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Transition Strategy, Commissioning Plan for the demonstration & replication

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Executive Summary

The present document is the Deliverable D1.7 entitled as “Transition Strategy, Commissioning Plan for the demonstration & replication” of the IRIS solutions in the five Transition Tracks. The document depicts the research and study carried out within the Task 1.6 entitled as “Transition Strategy planning for demonstration, replication and knowledge transfer”, towards the development of a preliminary integration plan and communication strategy among the cities’ coordination units (LHs and FCs), local authorities, stakeholders and citizens. The main focus of the document is to provide a transition strategy to demonstration coordination teams, decision makers, existing and potential stakeholders and citizens.

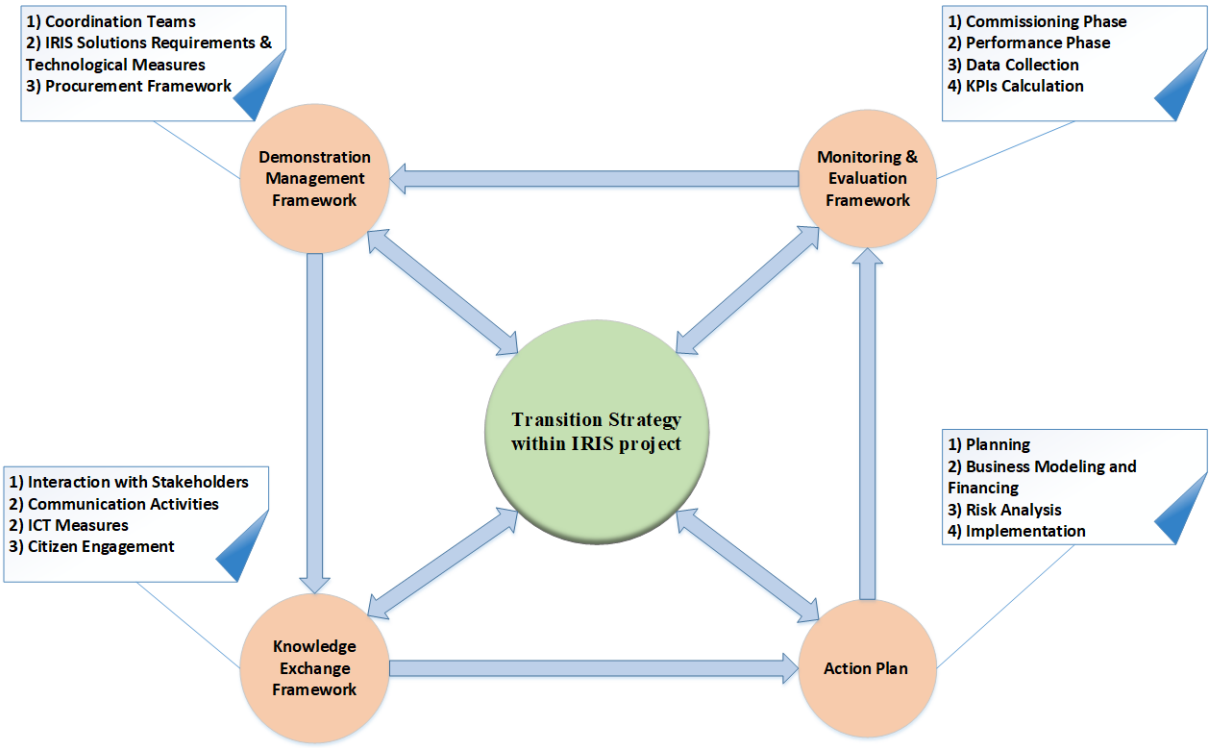
Based on the work done in Task 1-6 of WP1, two core areas of city operation turn out to be especially important in the transition. The first one is the stakeholders’ engagement, their participation in a collaboration platform and their interaction, so as to achieve the effective exploration of upcoming business opportunities and financing schemes and ensure their effective involvement in the implementation and monitoring of the innovative urban development projects. The second one is the association of all the related municipal sectors, considering that the existing sectoral strategies should be harmonized within the city’s transition strategy.

To handle these two important aspects of the transition process, the city's strategy should be organized along the lines of Integrated Solutions. This will specify any potential or impending practical barriers concerning the regulatory framework, the decision-making processes, and the implemented governance models during demonstration and replication activities.

The parallel work on the two critical areas of city operation as mentioned above provides valuable feedback and guidelines for proper configuration of the demonstration integration plan within each LH city and will contribute to the rapid evolution of communication strategy and knowledge transfer among the LH/FC/TT experts. It also enables a communicative channel between the local authorities, the stakeholders and the citizens in each LH and FC ecosystem. In addition, the peer to peer knowledge transfer is facilitated and the LH/TT partners are able to find people with the same expertise or interest.

D1.7 presents a holistic demonstration framework that consists of the demonstration management structure with the specific roles of the local stakeholders’ groups, the procurement framework, the communication and knowledge exchange framework, the planning of citizen engagement and co-creation activities, the framework for an Action Plan per integrated solution, and guidelines for business modelling and financing. Moreover, the document provides an initial common monitoring framework for IRIS project describing potential processes and tools, which can be used to monitor the performance and progress of activities. The deliverable introduces the project’s Ethics Board and presents its main functions. It also provides the general framework of the commissioning plan to be followed by each demonstration activity for the final tuning, the validation and the initial operation of the installed equipment.

The main elements of the IRIS Transition Strategy that covered in D1.7 are presented in the following schematic diagram.



The Action Plans per Integrated Solution will be further elaborated during the implementation of WP5, WP6 and WP7 for the Utrecht, Nice Cote d'Azur and Gothenburg demonstration sites respectively. The monitoring and evaluation framework will be elaborated in WP9 (Monitoring and Evaluation).

The transition strategy and the commissioning plan will be used from LH cities for the detailed planning of their demonstration activities. Moreover, they will be used from FCs for the creation of the replication roadmap and for the creation of the replication plans of each city.

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List of Acronyms and Abbreviations

Abbreviation	Definition
BSI	British Standards Institute
CEL	Citizen Engagement Ladder
CEN	European Committee for Standardization
DMP	Data Management Plan
DSO	Distributed System Operator
ESCO	Energy Service Company
FC	Follower City
IAR	Investment Analysis Report
IS	IRIS Solution
ISO	International Standards Organization
ICT	Information and Communication Technology
KPI	Key Performance Indicator
LH	Lighthouse
O&M	Operations & Maintenance
PPI	Public Procurement of Innovation
PPP	Public-Private Partnership
RES	Renewable Energy Sources
RFP	Request for Proposal
ROI	Return on Investment
SC	Smart City
TT	Transition Track

1. Introduction

1.1 Scope, objectives and expected impact

The main objective of this deliverable is to provide a preliminary transition strategy to demonstration coordination teams, decision makers, existing and potential stakeholders and citizens, mainly for use in LH cities but also in FCs.

D1.7 have to present the key aspects of the transition strategy for the Lighthouse demonstrations that should be considered during the planning, and implementation of the IRIS Integrated Solutions. The transition strategy will provide guidelines and principles for the Lighthouse ecosystem coordination teams, procurement, stakeholder mapping, citizen engagement and co-creation, development of an Action Plan per Integrated Solution, business modelling, risk and mitigation analysis, and monitoring and evaluation. Moreover, the deliverable should present the project's Ethics Board and its main functions. Finally, there will be a description of the general framework of the commissioning plan which will be followed during the validation and the launching of the demonstration activities.

The transition strategy and the commissioning plan will be used from LH cities during the 2nd year of the project for the detailed planning of their demonstration activities. Moreover, they will be used from FCs during the 2nd year of the project for the creation of the replication roadmap and during the 3rd year for the creation of the replication plans of each city.

1.2 Relation to other activities

Table 1 depicts the relation of D1.7 to other activities (deliverables) developed within the IRIS project.

Table 1 Relation of D1.7 with other activities (deliverables)

Number	Title	Relation
D1.1 (M9)	Report on the list of selected KPIs for each Transition Track	Input used for the creation of the monitoring and evaluation framework (chapter 4).
D1.2, D1.3, D1.4, D1.5 & D1.6 (M9)	Report on Business, Users' & Technical Requirements of the IRIS 5 Transition Tracks	Input used for the creation of the demonstration and the monitoring and evaluation frameworks (chapters 3 & 4).
D5.3, D5.4, D5.5, D5.6, D5.7 (M24)	Launch of the activities on each TT in Utrecht	Output to be used for the detailed planning of integration, work management & commissioning of demonstration activities in Utrecht.
D6.3, D6.4, D6.5, D6.6, D6.7 (M24)	Launch of the activities on each TT in Nice	Output to be used for the detailed planning of integration, work management & commissioning of demonstration activities in Nice.
D7.3, D7.4, D7.5, D7.6, D7.7 (M24)	Launch of the activities on each TT in Gothenburg	Output to be used for the detailed planning of integration, work management & commissioning of demonstration activities in Gothenburg.

D8.1 (M25)	A Roadmap for replication of activities	Output to be used for the creation of the replication roadmap.
D8.4, D8.6, D8.8, D8.10 (M36)	Vaasa / Alexandroupolis / Santa Cruz de Tenerife / Focsani replication plan	Output to be used for the creation of the replication plans of each FC.
D9. 4 (M18)	Report on unified framework for harmonized data gathering, analysis and reporting	Output to be used for the refinement of the monitoring and evaluation framework.

1.3 Structure of the deliverable

The structure of this deliverable is as follows:

Chapter 1 is the introduction.

Chapter 2 presents the methodology followed to prepare the deliverable.

Chapter 3 presents the demonstration framework concerning the demonstration management structure, roles of stakeholders' groups, procurement, communication and knowledge exchange, citizen engagement and co-creation, the framework for an Action Plan per solution, and guidelines for business modelling and financing.

Chapter 4 provides guidelines for monitoring and evaluation.

Chapter 5 introduces the project's Ethics Board and presents its main functions.

Chapter 6 provides the general framework of the commissioning plan to be followed by each demonstration activity for the final tuning, the validation and the initial operation.

Chapter 7 provides an overview of how D1.7 is linked with the forthcoming activities in the rest of WPs.

Chapter 8 presents the conclusions.

Chapter 9 contains the references to external sources that used in the document.

Chapter 10 contains three Annexes. Annex 1 presents detailed information for the relevant stakeholders in LH cities Utrecht and Gothenburg. Annex 2 presents indicative screenshots from the CurateFX platform that will be used for the stakeholder collaboration and engagement in each LH city. Annex 3 presents a detailed plan of citizen engagement & Co-Creation activities in Utrecht.

2. Methodology

This Deliverable is part of IRIS WP1: Transition strategy: five tracks to maximize integration synergy and replicability, and it is related to T1.6: Transition Strategy planning for demonstration, replication and knowledge transfer. Deliverable D1.7, Transition Strategy, Commissioning Plan for the demonstration and replication provides a detailed transition strategy plan, comprising of the demonstration, replication and opinions exchange planning among cities / administrations / cities planners and all involved stakeholders, on the basis of the analysis of all the defined solutions in the five IRIS transition tracks. A commissioning plan will further be developed and commonly approved by all involved partners, to be used in the demonstrations of the three LH cities, the result of which will feed back in to the replication plans in WP8.

The transition strategy builds on the work done in Task 1-6 of WP1 in M1-12. Two core areas of city operation turn out to be specifically important in the transition. The first one is the stakeholders' engagement, their participation in a collaboration platform and their interaction, so as to achieve the effective exploration of upcoming business opportunities and financing schemes and ensure their constructive involvement in the implementation and monitoring of the innovative urban development projects. The second one is the association of all the related municipal sectors, considering that the existing sectoral strategies should be harmonized within the city's transition strategy.

To handle these two important aspects of the transition process, the city's strategy should be organized along the lines of Integrated Solutions. This will specify any potential or impending practical barriers concerning the regulatory framework, the decision-making processes, and the implemented governance models during demonstration and replication activities.

Therefore, the transition strategy is addressed as follows:

- Establishing the demonstration management structure;
- Connect with demonstration stakeholders, including citizens, taking into account ethical requirements;
- Establish knowledge exchange framework and the ICT measures that will be used for the support and enhancement of the communication;
- Draft Action Plan per Solution; and
- Realization of a monitoring and evaluation framework.

The correlation of the above phases is presented in Figure 1 that is a high-level schematic diagram addressing the transition strategy concept within IRIS project.

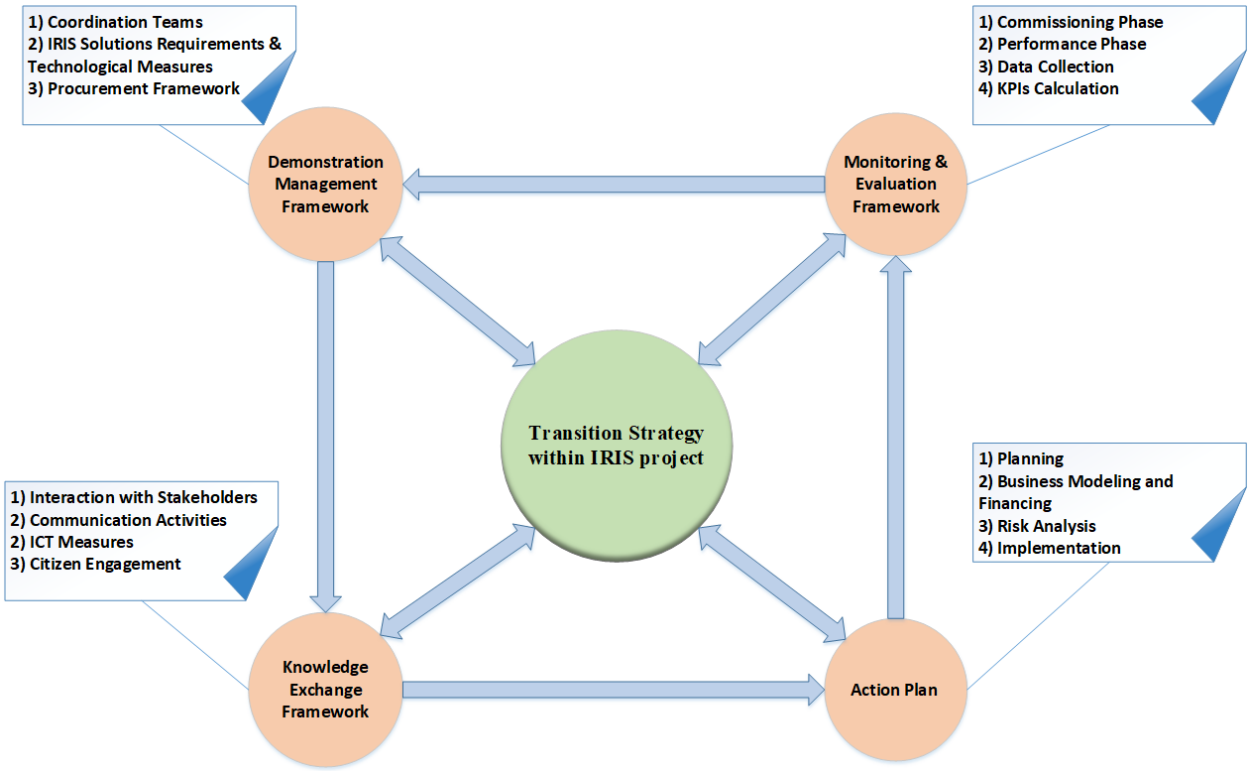


Figure 1 Transition Strategy Phases within IRIS project

3. Demonstration framework

3.1 Demonstration coordination teams

The implementation of IRIS involves a quite complex synthesis of many technologies and proposed strategies in each of the IRIS Lighthouse cities. This, as well as the fact that the consortium is mainly composed of partners that belong to the Lighthouse cities' environments (the Lighthouse city ecosystems), call for a city-based management structure. This management structure has to be as simple as possible, with clear roles and responsibilities, in order to support and accelerate actions planning and decision-making processes. Following that, the Lighthouse ecosystem management structure has the form of a pyramid. In each Lighthouse city ecosystem, the whole demonstration is monitored and managed by a Site Manager. Per Transition Track (TT) the implementation is under the authority of a TT Leader. While the implementation of each Integrated Solution (IS) within the TTs is under the responsibility of an IS Leader. Site Manager, local TT Leaders and local IS Leaders together form a Lighthouse city demonstration coordination team (a triangle of one colour in the Figure 2 below).

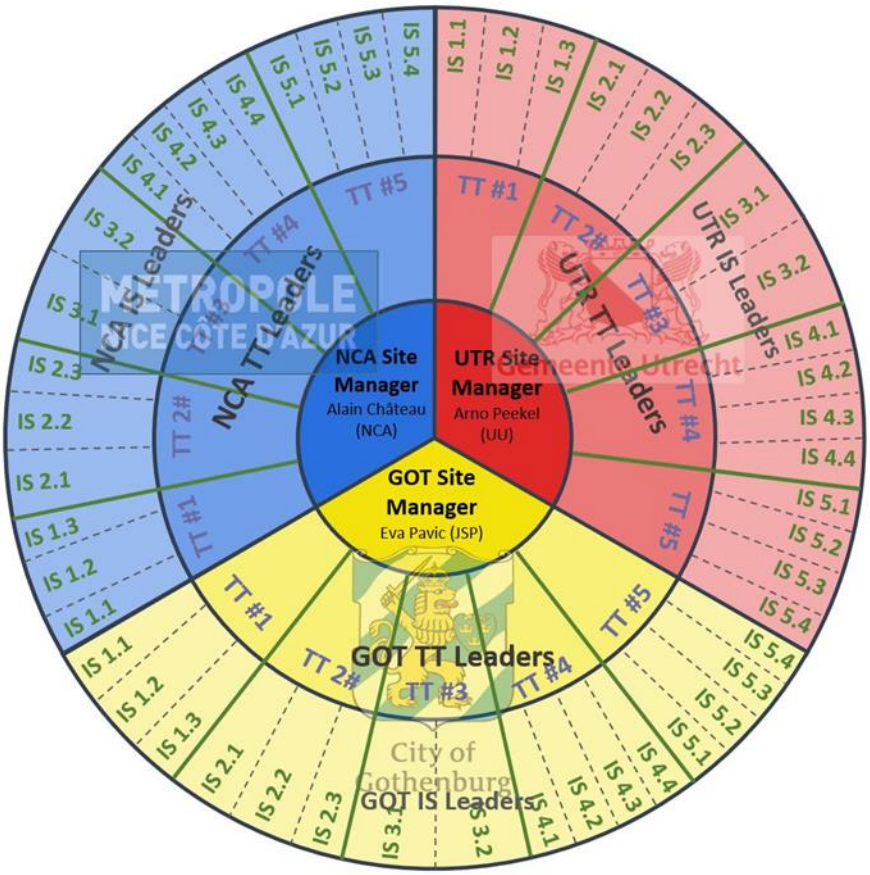


Figure 2 The city-based structure in the IRIS project coordination

The roles and responsibilities of the Site Manager, the Transition Track leader and the IS Leader are described in detail below.

3.1.1 Site Manager

The Site Managers are responsible for the technical, administrative and financial coordination of all the interventions under development in the LH city demonstration site. They take care of meetings with the working groups under their responsibility (i.e. the TT Leaders and IS Leaders), where discussions and decisions need to be made about the organization and planning of the demonstration implementation, in order to reach the targets of the IRIS project. The Site Manager coordinates the demonstration activities together with all partners belonging to their LH city ecosystem within the timeframe of the milestones, and also coordinates the timely preparation of deliverables. The Site Manager is responsible for the entire management of the demonstration at LH ecosystem level, including the representation to the IRIS Steering Committee and to the IRIS Consortium Plenary Board. Thus, the three Site Managers together have the overall management responsibility for Work Packages 5, 6, and 7.

The Site Managers also gather all data at Lighthouse city level for the indicators as specified by the IS Leaders, in order to calculate the performance of their LH city. In this way, the Site Managers are the LH city's information condenser, transmitting all the data needed to both their local ecosystem partners and the other IRIS partners.

Summarizing, among the responsibilities of the Site Managers are:

- Lighthouse ecosystem coordination and establishment of communication with all ecosystem partners;
- Lighthouse ecosystem resource management in line with the IRIS Description of the Action;
- Informing the ecosystem partners on IRIS contractual agreements;
- Collection of data from demonstration monitoring for the calculation of city performance;
- Definition of appropriate corrective actions to be taken in case of progress problems or conflicts;
- Dealing with the project risks detected; and
- Any other issue concerning the demonstration at city level.

3.1.2 Transition Track Leader

The TT Leaders are responsible for the demonstration and monitoring of the IRIS technology implementations of each Transition Track in each LH ecosystem. Thus, there is a group of 5 TT Leaders in each LH ecosystem, each responsible for a Transition Track. They take care of the accurate undertaking of the demonstration activities of their Transition Track - technically, but also concerning the milestones. As each TT consists of a group of IRIS Solutions, the TT Leader sees to the coherence of the various IS implementations of the TT. And they act as a liaison between the Site Manager and the demonstration progress in each IS.

The TT Leaders are also in charge of the monitoring at TT level in the LH ecosystem. They collect the data results of the demonstrations in order to give values to the corresponding performance indicators and formulate conclusions regarding the implementations of their TT in their LH ecosystem. The following figures (Figure 3, Figure 4 and Figure 5) provide the TT Leaders in each Lighthouse ecosystem:

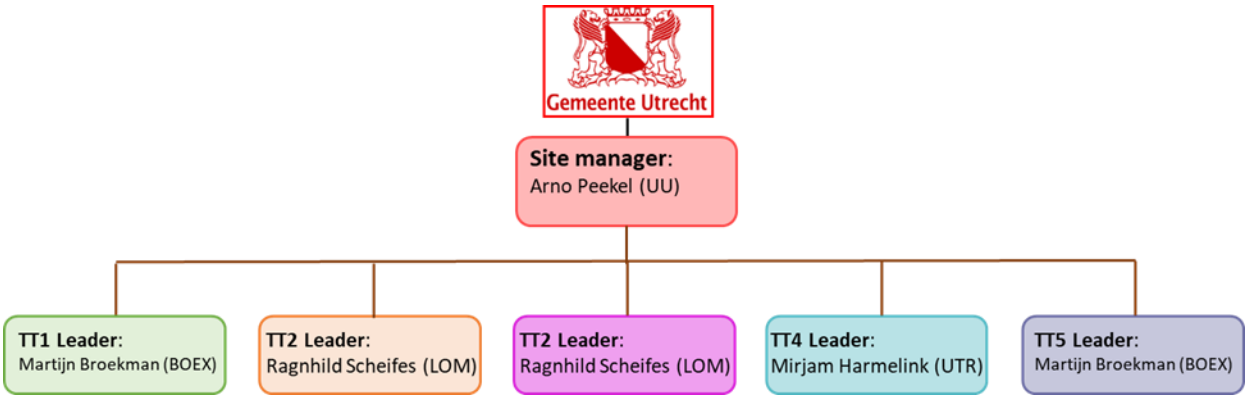


Figure 3 The TT Leaders in the Utrecht demonstration

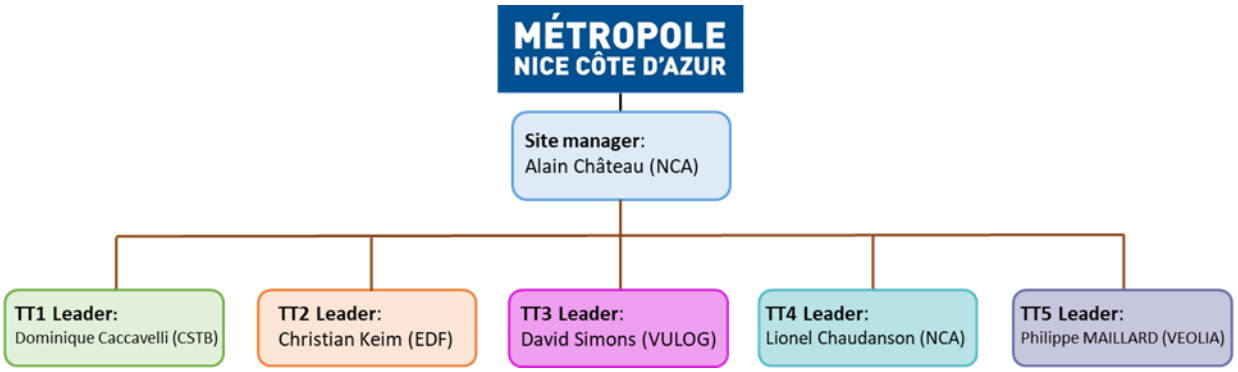


Figure 4 The TT Leaders in the Nice demonstration

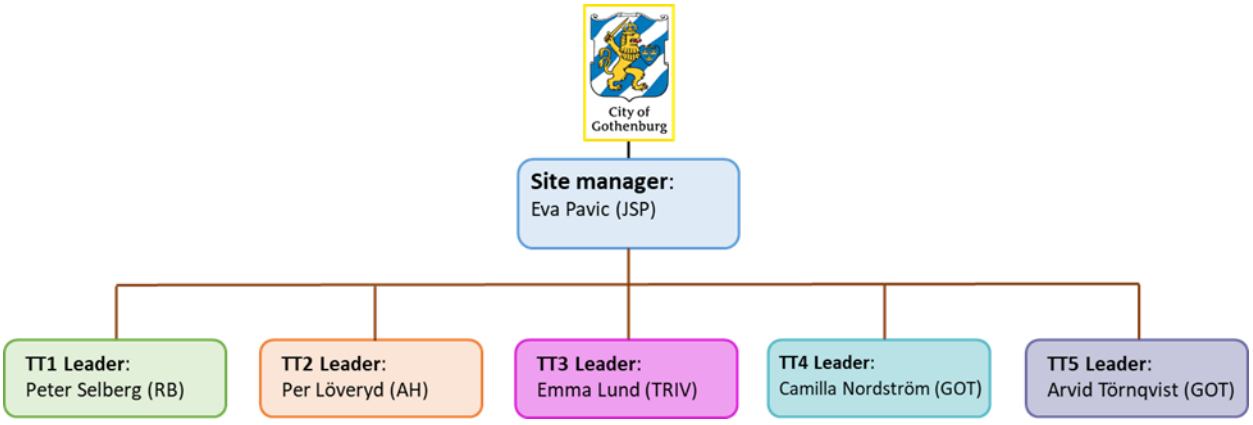


Figure 5 The TT Leaders in the Gothenburg demonstration

3.1.3 Integrated Solution Leader

Finally, the IS Leaders are in direct communication with the partners that are to deliver each individual task of the IS. They oversee the design and commissioning of a specific IS at the demonstration site. They also do the local monitoring by gathering the actual data provided by the various (smart) metering systems or the survey results. They refer to the TT Leader in case the problems faced are difficult to be dealt with, or in order to mitigate potential risks. They stay in touch with other IS Leaders in order to exchange experience and know-how during the commissioning.

3.2 Procurement Framework

The objective of this section is to present in brief the process that should be followed by LH and later by FC cities, in order to formulate the request for purchasing equipment for the demonstration pilot from the relevant suppliers. This procedure includes purchase planning, determination of standards and specifications for the components to be acquired, market research for supplier selection, price negotiation and inventory audit. The procurement phase will be a key stage for the demonstration plan of each LH city, because it determines to a certain extent the profitability of the IRIS solutions to be implemented.

There are two types of procurement, the private and the public procurement. In the private sector, procurement is carried out within privately owned companies and it has as a goal to maximize the profit of companies. In this case, the private entity may acquire the project's services or assets for consideration. On the contrary, public procurement raises funds from tax revenues and it should consider and address the public concerns, as well as efficiency. Nevertheless, both types have many similarities, as for example supply market, green procurement, procurement ethics, cost savings etc [1].

Within the planning of smart cities, the public authorities have a vital role in configuring the solutions to be integrated in the energy, transport and ICT sector. They have also a strong influence on citizens' engagement. It is worth mentioning that they can not only buy product, but they can also submit requests for innovative products and equipment that are not available yet changing market trends.

Europe has a powerful potential to promote innovation actions through the procurement process. Nevertheless, smart city solutions like IRIS solutions consist of multiple components and thus their procurement is sometimes characterized by complexity. One possible reason for this is that the current EU legislation sets limits to the municipal authorities regarding the interaction with the private sector. These limitations are imposed towards ensuring transparent procurement processes and free and open competition in the bidding process [2]. Below, some other causes for limited use of public procurement are presented:

Other causes of underuse of public procurement for innovation from the demand side may include [1]:

- Outdated and non-flexible processes;
- The necessity for multi-aspect approach and incorporated contracts (comprising contracts for a variety of assets); and
- The preference for consolidated ideas and guaranteed suppliers.

The above issues pose many barriers concerning specifically the participation of new potential investors to the market. Another problem is that innovative and complex systems that should be integrated, such as IRIS solutions, cannot be managed efficiently.

Although private procurement is more flexible than public procurement concerning the legislative and procedural issues, the public procurement is more secure for smart cities projects like IRIS. The reason is that these projects address various innovative systems and solutions and thus imply many technical and financial risks.
It is worth mentioning that in 2013, public procurement represented on average 12% of GDP and 29% of total government expenditures in OECD countries [3]. In Germany, the quantitative potential of public

procurement of innovation is estimated at about 250 billion euros, i.e. ten times larger than the amount of public R&D subsidies distributed to the business sector (25 billion euros) [4].
Towards enriching investors landscape, city authorities are looking for new and more resilient public procurement models, so as to attempt the access in a wider variety of new concepts and technologies.

The IRIS demonstration sites projects should address many technical and financial risks. Towards, minimizing the risk factor, the city participants of IRIS elaborate credible business models from the beginning of the project. These business models should be accompanied by an appropriate procurement plan to guarantee the feasibility of the IRIS solutions.

In the context of innovative projects, as for example smart city projects (retrofitting of public sector buildings, smart energy grids, electric vehicle charging infrastructure, installation of heat networks, renewable energy generation etc.), the contracting authorities can adopt two models:

- Traditional Procurement
- Public Procurement of Innovation (PPI)

In the case of the IRIS project, prior to selection and launch of procurement procedure, LH and FC cities may carry out a preliminary market analysis aiming at gathering useful information and informing potential suppliers about future procurement opportunities.

