D7.4 Lighthouse Cities Start-Up Smart City Challenge Report and Lessons Learned

30/03/2022

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Topic: LC-SC3-SCC-1-2018-2019-2020: Smart Cities and Communities

Deliverable administration

No & name	**D7.4 Lighthouse Cities Start-Up Smart City Challenge Report and Lessons Learned**				
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Description of the related task and the deliverable. Extract from DoA	**T7.4 SPARCs Start-Up Competition (FHG) M22 – M48** The validation of the SPARCs smart interventions in the lighthouse (and following) cities will ensure the realization of the ambitious project impacts and the maximisation of its replication potential in diverse contexts around the EU. However, the real value of the SPARCs project will be revealed and untapped only if it achieves to directly involve local smart city business ecosystems in co-designing and co-creating their sustainable future through novel additional services. SPARCs will work towards opening up both the accumulated knowledge of the project, but also its infrastructure to new interested parties that would like to be engaged not only after but also during the project's implementation and demonstration phases, adopting an open innovation agile development approach, where external entities (mainly innovative start-ups and SMEs) could provide added value services and features that will help to strengthen the project's impact, while reinforcing the lighthouse and Fellow cities' smart city vision and accelerating their smart transition. In this context, SPARCs will contribute to start-up smart city competition initiatives in the LHCs and FCs. Inspired by the Pre-Commercial Procurement process of the European Commission, this task will connect with ongoing activities taking place in LHCs, by assisting, documenting, and assessing lessons learned in existing processes. The addressed existing initiatives are the Smart City Challenge, by the city of Leipzig, and the Sustainable Mobility Challenge, by KONE in the Espoo lighthouse. The documentation, and assessment of lessons learned has the intention to inform and guide future similar replication activities in the FCs. **D7.4 Lighthouse Cities Start-Up City Challenge Report and Lessons Learned. (FHG)** Deliverable 7.4 summarises the best practices drawn from the launched start-up smart city challenges in the LHCs. This deliverable will contribute to an easier engagement of local smart city business ecosystems in co-designing and co-creating their sustainable future through offering of innovative services. FHG collaborates with the LHCs to document the process, development, and implementation of each individual start-up smart city challenge, and provides a comprehensive description of goals, selected scope and themes, vision, expected results, policy and financial frameworks, format and timelines, selection criteria, participants, piloting implementation, obstacles and strengths, as well as of the dialogue and exchange between the two LHCs.				
Participants	FHG, LPZ, KONE				

V	Date	Authors	Description
0	18/02/2022	FHG	First internal FHG draft
0	08/03/2022	FHG	Second internal FHG draft

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1	25/03/2022	FHG	Deliverable checked by WP leader and released to the Coordinator and the Quality Manager for quality check and subsequent submission to the EC.
2	30/03/2022	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

This document contributes to the replication efforts intended for the Fellow Cities and other implementors beyond SPARCS. It is a report and integration of recommendations for future implementors. These lessons learned are drawn from the case study of two start-up smart city challenges in the Lighthouse Cities: The Sustainable Mobility Challenge, implemented by KONE and Gaia Consulting, and supported by the city administration in Espoo; and the Smart City Challenge, implemented by the Digital City Unit and the city administration, and supported by the Smart Infrastructure Hub in Leipzig. This deliverable aims to support local smart city business ecosystems, and to contribute to co-creation of innovative solutions. It works towards opening accumulated knowledge and advancing the smart transitions in cities. This deliverable will be followed up by further tasks in T7.4 in the upcoming months.

Both competitions were inspired by traditional pre-commercial procurement processes, based on stages of development and implementation of services. However, both competitions opted for more flexible organizational programs. The Sustainable Mobility Challenge in Espoo was framed around smart mobility topics and invited over 140 start-ups and SMBs to participate. Out of 8 qualifying start-ups, 1 proposal was selected for pilot implementation. The Smart City Challenge in Leipzig was framed around three thematic axes: i. digital tourism, ii. urban environmental data, and iii. citizen participation. Out of 9 qualifying proposals, 3 (one for each thematic axis), were selected for pilot implementation.

For each challenge, the following criteria were examined: a) goals and justification, b) addressed local demands and selection of the themes, c) the overall vision and the expected results, d) its circumscribing policy and financial frameworks, e) the main stakeholders and involved partners, e) the followed timeline and activities, f) the criteria for selection and filtering of participants, g) the constitution of the jury board and other involved mentors, consultants, and moderators, h) a brief overview of the selected start-ups, and, finally, i) obstacles and j) success factors for the development and implementation of the start-up competition. Based on these aspects, as well as experiential knowledge from the implementors, general recommendations were outlined as conclusive statements for this deliverable. These include aspects such as organisation and planning, selection of evaluation criteria, and addressing heterogeneous managerial capacities of participant start-ups, among others.

1. INTRODUCTION

Purpose and target group

This deliverable provides a documentation and lessons-learned of two the different start-up competition processes: the Sustainable Mobility Challenge in Espoo, Finland, conducted by KONE, and the Smart City Challenge 2021 in Leipzig, Germany conducted by the Digital City Unit.

Through documentation of the necessary steps, preparations and stakeholders involved in the respective start-up competitions, this deliverable provides a guideline for replications. Those can either occur in the context of Fellow Cities within the SPARCS projects, or other cities and institutions pursuing to develop and implement start-up competitions with a focus on smart city project implementations. This documentation provides an overview of both a private (KONE) and a public (City of Leipzig) initiative.

Contributions of partners

KONE and the City of Leipzig were the main organisers of the respective start-up challenges. Both have provided the main contents by contributing information on the set-up, structure, and implementation of the local start-up competitions through the provision of presentations, documents and hand-outs. Both institutions were interviewed for the elaboration of further implicit and contextual knowledge that did not feed into official documents. Fraunhofer IAO outlined the deliverable's scope, goals and composed the contents provided by KONE and Leipzig for a synthesis. FHG IAO was also responsible for conducting the interviews. Furthermore, FHG IAO synthesized the documents and interview contents for this deliverable. KONE, the City of Leipzig, the City of Espoo, Fraunhofer IAO, Civiesco and GOPA Com. were responsible for reviewing the contents in several rounds of feedback.

Background and objectives

This document is a deliverable draft from Work Package 7 Exploitation and Business Ecosystems, where the final deliverable is due in M48. T7.4 focuses on the maximisation of its replication potential of the SPARCS project and its related and partner programs. It attempts to involve local smart city business ecosystems and to open up the accumulated knowledge of the project mainly towards innovative start-ups and SMEs. The deliverable draft assists in documenting, and assessing lessons learned in existing processes to inform and guide future similar replication activities in the FCs.

Methodology

This deliverable was composed utilizing a three-staged methodology. Non-intrusive observation was conducted during some of the program events of the reported start-up competitions where FHG IAO participated as an external observer. Semi-structured interviews were conducted with representatives from both programs in question. Secondary research on existing materials and contents available online was conducted in the form of desktop research.

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Structure

This deliverable is divided into three main chapters. The first and second chapter correspond to the report of the start-up competitions in Espoo and Leipzig respectively.The third chapter provides a brief rundown of the main achievements of each competition and the general inferences and recommendations drawn from the previous chapters and aimed at future replication efforts.

As mentioned in the contribution from partners and the methodology, most information used to synthesize this deliverable come either through interviews directly from representatives of the two addressed associations, or from documents not available to the public and shared with FHG IAO under the confidentiality agreements applying in the SPARCS project. This document contains therefore no direct quotes. The bibliographical references correspond then only to publicly available documents and websites. For any enquiries about the used material, we urge you to do us the courtesy of addressing any of the authors or the affiliated institutions.

2. SUSTAINABLE MOBILITY CHALLENGE: PROCESS, DEVELOPMENT, AND IMPLEMENTATION

This chapter presents a concise documentation of the Sustainable Mobility Challenge developed by KONE and Gaia Consulting, implemented in Espoo lighthouse city. It informs on the basic constituents of the challenge, specifically: a) goals and justification, b) addressed local demands and selection of the themes, c) the overall vision and the expected results, d) its circumscribing policy and financial frameworks, e) the main stakeholders and involved partners, e) the followed timeline and activities, f) the criteria for selection and filtering of participants, g) the constitution of the jury board and other involved mentors, consultants, and moderators, h) a brief overview of the selected start-ups, and, finally, i) obstacles and j) success factors for the development and implementation of the start-up competition.

KONE, the implementor

KONE is a global leader of people flow solutions with a mission to improve the flow of urban life. Each day, the company moves over a billion people with their portfolio of elevators, escalators and automatic building doors as well as a range of services for equipment modernisation and maintenance. They help customers, cities and citizens improve the city infrastructure world-wide, buildings and public spaces, with the aim of making cities more sustainable places to live.

In the SPARCS project, KONE focuses on co-creating sustainable and energy positive cities by engaging citizens and varying stakeholders in designing new solutions and co-creating new business models. KONE develops new solutions for building energy management and people flow. The organised Sustainable Mobility Challenge is part of KONE's SPARCS WP7 task T7.4 SPARCS Start-up competition and links with WP3 tasks T3.6 Community Management and T3.8 Smart Business Models.

