:

- number of participants in co-creation process (residents, company representatives)
- number of different participatory actions during the project
- times 3D model utilised via open interface
- number of persons from city organization utilising 3D model or co-creation model
- organizations other than the city providing their data to 3D model
- amount of individual feedback from tool users and citizen

2.3 Securing funding budget

2.3.1 Budget Allocation

Preliminary budget for the project:	Expenses:
Procurement co-creation model cost	80 000 €
Procurement 3D model development	300 000 €
Personnel cost of	160 000 €
Engagement activities	50 000 €
Communications and dissemination	35 000 €
	Altogether 625 000 €

Income: 100% Horizon or other suitable funding instrument
In negotiations of funding the amount of Espoo may change and the work carried by City of Espoo will be adjusted.

2.3.2 Additional Sources of Funding

To be assessed when development phase is over if there is any possibility to sell the new 3D model as a service. The city may prefer open access to provide development platform instead of making it a business, to support the development and better service to our citizens.

3. CONCLUSION

Conclusions and lessons learnt in this process has been versatile and proved useful for Espoo's future project assessment. Framework has now been tested and approved and it can support all sustainable development work and new projects in Espoo. It gives us process with clear steps and support dialogue and co-creation in Espoo community. As the world changes around us, the city develops with its needs and challenges, we urgently need process supporting city organisation with stakeholders to look at the opportunities for collaboration.

For project definition it gives valuable advice how to keep it simple and find the most impactful and important topics for future projects. It also supports and speeds up partner selection and communication. The framework gives the city tools and ideas how to support internal collaboration of city organization.

Some internal challenges were observed and recognised during the process. Time and especially time together is a significant challenge for new project ideation. This does not concern only management level but also specialists and development managers. Sometimes also the decision making (go, no go) to participate in a consortium and call takes way too long. City organization's other units must be engaged too, as well as relevant stakeholders outside city organization. Support and leadership from management level is essential for successful project preparation.

In general an impactful project cannot promise to solve all challenges in everything with everybody. Project work is all about prioritization, and fruitful collaboration.

3.1 Contribution of Partners

A workshop on Espoo replication was arranged where city representatives with partner organisation representatives worked on topics of interest and highest potential for replication and upscaling.

Separate work shops for partners and their own replication planning was arranged in January 2024 and is described in detail in D3.7.

4. ACRONYMS AND TERMS

The list of abbreviations used in the document is presented in Table 1.

Table 1. List of abbreviations

Abbreviation	Explanation
3D	Three-dimensional
BIM	Building Information Modelling
BMC	Business Model Canvas
BMS	Building Management System
COVID-19	Coronavirus Disease 2019
DX.X	Deliverable 'X.X' (number)
HRI	Helsinki Region Infoshare
HSL	Helsinki Region Transport (Helsingin Seudun Liikenne)
HSY	Helsinki Region Environmental Services (Helsingin Seudun Ympäristöpalvelut)
KER	Key Exploitative Result
KPI	Key Performance Indicator
PEB	Positive Energy Block
PED	Positive Energy District
SDG	United Nations Agenda 2030 Sustainable Development Goals
SWOT	SWOT Analysis; Strengths, Weaknesses, Opportunities, Threats
WP	Work Package

5. REFERENCES

Tartia J and Hämäläinen M. Co-creation Processes and Urban Digital Twins in Sustainable and Smart Urban District Development - Case Kera District in Espoo, Finland. Open Res Europe 2024, 4:130.

6. APPENDICES

Business Model Canvases (BMCs)

Business Model Canvases (or BMCs) were created from the WP3 demonstrations as part of *WP7 Exploitation and Business Ecosystems*. The BMCs cover highlighted business/government cases from the Lighthouse City Espoo WP3 demonstration activities. The process for developing the BMCs was led by BABLE. The canvas template and the related workshop processes related to the creation of the canvases were also provided by BABLE. In total, ten (10) BMCs were generated by WP3 partners CIT, ADV, ESP, SIE, KONE and PIT. The BMCs of Co-creation model and 3D model are presented in Figures 8 and 9.