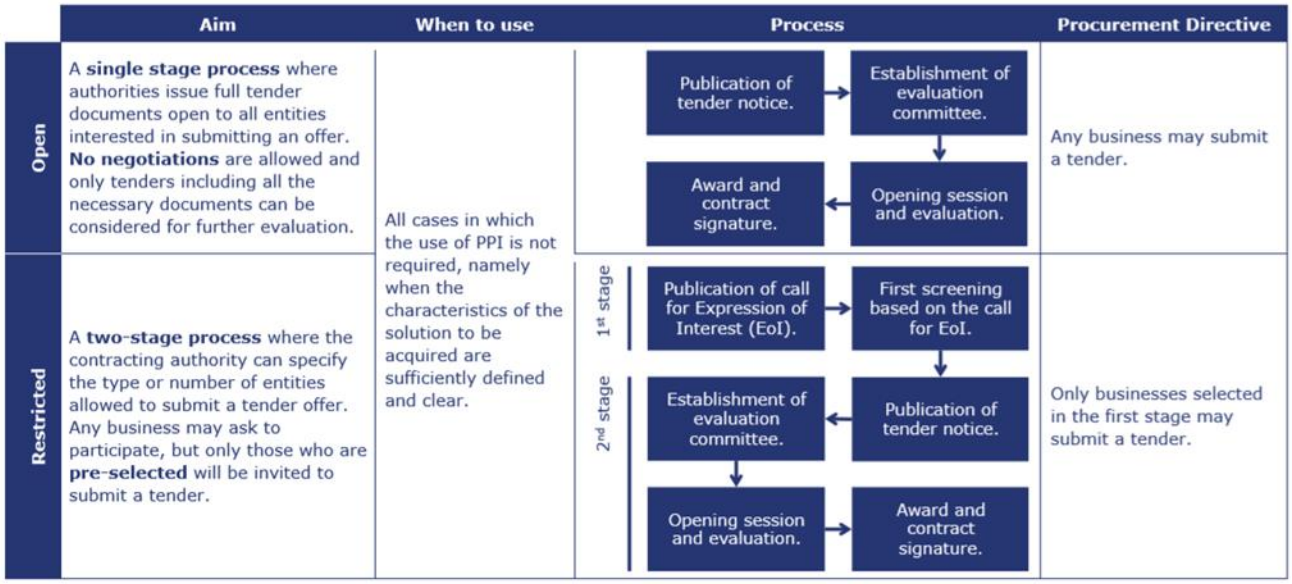
3.2.1 Traditional Public Procurement

Traditional Public Procurement can be used for a separate pilot, but also for a complete project with full procurement action and can be carried out either as open or restricted procedure [1]:

- The **open procedure** is suitable for simple projects, where the requirements are straightforward and the size of the required equipment is limited. It can be widely used for the purchasing products with clearly defined requirements, where the objective of the buyer is the least expensive supplier. There is no predefined qualification criteria for bidders and thus anyone can submit a tender leading to the concentration of a large number of suppliers.
- The **restricted procedure** aims to attract the pre-qualified suppliers considering their financial capability and technical expertise, in order to limit the number of submitted bids. In the business cases where the restricted procedure is appropriate, it is legitimate that the buyer will be able to determine the specific requirements from the beginning during the invitation to tender, so as the bidders will be able to submit a properly calculated bid avoiding that way any upcoming negotiations following the bid acceptance.

The Table 2 below presents the distinctive characteristics of the two types of traditional procurement procedures:

Table 2 Traditional Procurement Procedures [1]



3.2.2 Public Procurement of Innovation

The main difference between this type of public procurement and the traditional public procurement is that it involves the negotiation between the potential suppliers and the competent entities. From the initial phase of the procedure, the R&D components and services are treated with separate tender, so as to address properly their future delivery to the market. Furthermore, it is worth mentioning that through the negotiation, the correct handling of innovative adaptive elements is possible in order to define their desired requirements before the competition. This lead to the selection of the suitable supplier that can provide the proper equipment.

The employment of Public Procurement of Innovation can offer many benefits to the local ecosystem promoting the fast development, to private enterprises raising the internal financial capacity, to smaller cities enabling networking and financial resilience, to suppliers preliminary evaluation of their equipment and to procurement competent bodies different alternatives.

The PPI has four main identified procedures with regard to regulatory issues. These are presented in the following Tables 3, 4 and 5 along with their contained processes and respective directives.

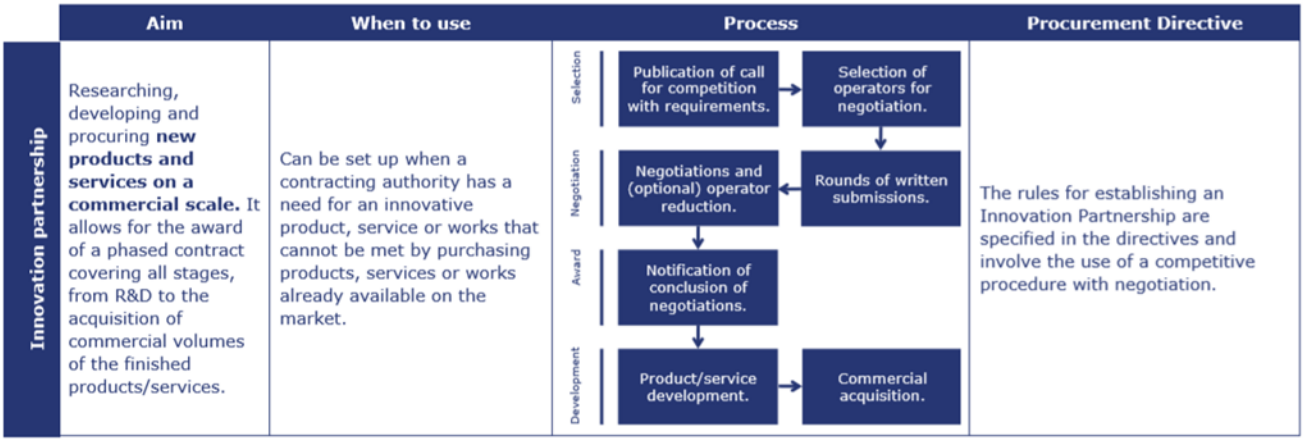
Table 3 PPI Procedures [1]

	Aim	When to use	Process	Procurement Directive
Pre-commercial procurement (PCP) *(also referred to as "contract" research)*	Procurement of R&D services, from prototype to first test, before they are commercially available. This means that if the developed good/service were to be procured, it would require a separate tender.[1]	**May encourage the market to develop new solutions,** so it is suitable when market consultation activities indicate that there is currently no solution. May also include the acquisition of the limited prototypes and/or test products developed, but it does not include the acquisition of a larger volume of resulting end solutions on a commercial scale and **must not constitute state aid.**	Preparation of PCP and call for tender. → Exploration of solutions. → Development of a test series.* → Prototyping. * *Includes assessment, publication, standardization, and payment for final phase.*	It does not constitute state aid, provided that: • The benefit of the R&D services does not accrue exclusively to the contracting authority; • The value of the procured R&D services is >50% of the total value of the project; • R&D costs are procured at market price (i.e. do no State Aid elements); • The procedure may not be used to test existing prototypes, but only prototypes requiring further development; • The principles of transparency, non-discrimination and equal treatment are observed.

Table 4 PPI Procedures [1]

	Aim	When to use	Process	Procurement Directive
Competitive dialogue	Awarding a contract to suppliers, for services or works following **a dialogue with selected participants, who have submitted an offer** according to the needs outlined by the public authority.	Often used for large complex projects where the **technical specifications cannot be adequately defined in advance.**	Selection: Publication of contract notice. → Selection of operators for dialogue. Dialogue: Issue of descriptive document. → Rounds of dialogue and (optional) operator reduction. Award: Invitation of final tenders. → Closure of dialogue. → Fine-tuning of offers. → Selection of bidder and confirmation of terms.	It is allowed when: • The needs cannot be met by adapting available solutions; • The need includes design or innovative solutions; • Prior negotiation is required due to the nature of the project; • Complexity/high risk/legal or financial make-up; • Technical specifications cannot be defined in a precise manner; • Irregular or unacceptable tenders are submitted.
Competitive procedure with negotiation	Procuring products, services or works **including elements of adaptation, design or innovation,** which necessarily requires negotiation. Compared to competitive dialogue, the required characteristics need to be specified prior to the competition.		Selection: Publication of call for competition with requirements. → Selection of operators for negotiation. Negotiation: Rounds of written submissions. → Negotiations and (optional) operator reduction. Award: Notification of conclusion of negotiations. Development: Product/service development. → Commercial acquisition.	Introduced in the 2014 directives, replacing the negotiated procedure with prior publication of a notice.

Table 5 PPI Procedures [1]



Concerning the city issues, concerns and priorities that should be addressed, the Public Procurement of Innovation is divided into **four sub-models** that are tailored mainly to environmental, social or financial issues and objectives.

Green, Sustainable and Energy efficient Public Procurement

Green public procurement aims at providing guidelines to the public contracting authorities on how the procedure should be performed taking into account environmental issues and concerns.

Sustainable public procurement refers to the procedure that considers the three fundamental principles of sustainable development regarding the effects on environment, society and economy.

One of the core issues for city development is the support and promotion of energy efficiency measures. Thus, another sub-category is the **Energy efficient public procurement** [5]. In this case, the tendering outline and the decision-making processes should be based on relevant criteria. Energy savings measures refers to the design, construction and management of buildings, to public lighting, to district heating and cooling network, to energy saving equipment, devices and management systems and to other relevant sectors. Some of the critical parameters that should be included in the relevant procurement documentation are the following:

- Life-cycle value;
- Minimum energy efficiency parameters;
- Energy efficiency standards;
- Proposed measures and processes for energy saving; and
- Appropriate handling procedures in the context of competent organizations.

The crucial benefits of energy efficient procurement to local ecosystems and public entities affecting the social, economic and environmental sector can be summarized as follows:

- By reducing the usage of energy, the operational costs will be minimized and public authorities will save money;

- The installation of energy efficient equipment that is characterized by higher qualify and longer lifetime can reduce in the long term the necessary time, effort and expenses for maintenance and replacing activities;
- The CO2 emissions reduction as a result of energy saving measures will contribute to better air quality improving health conditions and life quality and achieving the city's strategic goal concerning the decrease in carbon footprint as mentioned in the SEAP; and
- The leading role and the active involvement of public authorities are of high importance towards raising citizens engagement and convincing private companies for the significant impacts of energy efficiency.

In the scope of presenting a quantitative picture of the two essential and attractive impacts of Green Public Procurement, the outcome of a relevant study (see study 'Collection of statistical information on Green Public Procurement in the EU' carried out for the European Commission-DG Environment) points out that through the use of this model:

- The average CO2 emission reduction is 25%; and
- The average financial impact is 1.2% of savings.

The following Table 6 presents some of the most often recommended means of energy saving in a high priority order:

Table 6 Examples of energy-efficient measures proposed in high-priority sector groups [5]

SECTOR GROUP	EXAMPLES OF PUBLIC PROCUREMENT REQUIREMENT
Public transport	Purchase of low-emission buses (e.g. electric or hybrid buses) and public fleet vehicles. The buses have to be equipped with driving-mode meters to monitor fuel consumption.
Electricity	Increase the electricity production from RES going beyond national support schemes. This measure can be reinforced by including the purchase of energy-efficiency services, as for example ESCOs.
IT equipment	Purchase of environmentally friendly IT products that meet the highest EU energy standards for energy performance. Training provision to users on how to save energy using their IT devices.
Building construction/ renovation	Use of local renewable energy sources (RES). Impose high energy efficiency standards to building's for reduction in consumption.

All the three types of public procurement are highly recommended and entail many benefits for the local community. Nevertheless, in the context of the **Covenant of Mayors** [18], the CO2 emission inventories refer to measures related to energy efficient public procurement focusing on reduction of energy consumption and emissions.

Joint Public Procurement

The term of **Joint public procurement** (JPP) concerns the combination of the procurement procedures that are carried out by two or more contracting authorities. The key feature of this model is that only one tender should be published representing all participating authorities [5]. The north European countries, as for example UK and Sweden, are familiar with this procurement model and they have been

using it on several occasions for a number of years. On the other side the south countries have very little or no experience in this field.

There are several substantial and explicit benefits for contracting authorities participating in these synergies:

- **Lower prices:** The combination of purchasing activities leads to reduced costs per unit as a consequence from increased total output of a product (economy of scale). This is very importance in the case of a renewable energy project that implies higher costs than conventional projects;
- **Administrative cost savings:** The total administrative work for the group of authorities in charge of preparing and carrying out the tenders will be significantly reduced, because only one tender should be completed; and
- **Skills and expertise:** Enabling the concentration of different skills and expertise among the authorities, increasing the variety range of technological fields and facilitating the knowledge transfer.

For a successful joint procurement model, the competent authorities of the involved cities should share their objectives, needs, capacities, responsibilities and legal framework, so that a fair and effective agreement can be reached. This will ensure their smooth, seamless and efficient future collaboration.

As mentioned in the GA, the IRIS LH and FC cities along with cities from other projects are oriented to joint public procurement model, so as to explore larger share of the market potential, address multiple needs, share development costs and spread the risks. The IRIS project creates partnerships with other demonstration and replication projects from different cities, in order to increase the volume of the total investment and reduce the risk for potential investors. This scheme, that is called **"Packaging"**, will be further explained at the end of this section. The IRIS partners will raise the issue of commitment process and the joint public procurement to the European Investment Bank (EIB), because this organization is able to provide anchor investments that are considered as an extra security for external investments.

Green Electricity Purchasing Case

Within the context of the liberalization of the European energy, the local authorities are able to choose freely their energy provider. According to the Directive 2001/77/EC electricity produced from renewable energy sources or **Green Electricity** can be defined as: "electricity produced by plants using only renewable energy sources, as well as the proportion of electricity produced from renewable energy sources in hybrid plants also using conventional energy sources and including renewable electricity used for filling storage systems, and excluding electricity produced as a result of storage systems".

Towards ensuring that the electricity supplied comes from a renewable energy source, consumers are entitled to request guarantees of origin certificates of the electricity. This mechanism has been described in the Directive 2001/77/EC. The energy providers has also the possibility to present clear evidence that a corresponding quantity of electricity has been generated from renewable sources or produced by means of high-efficiency cogeneration.

The level of the energy market liberalization, the characteristics of the national support schemes and the existence of green electricity providers determine the price differences between conventional and green

electricity. Although the price of Green electricity is quite fluctuating (higher, equal or cheaper rate than conventional electricity), it is considered as a competitive measure for public procurement [5].

The Figure 6 presents an approximate distribution estimation of the procurement procedures adopted smart cities projects:

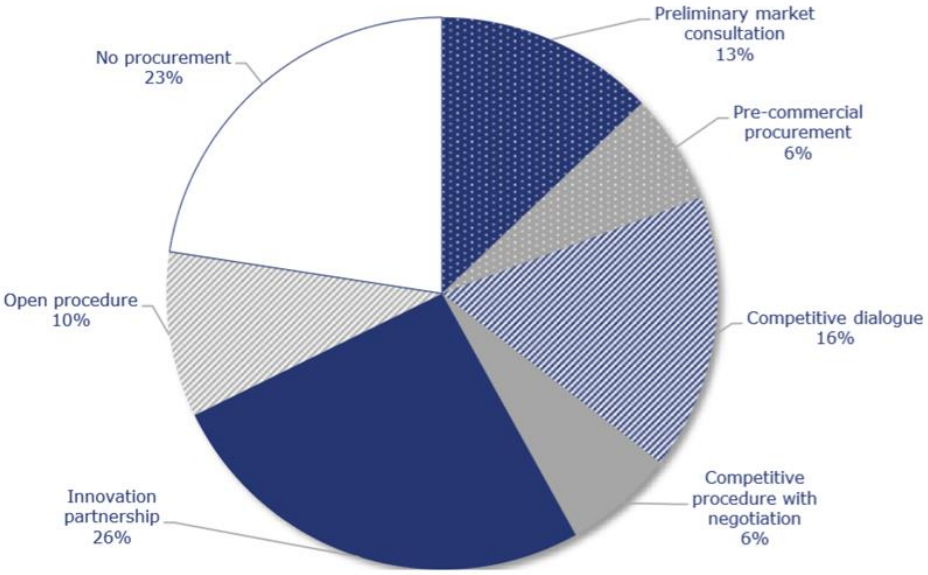


Figure 6 Procurement models in smart cities projects [1]

The above shape depicts that the Innovation partnership is the most popular for smart city initiatives. The principles of this model also address some substantial characteristics of green, sustainable and energy efficient public procurement models.

Packaging Model

At this point it is worth mentioning, the ongoing project with **12 running Lighthouse projects' Task Group on Business Modeling & Financing.** All 12 Lighthouse projects work together on Joint Procurement. The IRIS project is member of this Innovation Partnership. This collaborative scheme is called **"Packaging"** methodology [6].

The term "packaging" refers to the correlation of measures and solutions among smart cities projects with quite different characteristics. This novel term refers to a methodology that entails many benefits for the Lighthouse cities participants:

- Contribute to better consistency on requirements between Lighthouse programs;
- Enable the delivery of more efficient documentation of measures and a more resilient market that is faster, cheaper, more accessible and flexible; and
- Provide to cities the possibility of handling the managing issues more independently.

Reasoning and Scope of Packaging

Although smart cities projects comprise many different components and solutions, they are examined as small-scale investments. Thus, investors consider the cities as very slowly growing enterprises presenting too high and heterogeneous risks. The smart cities, towards addressing properly their

innovative objectives, should gain access to a larger share of public funds. This scheme will enable the volume increase of the measures to be acquired. Therefore, the total outcome will be of best lifecycle value as for investors (economy of scale).

Moreover, it is widely known that smart cities cannot keep up with the pace of large industries, if they act independently. With this model, the cities will be able to support their local economies, to approach the large industries and facilitates the local SMEs. Following secure and methodical steps, smart cities will achieve not be industry-driven. They will focus on their needs and objectives and they will manage all together to shape the market according to common development criteria.

The package methodology will definitely offer the opportunity for creating collaborative synergies and coordinated progress among the various city projects. This encouraging model will increase the added value of the investments and it will contribute to more rapid and efficient delivery of affordable solutions with reasonable risk margins for such innovative projects.

Measures and Methodology of Packaging

The concept of package is quite simple and focuses in the commonalities among city activities understanding the differences, but not considering them as a barrier. The main scope of this method is to outline the type and the requirements of measures and how they should be implemented.

Within the innovation framework, it is quite difficult for cities to work individually in terms of time, money and effort. However, cities have many unique features, they operate and evolve much better within cooperative groups with common understanding and visions.

During the packaging method, each solution is considered and examined following the below essential principles:

- *Clear and imperative proposal with explicitly outlined measures and features;*
- *Affordable price;*
- *Interoperability; and*
- *Adaptability to new standard applications and locally tailored solutions.*

Each measure, that is proposed to be included in the demonstration site of each LH city, should be examined according to three following perspectives:

- *Societal proposition (indicating the use cases and the added value to society);*
- *Technical specification (provision of detailed technical description to inform properly decision makers and guide the technology and industry suppliers); and*
- *Bankable business models, financing sources and indicators.*

Since the consistency of packaging methodology is crucial, common templates, tools and documentation should be used to speed up and facilitated the process. In addition, coherent guidelines and relevant standards will support the quality assurance of upcoming products and services.

The measures to be selected and implemented should be prioritized according to the impact and benefits to the local community and the potential for standardization.

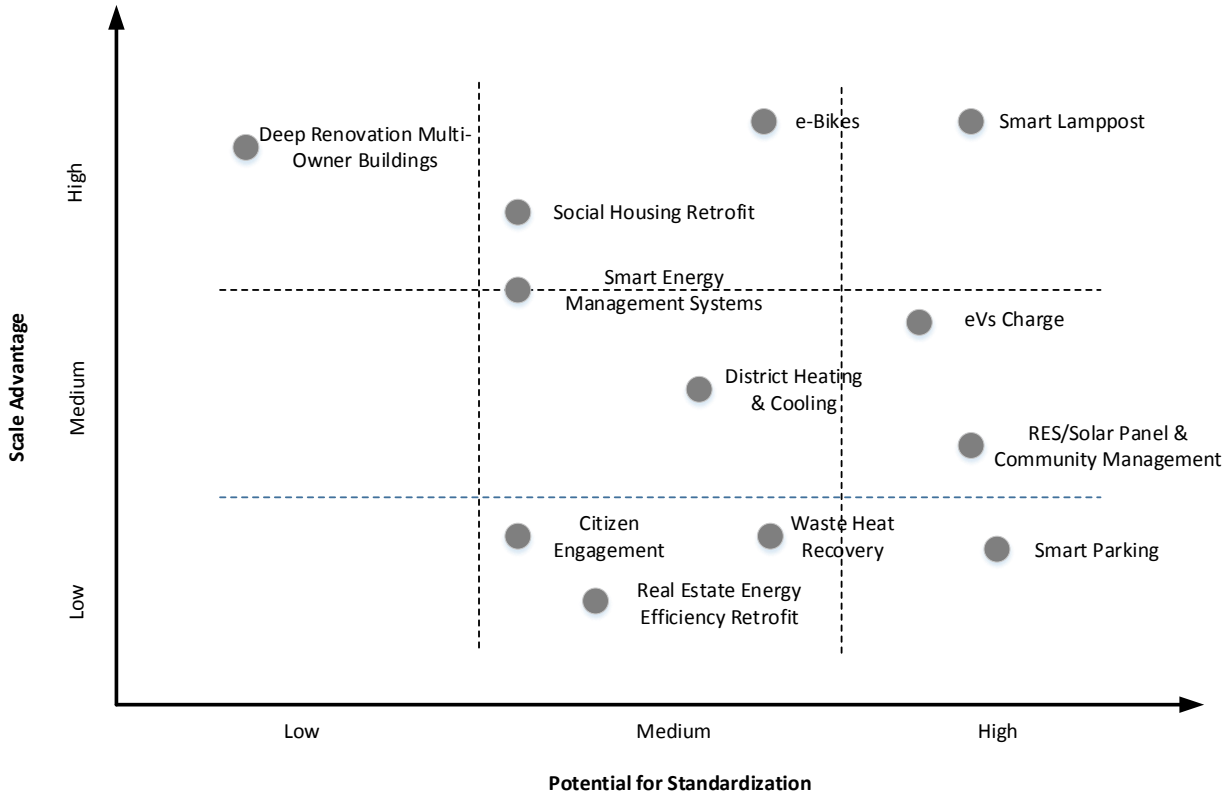


Figure 7 Allocation of measures to be applied in smart cities [6]

The above Figure 7 presents a classification of the proposed measures for the LH demonstration pilot sites according to their scale of advantage and their potential for standardization. The position of the measure in the grid indicates its suitability for implementation and integration.

3.2.3 Operational Guidelines

This sub-section is dedicated to the presentation of indicative guidelines to the LH and FC cities of the IRIS project for the proper preparation and performance of procurement procedure. The guiding principles mentioned in the Table 7 [1], [7] were first outlined in the *BSI Standards Publication (2014) Smart city framework – Guide to establishing strategies for smart cities and communities* and they were elaborated in the *Public procurement models for SCC solutions Report published by EU [7]*.

Table 7 Guidelines for procurement process in smart cities for local authorities [1], [7]

Procurement Process Phases	Guidelines
Tendering preparation	• Treat the procurement process as a specific project and not as a purely financial and administrative task; align it with broader policy objectives (e.g. health, environment, transport), indicating clear objectives, a clear work plan, tasks, timeframes and responsibilities, and allocated resources. • Ensure high-level support, also in terms of technical, legal and management skills within the project team following the tendering process. • Involve and consult end-users at different stages of the process, in order to identify real needs and to ensure that a given solution is successfully adopted.
Early market Engagement	• Consult the market before tendering (e.g. through a technical dialogue), respecting company confidentiality and ensuring transparency, in order to identify what is available on the market and to involve it in the city's strategic processes, vision and future city priorities. Accordingly, it is advisable to document all information given during a meeting with a company and ensure equal treatment of others. • Give the market sufficient warning, to ensure better responses from companies (who need time to develop new solutions). • Create an updated library of innovative technical solutions, including evaluation costs and benefits, in order to make the market research phase easier.
Tendering and contracting	• Consider the full-life cycle costs of the product; in other words, do not only consider the purchase price of the product but also the cost of operation (e.g. energy and water consumption), maintenance, and final disposal. • Make the tender SME-friendly, as many innovative solutions may come from smaller, more creative companies; accordingly, consider splitting tenders into lots or encouraging consortia to bid, in order to make volumes manageable. • Promote centralized or collaborative public procurement between cities for a number of Public Authorities, if needed using the service

	of intermediate experts (e.g. regional agencies, experts hired ad-hoc for a tendering process, etc.), to take advantage of knowledge and synergies from different public authorities that have similar needs. • Reduce the duration of a framework contract when it is focused on a specific technology. • Focus on the service provided and not on the technology used. In this regard, longer contracts could help the provider to introduce newer and more efficient solutions. • Be clear about how to evaluate proposals against a tender's award criteria, ensuring a fair comparison of bids so as not to disadvantage the most innovative proposals.
Monitoring and Evaluation	• Monitor the performance, both in economic terms and with respect to resource consumption, to identify deviations and apply, if necessary, the damages or penalties foreseen in the contract. • Communicate the achievements and promote greater engagement with other city authorities to understand what has worked well and foster closer collaboration.

3.3 Knowledge Exchange Framework

3.3.1 Stakeholders mapping

In this section, the IRIS stakeholder's groups, relevant actors and their role are presented with a view to clarify their interconnection and map their impact/interest on IRIS project. IRIS considers as main stakeholders those: a) whose interests are affected by the Project, b) whose activities affect the Project, c) who possess/control information, resources and expertise needed for the implementation of the Project and d) whose participation and active involvement is necessary for the successful implementation and/or dissemination of results. The inclusion of key stakeholders in decision-making and implementation of the project is critical since no one knows better the needs and other parameters of a problem than the people affected by and affecting it.

In D1.1 specific groups of stakeholders have been determined, and the objectives for each stakeholder and their connection between each of the IRIS domains, namely technical, economic, environmental, social, ICT and legal have been analysed. The stakeholder's groups were identified through the following procedures: a) examination of other Smart City projects to extract relevant information and identify successful examples; b) analysis of LH cities special needs and respective integrated solutions so that most of the stakeholders can be actively participating/represented in the implementation/evaluation of solutions; c) internal communications of IRIS experts. The key groups of stakeholders for IRIS include the: a) Distribution System Operators (DSOs), b) Consumers, c) Technology and Services Providers, d) Policy-Making Bodies and Governance, e) Citizens, f) Representative Citizen Groups and g) Citizen Ambassadors.

The active involvement of relevant stakeholders plays a dominant role in the successful implementation of any Smart City Project. Many interdependencies exist between these stakeholders due to the complexity of Smart City projects, meaning that a variety of interests have to be aligned [8]. With a view to resolve this issue and enhance stakeholder's mutual sharing of common interests, all the involved actors with direct effect to smart city development have been identified per stakeholder group. Additionally, the following five key roles of actors have been distinguished:

- **Enablers** (framework instigators): The specific actors can boost the exploitation of IRIS results and the realization of long-term impact; can help overcome barriers (especially legal and policy related) and ensure a favourable environment for implementation. For IRIS, key actors playing the role of enabler are local/regional/national authorities, EU policy makers and standardization/regulation bodies.
- **Providers** (knowledge ecosystem): The specific actors can grow the body of knowledge; can boost innovation and knowledge distribution; act as data interpreters; support and test new technologies and develop synergies to maximize impact. For IRIS, key actors playing the role of provider are knowledge institutes and universities, relevant EU funded projects and providers of technical solutions that serve IS.
- **Utilizers** (value partners): The specific actors are potential collaborators and catalysts for delivery; improve products/processes, profitability and skill in the field; are the primary users in new markets and innovation. Most of the involved actors in IRIS fall under the specific category including energy network operators and suppliers, public transport operators, SMEs and

industry, ESCOs, architects, planners, ICT consultants and others (see Table 1), since their participation in the project is essential to deliver solutions.

- **End – users** (point of delivery): The specific actors can provide feedback and improvement loops; can act as data providers/testers; are definitive to the success or failure of the Project. For IRIS, key actors playing the role of end-user are residential and non-residential consumers and drivers being the end beneficiaries of IRIS IS.
- **Facilitators** (financial provisions and support): The specific actors can navigate complex financing issues; roll-out IRIS results and ensure IRIS and replication projects are achievable and sustainable; present a high level of engagement and support further communication. For IRIS, key actors playing the role of facilitator are investors, financial institutions, banks and residents and non-residential agents with high interest in IRIS results (forming representative citizen groups and citizen ambassadors).

Table 8 lists the Stakeholder groups, with their actors, and the role of these actors in the Smart City.

Table 8 Stakeholders' group, involved actors and their roles within IRIS

Stakeholders Mapping		
Stakeholders' Group	**Involved actors**	**Roles of Actors within Smart City**
Distribution System Operators	Energy network operators	Utilizer
	Energy suppliers	Utilizer
	Heating/Cooling distributors	Utilizer
Consumers	Residential consumers	End-user
	Non-residential consumers	End-user
	Drivers	End-user
	Public transport operators	Utilizer
	Owners of transport infrastructure	Utilizer
Technology and Services Providers	Local businesses/SMEs	Utilizer
	Construction industry	Utilizer
	Vehicle manufacturers	Utilizer
	Traffic management providers	Utilizer
	ESCOs/Utility operators	Utilizer
	Real estate developers/Social housing	Utilizer
	Advisors, consultants, engineers	Utilizer
	Architects, planners	Utilizer
	ICT consultants/developers	Utilizer
	Investors, financial institutions, banks	Facilitator
	Knowledge institutes and universities	Provider
	Relevant EU funded projects	Provider
	Providers of technical solutions	Provider
Policy-Making Bodies and Governance	Local authorities	Enabler
	Regional authorities	Enabler
	National authorities	Enabler
	EU policy makers	Enabler

	Standardization/Regulation bodies	Enabler
Citizens	Residents	End-user
	Visitors/Tourists	End-user
	Building owners	End-user
Representative Citizen Groups	Residents	Facilitator
	Non-residential agents with high interest	Facilitator
Citizen Ambassadors	Residents	Facilitator
	Non-residential agents with high interest	Facilitator

The complexity of IRIS (as most other smart city projects) means that many actors need to be involved. IRIS focuses on engaging stakeholders' groups and relevant actors serving different roles within smart cities to ensure maximum impact. The IRIS project is based on a solid foundation for its successful implementation since a significant number of key actors per stakeholder group (especially regarding technology and service providers) are already partners of the IRIS consortium (Table 9).