Goals and added value

KONE has developed vast experience in creating concepts and providing products and services for indoor people flow in urban environments. In SPARCS, the company also studies existing solutions and explores new concepts for sustainable modes of urban transportation between buildings. Whilst setting up the Sustainable Mobility Challenge, the overarching goals were to seek innovative solutions for sustainable urban flow and future mobility and to engage a variety of ICT and mobility stakeholders to promote sustainable mobility in Espoo, Finland. This goal was envisioned through identifying relevant companies operating in the field of sustainable mobility, co-creating mobility solutions through mentoring, and pitching processes, developing new business model innovations, and the selection of the most promising solution for a pilot. To answer these needs, a co-innovation challenge competition was foreseen as the best option for implementation.

Initial ideas for setting-up the co-innovation challenge were developed in WP3 – Demonstration Lighthouse City Espoo in connection to tasks T3.6 Community

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engagement and T3.8 Smart business models. There was a need to find innovative sustainable mobility solutions to meet the pre-defined user challenges identified through user research. The co-innovation challenge was later transferred into WP7 under T7.4 SPARCS start-up challenge since it aligned with the requirement of organising a start-up challenge in Espoo lighthouse city. However, an underlying goal was to create an example for future replications and interested implementors by demonstrating how a greater number of mobility and service providers could potentially develop needed solutions collaboratively by means of a start-up challenge.

Lastly, the Sustainable Mobility Challenge represents an opportunity for KONE to improve its presence in the local and international smart city ecosystem. The challenge was therefore also intended to create interest in the company and extent networking opportunities and contacts for future collaborations.

Local demand and selection of the theme(s)

The specific theme of the Sustainable Mobility Challenge was chosen due to KONE´s focus on mobility in SPARCS. Furthermore, KONE's contribution to the SPARCS project has also been to study citizens' mobility behaviour, to develop and test new mobility concepts and to provide insights on the transition to more sustainable mobility modes.

In the current business offering, KONE's focus is primarily on providing solutions for the flow of people through buildings (e.g., escalators, elevators, and automatic building doors) in the built environment. New questions regarding developments and innovation around mobility respond to urban trends that were identified in previous research: Due to a constant increase in the urban population through an inflow of people moving from rural areas, there are new global needs developing with regards to moving bigger masses of people in the city in a sustainable manner. An enhanced understanding of how to improve the urban people flow and the interconnections between indoor and outdoor mobility behaviour is therefore at the core of KONE's research in SPARCS. Four major trends were identified in relation to sustainable mobility: 1) increased use of micro mobility, 2) new paradigm of shared mobility solutions, 3) multimodal travel chains and navigation (combining several mobility modalities in one journey) and 4) autonomous mobility.

In the process of setting-up the start-up competition, Gaia Consulting, a consultancy for sustainable business development, which is located in Helsinki, was subcontracted for the facilitation of the start-up competition. The challenge process was carried out in collaboration with Gaia Consulting and was based on an iterative process to choose an adequate focus for the challenge brief.

- The topics **micro-mobility, shared mobility and multimodal navigation** were selected for the challenge brief. Participants of the start-up challenge were thus encouraged to tailor their solutions to user challenges in these overarching topics. KONE established a list of already identified specific user challenges based on the user research done in Espoo, to which ideas should work towards solving:**Pre-identified user challenges: Micro-mobility**
    - Frustration of registering for several different services, a shattered service selection is experienced as slow, difficult, and stressful;

- Lack of safe and trusted parking and locking stations for (expensive) micro mobility vehicles;
- Moving goods and other people with micro mobility solutions is demanding and requires cargo solutions;
- Cycling is experienced challenging and weather-dependent, vehicles are often unrepaired;
- Electric bikes are seen as interesting but the cost vs. benefit is still challenging;
- There is a need to improve infrastructure to increase usage of micro mobility solutions throughout the year;
- Citizens are not rewarded for sustainable behaviour.

- **Pre-identified user challenges: Shared mobility**
  - Lack of trust in commonly shared mobility services;
  - Irregular need for using a car;
  - A need to have access for an adequate vehicle to fit the right purpose without ownership;
  - Minor use of expensive, maintenance requiring, private vehicles;
  - Irregular need for other vehicles and wish to test different solutions;
  - There are big barriers for giving up cars, and it requires effort and taking initiative.

- **Pre-identified user challenges: Multimodal navigation**
  - Citizens' mobility needs and desires vary depending on the day (weekday versus weekend), season and weather;
  - Lack of knowledge and clear visualizations of own carbon footprint in mobility;
  - Generalized services are overlooking user's personalized needs for mobility decision-making (i.e., price, speed, convenience, health, forest route, cargo, accessibility, sustainability, possibility to meet people);
  - Lack of knowledge about different mobility modes and how to combine multi-modal mobility modes (e.g., take a bike with you to the metro/train);
  - The significant challenges of public transport are tight schedules and lack of flexibility;
  - Sustainable mobility choices are experienced challenging to execute on an individual level.

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Vision and expected results

The main vision that drove the competition and the co-innovation process was sustainability viewed from three different angles: Environmental sustainability, social wellbeing, and economic sustainability. Specifically, the action focuses on environmental sustainability concerning the reduction of greenhouse gas emissions such as CO_2. An additional focus is depicted by the evaluation of social sustainability through an inclusion of different socio-economic backgrounds of citizens (e.g., vulnerable groups) in developing such mobility concepts. Lastly, new innovative business models should be economically sustainable and promote economic growth in the long-term, i.e., after the testing period and without additional funding resources, as provided in the context of the start-up competition.

Flexibility was another important aspect of the driving vision. Even though participants were expected to answer to the previously mentioned demands and themes, as well as to respond to environmental, social, and/or economic sustainability, the vision of the competition embraced a variety of solutions and innovative ideas. Therefore, the challenge brief was formulated in an open-ended way and welcomed ideas, business models or solutions that help transform the way people move sustainably in an urban setting.

The objectives and expected results were co-designed in cooperation with Gaia Consulting. At least 100 start-ups and companies were expected to be reached and 10-20 companies to hand in their solution proposals. In the next steps, a co-design, pitching, and mentoring process followed out. In the final step, one or two implementable pilot solutions were to be selected to be carried out. This baseline target was fulfilled. More than 140 companies were reached through communication channels and direct contacting by Gaia and KONE, out of which ten handed in solutions and eight were chosen for the final round of presentations.

Policy and financial frameworks

The start-up competition was carried out as an independent process and is thus not established in collaboration or based on specific municipal frameworks of the city of Espoo. This gave opportunity to follow KONE's own policy and goals.

In the process of choosing subcontractors for establishing the start-up competition three different proposals for subcontracting needed to be included in the tendering process, out of which Gaia was chosen to be the most suitable fit. Decisive factors for choosing Gaia were the pricing and their previous references in hosting and organizing similar sustainability challenges.

KONE facilitates annual start-up competitions, which have a global outreach and focus. Therefore, it was initially foreseen to make the sustainable mobility start-up competition part of this process. This option was eventually dismissed since the sustainable mobility start-up challenge had a specific local focus on implementing solutions in Espoo. Despite the global reach of start-ups and companies would have been wider, a risk was foreseen in attracting companies that were not established in Finland and would have limited possibilities to implement their solution locally in the scheduled time plan. During the planning process, in spring 2021, there were still global travel restrictions due to the

Covid-19 pandemic and it was difficult to anticipate how the situation would develop. A limitation for this process was thus also given by the SPARCS framework, which limited the scope to Espoo.

As the Sustainable Mobility Challenge was fully SPARCS related co-innovation process, it was financed entirely from KONE's SPARCS funds. The allocated budget consisted of human resources for organisation and facilitation of € 40000 divided by the organising partners. A single € 14000 contribution was allocated to the implemented project. Additionally, the jury members, the mentors and the participating teams contributed with human resources.

Partners & stakeholders

Besides KONE and Gaia Consulting, the following partners contributed to the process in varying degrees:

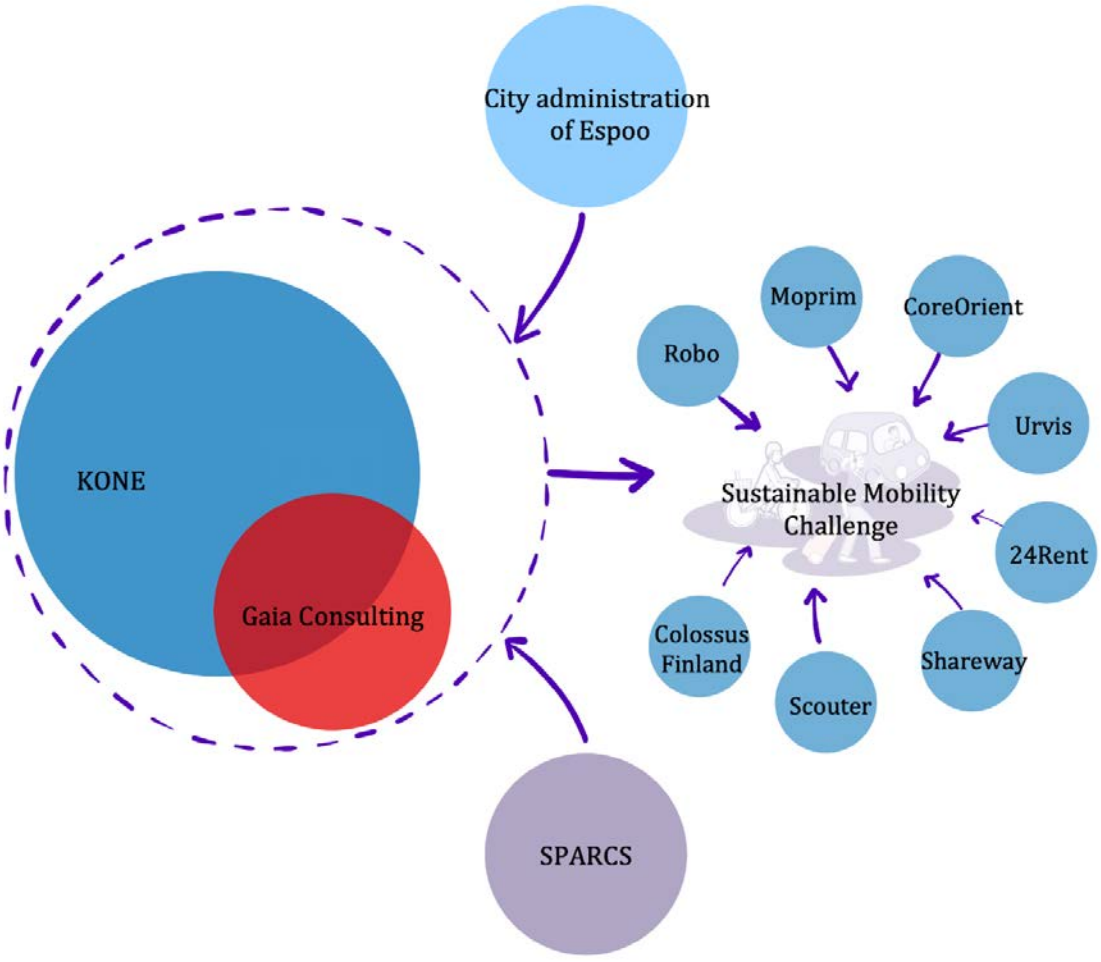

Figure 1: Sustainable Mobility Challenge, stakeholders & partners

- **KONE:** Organiser and facilitator of the implementation of the start-up challenge, set-up the overall strategy, selection criteria, communication in SPARCS channels and KONE social media channels, definition of goals and recruitment of mentors and jury members. Overall responsibility for the implementation of the project.

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- **Gaia Consulting:** Responsible for reaching out and communicating towards potential participant companies. Furthermore, Gaia contributed to the formation of the marketing brief and selection criteria, briefing the start-ups, mentors, and the jury with their respective tasks at each step of the process. Gaia coordinated the co-creation process, organized the matchmaking and pitching event and supported in the selection of the most promising solutions. Moreover, Gaia coordinated the ratings of each jury member and calculated the overall ratings of the start-ups.
- **Jury**: A jury was formed with five experts from KONE and the City of Espoo to evaluate the start-ups during the challenge competition pitching rounds.
- **Mentors**: Twelve mentors were selected to guide the start-ups through the competition process, develop, and give feedback on ideas and to improve and tailor the selected ideas towards the overall goals of the competition. Mentors were different experts from KONE as well as from the City of Espoo.
- **The City of Espoo:** Since KONE initiated the process, the City of Espoo took over an advisory role. This was displayed through its support in the mentoring and jurying process as well as providing support on the formation of the pilot after the competition.
- **SPARCS:** The SPARCS project provided the thematic framework, geographic focus, project funding and support in linking and comparing the processes of the start-up competition in the two LHC.

Steps and timelines

Phase 1, titled Game Plan, had an approximate duration of one month. It was constituted by setting up the basic rules of the innovation process, the selection and matchmaking criteria, the time schedules, objectives, and jury procedures. Potential start-up prospects were identified, contacted, and recruited to participate. The submission for proposals was due 1st October 2021. The jury board was selected, and a selection of the first-round pitching was carried out by KONE and Gaia.

Phase 2 refers to Pitching and Matchmaking and had a duration of approximately one and a half months. Evaluation templates and guidelines for the pitching session were established by Gaia Consulting. They also organised briefing sessions with the jury team. The first pitching event held in late October 2021 took place online and consisted of a 4-minute pitch followed by a 15-minute Q&A for each participating company. A meeting was called to evaluate the pitching sessions by the jury members and 4 start-ups were selected to advance to the next phases.

Phase 3 refers to the mentoring and selection of final implementation projects. It had a duration of approximately one and a half months. This phase consisted of refining the business solutions from the previous phase and conducting final pitching sessions with the selected start-ups. A guideline and a briefing session with the mentoring team were assisted by Gaia. KONE organized one-on-one mentoring sessions with the participant teams. Ultimately, a last round of pitching sessions took place at the beginning of December 2021 for the remaining four companies. A final selection of the project chosen for implementation between juries, mentors, and moderators was conducted following this step.

Phase 4 is the implementation and piloting of the selected smart city solutions. The pilot setup is expected to happen during the first half of 2022 and the pilot will be completed by the end of 2022. The following figure illustrates the steps chronologically.

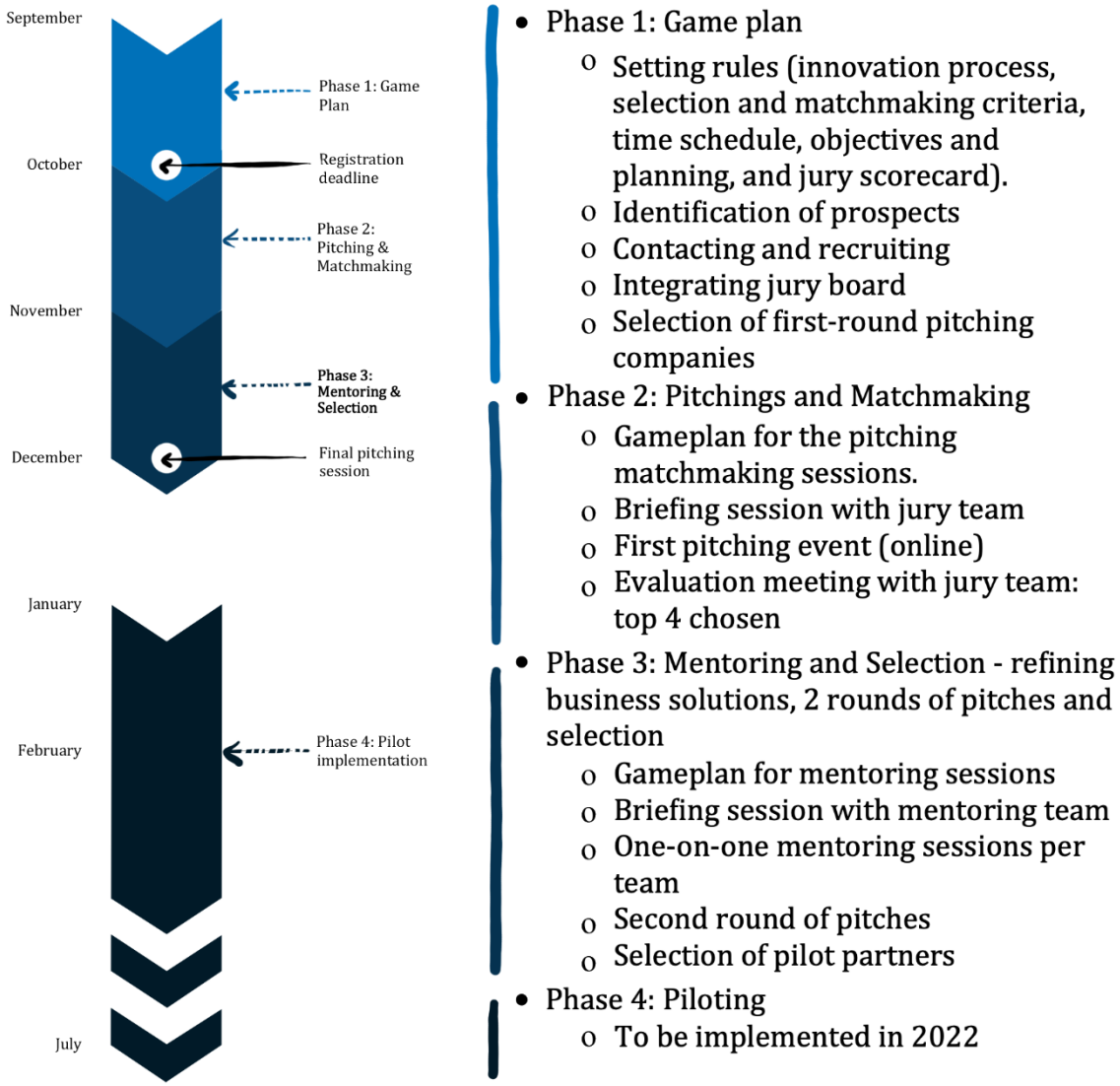

Figure 2: The four phases of Sustainable Mobility Challenge process on a timeline.

Selection criteria and juries

The selection of successful applications, filtering participants for the further rounds, and the implementation of selected pilot projects are based on different criteria.

For the selection of participants on the initial round both formal and implicit criteria were used to single out proposals. The initial criteria were developed by KONE based on previous business model co-creation work and supplemented by Gaia and Leipzig start-up competition criteria. The formal criteria were sustainability, differentiation, scalability, costumer value, trustworthiness, inclusivity, and implementation effort. The latter criterion was only applied in the second round of pitches.

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The following table provides brief guidelines and definitions of the above-mentioned criteria:

Table 1: Evaluation Template for the challenge proposals.

