

D1.4 SECOND TECHNICAL REPORT (PARTS A AND B)

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The report is elaborated on the basis of the Amended Grant Agreement through amendment n° AMD-646456-33

1) The term 'project' used in this template equates to an 'action' in certain other Horizon 2020 documentation
2) The home page of the website should contain the European flag which are available in electronic format at the Europa website (European flag: http://europa.eu/abc/symbols/emblem/index_en.htm) and the Horizon 2020 programme name.

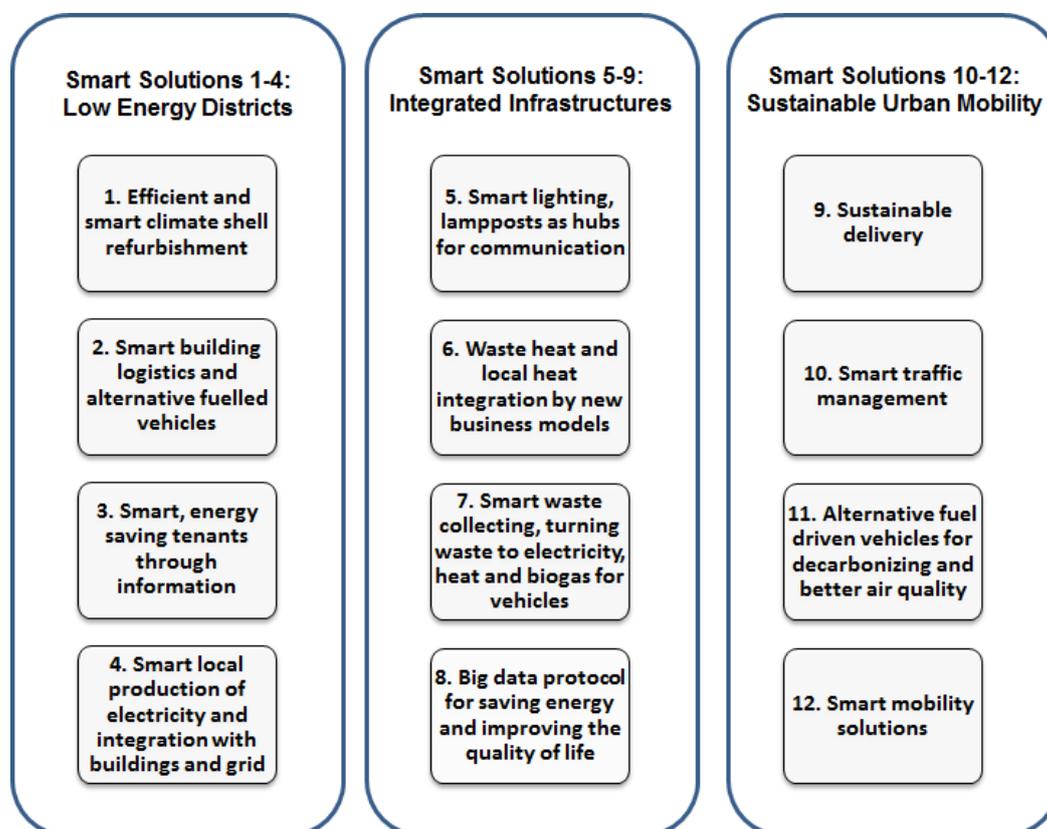
1. SUMMARY FOR PUBLICATION

1.1 Summary and overall objectives of the project

In a rapidly urbanising world cities need to become smarter to respond to citizen needs and to reduce their environmental footprint. GrowSmarter brings together cities and industry to integrate and demonstrate '12 smart city solutions' in energy, infrastructure and transport, in order to provide other cities with valuable insights on how the solutions work in practice and the opportunities for replication.

12 Smart solutions

An integrated approach is key to our roll out of 12 smart solutions. Working together with 25 industrial partners, we roll out smart technologies related to low energy districts, integrated infrastructures and sustainable urban mobility in chosen sites. The solutions range from advanced information and communication technology and better connected urban mobility, to incorporating renewable energy sources directly into the city's supply network. The idea is to create business cases for each of the smart solutions and to initiate market roll outs in the Follower cities, take up cities and the rest of Europe.



The smart solutions in GrowSmarter

The Lighthouse cities together with industrial partners are implementing and evaluating the solutions for energy efficiency, greenhouse gas saving capacity, economic viability and economic impact and replicability. The solutions are well chosen and in line with the cities urban strategies and plans, as well as with consumer organizations and tenants associations.

3 Lighthouse cities

GrowSmarter aims to stimulate city uptake of the 'smart solutions using the three Lighthouse cities Stockholm, Cologne and Barcelona to show how 'smart' work in practice. The solutions are being tested in 3 different city areas – representative for many European cities: downtown city district, inner city suburb about to be densified and a former industrial/business area which is being partly turned into a residential area.

Stockholm, Cologne and Barcelona have selected a site in their city where the 12 smart solutions will be rolled out over five years. They will be documenting their journey with regular news updates to be followed online. The three Lighthouse cities will host a number of free of charge study visits and European workshops, which provide opportunities first-hand to see the technological applications of the smart solutions and meet the 25 industrial partners in GrowSmarter.

Targets & evaluation

The scope of the project is to:

- demonstrate and validate 12 economically and environmentally sustainable integrated smart solutions in the three Lighthouse cities;
- foster collaboration between cities, businesses and academia to transform the smart solutions into business models to be rolled out across Europe;
- improve the quality of life for European citizens, reduce environmental impact and create sustainable economic development.

GrowSmarter takes a holistic approach to sustainable growth. The demonstrations in the Lighthouse cities are not the primary aim, but a mean to contribute to solving city challenges and create validated business cases to initiate a market roll out of the smart solutions to Follower cities, and especially to the rest of the European market, thus helping Europe Grow Smarter.

The 12 solutions are designed to meet the three pillars of sustainability: economic, social and environmental concerns. Targets related to climate change, energy usage, transport emissions and jobs have been set as part of our ongoing evaluation.

Knowledge replication

Knowledge exchange and transfer is a key to the success of GrowSmarter. The five Follower cities Valetta, Suceava, Porto, Cork and Graz will closely follow the Lighthouse cities to learn from their experiences and to identify measures suitable for their specific local context. As part of the project they develop a smart city replication plan tailored to their local needs.

Project duration & funding

The GrowSmarter project has a funding of €25 million from the European Commission's 'Smart cities and communities' Horizon2020 research and innovation programme. The GrowSmarter project is working closely together with the other Lighthouse projects to maximise the impact and exchange of experiences. GrowSmarter kicked off on 1 January 2015 and will run until 31 December 2019. For more information, visit the project website www.grow-smarter.eu or follow us on Twitter @EUGrowSmarter.

1.2 Work performed and main results

We here describe the work performed from the beginning of the project to the end of the period (may 2017) and main results achieved so far. The organisation of the project is established and the cooperation works well between the sites, the research institutes and the coordination team, within the sites and within each WP.

The work preparing the implementation has been intensive, and has taken more time than predicted, especially for the refurbishment but it does not imply a delay in the end of the project.

WP2 Low energy districts

In Stockholm, the refurbishment of the tertiary building in Slakthusarea has started and a second tertiary building was approved by the EC in Amendment 5. The refurbishment of the residential building BRF Årstakrönet is completed while in three out of the six residential buildings in Valla Torg the retrofitting works have started. Generally, the issue of the process of getting approvals from the tenants and dwelling owners in the residential buildings in Barcelona and Stockholm has led to delays in refurbishment but now this is solved.

In Cologne the refurbishment of the first construction phase is finished. The second construction phase is underway. The installation of the battery storages in the first construction phase will start at the end of June 2017 and the works (district heating, electricity and water) are finished. Some of the buildings in the third construction phase are delayed and this was approved by the EC in Amendment 5.

The refurbishment in two residential buildings is completed in Barcelona, and it has also started in two other residential buildings and in Ca l'Alie and the Sports center. For the last residential building, refurbishment starts in August 2017. For the two last tertiary buildings in Barcelona, Hotel H10 and educative centre Escola Sert, contracts have been signed by the owners. Works in Hotel H10 out of the GrowSmarter scope started in August 2016. Façade refurbishment work has started in Escola Sert (educative Centre) and the photovoltaic installation in the façade within GrowSmarter is planned for September 2017. The Hotel and the delay of Ca l'Alie were approved by the EC in Amendment 5.

In Stockholm, the Energy Savings Center is installed in the residential BRF Årstakrönet and will be installed in 2017 in the tertiary buildings in the Slakthusarea. The Home Energy

Management System (HEMS); the Open Home Net and the Energy Savings Center will be installed in 2017 in Valla Torg as well. In Cologne, an event will be arranged at the beginning of July 2017 to describe the smart home system that tenants will have access to in their refurbished apartments, and the smart meters will probably be installed in August 2017. In Barcelona, 70 HEMS and smart meters have been installed in dwellings by GNF, while 400 users have signed up for Virtual Energy Advisor platform by Barcelona Municipality up to now.

In Cologne, the planning and tendering process for the different local renewable energy productions and the virtual powerplant is finished. In Barcelona, local solar energy production is in tendering process for some locations and finished for others. Two suitable blocks in Clot Island have been selected and agreements have been signed. In the first one, Sibelius 3, a photovoltaic system with Li-ion storage has been installed. In the second one, another block in Clot Island (in Meridiana, 141), agreement with the community is ready to be signed. Three more buildings have been identified and energy pre-analyses for the agreements are on-going.

WP3 Integrated infrastructure

In Stockholm the biking and walking lane for implementing the smart street lighting has been implemented and is completed. In Stockholm the Slakthusarea is chosen to implement Internet of Everything. The preparation for implementing the SmartMeters is ready. The API for smart lighting is almost complete as well. Five smart towers were agreed on in Pere IV, and two additional ones on the Cellnex premises and in Canelles. Retevision identified a risk that a delay in the execution of measure 5.2 will delay the definition and development of the API in measure 8.5. Therefore, Retevision will use the smart towers that have been deployed in Cellnex premises to perform the design of the API.

Since there are no certified smart meters in Cologne yet, due to delays in national legislation, RheinEnergie will install smart meters that are not certified, but need the tenants' permission. This process has started. AGT can then start with its implementation of the smart plugs. The measure regarding charging and lighting will be implemented in Cologne when RheinEnergie has found a way to integrate charging into lighting poles. RheinEnergie is currently talking to potential providers for the infrastructure. WiFi infrastructure had already been installed.

In Stockholm, the supermarket is connected to the open district heating and the data center will be connected in June 2017. In Barcelona, refurbishment of Ca l'Alier considers connection to Districlima (district heating and cooling network which recovers heat from urban waste plant) and the residential building Melon District was connected to Districlima for heating provision in the end of 2016 (monitoring work finished April 2017; connection for cooling and DHW provision was already done by the owner before GrowSmarter).

The smart waste collection measures in Stockholm were dependent on the refurbishment and are now ongoing. It is planned to be in operation by June 2017.

In Stockholm, sensors and cameras have been installed and in Slakthusarea sensors will be installed in summer to collect data from bicyclists and pedestrians to facilitate city planning decisions in the future.

In Cologne, three apps and prototypes have been developed; The Urban Traffic app, Urban Environment app and the Urban cockpit. The current traffic load is shown, environment data distributed and the current situation in the city concerning available cars in mobility stations and parking spaces, parking surveillance data and more is shown. The three apps have been integrated in one app, the Urban cockpit, providing two different views. The map view supports filtering the different data types in terms of turning on or off, showing these data on the map. The dashboard view gives an overview of all data by displaying statistical values structured on different tiles. The cockpit is a web frontend on top of an Urban Big Data backend called UrbanPulse. The architecture of the backend is designed in accordance to the upcoming european standard for Big Urban Data platforms. During a hackathon event at openairCologne, a part of the open data Community Cologne, a group of citizens developed sensors that are useful for further development in the project (<http://openair.codingcologne.de>)

In Barcelona, a working document “Architecture of the Growsmarter-BCN platform” has been produced. This document includes a description of the different elements and interfaces of the Growsmarter-BCN platform and a description of the data produced and consumed by different measures. Ongoing tasks are the initial set-up of the platform, definition of main functions of Growsmarter API according to Growsmarter data model and applications requirements, and implementation of Big Data storage capabilities that will support the Growsmarter data model. In Barcelona the work with the urban model is almost completed, pending evaluation and testing. It consists of two main components: Development of a semantic model (in testing and validation phase) and development of the semantic layer that allows applications to query city data via the semantic model (done). The development of a semi-automatic mapping tool is complete.

WP4 Urban mobility

The sustainable deliveries have been completed in Stockholm and Barcelona as well as the planning and operation for smart traffic management solutions in all three cities. The service boxes in Stockholm will be initiated once the first tenants move back by the end of 2017. Currently a logistic solution and a business model are being developed together with MoveBy Bike, a company providing deliveries with cargo bikes in Stockholm.

The traffic management solutions are almost on schedule. In Stockholm the two different traffic management projects; equipment in private cars receiving information on green lights, and signal priority for alternatively fueled heavy vehicles, are to start operation and test during the summer 2017. A demo version of the traffic guide app is currently tested and it will be ready as tenants move back to the refurbished buildings in fall 2017. In Barcelona the modelling of the Sant Martí district is ongoing.

The implementation of five fast charging stations in Barcelona and one in Stockholm is finalized and data collection is ongoing. In Stockholm the location of a majority of the normal chargers has been decided and will be installed in the autumn of 2017. The first filling station for renewable fuels for heavy vehicles in the Stockholm area was inaugurated in May 2016. Three more locations have been established for additional filling stations and contracts have been signed. The process of changing the city plan etc is ongoing. In total, these four locations add up to ten new filling stations in the Stockholm area (4 HVO, 3

biogas and 3 ethanol). In Barcelona, the chargers for the tricycles are in place and the vehicle to grid-chargers are being fabricated. The location of the CNG filling stations in Barcelona has been identified but is still pending the official approval.

The City of Cologne has identified 9 possible spots for mobility stations. The installation would be an achievement far beyond the grant agreement (that only had 3 stations). The first mobility station in Cologne was implemented in April 2016. During 2015 a number of unforeseeable legal stumbling blocks were identified and solutions were provided. The legal difficulties were reported to Düsseldorf (State Capital) for future amendments of the state legislation. This is a significant help for future installation of mobility stations and is considered an icebreaker for other municipalities in North Rhine-Westfalia. GrowSmarter is working towards creating an eco-mobility-friendly legislation. The development of mobility stations and E-carsharing in GrowSmarter currently serves as a role model for the entire City of Cologne in order to improve traffic flow. Stockholmshem has signed an agreement with an EV car-sharing provider, who will put two EV car-sharing cars in operation at Valla Torg in the beginning of December 2017 when the tenants move back. Hopefully the same company will be able to provide the electric bikes and cargo bikes in the same sharing system. Negotiations are ongoing.

Taxi stands have been decided with approval of the city council and the taxi institute of Barcelona. Sensors have been installed in late March 2017 in three taxi stands. Data are tested and an app is being developed. The system will be in full operation by the end of 2017.

WP5 and WP6 Technical and economic evaluation

The evaluation plans have been developed, defining the monitoring of all smart solutions in the project. A revised version was submitted in May 2017. Additionally, guidelines for monitoring and evaluation has been written and sent out to all partners. Before the beginning of June 2017, local evaluation strategies are developed by each partner based on the evaluation plans and expected to be agreed on.

WP7 Replication

A capacity building programme for Follower cities is being implemented, with a series of study visits, webinars and workshops taking place. Follower cities are currently updating their replication assessments. In some cases replication activities are already underway.

WP8 Dissemination and communication

Regular communication co-ordination meetings are being held between the European and local dissemination managers, as well as between ICLEI and the other SCC01 Lighthouse smart city projects. The City Interest Group continues to grow, and now includes 17 participants. Further workshops and study visits are being organised in the Lighthouse cities, and a series of fact sheets on the smart measures have been published. Regular e-updates are being published, as well as a number of press releases and articles in relevant publications. The project has been presented by several partners at various conferences worldwide. Local events have been arranged in each site. In total, the project has been presented through 500 different events and media activities.

1.3 Progress beyond the state of the art and expected potential impact

STOCKHOLM

WP2 Low energy districts

A lot of innovative, smart solutions are included in the refurbishment of buildings in three building zones with different building types – residential buildings from 1960s, industrial buildings from 1910 and residential buildings from 2007.

In Stockholm, the private Condominia BRF Årstakrönet was first in line to have the European Innovation Award winning EnergyHub system installed by Veolia FM AB. The EnergyHub system offers a new approach to optimize the electricity use in a building. It is maximizing the investment in solar power but also an adaptive current equalization system, a unique system called ACE. Veolia is through the Ferroamp, introducing a smart flexible technology that increases the output of the electrical system. The heart of the system is the Power Module, a 3x5 A (3.5 kW) three phase, scalable bi-directional power inverter. The Power Module converts the DC energy from the solar panels and energy storage into AC energy that can be used in the building or sold to the electric grid company. The EnergyHub inverter has a function that convert AC from the electric grid into DC to charge the batteries in the energy storage.

The second use is Adaptive current equalization (ACE). A three phase power reinvented Ferroamps patented Adaptive Current Equalization technology allows for a more efficient use of a three phase supply. EnergyHub ACE transfers energy between the phase conductors. The benefits are:

- Main fuse overloading avoided
- Possibility to reduce the main fuse getting a lower fixed fee
- Reduced distribution losses
- Simple installation
- Transparent to existing loads
- Prevents over currents from all loads in the installation

Veolia provides an adaptive technology for central control system for heating. Temperature sensors inside the building in a number of apartments and a traditional outdoor sensor uses weather forecasting. The system generates a more stable indoor temperature and benefit better from internal loads and heating from the sun. The energy savings of this solution has been as expected 10–15%.

Earlier unrecognized heat losses in buildings have been hot water circulation losses. Systems are often insufficiently insulated and losses within buildings are measured to ca 6–10 kWh/m² and with internal culvert system for 5–10 buildings it is 15–20 kWh/m². Solutions can vary, from more insulation, different location and technology. Losses can be cut with

50% with the right type of solutions. These solutions are implemented in the residential buildings at Valla Torg.

Exhaust air heatpumps recover the heat in the ventilation exhaust air. It requires mechanical exhaust air ventilation and a central heating system for the building to use the recovered energy for heating and domestic hot water. Conventional heatpumps cool down the exhaust air to ca +4°C. The innovative technology used at Valla Torg cools down the air to -10°C and use the heat content of the condensed exhaust air humidity. With these innovative technologies possible net energy savings are 50 kWh/m².

A pre-study in the Slakthusarea found that there was enough waste heat from the nearby Sports arena and a Data center to heat up both GrowSmarter buildings as well as other city-owned buildings in the neighbourhood. This is added value to the project, and the solution could be replicated in many cities.

WP3 Integrated infrastructures

Integrated infrastructures, such as the open district heating system (a new business model for adding waste heat to the district heating system) and extensive fibre networks are important parts of making Stockholm a smart city. To achieve the City's environmental goals, an efficient cooperation between inhabitants, the private industry, the public sector and many other players is crucial. Environmental and information technology are both key priorities in developing a sustainable society.

The installation of adaptive LED-lighting at Valla Torg will save energy to 50%, but still provide the same sense of security in walking and bicycling paths.

Fortum's open district heating solution uses waste heat from Data Centres and Supermarkets to feed into the district heating system. This solution has the potential of saving 0.12 TWh annually in Stockholm alone, and has a huge replication potential. The business model is favorable for both the energy company and the waste heat producer.

Stockholm enjoys 100% broadband coverage, both fixed and mobile. The goal of the City's fibre network efforts is to build a competition-neutral infrastructure capable of meeting future communication needs, spur economic activity, diversity and freedom of choice, as well as minimising disruption to the City's streets. The fibre network is owned and provided by the City of Stockholm. In total, the network stretches the equivalent of more than 30 times around the earth. It is 1.25 million fibre km long, 5,500 cable km long and boasts 600 crossover connections (nodes) and more than 15,000 access points (ODF).

Several Internet of Everything applications and solutions can be built on top of the fibre network. The work with Internet of Everything is closely connected with the implementation of Stockholm's smart connected city strategy. In GrowSmarter the Event Arenas in direct connection to Slakthusarea is the starting point for developing, implementing and testing how city functions such as lighting, parking, transport, maintenance in street environments as well as buildings could be performed in a way providing more added value to both citizens, companies as well as the City itself.

The fibre network can also be combined with Wi-Fi to collect data from sensors. IBM, which is responsible for the open consolidated big data platform, will gather and analyse data related to pedestrian and bicycle flows in the city. This analysis will thereafter be used in the

big data platform by city traffic planners to address different planning questions, for instance how wide should a sidewalk be to both provide a good flow, but also a possibility to stop and talk.

WP4 Urban mobility

To enable alternative fuelled heavy vehicles to get a larger share of the market, refuelling stations are being installed around the city center through GrowSmarter. This makes it possible to demand alternatively fuelled heavy vehicles without having to drive 20 km to a fuel station. They will also get signal priority to be more competitive than fossil fuelled heavy vehicles.

COLOGNE

The City of Cologne has experienced an initial transition to a new culture of collaboration and team work within the City government, away from thinking only in silos to interdisciplinary communication and cooperation. Many advantages, such as faster processing for building permits, have derived from this transition and GrowSmarter has an important impact on guiding the City of Cologne on its path to becoming a smarter city. New cooperation has taken place with research institutes and the industrial partners, leading to smarter governance. The communication with citizens is an important component in GrowSmarter and the partners are communicating with tenants and citizens online in the form of community reporters as well as offline with on-site consultation time. The project has been followed intensely by local, regional, national and international press and events.

