IRIS

Integrated and Replicable Solutions for Co-Creation in Sustainable Cities

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Deliverable 1.5

User, Business and Technical requirements of Transition Track #4 Solutions

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Authors

Surname	First Name	Beneficiary
Harmelink	Mirjam	Municipality of Utrecht
Chaudanson	Lionel	Nice Ecosystem
Roux	Stéphane	Nice Ecosystem
Pavic	Eva	City of Gothenburg
Westling	Bjorn	City of Gothenburg
Onkalo	Perrti	Vaasa
Mincuic	Eduard	University Politehnica of Bucharest
Purece	Cristian	ICEMENERG
Mihăila	Eliza Gabriela	ICEMENERG
Broock	Diego	St. Cruz Tenerife
Lymperopoulos	Konstantinos	Municipality of Alexandroupolis
Noula	Antigoni	CERTH
Prekas	Michalis	CERTH

In case you want any additional information or you want to consult with the authors of this document, please send your inquiries to: irissmartcities@gmail.com.

Reviewers

Surname	First Name	Beneficiary
Tsarchopoulos	Panagiotis	CERTH

Version History

Version	Date	Modifications made by
0.1	15/01/2018	First draft created by Civity for internal review
0.2	04/02/2018	Updated template shared with LH-partners from WP4
0.3	13/02/2018	Updated structure and methodology
0.4	07/03/2018	Updated partial information Nice
0.5	29/03/2018	Updated information Utrecht
0.6	18/04/2018	Updated information Utrecht and Nice
0.7	24/04/2018	Updated information Gothenburg
0.8	14/05/2018	Combining information
0.9	08/06/2018	Standards and lay out
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Disclaimer

Executive Summary

Deliverable 1.5 contains information regarding the status of the IRIS transition task 4: CIP solutions offered by the Lighthouse cities to the grant agreement. The information about the solutions was described very briefly in the grant agreement. This deliverable provides the reader with up to date data about the user, business and technical requirements of the solutions in the three areas: pre-pilot, demonstration and replication in the Lighthouse cities, furthermore a high-level insight in the standards in the IRIS solutions is presented.

The scope of the deliverable is to gather information regarding the lighthouse cities services. All gave their input on the various transition track 4 solutions to gain a baseline analysis of the current services and solutions. Also, the follower cities gave their input on the possible replicable WP4 solutions. The information about the pre-pilot areas has the highest level of elaboration. During the process of working on this deliverable the lighthouse cities were still debating on the demonstration areas and their contents. Utrecht offered the most solutions to the CIP transition track and presented one or more solution per service.

The used methodology for the gathering of the baseline information on the services was done via questionnaires. The questionnaires were filled in by key municipal colleagues within the lighthouse cities. They also communicated with third party organizations to add information to the data collection files.

D1.5 acts as a baseline document for the collection of the various WP4 services and solutions and will serve as input for the progress in the lighthouse city work packages. The follower cities also make use of this deliverable as a basis for their interests.

The last part of the deliverable is concerning the current standards, developing standards and security measures. Standardization of the smart city ICT systems will be a great task, since the are many parties, organizations, governmental bodies and NGO's working on technologies. The Standardization developing organizations (SDO'S) of the European Union are working on mapping and developing new standards.

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List of Abbreviations and Acronyms

Abbreviation	Definition
CEN	European Committee for standardization
CENELEC	European Committee for Electrotechnical Standardization
EU	European Union
FC	Follower City
GEO	Geospatial
LH	Lighthouse
TT #4	Transition track 4
WP	Work Package
API	Application programming interface
DCAT	Data catalog vocabulary
CIP	City Innovation Platform
V2G	Vehicle to grid
ICT	Information and communication technologies
EV	Electronic vehicle
EU	European Union
RES	Renewable Energy Sources
SME	Small and medium enterprises
WP	Work package
PV	Photovoltaic
USEF	Universal Smart Energy Framework (USEF)
KPN	Dutch telecom provider
CKAN	Open source data storage solution
LoRa	Low power long range connection

1. Introduction

1.1. Scope, objectives and expected impact

The scope of the T1.4 is to gather and present all the information regarding the services for each individual IRIS solution in Transition Track #4 (City Innovation Platform) in the lighthouse cities. The information describing the services was explained briefly in the IRIS Grant Agreement GA) because of the limited space available. It is our objective to retrieve the extensive information about the Pre-pilot, Demonstration and replication areas of the lighthouse cities: Utrecht, Nice and Gothenburg.

Figure 1: TT#4 Solutions

Each LH city has documented their own services and services supplied by external companies. This provides us with a large number of use cases, as every Lighthouse has four CIP service domains (figure 1: TT4 Solutions).

Summarized: We are going to collect the information of the 4 services domains, in three phases: Pre-pilot, Demonstration and Replication of the three LH cities. The goal is to provide a sufficient baseline for implementing an open, flexible City Innovation Platform that matches existing and developing initiatives in LH cities. In particular, D1.5 gathers information about:

- The services offered by the cities
- Data standards
- Services and applications
- Technologies
- Status of the services

In the main chapters, the lighthouse city services the chapters will be explained. It is important to thoroughly understand the definitions of the services before diving deeper into the matter. After these explanations as distributed in the grant agreement, a series of scopes will be offered in the upcoming chapters.

First, a summary of the applied pre-pilot areas, demonstration areas and replication areas as posted in the grant will be given. Secondly the reader will get a more in depth look at the various services offered by the cities. After that the results of the questionnaire are shown and the conclusion will be presented. This structure is applied throughout the explanation of the services provided by the cities.

The city innovation platform solutions are divided in four services as visualized in figure 2: *Various IRIS services* the services are divided in three areas.

Figure 2: various IRIS services

***Transition track**:* A group of Solutions addressing the same need.

Pre-Pilot Area: An area identified in each city, where the Solution has been already tested, proving its maturity level and know-how basis.

Demonstrating Area: An area identified in each city, where the Solution will be demonstrated accompanied by monitoring activities.

Replication Area: An area identified in each city, where the Solution will be studied for its replicability in the near future (< 7 years).

In the table 1: *IRIS services LH and FH cities* a view of the cities contributions to this transition track is presented. Utrecht is the main supplier of pre-pilot-, demonstration- and replication areas. They are committed to all the CIP solutions. Nice applied for the entire services for urban monitoring area and some services for mobility solutions later on in the IRIS project. Gothenburg applied for two pre-pilots and will work on demonstration and replication of the services for grid flexibility.

Table 1: IRIS services LH and FH cities

Transitions Tracks	Integrated Solutions	Lighthouse Cities									Follower Cities			
		Utrecht			Nice Cote d' Azur			Gothenburg			Vaasa	Alex	Tenerife	Focsani
#4 City Innovation Platform (CIP)	**IS-4.1:** Services for Urban Monitoring	P	D	R	P	D	R	P	-	R	R	R	R	R
	IS-4.2: Services for City Management and Planning	P	D	R	-	-	-	P	D	R	R	-	-	R
	IS4.3: Services for Mobility	P	D	R	-	D	R	-	-	-	R	-	R	R
	IS-4.4: Services for Grid Flexibility	P	D	R	-	-	-	-	D	R	R	R	-	-

Utrecht entered various pre-pilots in the same services and overall has a larger amount of entries in this transition track #4 City innovation platform. This means Utrecht will have a larger stake in this deliverable than the other cities that offer fewer services to this transition track.

1.2. Relation to other activities

As D1.5 deals with the gathering of the services within the transition track #4: City Innovation Platform. This deliverable relates to all the lighthouse city specific work packages and their respective related WP4 deliverables: WP5 (D5.1, D5.2), WP6 (D6.1, D6.2), WP7 (D7.1, D7.2). Since D1.5 has a high-level view on standards it is also loosely connected to T2.2 ESPRESSO collaboration.

1.3. Structure of the deliverable

1.3.1. TT 4 Lighthouse city services explained

The explanations of the services will be given as described in the grant agreement.

IS-4.1: Services for Urban Monitoring

Urban monitoring services aim at an optimal operation of the main city activities thanks to connected objects, i.e. smart sensors network (multi-sensoring) and the Internet of Things deployed all over the city and to the Big Data processing capabilities. Data gathered are analyzed by means of processing tools for correlation, modelling, statistics, etc. before being distributed to various city departments, such as waste, transportation and water departments, to private companies for the development of commercial applications and services and to research labs. Additionally, this data should be respected with citizens under certain conditions, as for example when citizens' data are shared with companies and is related to information sensitivity.

IS-4.2: Services for City Management and Planning

The following CIP repository of Gothenburg and Utrecht cities solutions are foreseen to be further developed, tested and demonstrated by all 3 LHs, in order to foster the citizen engagement in cities planning and systems operation. In more detail the following solutions will be further developed and tested: #1 A 3D CIM (City Innovation Model) that facilitates city management and planning by

including building information, infrastructure, geodata and planning data. In a digital model of the city, decisions, documents and plans can be connected to geographic locations, and forecasts, taking benefit that visualization and planning application innovations provided by the GIS (Geographical Information Systems) can support the Urban area with analyses and maps. In parallel with this, BIM (Building Information Model) can add intelligence in the construction industry, while the information can also live on in the next stage when one wants to work with smart management.

IS-4.3: Services for Mobility

The CIP brings together city data in a structure that facilitates development of services of all sorts, like services improving the city mobility system. Mobility must be seen as a service and consequently encompass various types of transportation means from personal cars to shared vehicles (bikes, cars), public transportation (bus, tramways), and walking. Geo-tracking of all transportation means must be coupled with traffic conditions, meteorological conditions and personal mobility profiles providing the user a multimodal trip planner and a mobility companion on the way. Thus, data from transportation means (e.g. bus geolocation), user mobile equipment (e.g. mobile phone GPS), city infrastructure (e.g. traffic flow detection, air quality, road disturbances) shall be aggregated to provide mobility services to user.

IS-4.4: Services for Grid Flexibility

The CIP brings together city data in a structure that enables new services increasing flexibility in the energy grids.

1.3.2. Structure of the chapters

The information of the lighthouse city services is presented, in the order: Utrecht, Nice and Gothenburg. First the images from the grant agreement will be shown, after that the summarized and tabulated information will be presented. To conclude, the information as distributed by the municipalities and or third parties is shown.

In section 1 per phase the transition track's 4 services will be presented that are developed in Utrecht.

In section 2 per phase the transition track's 4 services will be presented that are developed in Nice.

In section 3 per phase the transition track's 4 services will be presented that are developed in Gothenburg.

In section 4 standards, security and international initiatives are shown in a high-level summary of the European standards currently at stake in the smart city environments. A short introduction to the standards is giving, followed by the management of smart city standards. After that smart city standards research ESPRESSO is provided, furthermore a look at the smart city standards in practice today is included.

In section 5 a high-level evaluation of the lighthouse cities is given to give a brief insight in the current status of the standards in the cities.

In section 6 an overview of follower city interests in the lighthouse solutions is provided.

In section 7 conclusion of this deliverable is presented.

In section 8 the annexed are shared.

2. Methodology

This deliverable was made with four main stages in mind. In the first stage we gathered all the information given in the IRIS grant, in the second stage we bundled all this information together in a survey and send it to the lighthouse cities. The third stage composes of retrieving the surveys and to order the information. During the fourth stage we put the outcomes together in a final deliverable to be reviewed.

The purpose of this report is twofold. On the one hand it will drive the process of collecting information (technical, business, lessons learned etc.) from all different stakeholders involved in the different IRIS Solutions, mainly from the Lighthouse cities. On the other hand, it will allow the cities (both Lighthouse and Follower) to have a better understanding of the details of each of the IRIS Solutions, to allow them to better map how they can be demonstrated and/or replicated.

The first step in the process was to analyze the services documented in the project's GA. In the GA, the lighthouse cities documented their: Pre-pilot areas, the demonstration areas, and the replication areas. The cities described their projects in four services domains: the services for urban monitoring, services for city planning and management, services for mobility and services for grid flexibility. We gathered all the information of all the given projects in one document and from there on we are mapping the details of the project from a closer perspective by sending them a survey.

Our goal is to collect the up to date data of the projects and gain a more specific insight in various topics. Several questions lead a big part in understanding those topics throughout the past, present and future projects in the Iris project. Those questions are:

- What kind of data is being shared during the projects?
- Which applications and services were developed during the projects?
- Which technology is used in the projects?
- What is the status of a project?

The research tool to collect the answers to the questions above, is a questionnaire in a Word document. A questionnaire let us research the transition services in-depth in a time efficient manner. We made one questionnaire for each of the lighthouse cities. The document will be distributed via the collaborators in each city, they were made responsible for the internal spread in the appropriate departments who are involved in the projects.

There are two options of working on the document, one is to send out the document to each department, make them independently and afterwards send them back to us. Later we gathered all the information and put it in one document.

The second option is to work on the same document online and later send the document back to us, all filled in. This option would save us a lot of time but is a little harder to plan internally.

The survey will be distributed through E-mail and if necessary we would walk each city through the matter in teleconferences to make sure all the questions were interpreted in a similar way.

During the distribution of the questionnaire, we wanted to be put in contact with other (commercial) parties to better map the services. We did this by using the networks of our WP 1.4 colleagues in the municipalities.

After we received the filled in surveys, we will gathered the information and summarized it in a clear way. If necessary, we researched more in-depth the services when the partners' feedback was not at a certain level of detail.

After this process the data was processed and made available through this deliverable. Since some of the demonstration areas are yet to be determined, there might be a lack of information. This means that the descriptions of the grant proposal could be used or some minor other information.

3. CIP solutions in the lighthouse cities

3.1. lighthouse city Utrecht

In figure 4: *Utrecht area*, a few districts of Utrecht are shown, and its transition tracks applied to them. In this chapter the information regarding the services will be presented.

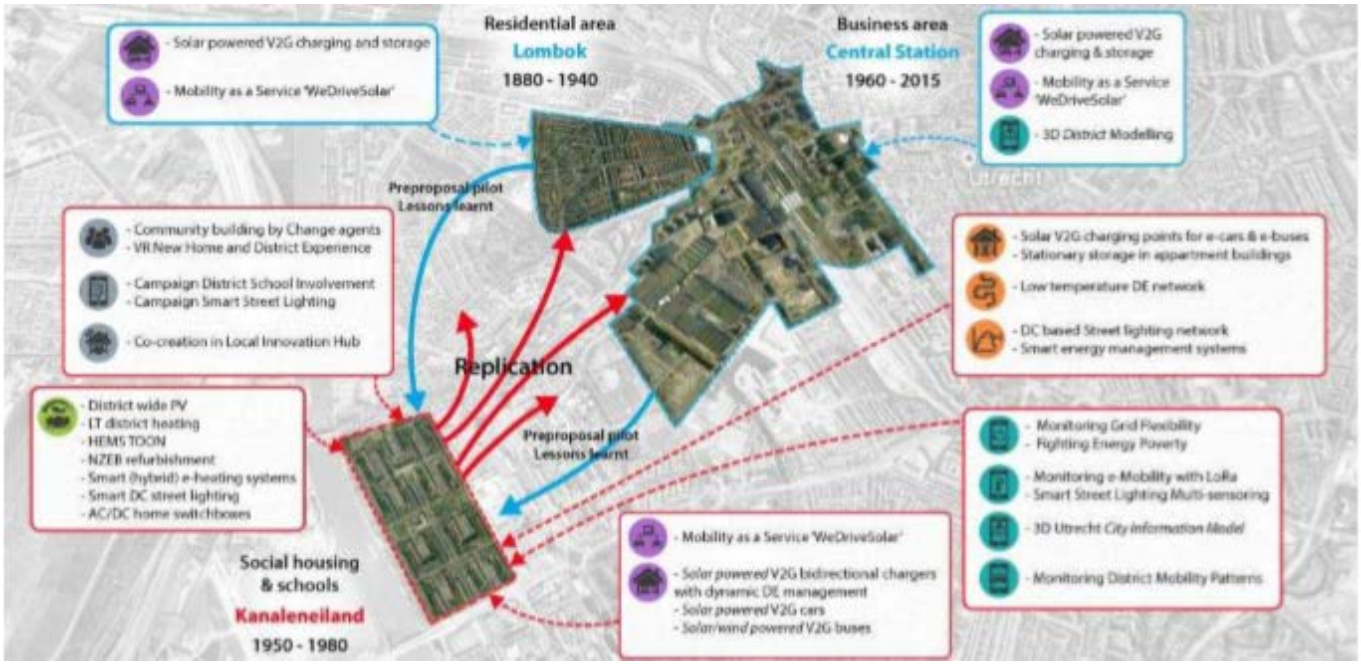


Figure 3: Utrecht area

As has been noted Utrecht applied its solutions to all the services in the transition track. They even delivered multiple solutions per service. Utrecht also has some crossovers between the services, because some solutions are being used for urban monitoring and city management and planning. The justifications of this crossover use will be given later in the document.

Table 2: Services Utrecht

IS-4.1: Services for Urban Monitoring	P	D	R
IS-4.2: Services for City Management and Planning	P	D	R
IS4.3: Services for Mobility	P	D	R
IS-4.4: Services for Grid Flexibility	P	D	R

3.1.1. IS- 4.1 services for urban monitoring

Table 3: IS-4.1: Services for Urban Monitoring

	Utrecht
Pre-pilot	Technology: • LoRa networks (KPN, Eurofiber, The Things Network) Services: • early warnings in the municipal waste collection system • instalment of air quality sensors in Utrecht science park, informing citizens real-time with air quality data via www.luchtradarutrecht.nl.
Demonstration	Technology: • LoRa networks • Lamp post connection Services: • Multisensors; for (dB), NO (ppm), CO (mg/m3), CO2 (ppm),O3 (ppm), air pressure (Pa), g) relative humidity (%),Temperature (‘C). Data driven policies. • Tracking e-mobility; use of the public infrastructure for electric vehicles, to understand usage of the chargers at parking spots.
Replication	Technology: • Smart lighting; Multisensors for tracking air quality, sound detection sensors reducing vandalism and human mobility.

Pre- pilot

LORA CONNECTIVITY

The Things Network is an open LoRa network, everyone is free to setup a gateway and to plug in his devices. LoRa is a technology that allows for long range, low power devices to be connected. This way of processing and connecting devices is made for sending small amounts of data to be send. The fact that small amounts of data can be send, means that very little energy is used.

LoRa is especially compatible with IoT solutions, ranging from smart trashcans to smart parking spots etc. Having a solid LoRa network enables smart cities, businesses, universities and other organizations to develop smart solutions to a wide variety of problems.

Late 2015 a LoRa network was made available through an initiative of The Things Network. This initiative received support from the economic board of Utrecht and was connected to the Fiware lab community in the Netherlands. The things networks’ ambition is to deliver an open and free wireless network worldwide based on the LoRa technology. The goal is to develop an abundant network so that applications and businesses can thrive. Eurofiber placed a number LoRa gateways to support the cause.