Criteria	Evaluation Guidelines
Sustainability	Considers how the idea supports climate targets and fosters social wellbeing while being economically sustainable
Differentiation	Considers how creative the idea is and how well it does differentiate from current competition.
Scalability	Considers the idea's potential for being globally scalable and attractive, while ensuring local customization.
Customer value	Considers how the idea empowers users, makes travelling easy, and improves users' control over their journey.
Trustworthiness	Considers how reliable the idea is: does it ensure safe and reliable handling of personal information and possible payments.
Inclusiveness	Considers how accessible and affordable the presented idea is, and whether it enables flexible and safe mobility for all.
Implementation effort [Criterion only applied in the second round]	Considers what is the potential realizing the projects, including maturity of the idea, and needed resources

Each criterion was evaluated with a point-based system ranging from 1-5 (5 being the highest) and open feedback for each category could be provided. In addition, the feasibility, and the piloting potential of the start-up ideas, the potential of scalability, and the maturity of the proposals were of major importance. Open feedback with regards to the quality of the pitch and the pitching material was also taken into consideration as implicit evaluation criteria. Another implicit criterion was the prospect of the company to implement the pilot within Espoo city. Since most companies were based in Finland, this aspect did not become overly significant.

The last category ("implementation effort"), which describes the piloting potential of the idea was not scrutinised in the first round of selection to allow for maximum creativity at this early stage of evaluation.

After the evaluation, feedback was shared with the participants. Gaia summarised the feedback from the jury members. Jury members were encouraged to provide extensive and constructive feedback to all participants for further development of their business

ideas. This aspect was especially relevant for the participants that were not chosen for advancing to the next round.

Further criteria regarding a) the maturity of the proposal, and b) the progress from the first selection to the second pitch were taken into consideration for the second round of selection.

The jury board and team of mentors

The jury was composed of members considered to be experts in their related domains. The following table gives an overview of the jury board, its affiliations, and its field of expertise:

Table 2: Members of the jury team.

Jury member	Affiliation	Expertise
Jury Member A	KONE (Head of Strategic Partnerships)	IT/IOT, strategic development, digitalization
Jury Member B	KONE (Senior Manager, Partner Ecosystem)	Business and finance, management, and business ecosystems
Jury Member C	KONE (New Equipment Business Functions)	Sales, management, business strategies
Jury Member D	City of Espoo (Project Manager, MAAS and public transport)	Service design, human-centered design, sustainable development
Jury Member E	KONE (Design research specialist, SPARCS project and mobility)	Design research, participatory design/co-design

Four out of five members are affiliated to KONE and provided expertise ranging from digitalisation, business and management to participatory design. One member represented the City of Espoo and brought expertise in human-centred design and mobility.

All five jury members were also part of the mentoring team. Further six members were recruited to compose the mentoring team. Among them, five were recruited from within KONE and one more represented the City of Espoo. Five of the eleven members are involved in the SPARCS project to guarantee that each mentoring team had SPARCS expertise within the team.

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Table 3: Members of the mentoring team.

Mentoring team	Affiliation	Expertise
Mentoring Team Member A	KONE (Head of Strategic Partnerships)	IT/IoT, strategic development, digitalization
Mentoring Team Member B	KONE (Senior Manager, Partner Ecosystem)	Business and finance, management and business ecosystems
Mentoring Team Member C	KONE (People Flow Offering and Sales Dev. Manager, New Equipment Business Functions)	Sales, management, business strategies
Mentoring Team Member D	City of Espoo (Project Manager, MAAS and public transport)	Service design, human-centered design, sustainable development
Mentoring Team Member E	KONE (Design research specialist, SPARCS project and mobility)	Design research, participatory design/co-design
Mentoring Team Member F	KONE (Program Director, Next-gen. Maintenance, Operations development)	Maintenance business, sustainable operations, mobility
Mentoring Team Member G	KONE (Design Research Specialist, SPARCS project and behaviour change)	Design research, strategic service designer
Mentoring Team Member H	KONE (Design Research Specialist, UX & Design, SPARCS project)	Design research, user experience design
Mentoring Team Member I	KONE (Energy and Environment Expert SPARCS project)	IoT, energy and technology
Mentoring Team Member J	City of Espoo (Specialist, Sustainable development, SPARCS project)	Sustainable development and urban mobility

Participants, filtering, and implementation of selected start-ups

First round participants

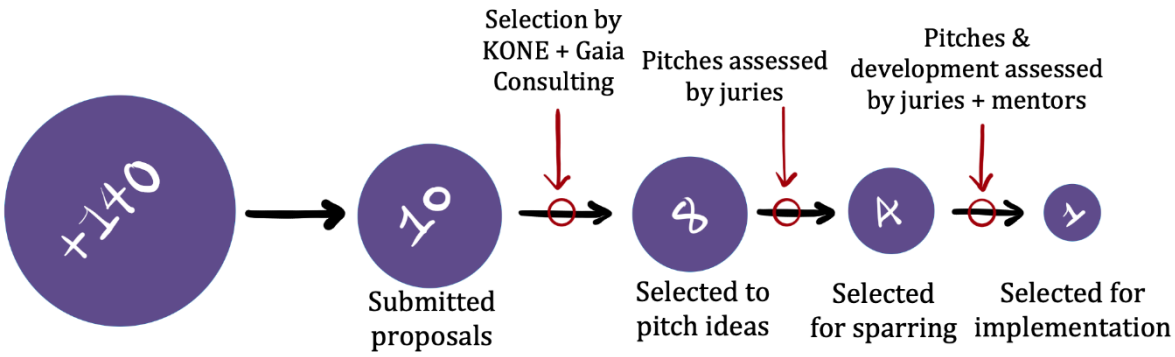

Figure 3: Participation and filtering process in Espoo

As illustrated in the figure above, from the 140 scouted and contacted start-ups, 10 submitted successful applications. Emphasising the sustainability and customer value selection criteria, KONE and Gaia Consulting selected 8 to continue to the phase 2. Based on the pitches, the juries assessed 4 as qualified to continue to the sparring phase. Based on the development and improvement of these 4 start-up ideas, and on another round of pitches, the juries and the mentors selected one final pilot project. The following table gives a brief overview of the 8 selected start-ups for the pitching sessions and their project proposal.

Table 4: 8 selected start-ups for the first pitching round in Espoo

Company	Description of the start-up
Robo	Robo is a service provider with transport solution based on autonomous vehicles with a turnkey solution for the first and last mile.
Moprim	Moprim is a software company developing data solutions for smart mobility based on patented methods for using accelerometers.
Urvis	Urvis is a one stop solution for last mile delivery offering robust e-cargo bike as a service with aim to provide a cargo bicycle that will grant its users greater flexibility in urban areas.
CoreOrient	CoReorient develops solutions for a sustainable society. The Helsinki based enterprise develops sustainable circular economy and sharing economy services and offers consultation in Finland, Scandinavia and globally for Smart Cities.
24Rent	24Rent provides car rental services and integrate car sharing service as part of fleet management operations

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Shareway	Shareway enables renting and sharing parking places. They provide sharing economy solutions in parking to reduce the amount of space and resources used in parking.
Scouter	Scouter Mobility Oy is a Finnish company focusing on designing and manufacturing lightweight vehicles. The company brings to a market place a Finnish innovation – Scouter. The vehicle is zero emission, safe, and active. As a two-seater e-bike with a large cargo space it offers similar capabilities to a car to users not having a driving license.
COLOSSUS Finland	Colossus Finland offers cargo bikes as a public service with an outlook to turn users to private cargo bike owners. Colossus offers to try out this lifestyle as part of their public cargo bike service, with an option to get a private cargo bike easily through the network after testing the public service.

Participants in the sparring/mentoring phase.

From the 8 participating start-ups presented in the previous table, four were selected to advance to the sparring/mentoring phase.

- MOPRIM: Smart mobility app
- URVIS: e-cargo bikes
- SHAREWAY: renting and sharing parking spaces
- COLOSSUS FINLAND: cargo bikes as a public service

After the selection of the four start-ups, it was evaluated what specific support would be crucial for each team. Based on that, the matches were made between mentors and companies. For the sparring process between the mentors and the teams, special attention was given to the instance that each mentor team had sufficient knowledge of the SPARCS project. A briefing session with the mentors was organised before a first meeting with the start-ups. Each mentor team had also one mentor, who is working in the SPARCS project and knew the purpose of the project in depth.

The sparring and mentoring phase was organised in a flexible manner. The number of meetings and duration was not fixed and was left to each team to agree. Each team had approximately 2-4 mentoring meetings during the period of 1 month. The degree of progress by teams also varied some teams had more prepared material for each mentoring session and others advanced less.

MOPRIM, chosen pilot project

After the assessment of mentors and juries during the sparing and pitching sessions, one start-up was selected to implement a pilot project in 2022. MOPRIM is a software developing company that proposes a community-based platform with an application to track travel chains. MOPRIM has signed a contract with KONE and piloting set up phase is expected to be finalised by the end of March. The implementation agreement reviewed by KONE determines the reach, the necessary improvements and features of the proposed application. The piloting itself is expected to start during spring 2022 and lasts until the end of 2022.

Obstacles for the implementation process

Several obstacles and challenges of the start-up competition occurred in different stages of the process, which yield potential for improvement for the implementation of such competitions in the future.

- Small pool of applicants.