The planning and procurement process for the technical work packages has taken place. The mobility solutions for the City of Cologne are worked on in partnership with the regional authorities. All measures have either been implemented or are still in the middle of the implementation phase.

WP2 Low energy districts

Virtual power plants for holistic settlement management have so far only been carried out as research projects. RheinEnergie has created a new business model with the Siedlungsmanagement software for the housing sector. The Siedlungsmanagement software leads to an autonomous self-sustaining development for communities. This will in part replace the supra-regional network expansion as well as the construction of new conventional power plants. In addition, it provides the residents with the opportunity to influence their own energy consumption. The software has been procured and is currently in development.

Based on the data provided by smart meters and smart home appliances, RheinEnergie is able to offer attractive rates (Mieterstrom) and useful services to the tenants. The holistic interaction of all components, such as power generation, storage, SmartHome, smart meter and consumption leads to a change towards energy awareness as well as a social sense of community within the settlement. The first phase of construction has been completed and the project has moved on to the second phase of construction. The third phase is almost completely permitted.

WP3 Integrated infrastructure

Cologne offers a lot of data as open data on its platform www.offenedaten-koeln.de. Through the GrowSmarter project, Cologne will expand the range of data by new sources and to extend the existing platform by a new sustainable Urban Big Data Platform called UrbanPulse, developed by [ui!]. Therefore, we expect the Community to use the data and build interesting new apps. We also expect new start-up enterprises entering this line of work so there should be an increase of new jobs created. A new traffic app has been developed and is in further research and development by the local public transportation company kvb.

Current Smart Home/Smart Energy solutions are technically able to measure energy consumption up to every 15 minutes. However, this coarse resolution of energy data will not be sufficient for advanced energy analytics allowing for the detection of e.g. power failures. AGT's Smart Energy Solution will be able to measure energy data every two seconds on device level. Data will be stored and analyzed. Insights into the data will provide basis for advanced analytics allowing energy savings for the tenants through a detailed transparency. However, in Cologne the energy consumption for heat and electricity can only be measured at a yearly term according to existing regulations, except if the tenant in writing agrees to an hourly measure.

State of the art sensor platforms use mostly proprietary connection standards. The UrbanPulse platform which [ui!] is developing in GrowSmarter, is multi sided open, i.e., sensors from arbitrary manufacturers can be connected to the platform and arbitrary applications can be built on top of the platform in order to use or to illustrate the data. The [ui!] platform will not be restricted to a certain kind of data. Furthermore, the data will be provided in part as closed as well as open data to the community. Another difference to the state of the art is the real time processing of the data. Due to the cloud based concept, it is easily scalable. UrbanPulse already follows the guidelines and policies of the upcoming European standard for open urban big data platforms.

WP4 Urban mobility

The City of Cologne has identified 9 mobility station locations in total, which are six more than in the Grant Agreement. Since almost all these locations have been implemented, more mobility stations will be implemented than described in the Grant Agreement. The innovative solutions concerning mobility stations, car-sharing and smart parking had to be aligned with existing national legislation. The development of mobility stations and E-carsharing in GrowSmarter currently serves as a role model for the entire City of Cologne in order to improve traffic flow. A larger comprehensive master plan regarding mobility stations across town is in development.

The City of Cologne and the partners try to integrate the citizens into the project in order to change mobility behaviour. During several public information events, especially in the Stegerwaldsiedlung, people were informed about the progress of the project. The City authorities believe that the acceptance of such a project can only be guaranteed as long as the public is well informed.

The State authorities in Düsseldorf are increasingly recognizing the efforts of Cologne and its partners in the field of improved urban mobility concepts. Cologne has collaborated with Düsseldorf regarding the design of mobility station signs. A common design for the general usage in North Rhine–Westphalia has been designed and created. It is installed at the first running mobility station and more will be installed soon. A general recognition of mobility stations for the public will be guaranteed.

BARCELONA

The City of Barcelona vision is to become self-sufficient, with productive neighbourhoods, living at a human speed and producing zero emissions. A productive, open, inclusive and innovative city; a living city with enterprising people and organised communities. The impact expected from implementing GrowSmarter measures not only fits well in the vision, but also pushes it forward beyond state-of-the-art in certain areas such as self-sufficiency and zero emissions production. Of course the impact of such new models is yet to be fully assessed, but we already see new small companies and innovative solutions appearing to build added-value around them, impacting socio-economically the city. Our vision now is that the GrowSmarter project will contribute significantly, notwithstanding all difficulties, to improved participation and decision-making processes in the City of Barcelona.

WP2 Low energy districts

The WP2 measures being implemented at district level are also pushing forward the City's advancements on sustainable neighborhoods and open government. Because mid-term successful implementation of the solutions requests of a true agreement by the different stakeholders (citizens, private sector and local authorities), this creates specific steps towards open government, community participation and even shared economy experiences.

WP3 Integrated infrastructures

The SmartTower solution will provide new telecommunication micro-sites, in addition to installing sensors whose data will be gathered for applications such as the air quality simulator.

The API implemented for the Smart Lighting System will allow the lighting management system to communicate with other applications (e.g. traffic management, weather systems). This measure will allow the remote control of the lighting of the Smart Towers, which will improve energy efficiency.

The Multiservice Concentrator (MSC) will collect and upload data from several utility meters (electric, water, possibly gas) and city sensors. The devices will communicate via the LPWA protocol LoRa. It is subject of current discussions to integrate the Lora-Gateway into the Cellnex Smart Towers and upload data with the Cellnex city Wifi. This network is also considered to be used for the transmission of data in other Barcelona measures or to enable third party use as a city service. Utility meter integration can help both users and the companies to improve resource utilization.

The measures that fall under Big Data Management (8.1–8.4) are the enablers for all applications that take advantage of crossing data from different domains (energy, mobility, integrated infrastructures, air quality) and data providers. The potential impact of data

Integration on the city is very significant, as it allows a global understanding of the actual state of things and the implications that changes can have on the rest of the connected urban system. Those applications that will be built on top of the semantic urban model (rather than directly accessing the city data via the GrowSmarter API) will have the additional advantage that they can be fully portable (between cities), assuming that the city has defined the translation between the city model and the concrete local city data. The air quality simulation, an application developed by BSC as part of GrowSmarter, intends to port to the City of Cologne.

WP4 Urban mobility

Sustainable mobility model is a healthy, low-carbon model that prioritises the quality of urban life and collective well-being, as well as the creation of comfortable urban spaces that promote coexistence among citizens.

This desire is expressed in Barcelona's 2013–2018 Urban Mobility Plan through actions aimed at gradually reducing the use of fossil fuels and the environmental impact and health effects of contaminant emissions, i.e., minimising the carbon footprint.

For years, motor vehicle traffic has been the main source of pollution in the city, particularly contaminants such as nitrogen oxides and particulates, as well as being the main source of noise. Promoting alternative energy vehicles, reducing vehicle use, introducing new mobility management technologies and facilitating a transition to more efficient methods are the main strategies that must be applied in order to continue improving the environmental quality of Barcelona and fulfil the objectives established by European legislation.

The mobility measures implemented and measured in Barcelona during the life of the project, will accelerate the validation of new forms of community implication in more sustainable mobility models, such as electric and shared mobility or multi-modal goods' transportation. Through the implementation of sensors at freight tricycles, relevant environmental parameters will be geolocated increasing the knowledge that the city has on the contaminants that are present in much more areas than previously monitored. The implementation of vehicle sensors at taxi stands will help increase the use of parking stations hence reducing the empty cruising for clients.

2. DELIVERABLES

Title, corresponding WP number, the lead beneficiary, the nature of reporting as well as dates for the estimated deliverable and the actual delivery are shown for promised deliverables in the below table. Also, the actual status for the deliverable (June 1st, 2017) is shown.

Del. No	Title	WP No	Lead Beneficiary	Nature	Dissemination	Del. Date	Receipt Date	Status
D1.1	Inception report	WP1	Stockholms Stad	Report	Public	2016-04-30	2017-04-04	Submitted
D1.2	Data management plan	WP1	Stockholms Stad	Report	Public	2015-06-30	2017-04-28	Submitted
D1.3	First technical and management report	WP1	Stockholms Stad	Report	Public	2016-02-29	2016-02-26	Approved
D1.4	Second technical and management report	WP1	Stockholms Stad	Report	Public	2017-06-30		Pending
D1.5	Third technical and management report	WP1	Stockholms Stad	Report	Public	2018-06-30		Pending
D1.6	Final technical report	WP1	Stockholms Stad	Report	Public	2019-12-31		Removed
D1.7	Recommendations for policy makers and practitioners	WP1	Stockholms Stad	Report	Public	2019-11-30		Pending
D2.1	Report on procurement experiences WP2	WP2	Barcelona City	Report	Public	2015-03-31	2015-09-25	Approved
D2.3	Implementation report WP2	WP2	Barcelona City	Report	Public	2018-02-28		Pending
D2.4	Draft concluding report WP2	WP2	Barcelona City	Report	Confidential	2019-02-28		Pending
D2.6	Concluding report WP2	WP2	Barcelona City	Report	Public	2019-10-31		Pending
D3.1	Report on procurement experiences WP3	WP3	Stadt Köln	Report	Public	2015-03-31	2015-09-22	Approved
D3.3	Implementation report WP3	WP3	Stadt Köln	Report	Public	2018-02-28		Pending
D3.4	Draft concluding report WP3	WP3	Stadt Köln	Report	Confidential	2019-02-28		Pending
D3.6	Concluding report WP3	WP3	Stadt Köln	Report	Public	2019-10-31		Pending
D4.1	Report on procurement experiences WP4	WP4	Stockholms Stad	Report	Public	2015-03-31	2015-09-21	Approved
D4.3	Implementation report WP4	WP4	Stockholms Stad	Report	Public	2017-08-31		Pending
D4.4	Draft concluding report WP4	WP4	Stockholms Stad	Report	Confidential	2019-02-28		Pending
D4.6	Concluding Report WP4	WP4	Stockholms Stad	Report	Public	2019-10-31		Pending
D5.1	Evaluation Plan WP5	WP5	KTH	Report	Public	2015-08-31		Submitted
D5.2	Guidelines for monitoring and evaluation	WP5	KTH	Report	Public	2016-06-30	2016-06-13	Approved
D5.3	Draft report on results of technical and social validation	WP5	KTH	ORPD	Public	2018-12-31		Pending
D5.4	Report on results of technical and social validation	WP5	KTH	Report	Public	2019-08-31		Pending
D6.1	Economic evaluation plan WP6	WP6	IESE	Report	Public	2015-08-31	2015-09-23	Approved
D6.2	Lighthouse cities market introduction	WP6	IESE	Report	Public	2017-12-31		Pending
D6.3	Economic validation and assessment	WP6	IESE	Report	Public	2019-01-31		Pending
D6.4	Smart city market introduction	WP6	IESE	Report	Public	2019-09-30		Pending
D7.1	Follower city replication assessments	WP7	ICLEI	Report	Public	2015-06-30	2015-10-05	Approved
D7.2	Updated replication assessments	WP7	ICLEI	Report	Public	2017-06-30		Pending
D7.3	Follower city replication plans	WP7	ICLEI	Report	Public	2019-03-31		Pending

D7.4	Concluding report WP7	WP7	ICLEI	Report	Public	2019-10-31		Pending
D8.1	Project website	WP8	ICLEI	Websites etc.	Public	2015-03-31	2015-09-21	Approved
D8.2	Corporate design	WP8	ICLEI	Other	Public	2015-03-31	2015-10-02	Approved
D8.3	Promotional brochure	WP8	ICLEI	Other	Public	2015-03-31	2016-02-18	Approved
D8.4	Project mailing list/interest group	WP8	ICLEI	Other	Public	2015-03-31	2016-02-18	Approved
D8.5	Electronic project diary	WP8	ICLEI	Other	Confidential	2015-04-30	2015-10-02	Approved
D8.6	Communication and dissemination strategy	WP8	ICLEI	Report	Public	2015-04-30	2015-09-21	Approved
D8.7	European workshops	WP8	ICLEI	Other	Public	2018-12-31		Pending
D8.8	Three study visits in each Lighthouse city	WP8	ICLEI	Other	Public	2018-12-31		Pending
D8.9	Press releases	WP8	ICLEI	Report	Public	2016-12-31	2017-02-28	Submitted
D8.10	Project results brochure	WP8	ICLEI	Report	Public	2019-11-30		Pending
D8.11	Smart cities fact sheets	WP8	ICLEI	Report	Public	2019-10-31		Pending
D9.1	OEI - Requirement No. 11	WP9	Stockholms Stad	Ethics	Confidential	2016-04-30	2016-01-20	Approved
D9.2	POPD - Requirement No. 3	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-06-28	Approved
D9.3	POPD - Requirement No. 7	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-01-20	Approved
D9.4	POPD - Requirement No. 6	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-01-20	Approved
D9.5	POPD - Requirement No. 4	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-01-20	Approved
D9.6	OEI - Requirement No. 10	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-01-20	Approved
D9.7	H - Requirement No. 2	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-01-20	Approved
D9.8	POPD - Requirement No. 5	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-01-20	Approved
D9.9	POPD - Requirement No. 8	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-01-20	Approved
D9.10	OEI - Requirement No. 9	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-01-20	Approved
D9.11	H - Requirement No. 1	WP9	Stockholms Stad	Ethics	Confidential	2015-03-31	2016-01-20	Approved

3. MILESTONES

Title, corresponding WP number, the lead beneficiary, the dates for delivery and the means of verification are shown for promised milestones in the below table. Also, comments to the status of the milestones (June 1st 2017) is shown.

MS No	Title	WP No	Lead Beneficiary	Del. Date	OK	Nature	Comments
MS1	Inception phase completed	WP1	Stockholms Stad	2017-02-01	Yes	Inception report	The Inception phase took longer than predicted due to the need of Amendments to add linked thirds and change of buildings in Barcelona.
MS2	All Smart solutions implemented	WP2	Barcelona City	2018-01-01			
MS3	All Smart solutions implemented	WP3	Stadt Köln	2018-01-01			
MS4	All Smart solutions implemented	WP4	Stockholms Stad	2018-01-01			
MS5	Validation of measures concluded	WP2	Barcelona City	2019-05-01			
MS6	Validation of measures concluded	WP3	Stadt Köln	2019-05-01			
MS7	Validation of measures concluded	WP4	Stockholms Stad	2019-05-01			
MS8	Evaluation finished		KTH	2019-07-01			
MS9	Business cases delivered		IESE	2019-11-01			
MS10	Workshops accomplished		ICLEI	2019-11-01			
MS11	Demonstrations concluded	WP2	Barcelona City	2019-11-01			
MS12	Demonstrations concluded	WP3	Stadt Köln	2019-11-01			
MS13	Demonstrations concluded	WP4	Stockholms Stad	2019-11-01			
MS14	Final reporting		Stockholms Stad	2020-01-01			
MS15	Replication implemented		ICLEI	2020-01-01			

4. CRITICAL IMPLEMENTATION RISKS AND MITIGATION ACTIONS

4.1 Forseen risks

The forseen risks below were identified in table 1.3.5 in Annex 1 Part A of the Grant Agreement.

Risk No	Description of risk	WP No	Proposed risk-mitigation measures
R1	Technical and Administrative coordination: Change of personnel	WP1	A system with open files accessible to all project partners makes it possible for new personnel to continue.
R2	Financial co-ordination: Delays by one partner causes delayed payments	WP1	Coordinator will not wait longer than accepted by Steering group. All partners have high liquidity.
R3	Quality assessment: Lack of skills	WP1	Contract external experts.
R4	Internal project communication: Lack of available relevant information, telecommunication show difficult	WP1	A system with open files accessible to all project partners. Substitute with fewer meetings IRL + telephone conferences.
R5	Local co-ordination: Change of personnel	WP1	Team consists of more persons knowledgeable of the project.
R6	Smart Solutions measures: Measures prove not to achieve the energy savings goals and replication potential as set up by the project and call text.	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8	Carefully selected measures which are 7-9 on TRL, industry partners with capability to serve Europe with measures and cities willing to demonstrate and further replicate the measures.
R7	Conclusions and recommendations: Unable to get credible data from demonstrated measures.	WP2, WP3, WP4	See relevant monitoring tasks in WP 1-4.
R8	Demonstration of smart solution measures fails or are considerable delayed due to local conditions, lack of partners, investment or legal regulation.	WP2, WP3, WP4	Good and stable GrowSmarter consortium with close cooperation between public, commercial and academic sector.
R9	Procurement of industrial partners: Unable to procure supplier due predefined requirements.	WP2, WP3, WP4	Close cooperation with the market sector.
R10	Monitoring: Different methods used to collect data, Not comparable data from year to year and from, Lighthouse cities to Lighthouse cities.	WP2, WP3, WP4	IPMVP protocol principles will be applied to ensure comparability of energy data.
R11	Different cities use different monitoring methodologies and metrics, Incomparable datasets produced, Difficulty in generating relevant monitoring data for projects and underestimation of time required to acquire data.	WP5	A common monitoring protocol will be agreed upon. This will ensure that common and recognised principles will be applied across the demonstration projects to ensure comparability of performance data.
R12	Evaluation of financial models: Contexts might be so different that it is difficult to develop common approaches.	WP6	Literature search to extract information from more or less similar projects and to put the investigated projects into perspective.
R13	National and EU policy and regulatory frameworks: Incomparable data due to different terminology between countries/cities.	WP6	Development of common analytical framework for all countries/cities.
R14	Replication analysis: Unable to get credible data.	WP5, WP6, WP7	See relevant monitoring tasks in WP 2-4.
R15	Follower cities replication: Follower cities do not replicate desired smart solutions.	WP1, WP7, WP8	Involve Follower cities from the start of the deployment of measures and communicate advantages and disadvantages in a transparent manner.
R16	Evaluation coordination: Unable to get credible data, data not comparable.	WP5, WP6, WP8	See relevant monitoring tasks in WP 2-4.
R17	Local and national Replication and Dissemination: Selection of wrong target group - wrong message, Non effective message - contrary result, Lack of interest from the sites.	WP7, WP8	Preparatory study on target group and messages. Keeping right contacts with media. The wrong target group has been identified, find another.
R18	European Replication and Dissemination: Selection of wrong target group - wrong message, Non effective message - contrary result, Lack of interest from the Lighthouse cities and follower cities.	WP7, WP8	Preparatory study on target group and messages. Keeping right contacts with media. The wrong target group has been identified, find another.

4.2 Unforeseen risks

WP6 leader IESE is in charge of the financial and economic evaluation of solutions. During the financial and economic data collection we have encountered some barriers from some partners that are reluctant to share their economic information. The main reason is claiming the need for business secrets to avoid sharing information with competitors outside the project. As a mitigation measure we have informed the project coordinator and the affected partners to solve this situation (See section 4.3).

Risk no	Description of risk	WP no	Proposed risk mitigation measures
R19	A new unforeseen risks is the long time for processing Amendments with the Commission.	All WPs	Closer contact with Project Officer at INEA during Amendments to adjust proposal and process to speed up the approval. This is now working well.
R20	Delay of the building owners in accepting to participate in the project.	WP2	Have alternative options pre-analyzed.
R21	Delay in the signature of agreement for partnerships with more than 2 partners, especially caused by the economical condition of payments to building constructor and the planning of works.	WP2	Have alternative options pre-analyzed.
R22	Barriers from partners reluctant to share their economic information for economic validation claiming the need for business secret to avoid sharing information with competitors outside the project.	WP6	The proposed mitigation measure is to mark this information as “confidential information” in terms of section 10 of the Project Consortium Agreement and in case the barrier persists, an additional non-disclosure agreement with the affected industrial partners could be needed.
R23	Difficulty in evaluation of individual measure due to problems with data collection, (e.g. owners of data not willing to share, problems with measurement methodology, problems with sensors).	WP5	Frequent check of sensors, automatic sanity check of data, personal communication with, motivation, incentivization of data owners.
R24	Difficulty to make the organisation efficient due to large number of participants and risks that work falls between partners or that lack of exchange of experiences	All WPs	Active participation from all partners in General Assemblies, Coordination letters provided to all partners, project place with all documentation, Close cooperation between Coordination, WP leaders and Site managers through Steering group, and frequent local meetings in Sites, and regular cross site telephone meetings in WP2-4, collaboration between WP7 and WP2-6 arranging webinars and present experiences in other occasions as well.
R25	In a project demonstrating new technologies, in many cases not previously demonstrated, there are risks that the budget will need revisions.	All WPs	To ensure that partners are aware of the amount of resources they have available and that they perform the work they are obliged to do the project has introduced the detailed budget as a way of managing these risks. The Coordination team requires assurance from partners, who use large resources that they will carry out all promised work. To ensure resources are distributed to right forms of costs amendments are written so the Grant Agreement corresponds to the most likely use of costs.

4.3 States of the Play for Risk Mitigation

With reference to the foreseen risks (table 1.3.5. in Annex 1 Part A of the Grant Agreement) a number of mitigation efforts have been made to deal with problems that have occurred.