The LoRa network is fully operational and supports various solutions and services. The Things Network is part of the LoRa alliance which promotes the use of LoRa worldwide.

As of 04-05-2018 there are 39 LoRa gateways and 58 contributors. Utrecht has a broad LoRa coverage throughout the city.

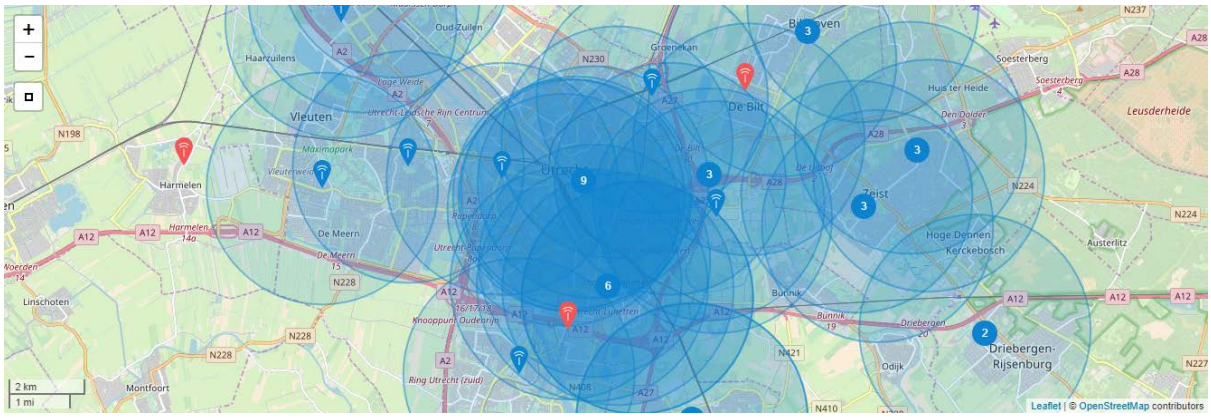


Figure 4: LoRa Network Utrecht

Figure 5: LoRa TheThings network

Dutch telecom provider KPN also offers a commercial nationwide coverage of the LoRa network.

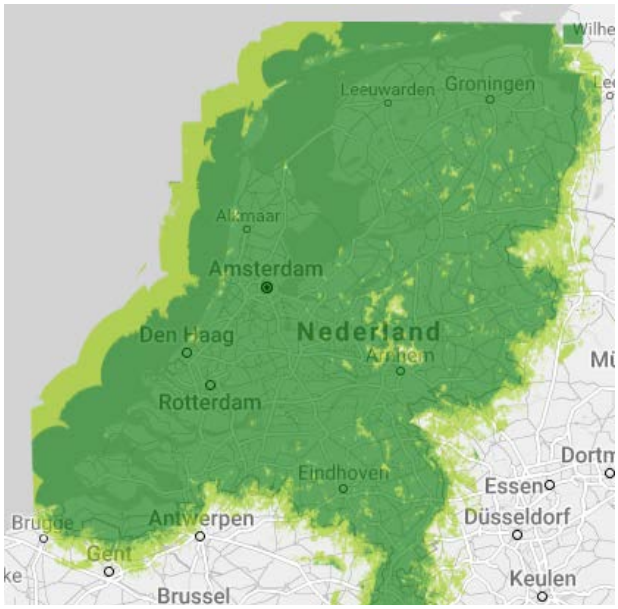


Figure 6: KPN LoRAWAN network

Because of the commercial nature of KPN a variety of tariffs can be used, just like a mobile phone plan.

The LoRaWAN services are available for private customers as well as corporate customers. They offer security services to help privately owned gateways to be protected sufficiently.

The coverage of the LoRa network is nationwide, so the municipality of Utrecht can easily make use of the services.

EARLY WARNING WASTE MANAGEMENT

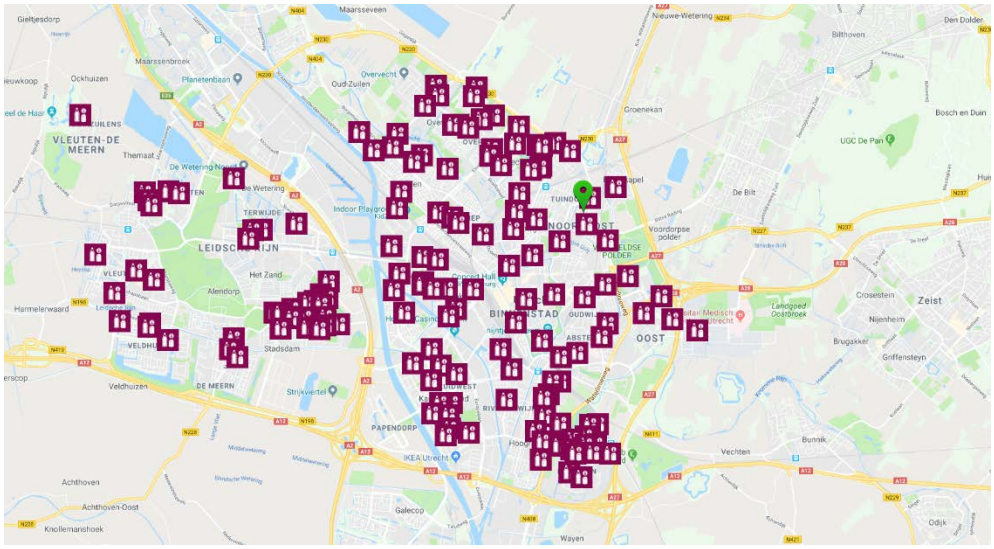


Figure 7: Waste management Utrecht

The municipality receives a warning when the underground waste containers are almost full. No further information could be found.

AIR RADAR SOLUTION

How healthy is the air you breathe? Living lab air is an innovative and compact sensor network for monitoring the current air quality. The network consists of about twenty sensors spread out over the Utrecht science park. The information of the newest generation sensors is being collected through the 4G network and validated by the national institute for public health and the environment (RIVM) and the University of Utrecht. The platform air radar displays the data Realtime after the before process. The air quality radar makes the current quality of the air visible through its platform. Employees, visitors and inhabitants now have a precise insight in the cleanest road to work. For the municipality of Utrecht this means they have information regarding the pollutants during rush hour and data to design urban mobility.

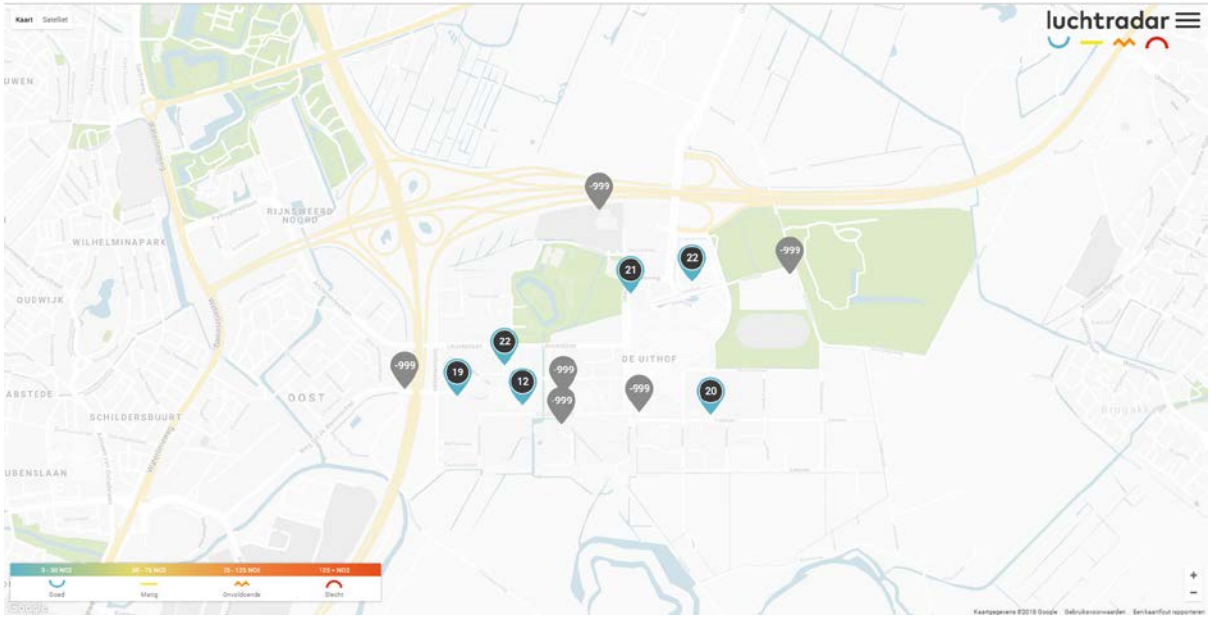


Figure 8: Air quality radar Utrecht Science Park

Figure 9: Air quality radar Utrecht Partners

This project, which goes by the name of 'Livinglabair', is run by RIVM (National institute for public health), Utrecht University, JCDecaux, TNO, Utrecht Science Park & Luchtradar.

The service is providing real-time data for some of the monitoring stations. Real-time data about air quality is shared (e.g. NO2) that is collected with sensors on 20 locations. The numbers indicate the amount of microgram of nitrogen dioxide per cubic meter.

The information collected by the sensors is shared through the 4G network and collected and validated by the RIVM and the Utrecht University.

The website http://www.luchtradarutrecht.nl/ was developed during the project and serves as a way to inform multiple users and stakeholders.

Demonstration

The broad LoRa network will be used to connect more devices in the future. The LoRa will also be used to monitor the utilization of the e-mobility infrastructure.

A broad network of sensors will also be deployed in the demonstration area of kanalen eiland. The data will be gathered about: average noise level (dB), b) NO (ppm), c) CO (mg/m3), d) CO2 (ppm), e) O3 (ppm), f) air pressure (Pa), g) relative humidity (%), h) Temperature (oC).

Replication

Smart public lighting with Multisensors for tracking air quality, sound detection sensors reducing vandalism and human sensing for bicyclists' road safety, as well as the LoRa network for tracking E-mobility can be replicated in the city and region of Utrecht.

3.1.2. IS 4.2 services for city management and planning

Table 4: Services for city management and planning

	Utrecht
Pre-pilot	Technology: • CKAN, open311 Services: • Utrecht deploys a well-functioning Dataplatform with over 200 data sets publicly available. www.utrecht.dataplatform.nl • Public space issue reporting solution www.slimmelden.utrecht.nl • A platform for information on air quality was launched in 2016, see www.luchtradarutrecht.nl • In 2010 Utrecht launched 3D modelling 'Virtueel Utrecht', a 3D representation of the city. • the Urban Gallery
Demonstration	Service: • 3D home and district modelling and virtual reality using BIM modelling will be demonstrated in the Utrecht Kanaleneiland demo area.
Replication	Service: • The CIP and the 3D City Innovation Model can be amplified to the whole city of Utrecht

Pre- pilot

DATAPLATFORM

Utrecht.Dataplatform is a Ckan based data storage platform where data suppliers: the municipality and other governmental bodies share their (open) data with interested parties. The dataplatform is being maintained by Civity but run by the municipality of Utrecht. The municipality also collaborates on standardization and development of the platform. Utrecht is one of the more import Dataplatform cities, as we speak more than 25 municipalities are using the Civity Dataplatform.

The Utrecht dataplatform has grown since the initial grant proposal from 200 datasets to around 500. The efforts of the municipality and the open data philosophy are the drivers behind the big rise in the number of datasets in such a short time. To be a more efficient governmental body, the Utrecht municipality gathers all sorts of information. This data could be valuable and interesting for businesses, organizations, journalists, researchers and inhabitants of the municipality of Utrecht.

According to research, open data could possibly have a massive economic value. A lot of stakeholders can benefit from the use of open data. To make the most of the data, the municipality tries to distribute the open data as much and as easy to use as they can. The data is available for free and without obligations.

The majority of the data comes from the municipality itself and is made public through the Ckan data storage website. The domains that contain the most datasets are: care and health, public order and safety, employment, administration, nature and environment.

As stated before the Utrecht municipality stimulates the use of open data. They communicate that their ideas about open data are the following:

- Public data
- Without copyrights
- Financed by public funding
- Collected for use by governmental bodies
- Open standards; possibility to be used between ICT systems
- Machine readable

The municipality has an active growth model which means that they are actively seeking datasets and organizations to collaborate with to provide the stake holders even more and better information.

The conditions of use of the data are simple: everyone private and corporate are allowed to re-use the data provided by the municipality of Utrecht as posted on Utrecht.dataplatform.nl in their own applications. Utrecht compiles the contents of the data with the utmost care, this however is not a guarantee that the datasets are complete, accurate and correct. The municipality is not accountable for any harm caused directly and or indirectly resulted from the use of the data.

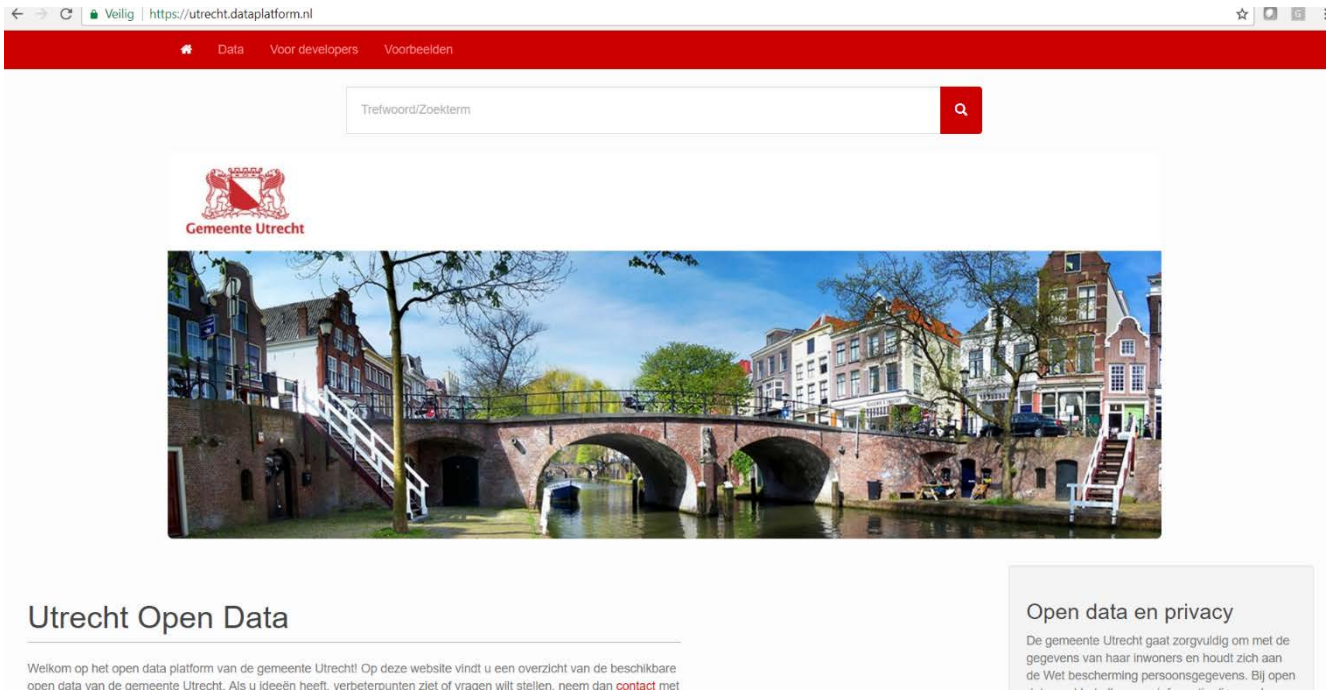


Figure 10: Utrecht.dataplatform.nl

The welcome page people land on when they visit the website is setup in an informative way. The municipality explains what open data is, the pros of open data and how to use it. In the menu on the upper bar, the visitors can choose their option: Data, for developers or examples.

When the visitor clicks on the data part of the menu, the page below shown opens up. If the user knows what to look for, he or she can find through the elastic search bar. The visitor could also use the filter functionality to browse through the various categories, formats and licenses.

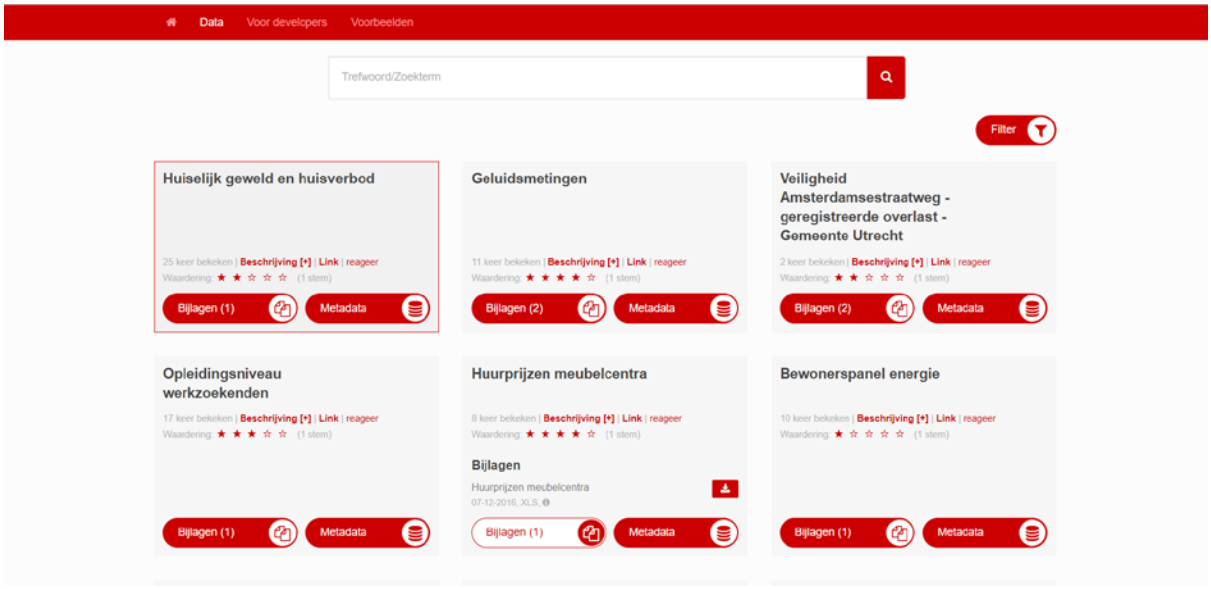


Figure 11: Dataplatform

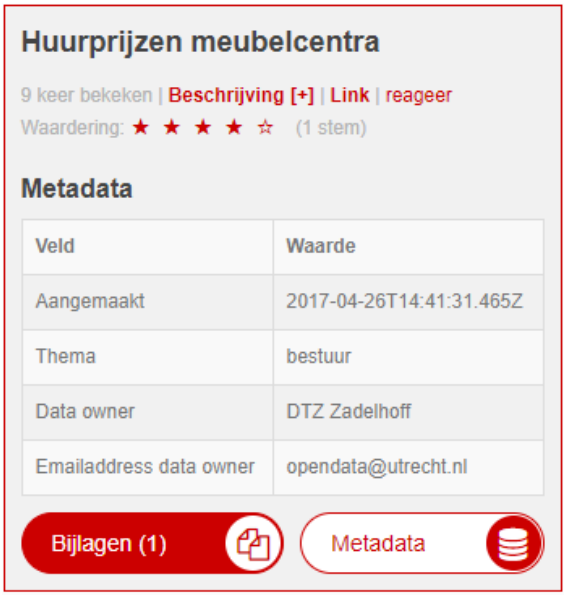


Figure 12: Meta data button

If you click on the metadata button, this menu opens up. This makes it possible to review the metadata before opening and using it.