With regards to the application phase, despite reaching out to more than 100 companies, only 10 handed in applications, out of which 8 were chosen for the final round. One obstacle in this regard was the limitations of the Finnish mobility market due to the necessity of companies being able to pilot their solution in Espoo. This was assessed as an obstacle for having a bigger outreach and led to few applications from outside Finland. However, also within the given outreach a larger response had been expected. Another factor was the Covid-19 pandemic and related travel restrictions, which may have restricted the eagerness of companies located outside of Finland to join the competition.

- Lack of maturity of the start-ups

Internal evaluations by KONE led to the conclusion that several of the small and medium-sized start-ups are in the built-up phase of their business infrastructure and thus often do not have formalised ways of working established yet. Furthermore, this implies limited resources regarding workforces that can participate in the start-up competition, since the main priority is establishing a product.

- Amount of price money

Participation in the start-up competition is thus ambivalent with regards to risks and opportunities. On one hand participation leads to further outreach and new business opportunities, but on the other hand it also implies increased workload for companies that have not yet established themselves on the market. This cost-benefit ratio is also linked to the amount of the price money of 14.000€ for piloting an idea, which was evaluated by KONE as a rather small amount. The rather small price was seen as unattractive especially by more firmly established companies. The budgetary restrictions for the pilot funding also led to not allowing for two pilots to be tested, since for that to occur, the budget would have needed to be split, which would have further decreased interest in participations.

- Framing of the challenge

Apart from organisational challenges, internal evaluations have shown that an open-ended framing of the challenges resulted in more open-ended proposals that were handed in. The proposals targeted many user challenges on a conceptual level, with a limited level of detail, and the economical profitability of the proposals were compromised.

- Assistance to mentors in the sparring process

With regards to the mentoring process, there was a limited access to engage mentors during the sparring-development process. To this end, more support from Gaia was expected to facilitate the mentoring process and aid in establishing a clear agenda for each

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meeting. This led to rather few developmental improvements between the first and second stage of the start-up ideas.

- Lack of sustainability experts

The mentoring process also saw a lack of experts in the area of sustainability. The organisations did not succeed in providing a sustainability expert for the jury team due to time constraints.

- COVID-19 restrictions

Finally, there also have been some COVID restrictions regarding meetings in person, which in all the described phases would have been beneficial for establishing a more direct contact and personal exchange with the start-up staff members.

Success factors for implementation

Within the evaluation of the start-up process several success factors for implementation were observed that dealt with the organisational structure of the start-ups, the framing of the challenges and the involvement of relevant stakeholders.

- Large target sample

During the recruitment process it was deemed crucial to target a large-enough sample size to yield enough feedback from companies. With regards to the companies targeted, enough mature organisational structures were deemed necessary for organisations to take part in the process. This aspect became clear during the competition when some companies lacked the resources for refining their ideas. The challenges of the start-up competition need careful framing, and the scope should be narrowed down at the earliest stage possible. This yields more clearly drafted proposals by participants.

- Communication means

Another important factor regarding the outreach of the competition are the communication channels used in the process to reach out to potential participants and to ensure that company networks (i.e., KONE; Gaia Consulting) are used efficiently.

- Commitment of the mentors

A further key factor for success is the mentoring and jury process, in which the feedback for participants is crucial for building and improving pilots. Furthermore, a good commitment of mentors is a necessity to this regard, which needs to be considered when mentoring is an additional voluntary task.

3. LEIPZIG'S SMART CITY CHALLENGE: PROCESS, DEVELOPMENT, AND IMPLEMENTATION

This chapter offers a brief documentation of the Smart City Challenge developed by the Digital City Unit of Leipzig in collaboration with the Smart Infrastructure Hub, implemented in the city of Leipzig. It informs on the basic constituent of the challenge, specifically: a) goals and justification, b) addressed local demands and selection of the themes, c) the overall vision and the expected results, d) its circumscribing policy and financial frameworks, e) the main stakeholders and involved partners, e) the followed timeline and activities, f) the criteria for selection and filtering of participants, g) the constitution of the jury board and other involved mentors, consultants, and moderators, h) a brief overview of selected start-ups, and, finally, i) obstacles and j) success factors for the development and implementation of the start-up competition.

Goals and Added Value

The main goal of the Smart City Challenge in Leipzig was to open the business atmosphere and the structures of public administration for innovation processes and creativity. To this end, the Digital City Unit of Leipzig has described itself a start-up, emphasising its role as an innovation opener for the different municipal departments. The aim was to broaden the mindset of all actors regarding the role and the importance of this sort of developing small and medium sized businesses.

The Digital City Unit is part of the department for economic development of the City of Leipzig. In this circumscription, another goal of the Smart City Challenge was to raise economic attractiveness and incentivise the business culture for start-ups in the city.

Local Demand and Selection of the Theme

The local demand for the Smart City Challenge 2021 as much as the selection of the different themes that would constitute it were identified through discussions for the elaboration of the city challenge concepts of 2020. An external group of experts oversaw developing this proposal.

The most important actors involved where the challenge providers. The challenge providers are the different administrative departments of the City of Leipzig that determined and oversaw each theme.

- Challenge Economic Development Office, Tourism Coordinator, LTM Leipzig Tourism and Marketing GmbH
- Challenge Environmental Protection Office, Unit for Environmental Information Systems
- Challenge from/for civil society, Council Affairs Office

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These different departments supervise the development of the Smart City Challenge in each thematic category. Their managerial capacities and institutional constitution articulated trustworthiness to the Digital City Unit to act as challenge providers. For the three challenges the following criteria were published, to which potential participants should adhere:

- **Digital urban tourism ("Virtual interactive sightseeing for families through Leipzig")**
    - Digitalisation in the form of apps;
    - Create new on-site experiences;
    - In combination with gamification, edutainment and storytelling;
    - Attract families to Leipzig's city centre;
    - Interactive and child- and adult-friendly;
    - Considering the central tourism data base of the Tourismus Marketing Gesellschaft Sachsen.
- **Urban environmental data ("Urban environmental data – see & understand")**
    - Innovative and interactive way to convey invisible urban data to the public;
    - Citizen-oriented administration;
    - Barrier-free digital solutions and strategies for digital communication for the public;
    - User-oriented;
    - Expandability to include additional environmental topics;
    - Spatio-temporal data, sensor data or modelled data;
    - Focus on air quality or urban climate as test example;
    - Development of low-threshold, media-didactic tools (e.g.: app, portal.);
    - Consideration of sustainable data structure;
    - Integration with municipal geodata infrastructure;
    - Low maintenance;
    - Linkage with website of the City of Leipzig.
- **Civil society and participation models ("Innovative cross-linking of participation models. Information – Cooperation - Networking"). Two sub-thematic areas:**
    - **Joint project development**
    - **Exchange and networking**
        - Innovative and inclusive digital tools that enable participation "bottom-up" processes;

- In the interface between urban actors such as business and science;
- In cooperation with local democracy and city administration;
- Testing new forms of democratic processes;
- Obtain a market overview of digital-analogue solutions for strengthening civil society exchange, engagement and co-production in the context of bottom-up processes in urban development and discuss possible interfaces for expanding the city's own participation infrastructures;
- Models to be tested in two specific areas in Leipzig;
- Motivation of communities;
- Intuitive usability;
- Online and offline participation;
- Open-source solutions preferred;
- Presentation of costs, follow-up costs as well as technical knowledge for operation, transfer of knowledge about the tool in organisations.

Vision and Expected Results

One driving vision for the Smart City Challenge 2021 is derived from the obstacles of conventional procurement processes. In the past, these kinds of processes have been the standard to attract new services and ideas. However, the Digital Unit of the City of Leipzig considered that conventional commercial procurement processes are inflexible and leave little room for innovation. The challenge for 2021 was then conceived as inspired by, but beyond, procurement processes to allow for more holistic mechanisms and improved involvement of the civil society through competition.

Additionally, the challenge is conceived as ground to practically test innovative ideas. This would allow to evaluate which kind of ideas stand to scrutiny in real business and innovation environments. In this regard, the feasibility and the possibility of scaling up were other crucial *foci* in selecting the projects.

The expected results are to boost the start-up ecosystem in the city of Leipzig and promote financial and institutional attractiveness for new business and services to be piloted in the city. The Smart City Challenge is expected to be reiterated in the future and the 2022 version is already in open call.

Policy and Financial Frameworks

The Smart City Challenge 2021 is based within the public procurement framework of the City of Leipzig. It is therefore based on municipal management, regulations, and funding. The public funding consisted of up to € 25.000 for each of the three implemented projects, as well as of € 2000 for each of the nine selected start-ups in the first round. The SCCL21

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is based on phases of selection, screening, development, and implementation of ideas. It is an open bid for commercial enterprises.

Each Challenge provider had to calculate up to 42 to 55 hours working hours to manage the challenge. The working hours split into the different steps as follows:

- Online assessment 4.0 - 5.5 hours
- Kick-off & further development phase 13.5 - 18 hours
- Jury session: pitch event 4.0 - 4.5 hours
- Implementation phase 18 - 24 hours
- Demo Day: Pitch event 2.5 - 3 hours

The screening and development process within each thematic area was supervised by each municipal department. The overall organisation and communication were the responsibility of the Digital City Unit.

The Smart City Challenge was financed entirely by the City of Leipzig's budget. No additional funding was foreseen in the framework of the SPARCS project. The challenge, however, was demarcated geographically to the city of Leipzig by the agreements with the SPARCS project.