Risk No	Period	Did you apply risk mitigation	Did your risk materialise?	Comments
R6/R8	1	YES	YES	Cologne: Decentralised ventilation system with heat recovery proved not to achieve the energy savings goal and replication potential. However, in relation to the BEST tables, this measure accounts for only a small part of the heat supply. A new BEST table was proposed in Amendment 2 and another one will be proposed in Amendment 6. As much debris as well as bomb-remains from WWII have been found, it is unclear how long the underground construction will take. This may lead to further delays. Amendment 5 speaks to the delays in the third construction phase.
R7	1	YES	YES	Barcelona Energy Advisor (Measure 3.1): Communication of monitored data by the smart meters of Barcelona Municipality with WP3 platform in order to display data of hourly consumption is not possible due to confidentiality issues. To overcome this issue, analysis are being carried out to identify the best aggregation criteria that does not compromise legal confidential issues and provides interesting insights for the evaluation and potential replication.
R7	1	YES	YES	In Cologne, it is not possible to measure hourly electricity and heat consumption on household level. It was decided to expand the project envisaged VPP to a community management system. With this software we are able to measure the heat consumption on an hourly basis for an entire building (but not per tenant). Also, the tenant power consumption ("Mieterstrom") can be represented as the sum of hourly measures for the building. The "Mieterstrom" is our second price model according to the Grant Agreement. We are not able to represent the consumption per household, except in cases of consent by the tenants. Base for the initial situation are the load profiles set by the grid company. These are set for the entire grid territory. Receiving consent by the tenants is currently under way.
R8	1	YES	YES partly	Stockholm: Stockholmshem had not received approval from all the tenants for the refurbishment in time to start refurbishment according to schedule. This risk was identified and informed to the Commission. In January 2016 50% of tenants had approved the refurbishment. This meant that the decision was forwarded to the Rental Board in January. The board made the decision in favor for Stockholmshem and the refurbishment could start in September 2016. The delay only affects the first building to be refurbished. The other buildings will be finalized according to schedule.
R8	1	YES	NO	Cologne: A delay of implementation of the mobility stations occurred due to a legal problem. The ontime implementation to fulfill two years of evaluation is not jeopardized. The City of Cologne and the partners have been working on different solutions for the establishment of mobility stations in the target area which are consistent with the legislation. An exemption was granted for the duration of the project to the private companies by using an "experimental clause" which exists in the present German legislation. This special clause allows the City of Cologne to disregard the normally existing legal limitations. Overall, 9 spots have been located (private land or publically owned land but not designated as an area for public use). A new legislation for the support of E-Mobility (EmoG) was released in Berlin. It supports the dissemination of E-Mobility in Germany. The delay will not affect the finalization of the demonstration site.
R7	1	YES	NO	Measure 5.3 Barcelona. Sensors/Actuators will use the IoT communication protocol LoRaWan. There is a small risk of insufficient network coverage. In this case the data will be uploaded with 3g/4g Modems.
R8	1	YES	YES	Measure 5.3 Barcelona: Due to compatibility and administrative problems it will most like not possible to achieve agreements with Gas Natural to collect gas consumption data.

R8	1	YES	NO	Barcelona: Measure 1 and Measure 6.3: Private parties change their corporate strategy being no longer aligned with Project vision. Ca l'Alier is an example of the public-private partnership that Barcelona Municipality is promoting. At the beginning, the Foundation BIT for the Habitat (Barcelona Innovation Technologies for the Habitat) had agreed a contract with Schneider Electric and Cisco to renovate and operate this old industrial building as their technology innovation and R&D centres. However, due to the change of the private company strategy, a new bidding process was required. This led to a delay in works. Other corporate partners were identified to substitute the non-interested parties thus the final Consortium is formed by Cisco and Municipality of Barcelona. The refurbishment for Ca l'Alier started in June 2016 and will finish later than December 2017. As 2-years monitoring will not be accomplished, Barcelona Municipality offers to include in the project a new extra tertiary building integrally refurbished by Barcelona Municipality which guarantees 2 years monitoring, namely Library Les Corts. As for residential building, a special Taskforce has been designed including refurbishment, governance and engagement experts aiming at increasing the speed of contacts and offers to potential customers as well as the ratio of success concerning residential housing. Works in Big Blue will be finished before December 2017.
R8	1	YES	YES	Barcelona WP4 Measure 12.5: A political review of policies and plans concerning car-sharing has been done. Despite the efforts made by CENIT and the Barcelona city council to try to monitor a car-motorsharing service this has proved to be unfeasible. The city council proposed the Commission to monitor a motorsharing service (which is increasingly available in Mediterranean cities and it is seen an efficient way to use motorbikes). The Commission finally refused this option since it's not included in its priorities. Since there is no commitment by the city council to promote a car-sharing service this measure will not be implemented. Instead, it has been proposed to the Commission to use the available resources (very scarce) to further disseminate the outcomes of the project.
R8	1	YES	NO	Cologne: In order for rents not to rise excessively (social tolerance), Germany has a system called "Mietpreisbremse", meaning "putting a break on rental prices". Additionally, the rise in rent in our project area is limited due to a local legislation to keep the rent and social structure in Mülheim/Stegerwald stable. This is of course a challenge to the business case but it gives a strong social dimension to "SmartCity" and GrowSmarter in Cologne. Therefore, the rent increase will be at a level of approximately 55% (limit is 9.97 Euro per m ²).
R8	1	YES	NO	Cologne WP2: Due to the unforeseen negotiations to fulfill a local legislation (keeping rents and social structure stable), the process regarding the building permit from the City of Cologne was delayed by about 6 months. As a result the procurement and the depreciation of technical equipment have been delayed by six months. The construction of the district heating has been delayed due to the longer permit process as well as due to unforeseen difficulties working the soil (i.e. bomb findings from WWII). As a way of mitigation, RheinEnergie supplied heating containers during the first phase of construction by the Dewog. The PV-systems have been mounted with a delay. The financial repercussions have been examined and solved. The problems that have been caused are sheerly of financial nature as depreciation is delayed. There are no risks for the evaluation phase and the demonstration site was not affected.
R8	1	YES	NO	Stockholm: The need for external involvement of sub-supplier in Measure 10.4 has changed the expected progress.
R10	1	YES	NO	Cologne: Unless the tenant agrees to an hourly measure in writing, in Germany the energy consumption for heat and electricity can only be measured at a yearly term according to existing regulations. The result of that is that we cannot evaluate peak loads. We need voluntary tenants who agree to an hourly measurement of their electricity consumption if they get the SmartHome application. The conversation with the tenants has started. It is currently in discussion whether AGT will receive access to this data. With our VPP (Siedlungsmanagement) we are able to measure the hourly heat consumption for an entire building. This enables us to develop peak loads for entire buildings. The Baseline is going to be evaluated on the basis of a "standard profile". Through this solution the evaluation will not be affected. RheinEnergie is the plant operator and will therefore take over the monitoring for Dewog. Charging from the grid is possible but feeding back into it is not. The installation of the heat pumps has been moved from moved from DEWOG to RheinEnergie.

New risk R19	1	NO	YES	A new unforeseen risks is the long time for processing Amendments with the Commission. Stockholm: The approval of Fortum Värme and Fortum Markets as Linked Third Party to Fortum Power and Heat was approved by EU on December 17th, 2015, valid retroactively from 15th of June 2015. The uncertainty if this approval would be made, delayed some activities, such as the implementation of the Charge and Drive Fast Charger and also in the area of Open District Heating. Though, there are no delays from original schedule point of view due to this.
New risk R20	2	NO	YES	Barcelona: A first technical and economical offer has been presented in September to the Catalonia hotel chain and the negotiation with the property lasted from September 2015 to May 2016. It has not yet been possible to receive a response from the property. During 2016 different alternatives have been analyzed and two offers for agreement were presented to 3 hotels in Barcelona (hotel Condestable, hotel Gótico and hotel H10). Finally, H10 hotel signed the agreement and the planning satisfies the requirements of the project for the minimum monitoring time.
New risk R21	2	NO	YES	Barcelona: negotiation activities for creating the partnership for Lope de Vega refurbishment started in the first semester of 2016. In Lope de Vega Street different blocks with the same constructive characteristics and dimensions exists: 4-5 months of negotiation activities were required to negotiate the participation with different blocks' owners and at the end one block accepted to participate. During this period an intense activity of collaboration with architect and public entity (Paisatge Urbà) have been carried out, in order to advance and solve previously all the architectural aspects of the project. After the signature of the convenium between the partners, the signature of the contract with conditions of payments, timings and works has caused delays, due to the need of private partners to specify detailed conditions. Every change in the contract required a new signature by the partners and a legal revision by public and private ones.
R8	1	YES	NO	Measure 11.1 Barcelona: Problems with the legalization of PV-Panels and therefore maybe not being able to use the full extent of the available renewable energy. (PV-Panels out of original project scope)
R7	1	YES	NO	Measure 11.1 Barcelona: PV-Panels might not meet the expectations which would imply less generated renewable Energy and therefore worse results in the Evaluation of the Measure (PV-Panels out of original project scope).
New risk R22	2	YES	YES	Some partners are reluctant to share their economic information to avoid the risk of sharing information with competitors outside the project. This situation has been informed and is being managed with the project coordinator. The proposed mitigation measure is to mark this information as "confidential information" in terms of section 10 of the Project Consortium Agreement and in case the barrier persists, an additional non-disclosure agreement with the affected industrial partners could be needed.
New risk R25	1 and 2	YES	NO	Several amendments has been approved by the commission and in the first Periodic report the partners who had used a large amount of resources signed letters assuring they will be able to participate actively in the project throughout the project.
R5	1 and 2	Yes	Yes	In the City of Barcelona the Site manager has changed several times, but with the mitigation measure with a local team consisting of several persons, knowledgeable of the project these changes has been without complications.

5. DISSEMINATION AND EXPLOITATION OF RESULTS

5.1 Dissemination and communication activities

In the following tables the number of activities performed by all partners from July 2016 to June 2017 and the number of persons reached during these activities is presented.

Type of dissemination and communication activities	Number
Organisation of a conference	8
Organisation of a workshop	13
Press release	2
Non-scientific and non-peer reviewed publications (popularised publications)	84
Exhibition	20
Flyers training	0
Social media	236
Web-site	30
Communication campaign (e.g. radio, TV)	0
Participation to a conference	49
Participation to a workshop	20
Participation to an event other than a conference or workshop	0
Video/film	3
Brokerage event	1
Pitch event	0
Trade fair	5
Participation in activities organised jointly with other H2020 project(s)	3
Other	

Type of audience reached in the context of all dissemination & communication activities ('multiple choices' is possible)	Estimated no of potential persons reached
Scientific community (higher education, research)	> 220000
Industry	> 220000
Civil society	> 270000
General public	> 150000
Policy makers	> 100000
Medias	> 110000
Investors	> 110000
Customers	> 700000
Other	> 300000

5.2 Intellectual property rights

The Cologne's OpenData in WP3 are published under CC BY 3.0 DE. We also gather data only for internal use because of legal restrictions. This information won't be published on the OpenData Platform but will be used for evaluation and controlling purposes.

5.3 Innovation

The project leads to the inclusion of a range of activities within the project:

Activities developed within the project	Number
Prototypes	4 + 1 (Stockholm)
Testing activities (feasibility/demo)	5
Clinical trials	0

The project should lead to launching new products, new processes and new methods into the market (several possible):

WP no		
	New products (good or service)	Yes
WP2	Holistic settlement energy management (Siedlungsmanagement)	
	Smart energy solution for tenants	
WP3	Probably	
WP4	Mobility stations + GrowSmarter travel app (CERO Challenge)	
	New processes	No
WP3	New methods	Yes

A number of private companies are introducing or are planning to introduce innovations (within the project lifetime or 3 years thereafter):

	No of companies	No of SMEs
Prototype companies introducing innovation(s) new to the market	4	3
Companies introducing innovation(s) new to the company	2	2

5.4 Impact on partners

One of the goals is 1500 jobs created through the smart solutions, therefore we are collecting the numbers of employees by the partners in the table below as well as the estimated number in ten years.

Partner	No of employees involved in GrowSmarter	New employees employed thanks to the project?	No of new employees working with the smart solutions 2015–2019?	No of new employees working with the smart solutions in 10 years?
City of Stockholm	17	0	5	100
Stockholmskem	19	0	5	2
City of Cologne	17	3	16	33
Urban Institute	4	0	0	6
KVB	1	0	3	4
City of Barcelona	8	0	0	0
ICLEI	12	0	0	0
KTH	9	0	0	0
IESE	6	3	5	0
City of GRAZ	1	0	0	2
City of Suceava	7	0	19	26
TRANSPORT IN MALTA	2	0	0	0
City of PORTO	5	1	3	10
CORK CITY COUNCIL	6	0	5	10
REC	6	0	0	0
ENVAC AB	6	0	0	2
Veolia SVERIGE	2	1	10	25
Veolia Nordic	2			
FORTUM POWER AND HEAT AB	3	0	0	0
Fortum Markets	3	0	0	Charge and Drive: 50. Active House: 10.
Fortum Värme	4	0	0	5 in Fortum Värme. Up to 100 in Stockholm region
CARRIER TRANSPORT AB	4	0	5	3
SKANSKA SVERIGE AB	30	0	5	20
Tingcore	3	0	5	10
INSERO E-MOBILITY AS	5	0	0	0
EFW institute	1	0	0	0
RHEINENERGIE	15	0	1	?
AMPIDO GMBH	11	5	2	2
Cambio	6	1	2	6
AGT GROUP (R&D) GMBH	2	0	2	6
DEWOG	7	0	0	0
RETEVISION I, S.A.	20	0	1	5
ANTEVERTI CONSULTING	4	1	0	0
BARCELONA SUPER-COMPUTING CENTER	5	0	0	5
Cenit	4	1	2	3
GAS NATURAL SDG SA	7	2	3	5
Gas Natural servicios	8	1	35	255
Gas Natural Fenosa Engineering	11	0	7	25

Gas natural informatica	8	1	15	15
I2CAT	4	0	2	10
IREC	9	1	2	4
SCHNEIDER ELECTRIC	4	1		
URBISUP CONSULTING SL	2	1	0	0
POLIS	1	0	0	0
IBM	10	0	0	0
ENDESA ENERGIA S.A.	5	0	2	Not yet known
Endesa Distribution	6	0	2	Not yet known

5.5 Open Research Data

STOCKHOLM

The intentions are to make statistical data (measure 10.3 and Measure 10.5) available for partners in the GrowSmarter project. KTH has defined how this data is made available in the Data Management Plan.

COLOGNE

The “Strategic Traffic Management” data provides information about the street utilization of Cologne, such as the number of cars in the streets and their speed. The “Environment” data is delivered by various environment sensors like pollution, temperature, noise and brightness. It is planned to install and integrate more environment sensors and afterwards the data will be provided as open data. Next to the data integrated in the GrowSmarter Project, 168 data sources are already available on the open data platform of the City of Cologne <http://www.offenedaten-koeln.de/dataset>

In the document “Architecture of the GrowSmarter–Cologne data management”, about 25 additional data types are listed and described. We are currently evaluating the data to figure out which data should and can be integrated next. The goal is to integrate as much data as possible. The meta-data (i.e. the Urban model for the city of Barcelona) will be openly available.

BARCELONA

Barcelona proposes a data integration platform, which will aggregate information in a City Datawarehouse, that supports third party applications exploiting the raw and rich data. The data integration platform will be composed by a set of functional modules, with the aim to establish a standard path from diverse data sources (data coming from many different heterogeneous sources, like city data sensors, mobile devices and other types of resources) to any data consumer system. New services can connect to energy consumption in residential buildings where residents may be informed about their current and historical energy consumption and with the help of that information decrease it.

Barcelona will then manage environmental impact and other evaluation metrics more efficiently but also will provide new generation policies as well as accelerate innovation of

new services based on the open and available data. This platform also will form a base for dialogue with citizens and the business community by means of a more transparent management.

5.6 Gender

Gender is important and the table below shows the number of female and male participants in GrowSmarter. Participants are defined as people actively participating and paid by the EU project.

Beneficiaries	No F including third parties	No M including third parties	Total including third parties
City of Stockholm	4	4	8
City of Stockholm/FSK	2	10	12
Stockholmskem	6	11	17
City of Cologne	6	11	17
Urban Institute	0	4	4
KVB	0	1	1
City of Barcelona	2	6	8
ICLEI	4	8	12
KTH	3	6	9
IESE	1	5	6
City of GRAZ	0	1	1
City of Suceava	4	3	7
TRANSPORT IN MALTA	1	1	2
City of PORTO	3	3	6
CORK CITY COUNCIL	2	5	7
REC	2	4	6
ENVAC AB	1	5	6
Veolia SVERIGE	0	3	3
Veolia Nordic	0	2	2
FORTUM POWER & HEAT	1	2	3
Fortum Markets	0	3	3
Fortum Värme	1	3	4
CARRIER	2	0	2
SKANSKA SVERIGE AB	15	50	65
Tingcore	2	1	3
INSERO E-MOBILITY AS	2	3	5
EFW institute	0	1	1
RHEINENERGIE	6	9	15
AMPIDO GMBH	3	8	11
Cambio	4	4	8
AGT GROUP (R&D) GMBH	0	1	1
DEWOG	2	5	7

RETEVISION I, S.A.	3	17	20
ANTEVERTI CONSULTING	3	1	4
BARCELONA SUPERCOMPUTING CENTER	2	3	5
Cenit	1	3	4
GAS NATURAL SDG SA	5	3	8
Gas Natural servicios	4	7	11
Gas Natural Fenosa Engineering	2	6	8
Gas natural informatica	1	2	3
I2CAT	2	2	4
IREC	5	4	9
SCHNEIDER ELECTRIC	2	2	4
URBISUP CONSULTING SL	1	1	2
POLIS	1	0	1
IBM	1	9	10
ENDESA ENERGIA S.A.	2	3	5
Endesa Distribution	3	3	6
TOTAL	114	249	363

Project⁹ Number: 646456

Project Acronym: GrowSmarter

Project title: GrowSmarter

Second Technical Report Part B

Period covered by the report: from 01012015 to 31122015

⁹ The term ‘project’ used in this template equates to an ‘action’ in certain other Horizon 2020 documentation

6. EXPLANATION OF WORK AND OVERVIEW OF THE PROGRESS

6.1 Objectives

The scope of the GrowSmarter project is to:

- demonstrate and validate 12 economically- end environmentally sustainable integrated smart solutions in the three light house cities;
- integrate cities, industries and academia in transforming the smart solutions into business models to be rolled out to Europe;
- improve the quality of life for European citizens, reduce environmental Impact and create sustainable economic development.

The third part of the scope described in Part B in the Grant Agreement was discussed at evaluation workshops in the three sites in the beginning of the project. The content and the measures contributing were defined as described below:

1) GrowSmarter improves the quality of life for European citizens by

- **Better options and access for urban transport**
Specification: timesaving, reliable, flexible, convenient, space saving, change of mobility behaviour, economic both maintenance and investment, plan able, foreseen
Contributing measures: 2.1, 4.1, 5.2, 7.2, 8.1, 8.2, 8.3, 8.4, 9.2, 10.1, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6
- **Better deliveries of goods**
Specification: timesaving, reliable, flexible, convenient, space saving, less noise
Contributing measures: 2.1, 7.2, 8.1, 8.2, 8.3, 8.4, 8.5, 9.1, 9.2, 11.3, 12.3, 12.4
- **Better waste handling**
Specification: less noise, better quality of the fractions, timesaving, reliable, convenient, flexible, space saving, accessible, hygienic
Contributing measures: 2.1, 7.1, 7.2, 7.3, 8.4
- **Cost efficient refurbishment (100,000 m²)**
Specification: economic, comfortable, better indoor climate, tools to control the consumption, more information about the options, energy production and energy use and mobility solutions to improve environmental behaviour, increased value of the neighbourhood and the building itself
Contributing measures: 1.1, 3.1, 4.1, 5.3, 8.1, 8.2, 8.3, 8.4
- **Improvement in street environment**
Specification: safety, enjoyable, less noise, reduce pollution, space saving, shift of users, access able, recreation, service

Contributing measures: 1.1, 3.1, 5.1, 5.2, 6.1, 7.1, 7.2, 8.1, 8.4, 9.2, 10.1, 10.3, 11.3, 11.4, 12.1, 12.2, 12.5, 12.6

- **Lower energy costs**

Specification: transport, refurbishment, economic, better conscious

Contributing measures: 1.1, 2.2, 3.1, 4.1, 4.2, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 8.1, 8.2, 8.3, 8.4, 9.2, 12.6

- **Increased job creation**

Specification: economic and social benefit, inspire more refurbishments and other measures) (general persons working on the implementation, new jobs in the future, new businesses, new skills needed, short and long run

Contributing measures: 1.1, 2.1, 3.1, 6.1, 8.1, 8.2, 8.3, 8.4, 9.1, 9.2, 11.3

- **Citizens participation**

Specification: information, interaction and engagement, inclusion, resource efficiency, control of the planning, ownership, innovation, local expertise, speed up processes, cost efficient, measure to reach targets, transparent

Contributing measures: 1.1, 3.1, 4.1, 4.2, 8.1, 8.2, 8.3, 8.4, 11.1, 12.5, 12.6

2) **GrowSmarter reduces environmental impact by**

- **Reducing the need for energy**

Specification: cost efficient, LCC, payback time of ten years? for the whole package in the building, also the measures outside the building and if the measures were done in the whole district.