The description (beschrijving) is also clickable. When clicked on, the information regarding the dataset is presented. The original source also shows. This menu offers the possibility to rate the dataset on a 1 to 5-star scale. Furthermore, people can comment on the dataset via the "reageer" button.

In the main browser bar, the option for developers was made available. Dataplatform offers downloadable datasets but a large number of datasets are made available through API. The dataplatform API uses the CKAN standards. For app developers it could be valuable to use the datasets through API calls.

If you want to visualize the geo data on dataplatform, it is possible to use the Qgis plugin to visualize *the data. The data viewer on the dataset page also offers some insights into the data.*

Technical features

The dataplatform uses the data catalog vocabulary (DCAT) meta data standards. This allows for an automatic synchronization with the Dutch national data platform and through the Dutch platform with the European system.

The dataplatforms is capable of storing the data posted below.

- CSV (554)
- XLS (243)
- XLSX (138)
- URL (111)
- GeoJSON (17)
- ZIP (14)
- url (11)
- PDF (10)
- XML (9)
- GML2 (8)
- GML3 (8)
- KML (8)
- SHAPE-ZIP (8)
- JSON (6)
- DOC (1)
- JPEG (1)
- KMZ (1)
- link (1)
- PPT (1)
- psd (1)
- WFS (1)
- XSLX (1)

SMART REPORTING

Smart reporting is an open, integrated solution for making reports in the public space. The most tangible part of the process is the application but that is only an interface for the rest of the smart reporting process. In the public reporting services market, a number of “similar” applications exist. They all serve the same

Smart reporting works on three angles: *Process, Insight and policy*

Process

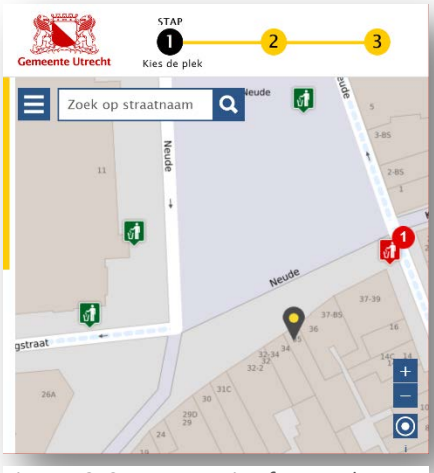


Figure 13: Smart reporting front end

Using the app is very easy to use and convenient for civilians. Civilians can easily report irregularities, by selecting the category in which the report lies within. The user can also submit up to three photos and send the GPS location to the municipality. The citizen can also track the report they made, because they receive a case number. Other civilian that also want to emphasize the urgency of the report, can vote on the report for it to gain more attraction from the municipality. This interaction keeps the civilian informed and presents the municipality in an open and transparent way. The smart application has the advantage that the municipal employee gets all required information through the platform, where no duplicate reports are made. Since all the employees at the municipality use the same system, even when a report through telephone comes in.

The software in the application allows for an efficient routing process, which means that some of the reports received by the municipality or not actually for the municipality to fix, for instance street lighting or waste. The system allows for an automated request to the third party to act on the report, cutting the municipality out of the process. This optimization results in a more efficient process, which means less stress on the workflow of the customer service employee.

Insight

All the citizen reports are comprehensively represented on a map, including the urgency. This allows for a quick overview of what needs to be repaired or changed according to citizens. Citizens can also show you a level of urgency a case has by voting on a report. Sequentially you can adjust your planning according the urgency. Using the smart reporting application, the municipality uses its resources more efficiently and keeps the municipal public spaces at a high quality.

The more reports are processed throughout the years, the more public space data is collected. This data can be visualized to gain a long-term overview of the city. These facts can teach the municipality a lot about their day to day strategy. More regarding the dashboard later on.

Policy

Adjusting maintenance policies based on data is not a one-time action. The city of Utrecht spots room to improve though the use of the buildup data collection, acts on it and then monitor the progress. The

reporting application drives the data driven policy making process. A short time gain due to the application is reached because of the streamlined internal process in the municipality.

The smart reporting application has been implemented rather successfully. After 1,5 years after its launch, over 70k reports have been done through the web application. There were also some new features added to the smart reporting application: a city insights dashboard has been built that displays the information on the reports on a district and neighborhood level. The dashboard can help the cities' officials to better understand the cities' most reported subjects. By knowing were the littering is at its most problematic or where no reports have been done, the officials can change their policy more efficiently.

In February of 2018 the smart reporting application was made available for Android and iPhone users. The apps' downloads range in the dozens. The app was developed because Civity is working with another city to develop an innovative way to open underground garbage bins.

In the future an application like smart reporting will allow cities to possibly plan their maintenance activities, citizen engagement much more efficiently with the use machine learning and other sentiment analyses.

On the upcoming page the process of reporting is explained with the use of an image.

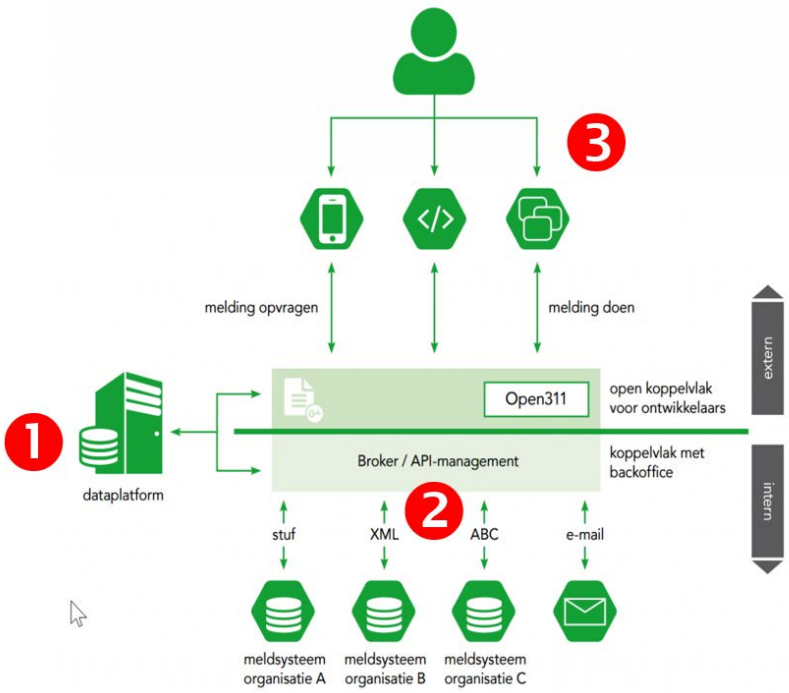


Figure 14: Smart reporting process

❶ Use of open data: single call, smart routing. Dataplatform is used to access a variety of datasets; Treescans, streetlighting, etcetera.

❷ One safe link to the activity-based information system has to be made via the civity broker. The link ensures a correct registration of new reports and updates existent ones.

❸ open interface on the basis of Open311 for re-use by any other party. The broker allows a transformation to and from the message from ❷. The API-manager manages who and which circumstances is granted access out of ❸. There is a strict line between ❷ and ❸ because security and performance.

The cycle of open data

The Smart reporting application uses open data to produce open data. Firstly, when designing the application for the municipality of Utrecht, the city offered the trash bin dataset and the lamppost

dataset for use in the application. This allows the programming directly to the third parties hired for an efficient process. Secondly by presenting open data, new report data regarding the public space is produced by citizens. Thirdly the municipality can implement this data to make policies, which on their turn produce data: costs, workflows, etcetera.

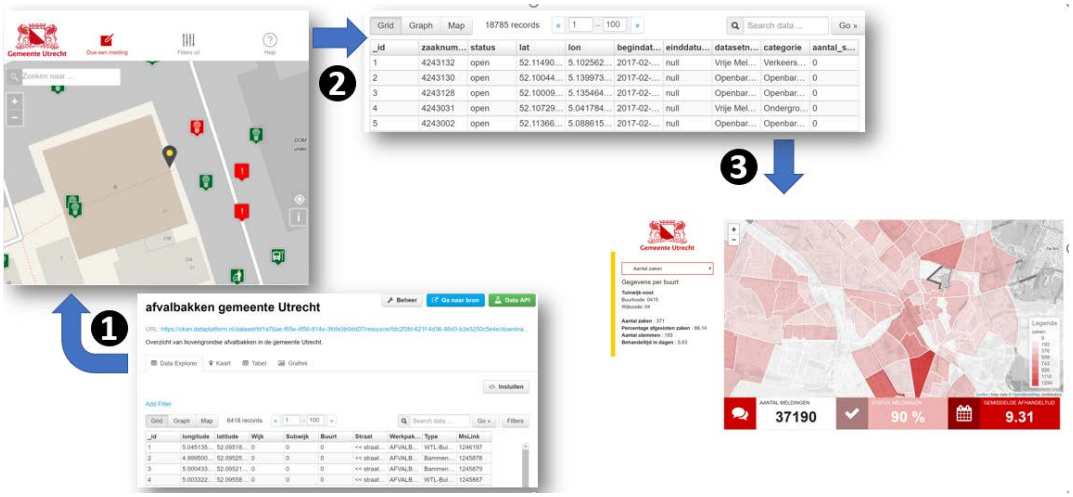


Figure 15: Open Data Cycle

The municipality gets the data presented on a smart city dashboard. The municipality gains more information on several areas:

- when the most reports are made
- number of reports done (per neighborhood or district)
- Average time of used to solve the cases
- Which categories of reports have been done the most
- Many more

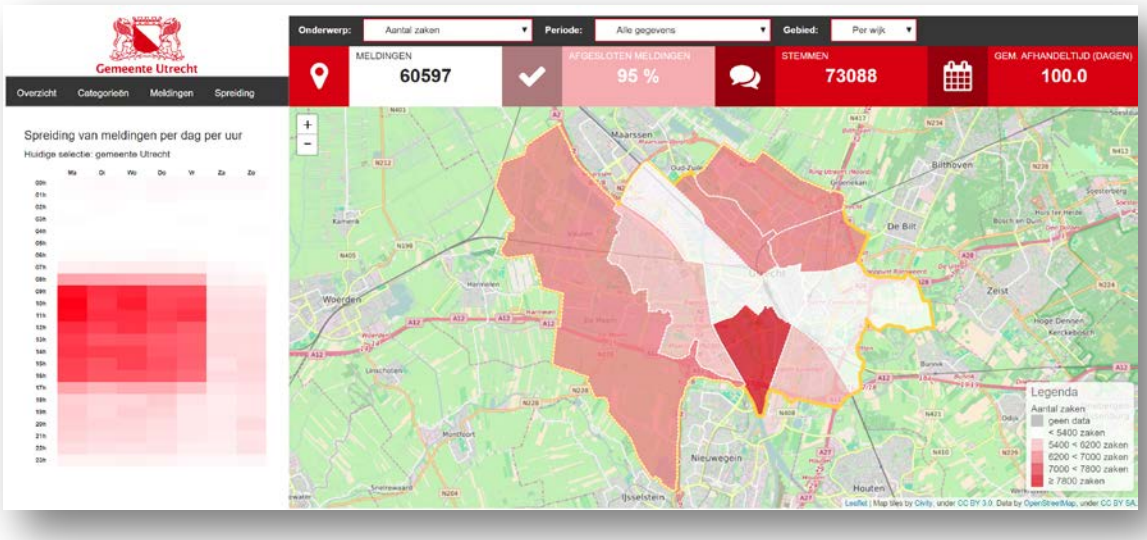


Figure 16: Smart reporting Dashboard

AIR QUALITY RADAR

The air quality radar as described in 4.1 is also used in the city management and planning from a policy making perspective of the city. Together with other datasets regarding traffic flows and the weather data, the air quality is very interesting to develop plans to improve the municipality based on layered data. For more in-depth information regarding air quality radar, see page 19.

VIRTUAL 3D UTRECHT

In 2010 a design company made a video game like environment for civilians to see the future city center. These last years the municipality of Utrecht has been restructuring the city center quite thoroughly. As of today, the service is down and no longer findable online. An insight of the service can be seen below. The service was made by a company called FutureInsights.

https://www.slimcity.nl/cases/2017/virtueel-utrecht

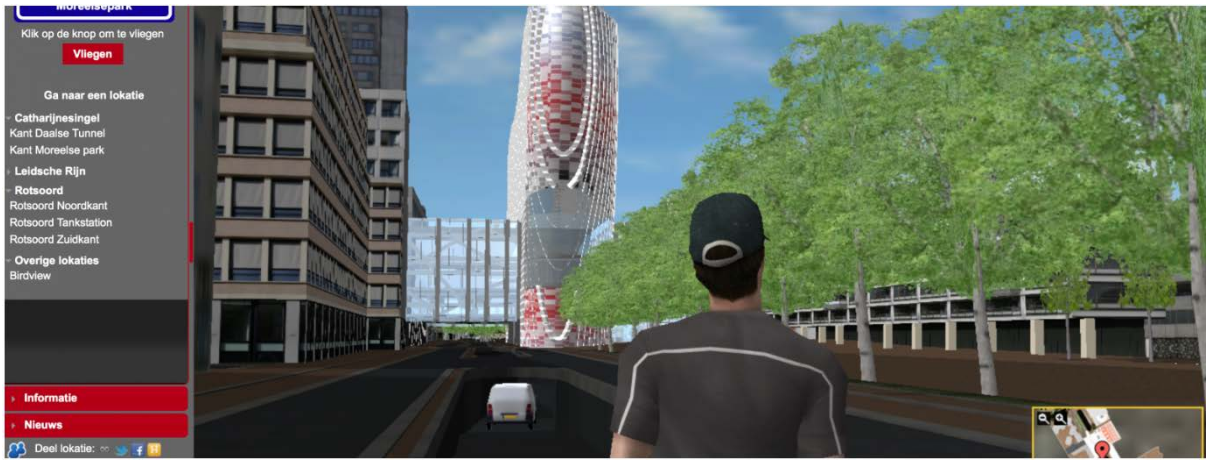


Figure 17: 3D Utrecht

URBAN GALLERY UTRECHT

The description from chora.tu-berlin.de/research is:

The Urban Gallery methodology and management framework was developed by CHORA in 1995. It is a tool and an instrument for management and curation of dynamic master plans. Urban Gallery is a new approach to urban planning that can address the complexity and dynamic character of, for example, climate change mitigation. The climate change mitigation and energy efficiency are the most current focus areas where Urban Gallery is being applied. Urban Gallery is uniquely suited to provide a robust framework for handling ever-changing conditions in urban environment. This is achieved by means of choreography, co-evolution, urban curation and cybernetics. In Urban Gallery, prototype projects play a significant role; these either achieve efficient energy management, link operations of different sectors and stakeholders or create a pattern of sustained growth or evolution. The Urban Gallery is a public arena that enables the stakeholders related to prototype projects to act jointly or collaborate over longer periods of time in order to develop, monitor and evaluate prototypes as pilot projects within an

overall plan. The structure of Urban Gallery consists of four main layers: Action Plans, Scenarios, Prototypes and Data Base.

In Utrecht a website was made on which citizens and other stakeholders could plant their ideas on a map of the project area. These inputs were then used as input for an interactive digital (touch) table.

Figure 18: Civil participation website

This civil participation website allowed citizens to give their ideas on various remodeling and livability topics for the Utrecht City center. This feedback was used in an interactive tablet table. So, the civilians could see how their feedback ultimately can been used during the process of renewing the city and to have constructive discussions about the impact of their ideas.

How does the table work?

Figure 19: Interactive project table

The stakeholders lay down a cart which they use to identify their selves. There are carts for: civilians and the municipality. When they lay down their carts, they have to state the goals they want to achieve. The table registers the QR-codes and the hand movements. One can see the impact the proposed solution has on the city. For example, if someone wants solar panels on all the roofs in the station area, the table shows the stakeholder the roofs that are more suitable and less suitable.

By entering goals and visualizing the consequences of all the possible solutions, a very detailed insight can be created. This interaction between stakeholders and the fact that they see the impacts of their choices together, leads to an open and constructive discussion. For the municipality this leads to a better understanding of the wishes of the inhabitants, and for the inhabitants this leads to a better understanding of the difficulties and consequences of the actions. In the future, these kinds of interventions create a better symbiosis between the parties and their interests. All the parties get a better understanding, very critical inhabitants and positive inhabitants will be more balanced out during the discussion.

Figure 20: Urban galley in action

http://urban-gallery.net/utrecht/

Demonstration

3D MODELING

3D home and district modelling and virtual reality using BIM modelling will be demonstrated in the Utrecht Kanaleneiland demo area. The municipality of Utrecht is busy designing this project internally. A roadmap presentation has been given to show the first common goals of the project.

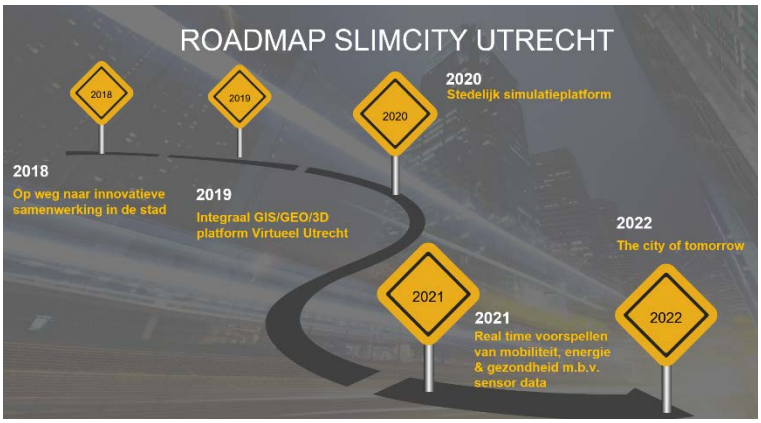


Figure 21: Roadmap slimcity

As presented in figure 22 In 2018 Utrecht will kick of with: “the road to innovative collaboration within the city”. This allows the city to look for collaborators to work with, so that in future years a more tangible product can be developed, the 3D platform virtual Utrecht.

