IRIS

Integrated and Replicable Solutions for Co-Creation in Sustainable Cities

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Deliverable 2.1

Lessons learnt through cooperation with other Lighthouse projects

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Version History

Version	Date	Modifications made by
0.8	31 Jan 2023	Muriel Pels – full draft to WP-internal reviewer (ESCI)
0.9	14 Feb 2023	Muriel Pels - pre-final draft to WP-external reviewer (NCA), IRIS Quality and Risk Manager, and IRIS Project Coordinator.
1.0	21 Feb 2023	Muriel Pels - final version to IRIS Project Coordinator for submission

Disclaimer

Executive Summary

The Deliverable 2.1 “Lessons learnt through cooperation with other Lighthouse projects” summarizes the contribution of IRIS to the identification and analysis of barriers and drivers in legislation, regulations and policies as experienced by the LHs and FCs at local, national and European level, and provides recommendations for adaptation, mitigation and lobby addressing specifically the barriers, focusing on barriers that can be addressed effectively within the scope of the project.

The Deliverable focuses on:

- IRIS engagement in the collaboration with other Lighthouse projects and related initiatives to understand barriers and drivers in scale-up and replication.
- IRIS contribution to understanding of barriers and drivers for scale-up and replication in these collaborations;
- IRIS lessons learnt in three key barriers in IRIS.

Since the start of IRIS in 2017, the collaboration landscape has expanded: not only has the number of Lighthouse projects to collaborate with, doubled. Also many related initiatives, supporting the Lighthouse project, ended, merged, and were newly established.

Alongside, the discourse on what replication is and how it happens, has evolved. Research questions that surfaced were:

- What do we look for when we talk about replication? What is the SCC01 definition of the object of replication?
- What are Key Performance Indicators for replication? How do we measure replication?
- What does it take to score high on these KPIs for replication? How to enable replication?

To make best use of the available expertise in other Lighthouse projects and related initiatives, IRIS became chair of SCC01 Task Group Replication in September 2019. As chair of the SCC01 Task Group Replication, IRIS has contributed to the understanding that replication is not a copy-paste exercise of an integrated solution. It is rather adaptation, or even customization, of solution ideas to local stakeholders, and to local contexts such as climate, national legal and fiscal frameworks, as well as available budgets and financing instruments.

This culminated in the contribution to the Scalable Cities Call for Experts for the Study on Systemic changes in governance in 2021, in the form of a first draft theoretical framework of the conditions for acceleration of replication, based on the many presentations and discussions in the Task Group Replication.

The lessons learnt in Task Group Replication where simultaneously learnt in IRIS implementation and replication, as actively exchanged and explored in IRIS Consortium Plenary Boards from 2019 onwards, and later also in the Site Management and Replication Board. From the wealth of lessons learnt, three IRIS Key Barriers are selected for this Deliverable to look at in detail.

Lessons learnt on these three IRIS Key Barriers and the nature and conditions for replication as understood by IRIS in collaboration with other Lighthouse projects and related initiatives, are presented as recommendations for newer projects and other cities on their journey to being smart climate-neutral cities and communities.

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List of Abbreviations and Acronyms

Abbreviation	Definition
ALEX	IRIS Fellow City of Alexandroupolis (Greece)
API	Application Programming Interface
BaaS	Building as a Service
BIM	Building Information Model
BoC	Board of Coordinators of the 18 Horizon2020-SCC01 Lighthouse projects
BOS	Building Operating Systems
CCG	Scalable Cities City Coordinators Group (2021-today)
CPB	IRIS Consortium Plenary Board (similar to General Assembly in other projects)
EIP-SCC	European Innovation Partnership for Smart Cities and Communities (2014-2019) – now integrated in SCM
EMS	Energy Management System
EV	Electric Vehicle
FC	Fellow City
FOC	IRIS Fellow City of Focsani (Romania)
GOT	IRIS Lighthouse City of Gothenburg (Sweden)
LHC, LH City	Lighthouse City
MaaS	Mobility as a Service
NCA	IRIS Lighthouse City of Nice Cote d'Azur (France)
PED	Positive Energy District
Scalable Cities	EU service contract (2021-today) in support of SCC01 BoC and TGs
SCC01	All 18 Lighthouse projects that have been selected under Horizon2020 call Smart Cities and Communities 01.
SCIS	Smart City Information System (2017-2020) – now integrated in SCM
SCM	Smart City Marketplace, follow-up of / incorporating EIP-SCC and SCIS
SCT	IRIS Fellow City of Santa Cruz de Tenerife (Spain)
SMRB	IRIS Site Management and Replication Board (coordinated by WP8)
TG	Task Group of the BoC of the 18 Lighthouse projects (one of five 2017-2021: Replication, Business modelling and financing, Communication, Monitoring, Data management).
UTR	IRIS Lighthouse City of Utrecht (The Netherlands)
VAASA	IRIS Fellow City of Vaasa (Finland)

1 Introduction

1.1 Scope, objectives and expected impact

Scope

This report is the Deliverable of **Task 2.1 "Cooperation with selected Lighthouse projects"**, which aimed at identification, analysis and effective dealing with the main barriers and drivers for the introduction and adoption of intelligent, user-driven and demand-oriented urban energy infrastructures and services, by learning from others, and contributing with own experiences. Activities in this Task were:

1) **Exchanging barriers and drivers at national and European level**, notably in the Community of Practice of Dutch Lighthouse cities (2019-2021), the SCC01 Task Group Replication (2019-2022) and in the Scalable Cities City Coordinators Group (2021-2023).

2) **Collaborating with other Lighthouse projects and related initiatives to tackle three IRIS key barriers.**

The **Deliverable 2.1 "Lessons learnt through cooperation with other Lighthouse projects"** summarizes the contribution of IRIS to the identification and analysis of barriers and drivers in legislation, regulations and policies as experienced by the LHs and FCs at local, national and European level, and provides recommendations for adaptation, mitigation and lobby addressing specifically the barriers, focusing on barriers that can be addressed effectively within the scope of the project.

The Deliverable focuses on:

- the value of the collaboration with other Lighthouse projects and related initiatives for the understanding of barriers and drivers for scale-up and replication in the implementation of IRIS integrated solutions;
- how IRIS has contributed to this understanding;
- and how these understandings have been applied in addressing three key barriers in IRIS.

Resulting in recommendations for new(er) projects and other cities to accelerate scale-up and replication of integrated solutions that help cities on their journey to climate neutrality.

NB: Deliverable 2.1 focuses on barriers and drivers other than those related to standards in ICT. Barriers and drivers in ICT, notably those related to urban data platforms, are addressed in D2.2 "Improvement of existing standards and interoperability issues of ICT".

Target groups of this Deliverable:

I. Cities selected for the Horizon Europe Mission on Climate Neutral & Smart Cities.
II. Horizon 2020 Lighthouse project coordinators (notably of newer projects) and cities.
III. Other cities embarked on the journey to climate neutrality.
IV. European Commission funding policies aiming to contribute to European green deal strategy, enhancing energy efficiency, adaptation of society to climate change and resilience of cities and communities.

The above target groups have already been informed of some of the main findings of this Deliverable through Task Group Replication and Scalable Cities (a.o. City Coordinators Group) during runtime of IRIS.

Expected impact of this Deliverable:

The expected impact of this Deliverable is to gain a better understanding of barriers and drivers in planning, implementation, scale-up and replication of Lighthouse integrated solutions among the above-mentioned target groups, in order to (not reinvent the wheel and) accelerate the European transition to climate neutrality.

1.2 Contributions of partners

- UTR: T2.1 Lead, D2.1 Editor.
- CERTH: T2.1 Co-lead, D2.1 Section Editor.
- VAAS: T2.1 Co-lead, D2.1 Contributor, SCGP Tester.
- ESCI: T2.1 Partner, D2.1 Contributor, D2.1 Reviewer.
- NCA: T2.1 Partner, D2.1 Contributor, D2.1 Reviewer.
- SCT, CCS: T2.1 Partner, D2.1 Contributor, SCGP Tester.
- VUB, HKU, UPB, ICEM, CSTB, GOT, JSP, CHALMERS, MERI, UVA, ALEX, E-HIVE: T2.1 Partner, T2.1 Contributor.

1.3 Relation to other activities

WP1: D2.1 builds on the typology of barriers and drivers, as well as the actual barriers and drivers encountered in the demonstrations in M1-12 of IRIS, mentioned in D1.6.

WP3: D2.1 contributed to D3.9 *IRIS Beyond Business Plan* (chapter "Partnerships with external organizations'). This section of D3.9 addresses existing and conceivable partnerships with external organisations, as partnership for the city are valuable for knowledge sharing for the continued development of IRIS solutions and uptake by other cities. D2.1 contributed to the overview of initiatives /networks and their relation to the IRIS Lighthouse Cities. This includes the EU Mission "100 Climate Neutral and Smart Cities" and the projects, service contracts and Task Groups supporting it, such as NetZeroCities (project), Scalable Cities and Smart City Marketplace (service contracts), and the Task Groups Replication and Monitoring (SCC01 Task Groups) .

WP5, 6, and 7: D2.1 builds on barriers and drivers mentioned in D5.1, D6.1 and D7.1, and in barriers and drivers mentioned in CPB and SMRB sessions.

WP8: D2.1 contributed to D8.1 Replication roadmap, D8.3 Replication toolbox. and D8.12 European level replication plan, as well as their updates.

WP9: D2.1 contributed to D2.3 on KPIs international cooperation, with a section on lessons learnt within other Lighthouse projects and related initiatives regarding KPI's on replication, drawing from the experiences of other Lighthouse projects and related initiatives/ service contracts. Notably through the exchanges in the SCC01 Task Group Replication that was chaired by IRIS (T2.1) 2019-2022.

WP10: D2.1 provided input for several articles, and an academic article on barriers and drivers

1.4 Structure of the deliverable

Chapter 2 describes how IRIS engaged in, contributed to and benefitted from the evolution of the 'collaboration landscape' (all other Lighthouse projects and related initiatives on barriers and drivers for replication of Lighthouse solutions) and from the evolution of the discourse on barriers and drivers for replication.

Chapter 3 describes how lessons learnt were applied in and distilled from three IRIS key barriers, as surfacing from the IRIS Transition Tracks in the process of implementation, scale-up and replication.

Chapter 4 offers conclusions, and recommendations for newer projects and other cities how to make best use of what's already there, both in the collaboration landscape, as well as lessons learnt in IRIS on these three key barriers.

2 Engaging in collaboration and discourse

2.1 Engaging in the evolvement of the collaboration landscape

Since the selection of the IRIS project in 2017, **the number of Lighthouse projects has doubled** from 9 projects early 2017, to 18 projects late 2020, as can be concluded from Table 1.

Table 1 The family of selected Lighthouse projects

	Start	Project	Lighthouse cities	Fellow cities
18	2020	**RESPONSE**	Dijon, Turku	Brussels (BE), Zaragoza (ES), Botosani (RO), Ptolemaida (GR), Gabrovo (BU) and Severodonetsk (UA)
17	2019	**SPARCS**	Espoo, Leipzig	Maia, Kifissia, Reykjavik, Kladno, Lviv
16	2019	**ATELIER**	Amsterdam, Bilbao	Riga, Kopenhagen, Budapest, Bratislava, Krakow, Matosinhos
15	2019	**PoCITYf**	Alkmaar, Evora	Granada, Bari, Celje, Ujpest, Ioannina, Hvidovre
14	2018	**MAKING-CITY**	Groningen, Olou	Vidin, Bassano del Gappa, Lublin, ~~Poprad~~, Léon, Kadiköy
13	2018	**CityxChange**	Limerick, Trondheim	Smolyan, Písek, Võru, Alba Iulia, Sestao
12	2017	**IRIS**	Utrecht, Nice, Gothenburg	Vaasa, Tenerife, Focsani, Alexandroupolis
11	2017	**MatchUP**	Valencia, Antalya, Dresden	Oostende, Herzliya, Kerava
10	2017	**STARDUST**	Pamplona, Tampere, Trento	Derry, Kozani, Litomerice
9	2016	**RUGGEDISED**	Rotterdam, Umeå, Glasgow	Gdansk, Brno, Parma
8	2016	**MySMARTLife**	Nantes, Hamburg, Helsinki	Varna, Bydgoszcz, Rijeka, Palencia
7	2015	**REPLICATE**	San Sebastian, Florence, Bristol	Essen, Nilüfer, Lausanne
6	2015	**SmarterTogether**	Lyon, Munchen, Wenen	Santiago de Compostela, Venetie, Sofia
5	2015	**SmartEnCity**	Vitoria-Gasteiz, Tartu, Sønderborg	Lecce, Asenovgrad
4	2015	**Sharing Cities**	Londen, Lissabon, Milaan	Bordeaux, Burgas, Warschau
3	2014	**GrowSmarter**	Stockholm, Barcelona, Keulen	Graz, Porto, Suceava, Cork, Valetta
2	2014	**Triangulum**	Manchester, Eindhoven, Stanvanger	Leipzig, Sabadell, Praag
1	2014	**ReMoURBAN**	Valladolid, Nottingham, Tepebasi/Eskisehir	Seraing, Miskolc

Since the start of the IRIS project in 2017, the **landscape of initiatives/organizations supporting the 18 Lighthouse projects in scale-up and replication** of smart solutions for energy transition and climate neutrality, has become a **'network of networks'**:

- At the time of conception of the IRIS project (2015-2016), the **European Innovation Platform on Smart Cities and Communities (EIP-SCC)** service contract was the dedicated platform for collaboration between Lighthouse projects and related initiatives, hence its appearance in the title of Task 2.1 that this deliverable is related with.