Contributing measures: 1.1, 3.1, 4.1, 4.2, 5.1, 5.3, 6.1, 6.2, 6.3, 8.1, 8.2, 8.3, 8.4, 9.2, 11.1, 11.3, 12.1, 12.3, 12.4, 12.5, 12.6

- **Reducing the greenhouse gas emissions from energy use and increasing use of renewable energy**

Specification: contribution from both the energy saving and the renewable energy, PV, green fuel, and use of waste heat, CNG, biogas

Contributing measures: 1.1, 3.1, 4.1, 4.2, 5.1, 6.1, 6.2, 8.1, 8.2, 8.3, 9.2, 11.1, 11.2, 11.3, 11.4, 12.1, 12.3, 12.4

- **Reducing the emissions of transports**

Specification: reducing car transportation, electric cars, electric taxi, green fueled cars, gps, choose the right size of cars, reservation of parking lots, Logistics, change of transport for deliveries, model shift

Contributing measures: 2.1, 7.1, 7.2, 8.4, 9.1, 9.2, 10.1, 10.3, 10.4, 10.5, 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6

3) **GrowSmarter creates sustainable economic development by**

- **Increased cost efficiency by lowering the combined capital and operational cost.**

Specification: reducing costs for energy, reducing costs for maintenance, investment, depreciation period, interest rate, in the perspective of the private company, the customer and the society– health, environmental and other benefits, reduction of energy dependence

Contributing measures: 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 6.3, 7.2, 8.1, 8.2, 8.3, 8.4, 10.3, 12.1, 12.3, 12.4

- **Increasing economic growth**

Specification: locally, regionally, nationally, internationally) (for the industrial partners involved

Contributing measures: 1.1, 2.1, 3.1, 5.1, 6.1, 6.2, 6.3, 7.1, 8.4, 9.1, 9.2, 11.4, 11.5, 12.3, 12.4

6.2 Explanation of work carried out per WP

WP1 Coordination

The Coordination team in the City of Stockholm completed the process of developing the Grant Agreement and the Consortium Agreement, which unfortunately meant one of the partners Philips had to leave the project as they could not agree with the compromises concerning the results from the project. This was quickly solved by replacing their measure responsibilities by the partner Retevision.

The organisation of the project was described in the Consortium Agreement. All partners participate in the General Assembly where decisions are taken on project content, finances and evolution of the consortium. The first General Assembly was arranged in Stockholm in February 2015 in connection with the Kick-off meeting. The coordination informed all partners about the financial rules and the time schedule for the project. The second General Assembly was in Cologne in June 2015, the third was held in Barcelona in June 2016 and the fourth in Cork June 2017. At these General Assemblies there has been a formal decision process on deliverables, WP meetings where the measures have been discussed in detail and study visits. In Cork, a workshop on business models was arranged by IESE to discuss the deliverable D6.2 Lighthouse cities market introduction

The Steering group consists of all WP leaders and site managers and is responsible for preparing the General Assembly meetings and the execution, implementation and monitoring of the project. Twenty steering group meetings were held up to June 2017.

The Steering Group has worked hard on solving upcoming issues about delayed buildings and possibility to monitor the buildings for at least two years. In Amendment 5 a new time schedule was approved including delays in Cologne and Barcelona where a new building was added to be able to evaluate all measures. Exchange of buildings was also done in Stockholm

and Barcelona. All buildings are approved and almost all measures will be monitored for two years.

The Inception phase resulted in the need for amendments mainly due to buildings and addition of linked third parties. Other changes are budget transfers, addition of new cost forms and categories, new subcontractors, a few minor revisions of task descriptions, and changes to the deliverables. Other amendments done are:

- Addition of the organisation with a General Assembly as the decision body;
- Clarification of responsibilities for each measure;
- More detailed information and sometimes corrections to clarify the measure including the changes for the buildings in Barcelona;
- Adding the new linked third parties that are necessary for the partners as they are dealing with parts of the implementation of the measures;
- Organizational changes within ENDESA resulted in ENDESA SA leaving the consortium, replaced by ENDESA ENERGIA SA and then they were replaced by Endesa Distribution;
- New subcontractors;
- Budget transfers;
- Replacement of the measure 12.5 regarding vehicle sharing in Barcelona.

In the Sites in Stockholm, Barcelona and Cologne regular meetings are held to follow-up on the implementation of the measures in each Lighthouse city. In addition the WP2–4 leaders have regular meetings in the respective topic Low energy districts, Integrated infrastructure and Urban mobility. In those meetings the measures are followed up and knowledge and experiences in the cities are exchanged. They also initiate webinars when interesting topics are found.

The Coordination team has established contact and initiated cooperation with the other Lighthouse projects. All projects were invited to Stockholm and participated in a common stand, in a breakfast meeting and Smart City session. Together with Triangulum, GrowSmarter developed a multitouch screen where all smart solutions were described in all Lighthouse cities. The multitouch screen was originally part of the stand in Stockholm but was also introduced at the Barcelona Expo and Cologne Smart City conference/study visit as well as at the General Assembly in Cork.

WP2 Low energy districts

Smart solution 1: Efficient and smart climate shell refurbishment

Demonstration of combining shell thermal envelope/refurbishment measures such as wall/floor, attics and roofs with energy efficient measure such as windows with low U-values, heat recuperation from ventilation and sewage, air tightness and technical insulation. This will drastically reduce the net energy demand for all buildings. GrowSmarter will act as a

showcase for the following technical and practice innovations that save energy and improve living conditions for the tenants

Measure 1.1 Energy efficient refurbishment of the building

Involved partners: Skanska, Stockholmshem, Gas Natural, IREC, Veolia, DEWOG, Stockholm, Barcelona

STOCKHOLM

Valla Torg (29,757 m² – savings 3,455,000 kWh/yr)

Results: Construction work has been on-going in Valla Torg 89 since August 2016. The indoor demolishing that was required for the refurbishment and for all the new installations is finished. The rebuilt walls are up and most of the new electrical installations are now in place and can be put to use when the sub stations arrive. The new elevators are being installed.

The new water system is nearly completed and about half of the radiators and heating pipes are installed. The additional insulation to the facade, the new roof and the new fan room is finalized and the fan units will soon be installed. PV-cells are being installed. New painting, new floors, kitchens, tiling bathrooms, etc is underway. Many of the activities are in the same phase in Sandfjärdsgatan 91–101, but the new roof is still under construction and insulation will be added soon.



Facade insulation of low story building in Valla Torg

The drilling for geothermal heating is finished for Valla Torg 81. Indoor demolishing and other preparations for new installations are on-going. Work for the automated vacuum waste collection system is on-going.

Work is going well, but Skanska has experienced some obstacles they have had to tackle. Among other things, analysis indicated moisture in the floor fillings and in the concrete beneath, in the apartments. The cold weather conditions have made it difficult to dry it. This added a lot of work for the project and stopped other activities for a period of time.

Veolia as responsible for „Energy Quality Assurance“ has checked and noticed that the project leaders in Valla Torg have necessary competence within the project organisations to assure focus on energy in every step. The selected products and technical solutions have been decided by the project leaders after separate investigations and in comparison with alternatives and are in line with the overall targets.



Finalised facade in high storey building in Valla Torg

Time schedule: The activity in Valla Torg 89 and Sandfjärdsgatan 97–101 (first half of building 8) is about one month behind the time schedule but Skanska is determined and confident that they will finalize it in time.

Next step: Preparation is made in order to install adaptive control system and indoor temperature meters when buildings are completed.

Risks: No risks are foreseen.

Slakthusarea (4,105 m² – savings 643,000 kWh/yr)

Results: The procurement for Tarmrenseriet is completed and a contractor is hired. Preparatory demolitions are completed. Production documents have been produced and remodeling works are ongoing.

Veolia as responsible for „Energy Quality Assurance“ has checked and noticed that the Project leaders in the Slakthusarea have the necessary competence within the project organisations to assure focus on energy in every step. The selected products and technical solutions have been decided by the project leaders after separate investigations and in comparison with alternatives and are in line with the overall targets.

Next step: Since the building is listed as culturally and historically valuable, new windows can't be installed without changing the original architecture. An extra internal window with low U-value will be installed instead. New energy efficient insulation is being used in insulation of the attic. Insulation of the exterior walls must be eliminated due to constructional constraints since insulation would mean risks for freezing damages on the outer brick layer of the wall. Since the building is listed a preservation of all original layers are desirable and due to this an insulation of the ground outside the building will be installed instead of groundfloor insulation.

The investigation of using waste heat from a nearby sportsarena is showing economic difficulties due to the new layout of the pipes because of the demands of cityplanning. This measure will not be possible to fulfill, but discussions with Fortum are on-going for the possibility of using the existing district heating system recovering heat from a nearby server hall. Indoor temperature sensors will give feedback to the heating/cooling and ventilation control system. The ventilation system will have efficient heat recovery. Excess heat from the kitchen will be used to heat hot water. The air tightness in the buildings will be tested in order to secure the quality of measures according to the climate shield. Integrated photovoltaics in the glass of the skylight will be installed. The photovoltaics are connected to battery storage. Energy saving LED lighting will be installed. Preparation is made in order to install adaptive control system and indoor temperature meters when the building is completed.

Kylhuset is a project approved by the Commission in Amendment 5 and the refurbishment will start during summer 2017.

Time schedule: The work with refurbishment is going according to the plan.

Risks: The short time schedule for refurbishment of Kylhuset can be a risk, but preparations have started to facilitate a quick process.

Brf Årstakrönet (4,950 – savings 161,400 kWh/yr)

Results: Veolia has provided an adaptive technology for a central control system for heating. Temperature sensors inside the building in a number of apartments and a traditional outdoor sensor uses weather forecasting. The system generates a more stable indoor temperature and benefit better from internal loads and heating from the sun. The energy savings of this solution has been 10–15%. The installation of adaptive control system, temperature sensors and PV cells are all installed according to plan. Thermography of selected apartments is made. Connection to Energy Saving Center is made and the monitoring is ongoing.

Next step: Evaluation will be performed.

Time schedule: All measures are installed according to the plan.

Risks: No risks are foreseen.

COLOGNE

Stegerwaldsiedlung (33,529 m² – total savings 4,288,007.50 kWh/yr)

Results: The scaffolding for phase 2 is up and Dewog has completed the first phase of the refurbishment in the project area. The second phase is under construction. Dewog is insulating the building envelope, basement ceilings and roofs as well as introducing the triple glazed windows in some buildings. Additional insulation in partly insulated buildings has been checked and was deemed as economically not feasible. The same applies for the decentralized ventilation system with heat-recovery, both measures do not provide enough impact (in relation to the BEST tables, this measure accounts for only a small part of the heat supply, please also refer Part A 4.2 Foreseen Risks R6 & R8). The stairway lighting in all renovated buildings is replaced with efficient LED lighting and energy efficient elevators are being installed. The communication between industrial partners and the tenants is on-going in order to provide the possibility of cocreation with the tenants.

Next step: Finalization and implementation of phases 2 and 3.

Time schedule: As documented in the Amendment 5, some of the phase 3 buildings will not be completed by december 2017. One building will not have district heating or heat pumps. A new BEST table is completed and will be proposed to the Commission after summer 2017.

Risks: The changes of this one building is not yet approved but could be a useful object for comparison, which is why we would like to keep it in the project.

BARCELONA

Tertiary buildings by Municipality, Ca l’Alier (2,400 m² – savings 289,200 kWh/yr)

Results: The Barcelona municipality has started the renovation of Ca l’Alier. Works have already been awarded (ELEC NOR and VOPI-4) and are on-going. Foundation works started in June 2016 and finished in April 2017 due to delays caused by technical reasons. Refurbishment works started in April 2017. The old textile industry will be re-built into a nearly net zero energy office building including a range of passive and active measures. Currently, refurbishment works are focused on the basement and paving and underground sewage networks.

Next Steps: The refurbishment works deployment will keep ongoing throughout 2017 and part of 2018. Construction of baseline by IREC is expected to be accomplished during 2017. Definition of communications between Ca l’Alier’s monitored data and WP3 platform will be done when first monitored data are available. The communication chain between Barcelona municipality platform and Cellnex has already been tested for the residential building in Passeig Santa Coloma. Communications are expected to be ready before completion of the works next year in order to promptly start the evaluation period.

Time Schedule: Works are scheduled to be finished by mid-2018.

Risks: Works will not be finished by December 2017 thus 2-years monitoring will not be possible for this building. A contingency plan has been approved by the EC and it justifies that 1year monitoring is of good value and adds an extra tertiary building retrofitted by Barcelona municipality in the evaluation plan. This building, namely Library Les Corts, will complete the retrofitting works in summer 2017 and start functioning in September-October 2017, thus 2-years monitoring is guaranteed. The actions done in Library Les Corts include improvement on facade, roof and ground floor insulation, glazing, building energy management system, PV installation and efficient radiant floor system for heating and cooling.

Residential buildings by Municipality, Big Blue (14,165 m² – savings 412,200 kWh/yr)

Results: The Barcelona municipality has started the renovation of Big Blue (14,200m² social housing) replacing the original proposal of Escocesa building (1,200m³ of residential and 6,450m² of tertiary). It was included in the Amendment 1 and accepted by the EU. The contractor is on-board from September 2016 (Constructions CONSTRAULA S.A) and work has already started in January 2017 (facade retrofitting + blinds replacement). The current work is focused on:

- Setting up of baseline methodology: analysis of answers from the survey campaign done in February 2017 with volunteer neighbours as well as the data from collected invoices; monitoring campaign by IREC of 20+ dwellings (temperature, humidity and CO₂ concentration monitoring) for baseline construction of indoor thermal comfort;
- Interaction with WP3 Platform and Schenider Electric platform (Resource Advisor, Measure 4.2) in order to establish the protocols required for an efficient communication of data: communication chain in operation and receiving real-time data of monitoring system of solar thermal system and 4 monitored dwellings.

Next Steps: Construction of baseline by continuing the analysis of collected baseline data and analyse monitored data sent to WP3 platform.

Time Schedule: Retrofitting work is scheduled to finish after the summer 2017.

Risks: No risks are foreseen.

Tertiary buildings by GNF

Results: Tertiary buildings that will participate in GrowSmarter have been selected and contracts have been signed. As explained in the previous technical report, the educative centre as well as the sports centre have already accepted the participation in the project and, therefore, work has been focused on signing the contract as well as the preparation of the procurement process and the start of the refurbishment work. In the case of the hotel Catalonia the owner was finally rejected participation in the project. Three different new alternatives were evaluated, hotel Condestable, hotel Gótico and hotel H10. Hotel H10 was selected, since the measures to be implemented, hotel characteristics and planning affection

perspective were the most similar to the initial proposal. The contract was signed in February 2017 and the procurement process for the selection of the subcontractor has been finalized.

Hotel H10 Catedral (4,100 m² – savings 576,215 kWh/yr)

Result: During this reporting period the following main works have been performed: Three technical new alternatives have been evaluated, carrying out the energy audits and presenting an economical proposal for participation in the project. The contract has been negotiated and signed with H10 hotel owners. Final contract was signed in February 2017. The procurement process by GNF for subcontracting has been finished. Preparatory works in the building for installing the VRV air-conditioning system has already started, with the aim of starting works at the end of May.

Next step: Passive measures are planned. The roof insulation begins by the end of May 2017 and the installation of the new windows during the summer 2017.

Time schedule: All works will be completed by December 2017.

Risks: Finalization of minor works (e.g. furniture) could delay the opening of the hotel and works carried out by the hotel could have unexpected complications with impact in the GrowSmarter scope implementation. No conflict is expected between the different scopes. Coordination meetings are taken place periodically to monitor this risk and define mitigation actions, if required.

Sports Centre: CEM Claror Cartagena. (2,993 m² – savings 1,268,433.4 kWh/yr)

Results: During the third and fourth quarter of 2016, a detailed energy audit has been carried out, with the aim of defining the details of the final measures to be implemented for signing an EPC contract (with guaranteed energy savings) as well as to develop the technical specification for the procurement process. In November 2016 the procurement process was launched and the subcontractor was awarded at the end of December 2016. The subcontractor finished the executive project in March 2017 and at the end of March, the work already started. Currently, most of the lamp posts are replaced and the insulation works in the swimming pools roof was finished. Moreover, the baseline scenario definition for the Technical Evaluation Plan has started. New meters have been installed and monitored for calculating the energy demands by sub-systems as well as the equipment performances. Furthermore, a specific measure campaign for the lighting system was performed during February and March 2017. BEMS screens for presenting the information to the final user have been defined.

Next step: Thermal systems replacement and lighting equipment replacement.

Time schedule: Work started in March 2017 and will be finished by October 2017.

Risks: Low risk of delay in delivery of equipment, as orders was planned with sufficient time in advance.

Education Centre: Escola Sert (3,427 m² – savings 75,051.3 kWh/yr)

Result: During this period, the final contract with the educative centre has been negotiated and signed. GNF has also negotiated the final conditions and signed the contract with the subcontractor responsible of supplying the photovoltaics. Furthermore, the legalization process for the PV has already started.

Regarding the Technical Evaluation Plan, electric meters have been installed for defining the baseline scenario. BEMS screens for presenting the information to the final user have been defined.

Next step: Finishing works of passive measures and licencing the PV plant.

Time schedule: Work started in April 2017 and will be finished by December 2017.

Risks: Low risk of delay in PV plant licensing and low risk that work carried out by the educative centre could have unexpected complications with impact in PV implementation. No conflict is expected between the different scopes. Coordination meetings are taken place periodically to monitor this risk and define mitigation actions, if required.

Residential buildings by GNF

Results: As it was explained in detail in the First Technical report of the project, the activity of the Task Force created by Gas Natural Fenosa, the collaboration of COAC (Catalan Architecture Official College) and of public administration (AHC–Agència de l’Habitatge de Catalunya and CHB – Consorci de l’Habitatge de Barcelona), allowed to achieve the required residential m² for the refurbishment during the first semester of 2016 and to start projects of public–private partnership. During the second semester of 2016, refurbishment works and first monitoring activities started in 2 buildings (Canyelles and Melon District), while tasks for starting implementation in time have been carried out for Ter 31 and Lope de Vega 111. During the first trimester of 2017 refurbishment works started in Ter 31 and finished in Canyelles and Melon District. During these months, the main activities of Gas Natural Fenosa have had these objectives:

- implementation of evaluation activities, according to the works specificities and adapting the required method to each individual case and possibilities;
- management of works in order to satisfy required timings and the quality of evaluation;
- management of negotiation agreements for Lope de Vega 111 in order to satisfy the required timings.

In all the buildings the minimum of two years of monitoring is guaranteed.

Canyelles – tower A16 (5,180 m² – savings 147,630 kWh/yr)

Results: In order to fulfill the refurbishment of this building, a public–private partnership has been signed between GNF and AHC (Agència de l’Habitatge de Catalunya). AHC is the promoter of the building refurbishment plan of Canyelles district from 2007. During the first reporting period, many steps have been done such as the formalization of the compatibility of

financial aid from Barcelona City and GrowSmarter, the participatory process with the neighbours of six towers, the selection of tower A16, the planning of works, the surveys for M&V process and infiltration test in six buildings. During the second reporting period the following was done:

- The participation of 79% (45/57) of owners was reached for the change of windows and shutters (5% higher than the previous version of the Best Table),
- New boilers were installed for 32% (19/57) owners (7% higher than the previous version of the Best Table)
- HEMS have been installed in 23% (13/57) of dwellings before works (M19), reaching 35% (20/57) after the start of works (by the end of M26)
- Infiltration tests have been done before and after works in 14% (8/57) dwellings, coupled with thermal imaging in some representative cases
- Participatory process with the neighbours is still on-going to help them to use the Home Energy Management System (HEMS).

Next step: Evaluation activities are to take place.

Time schedule: Work will finish in M28.

Risks: No risks are foreseen.

Ter, 31 (393 m² – savings 5,816.4 kWh/yr)

Results: This building has an 80% unique owner, why it has been simpler to manage the signature of the contract. The signature of the contract had some delay (M22) due to the fact that one owner started a process of selling a dwelling. Due to this delay and to a structural problem that appeared in balconies at the beginning of refurbishment works, proper works of energy refurbishment started in M27 and are planned to finish by the end of M31. Despite of this delay, the minimum of 2 years of monitoring after the end of the work is still widely guaranteed. During the second reporting period this happened:

- Refurbishment work started;
- HEMS have been installed in 17% (1/6) of dwellings before works (M26), and they will reach 50% (3/6) by the end of works;
- Infiltration tests have been done before works in 50% (3/6) of dwellings, coupled with thermal imaging in representative zones, and they will be repeated after the end of the works;
- Participatory process with the neighbours is on going to concienciate them to use HEMS;
- This case is different from Canyelles, because flats are on rent and in some cases the tenants disagree to install HEMS or make tests inside the dwelling.

Next step: Finishing the work and evaluation activities.

Time schedule: A slight delay but planned to finish by the end of M31.

Risks: There is a low risk of delay in the refurbishment due to summer vacations, but so it will not cause a delay after M36.

Lope de Vega, 111 (1,015 m² – savings 15,428.0 kWh/yr)

Results: During the first reporting period, a first contact with the administrators of five communities of this street was written. The refurbishment of this building is going to be executed thanks to the agreement between the owners of the building, GNF, Barcelona Municipality Urban Landscape Department (Paisatge Urbà) and the private company Cushman&Wakefield. The building refurbished in GrowSmarter will be the first phase of the whole refurbishment and renovation of the island (building facades and public spaces).

During the second reporting period, an agreement with the community N.111 have been reached and the definitive project have been drawn by the architect, under the supervision of Barcelona Municipality Urban Landscape Department (Paisatge Urbà). Current work is focused on the control activity and pressure on partners in order to start the work in time to guarantee two years of monitoring after implementation. The main requirement for choosing the builder will be the finalization of the works by the end of 2017.

Next step: Obtain permission for works, participatory process with tenants, installation of HEMS, infiltration tests and thermal imaging.

Time schedule: Work will start in M32 and finish in M36.

Risks: There might be delays in starting the refurbishment work and in finishing before M36. As a mitigation measure, the guarantee of the timing of the work is a strict condition for the selection of the builder. In parallel, analysis of alternative solutions will be carried out.

Melon District (13,000 m² – savings 165,100 kWh/yr)

Results: During the first reporting period, the participation in the project was accepted by the owner, the executive project was performed and the installer was selected. During the second report period:

- Monitoring installation has been executed and coordination activities with the team that will work on evaluation phase started;
- Representative surveys are on going.

Next step: Evaluation activities will be performed.