If you look at the future, a 3D real-time data model will be build based on input from sensors in various areas: mobility, energy and health. Different districts are open to innovation regarding this topic: Utrecht science park, Merwede chanel zone, Central station area and the city center. By doing this the municipality stimulates the corporate sector to develop services that civilians can benefit from.

FIRST 3D MODEL KANALENEILAND

As a first 3D data model start, the municipality compiled multiple data layers regarding the infrastructure, buildings, etcetera. As shown in the legend, all the poles in the public space can be presented: street lights, street closing poles, traffic signs, traffic controlling signs and flagpoles. Also, information about the apartment buildings owned by housing corporations and the municipality is added to the data model. The municipality also presented the gas lines, which are in need to replace and those that is still safe to use. The city heat network is also shown in the map.

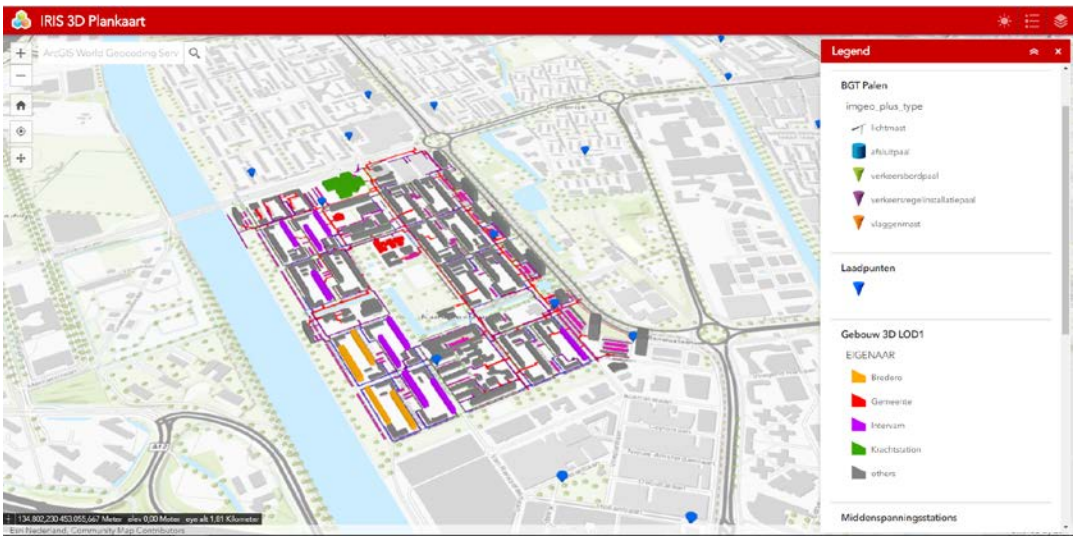


Figure 22: 3D dashboard Kanaleneiland

Figure 23: IRIS 3D map

Replication

The CIP and the 3D City Innovation Model can be amplified to the whole city of Utrecht.

IS 4.3 services for mobility

Table 5: Services for mobility

	Utrecht
Pre-pilot	• Deployment CIP for mobility insights
Demonstration	• Using CIP for: • Monitoring solar V2G e-car sharing system We Drive Solar datasets • Monitoring the mobility patterns • Monitoring the use of e-bikes
Replication	• solar V2G e-cars, • car sharing systems, • charging infrastructure • e-bikes.

Pre-pilot

CIP DEPLOYMENT FOR MOBILITY ISSUES

The municipal dataplatform contains a wide variety of datasets to be used in the mobility policy making, app development and other topics. The traffic datasets on dataplatform offer data from research organizations, Realtime bicycle parking information, safety in the municipality, infrastructure, maintenance, vehicle possession and in the future real time parking information of the charging stations for electric vehicles can easily be added to the dataplatform to allow data driven policy making.

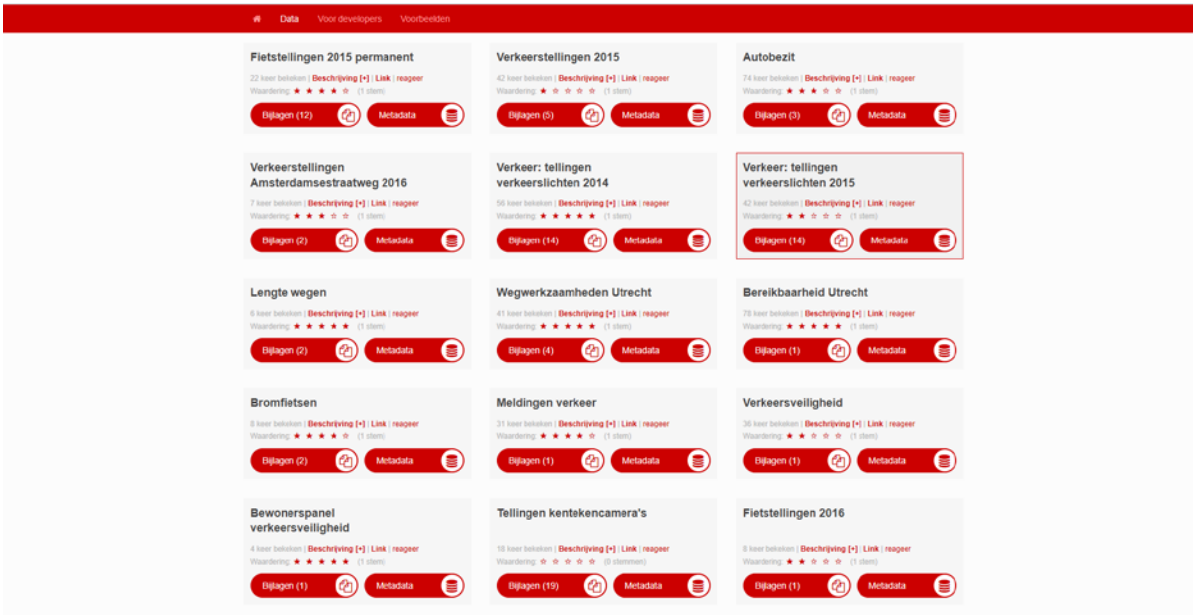


Figure 24: Urban mobility datasets

P-ROUTE BICYCLE

The municipality of Utrecht boosts the use of the cycle. They focus on designing better infrastructure, so cyclists can easily and safely navigate to a permanent or mobile parking facility. The P-route app guides the cyclists to a nearby parking garage to find a space to stall their bike. This leads to a happy cyclist and municipal mobility officer. The data could also trigger short term solutions such as the need to use mobile parking facilities at certain times.

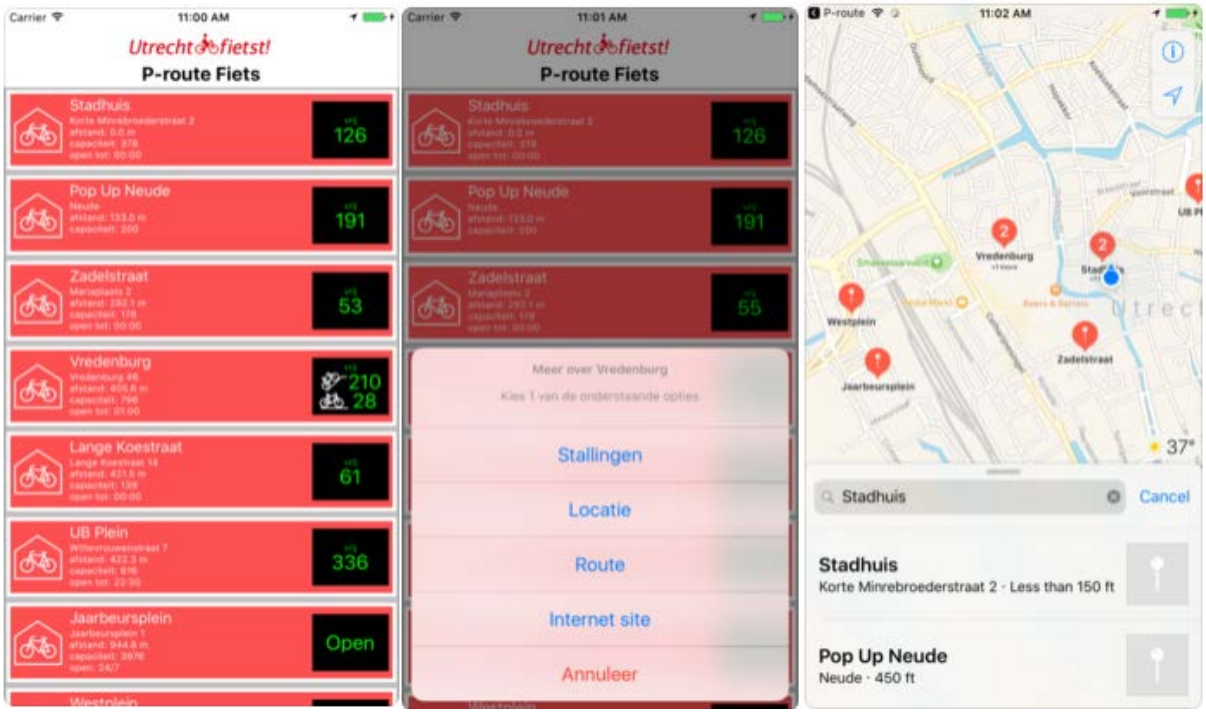
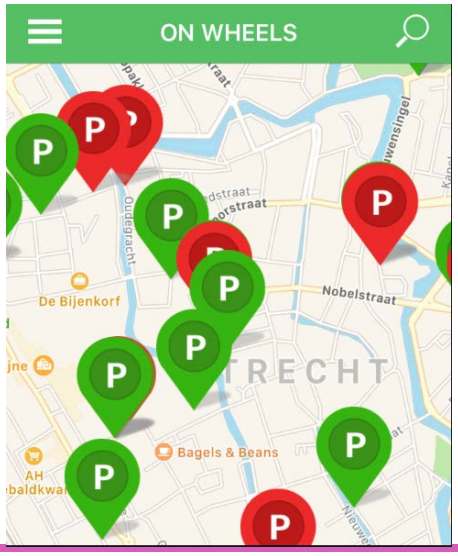


Figure 25: Frond end Utrecht cycles app

The data produced by the parking garages is also updated to Dataplatform, so insights can be gained throughout the years.

ON WHEELS



In Utrecht also installed smart parking sensors in disabled parking spots, to monitor its use.

Using the application “on wheels” allows the user to find an open parking spot more easily. No more useless searching for a spot and emitting gases but efficiently get guided to a spot.

On the other hand, the municipality collects valuable information regarding the use of their most important parking spots.

The data can be used to form other policies relating to mobility, health and other air quality related issues.

Figure 26: ON WHEELS frond end

Demonstration

In relation to the demo district Kanaleneiland Zuid data sets and CIP services will be demonstrated in various ways.

- A system to monitor the V2G e-car sharing system has to be developed to fully exploit the benefits of such a system.
- A system to monitor the use of the charging infrastructure has to be put in place also to fully exploit the benefits of the use of e- vehicles in the municipality.
- District level monitoring of mobility patterns to plan charging stations and care sharing spots. The municipality and the transport organizations want to know how inhabitants and visitors move through the district.
- The city is progressing towards a car-free city, to invest more in the infrastructure, the need more monitoring options to get a better perspective on bikes and e-bikes.

Replication

In relation to the demonstration area, the municipality wants to replicate the services throughout the entire district.

- A system to monitor the V2G e-car sharing system has to be developed to fully exploit the benefits of such a system.
- A system to monitor the use of the charging infrastructure has to be put in place also to fully exploit the benefits of the use of e- vehicles in the municipality.
- District level monitoring of mobility patterns to plan charging stations and care sharing spots. The municipality and the transport organizations want to know how inhabitants and visitors move through the district.
- The city is progressing towards a car-free city, to invest more in the infrastructure, the need more monitoring options to get a better perspective on bikes and e-bikes.

3.1.3. IS 4.4 Services for grid flexibility

Table 6: Services for grid flexibility

	Utrecht
Pre-pilot	• USEF framework
Demonstration	Service • The USEF framework will be demonstrated in the Kanaleneiland Zuid demo district, as a means to optimize the flexibility in the district electricity grid, characterized by massive decentralized PV-production as well as district wide storage by means of V2G e-car and e-bus batteries in combination with stationary storage. Services will be developed to incentivize to match demand and supply for flexibility.

Replication	• CIP service • Deploying flexibility services in areas with large scale PV production as well as storage systems in V2G batteries of e-cars and e-busses.

Pre-pilot

Universal Smart Energy Framework (USEF)

The USEF framework was amongst others pre-piloted by IRIS partner Stedin in the city of Heerhugowaard (Hoog Dalem).

The Universal Smart Energy Framework (USEF) delivers a market model for the trading and commoditisation of energy flexibility, and the architecture, tools and rules to make it work effectively. In principle USEF comprises of a set of rules and standards for cost-effectively unlocking flexibility in the energy system. USEF positions the Aggregator centrally within the USEF flexibility value chain. The Aggregator is responsible for acquiring flexibility from Prosumers, aggregating it into a portfolio, creating services that draw on the accumulated flexibility, and offering these flexibility services to different markets, serving different market players. Flexibility can be provided by prosumer comprising of a variety of sources, ranging from heat pumps and PV panels with households, to cooling systems at large offices indicated. In return, the aggregator receives the value it creates with the flexibility on these markets and shares it with the Prosumer as an incentive to shift its load. Through the Aggregator, Prosumers gain access to the energy markets. Prosumers can comprise of a variety of stakeholders ranging from households with heat pumps and PV panels to large offices with cooling systems. USEF distinguished 3 parties with demand for flexibility services: (1) The Balance Responsible Party (BRP) (2) he Distribution System Operator (DSO) (3) The Transmission System Operator (TSO), which is indirectly served by the Aggregator through a BRP (See figure 28 **Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.**). Detailed specification on the framework can be found in USEF (2015): The Framework specification 2015

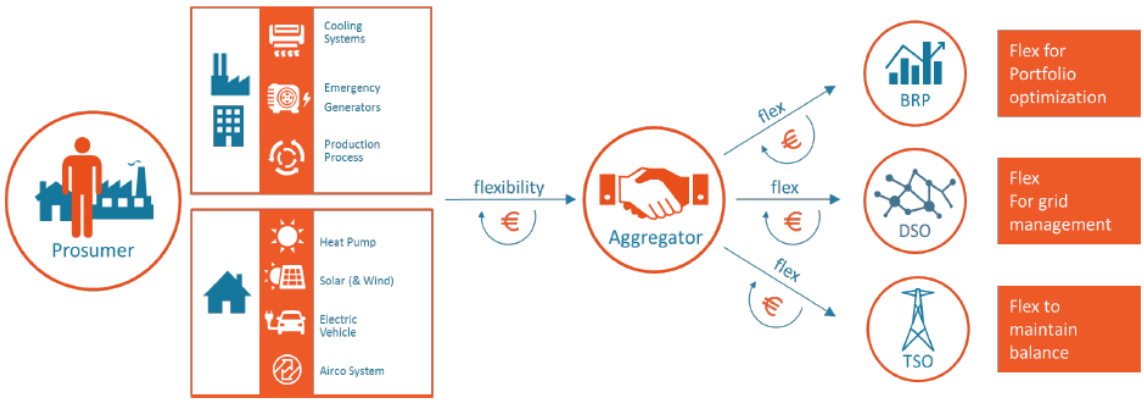


Figure 27: Overview of the USEF model with potential sources of flexibility (left hand side), the role of the aggregator and the demand for flexibility by various stakeholders (right). Source: USEF (2015) USEF: The Framework explained

The Hoog Dalem pre-pilot

Stedin carried out the Hoog Dalem Energy Project with partners ABB, Heijmans and KPN. In total 42 households were involved in the pilot project. **Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.**Closed provides an overview of the elements of smart energy systems that was included in the pre-pilot.

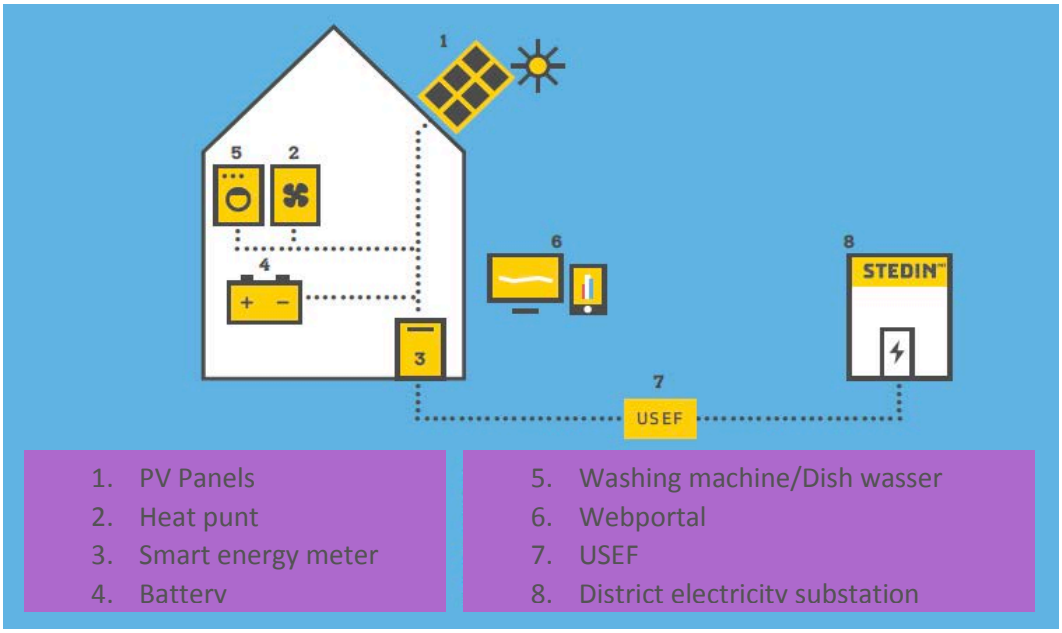


Figure 28: Element of the smart energy system included in the Pre-pilot in Hoog Dalem

The project aimed at:

- Studying the interaction between the residents and the adaptation of a smart energy system;
- Demonstrating the impact decentralized generation by solar panels on the low-voltage grid;
- Demonstrating the impact of the heat pumps on the low-voltage grid and in particular the simultaneity with which they charge the grid;
- Demonstrating and evaluating the functioning and effect of the Universal Smart Energy Framework.