- In 2017-2019, the **Smart City Marketplace (SCM)** and the **Smart City Information System (SCIS)** service contracts manifested themselves as second and third collaboration platforms.
- In 2021, **EIP-SCC and SCIS ended,** their work was incorporated by the SCM.
- In 2021 the new **Scalable Cities** service contract was established in support of the Board of Coordinators (BoC) of the 18 Lighthouse projects (including the BoC's five Task Groups), including a **City Coordinators Group**.
- From 2022 onwards, several new projects selected under the HorizonEurope **Mission for Smart & Climate-Neutral Cities** aim to support cities in the scale-up and replication of smart solutions for climate neutrality. For example the **NetZeroCities project**.

The above evolution in the European context of IRIS, led to an increasing number and interconnectedness of European smart city support and collaboration networks, with overlapping ambitions, objectives and offers to cities, by 2018. This posed a challenge to T2.1 in keeping IRIS partners well-informed on collaboration opportunities, of what project/initiative/network offered what for whom when where - in 2022 described by some IRIS partners as **"collaboration congestion"**.

2.2 Chairing SCC01 Task Group Replication (2019 – 2022)

During 2016-2019, the community of selected Lighthouse projects established five Task Groups to share experiences and cooperate for optimization of visibility, impact, and replication. IRIS has been represented in each of these five Task Groups from the beginning. In each by the most relevant IRIS partner for that Task Group:

- **Task Group *Replication*.** IRIS representative: VAASA (IRIS Replication Manager).
- **Task Group *Business Models and Financing*.** IRIS representative: IMCG (IRIS Business modelling Manager).
- **Task Group *Communication*.** IRIS representative: ESCI (IRIS Communication Manager).
- **Task Group *Data*.** IRIS Representative: UTR (IRIS Interoperability and Standards Manager).
- **Task Group *Monitoring*.** IRIS Representative: RISE (IRIS Monitoring and Evaluation manager).

The IRIS WP2 and T2.1 Leader became chair of the Task Group Replication in 2019, together with the IRIS WP8 Leader as co-chair, with support from (vice-chair) +CityxChange. The Task Group Replication was first established in 2015, out of the need of the first Lighthouse projects to create a multitouch tool together to inform the audiences at conferences and fairs about the Lighthouse projects. TG Replication organized online meetings of about two hours every last Thursday of the month (outside Summer and mid-Winter). Focus gradually shifted from communication and dissemination to identification of barriers and drivers in scale-up and replication of Lighthouse projects integrated solutions. A highlight was the SCC01 replication event organized by EC-INEA in close cooperation with TG Replication in January 2018 in Brussels. This well-attended event offered Fellow Cities access to SCC01 solutions of the then 12 Lighthouse projects in thematic workshops. The results of the meeting were input to the 2018 SCIS policy report on barriers and drivers ***"Why may replication (not) be happening?'.***

The January 2018 event in Brussels was followed by similar best practice sharing/replication events, often with site visits, about every half year, organized by the Lighthouse project then chairing the BoC in cooperation with the Task Groups. In addition to these SCC01 'family meetings', TG Replication met

live at EIP-SCC General Assemblies and at the Smart City Expo & World Congress in Barcelona, for four years in a row (2016-2019) until the Covid epidemic stopped anything live in January 2020.

Inspired by the January 2018 event, IRIS took over chairing the TG Replication from the GrowSmarter project from September 2019 onwards, until September 2022. In these three years, TG Replication consistently had around 70 members receiving the agenda and minutes of the monthly 2-hour virtual meetings (except summer months and December). Each meeting was attended by 20-25 members (among which the 18 Replication Managers of the Lighthouse projects), generally representing over 80% of the Lighthouse projects and the service contracts (SCIS, EIP-SCC, Smart City Marketplace, Scalable Cities).

Overall goals of the Task Group Replication were:

- Sharing replication (best) strategies and results between Lighthouse projects.
- Sharing replication (best) experiences and results between Fellow Cities and their innovation ecosystems.
- Dissemination and exploitation of TG Replication findings and results.
- Collaboration with European research networks and with European other city networks in support of scale-up and replication.

See for more detail: Annex 3: T2.1 report on TG Replication for Scalable Cities Secretariat

Between September 2019 and October 2022, Task Group Replication organized 25 meetings/sessions, of which:

- meetings offline alongside other European meetings (Lyon, Brussels, Utrecht), before and after C-19 restrictions.
- 1 session online in close cooperation with Lighthouse project MatchUp during the European Sustainable Energy Week (2020).
- 1 session online during the European Week of Regions and Cities (2021). Moderated by EUROCITIES the event staged the Fellow Cities of Parma (IT), Bydgoszcz (PL), Lviv (UA), and Vaasa (FI), sharing stories highlighting the importance and best practices of local innovation ecosystem development, based on the European Innovation Council's 2020 report on Innovation Ecosystems, notably the requirements of Connectedness, Capacities, and Capital.
- online sessions organized together with the Scalable Cities Coordinators Group (2021-2022), two on the Mission Smart Climate-Neutral Cities (December 2021, January 2022), and two in support of the Scalable Cities expert study on Systemic changes in Governance for Innovation Ecosystems (March 2022, April 2022).

In these 25 sessions, presentations were given by Replication Managers, Fellow Cities and topical experts of many Lighthouse projects, as well as by EUROCITIES, Smart City Marketplace, EERA JPSC, Scalable Cities (+ City Coordinators Group), and by the Task Group Replication chair herself.

As chair of Task Group Replication, IRIS presented the work and findings of the TG replication in several related networks such as EERA-JPSC (2020), Viable Cities (2021), and the SmartEnCity final event (2022).

In December 2021 – January 2022, IRIS as chair of Task Group Replication also contributed to the Scalable Cities Call for Experts for the Study on Systemic changes in governance. This contribution had the form of a first draft theoretical framework of the conditions for acceleration of replication, based on the many presentations and discussions in the Task Group Replication, in cooperation with 3rd

Mission Paper chief editor Annemie Wyckmans, December-January. In this framework TG Replication summarized the following essential conditions that need to be met, finetuned and approved by the Lighthouse projects Board of Coordinators in May 2020, in line with the three main pillars for innovation ecosystems as identified by the European Innovation Council in 2020:

- Work from the beginning on **Connectedness** between stakeholders in urban decarbonization ecosystems and across borders:
    - Organize local and regional stakeholder alignment processes in urban decarbonization ecosystems for climate neutral cities;
    - Support alignment of local /regional ecosystems with National Energy and Climate Plans, benefitting from common language, climate, and notably national legal and fiscal frameworks;
    - Organize cross-border exchange between urban ecosystems (e.g. EU Digital Innovation Hubs strategy).
- Work from the beginning on **Competence** of stakeholders in urban decarbonization ecosystems to implement and scale innovations:
    - Support capacity building, notably on innovative financing mechanisms (including technical assistance e.g. on monetization of benefits including social and environmental benefits, innovation procurement);
    - Organize trusted, comprehensible, accessible information in one place, standardizing terminology (e.g. through Solution Booklets and guidance materials[2], in business modelling and financing), as well as KPIs on impact sought (such that it serves stakeholder alignment processes and capacity building);
    - Research and make available what is being scaled-up and replicated where, and why (such that it serves stakeholder alignment processes and capacity building);
    - Ensure expertise of financiers/investors in pilot phase of projects by specifying this need in call texts.
- Work from the beginning on **Capital** in all phases of the urban decarbonization ecosystem:
    - Support smaller projects.
    - Support capacity building on different financing mechanisms for different stages of the project among all local/regional stakeholders (including innovation procurement).
    - Support hybrid financial packages to attract additional funds and couple them with cities' financing mechanisms."

As IRIS ends 1 April 2023, during Summer 2022 the **chairing of TG Replication was transferred to the ATELIER project (2019-2025)**, which took over fully in M61, in close cooperation with the Scalable Cities Secretariat's City Coordinators Group.

2.3 Engaging in the evolvement of the discourse on drivers and barriers for replication

Since the conception of the IRIS project in 2015, the smart city concept has evolved from a merely technical concept to a more socio-technical approach. It came to include urban data platforms, citizen engagement, business modelling and procurement, positive clean energy district thinking and requirements of systemic governance for innovation ecosystems. However, reports of successful replication of smart city solutions remain relatively rare. Since the start of IRIS in 2017, many studies have been done to get a grip on replication and make it happen. Research questions that surfaced were:

- What do we look for when we talk about replication? What is the SCC01 definition of the **object of replication?**
- What are Key Performance Indicators for replication? How to we **measure replication**?
- What does it take to score high on these KPIs for replication? How to **enable replication?**

To increase understanding of replication, the Task Group Replication of the SCC01 Lighthouse projects started working from 2014 onwards on identification of barriers and drivers that were occurring in the Lighthouse projects. This was mostly through meetings of the projects' Replication Managers, and an SCC01 replication event in Brussels, co-organized with INEA. The work provided input for a paper published in 2017 by the European Innovation Partnership on Smart Cities and Communities (EIP-SCC): *Towards a joint investment programme for European smart cities* (2017).

European Innovation Partnership on Smart Cities and Communities (EIP-SCC): Towards a joint investment programme for European smart cities (2017)

This paper was drafted by the coordinator of Task Group Business Models & Financing, Graham Colclough, on behalf of the EIP-SCC. The paper aimed to speed up the adoption of smart city solutions in Europe, by having 300 cities invest 1 billion euro in by 2019. The paper observed in 2017 a trend in cities to continue externalisation of what was in the past considered 'public' services: utilities, transport, health, waste and the like. As a result, cities shift from investing/operating themselves to commissioning performances to others. New business models are required that involve cross-functional (and often cross-sector) interdependencies in which delivered value accrues to different parties over different timescales. The EIP-SCC *Towards a joint investment programme for European smart cities* program paper intended to build investor and broader market confidence by developing the concept of 'packaging solutions', as Lighthouse projects are implementing fairly similar measures.

Smart City Information System (SCIS): Why may replication (not) be happening (2018), and Solution Booklets (2018-2020).

In November 2018, Smart City Information System (SCIS) published a Deliverable called *Why may replication (not) be happening*, targeted at EU policy makers. In this paper, SCIS mentions, remarkably hidden on page 7, the following aspects of replicability of smart city solutions, which may be underlying the typology used seven months later for the Solutions Booklets (targeted at cities):

- technologies
- business models
- governance
- legal context
- social acceptance

- user motivation
- capacities & knowledge
- budget

Around the same time, a cooperation between EIP-SCC and Smart City Information System (SCIS) was established to develop Solution Booklets in support of scale-up and replication. A Solution Booklet is a summary of the management framework, primarily written for cities. It seeks to reduce the effort, speed up the process, strengthen quality and confidence in outputs, align across disciplines, and generally prepare a city to engage the market to acquire a solution.

All Solution Booklets follow more or less the same Table of Contents, in which five to seven chapters contain lessons learnt, covering barriers as well as drivers for replication:

- what & why
- city context
- societal and user aspects
- technical specifications
- business models and finance
- governance & regulation
- general lessons learnt

By 2020 SCIS had published Solution Booklets on E-bus, Urban freight logistics, Batteries and PV, Building envelope retrofit, Building integrated PV, District heating and cooling, Heat pump drive district heating systems, Citizen engagement, Electric vehicles & the grid, From idea to implementation, Positive energy districts, and Energy communities.

The Solution Booklets were very positively received by many Fellow Cities in the Lighthouse projects.

European Innovation Partnership on Smart Cities and Communities in cooperation with NTNU: Smart City Guidance Package (2019)[1]

In May 2019, alongside the development of the Solution Booklets, the Smart City Guidance Package was developed by the Marketplace of the European Innovation Partnership on Smart Cities and Communities, specifically its Action Cluster on Integrated Planning, Policy and Regulation, in cooperation with NTNU. The Smart City Guidance Package is an overall urban governance and planning manual meant to help plan and implement smart city low energy district projects in an integrated way. Its methodology consists of seven elements:

- Political mandate for implementing sustainable development;
- Identifying and engaging stakeholders, developing consensus on priorities;
- Evaluating, benchmarking and measuring current and future conditions that impact progress toward sustainable development;
- Developing and implementing a coherent action plan;
- Forecasting and back casting methods for bridging visions, targets and actions;
- Setting targets and KPI's for sustainable development;
- Meeting city's needs to carry out all these functions;
- Monitoring, reporting and verification. clarify responsibilities;

[1] Borsboom, Judith & Gindroz, Bernard & Costa, Simona & Georgiev, Georgi. (2019). Smart City Guidance Package.

- Ensuring that there is consensus on who holds the coordinating role that has the needed competency and can be a vision holder to safeguard that the project fulfils the decided KPI goals and that criteria are met.

The Smart City Guidance Package may be compared to a tree structure to which the Solution Booklets are attached as its leaves.