Table 9 Stakeholders' group and relevant IRIS ecosystem partners

Stakeholders' Group	Relevant IRIS Ecosystem Partners
Distribution System Operators	Stedin Netbeheer BV, Enedis, Electricite de France
Consumers	Qbuzz BV
Technology and Services Providers	LomboXnet, VULOG, Metry AB, Merinova Oy AB, Energy Hive, Associacion Cluster Construccion Sostenible, IMCG Sweden AB, Civity BV, Trivector Traffic AB, Eneco Zakelijk BV, Stichting Bo-EX '91, Cote d'Azur Habitat, NEXIMNO 96, HSB Gotheborg, RIKSBYGGEN Ekonomisk Forening, VEOLIA ENVIRONMENT, Johanneberg Science Park AB, Tyrens AB, *Knowledge institutes and universities*: Utrecht University, Stichting Hogeschool voor de Kunsten Utrecht, Universite de Nice Sophia Antipolis, Centre Scientifique et Technique du Batiment, Chalmers University of Technology, University of Vaasa, University Politechnica of Bucharest, National Research and Development Institute for Energy (Romania), Center for Research and Technology Hellas, SP Technical Research Institute, European Science Communication Institute, Vrije Universiteit Brussel, Koninklijke KPN NV,
Policy-Making Bodies and Governance	Municipality of Utrecht, Metropole Nice Cote d'Azur, City of Gothenburg, City of Vaasa, Municipality of Alexandroupolis, Municipality of Santa Cruz de Tenerife, Municipality of Foscani
Citizens	Akademiska Hus

Table 10 presents a list of companies/entities/Beneficiaries, out of the bounds of IRIS project, who have an interest in the development of IRIS project, and with whom each LH has already strong contacts. This is to act both as communication and know-how sharing/flowing channels within each LH itself; thus, increasing the impact of Solutions made, but also for the rest of LHs and FCs, for the case external additional know-how is required.

Table 10 Relevant Non-members of IRIS project Companies and Organizations

LH	Stakeholders' Group	Relevant non- members of IRIS entities (with which LHs are in contact with)
UTR	**Technology and Services providers**	Antea Group, Elaad, Senfal, Solease, Strukton, Suez, Sundata, TNO, van Scherpenzeel, Viriciti, Wocozon
	Policy-making bodies and Governance	Municipalities of Utrecht Province
	Representative citizen groups	Labyrinth B.V., Doenja Dienstverlening, Wijkraad Zuid-West, Buurtcentrum BuurtThuis - Kanaleneiland Zuid, Eyüb Sultan Moskee Utrecht, Theehuis Al-Asdekaa
NCA	**Technology and Services providers**	Apexenergies, Arcsis, ASI, Axun Solar, Azur Systeme Solaire, CEA Tech, DAIKIN, Ecorealis, Eneco, Engie, Farmgrid, Giordano Industries, Guiban Mediterranee, Helioclim, IUT Nice Cote D' Azur, Mines Paris Tech, Neurone, Osmose, O'Sol, Seazen, Sunpartner Technologies, Sustain'Air, Valenergies, Windpulse, AVEM, Chauvin Arnoux Energy, Le Confort Electrique, Cristopia Energy Systems SAS, Enoleo, Greencom Networks, Gridpocket, Hewlett Packard Enterprise, Ingespim, Legrand, Mobendi, Montelec, Orsteel Light, Ragni, Resistex, Schneider Electric, WIT, Acqua Solutions, Aitec Elec, Athanor, Bouygues, Energie Service, Dalkia, Engie Cofely, GRDF, GRT Gas, Jean Graniou, RTE France, Senseor, Techtel, Azzura Lights, Capitole Energie, DCR Consultants, ECO CO_2, Eiffage Energie, Ovezia, Vinci Facilities, Benomad, Busit SAS, Cirane, IBM, Imredd, IO Think Solutions, Izypeo, Orange, Qualisteo, SAP Labs, SFR Business, Smart Service Connect, Acta Consult, Adista, Alpheeis, Apave, Apis Mallifera, Artelia, Atiane Energy, Blue2BGreen, Cerema, Cesi, CSTB, Cust'Home, Dowel, Eiffage Constuction, Engie Axima, Euklead, Garcia Igenierie, GS2X, IA BTP, Joel Druelle Architecte, Kleber Daudin Bet, LE BE, Meritis Paca, MI2020, Polymage, Projetechnique, Scapes, SLK Ingenierie, SO WATT, Transenergie, Watinyoo, Capenergies, Pole Emploi 06
	Policy-making bodies	Association des Maires Du 06, Fédération Du Bâtiment Et Des Tp Des Alpes-Maritimes, Caisse Des Dépôts, Communauté D'agglomération Sophia Antipolis,
	Representative citizen groups	Communaute Communes Alpes D'azur, Nice Ecovalee
	Citizen Ambassadors	CCI Nice Cote D' Azur, Sictiam

GOT	**DSO**	Göteborg Energi, Mölndal Energi, Partille Energi, Härryda Energi
	Technology and Services providers	Metry, Trivector, Tyrens, Riksbyggen, HSB, Akademiska Hus, RISE, IMCG, Volvo AB, Volvo Cars AB, Ericsson, Bengt Dahlgren, Skanska, White, PEAB, Mölndala, Husqvarna
	Policy-making bodies	Regions: Västra Götalandsregionen, Västra Götalands län, Municipalities: Göteborg, Partille, Mölndal, Lerums, Härryda, Kungsbacka, Kungälv, Trollhättan, Borås, Skövde
	Representative citizen groups	IQ Samhällsbyggnad, Viable cities, Ekocentrum, CSR Västsverige

IRIS Lighthouse city ecosystem coordination teams (consisting of Site Managers, TT Leaders and IS Leaders, see section 3.1.1) will attempt to bring close together actors with similar roles and/or actors that are sharing common interests (Figure 8). This will be further supported by a digital online social collaboration space, operating in each LH city as a private section for registered users.

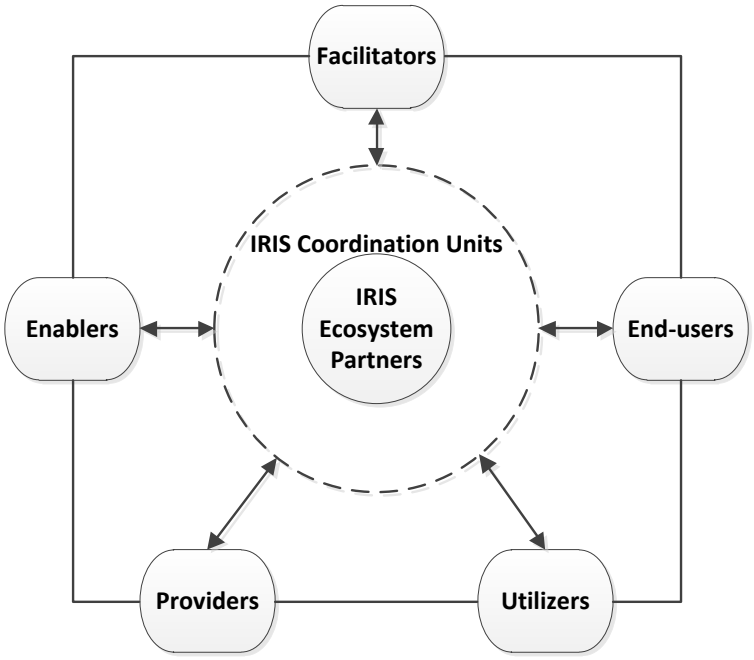


Figure 8 IRIS Stakeholders' environment

Identifying key stakeholders and clarifying their role and their interconnections is essential to effectively manage them during the project. Their prioritization is also significant to maximize impact and engage them in the most cost-effective and efficient manner. To do so, a mapping procedure was followed, classifying the identified stakeholders according to their power over IRIS project and their interest in it (Figure 9) [9], [10].

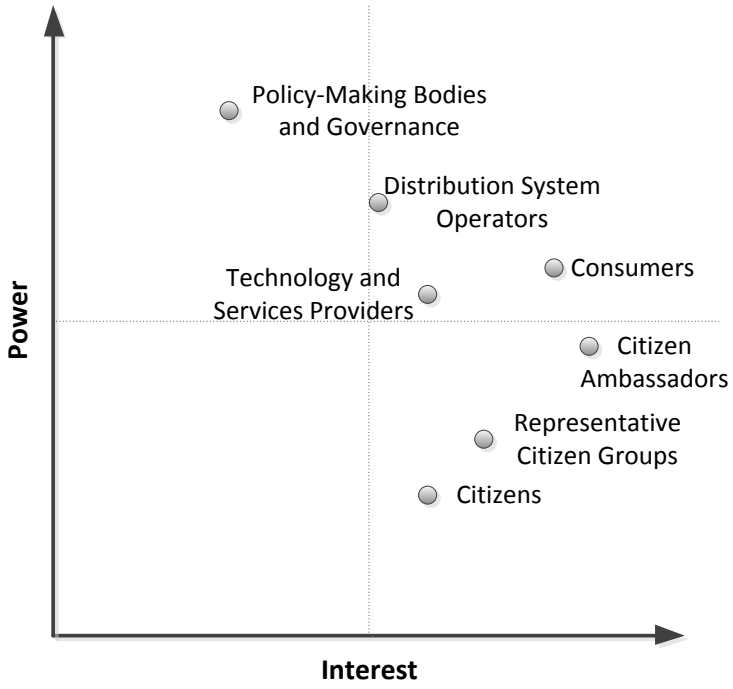


Figure 9 Power/Interest grid for IRIS stakeholder prioritization and mapping

The position of the allocated stakeholder groups on the grid indicate specific actions to be taken with them:

- Upper right grid – High power/highly interested stakeholders [key players]: The specific stakeholder groups must be managed closely, and the IRIS coordination units should put great efforts to engage them in the project. Reaching them is critical for the successful implementation. One of the main objectives of IRIS project is to ensure and promote the active participation of consumers (end users) in market and grid operations; thus, special focus is delivered to the evaluation of End Users performance within the context of the project. Consumers, being key beneficiaries of IRIS solutions have both significant interest and power over the project. Technology and Service providers play also a crucial role by connecting the IRIS eco-system and supporting the provision of the solutions in different ways. Additionally, it is of high interest for the project to evaluate IRIS system performance from the DSO's point of view. DSO's are catalysts for delivery of IRIS solutions (high power over IRIS results). Reaching and cooperating with these three stakeholder groups is essential for the realization of the project.
- Upper left grid – High power/less interested stakeholders: These stakeholders are essential for the project and must be kept satisfied, but they should not be bored with excessive communication. For IRIS, policy-making bodies are responsible for a normal and steady operation of the energy market, its gradual privatization, and they provide the basis of the regulatory framework, which is responsible for the determination of the quality standards and the basic rules. While policy making-bodies can have a great impact over IRIS, engaging them can be a challenging and time-consuming task since they usually receive multiple inputs from various sources and they have to satisfy and prioritize in many cases conflicting interests. IRIS

has already the support of the involved municipalities (being leaders of the respective LH Cities) something that can smooth implementation.

- Lower right grid – Low power/highly interested stakeholders: These stakeholder groups must be kept adequately informed and resolve any major issues arise with them. The specific groups can be of great help to the project. The IRIS stakeholders group included in this category are the citizens, representative citizen groups and citizen ambassadors. These are groups of citizens who are residents of the target areas, some or all of whom may become consumers of the services being provided via IRIS, have a representative role within those areas and have a strong interest in the deployment of IRIS Integrated Solutions. Non-residential citizens (e.g. citizens involved in similar activities in neighbouring areas) with other connections or interests may also be included in those groups. While these groups are characterized by inherently high interest, their power is limited if a number of barriers (financial, technical, regulatory and awareness related) are not resolved.
- Lower left grid – Low power/less interested stakeholders: IRIS does not include any stakeholders in this category, since it focuses on key stakeholder groups.

3.3.2 Communication and knowledge exchange plan

The main objective of this section to describe the knowledge exchange plan among the LH cities and the other IRIS partners and highlight its importance for successful demonstration and replication projects.

Knowledge exchange between international IRIS partners

The establishment of an efficient communication strategy between the LH cities, the LH partners and the other international IRIS partners will contribute to the seamless performance of the integration plan during the demonstration activities and it will provide valuable feedback to the replication plans of FC. The two fundamental components for the formulation of the communication plan is the stakeholders' engagement and the involvement of municipal authorities, because these city actors affect significantly the transition and integration strategies. The structure of the knowledge exchange plan will be based on the transition tracks.

The **main objectives** of the knowledge exchange are the following:

- Facilitate the process of finding solutions, solving barriers and facing challenges within IRIS consortium (mediation of knowledge);
- Accelerate the knowledge transfer from one LH/FC/TT expert to another; and
- Community formation among LH/TT partners (people with same interest and skills can come in contact and interact more easily).

An effective communication strategy should employ several ways to bring together partners, propagate the knowledge, create related groups and address topics of interest. Figure 10 depicts the communication channels among IRIS partners:

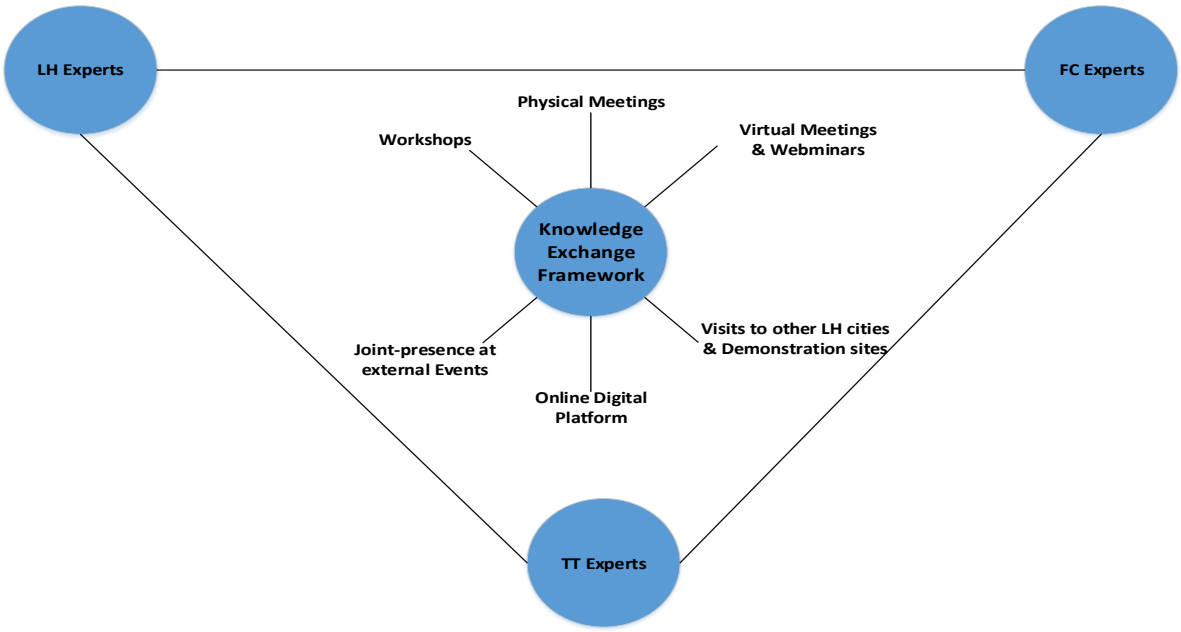


Figure 10 Knowledge Exchange Framework within IRIS project

Instruments for achieving knowledge exchange:

- Physical meetings, workshops and regular virtual meetings;

- Webinars;
- Presence at related events (internal and external);
- Collaboration or visits to other LH cities and demonstration sites; and
- Use of an online digital platform.

Within the structure of the knowledge exchange scheme, key roles should be identified, and responsibilities should be assigned. Other two crucial parameters are the definition of specific thematic topics and the arrangement of special interest groups and task forces.

The **key identified roles** within the IRIS knowledge exchange plan are:

- **Process facilitators**;
- Respective **TT leaders or partners** from LH cities; and
- Respective **TT partners** from horizontal work packages (mainly WP3, WP9, WP10).

And the proposed **interest groups** are:

- **Energy:** TT1 & TT2 (perhaps they can be merged, because they address complementary technologies);
- **Mobility:** TT3;
- **ICT:** TT4;
- **Citizen Engagement:** TT5 (maybe in combination with TT4 – ICT helping interaction with citizens);
- **Coordinators exchange:** WP 5, 6 and 7 leaders and LH cities Site managers.

It should be pointed out that FC cities is strongly recommended to be actively involved in the knowledge exchange processes. In this way, they will have the opportunity to benefit though the knowledge transfer from demonstration activities and the corresponding challenges. This interaction with LH cities will help FC to formulate properly their replication plans.

A fairly common and widespread way of achieving effective communication and exchange of information is the organization of thematic peer-to-peer workshops. The most popular topics of these workshops are considered the following:

- Business modelling;
- Technical issues;
- Communication;
- Citizen Engagement;
- Data Management Platform; and
- Monitoring.

Business modelling

The purpose of such a workshop can be to analyze and understand the LH cities innovation ecosystems figuring out their actual needs and objectives. The interaction with the LH partners will help to the definition of suitable business models and to the proposal configuration of tailored solutions for local community development.

Technical issues

During this workshop, technical aspects of the demonstration activities can be discussed. For example, the relevant key partners can argue for the proper combination of measures and building of system architecture in local area, so as to cover both the citizens' and market stakeholders needs.

Communication

External or joint events can be organized in the form of workshop, so as to approach and attract targeted audience, such as qualified stakeholders in a specific field.

Citizen Engagement

Within this workshop, the IRIS responsible partner can present to the LH ecosystems partners the model of citizen engagement approach. This will help to map the planned integrated IRIS solutions according to the need for citizen engagement in terms of co-creation.

Data Management Platform

In the context of this workshop, the data to be collected in the demonstration sites can be identified, data management techniques can be discussed, and the purpose of data handling can be clarified. The outcome of this workshop can provide valuable feedback for the monitoring process.

Monitoring

This workshop can be oriented to possible monitoring strategies for measures, data collection processes and indicators. Extended and fruitful discussions for KPIs calculation can be realized in terms of identifying the necessary data for KPIs quantification.

In the GA within the section of contribution to the project's expected impacts, there is a brief reference on the possible mechanisms for supporting the creation of stronger links and active cooperation between many cities with quite different features.

These mechanisms can be summarized in the following Table 11.

Table 11 Cooperation mechanisms between cities [1]

Mechanism	Example
Common public procurement	Sourcing of smart mobility solutions and services.
Common best practices	To adopt /develop or collect good practices within the consortium and make these available to all. To provide common frames for evaluating public policies measures, in order to make them comparable.
Knowledge-transfer process	Mutual learning model where experienced cities teach more novice cities.
Replication	Processes for scaling the solutions both inside and outside of the consortium.
Joint Ventures	Common development of mobility solutions (partnerships between local startups/ enterprises).
IT environment	Support functionality that is needed in order to obtain an efficient environment for cooperation.

Living labs	A common framework for implementing and operating Living Labs.
Lobbying	Develop and operates common policy strategies with the objective to support smart mobility solutions to be taken up at scale.

Nowadays, many organizations are oriented to digital ecosystems, because most transactions take place online and the constantly expanding digital landscape offers several possibilities for communicating and decision making between partners and stakeholders in each ecosystem, data sharing, extending business and revenue model outside the organization and exploring more efficiently new business opportunities.

The IRIS Lighthouse Project aims at developing smart, innovative and replicable solutions and methods for envisioned smart cities that respond to stakeholders' requests. Therefore, an interactive ICT system is indispensable, because it enables efficient knowledge sharing among stakeholders (internal and external), Lighthouse and Follower cities, as well as research and industrial partners, in order to participate in an interactive peer to peer exchange and learning approach.

Thus, LH cities decided to acquire an online collaboration platform that is called CurateFX. This platform will bridge the gap in knowledge transfer and sharing between the partners, the customers and the suppliers as well as other potential system stakeholders. It is be also a powerful tool for the coordination of all the relevant demonstration and replication activities.

At this point, the main difference between the CurateFX and the EMDESK platform should be mentioned, in order to avoid future misunderstandings. In the deliverable D11.1, there is a short description for an online collaboration platform called EMDESK that is a project management tool. EMDESK is used by partners for coordination, WPs organization and document sharing. CurateFX is an online collaboration platform that digitally supports an ecosystem.

Curate FX Collaboration Platform

CurateFx is a **Software as a Service (SaaS) tool** that provides a way of delivering centrally hosted applications over the Internet as a service. These applications are sometimes called web-based software, on-demand software or hosted software. The SaaS applications run always on a SaaS provider's servers. This tool helps different stakeholders to manage digital information and digital ecosystem as a whole. It gives users the ability to make faster, more confident, more informed, collaborative decisions around complex business scenarios. It is used internally to breakdown silos between departments and go beyond an organization in order to connect the ecosystem of partners, suppliers, customers and other potential stakeholders. Regarding the IRIS case, the **CurateFX platform** provides several capabilities for communication and interaction [11], [12]. Some of them are presented in brief below:

- Facilitate communication between the different WP teams around issues related to use cases planned by the lighthouse cities;
- Enable the management of data exchanges related with the City Innovation Platform (CIP);
- Represent all the stakeholders involved in a specific use case and all the relations between these stakeholders at contractual, financial and technical levels; and

- Contribute to the formulation of specific business and technical objectives through the representation provided.

Today the transactions in the largest market share have been digitalized and as a result the system stakeholders need to have access to digital business models. Consultants and system integrators need to keep up with this transition and accelerate the definition of the technical solutions and services according to platform capabilities based on the digital business models. The presentation of all the opportunities and the provided services within this unified platform-based scheme will enable the efficient interaction and co-creation between the current system stakeholders, the potential future investors and the possible partners. Towards improving this collaborative model, it is recommended to clarify the time frame, the included risks, the relationships and the data exchange framework.

The **challenges** that should be addressed by the platform are:

- Determination of all the interactive aspects of the proposed business models;
- Bridging the gap between traditional business and the IT sector;
- Enabling the tracking of the market trends; and
- Formulating stakeholders' relationships and contributing to the creation of collaborative models.

The **potential impacts of not addressing the above challenges** can be:

- Missing business opportunities by stakeholders;
- Not satisfying the customers' needs; and
- Increasing errors during the implementation of the business plan.

Contribution and benefits of CurateFX Platform:

- Co-creating new business models through the built-in methodology, best practice guidance and visualization tools that accelerate the capture of the stakeholders' concepts;
- Defining clearly the roles of ecosystem stakeholders and map their multifaceted relationships with the Ecosystem Designer purpose-built interface;
- Industry leading Framework and Open APIs are integrated into the platform, allowing IT and business to clearly capture and assign ownership of requirements; and
- Providing flexibility, as it can be used simultaneously by the city coordination teams and internal and external stakeholders (even non-partners).

The expected **added value from the use of the platform** can be captured in the following aspects:

- Faster IRIS ecosystems definition;
- Decrease in time to reach an agreement between the involved stakeholders; and
- Reduction in computing effort and IT infrastructures through the clear definition of the requirements.

In a nutshell, the **provided functionalities of the CurateFX Platform** are the following:

- Define Business Scenarios, Ecosystems, Products/Services;
- Make combinations of system measures and financing models and perform feasibility studies;
- Create stakeholders' synergies and collaborative models with less risk;
- Create a mapping of industries best practices and have quick access on them;
- Provide a complete collaboration framework; and

- Create a full profile for your coordination team.

The core functionalities of CurateFX platform are presented in the form of screenshots in Annex 2. More information about the platform and the provided services are presented on the website https://www.tmforum.org/curatefx/.

Enterprise Europe Network

Another significant opportunity for networking is to exploit the potential of the Enterprise Europe Network (ENN). The Enterprise Europe Network is the largest network of contact points concerning technology poles, innovation support organizations, universities and research institutes, regional development organizations and chamber of commerce and industry [13]. Its role is to provide information and advice in particular to small and medium enterprises (SMEs) and support them towards achieving their business goals and growing on an international scale. IRIS stakeholders and partners can use the services offered, so as to develop the transition strategy and knowledge transfer for LH and FC cities. More specifically, the most representative services provided by the network include:

- **International Tenders Alerting Service:** The Enterprise Europe Network can inform clients about all the tendering opportunities that appear in particular areas of business. It can offer businesses help and support regarding all aspects of public procurement in Europe.
- **Technology Transfer Service:** IRIS stakeholders can insert business offers, technology offers, business requests and technology requests in the ENN database and find other relevant partners in Europe (partnering opportunities).
- **Organization of business matchmaking events:** IRIS partners can be informed for the upcoming brokerage events and sign up. The participation in these events can further facilitate network developments, knowledge transfer and replication.

Partnering Opportunities

The Profile Search functionality of EEN allow IRIS partner to search for company profiles that suit their criteria for cooperation based on requirements/specifications for each TT and company characteristics. Figure 11 depicts the EEN format with the available options for conducting the search.

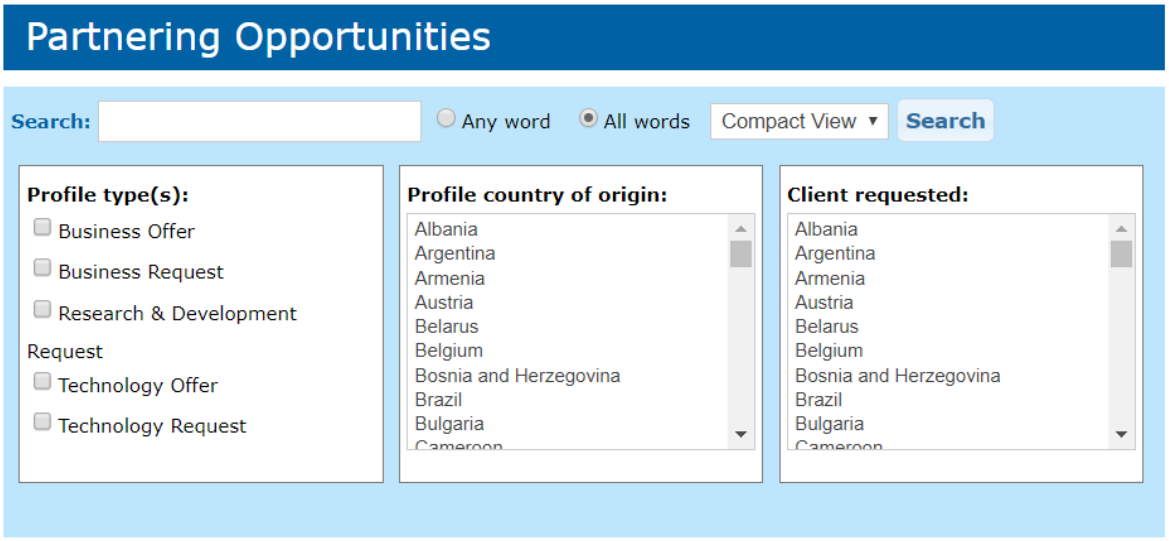


Figure 11 EEN format for Partnering Opportunities

The profile types for search include:

- **Business Offer:** Profiles offering their products / services to other parties
- **Business Request:** Profiles requesting products / services from other parties
- **Technology Offer:** Profiles offering their expertise/knowledge to other parties
- **Technology Request:** Profiles requesting expertise / knowledge from other parties
- **Research Development Request:** Profiles looking for research development collaboration projects

Business Matchmaking Events

The Enterprise Europe Network branches organize a variety of events that enable participants to meet potential business partners and learn methods for business expansion, network development and peer-to-peer knowledge exchange. IRIS stakeholders and partners can participate through EEN in relevant brokerage events organized by Sector Group Intelligent Energy for Energy Solutions. This is the Network's expert platform for renewable energies and energy efficiency and offer guidance and information to find business, technology and research partners. Business matchmaking events often take place along with international trade fairs and conferences. Therefore, IRIS partners will have multiple opportunities to develop their business interconnections and improve their replication strategy. The interested stakeholders can use the EEN interface for searching the upcoming events (Figure 12).

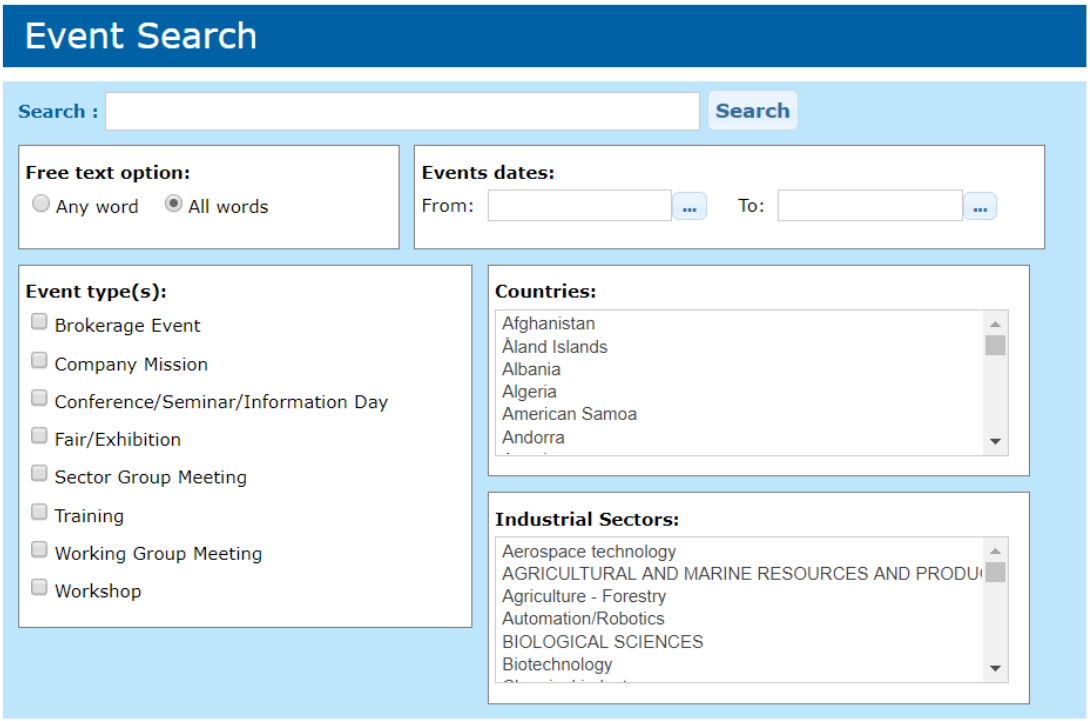


Figure 12 EEN format for business matchmaking events

As it is presented, there are several types of events and industrial sectors for different scientific fields in different countries. The website of Europe Enterprise Network (https://een.ec.europa.eu/) can be a powerful tool for updating and network for Small and Medium-sized enterprises (SMEs) with international goals.