Most important findings of the pre-pilot were:

- Orientation of the solar panels - the so-called roof orientation – hardly affects the maximum return of decentralized production with solar panels. This contradicts with earlier assumptions that changes in the orientation could reduce peaks in feed-in of electricity produced with PV panels.
- A factor for the simultaneous use of heat pumps could be established. A factor of 0,8 was established, i.e. the electricity net needs to be designed in such a way that it can accommodate 80% of the total installed heat pump capacity (see 29 **Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.**)

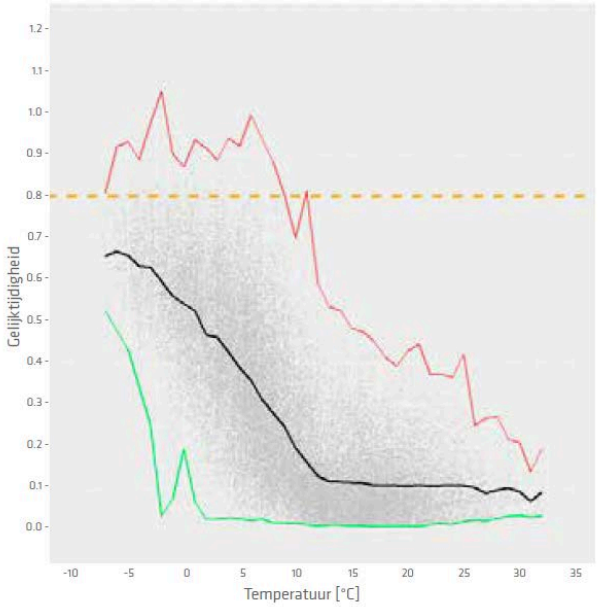


Figure 29: Anaslysis of the simultaneousness of heat pump operation in the Pre-pilot in Hoog Dalem

- It was demonstrated that the USEF processes of 'plan', 'validate' and 'Operate' worked according to expectation: a request to flexibility resulted in most cases in an offer for flexibility, followed in turn by a request to deliver that flexibility.

Demonstration

To make full use of the USEF framework, it will be demonstrated in the Kanaleneiland Zuid demo district, as a means to optimize the flexibility in the district electricity grid, characterized by massive decentralized PV-production as well as district wide storage by means of V2G e-car and e-bus batteries in combination with stationary storage.

As of now no concrete solutions have been presented other than the USEF framework. In Utrecht a relatively large network of corporate and private solar panels are and will be deployed, making full use of the USEF framework. Also, the e-mobility structures will be enlarged to store energy in the e-vehicles and e-busses.

Replication

The demonstration successes will be replicated throughout the Utrecht regional since there are sustainability goals to be reached.

3.2. Lighthouse city Nice

Nice focuses on smart urban monitoring and delivered a significant sensor network. In the Urban environmental Monitoring (UEM) project a demonstration was done in Nice Plain du Var. The main themes were the installation of sensor platforms to gain data about the status of the city. The aim was to let small and large tech companies collaborate with the governmental authorities to make Nice a smarter city. A large number of sensors were installed in the city and monitored by the metropolitan government.

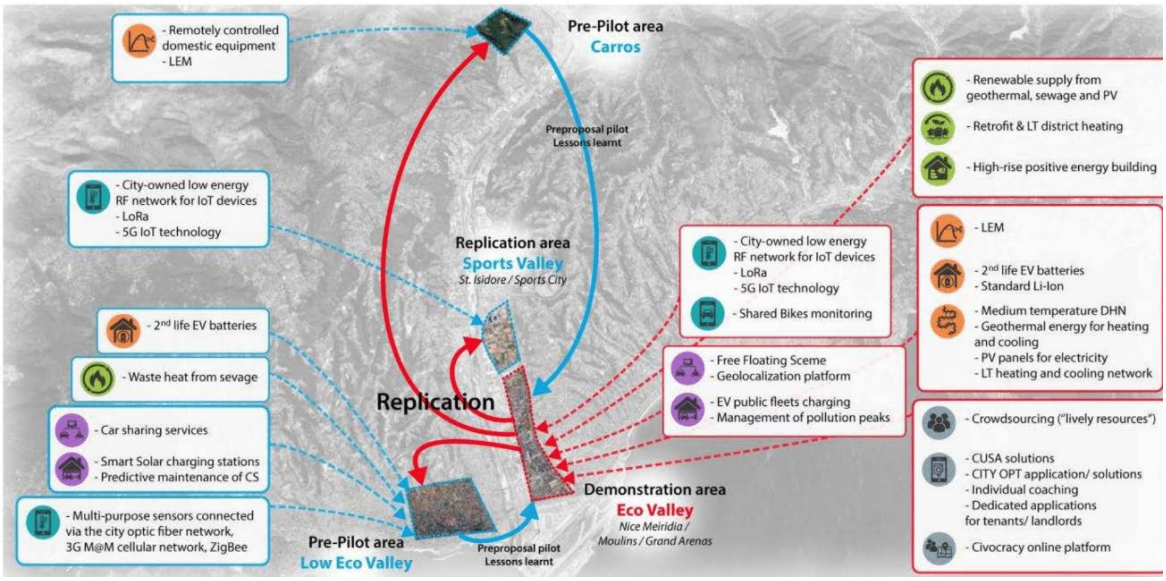


Figure 30: Nice Area

Nice will focus on services for Urban monitoring and services for mobility.

Table 7: Services Nice

IS-4.1: Services for Urban Monitoring	P	D	R
IS-4.2: Services for City Management and Planning	-	-	-
IS4.3: Services for Mobility	-	D	R
IS-4.4: Services for Grid Flexibility	-	-	-

IS 4.1 services for urban monitoring

Table 8: Services for urban monitoring

	Nice
Pre-pilot	Technology: • City optic fiber network, 3G M2M cellular network, ZigBee radio network Services: • multiple-purpose sensors.
Demonstration	Technology: • LoRa, WiFi, city fiber optic network. LoRa migration to 5G in 18/19. Services: • Same sensors as Pre-pilot area. • application fields of biodiversity, for green watering forecast and control, inside buildings to correlate indoor air quality with outdoor air quality.
Replication	Technology: • LoRa regional coverage

Services:
- The various sensors in the demonstration area will be deployed in the new eco-district of Saint Isidore with the construction of new building lots (total building surface of 100,000 m² over 8 ha) 2017-2020.

Pre-pilot

Developed jointly by the metropolitan authority of Nice Côte d'Azur, Veolia, Orange, m2oCity and IBM since 2012, Urban Environmental Monitoring is a unique demonstration project that aims at enabling collaboration between large and small companies, research laboratories, local government authorities and residents to make Nice a smarter city. All these stakeholders share a common concern: how can a broad range of data de developed to advantage to offer new urban services and make the city more attractive, sustainable and competitive?

UEM collects a broad spread of environmental data (air quality, noise levels, water network losses, traffic density, energy consumption, waste management, etc.) thanks to a network of close to 3,000 sensors across a 160 hectare eco district at the southern end of Plaine du Var area. Energy-autonomous wireless sensors are located all over the district: on street furniture (light stands, waste collection points, water distribution networks, etc.), in buildings (public buildings, social housing, apartment blocks, etc.), on a fleet of vehicles owned by the Nice Côte d'Azur metropolitan authority and the City of Nice, and in a special sensor-equipped trailer successively moved throughout the district.

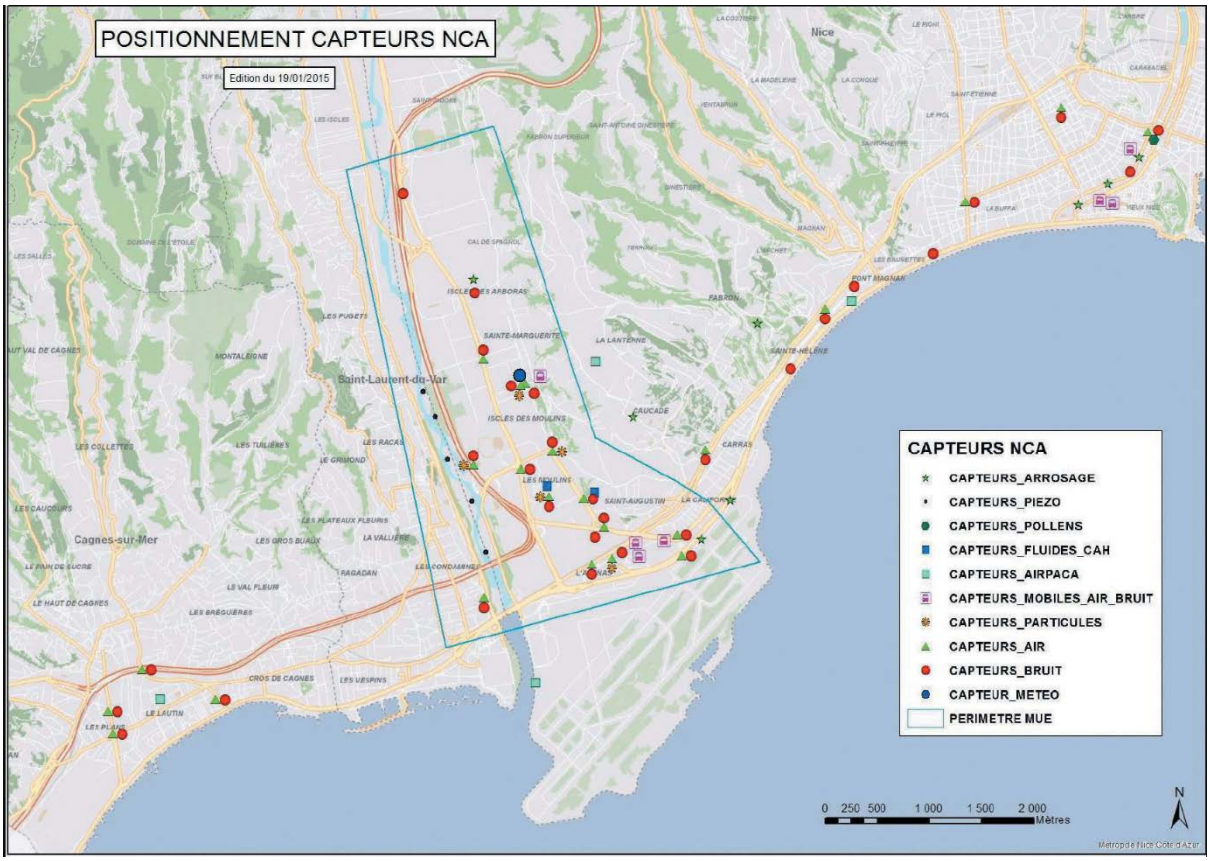
The UEM project's cross-disciplinary nature (involvement of a large number of stakeholders, the broad range of services tested and the combination of technology and social sciences) makes it a unique innovation laboratory for tomorrow's smart city's imagination and design. Focusing on collaboration and co-design within a genuinely experiment-driven mindset, it facilitates integrated testing at the district level of a multitude of new services for cities.

30The project's implementation is scheduled in two steps: experimental phase from 2014 to 2017, and deployment and economic development from 2017. This approach should soon yield the first results. the set out targets are already encouraging:

financial and economic impacts: net cost savings of 10–20% for energy and water use in public buildings and for street-lighting, 10% increase in efficiency across the public water network (rate achieved in Beaune, where a similar service was tested), etc.;

environmental impacts: 15% cut in greenhouse gas emissions and local air pollution thanks to better managed collections from local waste drop-off points, etc.;

social and societal impacts: improved quality of life for residents (public health, well-being, time savings, etc.).



Nice will deploy an extensive sensor network. The projects will be for two goals: to inform the citizen and to optimize the administration efficiency.

These sensors will be deployed using multiple connecting technologies:

- Optical fiber: The Nice Côte d'Azur Metropolis has deployed optical fiber on its territory, as soon as possible some of the sensors will be connected to this network.

- 3G M2M: The Nice Côte d'Azur metropolis use a cellular network M2M for environmental sensors (Air quality, weather ...),

- ZigBee: the social housing units in Les Moulins district are equipped with communicating sensors through a radio network.

The data shared in the projects are mainly sensor measurements. The technology used in the solutions are Telecommunication technologies, API's and data models.

Standards used in the process of connecting the devices:

- REST web services,
- SOAP/XML web services,
- FTP Servers,
- CSV files,
- Nonstandard date model

Demonstration

The Nice Côte d'Azur Metropolis:

- will deploy his LoRa network and his own Network Server,
- will experiment the 5G network,
- will use his fiber optic network.

New developments for the demonstration area will be: LoRa network and the 5G network.

The data shared within the project are sensor measurements.

LoRa Antennas, LoRa Gateway, Network Server, 5G network, fiber optic network, CIP (Fiware) will be used during the demonstration area. The standards for the connection of the devices still isn't very clear.

Replication

The goal in the replication area is to amplify the LoRa network regionally in the Nice metropolitan area. Sensors tested in the demonstration area will by deployed in the Eco district of Saint Isidore with the construction of the new building lots. This will be constructed from 2017 to 2020.

3.2.1. IS services for mobility

Table 9: Services for mobility

	Nice
Pre-pilot	Not represented
Demonstration	• 1,750 shared bikes (Velo Bleu sharing system) equipped with gps system
Replication	The replication area is already included in the demo area, so not specific studies will be done, more demo area though.

Demonstration

A new shared bikes system equipped with GPS will be deployed. This service needs to be developed. The CIP (Fiware platform) will be added to the services to roll out.

During the project different sorts of information with be shared:

- -Customer information
- Mobility,
- Connected bikes,
- Accounting
- -CIP (Fiware)

The services will be set up to inform citizens and to optimize administration efficiency.

Replication

The replication area is already included in the demo area, so not specific studies will be done, more demo area though.

3.3. Lighthouse city Gothenburg

Gothenburg is planning on deploying a variety of services, regarding urban monitoring, city management and planning and grid flexibility.

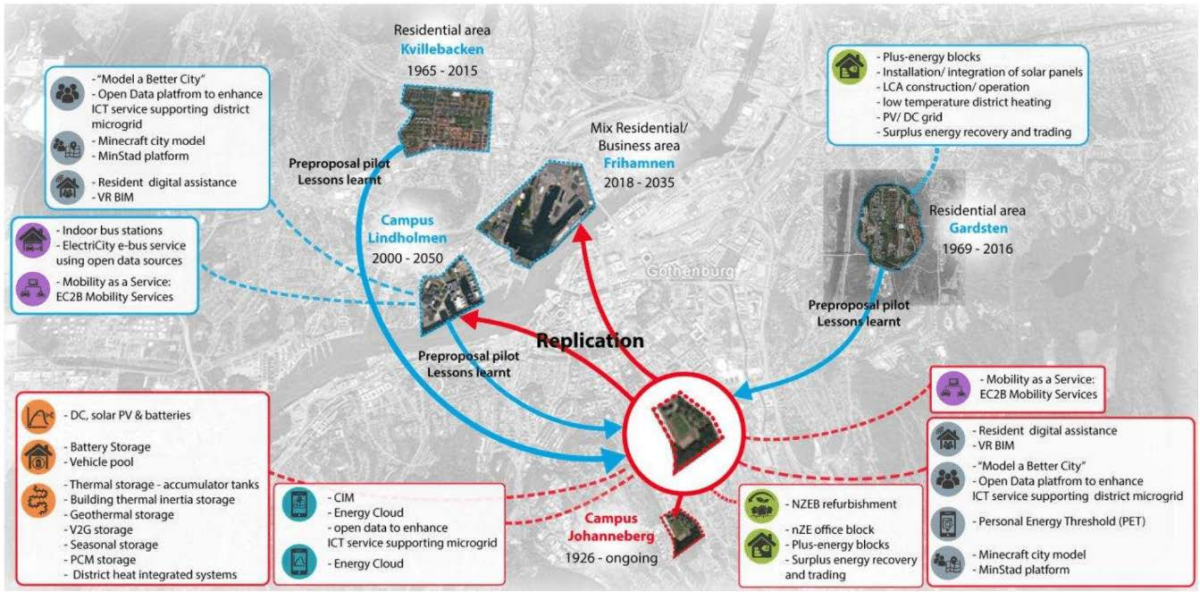


Figure 31: Gothenburg area

Table 10: Services Gothenburg

IS-4.1: Services for Urban Monitoring	P	-	R
IS-4.2: Services for City Management and Planning	P	D	R
IS4.3: Services for Mobility	-	-	-
IS-4.4: Services for Grid Flexibility	-	D	R

3.3.1. IS services for urban monitoring

Table 11: Services for urban monitoring

	Gothenburg
Pre-pilot	Service: Smart lighting project Tuvevägen and Högsboleden
Demonstration	Does not contribute in the demonstration area
Replication	Technology: • LoRa network Services: • Replication of IoT and sensor solutions using that have been implemented by a commercial actor throughout Gothenburg

Pre-pilot

Intelligent street lighting in Gothenburg saves electricity and lasts longer The City of Gothenburg Traffic and Public Transport Authority has been working on intelligent systems for street lighting since 2006. It has been successful with the unusual combination of arranging better lighting with lower electricity consumption and at a lower operating cost. The project is also opening up the prospect of future smart solutions, for example for traffic information.

Street lighting is expensive. Electricity costs money, and the monitoring and maintenance of the light sources is time-consuming. In a unique project on the two thoroughfares Tuvevägen and Högsboleden, the City of Gothenburg Traffic and Public Transport Authority has succeeded in reducing both types of cost. An intelligent control system makes it possible to reduce the power level at night when traffic is sparse, but also indicates when a light source needs to be replaced. The project, which has entailed new light sources and better fixtures, has reduced electricity consumption by more than 60 percent, and at the same time has lowered maintenance costs. The project is a good example of how modern street lighting can be made more effective and was carried out in 2006–2009, with grants from the climate investment programme Klimp.

POSITIVE ENVIRONMENTAL AND ECONOMIC IMPACTS

Consumption of electricity has decreased by 132 MWh per year.

- A total of 340 lighting fixtures with PCB condensers have been removed.
- Remote control has reduced carbon dioxide emissions by 0.16 tonnes, nitrogen oxides by 85 tonnes and particulates by 1.3 tonnes annually.
- Remote control, fault reporting and longer life for the light sources reduce the need for inspection trips and servicing work.
- The costs of energy and operation have been substantially reduced. Swedish EPA SE-106 48 Stockholm.

IMPLEMENTATION

In 2007, adaptive street light with intelligent control was introduced on Tuvevägen and Högsboleden in Gothenburg. New light fixtures with better light dispersal reduced the number of light sources by 28 percent, while electronic starters increased the service life of the light sources from four to twelve years. The intelligent control system makes it possible to lower the power level during the night when traffic is very sparse. The system also issues an alert if an individual light source becomes defective, which greatly simplifies maintenance. The project has attracted great attention in the media and has been demonstrated to a large number of interested parties from within Sweden and from abroad. In the future it will be possible to use the system to connect other road equipment, such as road cameras, information boards and parking meters, reducing the number of electricity connection points in the city.