European Innovation Council (EIC): Towards a robust innovation ecosystem for the future of Europe (2020)[2]

In 2020, the European Innovation Council published the report *Towards a robust innovation ecosystem for the future of Europe* (2020) in which the following four pillars were identified for innovation ecosystems:

1. Connectedness of stakeholders
2. Competence and talent
3. Capital
4. Cross-cutting challenges.

This presented a whole new way for SCC01 projects and related initiatives of looking at replication: not as the result of solving barriers to implementation, but **replication as the result of development of an innovation ecosystem based on these four pillars**. This was much in line with the experiences and best practices that were shared by Lighthouse and Fellow Cities in TG Replication in 2019-2021. This, together with findings in IRIS, led Task Group Replication to provide input to the Call for Experts for the study on Systemic changes in governance (December 2021 – January 2022. In this framework TG Replication summarized the following essential conditions that need to be met, finetuned and approved by the Lighthouse projects Board of Coordinators in May 2020, in line with the three main pillars for innovation ecosystems as identified by the European Innovation Council in 2020:

- Work from the beginning on **Connectedness** between stakeholders in urban decarbonization ecosystems and across borders:
  - Organize local and regional stakeholder alignment processes in urban decarbonization ecosystems for climate neutral cities;
  - Support alignment of local /regional ecosystems with National Energy and Climate Plans, benefitting from common language, climate, and notably national legal and fiscal frameworks;
  - Organize cross-border exchange between urban ecosystems (e.g. EU Digital Innovation Hubs strategy).
- Work from the beginning on **Competence** of stakeholders in urban decarbonization ecosystems to implement and scale innovations:
  - Support capacity building, notably on innovative financing mechanisms (including technical assistance, for example on monetization of benefits including social and environmental benefits, innovation procurement);

[2] Towards a robust innovation ecosystem for the future of Europe – stakeholders perspectives | European Commission (europa.eu)

- Organize trusted, comprehensible, accessible information in one place, standardizing terminology (for example through Solution Booklets and guidance materials[2], in business modelling and financing), as well as KPIs on impact sought (such that it serves stakeholder alignment processes and capacity building);
- Research and make available what is being scaled-up and replicated where, and why (such that it serves stakeholder alignment processes and capacity building);
- Ensure expertise of financiers/investors in pilot phase of projects by specifying this need in call texts.

- Work from the beginning on **Capital** in all phases of the urban decarbonization ecosystem:
  - Support smaller projects.
  - Support capacity building on different financing mechanisms for different stages of the project among all local/regional stakeholders (including innovation procurement).
  - Support hybrid financial packages to attract additional funds and couple them with cities' financing mechanisms."

2.4 SCC01 Task Group Replication and Scalable Cities: systemic changes in governance needed

In 2022, the Scalable Cities service contract (established in 2021 in support of the Board of Coordinators of the 18 Lighthouse projects and its Task Groups) formed an **Expert Group on systemic changes in governance structures**[3]. The expert group was to perform a study and deliver a report (+ Solution Booklet) on systemic changes in governance, that should equip local governments to realize climate-neutral and smart cities.

Why a study on systemic changes in governance? According to the **100 climate-neutral cities by 2030** report (September 2020), the present silo-based form of governance, designed and developed for traditional city operations and services, cannot drive an ambitious climate transition. Therefore, a systemic transformation is urgent, accompanied by a more strategic, holistic and long-term climate investment approach, together with a new city governance for climate action. The holistic approach, as opposed to the silo approach, will require a change of habits and style of management. The main capabilities/competences that should be assured at the city level are:

a) Organizational capabilities, including orchestration; connection with regional, national and European initiatives; and political support.
b) Technical capabilities, including capacitation; learning by experimenting; advising; financial and project management.
c) Design and monitoring capabilities, including designing; strategic and evolutionary evaluation; and KPI monitoring.

In the preliminary findings of the study of the Expert Group (at the time of this writing - January 2023 - the report was not officially published yet), the definition of 'governance' is in line with the findings of the Task Group Replication and Scalable Cities City Coordinators Group: "The framework of rules,

[3] Judith Borsboom-van Beurden, Adriano Bisello, Dusan Jakovljevic, Tomas Vacha, Daniele Vettorato

procedures, roles and responsibilities that constitute decision-making processes and project management". In the preliminary findings it is stated that "the transition to climate neutrality calls for inclusive co-design processes for urban planning and implementation of solutions, requiring new ways of thinking, working and collaborating. The main challenge seems to be the work in silos of themes, data, tasks, responsibilities, and timelines. The resulting different perceptions of problems and solutions seem to hinder a holistic innovative approach".

As is further detailed in D2.3, this Expert Group study on systemic change in governance may be considered an effort to identify KPIs for replicability. In fact, the third effort: after SCIS *Why may replication (not) be happening* being the first, and *EIP-SCC Smart City Guidance Package*, being the second.

2.5 Drivers and barriers in IRIS

At conception phase, IRIS grouped its integration solutions in five **Transition Tracks**:

1. **Renewable and energy positive districts**
2. **Flexible energy management and storage**
3. **Intelligent mobility solutions**
4. **Digital transformation and services**
5. **Citizen engagement and co-creation**

In May 2019, IRIS published its first Deliverables from the Lighthouse demonstrations: per Lighthouse city a Deliverable on demonstration baseline, ambition, activities, and barriers & drivers, covering the first 24 months of the project. Two of the three Lighthouse cities (Utrecht and Gothenburg) included a paragraph 'Barriers and Drivers' in this Deliverable. Input for this was provided by IRIS partners involved in the implementation of the integrated solutions. Utrecht noted that "in some cases, when there is not a 100 % certainty that the barrier will materialize, barriers may be viewed as risks. In the same fashion, drivers may be viewed as opportunities."

Utrecht and Gothenburg used the same tool to group barriers and drivers encountered: the so-called PESTLE tool for analysis of the business environment:

- ***P**olitical*
- ***E**conomic*
- ***S**ociological (which seems the largest group in Nice)*
- ***T**echnological*
- ***L**egal/Regulatory framework (which is by far the largest group in Utrecht)*
- ***E**nvironmental*

At that time, there was a lot of overlap in classifications of barriers and drivers by other networks and initiatives, using the same structuring principles:

- per target group (public authorities, market, citizens)
- per solution (construction mostly, not much about data platform, mobility), or
- per type of barrier (economic, social, regulatory, technical).

Based on this, a first typology of barriers and drivers was developed by CERTH:

Drivers

- ***Legislation and regulation*** – transposition of the EPBD and other EU directives to national legislation
- ***Demand*** – structuring and bundling of the demand for solutions from public authorities can be considered as a market incentive while lack of clarity and scale in cities' demand for these solutions may be seen as a barrier for cities to replicate and for investors to gain trust in demand-driven smart city solutions.
- ***Fiscal drivers*** –fiscal obstacles at national level.
- ***Public sector support***.
- ***Awareness and knowledge*** – in particular awareness of consumers that NZEBs may be more comfortable or to actors in the supply chain, who are familiar with the solutions that exist for building NZEBs and NZE settlements.

Barriers

- ***Technological barriers*** – the lack of skills and expertise throughout the construction sector, but also uncertainty as to how new technologies perform.
- ***Economic & Financial barriers*** – high costs of construction, and the difficulty of obtaining financing, while fiscal aspects are relevant notably in V2G.
- ***Regulatory and legislative barriers*** - the unclear definition of NZEB and a lack of policy coherence.
- ***Market organization barriers*** - a lack of communication and insufficient partnerships within the sector, notably relevant for business modeling of multiple sector (data) platforms.
- ***Awareness and knowledge (credibility) barriers*** - a lack of familiarity with existing solutions by professionals is exacerbated by the lack of mainstream examples of good practice and robust data from nearly zero energy homes, which has created an environment of confusion and misinformation.
- ***Institutional barriers*** – the construction industry is a conservative one (though this can be considered a cultural barrier), and there is resistance by constructors and developers to the changes needed in order to build reliable NZEBs at a large scale, possibly due to lack of trust.
- ***Social and behavioral barriers*** - saving energy depends a lot on the users themselves and not just the design of the buildings and its systems.

In the course of the implementation of IRIS, the lessons learnt in the Task Group Replication also turned out to be relevant for IRIS: replication is not a copy-paste exercise of an integrated solution. It is rather adaptation, or even customization, of solution ideas to local stakeholders, and to local contexts such as climate, national legal and fiscal frameworks, as well as available budgets and financing instruments. To get a better grip on this, IRIS established several regional Communities of Practice.

See for more detail: Annex 1: Main barriers and drivers encountered in IRIS, per Transition Track

2.5.1 Establishing national Communities of Practice in IRIS

In addition to exchange of knowledge and lessons learnt with other Lighthouse projects and related initiatives, IRIS also sought connection with national networks of Lighthouse and Fellow cities in M13-M30. Examples of this are the 6-weekly telephone conferences of IRIS Lighthouse city UTR with all other Dutch Lighthouse cities (3 in 2017, 6 in 2020) to discuss implementation issues. This resulted for example in cooperation between UTR and Lighthouse city Rotterdam of RUGGEDIZED on smart public lighting (M28-M30). Another example is the cooperation between three of the Dutch Lighthouse projects (TRIANGULUM, RUGGEDIZED and IRIS) to create the Practitioners guideline on open urban data platforms, published by Dutch standardization body NEN, and presented March 2020 at the

annual conference of the Open & Agile Smart Cities (OASC) in Brussels. Another example of cooperation in national networks of Lighthouse and Fellow cities comes from Finland where IRIS Follower city Vaasa cooperated with other Finnish Lighthouse and Follower cities (Making-City, MatchUP, mySMARTLife, STARDUST) to gain insight in social and economic aspects of successful replication (Jan 2020).

2.5.2 Discovering a new Transition Track "6" for replication: governance

During the IRIS Consortium Plenary Board in Vaasa June 2019 the need for a description of the making of the IRIS demonstrations was identified as an important part of the Replication Roadmap and/or Toolbox, developed in 2019 in WP8 Replication. The need for a process description as a tool for replication was highlighted by two different Fellow Cities during the IRIS CPB in Vaasa, June 2019:

"Coordination of investments of stakeholder and city are not timed very well, benefits are not clear, everything is delayed, we need to align priorities and budgets."
"Before, many participation processes failed. But now we have six (political)groups agree on the strategic plan, and everybody is committed. Keywords: openness, and trust."

In the second year of IRIS, it appeared not so easy for Fellow and other cities to define and implement the process to turn the preliminary investment plans into a definitive investment plan for their city. How to come to choices for specific integrated solutions to accelerate the energy transition, in a specific district, in a given time? How to find the stakeholders and connect their interests collaboratively in an investment plan? To provide insight in these processes, UTR (WP2, T2.1 lead) interviewed in July 2019 local key players in the conception of the IRIS project, notably the process that resulted in the IRIS demonstration descriptions. Interviewed were:

- Carolien van Hemel, director of Utrecht Sustainability Institute (coordinator of the IRIS Utrecht demonstration and implementation plan WP5 in IRIS), and
- Inge van de Klundert, senior policy advisor Energy with Municipality Utrecht.

These interviews resulted in the IRIS web post **'How to build a smart city: innovation diplomacy, transparency, trust, and a healthy amount of conflict?'** (IRIS Project, 2019, see Annex 2: Transition Track "6": innovation diplomacy, transparency, trust, and a healthy amount of conflict).

The birth of IRIS Smart Cities in Utrecht dates back to numerous converging initiatives. Top down, a ***municipal coalition agreement*** in 2014 emphasized a multi-stakeholder approach to accelerate the energy transition. City ***engagement in EUROCITIES working groups*** on mobility, environment and knowledge society as chair or co-chair helped to inspire new ideas and expose councilors and civil servants to best practices. ***Participating in European project development*** and attracting funds from diverse sources such as INTERREG and Horizon2020 required a substantial and concerted effort; but helped to build trust in European cooperation, create momentum, and support micro-pilots across the city. It also helped Municipality Utrecht to ***identify and prioritize city strengths, work together with innovative SME's and tap into local and international process expertise***.

The know-how, relationships and tangible results, inspired the city to target a flagship 'Smart Cities and Communities' funding call. Following up on actions from previous project such as a near zero energy retrofit as part of the Climate-KIC Smart Sustainable Districts (SSD) program. A clear and well researched project proposition, shared transparently, was an essential starting point. USI tried to identify and build on the assets and ambitions of everyone in the ***core group***. Did it ***fit with their***

thematic focus, plans and investment strategies? Actors included energy grid operator Stedin and LomboXnet, a SME creating smart solar charging solutions for e-vehicles.

With a solid skeleton document in play the natural step was to get everyone around the table. But meetings never quite delivered with several directors together. The conversations did not become open enough to really advance ideas. ***Smaller meetings – 1:1 even if possible – turned out to be key*** to building openness and trust in the early stages of a complex project. USI and the municipality also tried to ***identify the right profile of person to talk with, not necessarily just start at the top***. Talk with a contact at the stakeholder organization that understands the project proposal, has a degree of expertise and is able to communicate it well internally.

With ambassadors recruited in key partner organizations, the second step was to ***look for a real estate owner with a renovation property and timeline that could fit***. After several exploratory conversations, social housing corporation Bo-Ex provided the perfect fit. Energy company Eneco came on board and University of the Arts Utrecht (HKU) also joined to bring co-creation and gamification expertise into the project.

A first European lighthouse project proposal was submitted by Utrecht in 2016. It was well appraised, but not approved for funding. However, the local ecosystem had become aware of their mutual interests, and wanted to try again. After some critical reflection helped by the Evaluation Summary Report, several ***new partners were invited***: Civity, a young SME that really understood the potential of (open) urban data to foster innovation and deliver better services; telecoms company KPN; and local mobility provider Qbuzz.

Adding new partners certainly enriched Utrecht's smart city plans, but also brought challenges. During the entire process of finding and aligning stakeholders around the basic project proposition, it was important to be ***aware of possibly conflicting interests between stakeholders***. Cities need to be creative in finding and offering solutions to this.

Behind every project are the people and organizations. ***Having a catalyst, broker and champion is essential***. USI has a strong DNA of connecting researchers, sustainability advocates and near-to-market solution providers. It is a young organization willing and able to take risks. Their collaboration with the municipality was highly complementary and based on a dedication and trust in each others' teams.

This role of smaller, more agile ***catalyst organization*** is also visible elsewhere in IRIS Smart Cities. Johanneberg Science Park has been instrumental in Gothenburg, Energy Hive for Fellow City Alexandroupolis and Sustainable Building Cluster in Santa Cruz de Tenerife immediately spring to mind.