Partners & Stakeholders

Besides the Digital City Unit, the different challenge providers, the following partners contributed to the process in varying degrees:

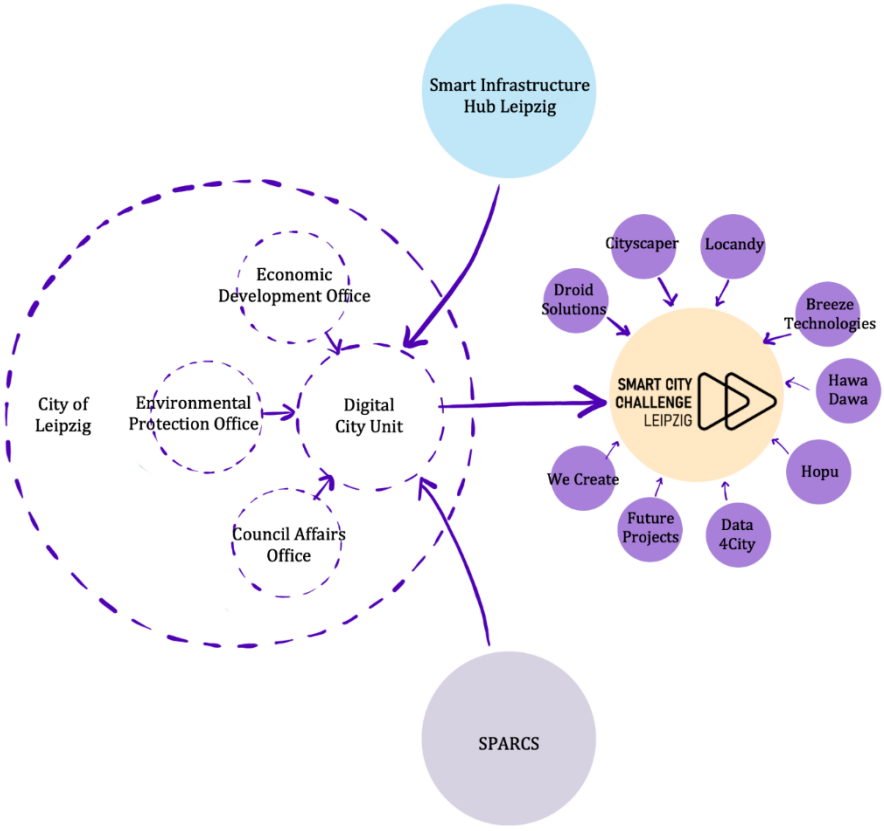

Figure 4: Smart City Challenge, stakeholders & partners

- **Digital City Unit (Digital Campus Leipzig):** Facilitator of the implementation of the start-up challenge, set-up, and communication. Along with the other challenge providers, it defined the selection criteria and goals.
- **Smart Infrastructure Hub and SpinLab:** linked players and projects, moderated between actors to support a strong network for new partners and projects.
- **Jury**: A jury was formed with 9 members to evaluate the start-ups during the competition. The members represented the Economic Development Office, the Leipzig Tourism and Marketing GmbH, the Council Affairs Office, the SpinLab Accelerator, Impact Hub Leipzig, the Office for Geoinformation and Land Use Planning, the University of Leipzig, and a local district stakeholder.
- **Mentors**: the challenge in Leipzig did not compose a designated mentoring team.
- **Offices of the City of Leipzig:** Supervised and collaborated on the planning and moderation of the development of each respective challenge, filtering and selection of participants, and directed the mentoring/development phase.
    - **Economic Development Office, Tourism Coordinator, LTM Leipzig Tourism and Marketing GmbH,** for the Virtual Interactive Sightseeing challenge.
    - **Office for Environmental Protection, Unit for Environmental Information Systems,** for the Urban Environmental Data challenge.
    - **Council Affairs Office,** for the Civil Society and Participation Models challenge.
- **SPARCS:** The SPARCS project provided the thematic framework, geographic focus, and support in linking and comparing the process of the start-up competition in the two LHCs.

Steps and Timelines

Phase 1 consisted of an open call for competitions and idea collection. The call was open for two months from March 2021 to the 7th of May of 2021. After the closing of the deadline, three proposals per thematic area were selected: one for digital tourism, one for urban environmental data, and one for civic participation. The nine selected start-ups received a 2000€ price for their qualification.

Phase 2 is considered the development phase and took place for 2 months. The nine selected start-ups worked in collaboration with one of the three different challenge providers/city administration offices to further develop and refine their solutions and ideas. At the end of this period the proposals were again presented in a final pitching event. In each thematic field, one of the three proposals was selected to advance to the implementation phase.

The implementation phase took place during the second semester of 2021 and had a duration of approximately 6 months. The three selected start-ups received a price up to 25000€. During this implementation phase, the different challenge partners supported and continued guiding the start-ups. However, after this last challenge phase each start-

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up is required to further pursue its idea without additional funding. However, some of the challenge providers have already stated interest in further pursuing the ideas and supporting the process. The following figure illustrates the steps chronologically.

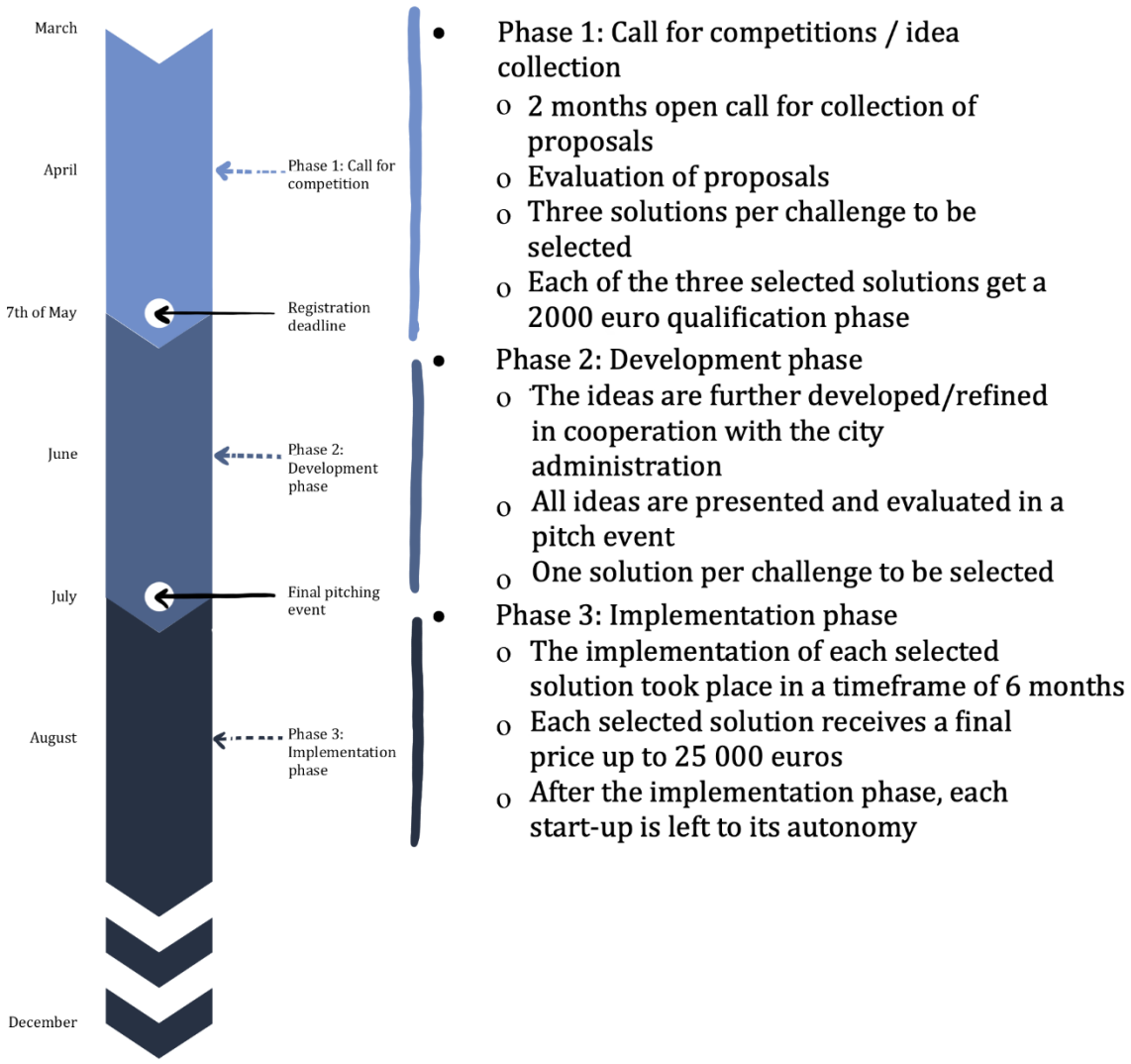

Figure 5: Smart City Challenge, stakeholders & partners

Selection Criteria and Jury

There were different selection criteria used for the different phases of proposals. The proposed ideas were first assessed based on the general proposal, the degree of innovation, the realisation potential, the overall understanding of the challenge, the team standing behind the start-up, as well as the overall impression of the pitch deck. The work plan as well as the financial plan were also considered implicit criteria in the evaluation of each proposal.

During the development phase, the four additional criteria composed the evaluation format: progress in further development phase (compared to first stage), were the conditions and tasks from the development phase addressed, realisation potential or feasibility, and scalability. In both phases, each criterion was evaluated in a 1 to 5 scale. The criteria had equal coefficients and weighted the same importance. The following table presents a brief account of each criterion.