POTENTIAL AND FUTURE BENEFIT

Energy efficiency of lighting is an extensive and clear need globally. The fact that many countries are phasing out energy-guzzling lighting and introducing various kinds of need-based control is driving the shift in technology in the area of lighting. There is great potential for similar projects, and the method can be transferred to other county councils, municipalities or countries.

Replication

Replication of IoT and sensor solutions using the LoRa network that has been implemented by a commercial actor throughout Gothenburg.

3.3.2. IS 4.2 city management and planning

Table 12: City management and planning

	Gothenburg
Pre-pilot	• Planning entirely in 3D, offering the possibility of visualization and interpretation.
Demonstration	• CIM (City Innovation Model) • (Geographical Information Systems) • BIM (Building Information Model)
Replication	BIM and 3D

Description:

Pre-pilot

Gothenburg is in the middle of a major transformation in the city's central areas. This is due to a large infrastructure project (The West Swedish package) as well as an increase in exploitation and urbanization. This is particularly noticeable on the North and South banks of the River

Such big changes within urban areas will affect many people's lives and force a higher degree of coordination between a large number of actors and organizations. It also requires better information and communication. This could easily be perceived to be a problem, but we wish to see this as an opportunity to take the next evolutionary step in adopting and using new technology in digitization (primarily in the visualization area) and thus achieve an improved citizen engagement and a more effective planning process.

To meet the above challenge, we wish to establish a CIM (City Information Model) and use digitalization (and primarily geospatial data) as a driving force. BIM is the existing well-established approach that most construction companies use to model, build and visualize buildings, bridges and streets. CIM, in its simplest form can be explained as an extension of BIM (Building Information Model) to encompass an entire city.

Demonstration

Today, it is not obvious or easy to access the digital information the city has, either internally or externally.

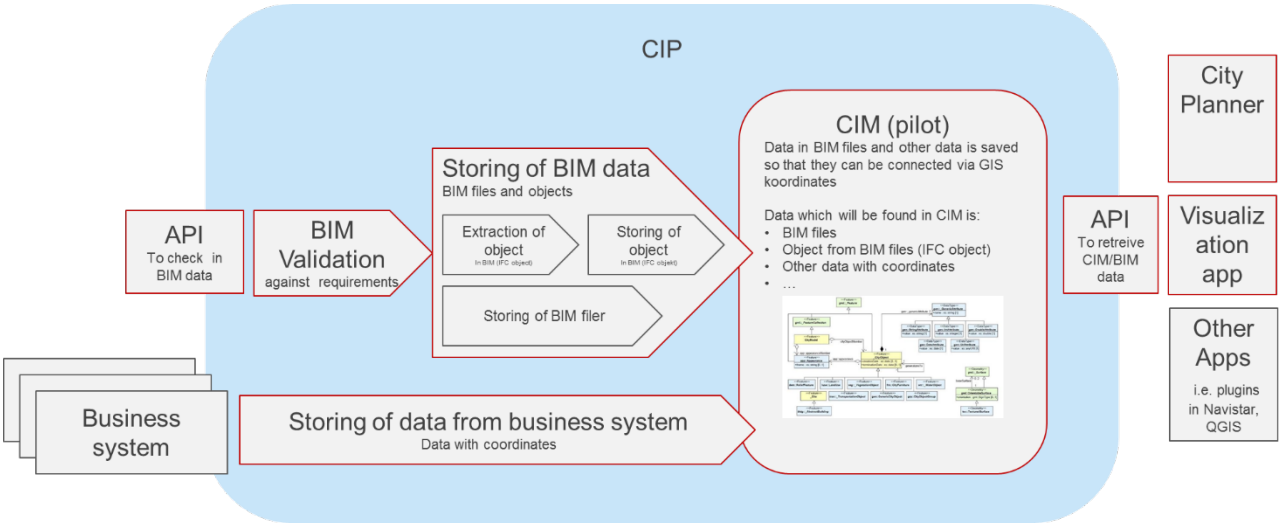
In order to take first steps to build our CIM we need to take advantage of BIM and the BIM files already delivered to the city. These BIM files should be accessible and connected to a visualization tool. The next step establishing CIM will be to link other types of data with BIM data in CIM. During development of CIM, we will also increase the amount of information procured in BIM models and gradually increase the BIM requirements. In the future you should be able to pick up the CIM data based on different timeframes: both the future and present.

Through our work establishing CIP (City Innovation Platform) as well as the digital model CIM, we hope to be able to:

- Increase citizen and political engagement by using visualization in all projects.
- Increase the level of access to project information internally in each executing organization and partnership organization.
- Facilitate the design work by centralizing and having Web interface where projects can submit and retrieve digital models and information both manually and through an API.
- Save money and reduce environmental impact by streamlining management and planning.
- Minimize errors by facilitating for projects to simulate buildings in an appropriate environment and by increasing transparency at all stages of the planning process
- Inspire innovation through visualization

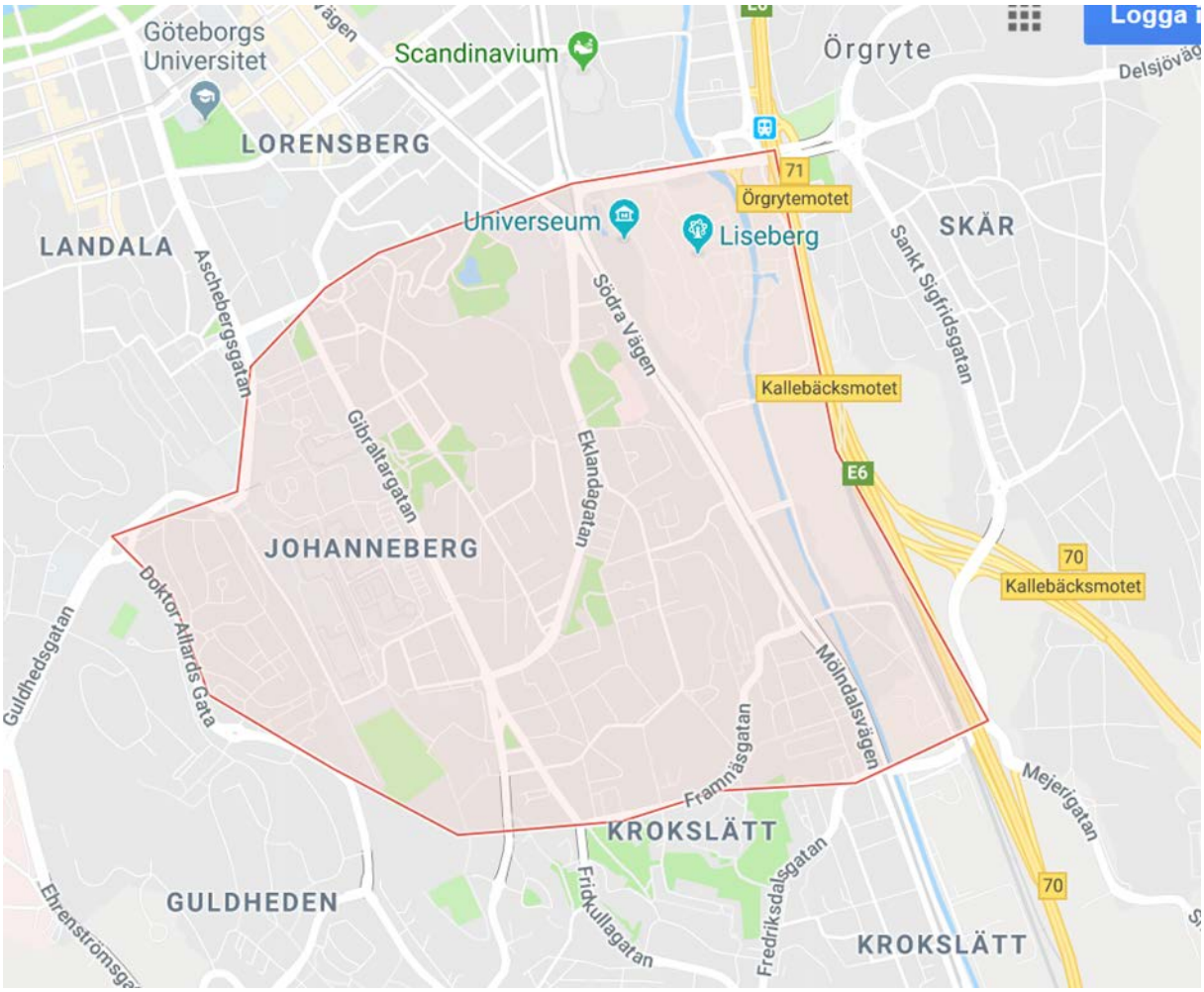
We wish to demonstrate the following:

- Establish a requirements specification for BIM files so they can be used as input to a CIM
- Describe the process as well as recommendations for management of BIM files for project milestones.
- How BIM files can be validated against the requirements (the validation component in the image below)
- How to store BIM files and data (the storage component in the image below)
- How BIM files and other data sources are used to build up CIM (CIM component in the image below)
- How we can make CIM available for visualization and innovation (API, and Visualization App in the image below)
- How we can make CIM/BIM available so that projects can access information from nearby projects (Via Apps/API in the image below)
- How CIM can be used as part of the public and political engagement through visualization (Via City Planner in the image below)



Picture 1: The picture describes which technical components we anticipate as part of the demonstration of CIM in task 7.6. The non-red marked components are expected to be developed by someone else.

Step 1 of the pilot is to implement this for the Johanneberg district, with the BIM files owned by the Urban Transport Administration. The area might increase if it is not sufficient for the pilot.



Picture 32: Map of Johanneberg district

Replication

Still unclear how the BIM will develop throughout the city.

3.3.3. IS 4.3 services for mobility

Table 13: Services for mobility

	Gothenburg
Pre-pilot	• Available bicycle services • Available bicycle infrastructure • allbikesnow.com • e-bike pool • e-cargo pool
Demonstration	• 100 more bikes
Replication	• Replication of existing services

Pre-pilot area

Cykelstaden

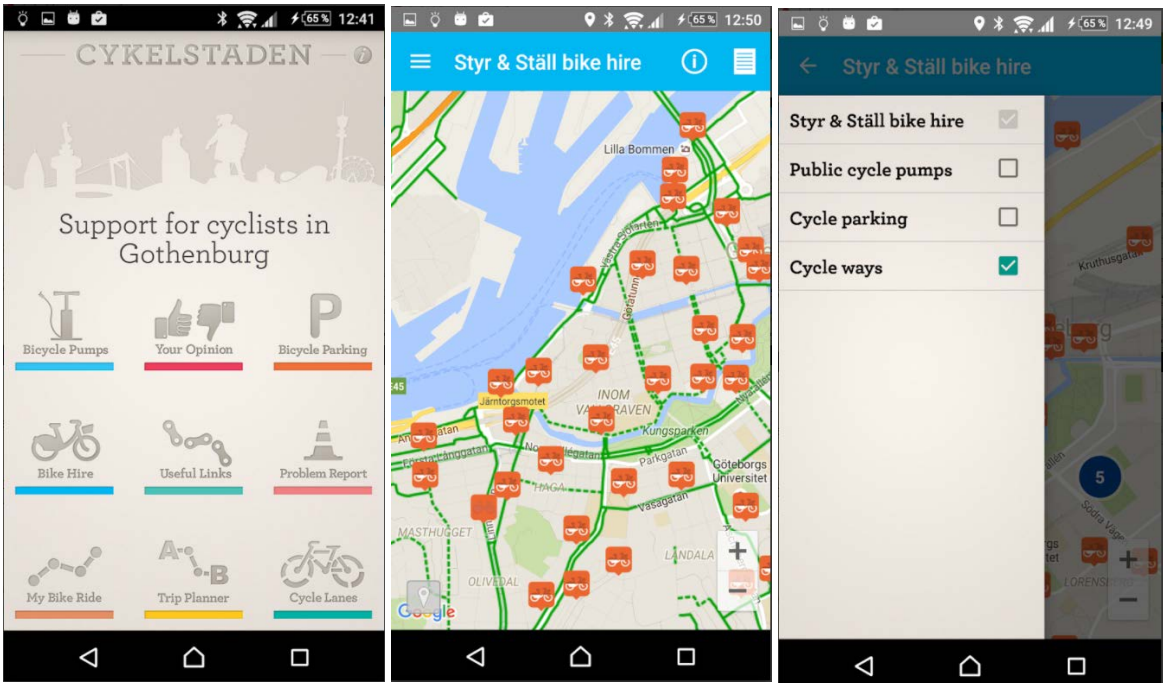


Figure 32: Cykelstaden app

The app Cykelstaden offers a multitude of features. The app helps the user find bike pumps, rental bikes, bike parking and the route-planning. While using the application the cyclist can report damages and obstacles on their route directly to the municipality of Gothenburg. This allows for a crowdsourced way of reporting therefor a more efficient maintenance process.

In the app Cykelstaden, the users of the app can permit that the current journey is recorded. This can be used to find out preferred routes of bikers. Other data is collected in the application: positions of rental bikes stations, number of available bikes and available bike parking at each station.

Allbikesnow.com

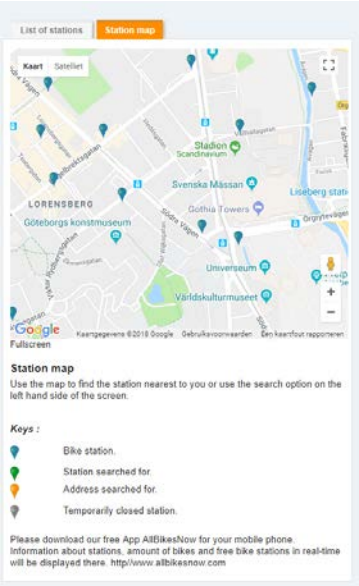


Figure 33: Allbikesnow.com service

The service: allbikesnow.com allows for bicycle transport for civilians throughout the city. The users have access to the bike by purchasing a 1-year ticket, for only 75 SEK you can rent a bicycle as often as you wish. Tourists can also buy a three-day pass.

The first half hour of each journey is free. The season is all year round. The first half hour of each ride bikes is always free, regardless of the number of journeys per day. For example, a user can borrow the bike 24 times in a day for free as long as each bike ride does not exceed 30 minutes.

If you rent a bike for longer than half an hour, there is an additional rental cost per half hour.

On a map and app, the real time information regarding stations and bikes nearby are presented. Civilians are directed to a docking station directed where they can stall their bikes.

Demonstration

The service will be expanded by investing in 100 more bikes.

Replication

A broad extension of the services developed throughout the city.

3.3.4. IS services for grid flexibility

Table 14: Services for grid flexibility

	Gothenburg
Pre-pilot	• Does not contribute to pre-pilot area
Demonstration	• App for visualizing total energy use will be implemented in the Riksbyggen buildings. • The Energy Cloud will be implemented in the Chalmers University Campus area.
Replication	• The energy app • The energy cloud

No information has been distributed.

4. Standards, security and initiatives

4.1. Introduction

During transition track number 4: The City Innovation Platform, a huge variety of different sorts of data will be exchanged in large quantities throughout the platform to different parties. This completely new way of collaborating on multiple governmental and corporate levels will mean many new requirements and standards to be elaborated. The old way of storing data in silo's will be linked though which means more people will have access to the data. Also, cities and communities will be producing more and more data during their daily processes. On the other hand, the cities but also civilians will be using more data generated by sensors, devices and systems.

Standardization is an import tool to reach a better workability of projects and can lead to a more efficient deployment of future projects and processes. During the ESPRESSO project, they found out that the current standardization manner of working is facing some barriers. This is not due to a lack of interest in the use of standards but because the standardization organizations are running behind on the technology suppliers in the market.

4.2. Management of smart city standards

SF-SSCC, the Sector Forum for Smart and Sustainable Cities and Communities, a joint activity of CEN/CENELEC/ETSI (the European Standards Organizations), elaborated a document to define the different levels of standards:

- Strategic
- Operational
- Technical

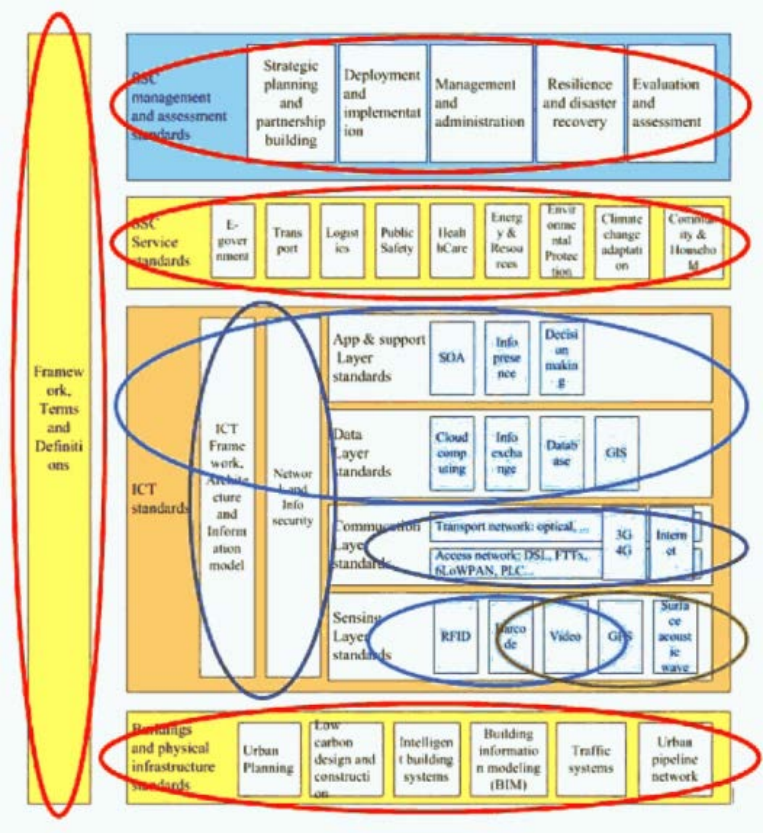


Figure 34 Three levels of standards

In the smart city projects, sometimes the projects touch each of the standardization levels. This usually happens with the deployment of a smart city platform. The SF- SSCC tries to pivot the technical based approach to solve problems to a goal driven approach that looks at problems and then how to solve them using different technologies.

4.3. Smart city standards research ESPRESSO

A large part of this technical section is based on previous outcomes of Horizon2020 projects. The paragraph about standardization is strongly related to the ESPRESSO deliverables. We have thoroughly investigated D3.3 and D7.4 to make full use of the information gathered by our horizon2020 colleagues.

In the ESPRESSO project Deliverable 7.4, a summary of the past and present standardization activities was made, as well as an overview of potential future standards based on the pilot activities in the responsible Lighthouse cities Rotterdam and Tartu. The ESPRESSO project also had a partner project where they gathered feedback.