With all the ***interests and ambitions aligned in the demonstration***, discussions inevitably come to the vital issue of money. For Utrecht, transparency was again the key word and efforts made to fully understand each other's interests. ***Individual and confidential meetings*** led to a clear budget proposal to be shared and finalize together. The whole process required a lot of calls and in-person exchange.

So, are there any more pointers for Fellow Cities looking to replicate to keep in mind? For Utrecht and IRIS Smart Cities, the principal vector was a major European Union funding call. An external framework and strict deadlines can give useful impetus, but even if not present, ***try and keep good pace and build momentum to the ideas and planning***.

A good framework for this is to ***organize people and initiatives around specific priorities or themes***. It could be the UN's Sustainable Development Goals or a more local long-term vision for sustainability. It also circumnavigates the beneficial but sometimes risky attachment to political or

personality sponsored themes. Political support for a demonstration can be a driver, but politicians can change or get cornered by their commitments and cannot give the same quality of support.

IRIS Fellow City Santa Cruz de Tenerife, for instance, has converged around a 'green for 2030' strategy. Their flagship program, channels numerous initiatives to: develop new green spaces, provide efficient public services and ensure a sustainable energy supply. It is a principal driver in a vision for innovation, entrepreneurship and creativity to prepare for the future set out for the entire island. Santa Cruz has also used an EIP-SCC methodology and external actors to accelerate alignment around this.

Finally, cities looking to set up their own demonstrators should ***look at the commercial and market dynamics. Are services largely provided by large companies or predominantly SMEs? The stakeholder engagement process and agreements made might be very different accordingly.*** A municipality and all partners can benefit for taking a good look into who supplies the solutions or services and who might buy and benefit from them before making plans final.

Initiatives around IRIS in support of the Lighthouse projects picked up on the same emerging key challenge. Most notably the EIP-SCC AC Urban Planning's **Smart City Guidance Package (2019),** to which IRIS Fellow Cities SCT and VAASA. The Smart City Guidance Package touches on several issues that were also addressed in the interview on the making of IRIS demonstrations, describing necessary steps such as development of a smart city vision for the area, and engage stakeholders from the beginning. The EIP-SCC Smart City Guidance Package was informative for the IRIS Fellow Cities but too big/detailed for a Fellow City to use as a practical guide.

The **Solution Booklet on Systemic Changes in Governance (expected in 2023)**, planned to be the practical version of the report on Systemic Changes in Governance that is being drafted 2022-2023 by the Scalable Cities Expert Group on Systemic Change in Governance, may very well be that practical guide for Fellow and other cities to innovation ecosystems for climate neutrality.

2.5.3 Identification of three IRIS key barriers

The overall concept of IRIS is the Transition Strategy, comprising five Transition Tracks that together provide a universal yet versatile framework to address both common and district specific challenges. Within these five tracks, IRIS demonstrates a set of integrated solutions built on top of both mature and innovative technologies.

To effectively address main barriers encountered in the implementation, scale-up and replication of solutions, the following criteria were applied to all barriers (**Fout! Verwijzingsbron niet gevonden.**) encountered per Transition Track:

a) How **representative** the solution and barrier is of the IRIS cities (e.g. relevant solution & barrier for at least 2 Lighthouse cities),
b) What **impact** the barrier has on the implementation, scale-up and replication of the solution,
c) Whether the barrier can be **effectively addressed by IRIS partners**, e.g. through communication, collaborative research, position paper development, advocacy,
d) Whether the barrier can **effectively be addressed within the runtime of IRIS**.

Based on these criteria, the main barriers were identified during IRIS CPBs and SMRBs across the five Transition Tracks, describing the barrier, the LHCs experiencing the barrier, the solution, and the expected impact of the solution.

Table 2 present the identified main drivers in the three LH Cities. Annex 1: Main barriers and drivers encountered in IRIS, per Transition Track presents in detail all the main drivers.

Table 2 Pool of the main barriers in the three LH Cities

LH City / TT	Utrecht	Nice	Gothenburg
TT1	• Law prohibits virtual netting	• Limited common self-consumption / P2P market / No DSO level market • Smart buildings system integration APIs vs. BOS	• Lack of the required equipment in buildings to support an advanced energy management system
TT2	• Double energy tax and double charging of variable grid fees • Procurement of flexibility services by grid operators • Grid connection costs	• BESS solutions – knowledge and regulatory gap	• Lack of business modes for electricity storage in second life batteries • Limited range of technical products for DC system solutions • DC system solutions aren't cost-effective • High installation costs for PCM storage • No market conditions for PCM storage
TT3	• Municipal policies can hinder scale-up of shared cars	• Technological lock-in in EVCI	• MaaS: From attractive value proposition to functioning business model • MaaS: Integration of APIs from several different mobility providers
TT4	• How to support third parties in capitalizing on the City Innovation Platform as a virtual marketplace for datasets?		
TT5	• Municipalities have (high ambitions but) insufficient know-how and resources on how to engage and co-create with citizens. Citizen engagement activities suffer from a disbalance in effort versus results.		
TT6	• How to organize collaboration arrangements locally with stakeholders that are willing to cooperate on innovations for the sustainability transition?		

From these main barrier descriptions, 3 key barriers were selected during the IRIS Consortium Plenary Board October 2021, based on the aforementioned criteria a)-d). These three key barriers are:

1. **Lack of building equipment and smart buildings system integration.**
2. **Citizen engagement and co-creation.**

3. Organization of collaboration arrangements locally with stakeholders.

For each of these three key barriers, an overview of their nature, IRIS work, and lessons learnt, is presented in Chapter 3, including:

- The description of the key barrier (barrier, LH Cities experiencing this, solution, expected impact).
- The IRIS experts on the key barrier.
- What has been done by IRIS partners on the key barrier so far.
- What can be done by IRIS partners on the key barrier within runtime IRIS.
- With whom outside of IRIS we can collaborate to address the key barrier (stakeholders)
- The **result(s)** IRIS aims to deliver in M60 per key barrier

3 Main findings on IRIS three key barriers

3.1 Lack of building equipment and smart buildings system integration - API vs. Building Operating System (BOS)

3.1.1 Barrier Overview

Description	○ Existing buildings are rarely equipped with sufficient hardware for receiving signals from advanced energy management systems, and for reacting to them. This also applies to rather newly built buildings. ○ Too often, proprietary systems and platforms multiply supervision and reporting interfaces for building owners and operators alike. ○ Built to serve "silos" among building exploitation tasks/businesses, share of data and information among them is limited and often, not even possible without (costly) interventions of the system provider or software developers (ad-hoc API and IT architectures development). ○ The situation could be defined as "spaghetti ware": as many APIs have to be created as there are services and underlying metering/IoT/management systems and platforms. ○ Project implementation costs and more importantly, that of delivery and exploitation phase, are driven by the development of such "ad-hoc" APIs. ○ Missing is the standardisation of the APIs for interfacing the multitude of IoT and exploitation systems available in the "smart building" market. ○ More importantly, as also endorsed by the SBA (Smart Building Alliance) a consistent approach in the industry with the attribution of an "IT/Smart Task" is missing in the construction industry: such tasks should drive the harmonisation and avoidance of inconsistencies and overlaps among information and exploitation systems/infrastructures. This is however nowadays not the case and is seldom implemented.
LH Cities	UTR, NCA, GOT
Solution	○ Integrate since project start, an "IT/Smart Task", entitled as other tasks (i.e. fluids, electricity or civil works) to work towards a harmonisation and efficient infrastructure and IT architecture to host all foreseen monitoring and exploitation systems. ○ More advanced EMS is to come in the future. Part of this is to install a slightly larger storage capacity than is required to allow more demand-side management. ○ As a package solution - include energy efficiency measures, during renovation, with smart material that can receive and respond to signals

	○ At best, exploitation systems will be in charge also of providing user-centred services and apps, leveraging from the data generated by, and transiting through, a building or even building portfolio. ○ Test and develop BOS (Building Operating Systems), seen as a solution to harmonise heterogeneous data and system sources and scales. Focusing on the data flows among buildings, modelling the integration among different systems and platforms via graph-driven solutions, thanks to open and documented APIs or ad-hoc developments (yet cheaper to implement). Besides opening the way to real "Digital Twins", enriching BIM or other models, it opens the way to evolutive and open-ended systems for a smoother design and integration of new services for owners, exploiters and users alike. The main gain is the reduced API costs, fewer system redundancies and higher value services to the whole building ecosystem.
Expected impact	○ Establishment of IT centred tasks in real-estate projects to achieve gains in terms of time and costs for project implementation in an ever more IT cantered urban context. ○ More open-ended smart buildings facilitate data/information and energy fluxes among buildings in districts and cities. The difficulty to access building and city relevant data is yet an obstacle to the emergence of smart-cities, not seen as operated by a single solution provider or platform but, where different systems and solutions are enabled to communicate and trade together and facilitate the emergence of new and added-value user centred services. ○ Instauration of BOS as a mean to achieve the development of a BaaS (Building as a Service) model, where buildings are able to expose and integrate information (via open and documented APIs and a BOS based IT architecture) with other public and city wide services or businesses (advanced energy management systems - useful in the energy grids). This is also the impact expected from the SBA in terms of next evolution needed to achieve real smart-cities.

3.1.2 IRIS work on building equipment and smart buildings system integration

Related IRIS Demonstrations	**Utrecht** Measure 1.1: District wide PV, Measure 1.3: HEMS Eneco Toon, Measure 1.4 NZEB refurbishment, Measure 1.5: Smart (hybrid) e-heating systems, Measure 1.8: PEB refurbishment, Measure 2.3 Stationary storage in apartment buildings, and Measure 2.4 EMSs- Smart Energy Management System **Nice**

	Measure 1.1: Collective self-consumption, Measure 1.2: Optimization of heating load curve, Measure 2.1: Stationary storage deployment in buildings and local electric flexibility management **Gothenburg** Measure 1.6: Development and demonstration of advanced Energy Management System to integrate PV, DH, grid and all abovementioned storage options to achieve peak shaving and minimal environmental impact.
IRIS Experts	▪ Cristian Keim (EDF) ▪ Honorat Quinard (UNS) ▪ Martijn Broekman (BOEX) ▪ Pierre Hult (RB) ▪ Helena Nordström (GOT - Göteborg Energi)
What IRIS has done on this M1-M66	▪ Feed Key Barrier into Scalable Cities Expert database and co-organizing the 1st CCG meeting on this topic (19 Nov 2021). ▪ Engage (as cities and with BoC) in discussions on finalisation and implementation of the Energy performance of buildings directive | Energy (europa.eu) ? ▪ Asked Scalable Cities for experts to help us address this Key Barrier. ▪ IRIS participated in the workshop on Visioning for Future Digitalized Urban Energy Systems. The workshop's outcome fed the report "Digitalization in Urban Energy Systems - Outlook 2025, 2030 and 2040" prepared by Scalable Cities Expert team (European Commission, 2022) ▪ Key Barrier included in IRIS Fellow Cities Study Visits to exchange and gain expertise and experiences. Many stakeholders visited the related building and gained hands-on experience on how to deal with this barrier. ▪ The IRIS deliverables from LH cities (WP5, WP6 and WP7) contain information regarding this barrier in the sections where the above mentioned measures are presented.
With whom (stakeholders) outside IRIS	▪ Scalable Cities City Coordinators Group ▪ BoC / other LHPs ▪ Smart Building Alliance

3.2 Insufficient know-how and resources on citizen engagement and co-creation in municipalities

3.2.1 Barrier Overview

Description	Municipalities have (high ambitions but) insufficient know-how and resources on how to engage and co-create with citizens. Citizen engagement activities suffer from a disbalance in effort versus results. Current paradigms and traditions in citizen engagement are based on small effort - large outreach philosophy. The result is usually reaching low numbers of citizens and making little connection, and long process times of transition leads to disappointment, frustration and distrust among citizens and stakeholders.

LH Cities	UTR, NCA, GOT
Solution:	Reframing of the paradigm in which the access for citizens regarding citizen engagement is shaped following principles of 'low effort design' to lower the entry and participation thresholds for citizens to engage. To enable stakeholders to develop this awareness and a repertoire in low effort design we need to provide guidance by webinars, mentoring activities based upon lessons learned in smart city projects (like formulated in SCIS booklet), and an accessible repository of approaches, tools etc. for all Lighthouse Cities.
Expected impact:	Awareness that citizen engagement is a process **with** citizen and not **about or for** citizens, plus implementation of (low-effort!) design based processes that support a citizen engagement process that continually re-assesses that the approach and tools fit the needs of the citizens.

3.2.2 IRIS work on citizen engagement and co-creation

Related IRIS Demonstrations	All the demonstrations in Transition Track 5.
IRIS experts	Willem Jan Renger (HKU) Rianne Bakker (HKU) Martijn Broekman (BOEX) Celine Gindre (NCA) Toan Vo (CSTB) Anna Reuter Metelius (GOT) Suzanna Ollila (CHALMERS)
What IRIS has done on this M1-M66	▪ Contribute to Solution Booklet on Citizen Engagement (Feb 2021) in collaboration with +CityxChange, EIP-SCC, SCIS. ▪ Feed Key Barrier into the Scalable Cities Experts database, and co-organizing the 1st CCG meeting on this topic (19 Nov 2021). ▪ Submit proposal to COST ACTION PED (Summer 2021) to implement research addressing the long-term felt, widely recognised need for information on what was replicated where (volume-value-timing), how and why, to get better understanding of the process of local adaptation/customisation of solutions. ▪ Ask SCALE to deliver on the long-term felt, widely recognised need for information on what was replicated where (volume-value-timing), how and why, to get better understanding of the process of local adaptation/customisation of solutions. ▪ Key Barrier included in IRIS Fellow Cities Study Visits to exchange and gain expertise and experiences. Many stakeholders participated in relevant meetings and gained hands-on experience on how to deal with this barrier. ▪ The IRIS deliverables from LH cities (WP5, WP6 and WP7) contain information regarding this barrier in the measures of Transition Track 5.