Table 5: Leipzig's evaluation template.

Criteria	Evaluation Guidelines
Idea	Considers the general value of the proposed idea by each member of the jury subjectively.
Degree of innovation	Considers how novel or creative this idea is in comparison with the conventional implementations and start of the art solutions.
Realisation potential	Considers the technical and practical feasibility of the idea for implementation.
Overall understanding of the challenge	Considers the level of understanding of the goals, themes, and vision of the challenge by each proposing start-up.
Team behind the Start-up	Considers the experience, references, and portfolio of each start-up.
Overall impression of the pitch	Considers the quality of the presentation and its capacity to present the team, communicate the idea, and address doubts.
Progress from development phase [Criterion only applied in the second round]	Considers whether the selected start-ups have been able to further develop and refine the proposal, through the development phase, in comparison with initial proposal.
Were conditions and tasks addressed [Criterion only applied in the second round]	Considers whether the necessary and assigned actions and conditions given by the mentors were successfully addressed.
Realistic / Feasibility [Criterion only applied in the second round]	Considers the practical and technical feasibility of the proposal given the new state of development of the proposal.
Scalability [Criterion only applied in the second round]	Considers the capacity of the proposal to address new financial, geographical, and demographical scales.

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Jury board and team of mentors. The jury members were selected from the Smart Infrastructure Hub accelerator programme, from the three respective challenge providers, and from the Digital City Unit. The following table gives an overview of the jury board, its affiliations and its field of expertise:

Table 6: Members of the jury team.

Jury members	Affiliation	Expertise
Member A	Economic Development Office, Tourism coordinator	Tourism, marketing and economic and regional development
Member B	Leipzig Tourism and Marketing GmbH	Tourism, marketing
Member C	Office for Environmental Protection	Environmental protection, sustainability, air quality
Member D	Council Affairs Office	Citizen engagement and participation
Member E	SpinLab Accelerator	Start-ups, digitalization, business development
Member F	Impact Hub Leipzig	Sustainability, Start-ups, business development
Member G	Office for Geoinformation and Land Use Planning	Data analysis and visualization
Member H	University of Leipzig, Information Technology	IT, data analysis, AR and VR
Member I	District stakeholders	Local experience

Each member represented a different affiliation. These members provided expertise ranging from tourism and marketing to sustainability and environmental protection, as well as start-up business development, and data analysis and visualisation. One member provided expertise in the fields of citizen engagement and participation. Local district stakeholders provided experience regarding local scenarios and needs. No dedicated mentoring team was involved in the implementation. The development phase was taken over by the same challenge teams.

Participants, Filtering, and Implementation of Selected Start-Ups

First round and development phase participants

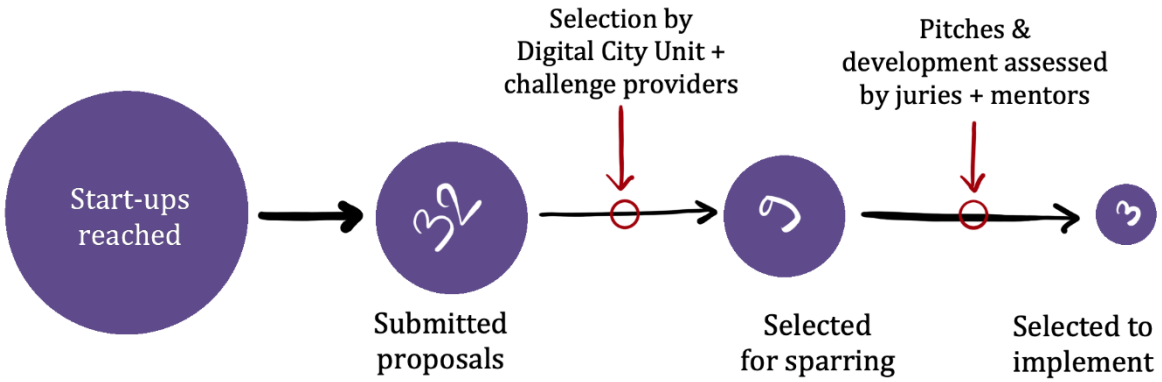

Figure 6: Participation and filtering process in Leipzig

As illustrated in the figure above, thirty-two participants submitted proposals for the Smart City Challenge 2021. From these, eight were originally from Leipzig. Considering the above-mentioned criteria, the Digital City Unit in collaboration with the different challenge providers selected nine proposals to continue to the next phase. Three proposals were selected for each thematic area. The following table gives a brief overview of the first nine selected start-ups.

Table 7: Selected start-ups for the development phase in Leipzig

Company	Description of the start-up
Digital tourism: Virtual interactive sightseeing.	
droid solutions	DroidSolutions is creating an app that can guide families with children in particular through Leipzig in an interactive tour with all kinds of playful content.
cityscaper	With an innovative apps, interested parties can use an augmented reality (AR) application to virtually discover project ideas as well as get informed and educated about existing sights and buildings. This company entered two different ideas, on the category of digital tourism, and another in the category of civil participation.
locandy location based games & stories	Locandy develops interactive and mixed-reality digital games and storytelling experiences for entertainment, education, and tourism.

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Urban environmental data	
HawaDawa The future of air quality management	HawaDawa focuses on measuring air quality and creates predictive models for measuring air in the city.
BREEZE TECHNOLOGIES	Breeze Technologies works with air quality sensors and data analysis to measure and improve air quality.
hopu Smart Cities	Hopu deals with Internet of Things (IoT) solutions. It supports urban development and seeks to provide environmental monitoring solutions.
Civil society	
cityscaper	(Same above)
DATA4CITY	Data4City is a research project focused on citizen-centered urban platforms for the generation of urban data by and for citizens.
fp	Future Projects supports, develops and pursues innovative software for community participation and collaborative projects.
WE CREATE	WeCreate is creating a platform for the exchange of ideas between citizens, institutions, and communities.

There were two weekly meetings held to decide which of the three start-ups per challenge would proceed into the further development phase. The challenge providers had to give certain framework conditions which had been depicted by solutions about accessibility, design requirements of the City of Leipzig as well as the interfaces of designed software solutions. The criteria for selection in this regard focussed questions regarding the different levels of progress as well as the evaluation which were the best ideas for implementation. Within the process it was evidenced that some of the applicants did not follow certain requirements while others did. The different teams were advancing their projects at different paces, which led to some of the developed ideas being very creative but not feasible in the framework of the start-up challenge.

Chosen start-ups per theme

For further implementation, one selected idea per challenge qualified for the pilot phase. This phase started in July 2021 and ran for approximately 6 months. During the implementation phase the Digital City Unit, whilst acting mainly from the background, controlled all the work and progress that emerged within the piloting phase. One of the three selected projects was originally a start-up from Leipzig.

Figure 7: DroidSolutions, selected start-up for pilot implementation in the Virtual Interactive Sightseeing category.

Figure 8: HawaDawa, selected start-up for pilot implementation in the Urban Environmental Data category.

Figure 9: Cityscaper, selected start-up for pilot implementation in the Innovative Cross-linking of Participation Models category.

Obstacles or handicaps

Several obstacles and challenges of the start-up competition occurred in different stages of the process, which yield potential for improvement for the implementation of such competitions in the future.

- Communication

One of the main hindrances of the process was the short 10 to 15 minutes time span for the pitches. Overall, several misunderstandings between the challenge providers and the pitch deck have been identified, which is the reason why for further projects a clearer explanation of the challenges needs to be provided. Furthermore, some misunderstandings of the projects emerged which could be avoided by enlarging the pitch deck and to give additional minutes of preparation to understand the crucial points of the project.

Another communication issue are language restrictions. English proficiency played a hindering role because some of the challenge providers as well as some international start-ups were not able to work in English language during the pitching sessions and during the development phase.

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- External actors and agreements

One obstacle relates to the degree to which external actors are able to engage and the agreed commitments. If external departments need to be involved in the implementation phase, the timeframe as well as the personal capacity to join meetings must be taken more into account.

- Start-ups staff stability

A further obstacle emerged regarding the staff capacity of start-ups. Some of the participant start-ups might have had less well established internal human resources. This presented a problem for some start-ups to maintain a steady participation in the process. There is a need for clear and projects-lasting involvement of start-up actors so that a change of staff in this role should be avoided as best as possible.

- COVID-19 restrictions

Finally, there also have been some COVID restrictions regarding meetings in person, which in all the described phases would have been beneficial for establishing a more direct contact and personal exchange with the start-up staff members.

Potentials and advantages

Within the evaluation of the start-up process, several success factors for implementation were observed that dealt with the decision to step away from conventional procurement processes, funding from the city administration, and the diversity of solutions proposed.

- Differentiation from commercial procurement processes

The main potential of the innovation competition lies in the differentiation from conventional commercial procurement procedures. The Digital City Unit argues that this made it possible to get in touch with and/or develop completely new approaches and solutions that could normally not have evolved during a standard procurement procedure. The flexibility of the process allowed for creativity to reflect on the solution of ideas.

- Funding

Being a municipal initiative, the SCCL21 had a sufficiently attractive financial incentive for start-ups to participate. This possibility for start-ups to access capital provided a sense of being taken seriously and an opportunity that is not usually given by big company incentives.

- Diversity of ideas

Another advantage for Leipzig has been the wide-spread geographical and conceptual approach of the challenge. This is considered as a marketable reach for the involvement of ideas from all over Europe.