One of ESPRESSO's main goals is was to find new ways to improve the standardization landscape in ICT. They wanted to collect the existing smart city standards and make a prediction about the future standardization. ESPRESSO compiled information regarding existing smart city standards, did pilot studies which resulted in the identification of gaps in the existing standards and the standards demanded by the smart city markets.

ESPRESSO molded the Smart city standards into four divisions:

- ICT infrastructure
- Public services infrastructure
- Mobility and logistics
- E-government

These divisions touch each of the four CIP services: urban monitoring, city management and planning, urban mobility and grid flexibility.

Within the divisions exist a very large number of standards. In deliverable 3.3 of the ESPRESSO project, an extensive list was made regarding all the standards related to smart cities. One of the conclusions was that it is impossible to analyze all the existing and potential future standards, and that the standards could not be extrapolated from the old standards and needed standards during the pilots.

At this moment in time, smart cities are the hubs where a large variety of organizations, businesses, city councils, technologies and professions cross paths for the first time. This means that all the traditionally closed markets now interoperate or will interoperate during the coming years, resulting in a broad database of standards developing organizations (SDO'S). The summary of the SDO's in short: ISO, IEC, ITU, CEN, CENELEC, ETSI, IEEE. Furthermore, other standardizing consortia, national standardization bodies and technical associations exist. An outcome is that many of the above organizations work on fixing the same issues by themselves, this causes a variety of standards solving similar problems.

To give an overview of the magnitude on SDO level, the image below has been made by one of the main standardization bodies of the European Union, CENELEC. They see the world like this; side note that the parties involved are also consortia, independent groups or organizations involved with the standardization in the IoT area, which means that behind all these organizations lay multiple standards alone per organization.

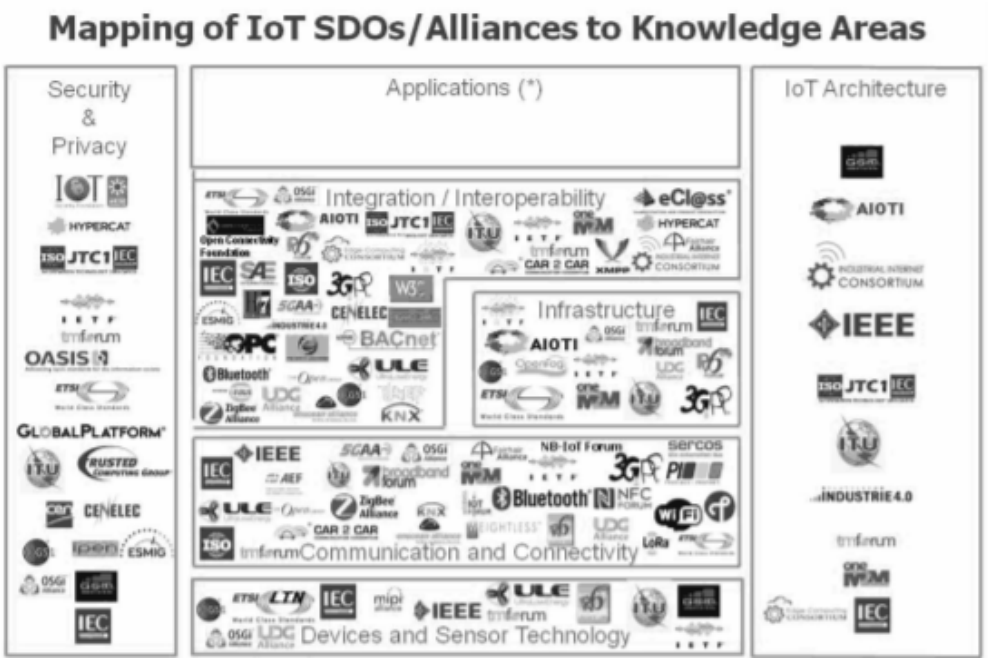


Figure 35 SDO standards

4.4. Smart city standards in practice

Due to sheer magnitude in the number and difference in standards, we will address some of the existing standards we see in practice and standards to be used in the future briefly for the CIP services. ESPRESSO also made a clear overview of the missing standardization gaps in the smart city environment.

Services for urban monitoring description + -Services for urban mobility + data management and planning

Urban monitoring services aim at an optimal operation of the main city activities thanks to connected objects, i.e. smart sensors network (multi-sensoring) and the Internet of Things deployed all over the city and to the Big Data processing capabilities. Data gathered are analyzed by means of processing tools for correlation, modelling, statistics, etc. before being distributed to various city departments, such as waste, transportation and water departments, to private companies for the development of commercial applications and services and to research labs. Additionally, this data should be respected with citizens under certain conditions, as for example when citizens' data are shared with companies and is related to information sensitivity.

When we dissect this information, several key processes come to light:

- Sensor networks and communication standards
- IoT standards
- Big data processing
- Data distribution to departments
- Data security & privacy.

To gain a more high-level view of the standards that are currently used in the market. We will give an example of a project that is being developed at the moment during the horizon2020 Ruggedised project in collaboration with ESPRESSO. There, a 3D city operations model will be tested that could be used for urban monitoring but also for city management and planning. In this model static data and real time sensor data are being inserted via smart connections made available by IoT and data processing standards and visualization. As this is all relatively new, multiple standards could be used to tackle similar projects. This way of connecting sensors to a data model could easily be adjusted and reused by other smart cities, which is the ultimate goal of standardization.

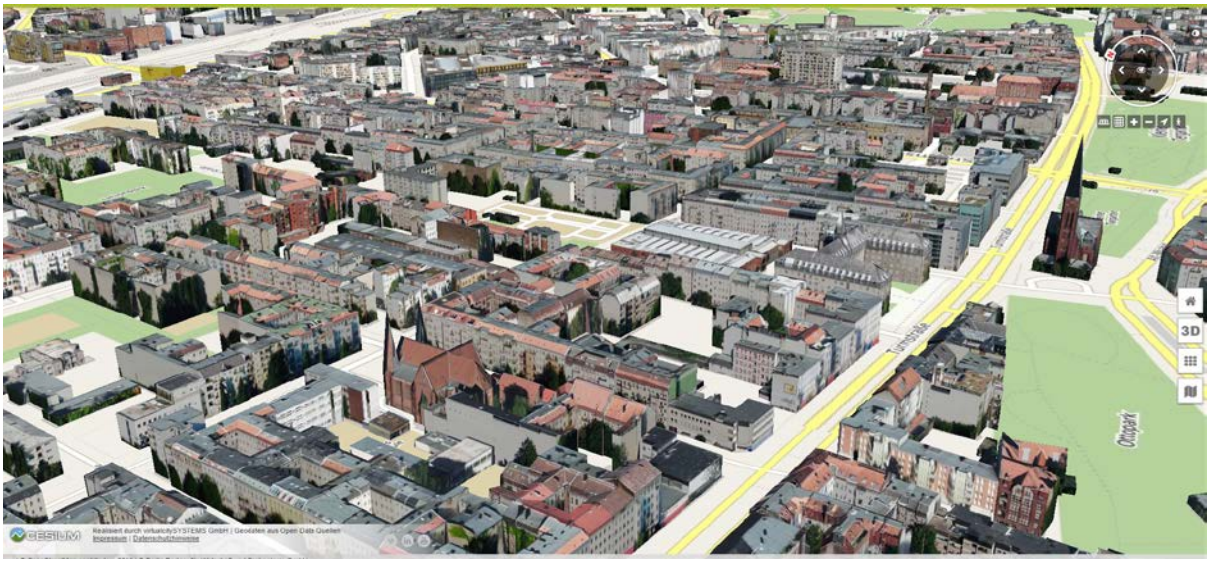


Figure 36 FutureInsight berlin virtualcitymap

The map of Rotterdam looks similar to this one of Berlin. All of the before mentioned key processes play a part in the making of a 3D map of the smart city. In the image below the structure of the process is presented. This gives a clear view of the extensive size of the technical standardization layers.

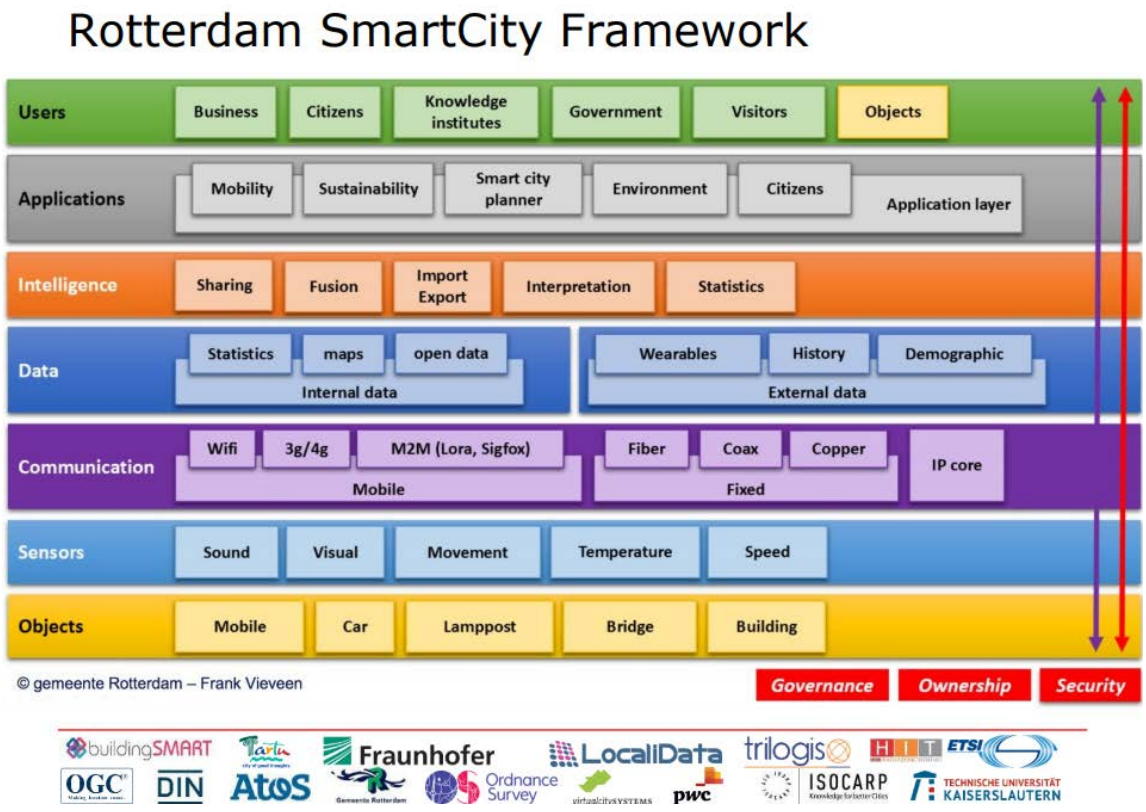


Figure 37 Smartcity framework Rotterdam

As you can see objects can be fitted with a wide variety of sensors to measure different parameters. The information produced by the sensors will need to be send to a source through communication technologies (Wi-Fi, 3G, 4G and M2M). This data then needs to be processed, calibrated, translated etc. to be used in data models, visualizations and applications for various purposes. Integrally the questions about data governance, ownership and security play a roll.

In the 3D data model, a variety of the open geospatial consortium (OGC) standards were used. Developers used these in the process of setting up the model, inserting, translating data to the model for easy coping and reusability. OGC offers open source solutions, which allowed the developers to feed the model with all kinds of static- and sensor data. These elements can be altered and improved by giving feedback to the development community.

Geoserver provides an implementation of the following open OGC standards: WCS, WMS and WFS. These standards all define an interface to work with geospatial-data. The sensorthings API is another OGC standard, aimed specifically at handling sensor related data. The implementation that is used is the FRaunhofer Opensource SensorThings-Server (FROST). Where Geoserver is designed for storing static data, FROST-server is designed to store real-time data. The combination of the two servers provides us with a powerful option to provide both the static and real-time data.

Security is currently arranged by putting the services behind gateways (APIMAN). Clients need to provide credentials in order to be able to use services. The gateways make sure the API can't be abused

by applying rate-limiting-, whitelisting and other type of security policies. The gateway also enforces the usage of HTTPS for secure transmission of data to clients.

4.5. Services for grid flexibility

The energy sector has changed a lot over last decade. The driving forces behind this change have been the development of decentralized energy resources such as PV, wind and heat energy. Also, the smart meters have provided a digitalization enhancement of the grid.

Traditionally the power grids transferred electricity from the large power plants, to passive customers. Smart grids need to be able to handle the energy in a different way due to the more active prosumers that produce, save and use energy in a more efficient manner.

The smart grids will produce a multitude of different dataflows and will need to cooperate with city, corporate organizations and civilians. This means standards about communication processes, data security will need to be in place.

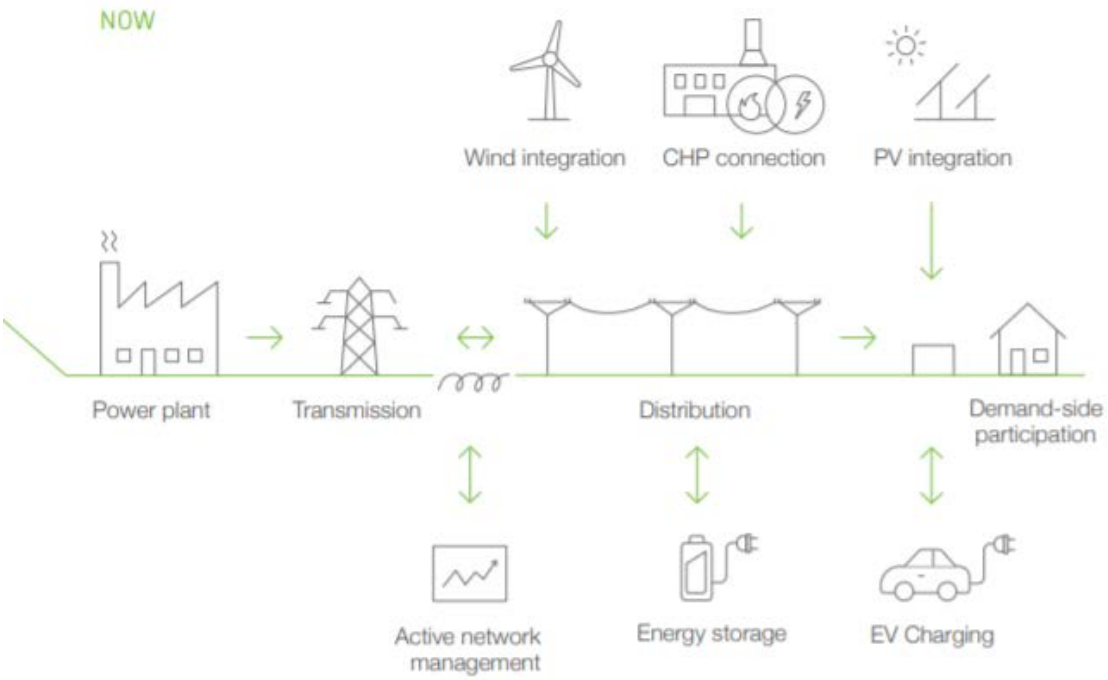


Figure 38 Future energy grid

All these data processes will mean data entries for the CIP services, in the city everything will be connected. A shared EV will for instance not only share data about its location, battery status, routes etc. but also about smart charging to store electricity peaks in the grids. This means a strong overlap between smart grid flexibility and services for urban mobility.

Since the electricity is of paramount importance to our societies and the fact that smart grids get digitalized on a big scale. Good security measures need to be in place. There are multiple categories that the ENISA (European network and information security agency) deployed to protect to energy grids on various levels. Data wise they differentiate between data security and information security, respectively raw information and processed information valuable to the organization.

Domain	List of Security Measures	No
Security governance & risk management	Information security policy	1
	Organisation of information security	2
	Information security procedures	3
	Risk management framework	4
	Risk assessment	5
	Risk treatment plan	6
Third parties management	Third party agreements	7
	Monitoring third parties services and validating solutions against predefined acceptance criteria	8
Secure lifecycle process for smart grid components and operating procedures	Security requirements analysis and specification	9
	Inventory of smart grid components/systems	10
	Secure configuration management of smart grid components/systems	11
	Secure configuration documentation	12
	Maintenance of smart grid components/systems	13
	Software/firmware upgrade of smart grid components/systems	14
	Disposal of smart grid components/systems	15
	Change management	16
	Security testing of smart grid components/systems	17
Personnel security, awareness and training	Personnel screening.	18
	Personnel changes	19
	Security and awareness program	20
	Security training and certification of personnel	21
Incident response & information knowledge sharing	Incident response capabilities	22
	Vulnerability assessment	23
	Vulnerability treatment	24
	Contact with authorities and security interest groups	25
Audit and accountability capability	Auditing capabilities	26
	Monitoring of smart grid information systems	27
	Protection of audit information	28
Continuity of operations capability	Continuity of operations capabilities	29
	Essential communication services	30
Physical security	Physical security	31
	Logging and monitoring physical access	32
	Physical security on third party premises	33
Information systems security	Classification/disclosure policy	34
	Data Security	35
	Account management	36
	Logical access control	37
	Secure remote access	38
	Information security on information systems	39
	Media handling	40
Network security	Functional and secure network segregation	41
	Secure network communications	42
Resilient and robust design of critical core functionalities and infrastructures	Minimum exposure	43
	Resiliency	44
	Safe interruption-Continuity of operation	45

Figure 39 security measures

The smart grid standards also operate on these levels, so a safe and efficient deployment of the smart grids in Europe can be achieved.

4.6. International smart city initiatives

There are countless smart city initiatives, both public (Eu managed) and corporate.

1. Covenant of mayors
2. EIP- Smart Cities and communities market place EIP- SCC
3. CITYKEYS
4. CIVITAS
5. Green digital charter
6. European Energy Award
7. BUILD UP: The European portal for energy efficiency in building
8. SETIS: Strategic Energy Technologies Information System
9. Energy Cities
10. EERA European Energy Research Alliance Joint Programme Smart Cities
11. ManagEnergy: Supporting local and regional sustainable energy actions
12. European Smart Grid Technology Platform
13. European Technology Platform on Renewable Heating & Cooling
14. The European Construction Technology Platform
15. European Urban Knowledge Network
16. Sustainable Energy Week
17. Energy Research Knowledge Centre
18. European Technology and Innovation Platform Photovoltaics
19. Urban Agenda for the EU
20. ESPRESSO

Non-governmental organizations

1. Fiware
2. TM forum
3. Github
4. Open knowledge International

4.7. EU technical regulations in force

GDPR

5. High level evaluation of Lighthouse cities

4.8. Utrecht

4.8.1. IS 4.1 services for urban monitoring & City management and planning

High level standards

(LoRa Hardware standard, Fiware data models) Communication standards, data exchange standards, data storage standards, Hardware standards, security standards, privacy standards.