With whom (stakeholders) outside IRIS	▪ Scalable Cities: City Coordinators group ▪ BoC of the 18 Lighthouse projects: Task Group Replication ▪ Smart City Marketplace: Smart City Guidance Package, AC Citizen engagement

3.3 Organizing local innovation ecosystems

3.3.1 Barrier Overview

Barrier (6.1):	▪ The given time for accelerating the energy transition, objectives and motivations of the partners in each case and generally a common approach for achieving all the goals may be different between the cities (possibly conflicting interests between stakeholders). Especially when the needs are multiplied and the addition of new partners is required ▪ The lack of suitable partners is a serious barrier. Lack of trust between partners is a crucial problem. In addition, communication with people who have no expertise for discussions could be a waste of time. Finally must be clarified if large companies or predominantly SMEs push towards specific solutions. The stakeholder engagement process and agreements made might be very different accordingly ▪ Sometimes it is risky the attachment to political or personality sponsored themes. For example, political support for a demonstration can be a driver, but politicians can change or get cornered by their commitments and not give the same support. ▪ Funding - vital issue. The continuous effort of converging initiatives to accelerate the energy transition and attracting funds from diverse sources
Solution:	▪ SCC01 shared vision on best replication approach/activities towards FCs ▪ Clear and concise guidance on the process of creating a local innovation ecosystem (Solution Booklet based on the making of IRIS UTR). ▪ Write narratives about the history of a successful smart city solution, aiming at describing the local context, involved stakeholders, a policy that has been developed, investments and subsidies, etc. ▪ An investment and implementation plan with local partners incorporating ICT, energy, mobility and citizen engagement could be a solution. ▪ Find researchers, sustainability advocates and near-to-market solution providers based on dedication and trust in each others' teams. A clear and well researched project proposition shared transparently is an essential starting point. Smaller meetings are the key to a most open and trusting climate. Municipality and all partners can benefit from taking a good look into who supplies the solutions or services and who might buy and benefit from them before making plans final ▪ Early involvement of all governmental and non-governmental actors is fundamental for maximising the output. The Guidance Package for Integrated Planning and Management can provide ideas on how to do this.

	▪ As transparency is the key word, efforts should be made to understand each other's interests fully. Individual and confidential meetings led to a clear budget proposal to be shared and finalised together. City engagement in EUROCITIES working groups on mobility, environment and knowledge society as chair or co-chair help to inspire new ideas and expose councillors and civil servants to best practices. It is also helpful to identify city strengths and prioritise to work together with innovative SMEs and tap into local and international process expertise.
Expected impact:	- Municipality and all partners can benefit if the challenges are the same and there is good communication internally. As a result, new ideas will be created, enriching smart city plans. - Awareness that a window of opportunity is needed, what aspects of the local context need attention to create that window of opportunity, and how to use that to create a collaboration between public authorities, private companies and research organisations.

3.3.2 IRIS work on planning and governance of local innovation ecosystems

Related IRIS Demonstrations	This barrier is not directly related with the IRIS demonstration in the 5 TTs. A sixth work package was therefore introduced "Governance".
IRIS experts:	Mauritz Knuts (VAASA) Arno Peekel (UTR) Eva Pavic (GOT) Jip Leendertse (UU) Muriel Pels (UTR)
What IRIS has done on this M1-M60:	▪ Article 'How to build a smart city – innovation diplomacy, transparency and trust' (Nov 2019) (IRIS, 2019). ▪ European Week of Regions and Cities session 'PEDs as innovation ecosystems for climate neutrality' (Oct 2021) – initiative (in cooperation with SCC01 TG Replication), organisation & coordination. Recap and share wider the four FCs best practices (Connectedness - Competence / Tools – Capital). ▪ Key Barrier included in IRIS-internal Study Visits (WP8: initiative from the IRIS Site Management and Replication Board) to exchange and gain expertise and experiences (Oct 2021). Transition Track #6 topics for Study Visits mentioned by FCs during IRIS CPB Oct 2021 were: - Innovation management (risk taking mentality, stakeholder management: how to create a strong innovation ecosystem, funding strategy: how to build winning proposals). - Municipal organisation: learn from the LHC innovation ecosystems per city. What capacities are for high level technical staff, politicians

	and directors to reorganise the internal organisation to achieve strong programs for achieving climate neutral and smart cities. - Procurement strategies: inspire, exchange and discuss how to improve internal procurement processes by municipalities, to create more innovation driven projects. ▪ Key Barrier fed into the Scalable Cities Experts database, and co-organizing the 1st CCG meeting on this topic (19 Nov 2021). ▪ Contribute to the text of the Scalable Cities Call for Experts on Systemic Governance for Innovation (December 2021), which is to lead to a Solution Booklet on Systemic Governance for Innovation. ▪ Contribute to the content of the Experts' study/report on Systemic Governance for Innovation (Feb – Apr 2022). ▪ IRIS Magazine section narrating the insights gained: from replication as a result to replication as a field of research (March 2023).
With whom (stakeholders) outside IRIS	▪ BoC of the 18 Lighthouse projects: Task Group Replication ▪ Scalable Cities: City Coordinator's group ▪ Smart City Marketplace: Smart City Guidance Package ▪ EERA-JPSC (including the Viable Cities network) ▪ EUROCITIES ▪ COST-ACTION on PED ▪ EC: EIE/EIC

4 Conclusions & Recommendations

4.1 Conclusions

When we conceived the IRIS project in 2016-2017, there were nine Lighthouse projects, with the European Innovation Platform on Smart Cities and Communities (EIP-SCC) as the dedicated platform for collaboration. By the end of IRIS in 2023, the number of Lighthouse projects had doubled to eighteen; the Smart City Marketplace (SCM) and the Smart City Information System (SCIS) consortia had been established as second and third collaboration platforms, after which EIP-SCC and SCIS were incorporated in the SCM consortium, while the Scalable Cities consortium was launched in support of the Board of Coordinators (BoC) of the 18 Lighthouse projects (including the BoC's five Task Groups). Several new projects were selected under the Horizon Europe Mission on Smart and Climate-Neutral Cities to support selected cities in scale-up and to replicate smart solutions for climate neutrality.

This evolution in the collaboration landscape towards a 'network of networks' for support and collaboration, some with overlapping ambitions, objectives and offers, posed a challenge to IRIS in keeping all partners informed on what collaboration opportunities were offered by whom, for whom, how, when, and where. The sheer number and the interconnectedness of the possibilities seemed to shy away some IRIS partners from what they called "collaboration congestion".

We needed to jump forward and be at the heart of the "collaboration congestion" if we wanted to keep track, contribute, and make the most of the opportunities. Inspired by a meeting in 2018 in Brussels on barriers and drivers for scale-up and replication that was organized by the EC in close cooperation with the Lighthouse projects' Task Group on Replication, IRIS chose to become chair of the Task Group Replication in 2019. As such, we saw that the collaboration landscape and the discourse on what was needed to make replication happen was evolving dramatically.

Instead of finding answers to our questions on scale-up and replication, we heard the same questions everywhere. Gradually, a shift in focus appeared: from collaboration on replication results to collaboration on replication research. What is it that makes replication (not) happen? What exactly is it that needs to be replicated? What research is required in order to answer that question and get meaningful results? It seemed that at the birth of the Lighthouse projects family, no-one really knew the questions yet, let alone the answer.

Replication turned out not to happen by copy-pasting integrated solutions, or by adapting integrated solutions to local circumstances. Replication appeared to require a perfect storm of explorers, shapers, and deal-makers (or, in IRIS language, boundary spanners, knights, and champions), creating together a local innovation ecosystem. But how to replicate a perfect storm at a given time and place? IRIS, as chair of the Lighthouse projects' Task Group Replication, and all of the IRIS partners, have contributed extensively to the discourse on what replication entails, and the research that needed to be done within IRIS as well as together with other selected Lighthouse projects and related initiatives to get the quintessential answers to that question. By European exchanges, presentations, and thematic collaborations with other Lighthouse projects and related service contracts, initiatives and projects. Last but not least, by contributing to the Scalable Cities study on requirements for systemic changes in governance structures (2021-2022), equipping local governments and many others to accelerate their journey towards climate neutrality.

Replication requires the activities of dissemination and learning of project results, which need people able (expertise) and willing (intrinsic interest) to learn about the project results. This can be considered the latent innovation ecosystem: present but needing particular conditions to become active and develop. The result of the learning is awareness and knowledge of project results (solutions, stakeholders, processes, enabling new collaborations, and new project agreements). This is where the innovation ecosystem manifests itself.

The cooperation with other Lighthouse projects not only brought together people able and willing to learn about project results, but also developed the skills of partners to identify and work in innovation ecosystems, who then later dare to enter into new partnerships for funding based on the experience gained from the LH projects. This could be called replication: translating a solution that works well elsewhere to your own local and regional context, in collaboration with your own local/regional/European innovation ecosystem.

4.2 Recommendations

4.2.1 Systemic changes in governance

In 2022, the Scalable Cities service contract (established in 2021 in support of the Board of Coordinators of the 18 Lighthouse projects and its Task Groups) formed an **Expert Group on systemic changes in governance structures**[4]. The expert group was to perform a study and deliver a report (+ Solution Booklet) on systemic changes in governance, that should equip local governments to realize climate-neutral and smart cities. IRIS, as chair of SCC01 Task Group Replication, contributed to the first framework for this study.

In the **preliminary** findings of the study of the Expert Group (at the time of this writing - January 2023 - the report was not officially published yet), the following definition of 'governance' was used, based on findings of the Task Group Replication and Scalable Cities City Coordinators Group: "*Governance is the framework of rules, procedures, roles and responsibilities that constitute decision-making processes and project management*".

In the preliminary findings, it is stated that "*the transition to climate neutrality calls for inclusive co-design processes for urban planning and implementation of solutions, requiring new ways of thinking, working and collaborating. The main challenge seems to be the work in silos of themes, data, tasks, responsibilities, and timelines. The resulting different perceptions of problems and solutions seem to hinder a holistic innovative approach*".

This resonates fully with lessons learnt in the Task Group Replication and in IRIS.

In more detail, the findings, which can all be read as recommendations, are as follows:

Solutions:

- City vision – ambitious, comprehensive, operational, and agreed - is backbone for becoming climate-neutral.
- Make concrete how decarbonization strategies will be integrated into mainstream policies

[4] Judith Borsboom-van Beurden, Adriano Bisello, Dusan Jakovljevic, Tomas Vacha, Daniele Vettorato

- Predefine what you intend to test before deciding upon experiments.
- Let it grow: make action plan what happens after a successful pilot, extend it spatial boundaries and have a good innovation ecosystem.

Municipal organization:

- A vehicle like a public development company tremendously speeds up implementation.
- More than usual level of cross-departmental cooperation is required.
- Promotion of a commons shared agenda across departments.
- Create a shared measurement system of success ensure that efforts remain aligned and accountable.

Citizen engagement:

- Real and not only virtual spaces and platforms are to build trust and sense of belonging
- Facilitator role must be in place to steer stakeholders with disparate interests towards consensus [link with boundary spanner and innovation broker of yesterday's breakouts].
- Narrative must be broader than only combatting climate change, and narratives are also needed to give meaning to KPIs!].
- Mainstream with other policies and politically approve results.
- New competences / jobs needed, e.g. attracting non-technical competences for technical depts, e.g. communication people, sociologists, anthropologists.

Public-private collaboration:

- PPPs deliver more as an engagement platform than as operational tool only.
- Legal arrangements are key for collaboration especially with private partners.
- Establish innovation manager and innovation advisory board.
- Well defined operational scope helps build trust among private partners.
- Major opportunities exist in public funds to build confidence with investors.

Learning within and between cities:

- Develop a process to extend learning beyond people directly involved in projects.

All of these findings are solidly in line with lessons learnt in the Task Group Replication and the IRIS project.

4.2.2 IRIS: three key barriers

The IRIS project worked extensively to identify the main barriers to the upscale and replicate the smart city demonstrations. The identified barriers were documented, solutions were proposed, and many knowledge exchange and capacity-building activities were organized. The IRIS methodology for identifying and working on the main barriers is a recommendation for other smart cities projects.

Special attention was paid to the three key barriers that were considered the most important (chapter 3). The following paragraphs summarize the recommendations for how to deal with them, while chapter 3 includes all the relevant information.

Lack of building equipment and smart buildings system integration

The establishment of IT-centered tasks in real estate projects is crucial in order to improve project implementation. The goal is to have open-ended smart buildings that can facilitate data and energy

exchange among buildings in cities and districts. The lack of access to building and city data is a barrier to the development of smart cities, but the establishment of building operating systems (BOS) will enable buildings to integrate with public services and businesses and contribute to the development of a "Building as a Service" (BaaS) model. The focus should be on modelling the integration among systems through graph-driven solutions with open APIs, leading to reduced API costs and better services for the building ecosystem.

Insufficient know-how and resources on citizen engagement and co-creation in municipalities

Smart city stakeholders must understand that citizen engagement is a process **with** citizens and not **about or for** citizens. To support this process, low-effort design-based processes should be implemented to make it easier for citizens to participate. To achieve this, stakeholders need guidance through webinars, mentoring activities based on lessons learned from smart city projects, and an accessible repository of approaches and tools for all lighthouse cities. The citizen engagement process should be continually re-assessed to ensure it fits the needs of citizens.