4. RECOMMENDATIONS AND STRATEGIES FOR FUTURE REPLICATIONS

This last chapter provides a brief recap of the main achievements of each smart city challenge. However, its main purpose is to provide helpful notes and considerations drawn from a general view of both challenges for replications of this process. As stated in the introduction of this deliverable, the finality of this document is to guide future initiatives through the barriers and potentials of both small private initiatives and larger public initiatives.

Summary of Achievements

Sustainable Mobility Challenge in Espoo

Kone and Gaia were able to approach and invite considerable number of start-ups to participate in the Sustainable Mobility Challenge. As mentioned in the previous chapters, around 140 initially contacted businesses were reached. From that pool of potential candidates 10 start-ups submitted proposals and 8 where preselected. 4 companies participated in the second stages of the process in the development and monitoring phases. Finally, 1 company, Moprim was selected to implement a pilot in Espoo city.

The current strategy lies in the implementation of Moprim's developed proposal. Current discussions are negotiating the integration of the city administration in the pilot.

As mentioned by KONE's representatives, even though the original reach of submitted proposals was deemed insufficient, the process was considered a success. SPARCS will contribute to KONE's goal of making an example out of the Sustainable Mobility Challenge for future interested implementors.

Since the piloting of the selected start-up is still being implemented, it is too early to assess whether it succeeded in bringing new innovative concepts and promote sustainability in Espoo. This aspect can be addressed in D7.13 due to M48.

Leipzig

After two months of open call for the Smart City Challenge 2021, 32 start-ups submitted proposals in the three different categories. 8 of these proposals came from start-ups based in Leipzig. 9 projects were taken to the second stage of development and refining of proposals, out of which 3 projects, one for each category qualified to be implemented in the final piloting stage.

Currently the piloting stage is finalizing the implementation of the three proposals: DroidSolutions for Digital Tourism, HawaDawa for Urban Environmental Data, and Cityscaper for Participation Models. Even though the official strategy for the continuation beyond the challenge period expected the start-ups to develop themselves with not further assistance, some challenge providers have stated interest to further pursue the initiatives. Furthermore, the Smart City Challenge 2022 is currently in open call for submission of ideas.

With the existence of initiatives like the Smart Infrastructure Hub and the De:Hub Digital Ecosystem it is challenging to test whether the SCCL21 will in fact succeed in boosting

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attractiveness for start-ups in the city of Leipzig. It is however, one of the most important actions of its kind and its impact and support to the start-up ecosystem will not go unnoticed. Future assessments on this issue will be necessary.

General recommendations for future replications

The following recommendations are drawn from an inspection and comparison of both smart city challenges. It is aimed at Fellow Cities that wish to replicate similar initiatives as well as to other private or public entities with a similar goal in mind. Some recommendations are more or less axiomatic and are also general theoretical ideals. Others are rather more incisive.

- Organisation

KONE was emphatic about the importance of elaboration of all plans and organisational matters with considerable anticipation. For instance, the Sustainable Mobility Challenge began the call for participation before a finalised jury and mentoring roster was established. This learning shows the necessity of setting up the necessary timeframes, schedules, and programs to avoid unexpected or unrehearsed situations, ideally at the outset of the process. However, in today's fast paced business atmosphere it is sometimes encouraged, or even necessary, to launch processes without a fully delineated roadmap.

It is then a basic recommendation for any implementor to dedicate sufficient effort and resources (if possible) to define an entire workplan beforehand. This will allow challenges to be adequately framed so that participants can grasp a better understanding of the expectations. Additionally, internal and external participants (such as juries and mentors) can also have a clearer picture of their engagement and therefore provide a better contribution.

- Criteria and coefficients

The following recommendation refers to the nature of the evaluation criteria. Both KONE and Leipzig used criteria with equal weights to assess and select proposals. As an example, criteria such as feasibility, or sustainability coherence had equal influence on the start-up's references and experience. Weighted coefficients on the other hand allow for more differentiated judgements of different project aspects. Some arguments can be made as to whether some criteria do have more weight than others for this kind of competitions. For instance, in the case of start-up competitions, where participants may not necessarily have much previous experience or portfolio, other criteria should count to a greater extent. In fact, weighted coefficients are the standard in procurement processes.

It is, therefore, necessary in the hands of possible future replications to decide as to whether equally weighted criteria or criteria with different coefficients create a more adequate assessment template. This decision is in the hand of future implementors of such start-up city challenges.

- Maturity of the start-ups

Both KONE and the City of Leipzig outlined that the size and maturity of the start-ups had an impact as to whether the participants could engage or develop more interesting proposals and stick to the process. Small companies with newly established teams,

organisations, and resources don't have the capacities of more established companies. Since these competitions are precisely about targeting these companies to cultivate innovative solutions, it is necessary to expect less financial, personnel, and organisational capacities compared to larger and more settled companies.

The first round of qualification price implemented by Leipzig is one solution to keep the very small companies interested and provide some financial support. Another solution would be to not only separate participants into thematic categories, but also in categories of capacities. Start-ups that are constituted of a dozen employees and with initial personal investments may not have the capacities of a bigger and better financially supported start-up. Naturally, this solution can complicate the organisation of the competition but will ensure fairness and more precise support and attractiveness for start-ups.

- Sustainability within the challenge.

It was noted that, even while working in the smart city industries, some start-ups had a limited understanding of sustainability aspects. The proposals were however interesting and diverse. There is then a need to engage the participating start-ups with sustainability concepts during the challenge. KONE suggests a brief introduction to sustainability in business to the sparring start-ups as one solution. It is also necessary to engage sustainability both in the jury and mentoring team, both for the assessment of the proposals and for the overall guiding of participants through the topic.

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5. CONCLUSIONS

This chapter concludes the main observations and recommendations drawn from the two studied smart city start-up challenges affiliated with the SPARCS project: the Sustainable Mobility Challenge implemented by KONE in Espoo city, and the Smart City Challenge implemented by the Digital City Unit in the city of Leipzig. This deliverable is an attempt to inform and guide future private or public entities that wish to implement similar competitions. Although, it is mainly directed at Fellow Cities within the SPARCs project.

KONE and Leipzig coincided on their main goals and intentions. Both conceived their respective smart city challenges as a mean to bring innovation and creativity to the business atmosphere. While Leipzig seeks to revitalize the processes themselves within the public administration, KONE aimed at supporting innovation in business ideas and sustainability solutions in general. Both actors acknowledge the importance to host new and more agile perspectives to tackle contemporary urban-environmental, social, and economic challenges. Their aim of boosting attractiveness for start-ups in their respective cities is an attempt to bring private and public entities at the epicentre of development and innovation in smart city practices.

Being a public entity and having access to a broader array of expertise from their challenge providers, Leipzig followed a broader approach to sustainability and smart city development by formulating a challenge in three categories (broadly social, economic, and environmental). KONE, on the other hand, based its approach on the experience and expertise of the company to narrow down its take on sustainability and smart city developments to the mobility sector.

Both actors did however follow a practical approach to the definition of themes since they relied on the expertise of the implementing actors to delineate the scope. An exclusive problem-oriented approach would, on the other hand, define themes solely based on a study of specific local demands.

The expected outcomes can be contemplated in terms of quantitative appraisal of direct engagement or in terms of mid- to long-term qualitative impacts of the competitions. Both KONE and Leipzig had previously delineated a quota of applications, selected participants, and implemented pilots. It is then easier to assess whether the number of participants or implemented solutions has been met. However, they both also contemplate the indirect impact of the competition in the start-up business ecosystems as an expected result. Obviously, the latter is harder to assess and determine whether the expectations are met, but it is crucial, nonetheless.

KONE implemented its competition based on private frameworks, regulations, and financing. Leipzig proceeded with municipal ones. Whether this difference was a determining factor that allowed one actor (e.g.,) more flexibility of processes or a larger founding is debatable. KONE encourages however, future implementations to seek mixed endeavours between public and private actors for the development of future start-up competitions.

At the core, both competitions followed a process broadly similar to pre-commercial procurement processes. They were both based on steps of development for the refinement of services and solutions. They did both however saw value in flexibilizing the

mechanism and adapting to local temporal and organisational demands. Future implementors will benefit from a good understanding of commercial procurement processes, but also from effort into determining personalized timeframes, framing and engagement of internal and external actors.

Finally, other factors such as communication vehicles within the process (e.g., exchange formats and language proficiency requirements), are also critical for the success of the endeavour. Addressing the different degrees of capacity of the participant start-ups, as well as to determine impartial but sensible systematic evaluation criteria are an added value to fair and attractive smart city competitions.

This deliverable is a first take on the development of the start-up city challenges in Espoo and Leipzig. Future tasks will keep following up the upcoming strategies and initiatives in the mentioned cities, as well as to further analyse and synthesize guidelines and recommendations for replication purposes in the Fellow Cities.

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6. ACRONYMS AND TERMS

AR	Augmented reality
FHG IAO	Fraunhofer
FC	Fellow Cities
ICT	Information and Communication Technologies
IOT	Internet of Things
LEI	Leipzig
LHC/ LhC	Lighthouse Cities
Q&A	Questions and Answers
SCCL21	Smart City Challenge 2021
SMBs	Small and Medium Businesses
SPARCS	Sustainable Energy Positive & Zero Carbon CommunitieS
UX	User experience
VR	Virtual reality
WP	Work package

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