3.3.3 Citizen Engagement and Co-creation plan

Following the work undertaken on co-creation and citizen engagement as reported in D1.6, work is ongoing in two main areas, namely:

1. Detailed planning of Citizen Engagement activities for each LH city. This planning will describe the key components of the citizen engagement activities for each if the Integrated Solutions
2. Citizen Engagement Field Guide. This will provide the initial structure and content for the Field Guide intended as a repository for all the relevant materials gathered or created during the project. This will also contain examples of best practices and related use cases where appropriate
3. An indication form FC as to which of the described plans will be shadowed with a view to replication

Following Workshops in Utrecht, Nice and Gothenburg, all LH cities have been active in identifying those Integrated `Solutions most suitable for citizen engagement activities using the Citizen Engagement Ladder model detailed in D1.6.

A template for bringing together the relevant information and planning was circulated to all LH cities. This template allows LH cities to explain why the proposed integrated solutions were considered to be a

level 3 or 4 activity (using the notion of active touchpoints as an important criterium). In addition, the type of citizen engagement activities can be described in detail per integrated solution, with associated stakeholders and stakeholder groups and with any related KPIs. Further, for each activity, a timeline of activities is also provided.

For LH Utrecht, this work is well-advanced and the initial planning descriptions are included for all the LH Utrecht Integrated Solutions in Annex 3 - Citizen Engagement & C0-Creation Planning. Citizen engagement and co-creation activities are described for the following Integrated Solutions:

Table 12 Citizens engagement related integrated solutions for Utrecht

Transition Track	Integrated Solution
Transition Track #1 Smart renewables and closed-loop energy positive districts	Measure 3: HEMS Eneco Toon Measure 5: Smart Hybrid e-heating systems Measure 6: AC/DC home switchboxes Measure 5: VR new home and district experience
Transition track #2: Smart energy management and storage for grid flexibility	Measure 1: Electrical charge points for e-car: location vs usage Measure 2: Electric V2G Car and We Drive Solar App
Transition track #3: Smart e-mobility sector	To be developed
Transition Track #4 City Innovation Platform	Smart Street Lighting with multi-sensoring Data service: Fighting Energy Poverty Data service: 3D Utrecht City Information modelling: building a 3D catalogue

Bringing together such detailed information has proved to be a time-consuming task. As a result, a schedule has been agreed to ensure that the same level of detailed planning will be completed for all LH cities by M21.

During the period M13-M21, co-creation planning and detailed descriptions for all citizen engagement and co-creation activities will be intensified for LH GOTHENBURG and LH NICE, with the partial involvement of the following cities as well. Table 13 presents the timetable of activities.

Table 13 Timetable for the all citizen engagement and co-creation planning in LH cities

Month	Activity	Partners
M12	Initial citizen engagement and co-creation activities planning and initial results for LH UTRECHT (D1.7)	LH Cities (HKU lead)
M13	Seminar on Citizen Engagement Ladder (CEL) for following cities	FC (HKU lead)
M13-M16	Ongoing mapping of CEL approach to IS (see D1.6) within LH cities	LH Cities (HKU lead)

M17	Two-day Citizen Engagement Workshop for all LH and following cities (Utrecht)	LH and FC (HKU lead)
M20	Draft Citizen Engagement & Co-creation planning for each Integrated Solution in each LH	LH Cities (HKU lead)
M21	Final Citizen Engagement & Co-creation planning for each Integrated Solution and for FC (D567.7)	LH and FC (HKU lead)

The work on the Citizen Engagement Field Guide will continue in parallel with the schedule outlined above. This is to ensure that the most relevant and useful materials are collated and sorted into the correct phases. It is intended that the Field Guide be made available in M22.

Regarding the following cities, there is an initial seminar on the CEL approach to be held in M13 in Nice. Furthermore, the following cities will be invited to participate in the two-day workshop scheduled for M17 in Utrecht.

3.4 Framework for Action Plan per Integrated Solution

The content of this section can be considered as indicative guidelines and suggestions for the preparation and execution of the action plan of each IRIS integrated solution within LH cities. Thus, it can be used as input to the deliverables D5.2, D6.2 and D7.2 of the corresponding WP5, 6 and 7, where the concrete work for the planning of integration and demonstration activities in each LH city will be presented.

The action plan of each IRIS's technical solution is a quite complicated and combinatorial task, because it depends on the organizational complexity and decision-making entities and procedures within the city operational framework. The aim of such a plan is not only to guide the successful completion of the technical solution, but also to deal with any regulatory barriers, the existing decision-making and governance structures and improve the business as usual models.

A strategic smart city action plan should not be designed according to the existing urban plans. First of all, it is necessary to define the baseline situation that is defined as the situation before the application of any intervention. The outcome of this study can be used in order to identify the kind and the level of the improvements and the transformations that should be done. It can also facilitate the evaluation of the solution, because the results after the intervention can be assessed based on the knowledge of the previous situation.

The design of an efficient smart city strategy requires the formulation and communication of a methodical and long-term plan for the city, the provision of funding, the planning, the cooperation of multiple actors/stakeholders, while considering the local, regional and national environment's individualities. The combination of these procedures is transformed into policies, programs and projects that should be put in place according to the guidelines of a structured action plan.

Short-Term & Long-Term Strategy

An Integrated Action Plan is originally designed for individual projects and has to include a contextual layout including the aspects to be addressed and the activities to be performed. The short-term strategy should be developed along with the long-term strategy, so that the results of the short-term actions can be integrated to the long-term procedures. This will also have a major role during the monitoring and evaluation process, during which different indicators in the short, medium and long timeframe will be examined.

The solutions to be deployed and integrated, as for example the energy positive districts, the energy management and the e-mobility, will be part of the long-term plan including many short-term overlapping projects. The industrial partners, the technology providers and the utilities should be involved in the formulation of the joint long-term strategy together with the local authorities in order to set the plan's basic principles and outline the executing guidelines [14].

The following processes are the preparatory steps that should be explored:

- Investigation of the current City Operational Framework (trends and business models in ICT, urban data platforms etc.);
- Definition of the project objectives;

- Identification of the municipality structures, assurance of political commitment and creation of the project's governance model;
- Mapping of system's stakeholders with relevant enterprises (e.g. experts in specific technological fields, having a large market share etc.); and
- Consideration of funding opportunities.

Some preliminary outcomes of the above steps will help to the definition of the short-term and medium-term objectives and intermediate phases of the action plan.

The IRIS project proposes a smart city model that comprises various sustainable solutions to be demonstrated in three lighthouse cities with quite different features concerning the city objectives, the organisational structure and the technological infrastructure. Each demonstration site consists of several measures that should be combined in an efficient way, so as to highlight the value of the proposed solution. Towards this direction, it is necessary that the lighthouse cities should follow a structured action plan in order to coordinate all the involved technical partners and stakeholders, the consulting companies and the local authorities. This will ensure to a certain extent the proper selection of resources and the seamless and successful completion and integration of the project.

The core part of the action plan consists of the individual specific procedures for the implementation of each IRIS solution within the demonstration site. The action plan will outline thoroughly the steps for realizing each smart city component in a specific time frame and with specific budget.

All the appropriate potential options should be pre-assessed according to pre-feasibility studies. More detailed feasibility studies will be required before the implementation of the investment projects identified in the Action Plan. The related activities should be carefully mentioned in each IRIS demonstration project's layout taking into consideration the required time and resources for the feasibility studies, the main planning stage, the authorities' approval and the operating expenses.

The phases of smart city integration plans are carefully outlined in relevant studies by European Union and smart cities associations [5]. The intermediate stages should take into account the city strategy concerning the environment and the development vision, the technical and financial individualities of the IRIS Solutions and the available resources. The selection and the execution consecutive steps will be performed following a **project management approach** in order to guarantee the coherence of the overall action plan.

The planning of the demonstration activities in the Lighthouse cities should be aligned with the following phases:

- Initiation (Smart City Strategic Model Configuration)
- Planning
- Implementation
- Monitoring and Evaluation

This first phase (Initiation) of the plan has almost been completed during the proposal stage of the IRIS project [15]. A short description of the intermediate steps of this phase is presented here, so as to indicate a coherent connection between what was mentioned in the proposal and what will be done in the demonstration sites.

Initiation (Smart City Strategic Model Configuration)

- In the Initiation phase, the **LH** cities local authorities should identify the **vision** and the **objectives** of the city concerning energy, climate policy, socio-economic conditions and mobility. The definition of the objectives and strategy within the smart city framework should be carried out taking as a basis the current trends and business scenarios in ICT and urban planning and the impact of CO2 emissions to health, regional profile and municipal budget. Another important step towards policy integration is the identification of relevant municipal, regional and national strategic development plans, so as to ensure the alignment of the proposed actions with already set objectives.

- The driving force for the realization of the action plan is the **political commitment and guidance**. The formal approval and support of the plan by the mayor and municipal council are critical factors for the successful implementation. Except from the local authorities, it is also crucial to ensure the empowerment by ministries, national agencies and specialized committees.

- Another significant success factor is the **governance model** of the project plan. The **LH cities demonstration coordination teams** (Site Manager, local TT Leaders and local IS Leaders together) will steer the development, the implementation and the management of the action plan for the demonstration activities in Utrecht, Nice and Gothenburg. The team members will have separate roles and assigned responsibilities and they will be in charge of the communication with the local partners, authorities and city organization structures (strategic planning, financial planning, spatial planning, energy and transport operators etc.)

- The smart city strategy should be translated into specific practical actions, potential measures and solutions to be foreseen in the plan. During the **business case development,** all the alternative options have to be considered along with the potential costs and benefits. The outcome of this process will provide the identified system stakeholders with necessary information concerning the investments on the proposed technologies and services. The formation of specific business models will facilitate the exploration of funding opportunities.

- To achieve the efficient delivery of the action plan and maximize the impact, the human involvement is considered as an integral part. Thus, it is highly recommended to gain the **stakeholders participation** in an early stage and increase the **citizens awareness** through clear and targeted information.

Planning

- The first step of the planning phase is recommended to be the **investigation and assessment of the baseline situation** within each LH city in order to identify the actual needs and the potential barriers [5]. A **SWOT analysis** will also be of great importance for presenting strengths, weaknesses, opportunities and threats of both TTs and LH ecosystems. Thus, the deliverables D5.1, D6.1 and D7.1 can provide necessary information for this process.

- After that, the **Site Managers** should be in close cooperation with the **TT Leaders** and the **IS Task Leaders** in order to identify the **city components** and the **physical assets** in terms of infrastructure in each demonstration area. The proper selection of the technological measures

will contribute to the efficient exploitation of the potential of the proposed business models. Appropriate tools can be used to test the suitability of the proposed measure such as the evaluation metrics of other similar demonstration projects.

- One key parameter for the project development is the **budget estimation** and the design of the **financial plan** according to financial indexes (CAPEX, OPEX, ROI etc.). An indicative report for the assessment is the cost estimates for the achievement of the maximum return on investment (ROI). Before the detailed study of the project, a **prefeasibility study** can analyze several options of the investment and indicate the most feasible and profitable one.
- For the final analysis and assessment of the demonstration project, it is recommended to carry out a complete **feasibility study** (technical, financial and environmental impact analysis). The produced reports will prove if the project plan deliver the pilot site activities in an optimal way.
- The actions drafted in the implementation plan and the measures selected should be accompanied by a **risk analysis** report. This document should cover different aspects of the project that imply potential risks, such as government-related risks, technical risks, market-related risks, etc.
- A core part of the planning phase is the determination of **financing schemes** that can contribute to the successful execution of the financial plan. The right selection of **funding mechanisms** (e.g. subsidies, grants, loans, revolving fund etc.) can secure the provision of sufficient financial resources.
- Before the completion of this phase, the legal and regulatory framework concerning the city operation principles should be checked. The field of procurement and contracting mechanisms is of great importance along with the permissions for building, construction etc.

The above identified working steps are presented briefly in the following Figure 13.

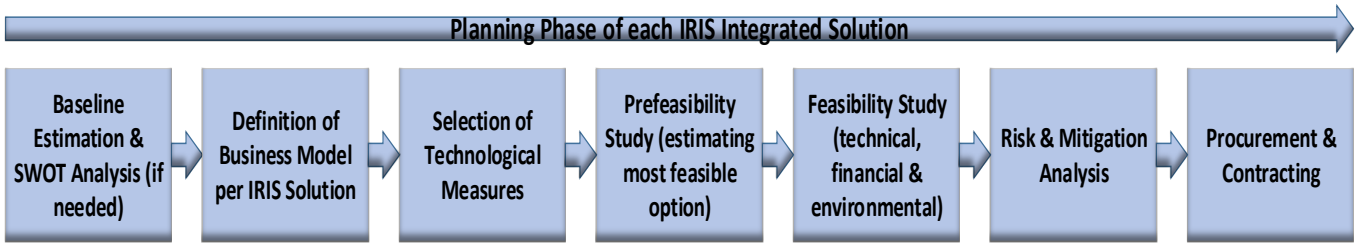


Figure 13 IRIS solution planning phase

Implementation

- The **LH cities demonstration coordination teams** should be aware of the administrative steps and procedures needed to be performed for the integration of each IRIS solution within the LH cities. In most cases, all or some of these procedures require the approval from the local public authorities that are the municipal councils of each city. Thus, an accurate planning with security factors is preferable to be presented to public administration prior to implementation.

- Before the launch of implementation activities, it is recommended to **test** some **indicative or crucial measures/components** using tools such as other pilots or demonstration projects.
- The **Site Managers**, who are responsible for the coordination and management of the activities in the demonstration sites, should divide the project into different parts, create tasks, assign responsibilities, select appropriate procedures, organize workflows and set deadlines. For the execution of these steps, it is essential to follow a **Project Management approach** (e.g. International Organization for Standardization (ISO) 21500:2012, Guidance on project management) for regular assessment of the work progress in terms of technical and financial aspects at specified time intervals.
- Towards enabling the efficient performance of quality control procedures, a list of **indicators** will be established for tracking and monitoring the action plan. Indicators such as percentage of compliance with deadlines, percentage of budget deviations and percentage of emissions reduction after the application of measures are quite representative. The other members of the LH cities demonstration coordination teams can also propose other relevant indicators deemed appropriate for the work progress evaluation.
- For ensuring efficient completion of the intermediate tasks, a **quality assurance plan** has to be considered in order to assess the processes according to standards and control the quality of the produced deliverables and results.
- The **IS Leaders** are responsible for the proposal and organization of regular **training sessions** at least for the staff who is directly involved in the implementation of each IRIS solution. The IS Leaders should inform the respective **TT Leaders** for these sessions, so as the possibility for joint training sessions can be examined.
- The **IS Leaders** are also in charge of **communication** with the team members, so as to motivate them, share the vision and discuss the progress-related problems. They should also provide progress updates to **TT Leaders**.
- It is worth mentioning that the **IS Leaders** should inform frequently the **TT Leaders** for the **successful results and failures**.
- During the final setup of the IRIS solution, a commissioning test will be performed, so as to identify any malfunctions and test if the operation of the installation is in compliance with the standards.

Figure 14 depicts the necessary steps, so as achieve the final setup of each IRIS integrated solutions.

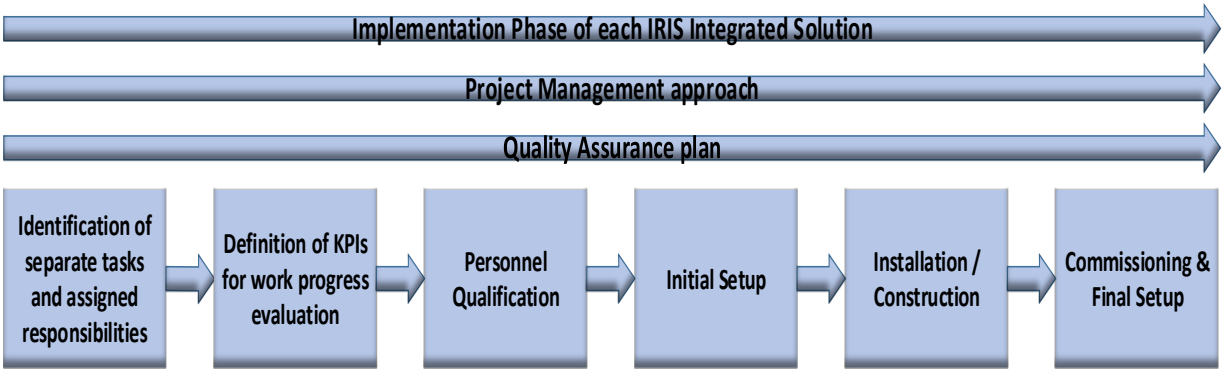


Figure 14 IRIS solution implementation phase

Monitoring and Evaluation

- For the monitoring and evaluation of the demonstration sites, the program management and the overall work progress, a necessary step is the definition of the appropriate key performance indicators (**KPIs)**. The IRIS KPIs are divided into six separate domains that cover all the considered aspects for the development of the project. The KPIs can be either **quantitative or qualitative**. Within the project framework, there are two categories of KPIs, the ones that **assess the work progress and commissioning phase** and the others that **evaluate the performance of the demonstration sites through monitoring energy consumption, CO_2 emission results and socio-economic benefits**.

The monitoring and evaluation phase is presented and analyzed in details in chapter 4, where the necessary procedures and parameters are highlighted.

According to EIP SCC, **four different purposes of evaluation** with specific boundaries have been identified. Detailed description of the following approaches will be provided in WP9:

- Program evaluation and management (holistic view)
- Project evaluation and management (sectoral approaches)
- Reporting and Communication (interaction with internal and external stakeholders)
- Benchmarking related issues (provisioning a benchmark of best practices)

3.5 Business modeling and financing

In this section, the correlation between the business models and financing schemes will be presented. These two concepts play a key role in the realization of the IRIS integrated solutions. As mentioned in section 3.2.2, 12 running Lighthouse projects work together as **Task Group on Business Modeling & Financing**. The outcome of this study will be reported in consolidated form in the respective deliverables of WP3.

The successful implementation of the action plan consists of three factors, the governance model, the technical integrity and the financial viability [5]. The last pre-condition requires sufficient financial resources. Thus, it is necessary to identify all the available financing schemes and mechanisms and motivate all the remarkable investors. Due to a number of financial barriers hindering the smart city innovations, such as lack of public financial capacity, the solutions to be demonstrated should be documented as bankable projects that are characterized by viable business models. The initial step during the design phase of a bankable project is the examination and assessment of the project's key components separately, but also as a whole. Each component involves a risk factor with implicit economic consequences. The assessment of these aspects can prove the economic attractiveness of the IRIS solution project within each LH city considering the different needs and objectives.

The purpose of this part is to present in brief the possible alternative financing solutions and explain the alignment of the investment planning with the planning of activities taking into account any potential barriers and risks. The information included in this paragraph can be used as high-level guidelines for WP3 and the respective tasks of WP5, 6 and 7. The process of financing smart cities should take into account that the integrated solutions will ensure urban development.

The possible funding mechanisms for the IRIS solutions of the IRIS project, that focuses in the areas of energy, transport and ICT like all the innovative smart cities projects, are based on the same generic principles and models of investment financing as for all projects in economy. **In terms of definition, investments** represent decisions and processes to acquire real assets in the form of fixed and working capital (e.g. land, buildings, plants, electric vehicles, equipment, but also patents and trademarks) or financial assets (e.g. securities, deposits), considering the operation costs of the investment during the projects' lifetime. Therefore, the **financing decision** addresses the question of how much capital is necessary for the funding of the related operations and which is the most profitable proportion in the funding mix [16].

Towards following an effective procurement process, the components and the requirements of the IRIS integrated solutions to be implemented should be specified, in order to avoid inconsistencies and omissions and prepare accurate tender procedures and contracts.

For a primary evaluation, two important indicators, that depict an initial attractive picture of the technological solution as an investment opportunity, are the **economic rates of return (ERR)** and the **internal rates of return (IRR)**. The ERR estimates the total value of an investment including externalities (positive or negative) and the IRR represents the financial rate of return for the investor. Even if an innovative solution displays significant ERR, such large-scale restructuring is quite challenging for private investors. Moreover, some of the components (technical measures) entail serious risks.

Thus, a concrete financing plan with successive phases should be performed. Below, the most significant steps are presented that reveal the essential elements and processes, but also the potential challenges and barriers during the financing procedure:

Definition of the business models per IRIS Solution and LH city

The concept of **business model** describes the rationale of how an organization captures value (economic, social, cultural, environmental or other forms of value [17]. This definition identifies actors, roles, potential business value and the source of revenue. So, each LH city as a living organization has to consolidate and propose the proper business models for the delivery of the IRIS solutions.

Table 14 presents the preliminary, indicative business models as mentioned in the proposal:

Table 14 Indicative business models per IRIS Solution per LH

IS Number	Indicative Business Models
IS 1.1	Surplus energy trading between legal entities in a district (GOT)
	Surplus energy trading between positive energy building and utility (GOT)
	Surplus energy trading between legal entities (GOT)
IS 1.2	Smart Near Zero Energy Housing (UTR)
	Sharing solar power (UTR)
IS 1.3	Excess Heat Sales (GOT)
IS 2.1	Smart DC public lighting (UTR)
	Customer oriented mechanisms (NCA)
	Local Energy Manager (NCA)
IS 2.2	LT instead of high temperature heating network (ALL)
IS 2.3	2nd life batteries to lower cost (ALL)
	Reserve power as an income source (NCA)
IS 3.1	E-mobility service driven by property owners (GOT)
	Second life batteries (GOT, UTR)
	Value of Grid Flexibility (UTR)
	Smart solar V2G charging of e-cars/e-buses (UTR)
	Smart management of pollution peaks (NCA)
IS 3.2	“We Drive Solar” (UTR)
	EC2B (GOT)

The above business models have been consolidated in the deliverables D5.1, D6.1 and D7.1.

Identification of IRIS solution key components and their corresponding requirements

The selection of the **key components** of the IRIS solution project depends on the specific technologies and characteristics of the IRIS Solutions along with the business models and the objectives to be

addressed. Each LH city should identify the type of the components and the respective **requirements** for the pilot sites to be implemented.

Representative examples of key components for the IRIS technologies are the PV panels, the wind turbines, the heat pumps, the storage systems, the EVs, the EVs chargers, the V2G systems etc. The proper combination of the relevant components configures each **integrated solution.** The requirements that characterize each solution as an overall system can be divide as follows:

- **Technical requirements** (e.g. PV-panel should at least have a peak capacity of 400 kWp etc.)
- **Dimensional/Situational requirements** (e.g. PV-panels should be installed on the façade of the building, power exchange between the tenants of the premises etc.)
- **Contractual requirements** (e.g. guaranty of 12 years for PV-panels and converters etc.)

Risks identification

In the context of investment, the risk is widely defined as the chance an outcome or investment's actual return will differ from the expected outcome or return. Risk includes the possibility of losing some or all of the original investment [16]. In the field of novel smart city infrastructures, the risks are quite high to attract the necessary funds. In order to minimize or mitigate the risks and motivate the potential investors, a feasible prevention measure is to identify the nature of the risks. Thus, the coordination team of each LH city is responsible to recognize and examine all the real or perceived risks concerning each IRIS solution. The risks will be further analyzed in the next section along with the proposed mitigation measures and instruments.

Definition of the levels of investment and maturity of technology

The level of investment for each IRIS solution is quite small. If this is considered along with the **high technological risks** and **long-term delays to maturity of the proposed solution,** the LH cities encounter many difficulties in gathering the necessary financial resources. The concept of **"packaging"**, already described in section 3.2.2, proposes a dynamic solution to this problem. Different LH cities work together as joint projects, in order to acquire the adequate financial resources. This merge of many LH cities projects financed together spread the risk and make the investment more attractive to potential investors.

Examination of potential lack of profitability of the IRIS solutions projects concerning the high socio-economic value

Smart cities projects are projects with high social and economic value for the local society. When it comes to assess the project's benefits, a major problem is the **difficulty in monetizing the positive externalities and the contribution to social sector**. Many projects presenting remarkable technologies are not profitable enough to prove their bankability, despite the provision of economic returns to society. Hence, it is necessary to retrieve somehow some of the benefits to finance the project. The most straightforward mechanism is the subsidies by the state. A potential source for this mode of financing can be the transfer of taxes to project's coordination teams as a reward for the social benefits. The process of identification and quantification of project's externalities and the calculation of the corresponding public share is not a simple case.

Towards proving the bankability of the IRIS solution, the above steps are combined as below (Figure 15):

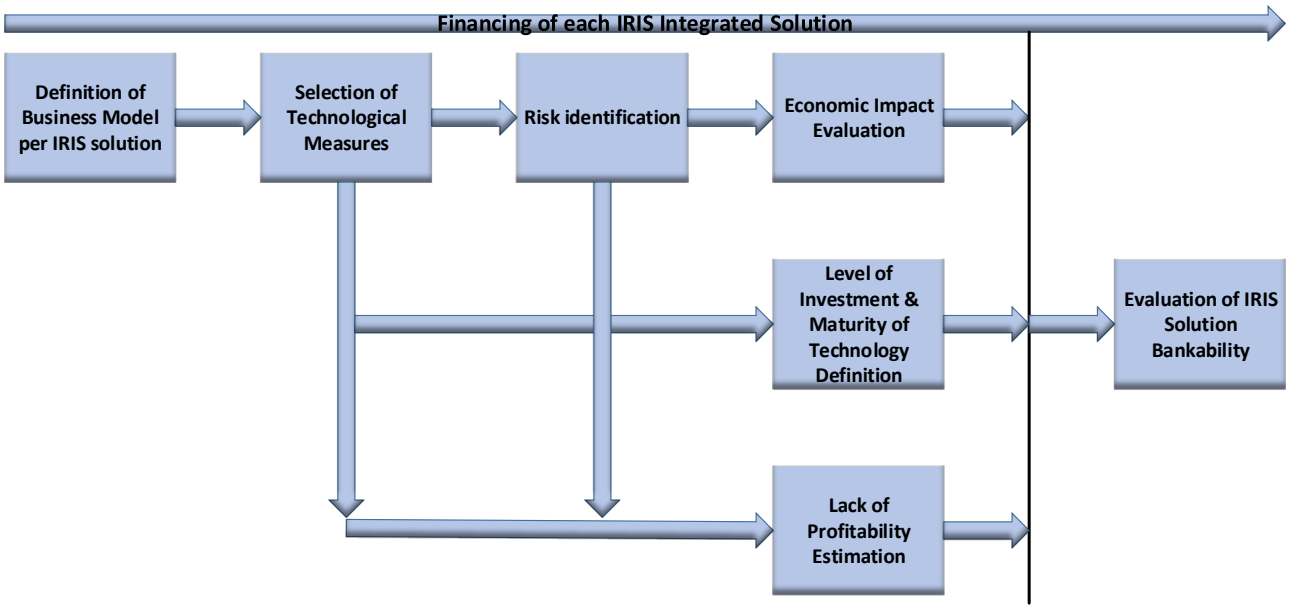


Figure 15 Financing phase of each IRIS solution

Description of financing models and schemes

The financial system performs its processes and activities through two operating modes of financing:

- *Direct financing*

This way imposes to firms and project coordination teams to give securities to investors, so as to obtain the capital.

- *Indirect or intermediated financing*

This case is related to recently established and too small firms that cannot issue the sufficient amount of securities to attract investors. The term of indirect or intermediated financing refers to compiling funds through financial intermediaries, as for example commercial banks, insurance companies and venture capital funds that act as mediators between the end recipients and the providers of capital.

The most well-known funding mechanisms for smart city projects [17] that can be found in the webpage of the Covenant of Mayors Office [18], are the following:

Revolving funds

This financial scheme is considered as a sustainable way of funding a category of investment projects. The involved parties can be public or private companies, organizations and institutions. The funding mix may consist of loans, grants, subsidies or other type of contributions in the scope of financing project with high Return On Investment (ROI) indicating short payback period. The controller of funds can be the investor or an appointed authority, as for example a contractor. The repayment should be done within a fixed period of time or at certain time intervals.

Third party financing schemes

This is the case when someone else provide the necessary funds for financing and take the financial risk. It constitutes a quite easy procedure for municipalities to conclude contracts and initiate projects. One of the main disadvantages is that the financing cost is quite high, because the responsible person for the debt is a third party.

Leasing

In this mode of financing, the client pays the amounts of capital and interest to the leasing authority. The payback period is determined in the contract. An attractive point of this financing scheme is that the amount to be paid is lower than the respective one in case of a loan. There are two major types of leases: capital and operating.

- **Capital leases** are installment purchases of equipment. In a capital lease, the leasing entity owns and decreases in value the equipment and may benefit from associated tax benefits. A capital asset and associated liability appears on the balance sheet.
- In **operating leases,** the owner of the asset owns the equipment and essentially rents it to the leasing entity for a fixed monthly amount of money. This scheme transfers the risk from the leasing entity to the client but tends to be more expensive for the leasing entity.

Energy services companies

The ESCO is one of the most popular and well-defined third-party financing entity for energy related projects. The ESCO is preferred for financing energy saving projects. The concept is that the energy savings achieved during the contract period recover the investment costs. The level of investment should be considered so as the energy savings can cover the contracting expenses and the cost of the new energy efficient equipment. It should be mentioned that the payback periods are quite negotiable. A critical aspect of this financing scheme is the monitoring and verification of related measurements for tracking the generation of the required energy savings.

Public-private partnerships (PPP)

This financial scheme is used when there is lack of public capital and resources and lack of expertized personnel to lead and manage the development of infrastructures. Private sector entities can also participate in a PPP under certain conditions. The contract is quite flexible in order to enable the private company to extend the contract in case of unexpected payback delays.

Figure 16 depicts the financial cycle of a demonstration project. As it can be observed, different financing schemes are mentioned. Towards compensating the death risk area, public financing can be used in the form of subsidized loans and loan guarantees and private support may be available in venture capital.