Organizing local innovation ecosystems

A holistic approach should be used to organize a local innovation ecosystem for smart cities. Some actions that can facilitate it are:

- Write narratives about successful solutions
- Develop an investment and implementation plan with local partners
- Find dedicated partners based on trust and transparency
- Involve all actors early on
- Make efforts towards transparency and understand each other's interests
- Participate in working groups and partnerships to share ideas and best practices.

As good communication and coordination among the municipality and the local stakeholders is required to create new ideas and improve smart city plans, municipalities must be aware of a window of opportunity and the local context to facilitate collaboration between public authorities, private companies, and research organizations.

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Input for this Deliverable was also distilled from the following sources:

- Experiences shared in the SCC01 Task Group Replication (chaired by IRIS September 2019 – September 2022).
- IRIS Consortium Plenary Board sessions (e.g. on 'Bears and Victories') and Site Management and Replication Board sessions.

Annex 1: Main barriers and drivers encountered in IRIS, per Transition Track

5.1 IRIS Transition Tracks

The overall concept of IRIS is the Transition Strategy, comprising five Transition Tracks that together provide a universal yet versatile framework to address both common and district specific challenges. Within these five tracks, IRIS demonstrated a set of integrated solutions built on top of both mature and innovative technologies.

In the second year of the implementation of IRIS, a sixth Transition Track was identified: that of conditions for alignment of stakeholders and governance of local innovation ecosystems.

5.2 Methodology for the identification of key barriers

To effectively address main barriers encountered in the implementation, scale-up and replication of solutions, the following criteria were applied to all barriers encountered per Transition Track:

a) How **representative** the solution and barrier is of the IRIS cities (e.g. relevant solution & barrier for at least 2 Lighthouse cities),
b) What **impact** the barrier has on the implementation, scale-up and replication of the solution,

c) Whether the barrier can be **effectively addressed by IRIS partners**, e.g. through communication, collaborative research, position paper development, advocacy,
d) Whether the barrier can **effectively be addressed within the runtime of IRIS**.

Based on these criteria, the following barriers were selected for national and European cooperation:

5.3 TT1 - Renewable and energy positive districts

Barrier (1.1):	**(Dutch) law prohibits virtual netting** The netting rule prescribes that energy consumed and produced by a household will be netted by the end of the year. It is a showstopper for using EVs and stationary storage to optimise consumption behind the meter. Due to the netting rule, there is no incentive for household's optimize own consumption behind the meter by using the battery of an electric vehicle. E-drivers with (their own) solar panels are not financially stimulated to optimally use the self- generated renewable electricity and the storage capacity from the car for their own electricity (peak) demand.
LH Cites	UTR
Solution:	(Dutch) law should allow virtual netting to enable self-consumption by sharing electricity and connecting 2nd life batteries, on two levels: ○ per building (a common cabling infrastructure per building instead of separate per apartment, could offer additional financial savings) ○ per real estate portfolio of an organization (i.e. a housing company can be energy neutral or even positive by virtually combining the energy production and consumption of its buildings)
Expected impact:	The Dutch Experiments Electricity law 2015-2018 gathered what the impact may be if more would be allowed legally/fiscally.

Barrier (1.2):	**Limited common self-consumption/P2P market/No DSO level market** ○ Given the current absence of a DSO level market (probably not before the mid to long term) and the current public and private electric system design and operation practices (concerning provision security and service quality), little incentive is left to prosumers to organise for trading and exchanges of RES electricity (PV) at the local urban/district scale or to adopt complementary assets as BESS or other storage solutions. The flexibility market is yet restrained to the TSO (transmission system operator) and aggregators are yet the most effective (if not only) manner to provide bankable services to the grid. ○ In this regard, the French electricity retail system, does not enable to implement peak shaving/shifting solutions, as capacity subscription fees are less relevant than variable fees, mostly driven by the volume of consumed energy. Storage systems as BESS, have to search other means to leverage from the market and become economically viable, as the energy spot market. ○ The French related ministries have recently defined a regulatory and technical framework for the deployment of such type of solutions and fall

	under so called "extended-" or simply "common self-consumption endeavours" (since end 2017): ○ The set technical constrains and the adopted tax and incentive system, are yet related to high contractual complexity (and uncertainties) and unclear cost/value distribution schemes for their implementation. ○ The overall business model for integrating local RES electricity among different prosumers, seems to lead to be a break-even situation towards the BAU (Business As Usual) case, with very little value creation for concerned parties. ○ Costs are yet beard by the construction sector and exploitation costs are yet high and limited value creation can be promised to end-users. ○ It could be said that such endeavour is perceived as un upper-cost for all parties, as gains are limited to the operation of the assets combined with relatively low financial gain, whilst investment costs are higher than any reference solution (as the electric system sizing requirements are the same in any scenario, as imposed by design regulation and standards, enabling little savings from system sizing or optimized operation). ○ The regulation among the PV sector and self-consumption schemes is yet new and changes are still expected to happen in the short term. This is in contrast to such endeavours which have relatively long ROI time and thus, long-term contractual arrangements. The decision making process is thus complicated and driver for such endeavours are bounded to innovators and early adopters in the real-estate/building industry, usually driven by environmental or image related objectives, instead of economic ones.
LH Cites	NCA
Solution:	○ Enhance the collaboration with Aggregators to bundle local pro-sumers to enable the market to develop via existing mechanisms. ○ Gain more experience in developing industrial scale demonstrators in relation with Aggregators and converge to different local market configurations or design, which could enable a cost/value redistribution among local communities to foster the adoption of distributed RES and favour a local consumption. ○ Await for the market, gaining more exploitation experience of such innovative assets and raise their adoption in order to demand for regulatory and other support instruments to be developed. ○ Development of market platforms enabling to reduce contractual and operational requirements and redistribution of cost/value among the concerned parties for the operation of such systems – via P2P or Aggregator schemes.

Expected impact:	○ Channelling of replication activities towards TSO level flexibility services of local RES based smart grid or smart charging projects. This will enable, in countries where the right energy market and regulation conditions exists (i.e. UK, DE or IT), to develop industrial scale demonstrators and gain experience in developing local market/flexibility markets or energy exchange platforms. ○ Adoption and replication in cities and other Partner related markets, influencing the regulatory development among EU countries.

Barrier (1.3):	**<u>Smart buildings system integration APIs vs. BOS</u>** ○ Too often, proprietary systems and platforms multiply supervision and reporting interfaces for building owners and operators alike. ○ Built to serve "silos" among building exploitation tasks/businesses, share of data and information among them is limited and often, not even possible without (costly) interventions of the system provider or software developers (ad-hoc API and IT architectures development). ○ The situation could be defined as "spaghetti ware": as many APIs have to be created as there are services and underlying metering/IoT/management systems and platforms. ○ Project implementation costs and more importantly, that of delivery and exploitation phase, are driven by the development of such "ad-hoc" APIs. ○ Missing is the standardization of the APIs for interfacing the multitude of IoT and exploitation systems available in the "smart building" market. ○ More importantly, as also endorsed by the SBA 5Smart Building Alliance) a consistent approach in the industry with the attribution of an "IT/Smart Task" is missing in the construction industry: such tasks should drive the harmonisation and avoidance of inconsistencies and overlaps among information and exploitation systems/infrastructures. This is however nowadays not the case and seldom implemented.
LH Cites	NCA
Solution:	○ Integrate since project start, an "IT/Smart Task", entitled as other tasks (i.e. fluids, electricity or civil works) to work towards a harmonisation and efficient infrastructure and IT architecture to host all foreseen monitoring and exploitation systems. ○ At best, the latter will be in charge also of providing user-centred services and apps, leveraging from the data generated by, and transiting through, a building or even building portfolio. ○ Test and develop BOS (Building Operating Systems), seen as a solution to harmonise heterogeneous data and system sources and scales. Focusing on the data flows among buildings, modelling via graph-driven solutions the integration among different systems and platform, thanks to open and documented APIs or ad-hoc developments (yet cheaper to implement). Besides opening the way to real "Digital Twins", enriching BIM or other models, it opens the way to evolutive and open ended systems for a smoother design and integration of new services for owners, exploiters and

	user alike. The main gain is on the reduced API costs, less system redundancies and higher value services to the whole building eco-system.
Expected impact:	○ Establishment of IT centred tasks in real-estate projects, to achieve gains in terms of time and costs for project implementation in an ever more IT cantered urban context. ○ More open-ended smart-buildings, facilitating the development of data/information and energy fluxes among buildings in districts and cities. The difficulty to access building and city relevant data is yet an obstacle to the emergence of smart-cities, not seen as operated by a single solution provider or platform but, where different systems and solutions are enabled to communicate and trade together and facilitate the emergence of new and added-value user centred services. ○ Instauration of BOS as a mean to achieve the development of a BaaS (Building as a Service) model, where buildings are able to expose and integrate information (via open and documented APIs and a BOS based IT architecture) with other public and city wide services or businesses. This is also the impact expected from the SBA in terms of next evolution needed to achieve real smart-cities.

Barrier (1.4):	**Lack of the required equipment in buildings to support an advanced energy management system.** Existing buildings are rarely equipped with sufficient hardware for receiving signals from advanced energy management systems, and for reacting to them. This applies also to rather newly built buildings like Brf Viva, to a surprising extent.
LH Cites	GOT
Solution:	Collect some learnings in a guide or pamphlet, to make the following things happen more often: ○ Include flexible solutions in the energy systems and consider that more advanced EMS is to come in the future. One part of this is install slightly more storage capacity than necessary, to enable more Demand-Side Management. ○ As a package solution – include measures for energy efficiency, when renovating, with smart hardware that can receive signals and react to them.
Expected impact:	More buildings, in new development or retrofitting, will be able to utilize advanced energy management systems, and be useful in the energy grids.

5.4 TT2 - Flexible energy management & storage

Barrier (2.1):	**Double energy tax and double charging of variable grid fees** Each time the EV battery charges, energy tax and sometimes variable grid tariffs are double. This also applies when performing bidirectional Smart Charging for storage services. Double taxation applies because the activity is classified as consumption from a tax perspective.
LH Cites	UTR
Solution:	Implement European tax regulation that bidirectional charging is not 'supply' for tax purposes, but (exempt) 'storage service'.
Expected impact:	As electricity will be taxed once, the charging cost of an EV will be reduced.

Barrier (2.2):	**Procurement of flexibility services by grid operators** It is unclear whether grid operators may purchase services from a storage facility. Therefore, it is unclear whether a grid operator may purchase smart charging services. Even though unbundling regulation in EU countries specifies that DSOs cannot own and operate storage facilities, in NL and SW it is uncertain if flexibility services (service which provides a change in demand or supply) of third parties can be procured by DSOs. Uncertainty in the market can hinder investment in innovation.
LH Cites	UTR
Solution:	Finalize and implement EU legislation (being developed). Define regulatory framework to incentivize DSOs to procure flexibility. National regulators and policy makers should provide clarity on whether DSOs can procure flexibility. The costs incurred by DSOs to procure and deploy flexibility should be incorporated in the reimbursement calculation by regulators.
Expected impact:	With finalization of EU legislation, there will be no market uncertainty regarding the supply of flexibility services. DSOs will be allowed to procure storage services for grid related activities if this is cost effective versus grid investments.

Barrier (2.3):	**Grid connection costs** Due to higher grid connection costs for higher capacities, there is a lower incentive to install high-capacity fast charging stations. In (competitive) tenders of public charging stations, often price plays an important role to win the tender. Therefore, operators may choose the lowest capacity connection to reduce costs and win the tender. This limits the potential to perform Smart Charging at public charging stations.
LH Cites	UTR
Solution:	To increase the incentive to roll out high-capacity public infrastructure, changes could be made in the grid connection tariff based on actual consumption instead of the capacity of the connection. Also, changes in tendering requirements to reward high-capacity connections could offer Smart Charging

	solutions. Finally, a reduced connection tariff could be used if the connection point is used for flexibility services.
Expected impact:	Determining grid connection tariff on actual consumption, reduces the barrier for the installation of a high-capacity connection required for faster charging.

Barrier (2.4):	**<u>BESS solutions – knowledge and regulatory gap</u>** ○ The overall level of knowledge on system design, delivery and operation of BESS, in the tertiary and residential sector, is yet limited as systems are yet at demonstration level and not reached enough market penetration. Knowledge about technical, permitting and regulatory constraints is so limited to a very few "insider" companies, having implemented first R&D/industrial demonstrators. ○ Moreover, existing regulation gives little guide to the industry about technical, functional and safety requirement for BESS and, needed additional requirements to be satisfied at a certain location and urban context. More precisely, guidance for residential and tertiary buildings is missing. ○ This knowledge gap brings delays in the system delivery and operation and clearly with additional costs, caused mostly by uncoordinated decisions among building construction tasks (silos) and little knowledge about the delivery and operation requirements of such systems by the general industry as for fire and safety requirements.
LH Cites	NCA
Solution:	○ Disseminate project findings among LH and FL cities and the wider real-estate and energy industry. ○ Provide clear guidance in the KER for its implementation.
Expected impact:	○ Adoption and replication in FL cities and other Partner related markets, in a more efficient manner, leaning on the experience from the LH demonstrations. ○ It is expected that the choice for the location and system design and the overall project implementation can be optimized in terms of time and costs.

Barrier (2.5):	**<u>Lack of business modes for electricity storage in second life batteries.</u>** The cost of the full storage system is nowhere near break-even, at least not from a purely economic perspective. Thus, the business models are not developed enough with relation to environmental benefits, technological development, etc. However, trends are pointing towards an increased variation in the cost of electrical effect, and towards an increased importance of shifting loads over time.
LH Cites	GOT
Solution:	○ Communicate how battery-based electricity storages can enable a reduced demand for electric power. ○ Develop a plug-and-play-system for installing serially produced storage units for second-life batteries.