Time schedule: Work started in M21 and finished during the second reporting period, in M28, including monitoring installation.

Risks: No risks are foreseen.

Smart solution 2: Smart building logistics and alternative fuelled vehicles

This smart solution will demonstrate what type of goods can be consolidated, how the city and local transport market are affected and the energy savings achieved e.g. less heavy goods transport in urban areas.

Measure 2.1 Integrated multi-modal transport for construction materials/logistics center in Årsta (Stockholm)

Involved partners: Carrier, Tingcore

STOCKHOLM

Results: The Building logistic centre is in operation and some deliveries such as windows to Valla Torg go through the centre.

Next step: Baseline is being established as the first house is being refurbished (no. 8). Carrier, Skanska, Stockholmshem, and Tingcore are working out a plan for full operation from the fall 2017 when house no 5 has started to be refurbished. Sensors to monitor reduction of transportation has been discussed for a long time but the decision has been taken not to use sensors since they have lots of limitations and are quite expensive. Transportation through Carrier will be collected at the logistic center instead. The amount of damaged goods etc will be collected by Skanska. The Building logistics centre will start handling more materials in autumn 2017. Carrier has together with Skanska agreed which material streams can be best handled by the logistics centre, and these materials will be handled by the centre when the next phase of the refurbishment begins later in the autumn.

Time schedule: Operation has started in small scale according to the defined time table, while the full scale operation is delayed a few months.

Risks: It is always hard to change behaviors and habits and the building sector are quite reluctant to change. It is easier to order goods and have them delivered just as they always have been. Establishing new routines is crucial for the success of this measure.

Smart solution 3: Smart, energy saving tenants

Demonstrating several smart ways to inform tenants how to optimize their behaviour to achieve maximum energy efficiency and reduce their energy bill. The basis is collection of individual energy data and compiling it to the tenants. The energy information will be integrated with mobility and infrastructure information in the different data platforms. On an aggregated level this data may complement other demand data and can be an important part of the smart grid system.

Measure 3.1 Active house (Stockholm) / Smart home system (Cologne)/Home Energy Management Systems (Barcelona)

Involved partners: Fortum (Markets and Power and heat), Veolia, Gas Natural, IREC, Rhein Energie, Tingcore, Barcelona

STOCKHOLM

Active House

Results: Fortum has successfully installed and commissioned Active House in an apartment in Årsta. In addition, Fortum is planning for implementation of Active House solution in 54 apartments in Årsta. The devices including water and electricity meters, sensors, tablets and dimmers are ordered and the team is following the construction plan closely. The gateways are under development by Tingcore and expected to be delivered before the implementation date in August 2017. Fortum also has a commissioning team to install the system based on the construction plan by Skanska.

Next step: Fortum will install Active House solutions in 54 apartments during summer 2017.

Time schedule: This part of the measure is on time.

Risks: No risks are foreseen.

Energy saving center, Adaptive temperature control system, Stockholm

Results: Installation of an adaptive control system is finalised in BRF Årstakrönet. A connection to the energy saving center is made. Measuring is on-going.

Next Step: Installation of adaptive control system in Valla Torg buildings and connection to energy saving center.

Time schedule: This part of the measure is on time.

Risks: No risks are foreseen.

COLOGNE

SmartHome

Results: 50–100 apartments will get SmartHome equipment in Cologne to save electricity for heating. The third partner, AGT International, will provide its expertise in acquiring energy consumption data on device level and its proven comprehensive data analytic capabilities developed in the PeerEnergyCloud project funded by the BMWi (<http://www.peerenergycloud.de>) – measure 5.3. A demonstration site showing these measures has been implemented in the Stegerwaldsiedlung. AGT presented its smart energy solution live as part of the event for the tenants in the Stegerwaldsiedlung in November 2015. The data has been collected in the close-by Stegerwald Café. Tenants were able to see the energy consumption and ask questions regarding the installation and use of the system and potential energy-saving opportunities.

Smart meters are not yet available on the German market because the federal government has not yet completely adopted the needed data protection profiles. It is currently not possible to evaluate hourly measured values and thus peak loads, because of the German data protection act. This can only be done with approval by the tenant and the process to talk with the tenants has started.

RheinEnergie has created a dynamic price model by introducing PV-Mieterstrom. That is a tariff for the tenants of the community which allow them to participate in receiving their

electricity from the installed photovoltaic systems. This tariff is a mixed product of PV electricity and power. Depending on the performance of the batteries, the base for the current quarter will be between 30–50% from PV current and analogously 50–70% from power plant.

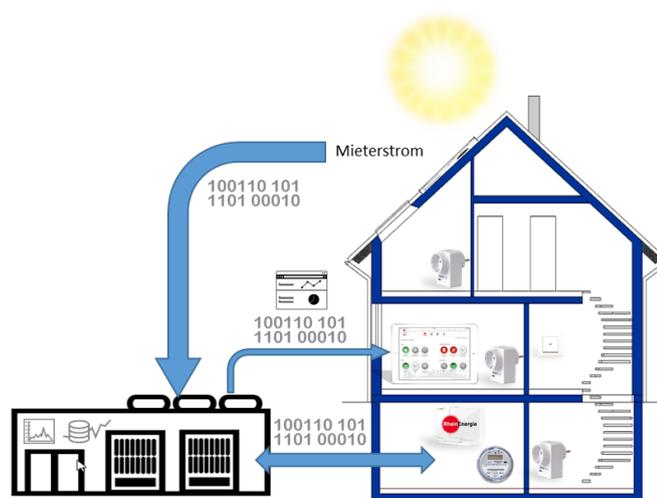
Next step: RheinEnergie will be talking to tenants in June 2017 to get permission to install.

Time schedule: This part of the measure is on time.

Risks: It is not possible to evaluate hourly measured values and thus peak loads, because of the German data protection act. This can only be done with approval by the tenant. In case not enough tenants agree to have the Smart Home system installed, there is a risk that this measure is difficult to evaluate.



Potential look of a dashboard



Tenant power consumption diagram

BARCELONA

Virtual energy advisor by Barcelona municipality

Results: The Virtual Energy Advisor from Barcelona municipality was awarded in 2015 and the electricity analyser was installed into the eligible dwellings, i.e. approximately 400 dwellings between 2015 and 2016. End-users can check their real-time consumption, compare with their peers and find individual advices on reducing their electricity bills. Invoices have been collected by Barcelona municipality prior to Virtual Energy Advisor implementation (may be used as baseline).

Next steps: The tasks are currently focused on the definition of the aggregation criteria to give interesting insights taking into account that no-individual data from dwellings can be delivered or displayed due to confidentiality issues. Analysis of both baseline invoices and of monitored data by the smart meters is performed by IREC.

Time schedule: IREC will during 2017 and 2018 evaluate the electricity consumption data of 400 dwellings gathered by Virtual Energy Advisor of Barcelona municipality.

Risks: No risks are foreseen. Electricity consumption data will be aggregated in order to respect confidentiality terms.



User Interface of the Virtual Energy Advisor

Stochastic models by IREC

Results: An electricity demand model based on stochastic approach has been developed by IREC using statistical data from Spain (Time Use Data Surveys).

Next steps: Next step will be to validate the model with aggregated data and also with detailed data collected from monitored buildings in Catalonia, including available data from some GrowSmarter buildings. Start of validation will be possible when aggregated data from Virtual Energy Advisor are available in WP3 platform.

Time schedule: Some apartments in Big Blue are recently sending their monitored electricity data to WP3 platform. Validation is expected to occur throughout 2017 in the course of reception of electricity consumption data. This tool will help to forecast with highly realistic approach the consumption of refurbished buildings in Mediterranean climates.

Risks: No risks are foreseen.

Home energy management system (HEMS) by Gas Natural Fenosa

Results: Gas Natural Fenosa is implementing HEMS to provide added value information and control to the residential customers. Details on evolution and functionalities included in the solutions are explained in the First Technical report.

During the first reporting period, the functionalities of the HEMS device were defined by GNF. Initial tests were developed, the procurement process finished and GNF signed the contract with the supplier (Wattio). 200 prototypes were commissioned and the first ones were installed in the residential building of Canyelles in M19.

During the second reporting period, new functionalities have been developed in order to improve the commissioned product, and a new version of the mobile app to visualize them is already in the final testing phase and includes: gas consumption, electrical & gas efficiency index, electric microisland, customized energy saving tips (see details in the First Technical report). A platform to receive and analyze monitored data from all the monitored

buildings/dwellings (both residential and tertiary ones) has been developed and is being used in the evaluation phase in some buildings.

Next step: Installing the new version of the mobile app in all the users; installing HEMS in the refurbished buildings and in available dwellings; evaluation activities.

Time schedule: All the prototypes will be installed by the end of M36.

Risks: Monitored data discontinuity is a risk. In order to control this risk and to solve problems, a strict following of the availability of data by the technical team is on-going.

Smart solution 4: Local renewable energy production and integration with buildings and grid

Demonstrating smart management of local renewable energy production with local demands, integrating producers and consumers and combining with heating/cooling and storage capacity for surplus production.

Measure 4.1 Virtual Power Plant (VPP) – balancing demand with supply (Cologne, Stockholm)

Involved partners: RheinEnergie, Fortum (Power and Heat, Market and Värme), Veolia, Stockholm

STOCKHOLM

Results: The theoretical analysis is focusing on capacity balancing of local PV production at an hourly time resolution. Work carried out to date is:

- Scenarios of local PV production;
- Analysis of local PV production in relation to local consumption.

A report called Expansion of photovoltaics in Stockholm has been delivered to the GrowSmarter team. The conclusions that can be drawn from the report are:

- It is reasonable to believe that the amount of large photovoltaic systems will increase in the future, because of better technology and lower prices;
- It is technically possible to balance intermittent sources of electricity by using district heating systems. This means that it also is possible to create a VPP from a photovoltaics system and a district heating system;
- there is no reason for companies running large district heating systems to offer balancing of large scale photovoltaic systems as the balancing service would increase the costs, lower the profits, cause additional wear on the production units and demand excessive production planning.

The private Condominia BRF Årstakrönet was first in line to have the European Innovation Award winning EnergyHub system installed by Veolia FM AB. The EnergyHub system offers a

new approach to optimize the electricity use in a building. It is maximizing the investment in solar power but also an adaptive current equalization system, a unique system called ACE. Ferroamp is introducing a smart flexibel technology that increases the output of the electrical system. The heart of the system is the Power Module, a 3 x 5 A (3.5 kW) three phase, scalable bi-directional power inverter. The Power Module converts the DC energy from the solar panels and energy storage into AC energy that can be used in the building or sold to the electric grid company. The EnergyHub inverter has a function that convert AC from the electric grid into DC to charge the batteries in the energy storage.

The second use is adaptive current equalization (ACE). A three phase power reinvented Ferroamps patented ACE technology allows for a more efficient use of a three phase supply. EnergyHub ACE transfers energy between the phase conductors.

The energy storage consists of many individual powerful Lithium Ion cells connected in series to form a powerful storage unit. It can be stored with free energy from solar cells or from the grid via the EnergyHub bi-directional inverter when the price is favorable. Instead of simply using the solar power only after sunset the EnergyHub can be programmed to use the stored energy when it is most beneficial depending on facility power demand, energy cost and weather forecast. This is what makes it a Smart Integrated Energy Storage designed for the future. The benefits are:

- Main fuse overloading avoided
- Possibility to reduce the main fuse getting a lower fix fee in several applications
- Reduced distribution losses
- Simple installation
- Transparent to existing loads
- Prevents over currents from all loads in the installation

Preparations have started to implement this measure in Kylhuset as well.

Next step: The Real Estate Administration will install photovoltaics in the glass of existing skylights in the building in Slakthusområdet. An effect of 50 W/m² will be installed and the photovoltaics will be connected to batteries for energy storage. In the newly approved substitute building Kylhuset, photovoltaics, energy hub and battery storage will be installed during autumn 2017.

Time schedule: The work is on schedule.

Risks: The installation of photovoltaics in Kylhuset will need a building permit and there is a risk that this process might take some time and affect how fast the installation can begin.

COLOGNE

Results: The virtual power plant (New: Siedlungsmanagement) connects local photovoltaic production with heat pumps and the storage batteries. The delayed building permit process led to a delay for procuring the batteries. So far, no devices are connected to the Siedlungsmanagement, but the software is in development. The plan is to connect mid June

2017 to collect first data. Automakers do not currently allow the draining of the car battery. RheinEnergie will try to find a solution with a manufacturer by the end of 2017.

RheinEnergie started installing photovoltaic on rooftops, storages in combination with district heating, heat pumps and Mieterstrom (renter's electricity). The tender of the photovoltaic has been completed. The company Rheinland Solar provides the PV-modules.

RheinEnergie created a dynamic price model by introducing PV-Mieterstrom (see Measure 3.1). The Mieterstrom-model is now complete and will be rolled out after the RheinEnergie promotion event at the end of June 2017.

In combination with SmartHome it is possible to keep track of the current energy consumption of the connected devices, which can be used for comparison and analysis.

Next step: Smart Meters are not yet available on the market because the federal government has not yet completely adopted the needed data protection profiles. At the earliest this might happen in mid 2017. After receiving renters' consent, RheinEnergie is planning to install non-certified smart meters in order to evaluate the needed data. The connection of Siedlungsmanagement to the implemented measures is planned to begin in July 2017.

Time schedule: The plan is to connect the Siedlungsmanagement mid June 2017 to collect the first data.

Risks: Automakers do not currently allow the draining of the car battery. RheinEnergie will try to find a solution with a manufacturer by the end of 2017. Otherwise, this component cannot be integrated into the Siedlungsmanagement (VPP).

Measure 4.2 Smart energy and self-sufficient block (Barcelona)

Involved partners: IREC, Gas Natural, Schneider

BARCELONA

Details on the activities of GNF and IREC during the first reporting period are explained in the First Technical report.

Software will be developed to create a block model for the global block energy optimization and self-sufficiency. The software will integrate block electricity demands and production as well as energy storage for both tertiary and residential buildings. A virtual management will be done, reducing the peak during the load congestion and reducing the energy invoice of the neighbours.

Status of implementation in Clot block of buildings (Clot Island)

Results: The refurbishment of the hotel will not be included in this measure because the hotel will not have photovoltaic installation.

- SIBELIUS 3 (residential building): Self-consumption installation and replacement of lighting at the common areas have been completed. Work started in M27 and finished in M28. Installation has been legalized and commissioned. HEMS are now being installed at

each individual dwelling: neighbours can visualize photovoltaic generation of their roof and the percentage of common consumption covered by own generation.

- PASSEIG TAULAT 281 (Residential Building): The economic proposal has been discussed with the neighbourhood community.
- MERIDIANA 141 (residential building): This building is going to add three additional floors on its roof-top in order to level its height with the contiguous buildings. The photovoltaic installation is going to be installed at the top of those additional pre-fabricated modules. Hence, this work has to undertake a Review Commission from the City Landscape Department.

Next step: Following and evaluation activities in Sibelius 3; beginning of works for the additional building modules in Meridiana 141, before the PV installation; negotiation and signature of the contract with the other buildings under analysis.

Time schedule: All the work will be finished by M36.

Risks: Delays of Meridiana 141 work for the additional building modules could cause delay in PV installation. All permits are already being prepared in order to shorten the commission time once installed. Other configurations and tertiary buildings are being analyzed too, if the two other buildings under analysis would not accept to participate in the project.

Status of Resource Advisor

Results: Schneider Electric has integrated its Performance Analytics Module within the Platform Resource Advisor to allow the platform to manage interval data and therefore allow the follow-up of the measures implemented. It also has improved some features on the platform, like the ability to customize data streams, the ability to display information publicly, the ability to add site schedules, configure alarms, calculate cumulative savings, display Energy Certificates and schedule periodic reports. The cloud-based servers are ready to receive data via FTP, and to serve and receive monthly data via its API. It was expected that the platform should already be receiving some data, but this has been delayed due to lack of data availability.

Next steps: Currently the link between the Resource Advisor and data aggregation and data collection platforms developed in WP3 is being developed, and it is planned to be available before summer 2017.

Time schedule: It is planned to start receiving data from already installed and commissioned sites around the same time, and to have the data from all sites in the scope by the end of the Year 2017, in time for the evaluation period.

Risks: There is a possibility for delays in the implementation of the measures to be evaluated through the platform (WP2 measures) and thus not having the data to setup the platform on time and/or delays on the integration of the data and the data chain. If the data is somehow collected, though, the platform has the ability to process historical data, so the evaluation of the measures can be performed once the data is available.

WP3 Integrated infrastructure

Smart Solution 5: Smart lightning, lamp posts and traffic posts as hubs for communication

Demonstrate remote, self-controlled and sensor-controlled LED lighting for pedestrians and cyclists and how these solutions increase traffic safety and perceived security. Demonstrate how smart traffic posts can be used to provide wifi, charging of electric vehicles with additional built in functionality.

Measure 5.1 Smart street lighting (Stockholm)

Involved partners: The City of Stockholm, Traffic Administration

STOCKHOLM

Results: The implementation of the smart lighting systems in Stockholm is completed. The City of Stockholm is investigating the potential for energy and cost savings using a modern control system that allows adaptable dimming curves and real time feedback for maintenance. Three different solutions have been implemented in June 2016 and are tested for comparison; (A) a stand-alone system with automatic dimming during 6 hours of the night, (B) an adjustable dimming curve set in a Central Management System (CMS), (C) a presence detection system which raise the lighting levels for a number of luminaires on detection. One aspect of the implementation is to test the usage of different manufacturers and technologies in the same system and CMS, which previously has been difficult due to proprietary solutions.

The evaluation of energy consumption started in December 2016. Three models are evaluated:

- Each individual luminaire learns when it is turned on and off and uses those times to calculate the middle point. From that middle point, the effect is lowered to 66% for a duration of 6 hours, or till it is turned off.
- All luminaires are connected to a CMS where a dimming schedule runs. In the dimming schedule, lighting levels are set according to sunset/sunrise and specific times during the night. The lighting is turned on at sunset to 100%, at 10 PM it is dimmed to 67%, at 1 AM it is dimmed to 50%, at 5 AM it dims up to 67% again, at 6 AM 100% and is turned off again at sunrise. Dim steps are equal to changing one lighting class in the road safety standard. This solution requires a constant power feed, which is not custom for a lighting installation that usually breaks the power supply during daylight hours. Also, the CMS is communicating with two different technologies; one group of luminaires are connected to a Mesh net while the other group is using powerline communication.
- A bicycle and pedestrian street might have several hours without usage. During that time the lighting is dimmed to 40%. When a person is approaching the street a sensor reacts and dims up the lighting to 100% on the detecting luminaire and three luminaries ahead. After a pre-set interval the lighting is dimmed down to 40% again.

Next step: Evaluation should be performed.

Time schedule: Will be performed in time as planned.

Risks: No risks are foreseen.

Measure 5.2 Combined electrical charging and street lighting poles + Wifi-to-grid connection (Stockholm, Barcelona)

Involved partners: City of Stockholm, Traffic administration, Retevision

STOCKHOLM

Results: In Stockholm the smart connected city will use the extensive fibre optic network provided in the Slakthusarea and administered by Stokab, a company owned by Stockholm City Council. Several Internet of Things applications and solutions are built on top of the network.

In April/May 2017 sensors were installed in the Slakthusarea. One set of sensors will measure the pedestrian and bicycle traffic in the area. Another set of sensors will analyse vehicle traffic. One of the main interests of the real-time data collected by the sensors is to give an understanding of how people travel to events taking place in the area. There are three sports arenas situated close to each other which host events year-round.

The collected real-time data is delivered to an open consolidated big data platform for further analysis. A workshop with city departments and other interested parties was organised March 2017 to define the types of analysis to be done.

Next step: When the first set of data has been analysed, further workshops are planned to define what kind of applications can be developed for lowering transport-based emissions based on the real-time data. In doing this, we are defining ways to provide higher quality of life for citizens with smart connected solutions.

Time schedule: Delayed, due to data protection issues.

Risks: There is a risk that data protections legislation might see problems with the data collection and analysis of sensorbased data. The solutions have received acceptance from the Swedish Data Inspection, but the new EU directive has not yet been tested on these solutions.

COLOGNE

Results: RheinEnergie is now able to add electric charging to street lighting poles. This change was done in Amendment 4, adopting this measure from Stockholm. By combining electrical charging to street lighting poles, the aim is to make walkable urban areas ubiquitously connected, and to enable a shared sensing infrastructure in the open street spaces. RheinEnergie will install 3 electric charging stations to street lighting poles. We will not install any Wi-Fi and environmental sensors at the lighting poles as Wi-Fi and environmental sensors had already been installed at the lighting poles in this area prior to GrowSmarter.

In the planned project area Mülheim (Stegerwaldsiedlung) the infrastructure is not well suited. Since several stations are installed, further expansion of charging infrastructure is not economical and meaningful. Therefore, the measure will be carried out in another area, called “Klimastraße”. RheinEnergie is running this project called Klimastraße in the district of Cologne called Nippes, where, in collaboration with the citizen, the goal is to save CO₂ and provide a sustainable way of life. The project is also proposed to have room to explore new technologies together with innovative companies. Here, we have already been asked for electrical charging stations. At the Klimastraße the existing infrared structure is more suitable than at the Stegerwaldsiedlung. RheinEnergie has already set up a Wi-Fi infrastructure prior to GrowSmarter.

Next step: RheinEnergie is currently in negotiations with different providers and is expecting to install the charging stations in August 2017.

Time schedule: According to the plan.

Risks: No risks are known at this time.