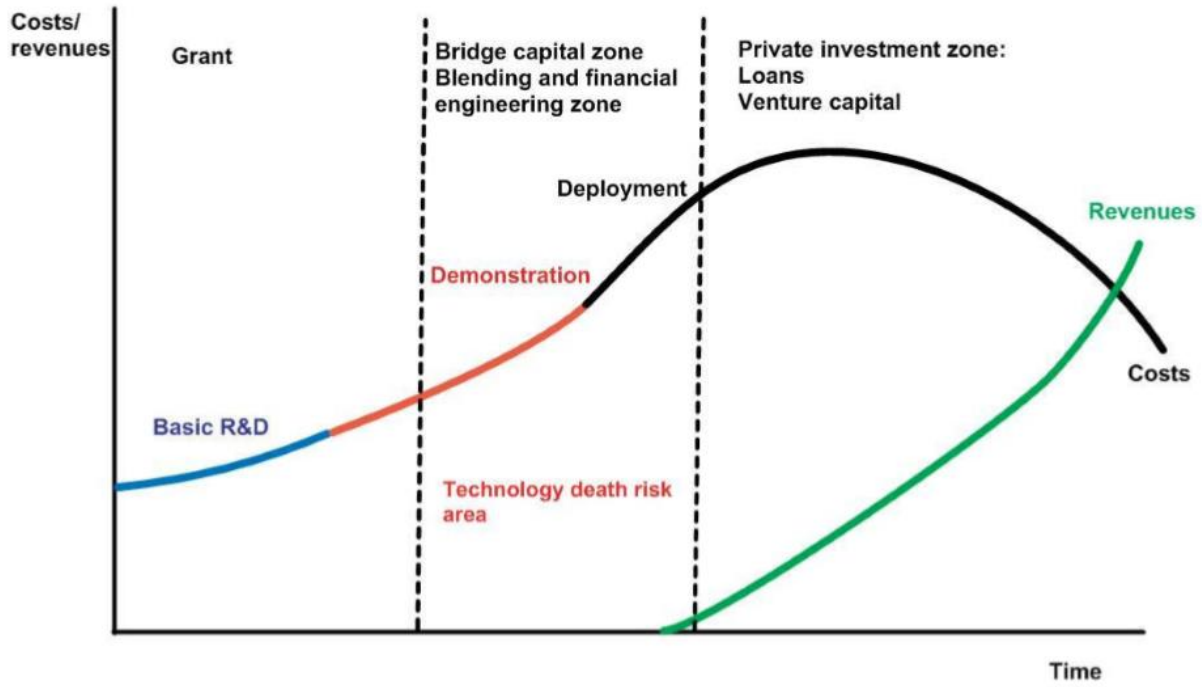


Figure 16 Indicative financial cycle of demonstration project [17]

When mapping financing models, the following should be considered as key considerable parameters:

- Investment time horizon (short/medium/long term)
- Revenues time horizon (short/medium/long term)
- Maturity of technology (prototype/early market/mature)
- Maturity of planning and implementing approach (standard/innovative)
- Type of project financing (infrastructure/buildings/products/soft measures)
- Project scale (national/regional/city wide/district/neighborhood)

3.6 Risk and mitigation analysis

This section refers to the risk identification and analysis in local level concerning each IRIS solution in Utrecht, Nice Cote d'Azur and Gothenburg. Each demonstration pilot site framework includes some of the IRIS solutions forming a combination of novel technologies and various stakeholders.

The three LH cities have provided in the corresponding deliverables D5.1, D6.1 and D7.1 the main barriers and drivers regarding the demonstration projects. When there is no absolute certainty (100%) that the barriers will be materialized, they may be considered as risks. With the same reasoning, the drivers may be viewed as opportunities. Taking into account the outcomes of D5.1, D6.1 and D7.1 and the preliminary information of D5.2, D6.2 and D7.2, this section provides some guidelines for risk analysis and mitigation. The mentioned guidelines can be considered as inputs during the progress of D5.2, D6.2 and D7.2.

The risks can be estimated and assessed at IS or TT level within each LH city and there is no direct correlation with the risks mentioned in the Part A of GA which are considered at project level.

Risk categories

The identified potential risks can affect the following aspects [5], [17]:

- **Project-related risks:** cost and time overruns, poor contract management, contractual disputes, delays in tendering and selection procedures, poor communication between project parties.
- **Government-related and Policy risks:** inadequate approved project budgets, delays in obtaining permissions, changes in Government regulations and laws as for example feed-in tariffs or fuel prices, leading to a reduction in profitability of the integrated solution, lack of project controls, administrative interference.
- **Technical and Operational risks:** inadequate design or technical specifications, technical failures, higher than expected operation costs, new technological measures do not perform as expected in real life deployment, suboptimal technical performance due to the lack of experienced staff.
- **Contractor-related risks:** inadequate estimates, financial difficulties, delays affecting the return on investment, lack of qualifications and experience, poor management, difficulty in coordinating and controlling appointed subcontractors, poor communication skills.
- **Market-related risks:** shortages of technical personnel, increase in wages, materials inflation, shortage of materials or equipment, variations in the price of the various energy carriers, reduced market interest for the new infrastructure or service.

Complete tables with the first identified risks and mitigation actions at TT and IS level are presented in the preliminary versions of the deliverables D5.2, D6.2 and D7.2.

According to risk analysis techniques, risks can be assessed through the calculation of the **Risk Priority Number (RPN)** that is a measure used during the assessment helping the identification of critical failures linked to the design or process [19], [20], [21], [22].

Considering the RPNs at IS level, the respective total risks at TT and IRIS demonstration level can be calculated. The below Table 15 depicts the correlation between the RPN and the severity level.

Table 15 Risk assessment according to severity level

Calculated RPN	Severity level
512-1000	I- Extremely severe
216-512	II- Severe
64-216	III – Moderate
8-64	IV – Slight
1-8	V – Insignificant

Corrective or Mitigating actions

Since the critical risks have been identified, corrective and mitigating actions should be proposed. The quantification of the potential success of these actions will be very useful, in order to decide if their application work in a compensative way. This may be an iterative process, because there are several options and dependencies. Possible corrective or mitigating actions can be the following:

- Reducing the magnitude (severity) of the consequences of the potential risk;
- Reducing the probability of the risk occurring;
- Increasing failure detection speed and probability;
- Protecting against the risk, mitigating strategies to compensate for a failure; and
- Transferring the risk to another solution or transition track.

After the selection of the proper mitigation actions, these can be evaluated according to the following Table 16.

Table 16 Definition of Mitigation possibility level

Mitigation Possibility	Definition
High	A solution is available at relatively little cost.
Medium	An achievable solution may be possible at reasonable cost or a reasonable solution is available at modest cost.
Low	An expensive solution may be possible, but system benefits may not justify these, and/or a solution needs further investigation or is highly complicated.
Improbable	Solutions are too expensive (likely to remain so) in relation to the reduction of risk(s) and the benefits gained from the functionality of the system and/or a solution is not available for the (extremely) severe risk that has been identified.

The risk assessment and the evaluation of the mitigation possibility level will contribute to the evaluation of the project's weaknesses and barriers. The outcome of this process can be used in the investigation of the proper confrontation measures, so as to make the project viable.

4. Monitoring and evaluation framework

The aim of this section is to provide an initial common monitoring framework for IRIS project describing potential processes and tools, which can be used to monitor the performance and progress of activities. The information included in this section provides generic guidance to be capitalized in WP9 where the comprehensive monitoring and evaluation program for IRIS will be developed. The following necessary working phases for monitoring have been identified, their implementation of which will lead to a complete and effective monitoring system.

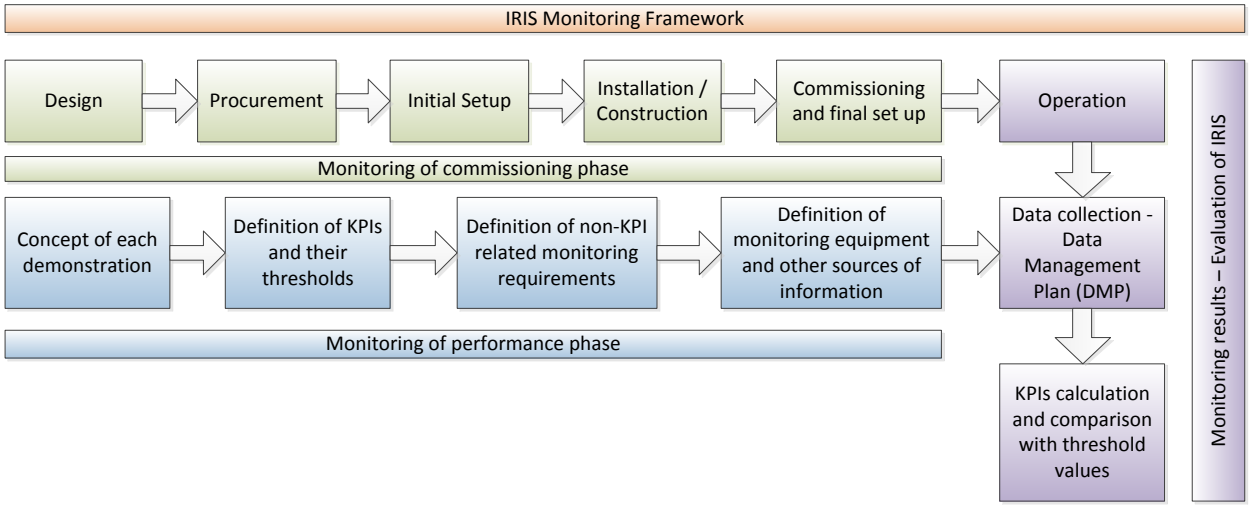


Figure 17 IRIS monitoring and evaluation framework

The IRIS monitoring framework can be separated into three interrelated generic phases (see Figure 17): **a)** the monitoring of performance (highlighted in blue blocks) which ensures that all necessary requirements/needs to efficiently monitor IRIS performance (both at an IS and LH level) have been determined, **b)** the monitoring of commissioning phase (highlighted in green blocks) which ensures that the commissioning of necessary equipment and means of IRIS implementation will be procured and set up smoothly and according to Project's needs and **c)** the monitoring of results – evaluation (highlighted in purple blocks) which ensures that all necessary data is collected and processed in an effective way and IRIS progress and impact can be evaluated over time.

4.1 Monitoring of Performance phase

4.1.1 Concept of each demonstration

The monitoring begins during the phase of structuring the idea of each demonstration. The DoA for each demonstration in WP 5, 6 and 7 included some KPIs per TT and LH, which clarified the guidelines to be followed regarding the objectives of each IS solution testing. It takes into consideration both the technology solution that is to be tested and evaluated, but also the end-user benefits that can be derived by the future operation of the demonstrated facilities and services. Regarding this, a case-by-case analysis had to be performed in order to consider both the IS that are to be tested but also their optimal integration in each LH city ecosystem in order to solve problems and provide an added value. The information that is of primary importance for the analysis of the concept of the demonstration is:

- The city background (in matter of emissions, energy price, motivation for investment in the energy sector, etc.);
- The climate influence both in the city need and the possible RES exploitation;
- The objective of the demonstrator;
- The technical specifications of the solutions to be proposed;
- The investment costs;
- The identification of the relevant stakeholders;
- A primary analysis of the management model.

4.1.2 Definition of KPIs and their thresholds

KPIs express as precisely as possible to what extent an aim, a goal or a standard has been reached or even surpassed.

The IRIS project definition of KPIs was conducted in D1.1 in accordance with other projects enhancing the way towards the energy smartification of European cities, using the uniform monitoring platforms of CITYkeys [23], as well as including some extra KPIs.

The list of KPIs was determined after bilateral discussions with key partners from the 3 LH ecosystems, as well as regarding a set of criteria [24], according to which a KPI list should be characterized by:

- Relevance to the object of assessment;
- Completeness taking all possible aspects and points of view;
- Availability of data needed for their calculation;
- Measurability in order to provide clear numerical results;
- Reliability so as the conclusions are not misdirective;
- Familiarity in order to be easily understood by the users;
- Non-redundancy, so each quantity/quality is expressed by one KPI; and
- Independence between different indicators of the set.

The IRIS list of KPIs are categorised into six domains (dimensions) which complement each other in order to provide a holistic performance framework. The IRIS KPI domains are defined as:

- **KPIs measuring Technical Performance**, such as the energy consumption, the RES generation ratio, the peak load reduction etc.

- **KPIs measuring Economic Performance**, such as the average cost of energy consumption, the average estimation of cost savings etc.
- **KPIs of Environmental Performance**, such as CO2 emissions reduction
- **KPIs of Social Performance** such as the degree of users' satisfaction
- **KPIs concerning the Performance of ICT** such as people following the advice of the Urban Pulse app, apps which enable the residents to monitor and analyse their energy and water consumptions, home energy management systems etc.
- **KPIs of Legal Performance**, such as the level of adaptation of electricity/heat integration in the legal framework, the legal barriers for usage of biofuels for energy exploitation purposes etc.

After the final definition of the KPI repository, the threshold definition is an important and sometimes difficult task, since it sets the quantified objectives of the project. Each KPI will finally acquire a value calculated throughout the monitoring of the project. The actual evaluation of the presented technology solution has to be done with the comparison of the KPI final value with a threshold that separates success to failure. This separation line can have the form of:

- **Baseline**, which is a measurement taken in the beginning of the project;
- **Business-as-usual**, which takes into consideration the change in the value of the KPI throughout the time period of the project, without the implementation of the tested technology solution; and
- **Other threshold**, which could be defined by the evaluator.

The determination of the threshold line is a responsibility of the partner in charge of the corresponding KPI.

4.1.3 Definition of non-KPI related monitoring requirements

Monitoring certainly is structured in a manner that can provide all the appropriate input for the KPI value calculation needed for the project evaluation. On the other hand, there are certain elements that need to be monitored even if they are not directly linked with the KPIs. For example, the weather conditions and forecasting have to be monitored, although they cannot be exploited in the KPI calculation. Weather forecasting can be used to predict and improve the operation of building management systems, and to inform the citizens in advance in case of possible modifications in energy application operability or energy management strategies. The weather data collection and forecasting can be undertaken through the services provided by existing weather platforms like https://www.wunderground.com/.

4.1.4 Definition of monitoring equipment and other sources of information

The data collection before, after and throughout the demonstration phase is crucial for the accurate evaluation of the proposed solutions through the quantified IRIS KPI values, which are necessary for the replication too. The data collected is both **primary** through the on-site measurement of certain values and **elementary** (such as feed-in-tariffs and energy price) that are parameters not measured during the project. The sources of primary data are:

- Web services API
- Smart meters
- Plug-level meters

- Utility bills
- Battery Management Systems (BMS) and EV charging platforms
- Grid power quality analysers
- Supervisory control and data acquisition (SCADA)

IRIS ability to harvest, manage and exchange urban data for the development of new applications and services is significantly strengthened through the elaboration of the City Innovation Platform (CIP). By offering real time data from multiple different sources through open API's, IRIS CIP enables KPI-monitoring for substantive topics (energy reduction, renewable energy growth, mobility modalities, etc.) but also for KPI-monitoring on data usage.

IRIS CIP includes three key functions/components that can greatly support monitoring procedure:

- **The Data Management Framework:** The specific component offers solutions to collect, process and exploit large amounts of data (open, shared and closed), delivered by various connected sources/formats deployed all over the LH city, in addition to data produced by existing platforms and domain specific solutions (e.g. waste collection, parking, air quality, energy consumption) by companies, research labs and citizens operating in the public space.

- **The Data Market:** The specific function/solution offers an online data market place for different data products and types (open, commercial datasets and information products) from different sources/organisations made available as download, API or other arrangements to support the development of new services and business models. The CIP Data Market will be a combination of several components that: a) provides a point of discoverability and comparison for data, along with indicators of quality and scope, b) offers ready to use data (high quality, high usability) that can be utilized to monitor both KPIs and non-KPIs related monitoring requirements (such as weather data).

- **The Platform Management:** The specific component can be used to support device and asset management for sensors and other devices, streamlining the process of managing them. This function is very important, since a very high number of devices will have to be monitored (many of them providing key information to assess relevant KPIs) requiring continuous reconfiguring, updates and setting control.

From a capabilities perspective and taking into account the EIP-SCC and TM Forum capabilities integrated onto the CIP-architecture, CIP brings into the monitoring procedure capabilities that enable: a) the external environment (field equipment, devices, IoT) to be sensed, measured, and controlled, b) the interaction and thus the exchange of data between devices and field equipment between themselves and with applications residing on some "backend systems", c) the delivery and assurance of the assets supporting the device communications and integration including positioning capabilities, d) the use of urban (field) data by applications, e) TM forum category 1 (Data Hub).

The above-mentioned functions and capabilities of IRIS CIP will be capitalized to establish a unified framework for harmonized data gathering, analysis and reporting (T9.3).

4.2 Monitoring of commissioning phase

After the definition of KPIs and non-KPI related monitoring requirements, monitoring equipment and other sources of information, it is significant to take into consideration the commissioning process of the means needed to realize IRIS solutions. The specific phase can be performed in parallel with monitoring performance procedures. A strong procurement framework (see also section 3.2) can help minimize work by IRIS teams in this phase. A general framework for commissioning plan can be found in Chapter 6.

More specifically, the commissioning phase should consider the following stages and respective issues:

- **Design:** During this stage the requirements for proper commissioning should be developed. For IRIS this can be done through the establishment of relevant KPIs and the definition of data that need to be measured. Additionally, during this stage the planning and schedule of the actions can be considered.
- **Procurement:** During this stage, it must be ensured that all necessary requirements are met, and everything is accordance with general rules/legislation (see also section 3. 2).
- **Initial setup (if applicable):** During this stage the initial setup of the equipment (see also section 4.1.4 for a preliminary list of monitoring equipment that can potentially be utilized in IRIS) can be performed. A preliminary visual inspection can ensure that the equipment is the right one and no damages are detected. The equipment needs to be pre-configured according to the monitoring needs instead of configured as default. Test plans to support the installation staff and checklists for testing the final performance are additional tools that can be developed during this stage. Finally, initial calibrations can be performed to verify that the equipment is ready to set in normal operation (i.e. firmware adaptation, operating system).
- **Installation/Construction:** During this stage, the installation, configuration and short-term first tests for data gathering can be carried out. In most of the cases the equipment needs to be further configured and calibrated to receive data correctly (i.e. range, frequency). Manuals and training could also be of great help.
- **Commissioning and final set up:** During this stage it should be checked that all components of the critical infrastructure, as well as the system as a whole, operate as intended and in accordance with the requirements established in the design phase. Long term data gathering should be conducted with the aim of checking data (i.e. correctly received within the envisaged features and also the communication is stable). Fine-tuning may also be needed during this stage. Lessons learnt, relevant data sheets, installation schemes etc. are suggested to be extracted and documented in order to support maintenance and further installations.

4.3 Monitoring results - Evaluation of IRIS

4.3.1 Data collection – Data Management Plan (DMP)

IRIS project involves extended data collection and processing from various sources to achieve its objectives and monitor its results. With a view to handle in the most efficient way the vast amount of data/information that will be produced, collected and processed during and after the end of the project, the Data Management Plan of IRIS (T9.2) details what data the project will generate, whether and how they will be exploited or made accessible for verification and re-use, and how will be curated and preserved. The DMP is a dynamic document that will be regularly monitored and updated in the context of the periodic evaluation of the project. Guidelines on FAIR Data Management in Horizon 2020 provided by European Commission can serve as the basis for DMP development and update. DMP will be carried out by taking advantage of CITYKEYS results and facilitate for all performance data to be incorporated into the CIP. The Data Management Framework component of CIP will further support efficient data collection, storing and processing while the DMP details and monitors the overall procedure of IRIS data management.

A key issue to be taken into account in DMP is that all data produced, utilized and monitored take into satisfy all necessary ethical aspects (see also Section 5 of this report). Human participants will be involved in certain aspects of the project and data will be collected regarding their energy needs and consumption behavior/habits. Since the project will collect personal-related data, the consortium will have to comply with any European and national legislation and directives relevant to the country where the data collections are taking place. To this end, personal -related data should be centrally stored and scrambled where possible and abstracted in a way that will not affect the final project outcome.

Additionally, the IRIS DMP should consider the following:

- The data produced/used are “FAIR” – Findable, Accessible, Interoperable and can be Re-used.
- Resources are allocated in an efficient manner.
- Data security is ensured.
- Templates that can facilitate data gathering and management are available.

4.3.2 KPIs calculation and comparison with threshold values

Data from monitoring will constitute the basis for the periodical calculation of a defined set of KPIs in order to evaluate the performance and progress of IRIS over time. Specific KPI values will include comparison with the baseline situation and threshold values in order to measure the efficiency and impact of the new integrated solutions in a holistic way. Under this framework, the IRIS Evaluation Plan is developed (D.9.2) for assessing the performance of the LH cities’ interventions from a holistic point-of- view, addressing such issues as energy and economic performance, social acceptance, urban mobility and integrated infrastructures actions.

The evaluation plan will describe how the project will be evaluated on several different levels from the solution level to transition track level, LH city level and IRIS project level and should enable comparison between the cities and supports further replication. The KPIs can be customized to suit the integrated solutions of the LH cities and their selection should involve key representatives from the LH cities and involved partners. Initiatives such as SCIS and CITYKeys can facilitate KPI selection. To compare the

results of the LH demonstrations, it is of interest to not only evaluate the project on the individual solution level, but on Transition Track level as well as LH city level. Additionally, the performance of the entire IRIS project also needs to be evaluated. To do so an aggregation procedure needs to be developed.

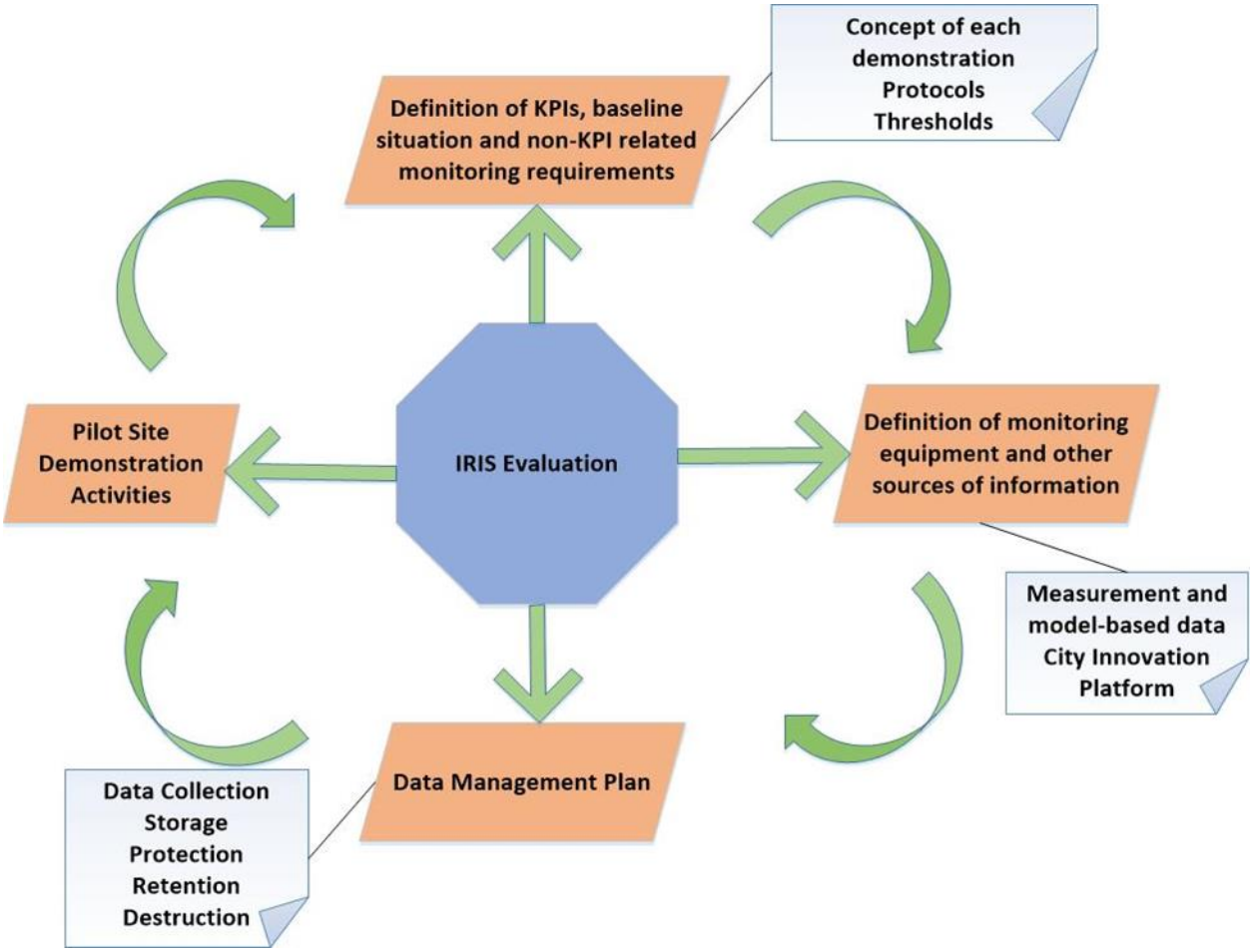


Figure 18 IRIS evaluation approach

5. Ethics management

The identification of ethical issues and requirements is imperative in all research projects including pilot site activities with human participants. Although IRIS does not introduce any critical ethical issues or problems, various concerns relevant to ICT and energy efficiency applications and on-site trials shall be taken into account. The consortium is fully aware of these and has the necessary experience to address them seamlessly. **The project addresses the ethical and privacy issues in WP9, where the task T9.2 is allocated to review the deployed solutions for privacy and security, and in WP12.** In WP12, the **deliverable "D12.1 H-Requirements" deals with the overarching Ethics Management Framework** and addresses how the LH cities will involve research (or rather 'pilot') participants and which consent procedures will be put in place. Moreover, **the deliverable "D12.2 POPD – Requirements" deals with all data processing / protection issues** and checks if IRIS is compliant with existing EC and national legislation.

During Task 1.6 an Ethics Board is established to address ethical, legal and notably privacy issues for the technologies developed and the procedures performed in the context of the real-life demonstration activities during the project lifetime. The Ethics Board is responsible for handling data protection and security issues related to the data management framework, thus providing valuable information to consortium partners involved in the real-time pilot trials, as well as end-user participants. The Ethics Board will support the Ethics Committees that operate locally in LH and FCs with an Ethics Helpdesk.

The Ethics Board is composed of one appointed person per each LH city, the Monitoring and Evaluation Manager (SP), the WP12 (ethics requirements) Leader (UTR), the Technical and Innovation Manager (CERTH), and the Advisor on EU Data Protection Law (VUB). More external experts (ethics advisers) will provide assistance to the Ethics Board for any necessary case.

Questions from the members of the consortium should be addressed to the Ethics Board, which will perform the following main functions among others:

- Continuous advice to the members of the consortium in the form of an "ethics helpdesk". Questions that can be answered on the basis of the expertise that the VUB brings to the ethics board, will be dealt with in a way of internal recommendations. Questions that need to be debated or require further fact finding will be addressed together by the relevant persons from the board.
- Monitoring of the solutions that are developed and used in the project, highlighting issues of concern, clarify the implications for the work package, if necessary, discuss the issue with the relevant persons from the consortium, and, if necessary, ask for external opinions. As the IRIS project involves a variety of efforts, this monitoring needs to be nourished by a pro-active involvement of the WP-leaders. The WP-leaders should support the monitoring by flagging issues of potential concern to the ethics board and by regularly providing short descriptions of the actions being performed within their WP.
- Critical evaluation of the project's procedures with the help of external experts.

6. General Framework for Commissioning Plan

6.1 Metrics & Standards

The concept of smart cities affects different areas of infrastructure, systems and services. Thus, there is the need for reference metrics, so as the assessment of measures' contribution by the competent authorities will be correct and reliable. A set of metrics should be defined concerning the infrastructure that underpins city services. These will be used as a benchmark for the evaluation of the current infrastructure and the determination of priorities regarding the areas and sectors to be improved. The metrics should cover the infrastructure for district water supply system, electricity and gas, sewage treatment, transports and telecommunications.

A core issue is that there is not a clearly defined and commonly accepted method for the quantification of the impact of smart city projects and initiatives. Therefore, the lack of coherence among the city metrics raises difficulties to the evaluation of the investment plan for the planned improvement actions. The solution to this problem is the standardization of metrics. The use of open standards is of great importance for the promotion of innovation actions and technological measures with long-term impact on envisioned sustainable cities. Standards create the foundation for development of interoperability concept that enables the cost-effective and seamless integration of novel technological components [25]. The major contribution of standardization is focused on the following topics:

- Shared objectives/purposes
- Common understanding
- Integration/interoperability/security
- Investment
- Procurement
- Up-scaling

The British Standards Institute (BSI), which is the UK's Standards body, published a report on standards for smart city initiatives based on the ongoing international standardization activities in this field. The BSI report presents the framework of standards within smart cities [26]. In the context of this framework, three categories of standards have been identified as depicted below:

- **Strategic:** The aim of these standards is to provide guidance to city authorities and to other relevant entities, in order to develop an effective smart city strategy. They include guidelines for the identification of priorities, the development of implementation plan and the monitoring and evaluation of work progress.
- **Process:** This category of standards refers to procurement and management procedures and processes within smart city projects and provide guidelines for the cooperation framework and financial transactions with associated enterprises, organizations and sectors.
- **Technical:** Standards of this group cover the variety of technical specifications that are essential for the implementation of smart city solutions, so as to achieve the predetermined goals. This type of standards is also important during the procurement procedure, because the competent

authorities should know the related standards for the respective technical specifications of the components and services to be procured.

The BSI report identifies the main international standardization bodies and their ongoing initiatives for integration of standards within smart city activities. These international bodies are the following:

- **ISO:** International Organization for Standards. This is the main global body and its published standards are adopted and followed by national standards bodies. The term "ISO certified" is well-known to the most of us.
- **CEN/CENELEC/ETSI:** In Europe, there are three officially recognized European Standardization Organizations: the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC) and the European Telecommunications Standards Institute (ETSI).
- **ITU:** ITU is the United Nations specialized agency for information and communication technologies (ICTs).
- **IEC:** The IEC (International Electrotechnical Commission) is the world's leading organization for the preparation and publication of International Standards for all electrical, electronic and related technologies.

Figure 19 presents the mapping of the standardization initiatives on the standards categories as mentioned in the relevant report of BSI.