In the canvas, key aspects of a business model case are examined. *Partners + key stakeholders* list relevant parties involved in the case. *City government role* gives an overview of the control that the city has on the design and management of the case. *Asset ownership* describes who owns the relevant physical, governmental or other assets related to the case. *Business model typology* defines roles for different type of stakeholders. *Funding & financing* describes the needed resources and available funding mechanisms. *Customer segments* defines key target users for the case product or service. *Value proposition* defines the intended value created through the case and what kind of impacts this might have for the user, the environment or other similar aspects. *Cost structure* describes capital and operational expenses, plans for further investments as *Surplus*, and identified *Revenue streams* (if applicable). *Social & environmental costs and benefits* describe identified effects of the case on social (community integrity, personal health, data privacy, social interaction, job creation/loss etc.) and environmental aspects (increased/decreased energy consumption and greenhouse gas emissions, natural resource utilization, waste creation, biodiversity etc.).

BMC#e9 City 3D model (E10/17, ESP)

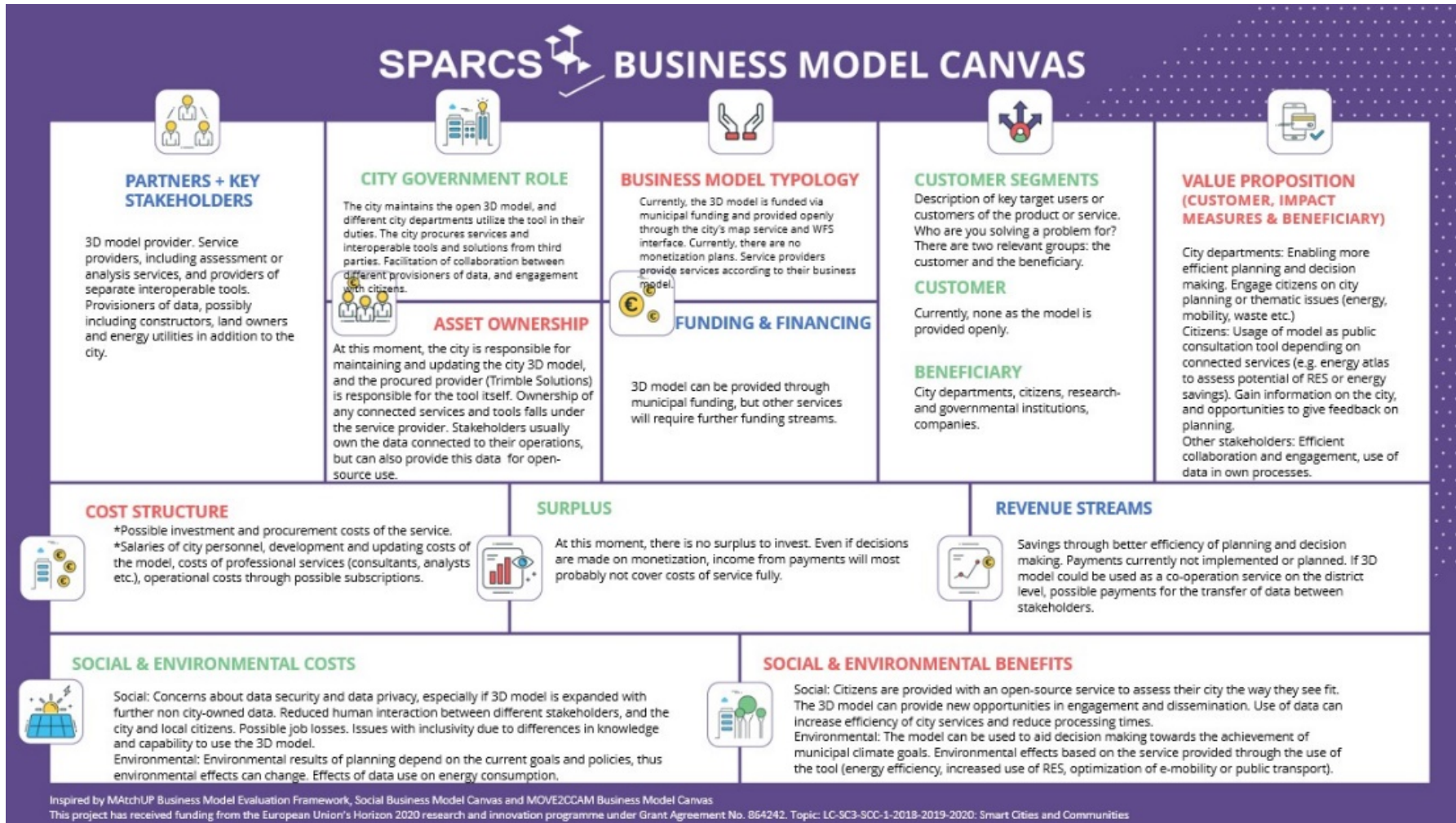


Figure 8. Business model canvas for Espoo City 3D Model

BMC#e10 Co-creation model for sustainable and smart urban areas (E14/E22, ESP)