	○ Or make it more so that owners of vehicles are not owners of batteries, but rather allowing participation in Vehicle-to-grid and balancing loads in the electric grid in a city. This will more easily be true with more leasing of vehicles, of self-driving vehicles, or by Mobility-as-a-Service schemes.
Expected impact:	Would contribute to a broader implementation of second life batteries that are being useful in the electricity grids.

Barrier (2.6):	**The range of technical products is limited for the development of DC system solutions**
LH Cites	GOT
Solution:	As the market for DC systems becomes more established, the market for DC products will increase
Expected impact:	There will be an expanded market of DC systems and their components as the demands on energy efficient systems increase

Barrier (2.7):	**Electricity prices are currently low and the price for DC products hamper the development of DC system solutions**
LH Cites	GOT
Solution:	In the future the energy prices will be much higher and when the DC systems will be more affordable the DC solution will be more attractive to use.
Expected impact:	In the future DC system will be one of the solutions to build effective energy systems

Barrier (2.8)	**<u>High installation costs for PCM storage solutions</u>** The installation costs for PCM storage have been high for implementing a pilot project and it is not today profitable
LH Cites	GOT
Solution:	It is normal that pilot projects are expensive to build and operate. When the market will build more PCM storage the installations costs will go down and the PCM product will be more attractive
Expected impact:	The PCM storage will one of the solutions in energy storage systems. It can reduce power peak and reduce installations costs cooling machines.

Barrier (2.9)	**<u>The implementation in the market is hard to start up for PCM storage solutions</u>** To reach the market is rather difficult. There are many systems that are already optimized and the building sector is difficult to adapt to new developments. Suppliers are in the process of launching many different technical cooling solutions. This includes not only the reluctance to launch

	new products, but also the price surcharges imposed by wholesalers and vendors. These ensure that the product is no longer attractive to the buyer in the end. Likewise, one must prove to the buyers that it works. Suppliers must have and test storage and can scale the data. However, there are very few storage devices that have good monitoring. Therefore, data of the Chalmers IRIS PCM storage is important.
LH Cites	GOT
Solution:	PCM strengths compared to similar solutions: To store cold can be done through several technical solutions depending on what temperature that should be delivered. The strengths of the PCM cold storage compared to other cold storage techniques is that the PCM is compact compared to alternative water volume storage and that it can deliver a more stable temperature.
Expected impact:	The PCM storage will be one of the solutions to get a better durable energy system. Today the market is low but with more information to the market and higher peak power costs the PCM can have a future role.

5.5 TT3 – Intelligent mobility solutions

Barrier (3.1):	**Municipal policies can hinder scale-up of shared cars.**
LH Cites	UTR
Solution: `	Municipalities should provide supporting policies for different MaaS-models, like fixed parking places for shared (electric) cars.
Expected impact:	Faster deployment of intelligent mobility solutions.

Barrier (3.2):	**Mobility as a Service (MaaS): From attractive value proposition to functioning business model** The value proposition for EC2B (MaaS for property developers or employers) is attractive on a theoretical level, for both property developers, employers and mobility providers. Core values include reduced costs for building parking and reduced costs for travelling, increased customer base for mobility providers, not to mention public values such as reduced emissions, efficient land use and increased health among users. However, before monetary values can be attached to the business model, it is difficult to get new customers and collaborators onboard. Developing and maintaining the digital platform costs money, and most mobility service providers usually have very low margins, so it is hard to find the additional money to fund this new layer, especially before the added value to partners can be demonstrated.
LH Cites	GOT
Solution:	Even though limited trials and pilots are not enough to "prove" the business model under market conditions, each of them contributes with new pieces to the puzzle, which over time will develop the business model and enable a broader scale up.
Expected impact:	Pilots contribute to developed business model that can be scaled up on market conditions.

Barrier (3.3):	**MaaS: Integration of APIs from several different mobility providers** In a MaaS solution, APIs from many different sources need to be integrated, which might be difficult if these APIs do not follow the same standard. Furthermore, as MaaS is a new phenomenon, transport operators have limited experience with integration, and do not know what problems can occur when they integrate with other platforms. This was experienced in the integration of public transport tickets from Västtrafik in the EC2B app, where technical barriers delayed the implementation of digital tickets in the app.
LH Cites	GOT
Solution:	Trial and error. It is only through trials these problems come to light, and can be overcome. This is an important role for trials and demonstrations, that can pave the way for eaiser implementation for MaaS on market conditions.
Expected impact:	As experience grows, implementation of new MaaS solution will be easier and mobility actors will be less reluctant to enter into new collaborations.

Barrier (3.4):	**Technological lock-in in EVCI** ○ On one hand, the technological solutions around the EV and EV-charging are evolving fast and charging and storage capacities are ever rising. On the other hand, the buildings and public spaces meant to host this infrastructure and more precisely their electric and ICT endowment, evolve at a different time scale in terms of speed of development and adaptation. ○ Innovators and early adopters of EV solutions, have aging EVCI that has to be replaced, whilst charging and overall EV-battery capacities have at least doubled. This leads to a discrepancy between expectations and real techno-economic feasibility, where the upgrade of a building integrated charging stations, can demand to double or triple its supply capacity. The impact of up-grading works' costs seems obvious. ○ Similarly, early adopters of public EVCI are confronted with the same need as installed charging capacities are undersized compared to current practices. Revamping projects come with important investments impacting their electric endowment on both private and public space. ○ In terms of governance, current practice needs the integration of different departments of a local authorities or companies to realize such endeavours, needing competencies coming from the sectors as building, electricity/energy, IT/ICT, fleet operation and mobility/transport. These are usually driven by different strategic plans or objectives and rarely are enabled to work in a transversal manner as needed to handle this type of matter and can be described as working "in-silo".
LH Cities	NCA
Solution:	○ Seen from a governance point of view, the first step towards a correct deployment of an EVCI/Smart Charging project, is to address the "EV-mobility strategy" of the local authority or company. This is not only needed to clarify the needs in terms of volume and time horizon but is the main driver to address all complementary developments as ICT/IT or building or sustainability related interventions/projects. ○ This has so to be coordinated with the building, energy and IT related entities/departments, in order to address the consequences on the related systems, coordinating planning and allocated budgets. In this process, management and operational level personnel have to cooperate, as the requirement assessment will need detailed work and on-site visits in order to have a complete vision of the existing assets which are seldom properly monitored and inventoried. Only this can give a clear vision of needed works and the cost allocation for one or multiple, coordinated calls for tender. ○ Seen from a budgetary point of view, such works which are usually considered as "annex", should move into foreground. Call for tenders around EVCI concerning existing buildings, should ensure a clear assessment of its technological and electric constrains is given. The needed up-grading works have to become integral part of the tendering, usually bounded more on EVCI procurement, installation and O&M.

	Consortia might be more appropriated to handle such tenders, instead of single EVCI technology/solution providers. Coordinated work arrangement concerning building or ICT related interventions could be imagined and enable a more even distribution of the budget to be allocated by the concerned departments/entities.
Expected impact:	○ Adoption and replication in FL cities and other Partner related markets, in a more efficient manner, leaning on the experience from the LH demonstrations. ○ It is expected that local authorities and companies address in a strategic manner its EV and related infrastructure deployment. This will lead to more comprehensive/complete call for tenders and hopefully, to a smoother deployment of EVCI, creating building scale systems, able to host raising EV-charging pole numbers with higher charging capacities. Key is to deploy a vision and related system, capable of adapting to meet the evolving demand of EV customers, avoiding to fall back into such a lock-in situation.

5.6 TT4 – Digital transformation and services

Barrier (4.1):	**How to support third parties in capitalizing on the City Innovation Platform as a virtual marketplace for datasets?**
Solution:	Create a sustainable business model for the CIP that offers third parties: ○ The possibility to acquire available data sets with which they can develop their own business models for their own data services. ○ The possibility to valorise their data sets by offering them through the CIP to anyone that want to build a new data service.
Expected impact:	Development of valuable public and commercial data services that can help solve urban challenges such as adaptation to climate change, the energy transition and social challenges.

Barrier (4.2):	**Delay in the development of CIM-City Innovation Platform** ○ Not as much useable project data as expected available. ○ The city has not had any guidelines regarding how 3D data should be provided, so the structure of the data available are currently different for each project, which makes it hard to put in a common database. ○ BIM requirements, like the ones produced in the CIM pilot project needs to be in place in order to start collecting BIM data in a structured way. ○ The city has a hesitation on sharing this type of detailed data in such an easily accessible way. ○ There is a fear that the data could be used in the wrong way. Especially for types of projects that are considered sensitive for security reasons. ○ For some projects, project data cannot be shared due to procurement reasons. ○ Data needs to be classed.
LH Cities	GOT
Solution:	○ BIM requirements for collecting BIM data in a structured way. ○ Development of procurement processes. ○ Development of data classification.
Expected impact:	○ Collect and share data from building projects (BIM data). ○ Reuse data is relevant for projects and thereby simplifying the design process and making it more cost effective. ○ Citizens and users can easier get access to/acknowledge projects and means to influence the planning process. ○ Development of services from shared data.

5.7 TT5 – Citizen engagement and co-creation

Barrier (5.1):	**Municipalities have (high ambitions but) insufficient know-how and resources on how to engage and co-create with citizens. Citizen engagement activities suffer from a disbalance in effort versus results.** Current paradigms and traditions in citizen engagement are based on small effort - large outreach philosophy. The result is usually reaching low numbers of citizens and making little connection, and long process times of transition leads to disappointment, frustration and distrust among citizens and stakeholders.
Solution:	Reframing of the paradigm in which the access for citizens regarding citizen engagement is shaped following principles of 'low effort design' to lower the entry and participation thresholds for citizens to engage. To enable stakeholders to develop this awareness and a repertoire in low effort design we need to provide guidance by webinars, mentoring activities based upon lessons learned in smart city projects (like formulated in SCIS booklet), and an accessible repository of approaches, tools etc. for all Lighthouse Cities.
Expected impact:	Awareness that citizen engagement is a process **with** citizen and not **about or for** citizens, plus implementation of (low-effort!) design based processes that support a citizen engagement process that continually re-assesses that the approach and tools fit the needs of the citizens.

Barrier (5.2):	**Min Stad, the Citizen-sourcing platform in Gothenburg, has seen a decline in activity in terms of posts for between 2012 – 2020, and the platform as a communication tool also felt low (conclusions from a project related study-Chalmers).** This is most likely an indication of two factors, 1) citizens or new users are not finding and contributing to the platform or 2) citizens that have posted once are not coming back to the platform to contribute more. Regarding what causes citizens to stop contributing to a Citizen-sourcing platform such as Min Stad, an interesting finding was that people viewed the platform as a tool for communication, mostly with the city but also with other citizens. This view of Min Stad as a communication platform is likely part of the explanation as to why a majority of the participants expected some sort of feedback on their contributions, and in turn why they felt like their efforts were not leading to anything when this expectation was not met and they did not receive any feedback.
LH Cities	GOT
Solution:	The lack of feedback leading to low Instrumentality likely plays a part in explaining the low activity on the platform from 2012 to 2020. ○ Put resources for administration on the platform. ○ Clear communication to the citizens the purpose of the platform. ○ The platform can be developed to meet the citizens expectations better. ○ Growing the platform to reach critical mass with a strategy.

Expected impact:	○ Two-way communication/engagement between City and citizens. ○ Motivation for citizens to engage with the city and other citizens. ○ Reduces the occurrence of false hopes and mistrust in the city.

5.8 TT"6" – Planning and governance

Barrier (6.1):	**<u>How to organize collaboration arrangements locally with stakeholders that are willing to cooperate on innovations for the sustainability transition?</u>**
Solution:	6.1.1 - SCC01 shared vision on best replication approach / activities towards FCs. 6.1.2 - Clear and concise guidance on process of creating a local innovation ecosystem (Solution Booklet based on the making of IRIS UTR). 6.1.3 - Write narratives about the history of a successful smart city solution, aiming at describing the local context, involved stakeholders, policy that has been developed, investments and subsidies, etc.
Expected impact:	Awareness that a window of opportunity is needed, what aspects of the local context need attention to create that window of opportunity, and how to use that to create a collaboration between public authorities, private companies and research organizations.

Annex 2: Transition Track "6": innovation diplomacy, transparency, trust, and a healthy amount of conflict

The birth of IRIS Smart Cities in Utrecht dates back to numerous converging initiatives. Top down, a ***municipal coalition agreement*** in 2014 emphasized a multi-stakeholder approach to accelerate the energy transition. City ***engagement in EUROCITIES working groups*** on mobility, environment and knowledge society as chair or co-chair helped to inspire new ideas and expose councilors and civil servants to best practices. ***Participating in European project development*** and attracting funds from diverse sources such as INTERREG and Horizon2020 required a substantial and concerted effort; but helped to build trust in European cooperation, create momentum, and support micro-pilots across the city. It also helped Municipality Utrecht to ***identify and prioritize city strengths, work together with innovative SME's and tap into local and international process expertise***.

The know-how, relationships and tangible results, inspired the city to target a flagship 'Smart Cities and Communities' funding call. Following up on actions from previous project such as a near zero energy retrofit as part of the Climate-KIC Smart Sustainable Districts (SSD) program. A clear and well researched project proposition, shared transparently, was an essential starting point. USI tried to identify and build on the assets and ambitions of everyone in the ***core group***. Did it ***fit with their thematic focus, plans and investment strategies***? Actors included energy grid operator Stedin and LomboXnet, a SME creating smart solar charging solutions for e-vehicles.