High level standards

Smart reporting: Based on Open311

Dataplatform: DCAT metadata, open source platform that supports a variety of data standards: JSON, CSV, WMS, WFS. In theory supports everything.

3D modeling: OGC standards, WMS, WFS.

(LoRa Hardware standard, Fiware data models, OGC standards) Communication standards, data exchange standards, data storage standards)

4.8.2. IS 4.3 services for urban mobility

Dataplatform: DCAT metadata, open source platform that supports a variety of data standards: JSON, CSV, WMS, WFS. All datafiles can theoretically be stored.

LoRa communication standards, 4/5G standards

4.8.3. IS 4.4 services for grid flexibility

Dataplatform IoT: SensorthingsAPI, Orion

(Communication standards, data exchange standards, data storage standards)

4.9. Nice

4.9.1. IS 4.1 services for urban monitoring

(Communication standards, data exchange standards, data storage standards)

REST web services, SOAP/XML web services, FTP Servers, CSV files,

4.9.2. IS 4-3 Services for urban mobility

Table 15 IS 4.3 services for urban mobility

(Communication standards, data exchange standards, data storage standards

4.10. Gothenburg

4.10.1. IS- 4.1 services for urban monitoring

(Communication standards, data exchange standards, data storage standards, hardware standards)

4.10.2. IS 4.2 services for city management and planning

(Communication standards, data exchange standards, data storage standards, OGC, FIWARE)

4.10.3. IS 4.3 services for urban mobility

(Communication standards, data exchange standards, data storage standards, OGC, FIWARE)

4.10.4. IS 4.4 Services for grid flexibility

(Communication standards, data exchange standards, data storage standards, OGC, FIWARE)

6. Interests of follower cities

In task 1.4 the follower cities were also involved in the LH CIP solutions. The FC's received questionnaires to gain an image on the level of interest in the solutions that are going to be demonstrated and developed in the LC's. The interest was investigated throughout the CIP services. For more detailed information regarding the levels of interest, please read page 99 of the annexes.

4.11. Follower city interest's summary

4.11.1. Services for urban monitoring

Pilot Utrecht LoRa measuring

Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
5	4	5	5

Pilot Nice sensor monitoring

Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
4	5	5	1

Pilot Gothenburg Smart lighting

Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
5	5	5	5

4.11.2. Services for city management and planning

Pilot Utrecht Data solutions

Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
3	3	4	5

Pilot Gothenburg 3D modeling

Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
5	1	4	1

4.11.3. Services for mobility

Pilot Utrecht mobility

Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
5	5	4	5

Pilot Gothenburg mobility applications

Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
5	3	3	5

4.11.4. Services for grid flexibility

Pilot grid flexibility Utrecht

Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
5	5	5	5

7. Conclusions

Deliverable 1.5 is the first view on the information regarding the status of the IRIS transition track# 4: CIP solutions offered by the Lighthouse cities to the IRIS project. The services were not described in much detail in the grant agreement, therefore more thorough investigation was done via questionnaires and teleconferences. Also, since the kick off of the project, the cities were investigating whether to develop certain solutions or to introduce new ones. This D1.5 provides the reader with up to date, high level data about the user, business and technical requirements of the solutions in the three areas: pre-pilot, demonstration and replication in the Lighthouse cities, furthermore a high-level insight in the standards in the IRIS solutions is presented. The deliverable contains information per city, per service and on solution level on the following services:

1. Services for urban monitoring
2. Services for city management and planning
3. Services for mobility
4. Services for grid flexibility

D1.5 allows the LC's and FC's cities to have a more detailed overview of the services they have now and find interesting to develop in the future. This means this deliverable has informative purposes of the number of services, the actual status and the information on them. This provides a baseline document for the other city specific work packages to develop WP5, 6 and 7.

The follower cities gave their input on the possible replicable TT #4 solutions. This information shows the possible interests in the services. Later on, when the WP 5,6 and 7 or more detailed and can offer more clarity, the same work has to be repeated. As of this phase in the IRIS project the information about the pre-pilot areas has the highest level of elaboration. During the writing of the deliverable, the cities were still defining the demonstration areas, in the future this document will give on image of the amount of deviation there is in the actual services and the services applied to the grant agreement. Utrecht offered the most solutions to the CIP transition track and presented one or more solution per service. Nice and Gothenburg are involved with more specific services. Nice already has a rather developed sensor project running and Gothenburg is in the midst of making great changes to city.

This deliverable is also related to T2.2, where the standardization framework from the ESPRESSO project need to be well integrated in the LC and FC solutions. The make a start with this collaboration between the IRIS project and ESPRESSO a high-level analysis was made of the IRIS TT #4 solutions.

8. References

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Annexes

8.1. Questionnaire Lighthouse cities

Introduction

In work package 1 transition track 4, Civity is responsible for the collection of technical and functional information about the solutions and services in the four transition tracks:

1. Services for urban monitoring,
2. Services for city management and planning,
3. Services for mobility and
4. Services for grid flexibility.

This will be investigated throughout the three areas as mentioned in the original proposal: pre-pilot, demonstration and replication.

Achievements

The goal of this questionnaire is to collect and map the current executed and planned services in the WP1.4 transition track. We invite the lighthouse cities: Utrecht, Nice and Gothenburg to fill in the survey, to get a better understanding of their solutions and services and their status. We also invite the Follower Cities to add information about their replication solutions and services.

What's in this survey?

In this questionnaire you will first read your own information given in the Iris grant proposal. We have summarized these services and solutions. In the Appendix we have added the original information from the proposal. Because of the limited space that was available during the initial documentation of the Iris grant proposal, many of the services were described marginally. Now is the data collection phase, in which we request you to answer the questions as extensive as possible to create a good image of the projects you are working and will work on in the future.

Secondly, we will ask you further questions about the status of the project, technologies used, etc. Since this is quite a broad theme, we ask you to gather your colleagues specifically working on the solutions to fill in this questionnaire and pass it around internally via Word online, dropbox, etc

How to fill in this questionnaire:

1: Read the description of the solutions you offered to the Iris grant.

2: Click the hyperlink to go to the fill in space

3: Scroll back to read the next question and check the box for each question you answered

If the questions are not clear, don't hesitate in contacting us on Arjen@civity.nl or thomas@civity.nl, we could also walk through the questions together via Skype if you prefer to.

Services for Urban Monitoring

Pre-pilot area

Description from proposal:

Technology:

- City optic fiber network, 3G M2M cellular network, ZigBee radio network

Services:

- multiple-purpose sensors.

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill- in area: Services for Urban monitoring 1: Pre-pilot area

Demonstration area

Description from proposal:

Technology:

- LoRa, WiFi, city fiber optic network. LoRa migration to 5G in 18/19.

Services:

- Same sensors as Pre-pilot area.
- application fields of biodiversity, for green watering forecast and control, inside buildings to correlate indoor air quality with outdoor air quality.

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill- in area Services for Urban monitoring 1.2: Demonstration area

Replication area:

Description from proposal:

Technology:

- LoRa regional coverage.

Services:

The various sensors demonstration area will be deployed in the new eco-district of Saint Isidore with the construction of new building lots (total building surface of 100,000 m² over 8 ha) 2017-2020.

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area Services for Urban monitoring 1.3 Replication area

Services for City Management and Planning

Pre-pilot area

Description from proposal:

Not represented

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area: Services for City Management and Planning 2.1 Pre-pilot area

Demonstration area

Description from proposal:

Not represented

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area: Services for City Management and Planning 2.2: Demonstration area

Replication area

Description from proposal:

Not represented

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area:Services for City Management and Planning 2.3: Replication area

Services for Mobility

Pre-pilot area

Description from proposal:

Not represented

Questions:

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area: Services for Mobility 3.1: Pre-pilot area

Demonstration area

Description from proposal:

- 1,750 shared bikes (Velo Bleu sharing system) equipped with gps system

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area: Services for Mobility 3.2: Demonstration area

Replication area

Description from proposal:

The replication area is already included in the demo area, so not specific studies will be done, more demo area though.

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area *Services for Mobility 3.3: Replication area*

Services for Grid Flexibility

Pre-pilot area

Description from proposal:

Not represented

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area: Services for Grid Flexibility 4.1: Pre-pilot area

Demonstration area

Description from proposal:

Not represented

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area: Services for Grid Flexibility 4.2: Demonstration area

Replication area

Description from proposal:

Not represented

Questions

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Fill-in area: Services for Grid Flexibility 4.3: Replication area

Part B Fill-in area of the survey

Services for Urban monitoring: Pre-pilot area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for Urban monitoring: Demonstration area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for Urban monitoring: Replication area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for City Management & Planning Pre-pilot area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for City Management and Planning: Demonstration area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for City Management and Planning: Replication area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for Mobility: Pre-pilot area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for Mobility: Demonstration area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for Mobility: Replication area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for Grid Flexibility: Pre-pilot area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for Grid Flexibility: Demonstration area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

Services for Grid Flexibility: Replication area

Use as much space to answer the question as you like.

☐ Do you have any documentation available regarding the services? If so, please upload the files

☐ Are the services still up to date? If not, how did they develop?

☐ Are there any other services added to the services for urban monitoring?

☐ What kind of data is shared in the project?

☐ What kind of technology is used in the project?

☐ which standards where used in the process of connecting the devices?

☐ Which applications and services were developed during the project?

8.2. Questionnaires Follower cities

Transition Track	**#4 City innovation platform**
IRIS Soultion	**IS-4.1: Services for urban monitoring**
Pre-Pilot LH City	**Utrecht**
Pre-pilot Name	**LoRa sensormonitoring**

Questions	Comments	Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
1) How interesting did you find the specific pre-pilot?	*1(low) to 5(high)*	5	4	5	5
2) Did you find the specific pre-pilot applicable for Demonstration for your city (only for LC)?	*YES/NO* *If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*				
3) Did you find the specific pre-pilot applicable for Replication in your city?	*YES/NO* *If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*	YES, Need to analyse more detail if system is possible in existing networks and services.	YES. Solutions is expected to be easily accepted by citizens and approved by ALEX city	YES	YES
4) If answer in 3) is YES, can you indicate potential social acceptability/ approval in your city during the next 10 years?	*1(low) to 5(high)*	4	3	5	5
5) Do you foresee any synergies/knowledge transfer for your demonstration/replication for the specific pre-pilot?	*YES/NO*	YES, University of Vaasa and local companies (ABB, Danforss, Wärtsilä) have good knowledge on the technical issues	YES	YES	YES
6) Do you need any further clarification based on the currently available pre-pilot description?	*YES/NO*	Vaasa would be interested on detailed costs of building the system an doperation costs. How buisness model is defined.	NO		NO

Pre-Pilot LH City	**Nice Cote d'Azur**
Pre-pilot Name	**Sensor monitoring**

Questions	Comments	Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
1) How interesting did you find the specific pre-pilot?	*1(low) to 5(high)*	4	5	5	1
2) Did you find the specific pre-pilot applicable for Demonstration for your city (only for LC)?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*				
3) Did you find the specific pre-pilot applicable for Replication in your city?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*	YES	YES	YES	NO
4) If answer in 3) is YES, can you indicate potential social acceptability/ approval in your city during the next 10 years?	*1(low) to 5(high)*	4	2. Infrastructure development is needed (not in place currently)	3	
5) Do you foresee any synergies/knowledge transfer for your demonstration/replication for the specific pre-pilot?	*YES/NO*	YES, University of Vaasa and local companies (ABB, Danforss, Wärtsilä) have good knowledge on the technical issues. Finland is also active on 5G network development.	YES. Knownledge transfer will be very useful to design such solution for ALEX	YES	
6) Do you need any further clarification based on the currently available pre-pilot description?	*YES/NO*	YES, Vaasa would be interested on detailed costs of building the system an doperation costs. How business model is defined.	NO		

Pre-Pilot LH City	**Gothenburg**
Pre-pilot Name	**Smartlighting**

Questions	Comments	Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
1) How interesting did you find the specific pre-pilot?	*1(low) to 5(high)*	5	5	5	5
2) Did you find the specific pre-pilot applicable for demonstration in your city?	*YES/NO* *If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*				
3) Did you find the specific pre-pilot applicable for replication in your city?	*YES/NO* *If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*	YES	YES	YES	YES
4) if in 3) is yes, can you indicate potential social acceptability/ approval in your city during the next 10 years?	*1(low) to 5(high)*	5	5	5	5
5) Do you foresee any synergies/knowledge transfer for your demonstration/ replication for the specific pre-pilot?	*YES/NO* *If Yes, please state here to get a more detailed insight*	YES, Vaasa has actively changed old street lights to new ones. New lights are also adaptive, but no intelligent control is included.	YES. ALEX is currently changing all streetlights to LED. Smartnening of streetlighting system is the next target. Technology transfer will be valuable to that effort	YES	YES
6) Do you need any further clarification based on the currently available pre-pilot description?	*YES/NO* *If Yes, please state here in order to gain more clarity*	YES, Vaasa would be interested on detailed costs of building the system and operation costs. What is the system for intelligent control?	NO	YES	NO

Transition Track	#4 City innovation platform
IRIS Solultion	IS-4.2: Services for City Management and Planning
Pre-Pilot LH City	Utrecht
Pre-pilot Name	3D Utrecht, Dataplatform and smart reporting

Questions	Comments	Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
1) How interesting did you find the specific pre-pilot?	*1(low) to 5(high)*	3	3	4	5
2) Did you find the specific pre-pilot applicable for Demonstration for your city (only for LC)?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*				
3) Did you find the specific pre-pilot applicable for Replication in your city?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*	YES, There are different countrywide solution already in Finland developed by National Survey of Finland, University of Turku etc. Interesting is how open data will promote use of data and how businesses will use it. Tehcnical solution behind is not so relevant.	YES	YES	YES
4) If answer in 3) is YES, can you indicate potential social acceptability/ approval in your city during the next 10 years?	*1(low) to 5(high)*	3, Different opinions exist on the open data. Some see income from data important, some prefer open data which is part of city infrastructure.	3	3	5
5) Do you foresee any synergies/knowledge transfer for your demonstration/replication for the specific pre-pilot?	*YES/NO*	NO, University of Vaasa has Virtual Reality Lab, which mainly focus on induatrial solutions.	YES	YES	YES
6) Do you need any further clarification based on the currently available pre-pilot description?	*YES/NO*	YES, Technical solutions, ingerfaces to other systems and EU-level standards.	NO		NO

Pre-Pilot LH City	Gothenburg
Pre-pilot Name	3-D planning and visualising

Questions	Comments	Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
1) How interesting did you find the specific pre-pilot?	*1(low) to 5(high)*	5	1	4	1
2) Did you find the specific pre-pilot applicable for Demonstration for your city (only for LC)?	*1(low) to 5(high)*				
3) Did you find the specific pre-pilot applicable for Replication in your city?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc)*	YES, Vaasa is using different sop	YES	YES	NO
4) If answer in 3) is YES, can you indicate potential social acceptability/ approval in your city during the next 10 years?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*	YES	1	3	
5) Do you foresee any synergies/knowledge transfer for your demonstration/replication for the specific pre-pilot?	*YES/NO*	University of Vaasa has Virtual Reality Lab, which mainly focus on induatrial solutions.	YES	YES	
6) Do you need any further clarification based on the currently available pre-pilot description?	*YES/NO*	YES, Technical solutions, interfaces to other systems and EU-level standards.	NO	YES	

Transition Track	**#4 City innovation platform**
IRIS Solution	**I-S 4.3 Services for mobility**
Pre-Pilot LH City	Utrecht
Pre-pilot Name	Dataplatform

Questions	Comments	Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
1) How interesting did you find the specific pre-pilot?	*1(low) to 5(high)*	5	5	4	5
2) Did you find the specific pre-pilot applicable for Demonstration for your city (only for LC)?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*				
3) Did you find the specific pre-pilot applicable for Replication in your city?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*	YES, There is a need to describe different data especially if open data is modre used.	YES	YES	YES
4) If answer in 3) is YES, can you indicate potential social acceptability/ approval in your city during the next 10 years?	*1(low) to 5(high)*	4	3	3	5
5) Do you foresee any synergies/knowledge transfer for your demonstration/replication for the specific pre-pilot?	*YES/NO*	YES, There are different solutions available on Finland, mainly under government systems. Not really focused on local conditions.	YES	YES	YES
6) Do you need any further clarification based on the currently available pre-pilot description?	*YES/NO*	YES, Detailed system descriptions	NO		NO

Pre-Pilot LH City	**Gothenburg**
Pre-pilot Name	**mobility applications**

Questions	Comments	Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
1) How interesting did you find the specific pre-pilot?	*1(low) to 5(high)*	5	3	3	5
2) Did you find the specific pre-pilot applicable for Demonstration for your city (only for LC)?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*				
3) Did you find the specific pre-pilot applicable for Replication in your city?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*	YES, Vaasa is developing environment better for bicykles.	YES	YES	YES
4) If answer in 3) is YES, can you indicate potential social acceptability/ approval in your city during the next 10 years?	*1(low) to 5(high)*	5	5. ALEX is gradually becoming very friendly to bicycles, there such apps is expected to be very welcome from citizens	3	5
5) Do you foresee any synergies/knowledge transfer for your demonstration/replication for the specific pre-pilot?	*YES/NO*	YES	YES. Potential replication of such apps in ALEX	YES	YES
6) Do you need any further clarification based on the currently available pre-pilot description?	*YES/NO*	YES, Detailed descriptions of the system specification, data collection, business models etc.	YES. More detailed information would support the description of the solution	YES	NO

Transition Track	#4 City innovation platform
IRIS Solution	I-S: 4,4
Pre-Pilot LH City	Utrecht
Pre-pilot Name	USEF

Questions	Comments	Vaasa	Alexandroupolis	Santa Cruz de Tenerife	Focsani
1) How interesting did you find the specific pre-pilot?	*1(low) to 5(high)*	5	5	5	5
2) Did you find the specific pre-pilot applicable for Demonstration for your city (only for LC)?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*				
3) Did you find the specific pre-pilot applicable for Replication in your city?	*YES/NO If No, please provide short justification, e.g. not applicable due to different needs, requirements, climate conditions, cost, business aspects, legal issues etc.*	YES, There are a lot of knowledge in University of Vaasa, local companies on energy sector	NO. No regulatory framework in place in Greece for such solution	No. Due to its complexity in applying to the city.	YES
4) If answer in 3) is YES, can you indicate potential social acceptability/ approval in your city during the next 10 years?	*1(low) to 5(high)*	5		3	5
5) Do you foresee any synergies/knowledge transfer for your demonstration/replication for the specific pre-pilot?	*YES/NO*	YES, Sundom smart grid pilot, University	NO. Since there is no regulatory framework, synergies are not expected to happen within IRIS duration	Yes	YES
6) Do you need any further clarification based on the currently available pre-pilot description?	*YES/NO*	YES, detailed system descriptions, whst is the legal framework trading energy	NO		NO