BARCELONA

Results: In Barcelona, the municipality has approved the “add-on” option to deploy the SmartTower solution to convert the traditional lamppost in new telecommunication micro-sites, offering space for communication devices and sensors. Besides, the Pere IV area has been selected to deploy the measure. Therefore, Retevision has been able to progress on the detailed design of the Smart Tower, to place the communication devices and sensors. Furthermore, Retevision has done the low level design of the new aggregation and access networks that will connect the Smart Towers with the backbone network in the selected area.

Next step: Contracting period has started and ready to be executed during June 2017.

Time schedule: Work to be finalized during last semester 2017.

Risks: No risks are foreseen.

Measure 5.3 Smart Meter information analysis and actuators (Barcelona, Cologne)

Involved partners: RheinEnergie, AGT, Endesa

COLOGNE

Results: With the SmartHome application in combination with SmartMeter the tenants are able to track current energy consumption of connected devices. After receiving renters’ consent, RheinEnergie is planning to install non-certified smart meters in order to evaluate the needed data. The application documents clearly show the consumption of the devices for comparison and analytics. RheinEnergie and AGT cooperate closely for an optimal

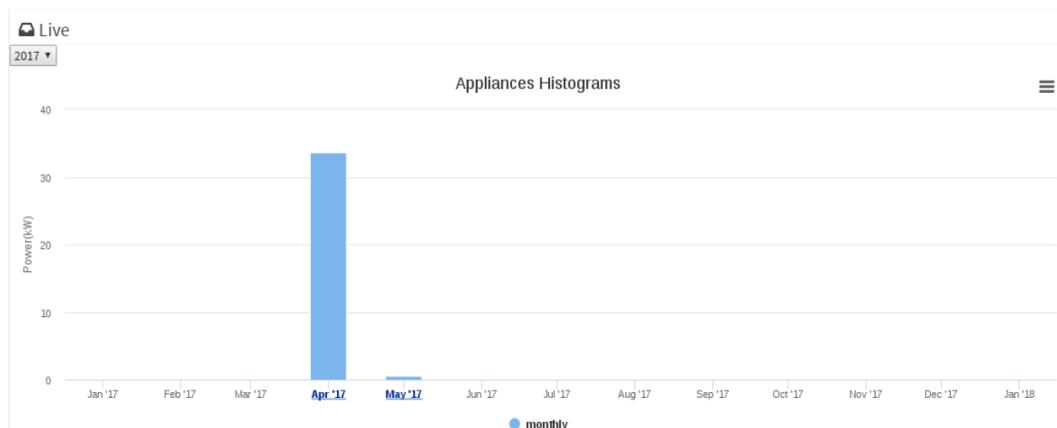
implementation. AGT has updated its server infrastructure to handle the incoming data from the tenants in the Stegerwald Siedlung.

The complete data collection backend infrastructure has been ported from in-house virtual machines to an AWS infrastructure using Elasticsearch, S3, ActiveMq and Postgres databases. The used Amazon EC2 instances are designed availability and scaled processing. Currently an Intel NUC barebone PC is used as local gateway collecting the data from the smart plugs and sending it to the AWS backend. As next step this processing unit will be replaced with a low energy consuming Raspberry Pi processing unit reducing the energy footprint and the costs per home.

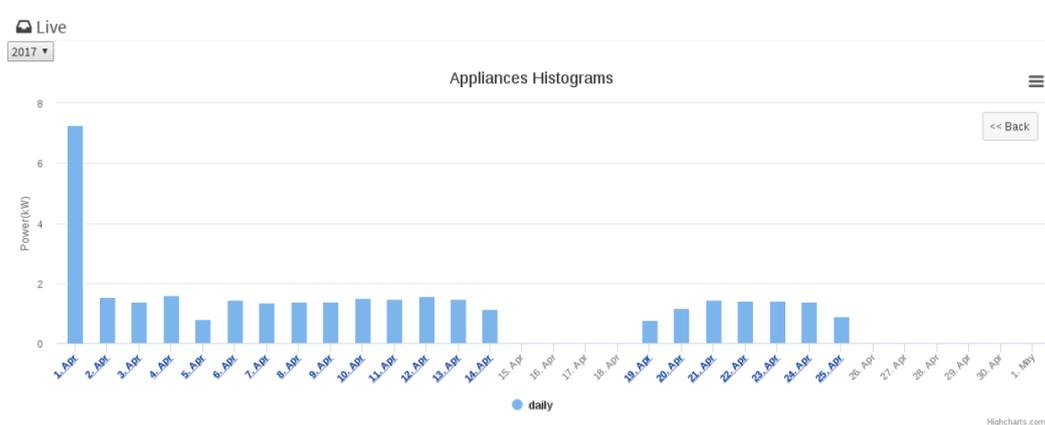
The existing web interface has been updated to a new dynamic web-based user interface being more light-weight and offering a faster response time. The admin panel is used to create configurations and users to each home so that they can see their dashboards using those credentials. Admin Panel is also used to create configurations to map devices to real names and add devices to home.

The user interface dashboard is currently showing electricity consumption depending upon the results from analytics engine. Histograms are built to show the tenant's consumption per year, month, and hourly. Moreover, it is also showing live energy consumption for each specific home.

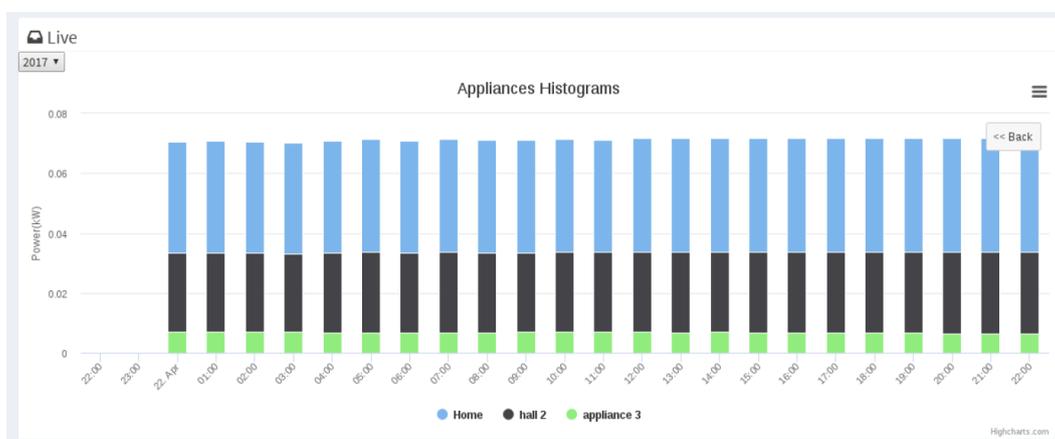
The monthly view is showing the energy consumption data for every month of the selected entire year.



The daily view is selected upon clicking on the respective bars in the monthly view. This will enable a further drill down into the chart and will show the data for each day of the selected month.



The hourly view is a further drill down of the daily view. The displayed graph would change to a stacked column graph showing consumption of each device stacked up to total consumption.

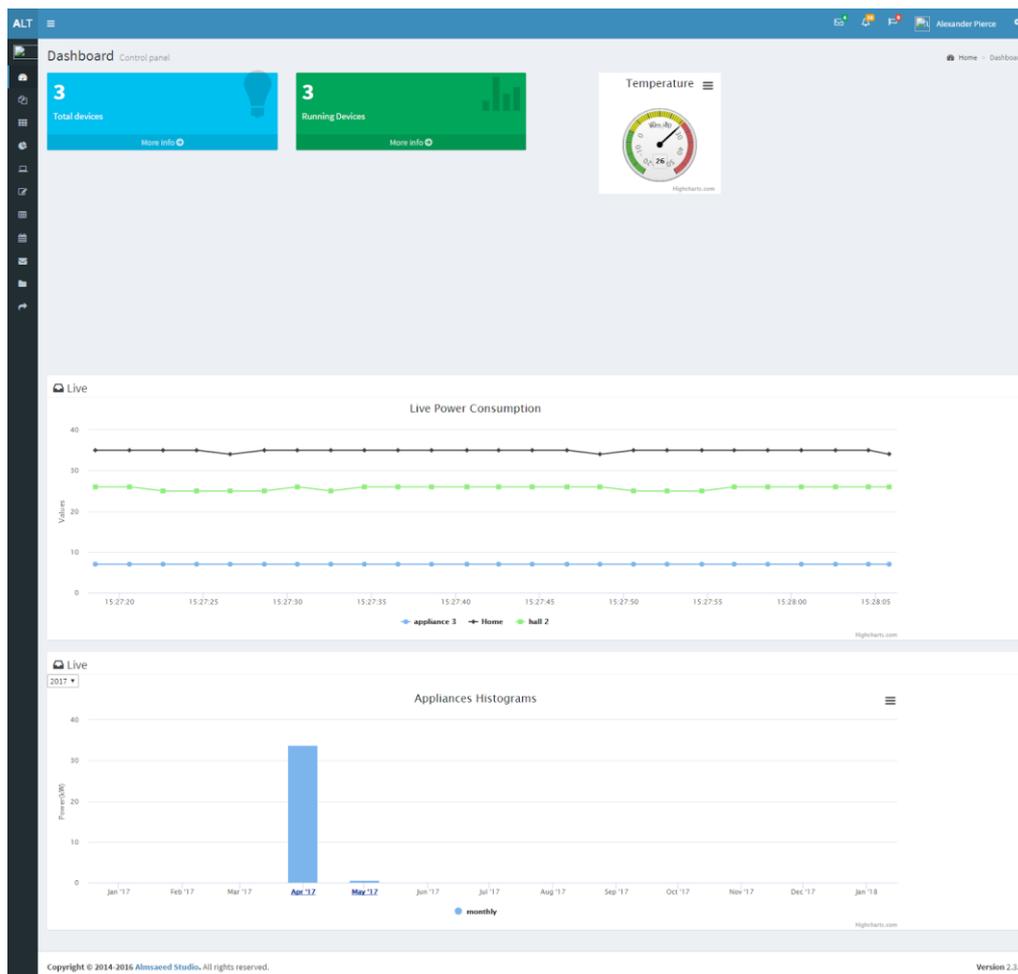


Additionally, the temperature in the room will be shown together with the device status (ON/OFF). Some stats are still needed to be added and it is under development.

The underlying analytics is calculated using crontab jobs to schedule analytics every hour. This has been designed to reduce processing at runtime for showing analytics in the frontend. Pre-computed analytics are used to reduce the runtime to display analytic results. The pre-calculating hourly consumption of power of each device in KWh is used to accumulate data till that hour of the day. Similarly, pre-calculated daily energy consumption data is used to compute monthly data for a current month.

Next steps:

- The processing unit will be replaced with a low energy consuming Raspberry Pi processing unit reducing the energy footprint and the costs per home.
- The addition of stats is in development.
- RheinEnergie and AGT are working on a joint solution.
- Involvement of the tenants in the planning process.
- Pitch event is planned in June/July 2017, combined with Mieterstrom.



Time schedule:

- Rollout of smart meters is delayed until October 2017 – January 2018 due to needed IT adjustments
- RheinEnergie is planning to install uncertified SmartMeter in September 2017

Risks: The Federal Government is supposed to finalise the demands for necessary IT-security by the end of 2017. The risk lies in the early implementation of un-certified smart meters that may have to be exchanged once the federal guidelines are known.

BARCELONA

Results: The Multiservice Concentrator (MSC) is the central element that will collect and upload data from several meters and sensors. The device is now adapted for implementation. The installation will take place in five secondary sub-stations in the 22@ district of Barcelona. The locations of the sub-stations have been revised and a final decision was taken.

Due to compatibility and legal issues the integration of gas and water meters in the MSC caused problems. Finally, a solution for the connection of water meters was found, the integration of gas meters is still subject to evaluation.

Besides the utility meters, city sensors have been selected and the complex communication architecture has been defined. Sensors and gateways are in the final stage of the development to guarantee compatibility of all devices.

The devices will communicate via the innovative Internet of Things low power wide area (LPWA) protocol LoRa. It is subject to current discussions to integrate the Lora-Gateway into the Cellnex Smart Towers and upload data with the Cellnex city Wifi. Also, it is considered to use this network for the transmission of data in other Barcelona measures or to enable third party use as a city service.

The intermediate Endesa platform has been defined and developed to manage the collected data and transmit all relevant data to the GrowSmarter Platform. To ensure the data transmission from the Endesa platform to the GrowSmarter platform, several meetings with Cellnex were held.

Also, several internal meetings have been taken place to guarantee permission and integration of all installed devices to achieve the installation as fast as possible.

Next step: The installation of the MSCs will take place before the end of this year to guarantee two years of evaluation.

Time schedule: All work will be finalized by the end of 2017.

Risks: No risks are foreseen.

Smart Solution 6: New business models for district heating and cooling

Demonstrate new business models with plug and play heat pumps and contracts where the district heating provider buys waste heat from local energy sources such as data centers and shopping malls with many freezers and coolers. This task will focus on how to recover this waste heat into district heating or other energy systems for local energy demands and how to develop this innovative business model for this yet unexplored potential as integrated energy solution.

Measure 6.1 Open district heating with feed in of waste heat (Stockholm)

Involved partners: Fortum

STOCKHOLM

Results: Fortum Värme has installed and commissioned the heat recovery system for a supermarket in Farsta in Stockholm. The supermarket is now selling its excess heat from the supermarket to the district heating system. In addition, a number of communication activities have been carried out. A large supermarket with 200 kW cooling capacity generates approximately 25 GWh/yr of waste heat. This is usually released into the atmosphere through cooling towers. With Open District Heating®, the waste heat can be recovered and

transferred to the district heating network. The recovered heat from a 200 kW supermarket could be used to heat up 200 standard apartments during one year.

Next step: The construction of a heat recovery system for GleSYS data center in Västberga is under development. Connecting pipes to the district heating system are in place and the heat pumps is delivered and installed during May 2017.

Time schedule: Installation is planned to be finished and commissioned by the end of June 2017.

Risks: No risks are foreseen.

Measure 6.2 District heating rings (Barcelona)

Involved partners: Gas Natural, IREC

BARCELONA

Results: As described in the First Technical report, some activities were carried out in order to re-orient the implementation of this measure with respect of the description of the Grant Agreement, due to the current limitations of Spanish legislation (penalization for injecting auto-generated electricity in the grid): La Llacuna block was analysed in detail, in order to create a mini-ring from the district heating inside the block, to connect a school and two residential buildings to the grid from the same sub-station. A detailed energy audit and technical study for district heating connection was done, technical offer was presented to the owners, but finally the project was stopped, due to the lack of permission to connect to district heating in this area of the city. After that, a new block was chosen, where Melon District residential building (Measure 1.1) is located, with the objective of creating a thermal and electric high efficiency island, with:

- Residential building (Melon District) and tertiary buildings connected to district heating network and managed with HEMS
- Tertiary building with PV and energy storage
- All the block virtually managed by SW developed in Measure 4.2

During the second reporting period, the measure has been adapted to an analysis of the real potential for the application of measures of distributed generation from renewable energy (FV+storage) and waste heat (district heating) for a real group of buildings with complementary consumption. The buildings which are going to be used to implement the measure will be: Melon District (M1.1), Canyelles (M1.1), H10 Hotel (M1.1) and all the buildings of the M4.2. These buildings are not in the same island, so that it is not possible to connect them with a real ring and the analysis will be carried out virtually. The monitored data used for the analysis will be: real profiles of energy consumption of the buildings, real profiles of FV generation and different storage's uses, real profile of district heating use with a real sub-station connected to the district heating network.

Next step: Planning and development of the methodology for the analysis.

Time schedule: The analysis will start with the beginning of the evaluation phase of the buildings included in the measure.

Risks: No risks are foreseen.

Measure 6.3 Smart local thermal districts (Barcelona)

Involved partners: Barcelona Municipality, IREC

BARCELONA

Results: Ca l'Alíer refurbishment works have started in April 2017 with several delays. The old textile industry will be re-built into a nearly net zero energy building with the help of the connection to the existing district heating and cooling network Districlima that valorises heat from solid urban waste.

Next step: This measure will be implemented when the refurbishment works advance and the building retrofitting process is ready for connection to the DHC network.

Time schedule: This is expected to occur during 2018.

Risks: Work will not be finished by December 2017. This measure will be evaluated for less than 2 years.

Smart Solution 7: Smart waste collection, turning waste into energy

Demonstrates a smart waste solution for residential areas using differently colored bags for different sorts of waste, transporting the bags long distance underground and sorting them automatically in the collection station. The food waste will be recovered to produce biogas, which fuels 400 buses and trucks and 15,000 cars. Other waste streams will be recovered as material and/or energy.

The challenge to the use of conventional Automated Waste Collection Systems (AWCS) has been the installation costs, as well as finding space underground to fit the pipe work.

Measure 7.1 Optical sorting of waste (Stockholm)

Involved partners: Envac

STOCKHOLM

Results: The implementation of the optical sorting of waste can be divided in two steps. Apartment specific sorting of several waste fractions is planned and implemented as part of the new kitchens in each apartment. This work has started in the beginning of 2017. Inlets which optically can read, define and document the waste fraction is installed outdoors close to the buildings in Valla Torg. The first inlet is installed in June 2017.

Next step: Finalise the apartments and install inlets during summer 2017 and have the system fully operational when the tenants start moving in to the refurbished buildings from September onwards. Prepare a communication package for tenants. Tenants can separate three fractions of waste. The optical sorting facility in Stockholm is not yet in place, so the waste will be transported to a near by facility in Södertälje.

Time schedule: Time schedule is kept.

Risks: No risks are foreseen.

Measure 7.2 Introduction of AWCS (Automated waste collecting system) in an existing neighborhood (Stockholm)

Involved partners: Envac

STOCKHOLM

Results: The automated waste collection system implementation started in spring 2017 and will be finalized by the end of June 2017. The solution will provide easy access to the waste disposal system, which will replace heavy waste collection lorries in the residential area. The system will also limit the use of inner and/or outer surfaces for waste bins and containers. Envac is the overall responsible partner, but Skanska is responsible for the construction related work with the waste system. This was approved in Amendment 5.



Pipeline installation in progress

Waste collection traffic will be reduced by 90% with an accompanying reduction in CO₂ emissions, noise and pollution. Additionally, the working environment for the waste collectors will be greatly improved due to the elimination of heavy lifting. Processing collected food waste as biogas will greatly reduce GHG emissions from the waste. During 2017 Envac has put orders for material.

Next step: Finalising implementation of system. Prepare a communication package for tenants.

Time schedule: Work is in line with the time schedule.

Risks: No risks are foreseen.

Measure 7.3 Waste collection statistics for individual households/businesses (Stockholm)

Involved partners: Envac, Tingcore

STOCKHOLM

Results: Each inlet will be equipped with a technology for collecting waste statistics. When the resident puts his/her waste into the Envac waste inlet, the user is identified alongside the type (by colour of bag) and weight of waste being deposited. The system will be able to

identify the amount and type of waste thrown away by individual users. This information could be used to provide feedback to the user, for instance, on individual recycling patterns, but due to data protection legislation only accumulated data on building level will be analysed. The system is installed together with the inlets in measure 7.2 and the system is finalized by the end of June 2017.

Next step: Finalising implementation of system. Prepare a communication package for tenants.

Time Schedule: Work is in line with the time schedule.

Risks: No risks are foreseen.

Smart solution 8: Big open data platform for saving energy and improving the quality of life

Due to the lack of standards in the area of smart cities, we propose a data integration platform (aligned with CityOS) which will aggregate information in a City Datawarehouse that support third party applications exploiting the raw and rich data. The data integration platform will be composed by a set of functional modules, with the aim to establish a standard path from diverse data sources (data coming from many different heterogeneous sources, like city data sensors, mobile devices and other types of resources) to any data consumer system. New services can connect to energy consumption in residential buildings where residents can be informed about their current and historical energy consumption and with the help of that information decrease it. Another application is the collection and processing of traffic data to make it possible to create a multi-modal travel planner or develop an API able to communicate the lighting management system with other applications (e.g. traffic management, weather systems).

Measure 8.1 Big consolidated open data platform (Stockholm, Cologne, Barcelona)

Involved Partners: IBM, AGT, Retevision

STOCKHOLM

Results: IBM has been forced to change the focus of the use cases in Stockholm. These use cases will act to demonstrate the impact on transportation planning from new insights within the City of Stockholm derived from new sensor data and visualization/analysis of transportation flow and mix and resulting emission reductions. All of this is enabled by the open, consolidated data platform (IBM Bluemix).

The previous use case “Sensing City Scale People Movements” had to be abandoned due to the legal assessment done by our subcontracted Telco. The conclusion in June 2016 by the Telco legal counsel and management was that the available technology and methods for anonymization of personal mobile telephone trajectory data was not sufficient to meet the EU GDPR legislation requirement for personal data protection.

The remaining project part “Movement of Pedestrians/Bicyclists” will be extended with sensor measurements of the flow of vehicles, together with details of the actual vehicle type and model including the stated emissions from the specific model. In addition, a weather data source (Weather Channel) will be made available to better understand how the weather influences the flow and mix of transportation modes as well as emission levels. The measure is still within the scope and done according to the description in the Grant Agreement.

In 2016, the work done resulted in identification of the primary users within Traffic Administration (being traffic analysts and traffic planners), the initial use cases and the requirements for new sensor data sources together with their positions were defined and agreed upon. A prototype visual working environment to combine data sources, visualization, analytics and reporting for transport analysts and transport planners was agreed and developed in IBM Bluemix.

Procurement of new sensor data sources by the City of Stockholm was executed in 2H of 2016 as is being finalized now by early 2Q 2017.

The use cases and the installations of these new sensor data sources are synchronized with measure 5.2. The first joint workshop to define the problem space and focus users/use cases and how measure 5.2 could benefit from the open big data analytics platform (IBM Bluemix) was held on 20 January 2016. These use cases include impact in transportation needs driven by large events.