With a solid skeleton document in play the natural step was to get everyone around the table. But meetings never quite delivered with several directors together. The conversations did not become open enough to really advance ideas. ***Smaller meetings – 1:1 even if possible – turned out to be key*** to building openness and trust in the early stages of a complex project. USI and the municipality also tried to ***identify the right profile of person to talk with, not necessarily just start at the top***. Talk with a contact at the stakeholder organization that understands the project proposal, has a degree of expertise and is able to communicate it well internally.

With ambassadors recruited in key partner organizations, the second step was to ***look for a real estate owner with a renovation property and timeline that could fit***. After several exploratory conversations, social housing corporation Bo-Ex provided the perfect fit. Energy company Eneco came on board and University of the Arts Utrecht (HKU) also joined to bring co-creation and gamification expertise into the project.

A first European lighthouse project proposal was submitted by Utrecht in 2016. It was well appraised, but not approved for funding. However, the local ecosystem had become aware of their mutual interests, and wanted to try again. After some critical reflection helped by the Evaluation Summary Report, several ***new partners were invited***: Civity, a young SME that really understood the potential of (open) urban data to foster innovation and deliver better services; telecoms company KPN; and local mobility provider Qbuzz.

Adding new partners certainly enriched Utrecht's smart city plans, but also brought challenges. During the entire process of finding and aligning stakeholders around the basic project proposition, it was important to be ***aware of possibly conflicting interests between stakeholders***. Cities need to be creative in finding and offering solutions to this.

Behind every project are the people and organizations. ***Having a catalyst, broker and champion is essential***. USI has a strong DNA of connecting researchers, sustainability advocates and near-to-market solution providers. It is a young organization willing and able to take risks. Their collaboration with the municipality was highly complementary and based on a dedication and trust in each-others' teams.

This role of smaller, more agile ***catalyst organization*** is also visible elsewhere in IRIS Smart Cities. Johanneberg Science Park has been instrumental in Gothenburg, Energy Hive for Fellow City Alexandroupolis and Sustainable Building Cluster in Santa Cruz de Tenerife immediately spring to mind.

With all the ***interests and ambitions aligned in the demonstration***, discussions inevitably come to the vital issue of money. For Utrecht, transparency was again the key word and efforts made to fully understand each other's interests. ***Individual and confidential meetings*** led to a clear budget proposal to be shared and finalize together. The whole process required a lot of calls and in-person exchange.

So, are there any more pointers for Fellow Cities looking to replicate to keep in mind? For Utrecht and IRIS Smart Cities, the principal vector was a major European Union funding call. An external framework and strict deadlines can give useful impetus, but even if not present, ***try and keep good pace and build momentum to the ideas and planning***.

A good framework for this is to ***organize people and initiatives around specific priorities or themes***. It could be the UN's Sustainable Development Goals or a more local long-term vision for sustainability. It also circumnavigates the beneficial but sometimes risky attachment to political or personality sponsored themes. Political support for a demonstration can be a driver, but politicians can change or get cornered by their commitments and cannot give the same quality of support.

IRIS Fellow City Santa Cruz de Tenerife, for instance, has converged around a 'green for 2030' strategy. Their flagship program, channels numerous initiatives to: develop new green spaces, provide efficient public services and ensure a sustainable energy supply. It is a principal driver in a vision for innovation, entrepreneurship and creativity to prepare for the future set out for the entire island. Santa Cruz has also used an EIP-SCC methodology and external actors to accelerate alignment around this.

Finally, cities looking to set up their own demonstrators should ***look at the commercial and market dynamics. Are services largely provided by large companies or predominantly SMEs? The stakeholder engagement process and agreements made might be very different accordingly.*** A municipality and all partners can benefit for taking a good look into who supplies the solutions or services and who might buy and benefit from them before making plans final.

Annex 3: T2.1 report on TG Replication for Scalable Cities Secretariat

Scalable Cities Secretariat

Deliverable D4-5-1 Report from working groups #1

02-2022

The deliverable D4-5-1 Reports form working groups #1 will provide a status report on the Task groups (TGs). It will aim to explain the TG strategy to help people from outside the SCC community to understand what is happening, as well as identifying synergies and/or overlaps for existing working groups within other initiatives. The report would also help the BoC to move forward with currently underperforming TGs.

The deliverable will feature 1 page per TG detailing their current status, goals, expected outputs and links with other EU initiatives.

The template below aims to collect the information on TG activities, goals and current status as of February/March 2022 as inputs to the deliverable.

Task group status update

/General information/

Task group name: Task Group Replication

Current Task group leader/ co-leader:
Chair: Muriel Pels. Co-chair: Mauritz Knuts. Vice-chair: Sander Smit.

Sub Task Groups (if relevant)**:** N/A

Number of members: 76 members, of which 18 are the Replication Managers of the 18 Lighthouse projects, they constitute the core of TG Replication. All Replication Managers regularly participate in the TG Rep meetings (15-25 participants), except for the Replication Managers of the three earliest projects who have joined occasionally in the past year.

Type of Task group: (Support / Mission-driven): Developing from support to mission-driven.

Overall goals:

- Sharing replication (best) strategies and results between Lighthouse projects.
- Sharing replication (best) experiences and results between Fellow Cities and their innovation ecosystems.
- Dissemination and exploitation of TG Replication findings and results.
- Collaboration with European research networks and with European other city networks in support of scale-up and replication.

Regularity of meetings: monthly 2-hour meeting (online, aiming for 1-2 x / year offline during other large SCC01 joint event), with summer break Mid-June until Mid-September.

/Evaluation of past activities/

Outline of 2021-2022 Roadmap:

- What were the main activities planned?
- What were the main focus topics?

Objective 1: Sharing replication (best) strategies and results between Lighthouse projects.
Activities:

a) Share Lighthouse projects' replication strategies and results through presentations in TG Replication (once or twice a year with break-out sessions in support of interaction).
b) Share Lighthouse and Fellow cities' regional/national cooperation approaches through presentations in TG Replication.
c) Share TG Monitoring's work on mapping and alignment of Lighthouse project's KPIs for replication monitoring and evaluation.

Ad b) The emerging EU-regional and national SCC01 city networks play an important role in demand-driven market uptake, scale-up and replication of knowledge and solutions, as cities in the same EU-region or Member State share contexts such as legislation, climate, culture, infrastructure typology, and city typology. Working together in regional/national networks also has practical benefits such as same first language and shorter travel to on-site events. This lowers the threshold to work together, and to engage cities outside the SCC01 cities network. Examples of existing regional and national SCC01 city networks that contribute to replication are Smart City Sweden / Viable Cities, the Finnish Lighthouse and Fellow cities network, and the Dutch Community of Practice of Dutch Lighthouse Cities.

Objective 2: Sharing replication (best) experiences and results between Fellow Cities and their innovation ecosystems.

Activities:

a) Cooperate with the City Coordinators Group to share Fellow City replication experiences and results, focusing on process drivers for local innovation ecosystems (Connectedness-Capacity building-Capital), through presentations in TG Replication (once or twice a year with break-out sessions in support of interaction).
b) Cooperate with the City Coordinators Group to promote funding opportunities and financial instruments for replication, such as the SCALE Replication Fund, in TG Replication.

Objective 3: Dissemination and exploitation of TG Replication results .

Activities:

a) Share with City Coordinators Group TG Replication's common repository of Lighthouse project's Deliverables and tools for replication (notably replication roadmaps and replication potential assessment tools).
b) Share with City Coordinators Group a calendar of most relevant SCC01-organized webinars/events with each meeting.
c) Promote the joint Smart City Marketplace / SCALE online one-stop shop for all Lighthouse projects dissemination materials, including the SCIS Solution Booklets that were co-created together with Lighthouse projects 2018-2020, as well as a joint calendar of events.
d) Promote the Smart City Marketplace Matchmaking events, the SCALE Roadshow and the SCALE Database of experts for capacity.
e) Draft an end-of -year summary of key takeaways from presentations by Lighthouse projects and Fellow Cities for SCALE/BoC/Smart City Marketplace, and research networks.

Objective 4: Collaboration with European research networks and with European other city networks in support of scale-up and replication.

Activities:

a) Share with SCALE TG Replication's needs towards European Energy Research Alliance (EERA) Joint Programme Smart Cities (JPSC) to help cities implement PEBs/PEDs, within and outside SCC01, e.g. to work across silo's, organize public-private partnership, deal with risk management, make information available understandably for stakeholders.
b) Share with SCALE TG Replication's needs towards European Strategic Energy Technology (SET) Plan Action 3.2 (June 2018): PEDs and neighbourhoods for sustainable urban development, to have SCC-01 partners benefit from research and exchange between European cities within and outside SCC01, as coordinated by Viable Cities network, as funded by SET Plan Action 3.2.

c) Share with SCALE TG Replication's needs towards European Cooperation in Science and Technology (COST) Action on PEDs (CA 19126 PED-EU-Net), in support of creation of a knowledge and evidence repository for PED development (how can we make something that can cover the interest of the different platforms?), as funded by COST.
d) Share with SCALE TG Replication's needs towards International Energy Agency, Energy in Buildings & Communities program (EA EBC) Annex 83
e) Share with SCALE TG Replication's needs towards Covenant of Mayors for Climate and Energy Europe, notably for cities peer-2-peer learning.

Has the roadmap been implemented as planned? Yes.

How have the regular Task Group meetings been held? What formats and tools were used?
Yes. In 2021-2022 so far the following meetings were held (online unless otherwise stated):

28 January 2021
25 February 2021
25 March 2021
29 April 2021
27 May 2021
30 September 2021
28 October 2021
25 November 2021
17 December 2021 *(special together with City Coordinators Group to inform cities on the Call for Expression of Interest for the Mission on Smart Climate-neutral Cities, with Mr Baldwin)*
27 January 2022 *(special together with City Coordinators Group to engage cities in the creation of the Scalable Cities Paper for the EC Mission on Smart Climate-neutral Cities on Systemic governance as condition for acceleration of replication, and the Solution Booklet following).*
24 February 2022

In 2022 the following meetings have been planned (online unless otherwise stated):

31 March 2022
28 April 2022
2 June 2022 *(offline, as part of the SCC01 Lighthouse projects joint event hosted by IRIS in Utrecht 1-2 June 2022)*

Main Outputs from 2021 *(joint articles, joint events, publications etc.)***:**

10 October 2021: TG Replication organized a **joint session of 4 Lighthouse projects on replication during the European Week of Regions and Cities 2021**. Moderated by EUROCITIES the event staged the Fellow Cities of Parma (IT), Bydgoszcz (PL), Lviv (UA), and Vaasa (FI), sharing stories highlighting the importance and best practices of local innovation ecosystem development, based on the three C's of the European Innovation Council's 2020 report on Innovation Ecosystems, being: Connectedness, Capacities, and Capital.

17 December 2021: The **first joint event of TG Replication and City Coordinators Group**, informing cities on the Call for Expression of Interest for the **Mission on Smart Climate-neutral Cities** by means of Q&A with Mr Baldwin, was attended by almost a hundred participants, who were very active asking questions, making the session last a very dynamic full 1,5 hours.

27 January 2022: The **second joint event of TG Replication and City Coordinators Group**, engaging cities in the creation of the Scalable Cities Paper for the EC Mission on Smart Climate-neutral Cities on **Systemic Governance** as condition for acceleration of replication, based on

examples and first draft theoretical framework provided by TG replication in cooperation with **3rd Mission Paper** chief editor Annemie Wyckmans, December-January.

2021-2022 (today): **23 presentations** were given in TG Replication by Replication Managers, Fellow Cities, EUROCITIES, Smart City Marketplace, and Scalable Cities.

/Current activities/

2022 Roadmap and expected outputs:
As IRIS ends in March 2023, the current chair and co-chair will hand over their role to a newer project Summer 2022. Call for expression of interest has been presented in TG Rep of 24 February, and several expressions of interest have been received after that.

Current status:
The TG Replication Action Plan 2022-2023 will be drafted in April-May, together with the new chair(s), draft will be presented in last TG replication before Summer, on June 2.

It is expected that some of the TG Replication 2021-2022 Objectives / activities can/will be shared with or transferred to Scalable Cities and/or the City Coordinators Group.

Is this Task Group collaborating with other EU Initiatives?
If so, please explain which common activities have been carried out:

- TG Replication organized a joint session of 4 Lighthouse projects during the European Week of Regions and Cities 2021, moderated by **EUROCITIES**.
- **EUROCITIES, Smart City Marketplace, Scalable Cities Secretariat and City Coordinators Group** have presented in TG Replication in 2021-2022.
- TG Replication presented her work in **EERA JPSC replication network Viable Cities** in April 2021.
- TG Replication co-created research questions with **COST Action 19126 PED-EU-Net** on replication in 2021-2022.

Are there EU Initiatives that could benefit from synergies with this TG?

- TG Replication aims to **continue the successful cooperation with City Coordinators Group**, as objectives and target groups overlap, and cooperation has been very constructive and fruitful. However, there are differences too that make continuation of both CCG and TG Replication reasonable too, at least for 2022. Main difference seems to be that CCG is EC Mission CNC driven, while TG Replication is driven by the needs of cities (and other Lighthouse project members with an interest in replication).
- TG Replication might benefit from more cooperation with **project NetZeroCities**, to ensure lessons learnt are passed on, and Lighthouse project cities benefit from knowledge exchange in NetZeroCities.
- TG Replication and **TG Business modelling and financing** have been aiming to work together in 2021-2022. This unfortunately has not materialized yet, but the need/interest is still there on both sides.
- TG Replication could possibly benefit more from work being done/shared in **TG Monitoring** (and vice versa?).

Are the TG activities overlapping with other EU Initiatives?

Yes: **City Coordinators Group**. In 2022-2023 possibly also: **NetZeroCities project/platform**.