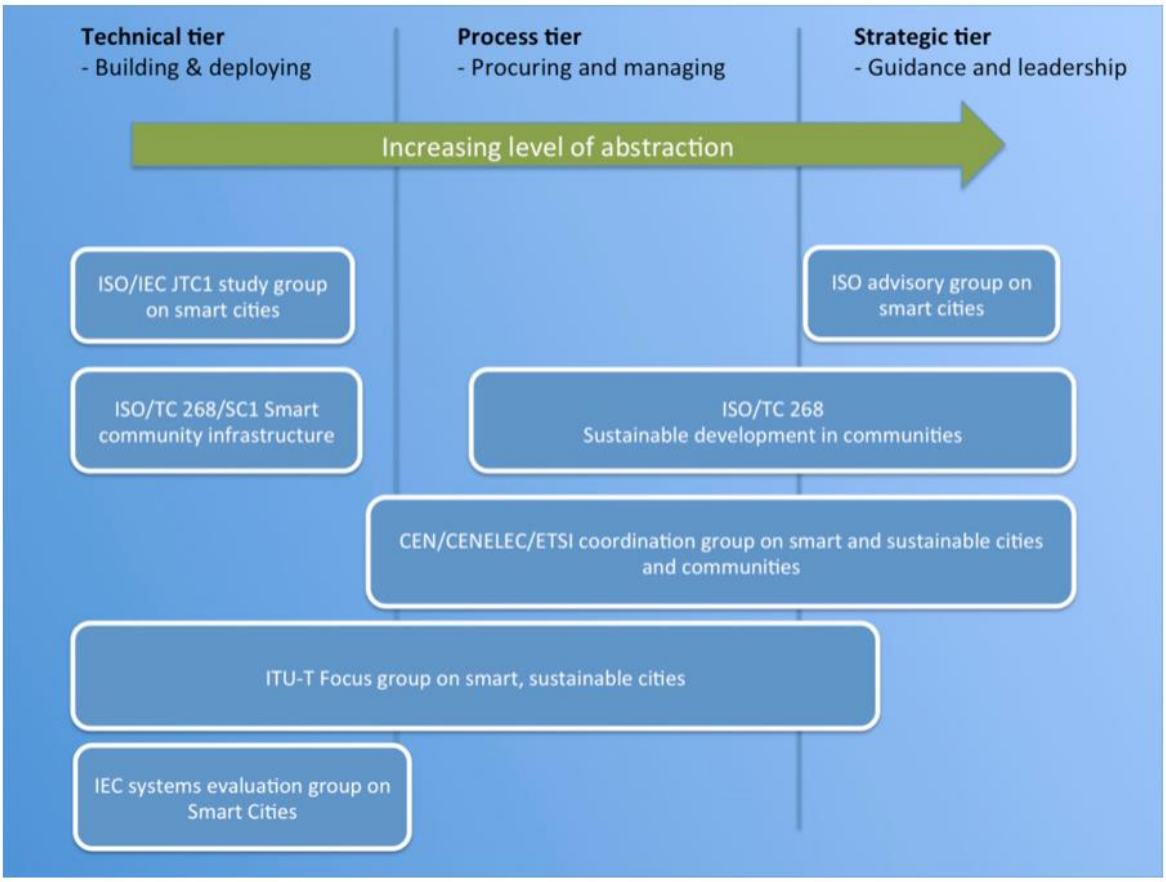


Figure 19 Mapping of international standards initiatives on BSI standards framework [27]

The most remarkable initiatives for standardization within smart cities are mentioned in brief per category below:

Strategic – Guidelines for development of the overall smart city strategy

I. **ISO 37120** for Sustainable Development of Communities‑Indicators for city services and quality of life. This standard is part of a sequence by ISO' s Technical Committee 268 (TC 268) and identifies 100 indicators that cities should follow, so as to provide evidence for the progress of development activities. The **World Council on City Data** was established by cities and was appointed as one of the competent bodies for city evaluation.
II. Two draft versions of ISO standards, also from TC 268, are **ISO 37101** for Sustainable development and resilience of communities‑Management systems‑General principles and requirements and **ISO 37102** for Sustainable development and resilience of communities.
III. From BSI (not an international organization), **BS 8904** concerns sustainable communities and provides recommendations and guidance for assistance in communities' improvement.

Process – Guidance for procurement and management processes

I. The BSI developed a smart city framework standard (**PAS 181**) that subjects to this category. This standard is also mentioned in the chapter related to procurement framework and as it is presented, it provides guidelines and best practices to city authorities for carrying out procurement.

II. The development of a data concept model for smart cities (**PAS 182**) is directly connected with PAS 181. Data model are critical for the development of smart city data hubs and data interoperability issues and they have a key role in the configuration of an open data strategy.

Technical – Related to technical specifications providing guidelines for implementation phase

I. Two technical standards from the ISO/IEC JTC1 group are still under development: **ISO/IEC AWI 30145** for Information technology–Smart city ICT reference framework and the associated **ISO/IEC AWI 30146** for Information technology–Smart city ICT indicators. Both concern the ICT infrastructure needed for smart cities.

II. A useful overview of the technical activities of the ISO, IEC, and ITU is contained in a report from the **ISO/IEC JTC1** – Preliminary Report on Smart Cities. This document presents the technical aspects of smart cities and the technical areas that are addressed by the ongoing work of ISO, IEC and ITU.

III. **IEEE P2413** is a developing standard from the Institute of Electrical and Electronic Engineers (IEEE) and addresses an architectural framework for the Internet of Things (IoT). The standard is being designed, in order to be considered after its completion as a reference model defining the dependencies among the various components (e.g. transportation, healthcare) within IoT sector.

It is worth mentioning that the work done by BSI on standards for smart cities presents a complete set of standards for the various sectors and processes within a smart city framework. These are national standards, but they provide valuable feedback to ongoing international organizations' initiatives. Figure 20 depicts the already completed standardization activities by BSI and the planned initiatives.

PD 8100 Smart city **Overview**

Leadership engagement guide, providing useful assessment, and navigation to key BSI guidance

PD 8101 Smart city **Planning**

Best practise for delivering smart development and infrastructure programmes

PAS 181 Smart city **Framework**

Overarching smart city framework addressing key issues in delivering smart programmes

Standards Mapping

Mapping of international standards to smart city model

PAS 180 **Terminology**

Basic lexicon of terms

SCLP (Smart City Leadership Programme)

Intensive 2-3d programme supports pan-city leadership to refine vision; develop roadmap; identify leadership model

PAS 182 Smart city **Data Concept Model**

Ontology that sits above data sets to make city data more discoverable

PAS 183 Decision Framework for Data Sharing

Decision making framework addressing wider data-sharing issues

PAS 184 **Options & Good Practices for Commissioning new projects**

Leadership guide providing insight on alternative business models and use-cases to support these

Figure 20 Smart city standardization activities by BSI

Some of the above standards are mapped on the smart cities' standards framework, as shown below:

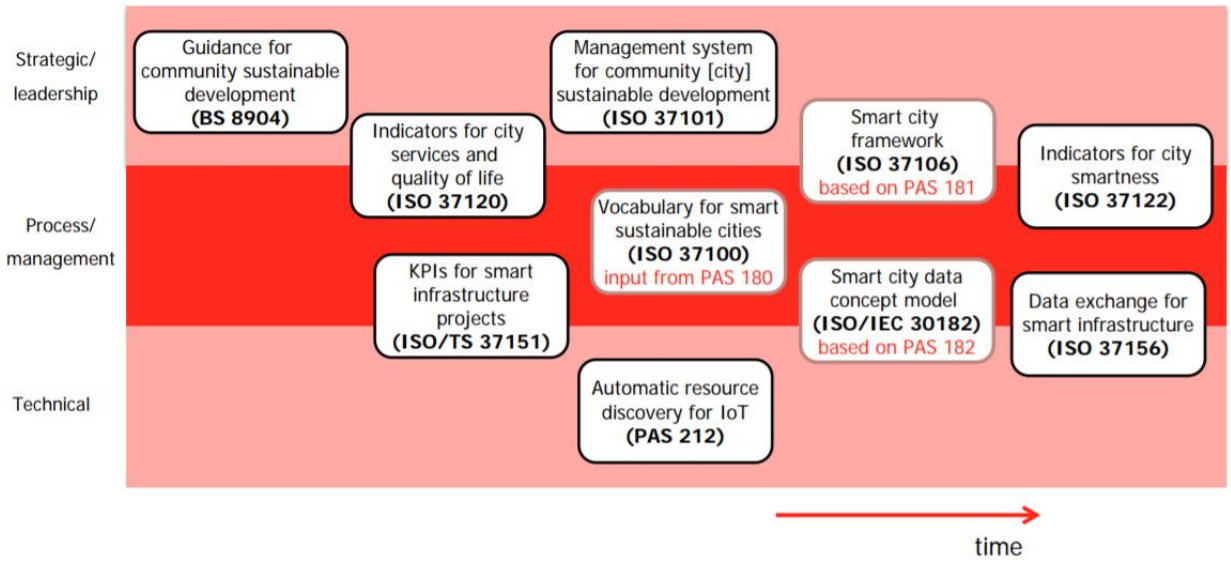


Figure 21 Indicative mapping of smart cities' published standards on ISO framework including BSI standards [28]

Figure 21 is a more specific version of Figure 19, where the most remarkable standards for smart city aspects are presented.

It is worth mentioning that the determination of metrics and ISO within smart city framework will contribute significantly to the efficient delivery of procedures and process from the initial planning to operation.

6.2 Definition of the commissioning plan within the city framework

The main objective of this section is to introduce the main principles and guidelines for the definition of Commissioning Plan of the IRIS solutions that will be implemented. The provided information can be used as guidance for the respective deliverables of WP5, WP6 and WP7 concerning the demonstration activities of the three LH cities. A structured and customized commissioning plan will ensure that the IRIS solutions will comply with the specifications, while providing the requirements for installer, builders, facility owners, municipal authorities and end-users facilitating the replicability of the integrated solutions and maximizing their impact.

The **term of commissioning** has two interrelated interpretations. The one refers to the **testing procedure** after completion of construction and the other relates to a **quality management technique** applied to a project from concept to delivery phase. Purchasing commissioning can not guarantee desired performance. A link is required between the management of the work progress and the verification of the achievements according to performance goals. This connection is attained through certification that is based on appropriate standards. **Standardization** is a valuable assistance in assessing consistency of performance through a structured process of documentation. However, it should be pointed out that consistent performance does not ensure desired performance. The certification of the procedure, as for example according to ISO, will be beneficial only if the achieved level of performance will be satisfactory [25], [29].

In the context of smart cities, commissioning is the key procedure for the delivery of the right outcomes at the right cost that can be translated as “the optimal use of resources towards achieving the intended outcomes”. As already mentioned, commissioning is the overall planned program of activities from the design phase of a project to final set up specifying how different market players should interact towards meeting the requirements for the IRIS solution to be implemented. While procurement procedure is the means for investigating the potential investors for the project and purchasing the necessary equipment.

IRIS project includes the demonstration and replication of various innovative solutions in different cities. The certification of commission plan for IRIS solutions will make the procedure generic allowing the application on a range of facilities and operation frameworks. Commissioning is considered as a specific quality management procedure for error prevention and performance verification during the demonstration activities in the scope of supporting the replicability of novel integrated technologies. Thus, the commissioning plan will define the **processes** and the necessary documentation for the below steps:

- Definition of IRIS solutions’ requirements;
- Design of demonstration system per IRIS solution;
- Definition of procurement procedure for technological components/measures per IRIS solution;
- Assessment of potential suppliers; and
- Monitoring of each IRIS solution project from planning to final operation.

The upcoming **benefits** from the employment of the commissioning plan can be the following:

- Decrease utility costs (energy savings);
- Improve functional specifications of system;

- Ensure satisfactory performance of the system as an integrated unit under a full range for operating conditions;
- Improve operation and maintenance;
- Ensure reliability and safety;
- Connection between construction, operation and maintenance activities;
- Extension of equipment life cycle;
- Improve system's documentation and information traceability; and
- Provide Operations & Maintenance (O&M) manual.

The BSI organization published the structured standard **PAS 184 Options & Good Practices for Commissioning new projects** that proposes guidelines for effective commissioning in smart city projects [30]. This PAS document presents smart city concepts for different infrastructures and components covering resources, methodologies, processes and applications. In addition, it provides guidance to city authorities, city planners, product and service providers and other stakeholders. On the other hand, **ISO 9003** standard is quite generic and is related to commission process covering a variety of projects [29].

Within IRIS project, the phases of commissioning as a quality management procedure are presented in figure 16 and are described briefly in section 4.2. Considering commissioning as a testing procedure, the intermediate phases can be those depicted in Figure 22.

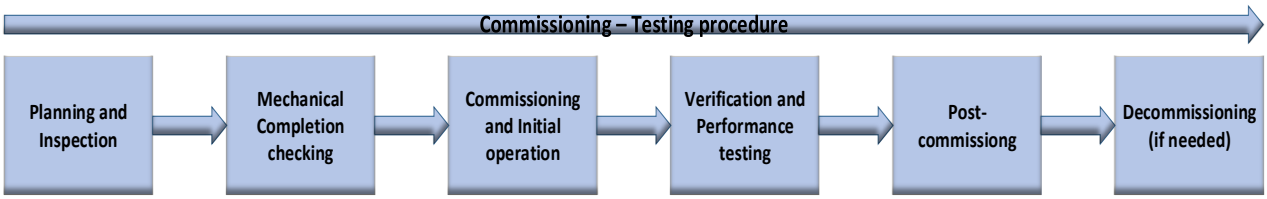


Figure 22 Commissioning phase per IRIS solution

The above phases include various processes and respective issues, so as to ensure the integrity of the integrity of the produced system [31]. A short insight of them is given below:

- **Planning and Inspection:** During this stage, the detailed procedure to be followed should be developed. After that, the time schedule along with the required resources and system boundaries should be defined. An important step is also the consideration of the produced documentation and manuals. Before to proceed with the installation/construction, inspection and pre-configuration activities should be performed concerning the equipment.
- **Mechanical Completion checking (Pre-commissioning):** This stage follows the completion of installation and entails control procedures for checking the design conformity, the status of mechanical and electrical installation and the accordance with the specifications. Testing checklists are prepared for the various mechanical and electrical elements, so as to ensure the integrity of the system. Configuration processes and initial calibrations should be also performed in order to prepare the equipment for pre-defined and regular operations.
- **Commissioning and Initial operation:** This phase refers to initial operation of the whole system and includes operating adjustments and functional checks, in order to achieve and guarantee the intended operation according to requirements and specifications determined in the design phase. Fine-tuning of system parameters, trouble-shooting, problem correction during the start-up and monitoring of measurements collection are also required to ensure the stability of the system.

- **Verification and Performance testing:** The objective of this phase is to validate and verify the speed, scalability and stability of the system under various workloads and variables' value range. During this phase, the value range of operational parameters is determined, such as response time, frequency of data collection etc.
- **Post-commissioning:** This phase covers the definition, evaluation and documentation of maintenance procedures that are necessary for a satisfactory performance. During this phase, data is collected and evaluated for controlling the equipment under warranty.
- **Decommissioning:** This phase addresses and describes the activities for dismantling the system, if such a decision is taken.

Roles and responsibilities

Commissioning procedure is a team effort that should be followed from the beginning of the project . The team members include the investor, the Site Manager, the TT Leader, the IS Leader, the Quality Assurance Team members, the Commissioning Manager and the Contractor [32]. Concerning the demonstration activities within IRIS project, a proposed assignment of responsibilities to team members is presented:

- **Site Manager:** is responsible for the management of the whole demonstration project at LH city level, for securing adequate funding and monitoring the overall performance of the system.
- **TT Leader:** has the responsibility to manage and monitor the demonstration system at TT level indicating to the Site manager the coherence of the installed systems and their satisfactory performance.
- **IS Leader:** refers to respective TT leader mentioning the performance levels, potential malfunctions and risks of the demonstration system per IRIS solution. The IS leader is responsible for monitoring the commissioning phase at IRIS solution level and interacts with other IS leaders in the scope of knowledge exchange concerning the commissioning processes.
- **Quality Assurance Team:** is in charge of monitoring the quality assurance procedures, controlling adherence to standards, evaluating the produced data and measurements and elaborating the related documentation and reports. The team members can be the Site manager along with the respective TT leader and IS leader for each IRIS solution system.
- **Commissioning Manager:** the Commissioning manager can be appointed at TT level. The TT Leader has the potential to be the Commissioning manager, as the TT leader is responsible for overseeing the coherence of implementation activities of the TT. The assigned responsibilities include planning and technical advice on O&M matters, coordination of commissioning activities and quality assurance of commissioning reports. The Commissioning manager refers to Site manager for the progress of commissioning activities and the level of the corresponding performance indicators.
- **Contractor:** is responsible for the various start-up testing processes, acceptance tests and performance verification activities. The contractor develops the commissioning schedule and the commissioning activities according to the requirements and specifications of each IRIS solutions that are mentioned in the relevant documents and considering the corresponding standards for the included components. The Contractor is in close cooperation with the Commissioning manager.

Commissioning Documentation

Some indicative produced documentation and reports during commissioning activities in demonstration sites comprising the stages from design to final operation are summarized below [32]:

- **Investment Analysis Report (IAR):** This report is produced during the design phase before proceeding in procurement in order to present the viability of the proposed solution.
- **Request for Proposal (RFP) or Project Brief:** In the context of this report, all the pre-defined requirements for system components/measures are described.
- **Installation/Commissioning checklists:** This report includes all the configuration and calibration tests that should be performed for the final setup of the solutions.
- **Product Information (PI) Report Forms:** All the information related to purchase of the equipment is mentioned in this report.
- **Performance Verification (PV) Report Forms:** This report presents the respective indicators and the measured data that should be collected, evaluated and compared to mentioned design criteria of the IRIS solution.
- **Report Forms for description of commissioning activities and assessment of installations:** Detailed description of commissioning activities and outcomes of installation assessment are be included in this report.
- **Manual for O&M activities:** This report is considered as a manual for the performance of the operation and maintenance activities during the lifecycle of the demonstration projects.
- **Final Commissioning/Evaluation Report:** During this report, the assessment of the overall project is presented along with conclusions and recommendations. Deviations from the desired performance and results from validation processes are also included.

Performance Verification

As it is mentioned above, the key for performance verification is the coupling of commission with certification process. Commissioning procedures are more flexible than certification and thus it is possible that the procedures to be slightly modified in order to accommodate certification standards. Consistent performance can be audited and ensured through certification following structured standards. This conjunction of the two processes is very significant and effective especially for projects with increasing complexity. Smart city projects tend to be quite complicated projects comprising many different solutions. Therefore, the correlation between commissioning plan and certification process is a core issue that should be addressed carefully and thoroughly by the LH cities during the demonstration activities.

7. Output to other work packages

D7.1 present the preliminary transition strategy for demonstration, replication and knowledge transfer in both LH and FCs. It also provides the initial common monitoring framework for IRIS project and the general framework of the commissioning plan. D1.7 outcomes will be used from LH cities for the detailed planning of their demonstration activities, and from FCs for the creation of the replication roadmap and the replication plans of each city. Moreover, it will be used for the refinement of the monitoring and evaluation framework in WP9.

Table 17 presents the way that the other work packages use the outcomes of the D1.7.

Table 17 – Use of D1.7 outcomes to other work packages

WP	Deliverable	Use of D1.7 output
WP5	D5.3, D5.4, D5.5, D5.6, D5.7 (M24) Launch of the activities on each TT in Utrecht	Output to be used for the detailed planning of integration, work management & commissioning of demonstration activities in Utrecht.
WP6	D6.3, D6.4, D6.5, D6.6, D6.7 (M24) Launch of the activities on each TT in Nice	Output to be used for the detailed planning of integration, work management & commissioning of demonstration activities in Nice.
WP7	D7.3, D7.4, D7.5, D7.6, D7.7 (M24) Launch of the activities on each TT in Gothenburg	Output to be used for the detailed planning of integration, work management & commissioning of demonstration activities in Gothenburg.
WP8	D8.1 (M25) A Roadmap for replication of activities	Output to be used for the creation of the replication roadmap.
	D8.4, D8.6, D8.8, D8.10 (M36) Vaasa / Alexandroupolis / Santa Cruz de Tenerife / Focsani replication plan	Output to be used for the creation of the replication plans of each FC.
WP9	D9. 4 (M18) Report on unified framework for harmonized data gathering, analysis and reporting	Output to be used for the creation of monitoring and evaluation framework in LH cities.

8. Conclusions

This deliverable provides a transition strategy plan that consists of the demonstration framework and the monitoring and evaluation framework. The plan will be used by demonstration coordination teams, decision makers, existing and potential stakeholders and citizens in the three LH cities. The demonstration framework proposes the demonstration management structure with the specific roles of the local stakeholders' groups, the procurement framework, the communication and knowledge exchange framework, the planning of citizen engagement and co-creation activities, the framework for an Action Plan per integrated solution, and guidelines for business modelling and financing. The monitoring and evaluation framework is describing the potential processes and tools, which can be used to monitor the performance and progress of activities.

The deliverable introduces the ethical issues arising from the real-life demonstration activities of the project and presents the initial actions regarding ethics management. It also provides the general framework of the commissioning plan to be followed by each demonstration activity for the final tuning, the validation and the initial operation of the installed equipment.

The coordination units should take into account the business as usual operations and formulate the communication strategy and the action plan, so that they can achieve the project objectives. An integrated action plan may be defined as a global strategic plan of the city, integrating all existing municipal, regional and national plans, so to cover all the city aspects, such as political and social issues, as well as technical and financial models. The principles of the project should take into account the regulatory framework of the city and any potential legal barriers.

A significant part of IRIS project that is related to city regulatory framework is the procurement procedure. Procurement is a structured procedure defining the way for investigating and contracting with the potential investors. This process addresses also the requirements and the technical specifications of the components of each IRIS solution. This is the second phase after the design phase of the project and it is very important for the progress of different activities as it plays a core role in proving project's bankability. The principles of this procedure set also the basis for interaction with project stakeholders.

With a view to clarify the many interdependencies that exist between IRIS stakeholder groups and enhance stakeholder's mutual sharing of common interests, specific actors and roles per stakeholder group have been identified. The classification of identified stakeholders according to their power over the project and interest in it highlighted the need to pay specific emphasis on reaching and engaging consumers (end users), technology and service providers and DSOs. Cooperating with these three stakeholder groups is essential for the successful realization of the project.

The transition strategy should address all the focus areas of the smart city, which are energy efficiency and management, transport and mobility and ICT platforms. The combination of all these fields, as well as a compact monitoring and data management framework based on the directions given by the stakeholders, will ensure the integrity of the results that provide the appropriate feedback for the evaluation of the proposed solutions through the calculation of the KPIs.

A well-structured monitoring framework along with a certified commissioning plan can ensure a consistent and satisfactory system performance according to the expected goals. Commissioning process is indispensable for projects with high complexity that involve many different novel technologies and measures. Certification according to verified standards can provide appropriate auditing procedures for controlling the various system components and ensure the integrity of the whole system.

Within the IRIS project, there are three different lighthouse cities with quite different operational framework and regulations. The detailed analysis of the different strategies among the three cities will highlight various issues that should be considered carefully during the designing of an integration plan. The deliverable provides guidelines to the three cities on how to perform all the activities concerning the coordination and the management of the demonstration activities. The transition strategy and the commissioning plan introduced in D1.7 will be further elaborated during the implementation of WP5, WP6 and WP7 for the Utrecht, Nice Cote d'Azur and Gothenburg demonstration sites respectively.

The FC will also use the outcomes of D1.7 to create the replication roadmap and the replication plans of each city.

The monitoring and evaluation framework will be elaborated in WP9 (Monitoring and Evaluation).

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10. Annexes

10.1 Annex 1 - Information concerning stakeholders in LH cities

10.1.1 Utrecht

Name	Address	City	Email	URL	Short Profile
Antea Group	Tolhuisweg 57	Heerenveen		http://www.anteagroup.nl/	As an international engineering and environmental consulting firm, Antea Group combines strategic thinking and multidisciplinary perspectives with technical expertise and pragmatic action to effectively solve client challenges while delivering sustainable results for a better future
Bo-Ex	Jan Cornelisz Maylaan 18	Utrecht	klantenservice@boex.nl	https://www.boex.nl	Bo-Ex wants to guarantee a good living in an attractive living and living environment for people who are less likely to benefit from the housing market due to their income or other circumstances. It is this task in which we find our right to exist. Bo-Ex wants to make this happen through a customer-oriented approach. The wishes and needs of the customer are the starting point for our plans. We want to guarantee a pleasant living environment by listening to the customers and by providing tailor-made solutions.
Buurtcentrum BuurtThuis - Kanaleneiland Zuid	Livingstonelaan 1350	Utrecht	https://www.wijkconnect.com/message/message/create/?received_by=10942&usergroup_id=1846	https://www.wijkconnect.com/utrecht/kanaleneiland/organisaties/1846/buurtcentrum-buurtthuis-kanaleneiland-zuid/	
Civity	Handelsweg 6	Zeist	info@civity.nl	https://www.civity.nl/	Working together on a livable, sustainable, safe and inviting city, that is what drives us at Civity. With our knowledge of local authorities, the insight into urban processes, our belief in the power of networks and our passion for data, we contribute to the development of smart cities. Cities with a pleasant living environment for residents, businesses and visitors. Where data is at the service of smart applications that reduce

					operational costs, lead to sustainable solutions and improve service.
Doenja Dienstverlening	Europalaan 55	Utrecht	info@doenjadienstverlening.nl	http://www.doenjadienstverlening.nl	DOENJA Dienstverlening is the Social Makelorganisation for the Utrecht districts Leidsche Rijn, Zuidwest and Binnenstad. The core of our work is brokering: we make connections so that residents can realize their initiatives and we translate signals from the neighborhood to advice on how to improve the quality of life in the neighborhood.
Elaad	Utrechtseweg 310 B42	Arnhem	info@elaad.nl	https://www.elaad.nl/	ElaadNL is the knowledge and innovation centre in the field of smart charging infrastructure in the Netherlands. Through their mutual involvement via ElaadNL, the grid operators prepare for a future with electric mobility and sustainable charging. It is our mission to make sure that everyone can charge smart. We monitor the EV-charging infrastructure and coordinate the connections between public charging stations and the electricity grid.
Eneco Group	Marten Meesweg 8	Rotterdam	CorporateCommunicatie@eneco.com	https://www.enecogroup.com	Eneco Group is a group of companies that is active in the energy sector. We work together and with customers and partners on our “Everyone’s sustainable energy” mission, so people can take control of their own energy. Thanks to our consistent strategy, we lead the way in the field of sustainability and innovation. We offer added value to consumers and businesses nationally and internationally with our smart products and services. And we make a valuable contribution to society by generating and supplying green energy.
Eyüb Sultan Moskee Utrecht	Bernadottelaan 3	Utrecht	n.a.	https://nl-nl.facebook.com/eyupsultanutrecht/	Mosk in district
Labyrinth B.V.	Amerikalaan 199	Utrecht	info@labyrinthonderzoek.nl	https://www.labyrinthonderzoek.nl/	Labyrinth is a full-service research and consultancy firm that consists of an excellently matched team of specialists with extensive experience in various fields of research. We have extensive research experience in the field of care, labor participation, strengthening the neighborhood economy and entrepreneurship. We work fast, are reliable and flexible and deliver top-quality and reliable research results within the agreed time.
LomboXnet	Jan Pieterszoon Coenstraat 5	Utrecht	info@lomboxnet.nl	http://www.lomboxnet.nl/	"LomboXnet is a residents' initiative in the Utrecht district of Lombok and aims to make super fast internet cheaply accessible with the speed of the light and the power of the sun.
Qbuzz	Europalaan 2a	Utrecht	info@qbuzz.nl	https://www.qbuzz.nl/	Qbuzz was founded in April 2008. Qbuzz transports around 230,000 customers every day with 2,400 employees, 650 buses and 26 trams.

					Qbuzz believes in forming partnerships with which successes in public transport can be achieved. Innovative working methods with drivers to increase the customer-friendliness of public transport, partnerships with other carriers to serve the customer as best as possible from front door to destination, open and transparent relationships with concession providers in order to respond quickly to the changing demand for public transport and not in the least attractive and easy offers to our customers to further increase the use of public transport.
Senfal	Distelweg 78 C	Amsterdam	info@senfal.com	https://senfal.com	We develop smart software that uses the energy surplus from wind turbines and solar panels. Our goal is to increase the returns for renewable energy technologies in order to accelerate the energy transition and reduce CO2 emissions.
Solease	Jaarbeursplein 22	Utrecht	info@solease.nl	https://www.solease.nl/	We have the dream to fill all suitable roofs in the Netherlands (but ultimately in the entire world) with solar panels. We have been doing this at Solease since 2011 by removing all barriers, such as financing, for private individuals and companies through a fully unburdened rental model for sustainable solar energy from our own roof.
Stedin Netbeheer B.V.	Blaak 8	Rotterdam	https://www.stedin.net/klantenservice	https://www.stedin.net	Stedin Netbeheer B.V. provides utility services. The Company transmits and transports gas and electricity, a well as constructs, expands, and maintains the transmission system. Stedin Netbeheer serves customers in the Netherlands.
Strukton	Westkanaaldijk 2	Utrecht	info@strukton.com	https://www.strukton.nl/	Strukton has operations in the rail systems, civil infrastructure and technique and buildings markets. Internationally, Strukton focuses on transport systems in densely populated areas, opening up port, airport and mining areas, and generating and distributing (sustainable) energy.
Suez	Mr E N van Kleffensstr 10	Arnhem	info.rr.nl@suez.com	https://www.suez.nl	There are few waste issues that we do not understand. Over the years we have developed a large amount of services. For each branch we have waste specialists and the necessary equipment in house. Our added value in the waste sector lies in quality, flexibility and sustainability. We strive for flows and solutions that are circular, concrete and in co-creation.
Sundata	Brigittenstraat 22	Utrecht	info@sundata.nl	https://sundata.nl/	We halen meer energie uit zonnepanelen. Dat doen we door actief te monitoren, automatisering en het toepassen van slimme analyses. We zijn ervan overtuigd dat actieve monitoring en geavanceerde data analyses een cruciale rol spelen in de energietransitie.
Theehuis Al-Asdekaa	Marco Pololaan 75	Utrecht	n.a.	n.a.	Local Moroccan café

TNO	Anna van Buerenplein 1	Den Haag	wegwijzer@tno.nl	https://www.tno.nl/en/	TNO connects people and knowledge to create innovations that boost the sustainable competitive strength of industry and well-being of society. This is our mission and it is what drives us, the 2,600 professionals at TNO, in our work every day.
van Scherpenzeel	Proostwetering 30	Utrecht	kcc@vanscherpenzeel.com	https://www.vanscherpenzeel.com/	Van Scherpenzeel is the specialist in the recycling and destruction of all possible materials and products, such as plastic, paper, textiles, glass, dry residual waste and confidential material and converting them into valuable raw materials.
Veolia	Wattbaan 2	Utrecht	https://www.veolia.nl/neem-contact-met-ons-op	https://www.veolia.nl/	Our mission is to ensure that resources are not exhausted by managing scarce resources and creating new sources. We are committed to reducing carbon dioxide emissions, protecting the environment and building the circular economy.
ViriCiti	Kabelweg 57	Amsterdam	info@viriciti.com	https://www.viriciti.com/	ViriCiti is the independent partner for data-insights in your entire electric operation. By connecting your vehicles and charge stations, ViriCiti gives you full insights in energy management, route operations and flexible charging in one platform.
Wijkraad Zuid-West	Al-Masoedilaan 188	Utrecht	info@wijkraadzuidwest.nl	http://www.wijkraadzuidwest.nl/	The Zuidwest district council is a link between the municipality of Utrecht and residents from the 4 suburbs: Dichterswijk, Kanaleneiland, Rivierenwijk and Transwijk. We advise the Board of Mayors and Aldermen - solicited and unsolicited - about various matters that are of importance to the district. This happens, among other things, on the basis of information we receive from the municipality. This may involve plans for large new construction projects or infrastructural interventions.