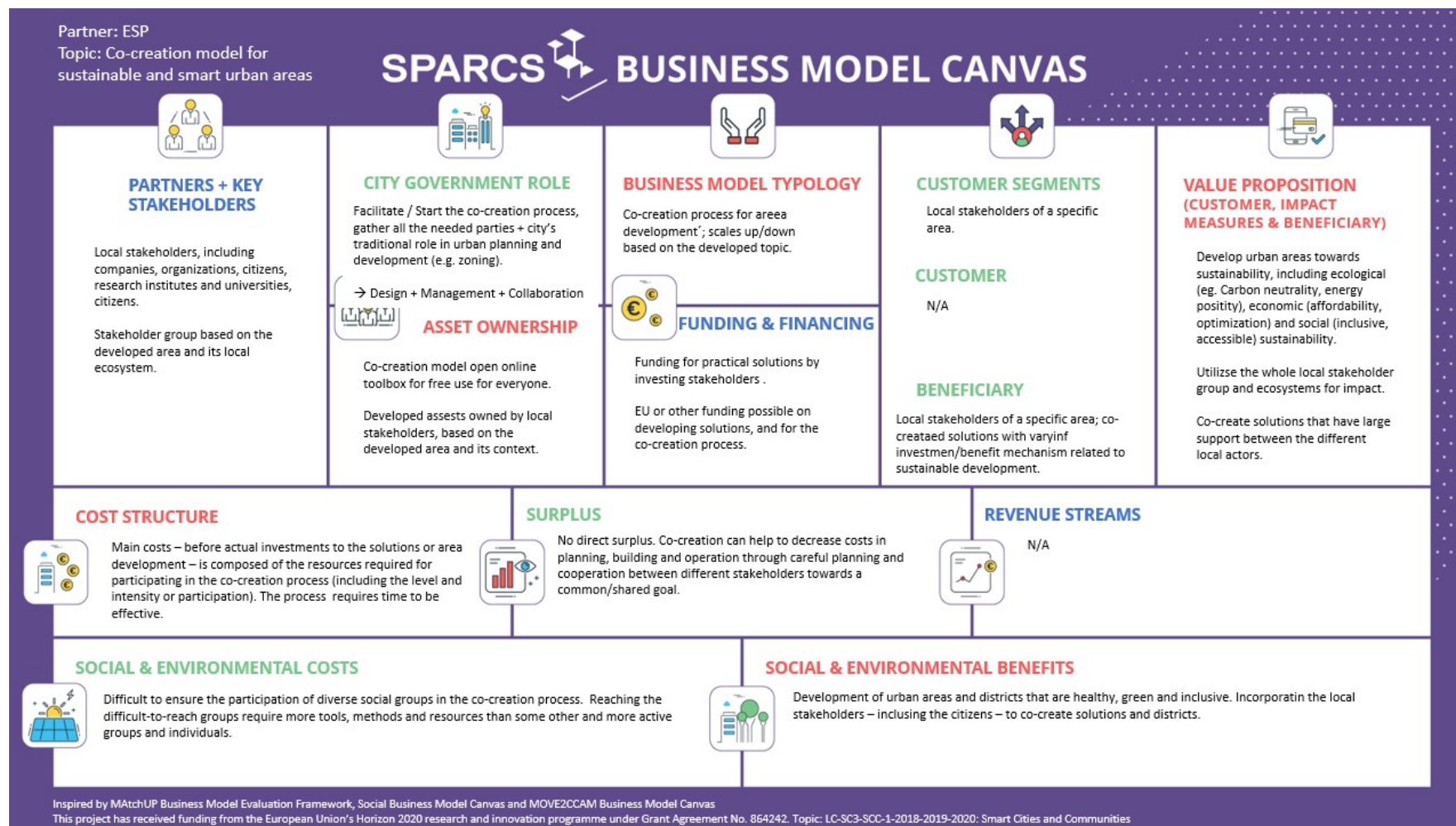


Figure 9. Business model canvas for Espoo Co-creation model.