In March to April 2017 IBM performed meetings with vendors of sensor data appointed by the City of Stockholm. In these meetings technical assessments and decisions on how to capture these new types of sensor data sources into IBM Bluemix have been executed i.e. the integration methods have been agreed upon.

The following is stated and agreed about personal data between the parties: The parties agree that any and all data and/or information that is provided, disclosed or otherwise made available between the parties under this Agreement shall not include personal data as defined by Article 2, section (a) of the Data Protection Directive (95/46/EEC) and applicable local implementing legislation (hereinafter referred to as “Personal Data”). IBM shall limit the use and access to the received data to this project only.

Next step: Before August 2017 the following will be done:

- Finalize the technical work required to capture and store the first two new sensor data sources into IBM Bluemix.
- Develop a technical plan for additional video sensor data sources, weather data sources, and air pollution/weather station data sources.
- Make the stored data presented to the tools for visualization and analysis required by the traffic analysts and traffic planners, as well as through open APIs to other user groups.

Plan for 3Q 2017:

- Test the data integrations from the sensors into the IBM Bluemix platform.
- In June–July start preparing for the test period of use cases for the users in 3Q–4Q and support them in execution of visualization and analysis in order to generate new insights.

- Identify and agree a roadmap for additional users and use cases (e.g. Environmental Department users, Traffic Signal Optimization, Parking Space Optimization and Public Transport scheduling).

Time Schedule: Delayed due to difficulties obtaining real time data.

Risks: Risks with the data protection legislation from EU.

COLOGNE

Results: During the first year, Cologne developed 3 apps and prototypes for measure 8.1; The Urban Traffic app, Urban Environment app and the Urban cockpit.

The Urban Traffic app is connected to the integrated data of the strategic traffic system of the City of Cologne. The current traffic load is shown and users can zoom in to certain regions to get more precise details about the situation.

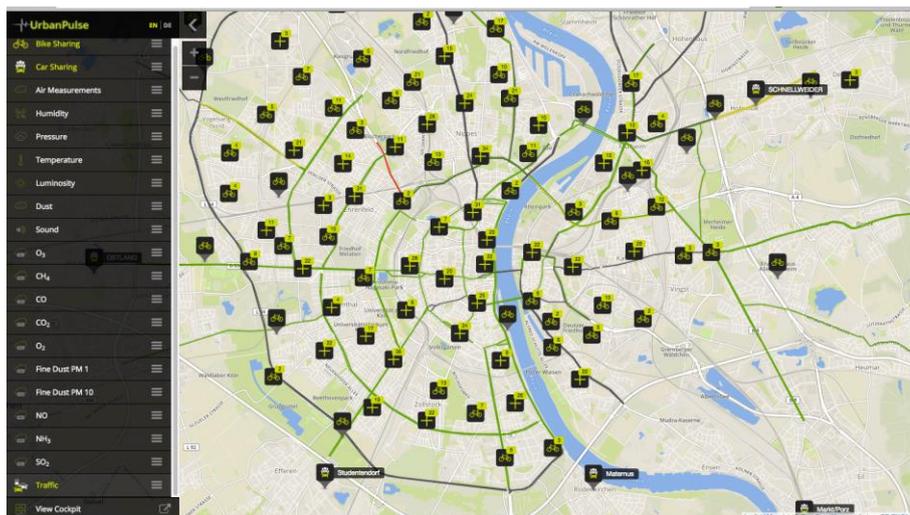
The Urban Environment app gives information about various environmental data like pollution, lightness, noise etc.

Urban cockpit is not connected to much real data yet but helps to explain the basic concept of integrated infrastructures and to figure out what data is useful to integrate to get a so called “pulse” of the city. The user easily gets an overview about the current overall situation of the city and about current sub-situations like available cars on a mobility station, the current parking space situation, information about public transport and others. More and more data delivered by the project partners are being integrated.

Since November 2016 the integration of the 3 apps into 1 app is ongoing. Further data sources are integrated as soon as they are available. The new Urban Cockpit app has two views: The dashboard view with pulse, tiles and timeline and the map view which allows monitoring on a location based and detailed level. Screenshots for both views are shown below:



Dashboard view of the Urban Cockpit



Map view of the Urban Cockpit

In 2016 a new data source was connected to the UrbanPulse, Cologne's urban big data solution: environment data collected by the North Rhine–Westphalia state which has three official sensor stations in Cologne.

Next step:

- Developing connectors from data provided by Cologne's project partners to the UrbanPulse;
- Display these data on both Urban Cockpit views (map and the dashboard view);
- Figure out whether and what kind of analytics could be done on the UrbanPulse in order to support the evaluation of other, non WP3 measures;
- Display environment data of NRW in Urban Cockpit;
- Integration of clever city data;
- Writing documentation of virtual machines on azure.

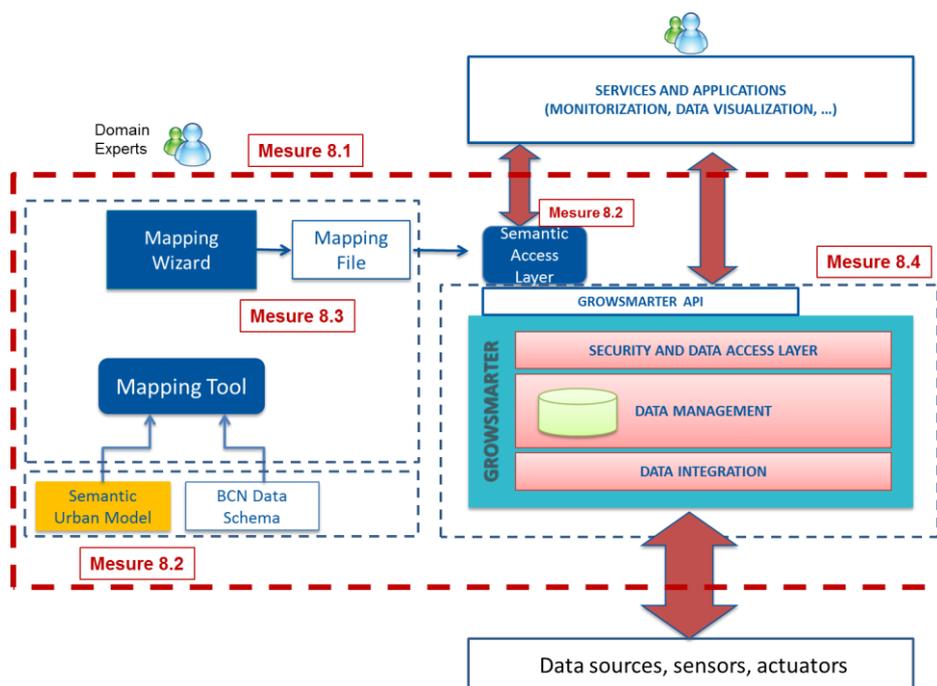
Time Schedule: On time.

Risks: Continuously receiving data from partners until the end of 2019, probable delay for certain components, such as the dependence on timing for the integration of data from new traffic management system.

BARCELONA

Results: A working document "Architecture of the GrowSmarter-BCN platform" has been produced. This document includes a high-level description of the different elements and interfaces of the GS-BCN platform, together with a mapping with activities of different measures. In order to coordinate the tasks of the measures that produce data and the measures than consume data (data producers/consumers) and in coordination with the tasks of measure 8.4 information has been collected from different measures (WP3, WP2 and WP5).

The targets for this measure have been reached without major problems or delays. No changes in the GA have been made. We have identified an end-to-end application that can showcase our data integration solution.



GrowSmarter Barcelona Platform

Next step: Related to this application (the air quality simulator designed and implemented by BSC as part of GrowSmarter), it is pending resolution on which data will come in and in which format such that it can be integrated by the platform.

Time Schedule: The implementation of the measure finishes in September 2017. The documentation of the architecture of the platform will be delivered then.

Risks: No risks are foreseen.

Measure 8.2 Urban models (Cologne, Barcelona)

Involved partners: Urban Institute, AGT, Barcelona Super Computing

COLOGNE

Results: Cologne and Barcelona have had teleconferences to develop this measure. Since Cologne is still working on integrating data, the outbound portion of this measure will come at a later date. Cologne obtained a list of semantic queries from Barcelona for the energy domain and gave them to Cologne's energy partner RheinEnergie to evaluate how it can be useful in Cologne.

Next step:

- RheinEnergie and Cologne are evaluating the semantic queries and will send the result back to Barcelona. The next steps will then be defined together with Barcelona;
- Thinking about using queries within WP5;
- Thinking about integrating data for queries.

Time Schedule: The implementation depends on the schedule in the building sector.

Risks: It is not sure if or which data will be shared.

BARCELONA

Results: We have finalized the development of the urban semantic model based on collaborations with domain specialists from WP2 (IREC) and WP4 (Cenit).

We have finalized the development of the semantic access layer that allows applications to query city data via the semantic model and access the real data via the GS API (measure 8.4). BSC has developed an application that explores and queries data via the semantic model. This tool was adapted to allow applications to explore the GrowSmarter ontology and formulate semantic queries in a user-friendly manner.

Next step: Currently, we are in the validation and testing phase, pending the availability of more data. As part of the validation and testing phase we are gathering a list of queries from all local partners involved. The queries are those which will be returning data from the Barcelona GS platform, but also queries that would be useful to ask assuming more complete and detailed data may become available. We have been talking to Cologne to follow this query gathering process at their site in the future. This would be a test for the completeness and generality of the urban model.

Time Schedule: The semantic model will be tested based on the queries sent from the partners during last part of 2017.

Risks: No risks are foreseen.

Measure 8.3 Semi-automatic instance mapping (Cologne, Barcelona)

Involved partners: Urban Institute, AGT, Barcelona Super Computing

COLOGNE

Results: Cologne and Barcelona have had teleconferences to develop this measure. Since Cologne is still working on integrating data, the outbound portion of this measure will come at a later date.

Next step:

- RheinEnergie and Cologne are evaluating the semantic queries and will send the result back to Barcelona. The next steps will then be defined together with Barcelona;
- Thinking about using queries within WP5;
- Thinking about integrating data for queries.

Time Schedule: The implementation depends on the schedule in the building sector.

Risks: It is not sure if or which data will be shared.

BARCELONA

Results: The target of measure 8.3 is the development of a semi-automatic mapping tool between schemas such that the actual data can be reached via their mapping to the semantic concepts. We have finalized the implementation of this measure.

The ontology navigation and search tool we developed will provide graphical access to the Urban Ontology, so the user can browse concepts and find relationships in the model. This functionality will help the user understand the Urban Ontology, so the domain expert can decide if the matching concepts suggested by the mapping tool are appropriate.

Next step: The finalised mapping tool will be validated during the evaluation period to gather feedback from users. The mapping tool may be finetuned if needed.

Time Schedule: Already in operation and in validation process.

Risks: One of the risks on the validation and testing phase is that the tool may not find many, or useful mappings to start the mapping process given that at this point there is not a lot of data available.

Measure 8.4 Integration of sensor data in a uniform standard-driven data format (Barcelona)

Involved partners: Barcelona Super Computing, Retevision

BARCELONA

Results: The initial set-up of the Data Integrated Platform has been enhanced with more features, like the 2nd release of the API that includes subscription methods, and new versions of the security layer, the API store and the real time demonstration application.

In accordance with the progress of the implementation times, Retevision has been in contact with the partners to update the collecting data form and deploy the integration of new data. Currently, we are working on the collection of new data from GNF and ENDESA.

Next step: Integration of sensor data from different measures. Sensors to be installed by January 2018 will be included as GrowSmarter data sources. Each data source will be integrated by Retevision.

Time Schedule: Data sources are being integrated during 2017.

Risks: The measures affected by some delays may impact on the integration of the data sources in the GrowSmarter platform.

Measure 8.5 Sustainable connected lighting to enhance safety and mobility (Barcelona)

Involved partners: Barcelona Super Computing, Retevision

BARCELONA

Results: The scope of this measure is to develop an API for smart lighting systems implemented by measure 5.2. This API will permit the lighting management system to communicate with other applications such as traffic management and weather systems. Retevision has carried out an analysis of smart-lighting actuators in order to define a solution that will allow the remote control of the lighting of the street pole deployed in measure 5.2. In this way, the expected improvement in the energy efficiency will be achieved.

In measure 5.2, Retevision has held several meetings with stakeholders to move forward towards the definition of the definitive solution for the street lighting pole, which will permit to complete the definition of the API in measure 8.5.

Next step: The next step is to complete a detailed API definition according to measure 5.2.

Time Schedule: The measure will be finalized by 2017.

Risks: Retevision identified the risk that a delay in the execution of measure 5.2 will delay the definition and development of the API in measure 8.5. Therefore, Retevision has been based on the Smart Towers that have been deployed in Cellnex premises to perform the design of the API.

WP4 Sustainable urban mobility

Smart solution: 9 Sustainable delivery

Demonstration of last mile deliveries to retailers and home-delivery.

Measure 9.1 Integrated multi-mode transport for light goods (Stockholm)

Involved partners: Stockholmshem, Carrier

STOCKHOLM

Results: Service box room planned in one of the refurbished buildings. Pre-study and business plan are currently being prepared by MoveByBike. Once the draft business plan is completed there will be a meeting between Carrier, Stockholmshem and MoveByBike.

Next step: If a convincing case is being presented this can be implemented by September/October 2017.

Time Schedule: In operation in the fall 2017 when the first tenants move back.

Risks: Perhaps there is little or no interest from the tenants to use the service boxes. A majority of the older people does not order goods for home delivery and once they do they are reluctant to change to a new distribution.

Measure 9.2 Micro distribution of freight (Barcelona)

Involved partners: i2CAT, CENIT, City of Barcelona

BARCELONA

Results: The work carried out by CENIT, I2CAT and the Barcelona City Council corresponds mainly to the preparation of the pilot, the search of the location for the urban microdistribution center, the development of the sensor device, its installation and the preparation of the technical/economic evaluation report.

The task carried out by i2CAT is entitled “Building an on-board Environmental Sensors”. The reasons are to experiment with a new concept on environmental monitoring, to validate the impact on limiting the vehicle traffic in some parts of the city and to help in managing a new concept of parcel delivery in the city, using electric vehicles for the last mile distribution.

The project proposes a complementary approach that uses moving elements, such as bikes, to capture data from different points. The data captured correspond to an area where the mobility of vehicles has been restricted. Monitoring environmental parameters on these points will show the impact on limiting the mobility of vehicles since it can measure differences between points we have conventional mobility and limited movement of conventional vehicles.

In order to carry out this measurement, distribution electric vehicles will transport a device able to monitor the environmental parameters. The data will be used to perform a better management of the distribution vehicles.

CENIT and the City council have been searching for a location to install the microplatform in a public space, or in a location with no costs for the operator. After several negotiations with key persons such as public parking managers, commercial mall managers etc., the location decided is a side building at the França Station (an important railway station). Although this location is outside the Sant Martí District (the GrowSmarter district), it will still be able to serve the area despite that the main delivery area will be the Ciutat Vella district. CENIT has planned both the technical and evaluation reports in accordance with the information provided by the Last Mile Operator and the information that will be gathered through the sensors installed in three bikes.

I2CAT has selected a suitable platform to implement the whole system. A set of sensors have been integrated on the platform. The sensors are analog and digital and so far comprise a gas sensor, temperature, relative humidity of air, and luminosity levels. The platform will be connected to the municipally platform based on Sentilo and managed by Cellnex (Retevisión). The Sentilo protocol has been implemented and a testbed Sentilo platform has been used to validate the functionality. I2CAT has developed a prototype of the sensor and is currently in the process of installation and testing.

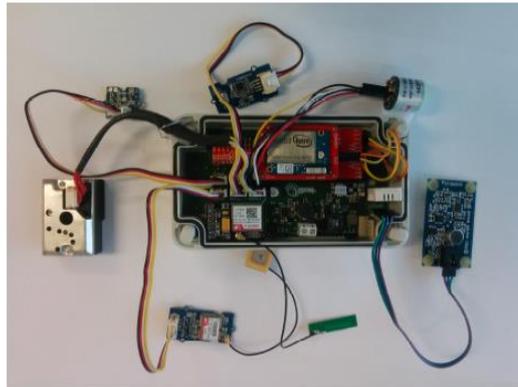


Image of the on-board unit sensors developed by I2CAT

Next step: The devices are installed in the vehicles to monitor the environmental parameters. The communication and data integrity are being tested at present. After the testing period, the evaluation period will start. In the following months the sensing node will be integrated with the municipality platform managed by Cellnex.

Time Schedule: The measure is on track, the evaluation period will start late 2017.

Risks: The operator of the service has reported some vandalism actions. These actions may produce a data loss that may affect the evaluation of the measures. The security of the monitoring devices will be improved.

Smart solution 10: Smart traffic management

Demonstration of how traffic signals can be controlled to even out traffic flows and avoiding unnecessary stops. This task will demonstrate a smart system monitoring and controlling traffic signals and at the same time providing real time information to users on traffic conditions with the help of different sensors.

Measure 10.1 Traffic management through MFD (Barcelona)

Involved partners: CENIT, City of Barcelona

BARCELONA

Results: The aim of this measure is to calculate the macro fundamental diagram of traffic flow of the district of Sant Martí and study how to manage traffic lights in the perimeter area in order to change the traffic states and improve traffic flows. During the preparation phase of this measure CENITs work has consisted mainly of the search of the information required to start the modelisation process. The city has permanent inductive loops that collect the number of vehicles running in several streets. With this data, the traffic flows at each time of the day can be reliably inferred.

The implementation phase consisted in building the model of the studied quarter. All traffic lights times are being introduced, as well as the direction of the flow of each street and the number of lanes. The department of mobility has provided CENIT with the required data.

Targets up to now were to gather the data and start defining the model while ensuring that we have the proper software license and implementing the model in order to find the Macroscopic Fundamental Diagram of the area of study.

Next step: After the model has been built, the simulation scenarios will start to be developed to design the best strategy to increase traffic flows in the district by preventing the entrance of vehicles in the area during high congestion events.

Time Schedule: The measure is on track. In late 2017 and 2018 different traffic simulation scenarios will be run in the model to find the MFD. During 2018, the outcomes of the simulations will be analysed and evaluated.

Risks: No risks are foreseen.

Measure 10.3 Travel Demand management (Stockholm)

Involved partners: KTH, Tingcore

STOCKHOLM

Results: Travel demand management aims to follow up and influence changes in travel behaviour to a healthier and environmentally friendly travel. Three alternative programmes have been evaluated for implementing the application and one of these is now contracted and has initialized the work. The work has primarily prepared for setup and how to obtain an attractive and challenging implementation and interaction with the residents. An event- or competition driven application is being developed to increase willingness to participate.

A statistic interface is developed for analysing users' travel data on an aggregate systems level. The development phase started M13 and was finished M18. Programmers are now working on a transformation of the dynamic web site to a mobile application for Android and Iphone.

Next step: Measure 10.3 will be synthesized with measure 11.5, in order for the users to get information and customized feedback on how to reduce emissions from use of electric vehicles (charging stations) and more energy efficient travel alternatives. A beta version of the mobile application will be finished June 2017, and will be ready for implementation October 2017 where test users in Årsta will start using the application.

Time Schedule: The work is on track as regards of the planning phase and a dynamic web site is developed in order to test the functionality and design of the application. Full scale use of the application will be launched as soon as the residents return to the refurbished buildings in Årsta during 2017/2018.

Risks: The majority of the population in Årsta is older and do not travel much and are not IT oriented and keen on using smart phone applications. There is a risk that the usage of the app will be low.

Measure 10.4 Traffic control system for passenger vehicles (Stockholm)

Involved partners: Insero E-Mobility, EWF institute, City of Stockholm – Traffic Administration

STOCKHOLM

Results: Insero, together with EWF Institute and Audi, are implementing an information system for drivers. In Stockholm ten traffic lights have been implemented equipped with software that can communicate and relay information about the status of the light and when it is about to switch. This is achieved through a data connection between the traffic light, the cars' onboard software and GPS, and a central computer handling the calculations. Through a special device in the car, the driver will receive information about what speed to drive in order to reach a green light at the next junction. This information tool will be tested in two cars starting in April–May 2017. Effects on travel time and the drivers' experiences will be evaluated.

Next step: Test starts in June 2017 and continues until end of August with a few weeks break during vacation time in July. During the test period all data will be collected both for base line and for the actual vehicle with the communication device.

Time Schedule: Test and demo period June–August 2017. A report with all experiences will be written during the fall of 2017.

Risks: There is a need to find additional test drivers that are ordinary people. So far 3 students have been recruited but 3 more are needed. Test drivers from Audi might have to be used but are they really like ordinary people or more experienced drivers? Using Audi drivers could question the end results if these drivers differ a lot from the students. Swarco who has installed the device will have limited possibility to support the system during this time since most of the personnel is on vacation. If something needs to be maintained or fixed by Swarco during the summer test this might take time and cause delays.

Measure 10.5 Traffic signals synchronized to prioritize certain vehicles movement of goods (Stockholm)

Involved partners: KTH, Carrier, City of Stockholm – Traffic Administration, Tingcore

STOCKHOLM

Results: System boundaries have been set up for which transport flows we may possibly track in Carriers logistics systems and how emission/energy effects could be reported from the two test-trucks. After Carrier moved to a new location the planned route has been changed. The new route is now established. Cooperation with the company/consultants operating the traffic signals has been established. The planning and preparation phase is still ongoing and the implementation phase is shortened.

Next step: Equipment in the trucks is soon to be put in place. The real demo will start after some technical issues with firewalls etc. are solved.

Time Schedule: The work is on track regarding the planning and implementation phase.