10.1.2 Gothenburg

Name	Address	City	Email	URL	Short Profile
Göteborg Energi	Box 53, 401 20	Göteborg	info@goteborgenergi.se	www.goteborgenergi.se	Göteborg Energi is a utility company owned by the municipality of Gothenburg, offering electricity, gas, heating and cooling to its customers within and outside of the city limits. The company owns and manages the energy infrastructure of the municipality. We produce, distribute and trade in the energy market. We always aim for high reliability, energy efficiency and affordability. Our profits should return to the city in projects that benefit citizens and society, not just in the energy field.
Mölndal Energi	Box 34, 431 21	Mölndal	n.a	www.molndalenergi.se	Mölndal Energi is a municipal energy company that develops and offers affordable and sustainable energy solutions to customers in both Mölndal and the rest of Sweden. The winnings are reinvested in the business or return to the citizens of Mölndal. Mölndal Energi is organized in five business areas: Power and Heating, Remote Heating, Electricity, Electricity and Wind Power.
Härryda Energi	Kabelvägen 2, 435 80	Mölnlycke	info@harrydaenergi.se	https://harrydaenergi.se/	At Härryda Energie you get affordable electricity, which also consists of 100% renewable hydroelectric power. Hydroelectric power feels for the most part, as something natural since we have many nice lakes in Härryda area. When you buy electricity from Härryda Energy, you also buy electricity that is produced with good environmental values and with minimal carbon dioxide emissions. Härryda Energie is wholly owned by Härryda municipality. This means that what you pay for via the electricity bill, goes to improvements to the power lines and the mains so you get electricity safely and safely home to you.
Metry	FÖRENINGS GATAN 6, 41127	Göteborg	support@metry.io	https://metry.io/en/	Fast, smart and simple data collection. If you digitize your energy statistics with Metry you will open up a new world of energy saving possibilities. Our smart robots automatically collect your energy usage data and via the Marketplace you can be connected to the industry's smartest energy services.
Trivector	Vävaregatan 21, 222 36	Lund	n.a	https://en.trivector.se/	Trivector consists of three subsidiaries – each specialising in a particular area. Trivector offers services within the areas of transport, IT-systems and business development. The Trivector group consists of Trivector Traffic, Trivector System and Trivector LogiQ. It's all about flows. A world without flows does not work: no transport, no information, no organisational processes. Our mission is to optimise these flows and make them more sustainable. To do this, you have to start by looking to

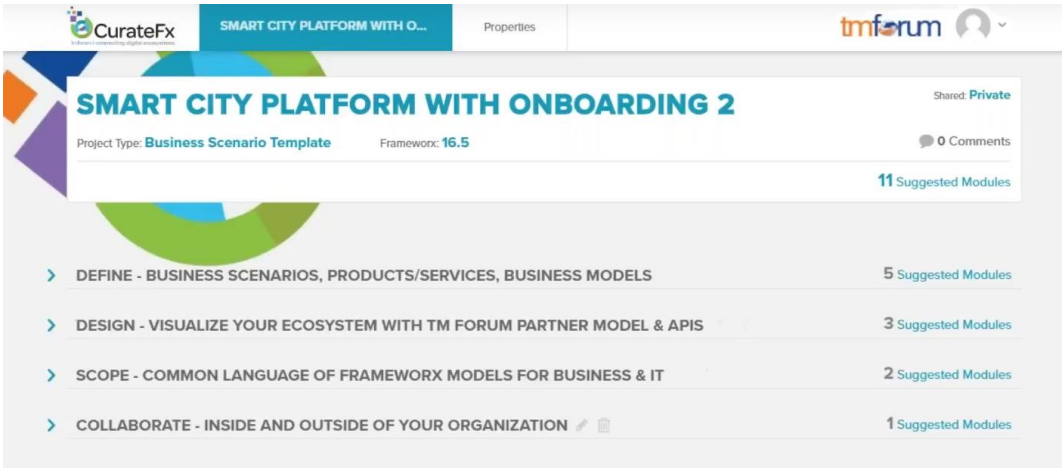
					the future. This is Trivector.
Riksbyggen	Masthuggstorget 3B, 413 18	Göteborg	n.a	www.riksbyggen.se	Riksbyggen is a company owned by the building unions, housing associations (local housing associations) and by other national co-operative associations. The aim is to establish housing associations and contribute to the fulfilment of other aims related to housing and co-operation, as formulated by the owners.
HSB	Box 311 11, 400 32	Göteborg	n.a	www.hsb.se/goteborg/om-hsb/in-english/	We are a cooperative organisation, owned by the members, operating in property development and property management. We focus on providing good and functional living. The revenue generated by HSB is invested back into the business.
Akademiska Hus	Box 476, 401 27	Göteborg	info@akademiskahus.se	www.akademiskahus.se	Akademiska Hus is a state-owned property company. We therefore have a special responsibility to be at the forefront of sustainability. In cooperation with our customers - Sweden's educational institutions - we develop, build and manage knowledge environments that contribute to Sweden's success as a knowledge nation. With our experience, expertise and size, we contribute to efficient and sustainable environments for education, research and innovation.
RISE	Box 857, 501 15	Borås	info@ri.se	https://imcg.se/en/	We facilitate new behaviours and transform societal challenges into business opportunities. By assisting companies and organisations in reaching out to the market with innovative solutions – together we contribute to a sustainable society at the leading edge. Based in Gothenburg and London, we offer strategic consulting services in Project Management, Innovation Management, Communication, Expertise and Funding
IMCG	Odinsgatan 20A, 411 03	Göteborg	info@imcg.se	https://imcg.se/en/	We facilitate new behaviours and transform societal challenges into business opportunities. By assisting companies and organisations in reaching out to the market with innovative solutions – together we contribute to a sustainable society at the leading edge. Based in Gothenburg and London, we offer strategic consulting services in Project Management, Innovation Management, Communication, Expertise and Funding
Volvo AB	n.a	n.a	n.a	www.volvobuses.com/en	Volvo offers a comprehensive range of city and intercity buses. Our range of electrified city buses allow operation with substantially reduced emissions and noise levels – even in sensitive areas and restricted zones. Efficient and responsible public transport requires a holistic and long-term approach. Volvo’s vision is to provide pioneering transport solutions, and our City Mobility offer is unsurpassed.

Volvo Cars AB	Volvo Car Sverige AB, 405 31	Göteborg	swedencr@volvocars.com	www.volvocars.com	n.a
Ericsson	Torshamnsgatan 21	Stockholm	n.a	www.ericsson.com/en	Ericsson is one of the leading providers of Information and Communication Technology (ICT) to service providers, with about 40% of the world's mobile traffic carried through our networks. We enable the full value of connectivity by creating game-changing technology and services that are easy to use, adopt and scale, making our customers successful in a fully connected world
Bengt Dahlgren	KROKSLÄTTS FABRIKER 52, 431 37	Mölndal	n.a	https://bengtdahlgren.se/	Bengt Dahlgren is a privately-owned technology consulting company active in civil engineering. We provide qualified engineers in installation, fire & risk, construction & real estate and energy & environment.
Skanska	Warfvinges väg 25, 112 74	Stockholm	n.a	www.skanska.se	Skanska is one of the world's leading project development and construction groups, concentrated on selected home markets in the Nordic countries, other European countries and in North America.
White	Box 2502, 40317	Göteborg	n.a	https://whitearkitekter.com/	At White, we have over 900 employees who create architecture that engages, contributes to a sustainable lifestyle and puts people at the heart. Since 1951, we are challenging with innovative architecture and building a society where everyone is given space to grow. And we do it together.
PEAB	Margretetorpsvägen 84, 269 73	Förslöv	n.a	http://www.peab.se/	n.a
Mölndala	Privatvägen 1, 431 82	Mölndal	info@molndala.com	www.molndala.se	n.a
Husqvarna	Drottninggatan 2, 561 82	Huskvarna	n.a	www.husqvarna.com/se/	The object of the company's business is to conduct, directly or indirectly, industrial and commercial activities with forestry, grubbing and gardening products, hard processing products, other motor products as well as other related activities.
Västra Götalandsregionen	Regionens Hus, 462 80	Vänersborg	post@vgregion.se	www.vgregion.se	Region – County administration
Västra Götalands län	Södra Hamngatan 3, 411 14 Göteborg	Göteborg	vastragotaland@lansstyrelsen.se	www.lansstyrelsen.se/vastra-gotaland/	Region – County administration
Partille	Partille	Partille	kundcenter@p	www.partille.se	Municipality

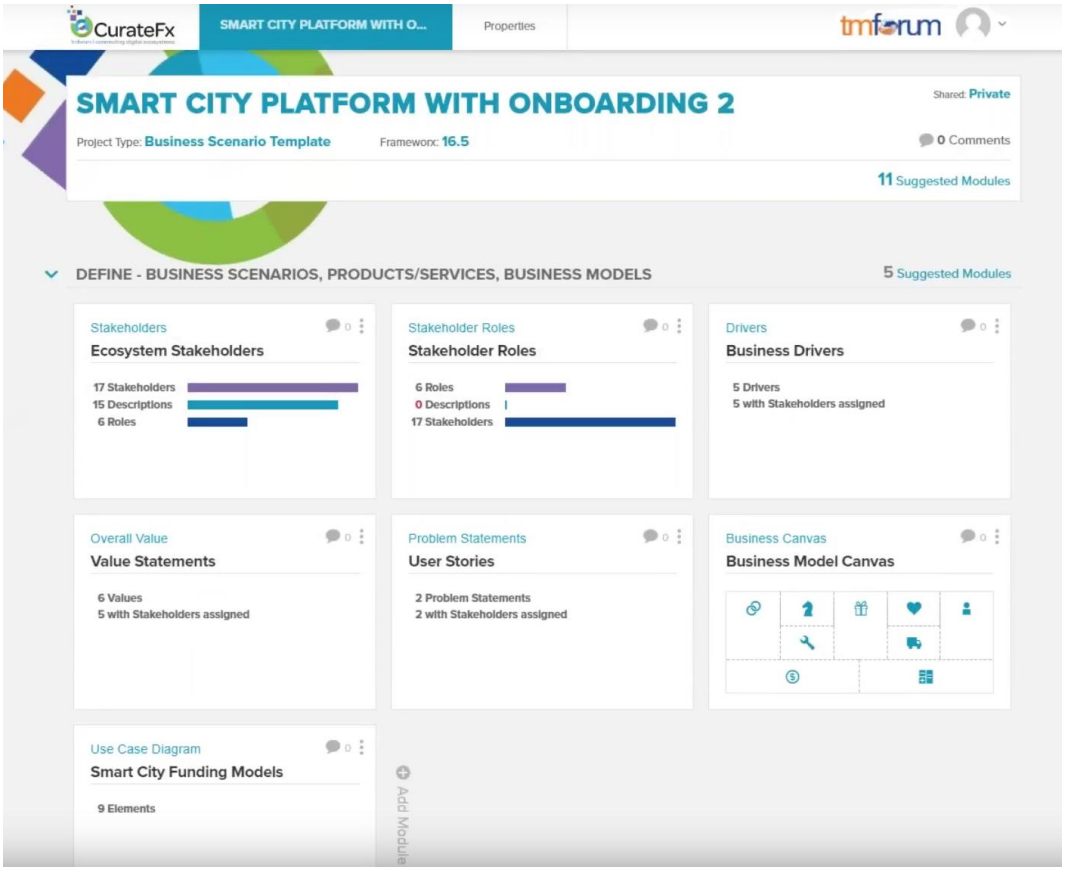
	kommun, Kommunkontoret, 433 82		artille.se		
Mölndal	Göteborgsvägen 11-17, 431 82	Mölndal	stad@molndal.se	www.molndal.se	Municipality
Lerums	443 80	Lerum	kommun@lerum.se	www.lerum.se	Municipality
Härryda	435 80	Mölnlycke	kommun@harryda.se	www.harryda.se	Municipality
Kungsbacka	Stadshuset, Storgatan 37, 434 81	Kungsbacka	info@kungsbacka.se	www.kungsbacka.se	Municipality
Kungälv	Kungälvs kommun, 442 81	Kungälv	kundservice.avfall@kungalv.se	www.kungalv.se	Municipality
IQ Samhällsbyggnad	Drottninggatan 33, 111 51	Stockholm	info@iqs.se	www.iqs.se	IQ Samhällsbyggnad (The Swedish Centre for Innovation and Quality in the Built Environment) is a Swedish member organization for companies and organizations in the built environment sector that combines research and innovation issues with cross-border collaboration.
Viable cities	Teknikringen 10B, 100 44	Stockholm	info@viableciti es.com	http://viableciti es.com/en/	Viable Cities – the strategic innovation programme for smart, sustainable cities – is the largest research and innovation initiative taken in Sweden so far in the field of smart, sustainable cities. Viable Cities is led by KTH Royal Institute of Technology, and brings together around 50 stakeholders in various areas of research, industry, government, local authorities and civil society.
Ekocentrum	Aschebergsgatan 44, 411 33	Göteborg	info@ekocentrum.se	www.ekocentrum.se	Ekocentrum offers some of Sweden's most sought after and appreciated independent environmental and CSR training. We offer a unique concept, where our trainers use the large, permanent exhibition with solutions like the educational arena. By doing so, we create a common platform of knowledge and motivation at hundreds of businesses, departments and organizations each year.
CSR Västsverige	Box 170, 405 30	Göteborg	n.a	http://csrvastsverige.se/	Sweden's largest cross-sector CSR network. Arena for knowledge and experience exchange between private, public and creative sectors as well as academia. An independent and non-profit-making association co-financed by the Västra Götaland region.

10.2 Annex 2 – CurateFX Screenshots

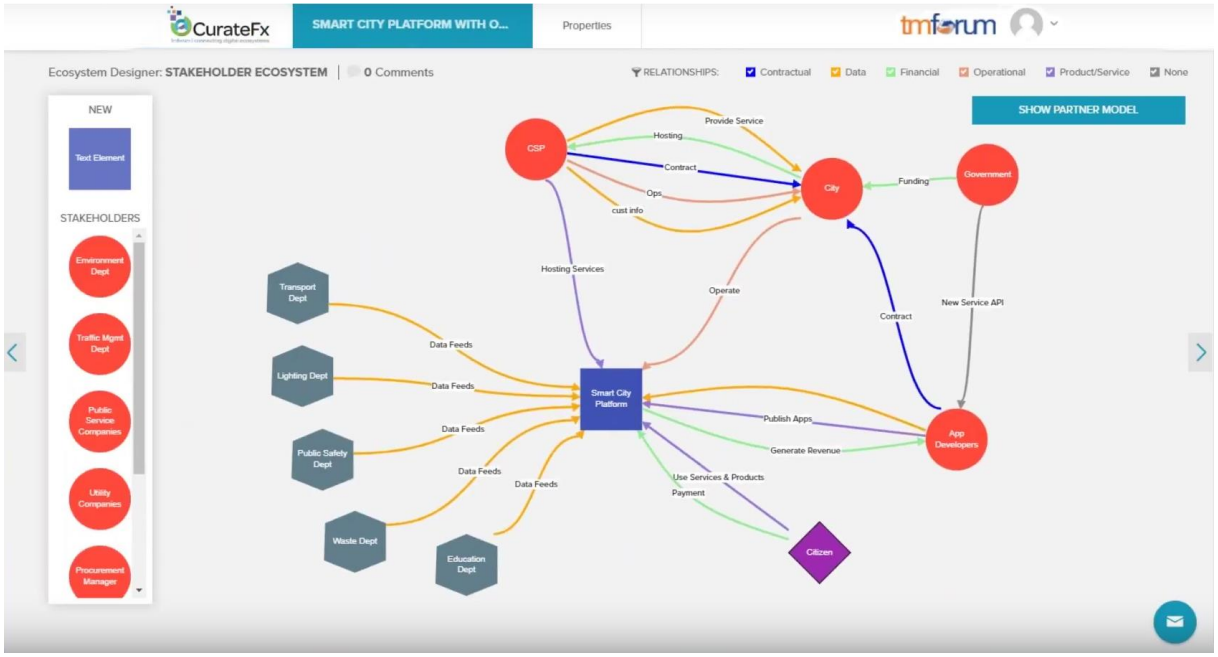
The following screenshots present the core functionality of CurateFX collaboration platform (Source: TM Forum). The screenshots are indicative, and they are not presenting the installation for the IRIS project.



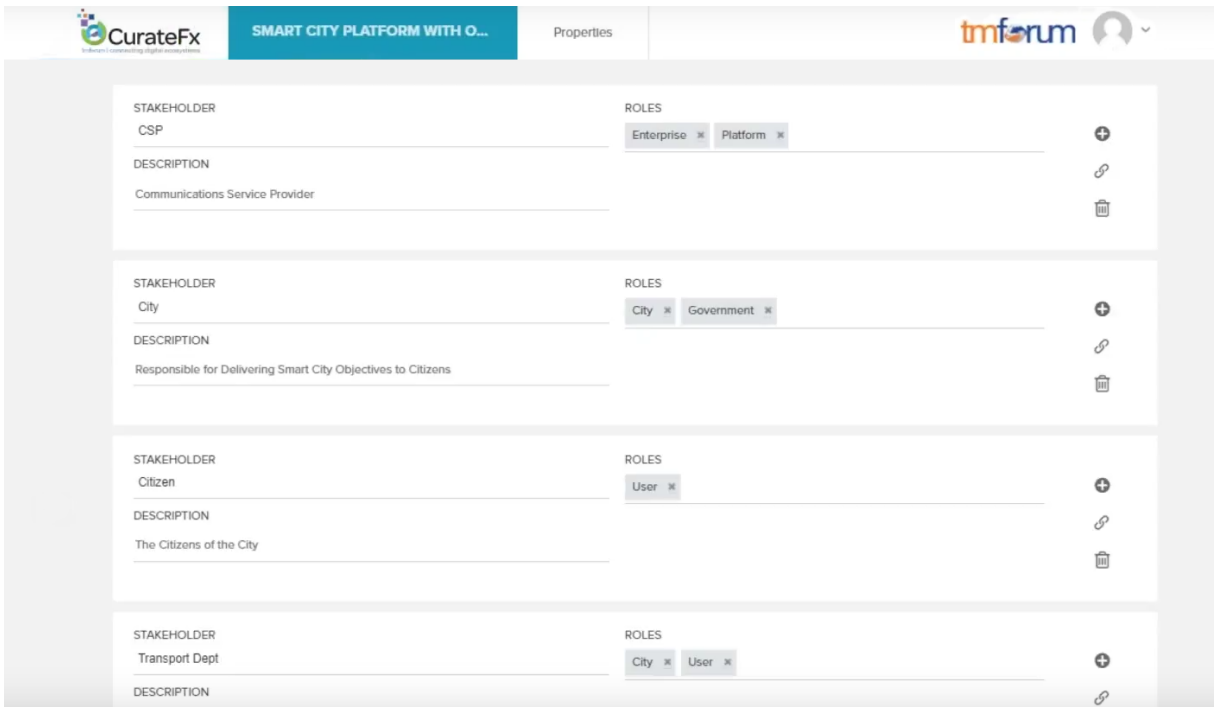
Screenshot 1 - CurateFX Project View



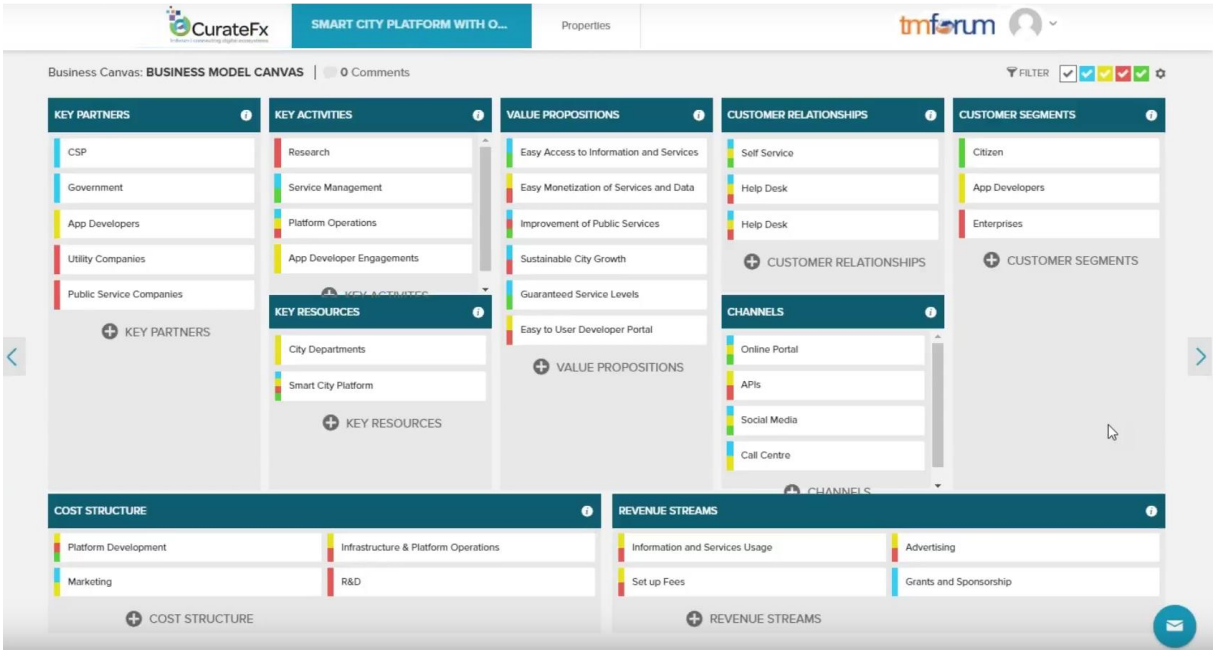
Screenshot 2 – CurateFX Modules



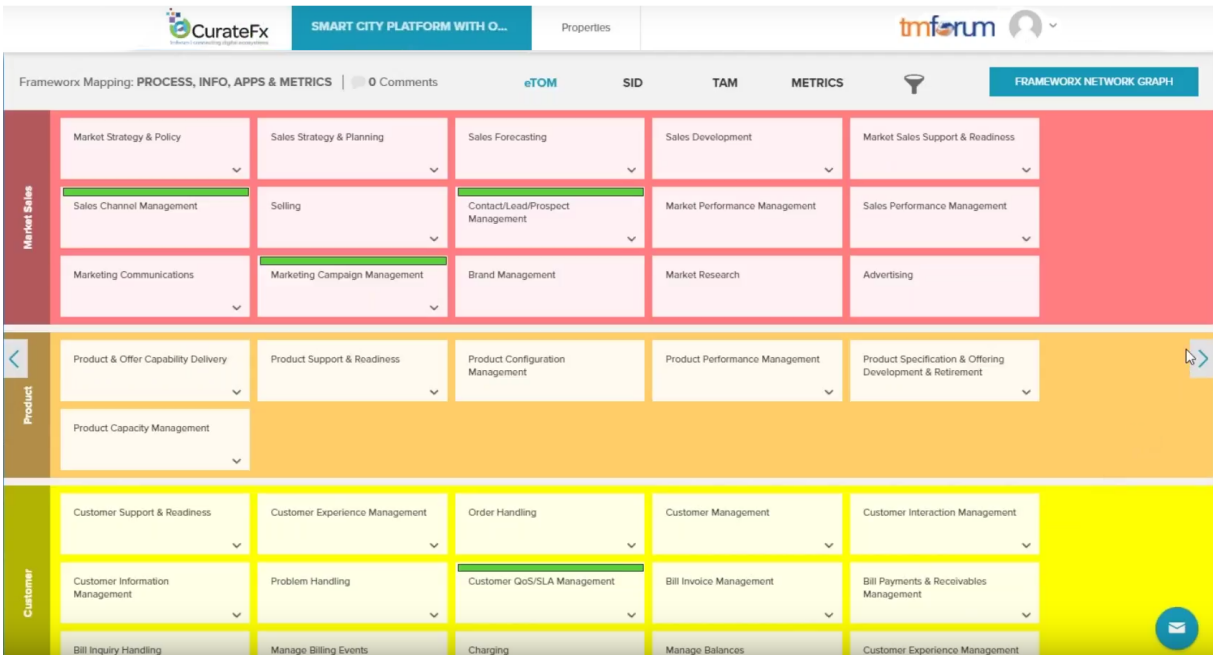
Screenshot 3 - CurateFX Stakeholder Ecosystem Design



Screenshot 4 - CurateFX Stakeholders



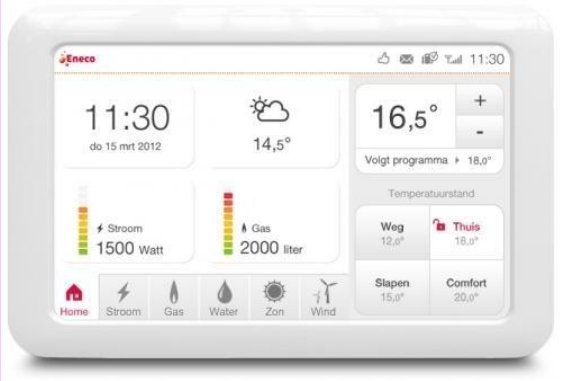
Screenshot 5 - CurateFX Business Model Camvas



Screenshot 6 - Framework Mapping

10.3 Annex 3 - Citizen Engagement & C0-Creation Planning

10.3.1 Utrecht

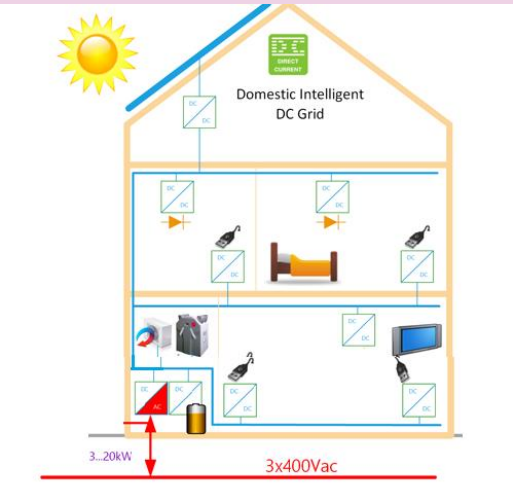
Transition Track #1 Smart renewables and closed-loop energy positive districts	
Name of integrated solution	**Measure 3: HEMS Eneco Toon**
Type of Citizen Engagement activity	Level 4: Co-create of new products/services
Introduction of the solution	The Eneco Toon® (hereafter Toon) is an existing device (7`` display) with proven technology. The main objective of the Toon is to provide information of the energy usage of a household. Since a couple of years, the Toon is already installed in many houses and apartments in The Netherlands, for clients and non-clients of Eneco. The user interface and hardware of the Toon has been adjusted frequently. Other functionalities have been added, such as: - amount of energy created by PV panels - monthly energy bill - spoilage checker  - weather forecast *The Eneco Toon display* Besides the device which will be installed in houses, users can install a Toon application on their smartphone. With this application users can for example guide their heating device from outside house. Considering the fact that the hardware and user interface of the Toon will not be changed into a special edition for the tenants of the 12 apartment buildings, the citizen engagement activities will focus on the accessibility and usage of Toon for a specific audience (tenants of the 12 apartment buildings) from their specific demands. If the

	demands of the audience require additional functionalities or guidelines, the Toon application for smartphone can be adjusted and/or enriched. Hence the main objectives of the citizen engagement activities for this measure are understanding and improve accessibility and usage.
Schedule	The schedule of these engagement activity consists of: - Workshop 1: introduction of the Toon September 2018 - Workshop 2: follow-up of workshop 1 November 2018 - Workshop 3: co-creation with tenants January 2019 - Implementation Toon in apartment building Columbuslaan III March – October 2019 - Evaluation of the Toon in apartment building Columbuslaan III March 2020 *For the next apartment buildings (combined apartment buildings if possible), workshop 2 and the implementation of the Toon will be repeated.*
Responsible organization(s)	Housing Corporation Stichting Bo-Ex '91
Organization(s) with design thinking expertise involved	- HKU - Eneco - Gemeente Utrecht
Main objectives	Co-create specific application(s) and/or Toon functionalities which contribute to the use of the Toon within our tenants.
Description of activities involved	The activities for this engagement activity are the following: - Workshop 1 (Tenants/Eneco/Bo-Ex/HKU/Gemeente Utrecht): ○ introduction in Toon to the tenants; ○ test of the Toon by the tenants; ○ find out what shall be changed/added to make the Toon easier/better to use. - Workshop 2 (Eneco/Bo-Ex/HKU/Gemeente Utrecht): ○ gather solutions to accommodate the specific requirements of the users from workshop 1. - Workshop 3 (Tenants/Eneco/Bo-Ex/HKU/Gemeente Utrecht): ○ co-create solutions to the specific requirements with the tenants. - implementation of the Toon in every household, including guiding the tenants; - evaluation of the use of Toon and the achieved energy efficiency.
Types of associated materials generated	During the workshops, pictures and videos will be taken, with the permission of the participants.
Possible risks	1. Tenants are not convinced of the possible positive effects of Toon. 2. The energy savings contributed by the use of Eneco Toon is seen as minimal and

	not interesting by our tenants. 3. The possibilities of creating new applications / functionalities with Toon is minimized and not relevant.
Stakeholder Groups involved	Group 3: Technology and Services Providers - Eneco - Qubie (developer of the Toon software and API's) Group 5: Citizens - Tenants with interests in sustainable solutions / Toon from one of the 12 apartment buildings Group 6: Representative Citizen Groups - Representatives of the tenants of the 12 apartment buildings
Related Citizen Engagement KPIs	- Improved flexibility of service delivery following citizen feedback phases - Increased awareness of energy consumption issues - Awareness of economic benefits of reduced energy consumption - Local citizen involvement in planning AND/OR design AND/OR implementation AND/OR validation phases - Provision of a localised multi stakeholder co-creation and co-production Field Guide for Citizen Engagement activities - Measure extent to which privacy by design has been ensured

Transition Track #1 Smart renewables and closed-loop energy positive districts	
Name of integrated solution	**Measure 5: Smart Hybrid e-heating systems**
Type of Citizen Engagement activity	Level 3: Co-creation for adoption of existing products/services
Introduction of the solution	The smart hybrid e-heating systems consists of devices which will provide heat and hot tap water for the tenants, in 8 of the 12 apartment buildings. The concept of the smart system consists of a gas central heating device in combination with a ventilation heat pump. The ventilation heat pump uses the heated ventilation air in an apartment to provide in heat. The ventilation air comes from outside or inside, depending on the chosen ventilation principle. This is a hybrid system, since it's a combination of electrical and gas feeded devices. The smartness of this system consists of the ability to switch between gas and electrical heat. When the electricity grid is not able to provide in electricity, the system can be switched so that the demanded electricity is low. When there's no electricity limit, the system shall be operated mainly electric wise to reduce the amount of gas usage. *A smart hybrid e-heating system* In the current situation, tenants are often faced with mould due to bad ventilated rooms. The apartment buildings don't have mechanical ventilation, the way an apartment is ventilated is mainly depended on the behavior of the tenants. The experience of Bo-Ex is that many tenants don't have the knowledge and insight in what contributes to a healthy climate. Sometimes, when we replace natural ventilation by mechanical ventilation with grills in the outer windows, people close the all the grills

	because of the cold air stream. This often causes bad air quality in the apartment and high risks for mould, especially in the bath room and kitchen. Hence the objective of this engagement activity is to find out what contributes to smart ventilation behavior.
Schedule	The schedule of these engagement activity consists of: - Workshop 1: ventilation principles, awareness and behavior March 2019 - Workshop 2: ventilation behavior change May 2019 - Evaluation of the ventilation systems in apartment building Columbuslaan III May 2020 *For the next apartment buildings (combined apartment buildings if possible), workshop 2 will be repeated.*
Responsible organization(s)	Housing Corporation Stichting Bo-Ex '91
Organization(s) with design thinking expertise involved	- HKU - Gemeente Utrecht - Supplier of ventilation systems (t.b.d.)
Main objectives	Contribute to smart ventilation behavior by tenants.
Description of activities involved	The activities for this engagement activity are the following: - Workshop 1 (Tenants/Bo-Ex/HKU/Gemeente Utrecht): o introduction in the provided ventilation system; o test of the ventilation system by the tenants; o find out what obstacles tenants face with ventilation. - Workshop 2 (Tenants /Bo-Ex/HKU/Gemeente Utrecht): o co-create solutions to the specific requirements with the tenants. - evaluation of the use of ventilation and the impact on the health of our tenants.
Types of associated materials generated	During the workshops, pictures and videos will be taken, with the permission of the participants.
Possible risks	1. Tenants don't like low temperature heating and refuse to accept the implementation of this solution.
Stakeholder Groups involved	- Group 3: Technology and Services Providers - Group 5: Citizens - Group 6: Representative Citizen Groups
Related Citizen Engagement KPIs	- Increased awareness of energy consumption issues - Awareness of economic benefits of reduced energy consumption

Transition Track #1 Smart renewables and closed-loop energy positive districts	
Name of integrated solution	**Measure 6: AC/DC home switchboxes**
Type of Citizen Engagement activity	Level 3: Co-creation for adoption of existing products/services
Introduction of the solution	This measure consists of a direct current (DC) network in a small-scale pilot of 8 houses, so that PV generated energy on the roof is used in the homes with less energy losses. Every apartment will be equipped with PV solar panels which will generate energy. This energy is low voltage direct current. Usually, the generated energy will be transformed by a transformer into 230 Volt alternating current (AC). This transformation causes energy losses. Because of the fact that many domestic devices operate on low voltage AC/DC, the question is whether it's interesting to implement a (parallel running) DC network in a house to provide energy for a certain amount of devices.  *A full DC-network operating house* To implement a DC network, it's necessary to have insight in the domestic devices of a (generic) household: which devices can be connected to a DC network directly and what is the impact for the user. To give answer to these questions, it's necessary to have insight in the tenants kind and usage of devices. With this information we can investigate the possibilities for implementing a DC network and guiding our tenants. This solution is planned to be implemented in only 8 apartments, because there's not many information and just a few experiences available on this subject in The Netherlands. Part of this engagement activity is to find 8 volunteers who provide the ability to implement a DC network in their house. Hence the objective of this engagement activity is to find out whether a DC network

	contributes to the energy efficiency of a tenant with representative domestic devices. With the outcomes of this investigation, the implementation of a parallel running DC network will take place.
Schedule	The schedule of these engagement activity consists of: - Workshop 1: investigation of energy usage by domestic devices End of 2019 - Workshop 2: investigation of possibilities for a representative apartment Begin 2020 - Workshop 3: chose of the preferred scenario by the tenants Begin 2020 - Implementation of the usage of a DC-network in 8 apartments Mid 2020 - Evaluation of the usage and gathered energy savings by tenants Mid 2021
Responsible organization(s)	Housing Corporation Stichting Bo-Ex '91
Organization(s) with design thinking expertise involved	- HKU - Directcurrent.nl (DC network provider)
Main objectives	Co-create specific application(s) and/or hardware to provide in a smart DC network within 8 test houses.

Description of activities involved	The activities for this engagement activity are the following:
	- Workshop 1: investigation of energy usage by domestic devices (HKU, Directcurrent, Bo-Ex, tenants)
	  ○ What kind/type of domestic devices are used by our tenants?
	  ○ What is the energy usages of the mentioned domestic devices?
	  ○ What do tenants prefer regarding charging/using the mentioned domestic devices?
	- Workshop 2: investigation of possibilities for a representative apartment (Directcurrent, Bo-Ex)
	  ○ What are the technical possibilities?
	  ○ What are the financial consequences?
	  ○ What scenarios/options can be offered to our tenants?
	- Workshop 3: chose of the preferred scenario by the tenants (HKU, Directcurrent, Bo-Ex, tenants)
	- Implementation of the usage of a DC-network in 8 apartments (contractor t.b.d)
	- Evaluation of the usage and gathered energy savings by tenants (HKU, Directcurrent, Bo-Ex, tenants)

Types of associated materials generated	During the workshops, pictures and videos will be taken, with the permission of the participants.

Possible risks	1. Tenants are not convinced of the possible positive effects of DC networks. 2. The (minimum) number of 8 volunteers is not found.
Stakeholder Groups involved	- Group 3: Technology and Services Providers - Group 5: Citizens - Group 6: Representative Citizen Groups
Related Citizen Engagement KPIs	- Improved flexibility of service delivery following citizen feedback phases - Increased awareness of energy consumption issues - Awareness of economic benefits of reduced energy consumption - Number of innovative ways found to implement Smart City Integrated Solutions in neighbourhoods using the Citizen Engagement Ladder approach - Local citizen involvement in planning AND/OR design AND/OR implementation AND/OR validation phases - Increased citizen awareness of the potential of smart city projects - Number of city officials and urban experts trained to conduct the meaningful and ethical engagement of citizens - Provision of a localised multi stakeholder co-creation and co-production Field Guide for Citizen Engagement activities - Participation of citizens, citizen representative groups and citizen ambassadors in the co-creation of local/micro KPIs for Citizen Engagement for Smart Cities - Number of active 'touch-points' identified where citizens have a degree of agency and interaction with solution - Measure extent to which privacy by design has been ensured

Transition Track #1 Smart renewables and closed-loop energy positive districts	
Name of integrated solution	**Measure 5: VR new home and district experience**
Type of Citizen Engagement activity	Level 3: Co-creation for adoption of existing products/services
Introduction of the solution	This activity focus on a virtual reality platform, extending existing Oculus Rift VR experiences for apartment buildings to other new buildings so households can experience their future 'new' home, including infotainment and interactive training about the new smart energy and mobility services they may expect. *A person who experiences virtual reality by using a VR-glass* In an earlier stage, experiments with 3D visualization has taken place to experience the renewed house of tenants after a refurbishment. This visualization worked well, since almost all apartments are built up the same and by using pictures (old/new) people could image which new parts/products were installed. On the other side, we've experienced that a certain amount of tenants can't 'read' visualizations: the don't understand a visualization and the linked pictures and descriptions to the visualization. This engagement activity broadens the scope of virtual reality: it will focus on the new homes of the tenants and also on infotainment and training about smart energy and mobility solutions. This means that tenants will be challenged to find their way in their own house and to find out what's needed to have a better energy usage performance. Hence the objective of this engagement activity is to develop an easy understanding virtual reality experience for the renewed houses of our tenants.
Schedule	The schedule of these engagement activity consists of: - Workshop 1: investigate wishes, demands and requirements of our tenants¨- mid 2019 - Workshop 2: develop several options for VR to offer the tenants - mid 2019 - Workshop 3: chose of the preferred VR solution by the tenants - end 2019

	- Implementation of VR in the citizen engagement activities for the apartment buildings - end 2019 - Evaluation of VR with a representative number and type of tenants - from end 2019
Responsible organization(s)	Housing Corporation Stichting Bo-Ex '91
Organization(s) with design thinking expertise involved	- HKU - Gemeente Utrecht
Main objectives	Co-create a specific application(s) which contributes to the virtual experience of the renewed houses of our tenants.

Description of activities involved	The activities for this engagement activity are the following:
	- Workshop 1: investigate wishes, demands and requirements of our tenants
	  ○ What do our tenants understand?
	  ○ What do our tenants wish to be visualized / developed?
	  ○ What information is required by our tenants?
	- Workshop 2: develop several options for VR to offer the tenants
	  ○ What information is minimal required?
	  ○ How can information be linked to each other in one platform?
	  ○ What information can be visualized in what way?
	- Workshop 3: chose of the preferred VR solution by the tenants
	- Implementation of VR in the citizen engagement activities for the apartment buildings
	- Evaluation of VR with a representative number and type of tenants

Types of associated materials generated	During the workshops, pictures and videos will be taken, with the permission of the participants.
Possible risks	1. The development of a well-working VR experience, which meets the requirements of our tenants, is too expensive regarding the available budget.
Stakeholder Groups involved	- Group 3: Technology and Services Providers - Group 5: Citizens - Group 6: Representative Citizen Groups
Related Citizen Engagement KPIs	- Improved flexibility of service delivery following citizen feedback phases - Increased awareness of energy consumption issues - Awareness of economic benefits of reduced energy consumption - Number of innovative ways found to implement Smart City Integrated Solutions in neighbourhoods using the Citizen Engagement Ladder approach - Local citizen involvement in planning AND/OR design AND/OR implementation

	AND/OR validation phases - Increased citizen awareness of the potential of smart city projects - Number of city officials and urban experts trained to conduct the meaningful and ethical engagement of citizens - Provision of a localised multi stakeholder co-creation and co-production Field Guide for Citizen Engagement activities - Participation of citizens, citizen representative groups and citizen ambassadors in the co-creation of local/micro KPIs for Citizen Engagement for Smart Cities - Number of active 'touch-points' identified where citizens have a degree of agency and interaction with solution - Measure extent to which privacy by design has been ensured

Transition track #2: Smart energy management and storage for grid flexibility	
Name of integrated solution	**Measure 1: Electrical charge points for e-car: location vs usage combined with Measure 2: Electric V2G Car and We Drive Solar App**
Type of Citizen Engagement activity	Level 3: Co-creation for adaptation of existing touchpoints
Introduction of the solution	V2G e-cars and smart solar power-driven charging stations linked to a car sharing system will be implement in Kanaleneiland-Zuid. 14 solar powered V2G e-cars delivered by Renault will be placed, demand driven, in the district. Also 18 solar V2G charging points will be deployed in the demonstration area. The placement of these charging point will be also be done demand-driven. The start of the demonstration will be made with a charging point and a v2g e-car in front of the Local Innovation Hub 'Krachtstation' (a former school building that now hosts startups and functions as a meeting place and student housing location). A very visible location in the district with potential users nearby. The demonstration will continue with 4 charging point connected to the 2nd life stationary batteries that will be placed in two of the apartment buildings garage boxes. Two at the first apartment building that will be refurbished (east part of the district) and two near to one of these boxes situated near to the 'Krachtstation". The citizen engagement activities will focus on motivating local inhabitants to make use of the e-car sharing system focusing on their mobility needs, also local employment will be taken into account. To enlarge the involvement of Local inhabitants of Kanaleneiland into the IRIS project Labyrinth will help to connect with them. Labyrinth is a research and advisory company located at the Krachtstation. Part of their daily work is related to citizen involvement and creating jobs in the local community of Kanaleneiland. Hence the main objectives of the citizen engagement activities for these measures are involving inhabitants in a sustainable mobility system and co-creation in the adoption campaigns.
Schedule	The schedule of these engagement activity consists of: - Desk research, kickoff meeting with Labyrinth and LomboXnet and meeting with key figures from Kanaleneiland - Q4 - Street interviews (Local inhabitants/ small enterprises) - Q4 - Interviews (grassroot organization/ medium and big enterprises) - Q4 - Focus group (Local inhabitants/ small enterprises) - Q4 - Focus group (grassroot organization/ medium and big enterprises) - Q4 - First car event - Q5
Responsible organization(s)	LomboXnet coworking with Labyrinth
Organization(s) with design thinking expertise involved	LomboXnet and Labyrinth supported by HKU
Main objectives	Co-creation in the adoption campaigns and job creation
Description of	All the activities will be executed by Labyrinth and LomboXnet. The activities for this

activities involved	engagement activity are the following:
	- Desk research, kickoff meeting with Labyrinth and LomboXnet and meeting with key figures from Kanaleneiland
	- Street interviews (Local inhabitants/ small enterprises):
	  o Interviewing Local inhabitants and owners of small enterprises about car sharing, to collect data and find focus group members.
	  o Selecting a focus group.
	- Interviews (grassroot organization/ medium and big enterprises):
	  o Interviewing Local inhabitants and owners of small enterprises about car sharing, to collect data and find focus group members.
	  o Selecting a focus group.
	- Focus group (Local inhabitants/ small enterprises):
	  o Discussion how to implement the cars is the local ecosystem and how to create work out of it.
	  o Finding early adaptors.
	- Focus group (grassroot organization/ medium and big enterprises):
	  o Discussion how to implement the cars is the local ecosystem and how to create work out of it.
	  o Finding early adaptors.
	- First car event.
	Additional activities
	- Analyses data and reporting.
	- Present report from Labyrinth to LomboXnet.

Types of associated materials generated	During the focus group meetings and community actions, pictures and videos will be taken, with the permission of the participants. Also, promotion material will be generated.
Possible risks	Due to other more urgent basic needs in life, inhabitants are not interested in the use of a e-car sharing system.
Stakeholder Groups involved	Group 3: Technology and Services Providers - Jedlix, charging point aggregator Group 5: Citizens - Traditional inhabitants (families) - Students and starters - Local small enterprises - Local Grassroot originations - Medium and lagers enterprises Group 7: Citizen Ambassadors - Focus group (Traditional inhabitants, Students and starters, Local small enterprises) - Focus group (Local Grassroot originations, medium and lagers enterprises)
Related Citizen Engagement KPIs	- Improved flexibility of service delivery following citizen feedback phases - Number of innovative ways found to implement Smart City Integrated Solutions in neighborhoods using the Citizen Engagement Ladder approach

	- Local citizen involvement in planning AND/OR design AND/OR implementation AND/OR validation phases - Increased citizen awareness of the potential of smart city projects - Number of city officials and urban experts trained to conduct the meaningful and ethical engagement of citizens - Participation of citizens, citizen representative groups and citizen ambassadors in the co-creation of local/micro KPIs for Citizen Engagement for Smart Cities - Number of active 'touch-points' identified where citizens have a degree of agency and interaction with solution

Transition Track #4 City Innovation Platform	
Name of integrated solution	**Smart Street Lighting with multi-sensoring**
Type of Citizen Engagement activity	Level 4: Co-create of new products/services
Introduction of the solution	In Kanaleneiland-Zuid smart street lighting will be introduced, which encompasses equipping existing lampposts with smart multi-sensors for e.g. tracking air quality, sound detection sensors reducing vandalism and human sensing for bicyclists' and pedestrians' road safety. Data collected through these sensors will be used to enhance data driven district policies aimed at reducing/minimizing problems faces by the citizens in public space. To develop a meaningful data service its necessary to get a good insight on the problems faced by the citizens in Kanaleneiland-Zuid in public space and select problems that potentially can be solved through the introduction of smart street lighting and related data services. Public surveys among citizen in Kanaleneiland e.g. show that dissatisfaction regarding transport above the average for Utrecht; citizens experience more traffic noise and feel unsafe when parking. Other problems that were mentioned during the first design workshop were vermin (rats), youth hanging around and harassing passers.
Schedule	The schedule of engagement activities consists/consisted of: - Workshop 1: Retrieval of wishes, needs & dreams - 20 June 2018 - Workshop 2: Design concepts of solutions meeting wishes, needs & dreams of citizens - 25 June 2018 - Workshop 3: Pitching: presentation of solutions and selecting a winning concept - 26 June 2018 - Workshop 4: Evaluating the implementation, testing & monitoring of a proof of concept for one location - June 2019 - Workshop 5: Evaluation of the rollout of final product/service in the district of Kanaleneiland Zuid - December 2021 *During the testing of the proof of concept at one location, and after rollout of the final product/service in the whole district citizens continuously have the opportunity to provide feedback, which (amongst others) will be discussed in workshops 4 and 5.*
Responsible organization(s)	- Municipality of Utrecht - Luminext
Organization(s) with design thinking expertise involved	- HKU - Municipality of Utrecht
Main objectives	Co-create (data) services for the citizen in Kanaleneiland-Zuid, which contribute to reducing/minimizing problems faced by the citizens in the public space and can be developed with data collected by sensors linked to smart lamp posts.
Description of activities involved	The activities for engagement activities are the following: - Workshop 1: Retrieval of wishes, needs & dreams (3 hours)

	○ Short introduction to the IRIS project, the concept of smart street lighting and what can be realised within the context of the IRIS project ○ Short introduction to the design thinking process ○ Introduction of participants ○ Plenary and working session (in changing compositions) to map major topic in public space, map wishes, needs & dreams - Workshop 2: Design concepts of solutions meeting wishes, needs & dreams of citizens (3 hours) ○ Short recap of results workshop #1 and introduction to boundary conditions set by the IRIS project for design of solutions concepts. ○ Working sessions in which various design thinking tools are applied to elaborate concept of potential solutions. - Workshop 3: Pitching: presentation of solutions and selecting a winning concept (1,5 hours) ○ Solutions developed in the second workshop are pitched for a jury (Dragons' Den approach[1]). - Further elaboration of the winning solutions from workshop 3 towards criteria for development/realisation of a "proof of concept". - Implement of the "proof of concept" and demonstrate its feasibility to meet listed criteria. - Workshop 4: Evaluating the implementation, testing & monitoring of a "proof of concept" for one location. ○ Citizen will be invited to provide feedback and make suggestion for improvements. - Definition of final criteria for smart street lighting and commissioning for full rollout in Kanaleneiland-Zuid. - Workshop 5: Evaluation of the rollout of final product/service in the district of Kanaleneiland Zuid
Types of associated materials generated:	During the session pictures are/will be taken (with the permission of the participants), narrative sheets (flip overs and post-its), map of Kanaleneiland where participants located various problems in public space, 2D and 3D visualisation of developed concepts (Mock-ups).

[1] https://en.wikipedia.org/wiki/Dragons%27_Den

	Impression on the type of results produced during the first workshop (left) and second/third workshop (right)
Possible risks:	- Citizens and other stakeholders are not interested to participate in the co-creating workshops. - Citizens and other stakeholders have divergent expectation on follow up or are dissatisfied with the follow up and are not willing to provide input through the whole process, - Citizens are not satisfied with the presented solution because they find other problems (which cannot be solved with smart lamp posts) more pressing.
Stakeholder groups involved	Group 3: Technology and Services Providers - Eneco/Luminext - Other providers of smart street lighting - Professionals with design thinking expertise Group 4: Policy-Making Bodies and Governance - Municipality of Utrecht - District bureau of the municipality of Utrecht - Public enforcement officials of the municipality of Utrecht Group 5: Citizens - Active citizens from various locations in Kanaleneiland-Zuid Group 6: Representative Citizen Groups - Entrepreneurs active in Kanaleneiland Zuid - "Waste" coach - Reporter of district newspaper.
Related citizen engagement KPIs	- Improved flexibility of service delivery following citizen feedback phases - Local citizen involvement in planning AND/OR design AND/OR implementation AND/OR validation phases - Participation of citizens, citizen representative groups and citizen ambassadors in the co-creation of local/micro KPIs for Citizen Engagement for Smart Cities - Number of active 'touch-points' identified where citizens have a degree of agency and interaction with solution - Measure extent to which privacy by design has been ensured

Transition Track #4 City Innovation Platform	
Name of integrated solution	**Data service: Fighting Energy Poverty**
Type of Citizen Engagement activity	Level 4: Co-create of new products/services
Introduction of the solution	The objective of the City Innovation Platform (CIP) is to bring together data of housing corporations, the Municipality, and energy grid operators on the energy consumption of citizens. The housing corporation Bo-Ex would like to use these data to develop an early warning system in case tenants have an extremely high or irregular energy consumption pattern. Bo-Ex wants would like its tenants to benefit from the IRIS solutions financially (a large part of the households renting an apartment from Bo-Ex have a free disposable income of only 50 euro per month) as well as socially (due to financial problems household are often socially isolated). The developed data services should therefore e.g.: - Warn tenant in case of extreme high or irregular energy consumption patterns by providing them with insight in their energy usage (e.g. compared to their peers) and provide concrete feedback how they can reduce their energy usage. - Increase disposable income of households or provide discounts to public transport or car sharing services by incentivising tenants to save energy, deliver energy, or provide grid flexibility.
Schedule	The schedule of engagement activities consists/consisted of: - Workshop 1: Definition of a number of *use-cases* - December 2018 - Workshop 2: Development of *scenario's* - February 2019 - Three workshop (provisional): Design of a *mock-up of an App* (program of requirements) - March-June 2019 - Implementation and testing of the *beta-version* of the App - Sept-Dec 2019 - Implementation and testing of the *final version* of the App - Jan-Dec 2021 - Workshop: final evaluation: usage of the App, customer satisfaction - December 2021
Responsible organization(s)	Housing Corporation Stichting Bo-Ex '91
Organization(s) with design thinking expertise involved	- HKU - Municipality of Utrecht - Civity - University of Utrecht
Main objectives	Co-create a data services for the tenants of Bo-Ex in Kanaleneiland-Zuid that they are willing to use to reduce their energy costs.
Description of activities involved	The schedule of engagement activities consists/consisted of: - Workshop 1: Definition of a number of *use-cases* by organizing o Attendees: relevant stakeholders and end-users o Results: definition of a number of relevant use-cases and list of criteria for selection of market party to take up the challenge to develop the data services

	○ Program: ▪ Short introduction to the IRIS project and the challenge (definition of the problem we want to solve) ▪ Short introduction to the design thinking process and tools that will be used. ▪ Introduction of participants ▪ Plenary and working session (in changing compositions) to map articulate the exact problems (challenge), define a number of use cases and list criteria for selection of the market party. - Selecting and contracting a market party, complying with the criteria resulting from workshop 1 that will take up the challenge. - Workshop 2: Development of use-cases into *scenario's* ○ Lead with market party commissioned to develop the data-service ○ Attendees: relevant stakeholder and end-users ○ Results: Various scenarios and most likely scenario selected. ○ Program ▪ Short recap of results workshop #1 and developed use cases ▪ Short introduction of the market party ▪ Working sessions in which various design thinking tools are applied to elaborate the use-cases into scenario's ▪ Working session in which scenarios are scored against nine "living" guidelines for development of digital services and most likely scenario is selected - Three workshop (provisional): Design of a *mock-up of an App* (program of requirements) ○ Market party organizes various design session with stakeholders and end-users, in which the selected scenario is translated into a data-service resulting in a Mock-up of an App (program of requirements). - Commissioning to build the App - Introduction of the *beta-version* of the App and testing with selected number of end-users ○ The App will be demonstrated and continuously tested by end-users, who are encouraged to provide feedback on e.g. usefulness, user friendliness etc. ○ Feedback will be used to adapt and improve the App. - Implementation and testing of the *final version* of the App. - Workshop: final evaluation: usage of the App, customer satisfaction
Types of associated materials generated	During the session pictures are/will be taken (with the permission of the participants), use cases and scenario's (flip overs and post-its), Mock-ups of App.
Possible risks	- Tenants are not willing to share data on their energy usage needed to develop a meaningful data service. - Tenants don't recognise this as a problem and are not interested to cooperate in the development of the service and (in the end) don't make use of the developed App. - User of the App loose interested because financial savings are too low.
Stakeholder groups involved	Group 1: Distribution System Operators (DSOs) - Stedin

	Group 2: Consumers (End-users) - Bo-Ex tenants Group 3: Technology and Services Providers - Professionals with design thinking expertise - Bo-Ex - Utrecht Inc. - QBuzz - Civity Group 4: Policy-Making Bodies and Governance - Municipality of Utrecht - District bureau of the municipality of Utrecht Group 5: Citizens - Active citizens in Kanaleneiland-Zuid
Related citizen engagement KPIs	- Improved flexibility of service delivery following citizen feedback phases - Increased awareness of energy consumption issues - Awareness of economic benefits of reduced energy consumption - Number of innovative ways found to implement Smart City Integrated Solutions in neighbourhoods using the Citizen Engagement Ladder approach - Local citizen involvement in planning AND/OR design AND/OR implementation AND/OR validation phases - Participation of citizens, citizen representative groups and citizen ambassadors in the co-creation of local/micro KPIs for Citizen Engagement for Smart Cities - Number of active 'touch-points' identified where citizens have a degree of agency and interaction with solution - Measure extent to which privacy by design has been ensured

Transition Track #4 City Innovation Platform	
Name of integrated solution	**Data service: 3D Utrecht City Information modelling: building a 3D catalogue**
Type of Citizen Engagement activity	Level 3: Co-creation for adoption of existing products/services
Introduction of the solution	The municipality wants to stimulate the use of 3D home and district modelling as a way to increase citizen engagement in urban planning by as this e.g. offering opportunities for co-creation. Experience shows that participation leads to better projects, better considerations and decision-making and more support for finally selected solutions. The municipality of Utrecht therefore developed a "Participation standard"[2] providing guidelines for civil servants responsible for organizing participation in policy development and project implements. Amongst others the municipality wants to enhance citizen engagement in urban planning by offering data services to citizens visualizing the impact of different scenario for a specific area by making use of data stored in a 3D data brought together in a catalogue through the City Innovation Platform (CIP).
Schedule	The schedule of engagement activities consists/consisted of: - Workshop 1: Definition of a number of *use-cases* - December 2018 - Workshop 2: Development of *scenario's* - February 2019 - Three workshop (provisional): Design of a *mock-up of an application* (program of requirements) - March-June 2019 - Implementation and testing of the *beta-version* of the App - Sept-Dec 2019 - Implementation and testing of the *final version* of the App - Jan-Dec 2021 - Workshop: final evaluation: usage of the App, customer satisfaction - December 2021
Responsible organization(s)	Municipality of Utrecht
Organization(s) with design thinking expertise involved	- HKU - Municipality of Utrecht - Civity - University of Utrecht
Main objectives	Co-create a data-service that is really helpful to enhance involvement of citizens in urban planning processes.
Description of activities involved	The schedule of engagement activities consists/consisted of: - Workshop 1: Definition of a number of *use-cases* by organizing o Attendees: relevant stakeholders and end-users o Results: definition of a number of relevant use-cases and list of criteria for

[2] https://www.utrecht.nl/fileadmin/uploads/documenten/bestuur-en-organisatie/initiatief-en-invloed/Participatiestandaard_1_.pdf

	selection of market party to take up the challenge to develop the data services o Program: ▪ Short introduction to the IRIS project and the challenge (definition of the problem we want to solve) ▪ Short introduction to the design thinking process and tools that will be used. ▪ Introduction of participants ▪ Plenary and working session (in changing compositions) to map articulate the exact problems (challenge), define a number of use cases and list criteria for selection of the market party. - Selecting and contracting a market party, complying with the criteria resulting from workshop 1 that will take up the challenge. - Workshop 2: Development of use-cases into *scenario's* o Lead with market party commissioned to develop the data-service o Attendees: relevant stakeholder and end-users o Results: Various scenarios and most likely scenario selected. o Program ▪ Short recap of results workshop #1 and developed use cases ▪ Short introduction of the market party ▪ Working sessions in which various design thinking tools are applied to elaborate the use-cases into scenario's ▪ Working session in which scenarios are scored against nine "living" guidelines for development of digital services and most likely scenario is selected - Three workshop (provisional): Design of a *mock-up of an Application* (program of requirements) o Market party organizes various design session with stakeholders and end-users, in which the selected scenario is translated into a data-service resulting in a Mock-up of an App (program of requirements). - Commissioning to build the Application - Introduction of the *beta-version* of the Application and testing with selected number of end-users o The App will be demonstrated and continuously tested by end-users, who are encouraged to provide feedback on e.g. usefulness, user friendliness etc. o Feedback will be used to adapt and improve the Application. - Implementation and testing of the *final version* of the Application. Workshop: final evaluation on results (does the app lead to improvement of participation).
Types of associated materials generated	During the session pictures are/will be taken (with the permission of the participants), use cases and scenario's (flip overs and post-its), Mock-ups of App.
Possible risks	- Citizen of Kanaleneiland-Zuid are not sufficiently interested to be engagement in urban planning processes
Stakeholder groups involved	Group 3: Technology and Services Providers - Professionals with design thinking expertise - Utrecht Inc.

	- Civity Group 4: Policy-Making Bodies and Governance - Municipality of Utrecht (amongst other civil servants involved in urban planning processes) - District bureau of the municipality of Utrecht Group 5: Citizens - Active citizens in Kanaleneiland-Zuid
Related Citizen Engagement KPIs	- Improved flexibility of service delivery following citizen feedback phases - Local citizen involvement in planning AND/OR design AND/OR implementation AND/OR validation phases - Increased citizen awareness of the potential of smart city projects - Number of city officials and urban experts trained to conduct the meaningful and ethical engagement of citizens - Participation of citizens, citizen representative groups and citizen ambassadors in the co-creation of local/micro KPIs for Citizen Engagement for Smart Cities - Number of active 'touch-points' identified where citizens have a degree of agency and interaction with solution - Measure extent to which privacy by design has been ensured