Risks: Some risks are identified, such as the risk of too few traffic signals on the route to give comparable results. The route is also long in relation to the expected time gain in the traffic signals which means that the time gain will be hard to measure.

Smart solution 11: Alternative fuel driven vehicles for decarbonizing and better air quality

There is no single propulsion technology that alone can replace the fossil fuelled vehicles of today. We will have to use both electrics and sustainable biofuels, in combination. To develop the market for these technologies we might even have to promote the use of some fossil fuels like natural gas (to promote biogas vehicles) and Plug-in Hybrid-Electric Vehicles operating on petrol or diesel (to develop the biofuel PHEVs). While the market development is a bit on its way for light duty vehicles and buses, distribution trucks which are so important for cities still have just started to develop.

Measure 11.1 Developing charging infrastructure (Stockholm, Barcelona and Cologne)

Involved partners: Info 24, Fortum, RheinEnergie, ENDESA, Barcelona City council

STOCKHOLM

Results: Fortum has successfully installed and commissioned a fast charger in Årsta near to a McDonalds. Fortum is also following the construction plans by Skanska to install 5-10 normal chargers in Valla Torg. There will be no chargers in the Slakthusarea but the chargers for Årstakrönet area are under development.

Next step: Continue with the data collection regarding the fast charger. Installation of normal chargers in Valla Torg and Årstakrönet.

Time Schedule: Installation of normal chargers in Valla Torg during November 2017. Installation of normal chargers at Årstakrönet after the summer 2017.

Risks: No special risks foreseen. The remaining work should be fairly easy to accomplish.

COLOGNE

Results: The City of Cologne, together with 12 partners, are working on a project called "colognE-mobil" (www.cologne-mobil.de). This is one of the largest field tests as part of a program called "model regions for electro-mobility" launched by the German government. Within this project, the partner RheinEnergie has implemented 120 charge columns with a total of 207 charging points at 80 locations in and around Cologne by the end of 2015. Four solar carports with 14 spots supply parking spaces to charge directly with solar energy. The partner RWE (Rheinisch-Westfälisches Elektrizitätswerk) includes 9 locations with charge

columns for electric vehicles within the City of Cologne and 40 locations within the Cologne region. Further expansion of the charging infrastructure is continuously occurring and according to the market demand in coordination with the Cologne partners. The average numbers for permitted electrical cars in Cologne are currently above the German average. At the end of the third quarter in 2015, more than 1,200 electrical vehicles and more than 2,000 hybrid vehicles were counted. All charging energy results from 100% renewable energy.

The charging infrastructure for GrowSmarter is being implemented together with the e-mobility. RheinEnergie will implement those columns that are assigned in individual cases by WP4. Lots of planning, including coordination with all affected City departments and transportation agencies as well as North Rhine–Westphalian legislation has taken place and most of the mobility stations are in place. The development of mobility stations and E-carsharing in GrowSmarter currently serves as a role model for the entire City of Cologne in order to improve traffic flow.

Next step: A larger comprehensive master plan regarding mobility stations across town is in development. Implementation of final charging stations.

Time Schedule: Completion by the end of 2017.

Risks: None known at this time.

BARCELONA

Results: Endesa Energía has implemented five fast charging stations in Barcelona in order to promote low carbon mobility modes and to give service to different transport e-mobility customers. The strategic locations were studied and analyzed in collaboration with the Barcelona Council. The last charging station was installed in November 2016.

Regarding the bidirectional charging infrastructure, Endesa Energía has been defining the use cases to demonstrate and validate V2X functionalities in the GrowSmarter project. Currently Endesa Distribución is evaluating the location of the V2G e-parking and considering the installation of 6 charging stations in Endesa premises. The stations will be delivered in summer 2017 and the installation is planned for late 2017.

Endesa Energía terminated the participation in the project on the 24th of March 2017. All remaining tasks have been transferred to IREC, Barcelona and Endesa Distribución. Endesa Distribución terminated the participation as third party of Endesa Energía and was added as new beneficiary of the project on 4th of February 2017.

Next step: To install the V2G charging stations in Endesa's premises and the integration of the charging stations data in the GrowSmarter platform. After the installation and the data integration, the measure will continue, according to the plan, with the evaluation phase.

Time Schedule: The measure is partially on track. The installation of the fast charging stations has already been finalized while the V2G stations are still pending to be installed during late 2017.

Risks: There is a potential risk of low usage of the V2G charging stations. The number of electric vehicles compatible with the V2G stations is, at present, limited. Nevertheless, this number is expected to increase during the evaluation period of the measure.

Measure 11.2 E-mobility management system (Barcelona)

Involved partners: ENDESA, IREC

BARCELONA

Results: The fast chargers supplied by Endesa Energía and installed by Barcelona Council in measure 11.1 can't be managed by the Endesa Energy Management System due to the integration of the chargers in the Barcelona City Management System. Endesa Energía does not have access to this system and therefore terminates the project participation. Barcelona will be responsible for the management and maintenance of the five installed fast chargers. The corresponding financial parts have been transferred from Endesa Energía to the Barcelona City Council.

Regarding the V2G-Chargers, Endesa Distribución is developing an e-mobility management system to manage, optimize and monitor the sustainable hub. The focus is set on minimizing the power demand peak (peak-shaving) and maximizing the use of renewable energy generated by the PV-Panel (if PV-integration in measure 11.1 is successful). Furthermore demand/response mechanisms and algorithms to charge the EV in times of low CO₂-emissions and/or low electricity are investigated.

Main parameters were determined and the algorithms to effectively integrate the V2G-Chargers and the PV-Panels in the sustainable hub are defined. To ensure the data transmission of relevant data from the Endesa management system to the GrowSmarter platform, several meetings with Cellnex were held.

Endesa Energía terminated the participation in the project on the 24th of March 2017. All remaining tasks have been transferred to IREC, Barcelona and Endesa Distribución. Endesa Distribución terminated the participation as third party of Endesa Energía and was added as new beneficiary of the project on 4th of February 2017.

Next step: At present, data from the charging stations is being received by the Barcelona NOC. Next step is to integrate the stations as data sources for the GrowSmarter platform.

Time Schedule: The link between NOC and the GrowSmarter platform will be finished towards the end of 2017.

Risks: There are no unforeseen risks as data is already being received and can be processed for further analysis.

Measure 11.3 Charging infrastructure for electric tricycles for micro distribution (Barcelona)

Involved partners: ENDESA, Cenit

BARCELONA

Results: This measure concerns installation of 3–4 charging points for the electric tricycles of the micro distribution measure (9.2), making them adaptable to electric bicycles and motorbikes to also be available for citizens. These charging points will provide energy to those tricycles that would substitute diesel vans in the last mile distribution in the macroblock through a micro Urban Consolidation Center (mUCC). These charging points will also be managed to assess their impact on the grid. Barcelona City Council will work together with a subcontractor to make this measure successful.

The plugs have been installed and used in the normal operation of the Last Mile Company Vanapedal. The energy used by the tricycles and bicycles that operate for the distribution of goods is being monitored in order to provide an evaluation of the measure.

Next step: To monitor and analyse the data received.

Time Schedule: According to the Gantt chart the schedule is ok, even though this measure depends exclusively on measure 9.2.

Risks: There are no unforeseen risks.

Measure 11.4 Setting up refueling facilities for alternative heavy duty fuels (Stockholm)

Involved partners: City of Stockholm – Environment and Health Administration

STOCKHOLM

Results: This year the City of Stockholm has searched for additional suitable sites for the location fuel stations of refueling facilities for renewable fuels for heavy vehicles in the Stockholm area. A lot of effort and time has been spent on accomplishing this task. Some minor changes may still occur mainly depending on new housing projects and infrastructure developments. Information and discussions about suitable land for refueling facilities for heavy vehicles is a key part of the infrastructure in growing urban areas. These discussions have been carried out internally with different administrations in the City of Stockholm. Meetings with suitable and interested fuel suppliers have been carried out.

The result so far is that one filling station for heavy vehicles have been inaugurated in Kallhäll north of the city. The station provides ED95, biogas and HVO. In addition to this there is two signed agreements between the City of Stockholm and OKQ8 regarding two new refueling facilities, one located in Årsta (will have ED95, biogas and HVO) and the other located close to Bromma Airport (will provide HVO). A third contract has been signed

between Preem Petroleum and City of Stockholm regarding a fourth location (will have ED95, biogas and HVO). Altogether this adds up to 10 refuelling alternatives.

Next step: Waiting for the revised city plans to be changed and during this time answer any questions that might need to be answered in order for the planning process to move as smooth and quick as possible. Also, look for additional locations in case any other planned new locations meet problems and get cancelled.

Time Schedule: The implementation of measure 11.4 is running in accordance to the plan.

Risks: Stockholm is growing fast and high priority is given to residential areas. Refueling facilities have a low priority in general which creates long waiting time. This is a crucial problem that has been identified within the GrowSmarter work and has been brought up to management level. Sometimes a city plan needs to be changed to allow a new refueling facility to be erected. Changing a city plan is a process that can take up to two years. An increased internal dialogue with the City Planning and Development Administration is ongoing to solve these issues.

Measure 11.5 Smart guiding to alternative fuel stations and fast charging (Stockholm)

Involved partners: Tingcore, KTH

STOCKHOLM

Results: Smart guiding to alternative fuel stations aims to facilitate and make it easier for drivers to locate and find the supply of alternative fuel. Focus has been on integration and collaboration with market actors as AGA (gas stations) and Fortum (electricity and charging stations). A segregated approach to alternative fuels and use information channels through existing market actors will be used. A common entry site for alternative fuels where you choose your propellant and the channels for that fuel and locations of fuel stations will be developed.

In order to make the app more appealing and make better use of the app by tenants, the partners decided to merge the application from M 10.3 to M 11.5. The requirements and design specifications for 11.5 are defined and structured and a developer is hired based on that.

Next step: Finalise the development and complete the app.

Time Schedule: The project is ongoing and it is expected to deliver the final app by June 2017.

Risks: The risk is that fewer users sign up than hoped for. Marketing the app and get many users to use it so that it serves the purpose is always hard. Another risk is that the app will not be kept updated as quickly as it needs to be. There is a need to keep the app updated

and since the information the app is displaying is changing fast it is important to give priority to regular updating.

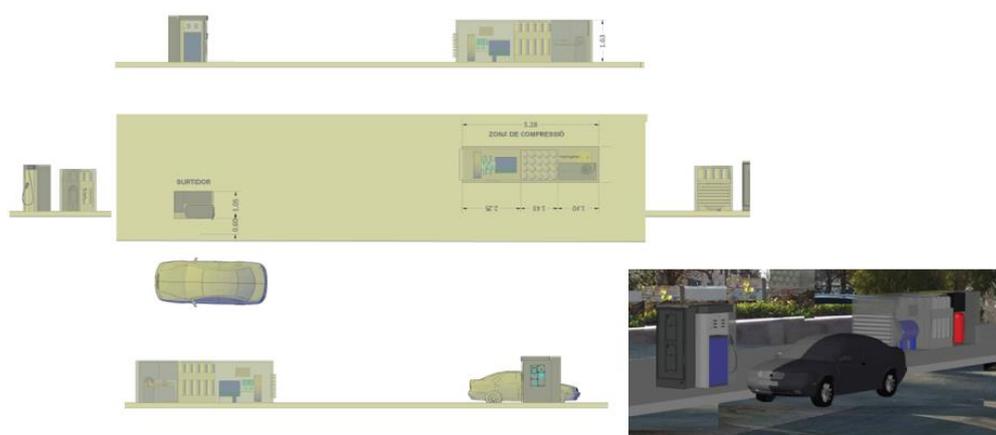
Measure 11.6 Small distributed CNG grid (Barcelona)

Involved partners: Gas Natural

BARCELONA

Results: The measure concerns setting of 1 small compressed natural gas (CNG) filling station servicing CNG vehicles. This kind of small CNG charging infrastructure technology has not yet been proven for public use. The CNG filling station will be installed in Horta-Guinardó district, as near as possible from Passeig de la Vall d'Hebrón Avenue where a high pressure gas pipe is located. Currently, negotiations with Barcelona City Council are performed in order to fix the final location for this measure, after several months of deliberations.

During this period of time different locations have been proposed. If necessary, a small portion of parking surface will be destined to the installation of this station. When it will be decided permits request period will start. The technical station specifications are defined and a design process has been developed dividing the station in two adaptative modules for optimizing its integration within the city environment.



Representation of the CNG filling station

Next step: During June 2017, the final decision from the Barcelona City Council regarding the final location of the CNG station is expected. Hereafter, the permits request period will start.

Time Schedule: The final decision from the Barcelona City Council regarding the final location of the CNG station is taking more time than expected and it is importantly affecting the initial schedule proposed. During the second half of 2017, the station installation process will start.

Risks: The installation process may finalise after 2017. For this reason, pilot demonstrative period of 2 years is highly in risk for this measure.

Smart solution 12: Smart mobility solutions

GrowSmarter will launch a range of different solutions completing the existing public transport network. By providing residents/citizens with alternatives to own their own car it is possible to reduce the number of trips that is done with car.

Measure 12.1 Green parking index in combination with car sharing pool with EV (Stockholm)

Involved partners: Stockholmskem, Tingcore, Fortum

STOCKHOLM

Results: The planning of the placement of parking lots in the area is completed. The number of charging stations for cars and their location in the area of the Valla Torg is decided. The technical solution, developed in cooperation between Fortum and Stockholmskem is completed. An agreement has been signed between Stockholmskem and MoveAbout, an electrical car-sharing company.

Next step: MoveAbout will provide a pool with two electric cars in December 2017. The electric cars will be open for use also for residents in neighbouring houses and if the interest is large additional electric cars can be added to the pool.

Time schedule: The work is to start at the end of 2017, when the tenants have moved back to their apartments.

Risks: Risk of low use of the electric car sharing cars. The older population in Valla Torg seems to travel with car little and seldom. The interest of a car sharing system was low in the base line survey sent out to all tenants in the beginning of the project. Important to also get users from the surroundings so that there is a business case for the sharing system to stay on.

Measure 12.2 Electrical and cargo bike pool (Stockholm)

Involved partners: Tingcore, Stockholmskem

STOCKHOLM

Results: The location of the bicycle pool has been decided. A study to find possible partners, suppliers of electric bikes and cargo bikes in a sharing system has been completed. Different actors have been contacted by Stockholmskem but no partner has been found yet.

Next step: Talks and negotiations with MoveAbout to also include electric bikes and cargo bikes together with the car sharing system.

Time schedule: The launch of the cargo bike pool is scheduled to take place when the first tenants move back to their apartments in 2017.

Risks: It is difficult to find a partner for the cargo bike pool, but the work is ongoing. There is a risk that we will not find any interested partners.

Measure 12.3 Mobility station (Cologne)

Involved partners: Cambio, Ampido, KVB, RheinEnergie

COLOGNE

Results: The City of Cologne and its partners are forerunners in the field of mobility stations in North Rhine–Westfalia and Germany. The City of Cologne has identified 9 possible spots for mobility stations. The installation is an achievement far beyond the grant agreement.

During 2015, a number of unforeseeable legal stumbling blocks were identified and solutions have been provided. The legal difficulties were reported to Düsseldorf (State Capital) and the Federal Transportation Agency for future amendments of the state legislation. This was a significant help for current and future installations of mobility stations and is considered an icebreaker for other municipalities in North Rhine–Westfalia. GrowSmarter is helping to create an eco–mobility–friendly legislation.

The installation of the first mobility stations are already in place or are taking place:

- The City of Cologne granted permission for the establishment of a first mobility station (Charles–de–Gaulles Platz) during the beginning of 2016. The implementation on–site has taken place with all partners involved in this measure. Cambio has two petrol powered cars as well as two electric cars at this location with the RheinEnergie providing the charging infrastructure. Furthermore, two public charging columns provide charging interfaces for a total of four electric vehicles. Non–electric vehicles are forbidden from using these parking spaces. Ampido is represented with five parking spaces for the duration of the project and the KVB bikes are coming soon.
- The mobility station at the Stegerwaldsiedlung is currently under construction.
- A third mobility station with all partners has been implemented and is up and running at the main station Mülheim (Bhf Mülheim).
- Six additional smaller mobility stations have been implemented or are currently being implemented (e.g. Regentenstr., Von Sparr–Str., Am Emberg, Stegerwaldsiedlung).

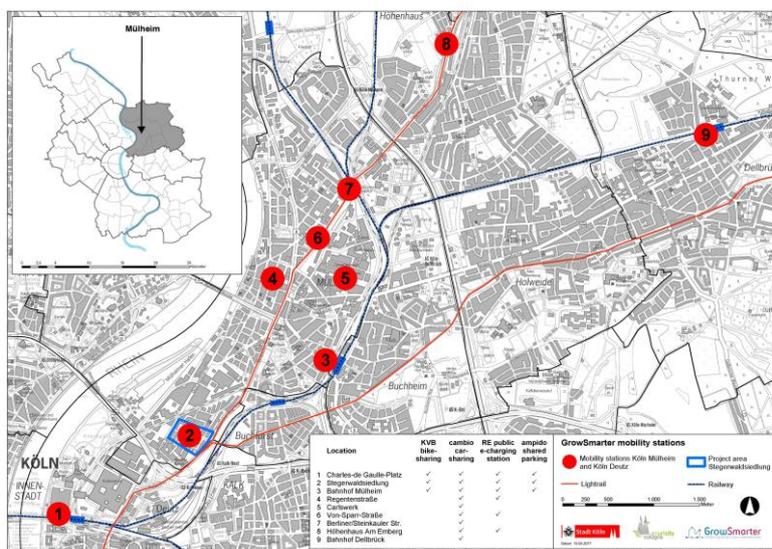
In context of mobility stations, the KVB (public transportation provider) has extended services: KVB has a free floating bike sharing system with about 1,000 bicycles installed in 2015. All eTickets of public transport in Cologne and surrounding areas have been integrated and created digital interfaces for data exchange in the GrowSmarter project. Procurement of eBikes for integration into the existing system and mobility stations is planned for mid–2017.

The development of mobility stations and E–carsharing in GrowSmarter currently serves as a role model for the entire City of Cologne in order to improve traffic flow. A larger comprehensive master plan regarding mobility stations across town is in development.

Next step: Complete implementation of mobility stations.

Time schedule: Done by the end of 2017.

Risks: None known at this time.



Cologne Map Mobility Stations

Measure 12.4 Electrical and conventional car sharing (Cologne)

Involved partners: Cambio

COLOGNE

Results: In addition to the mobility stations planned and implemented in M12.3, the aim of measure 12.4 is to install a carsharing service in the district Mülheim with up to 50 E-Cars or conventional cars by Cambio. The stations (in the table below) are ready in the timeframe described below or by the end of 2017 (completion date).

If every station is well received by its users, cambio will offer vehicles at every mobility station (see map M 12.3).

Next step: Continue and complete implementation of electric vehicles.

Time schedule: Completion done by the end of 2017.

Risks: None known at this point.

Location of car sharing station	Vehicles offered by Cambio	Implementation
Central station Mülheim private allocation Deutsche Bahn	3 petrol powered cars (Fiesta)	starting 04/2016 to 06/2016
	4 petrol powered cars (Fiesta),	starting 06/2016
	1 diesel powered transporter (Transit)	
Charles-de-Gaulles-Platz	2 petrol powered cars (Fiesta)	starting 08/2016
	5 petrol powered cars (Fiesta)	starting 11/2016 to 02/2017
	2 petrol powered cars (Fiesta),	starting 03/2017
	2 electric cars (ZOE)	
Stegerwaldsiedlung ¹	2 petrol powered cars (Fiesta),	starting 10-12/2017
	2 electric cars (ZOE)	
Regentenstr.	4 petrol powered cars (Fiesta)	starting 11/2016 to 01/2017
	2 petrol powered cars (Fiesta),	starting 02/2017
	2 electric cars (ZOE)	
Von-Sparr-Str.	4 petrol powered cars (Fiesta)	starting 11/2016 to 01/2017
	2 petrol powered cars (Fiesta),	starting 02/2017
	2 electric cars (ZOE)	
Am Emberg	4 petrol powered cars (Fiesta)	starting 03/2017 to 11/2017
	2 petrol powered cars (Fiesta),	starting 10-12/2017
	2 electric cars (ZOE)	
Carlswerk ²	2 petrol powered cars (Fiesta),	starting 10 - 12/2017
Berliner/ Steinkauler Str. ²	2 electric cars (ZOE)	
Central station Dellbrück ²		

¹In progress

²Cambio is trying to open further locations, such as Carlswerk, Berliner/Steinkauler Str. and central station Dellbrück.

Measure 12.5 Conventional/PHEV/CNG vehicle-sharing fleets (Barcelona)

Involved partners: CENIT and Barcelona city council

BARCELONA

Results: The aim of this measure was to provide a carsharing service in the district Sant Martí. During the last two years CENIT and the Barcelona City Council have conducted a research on the companies providing carsharing services in the city and prospected the services that could be provided in this area. The company Avancar was at first open to offer their services in this area and in return they would place their vehicles in the public space to promote the service but the municipality does no longer support carsharing initiatives.

This measure was conceived by the e-mobility unit of the City Planning dept of the outgoing government (it foresaw a development with new operators such as Car2Go). Following the change in government after the May 2015 elections there has been a re-structuring that has integrated ecology, city planning and mobility within a single coordinated service area.

CENIT and Barcelona searched for new opportunities in the motorsharing businesses since it is a growing sector. Even though an agreement with the company *Motit* was reached in order

to monitor and evaluate technically and economically the service, it was finally refused by the Commission since motorsharing is not in their priorities.

In Amendment 5 the Commission approved to use the budget allocated for this measure for dissemination activities.

Measure 12.6 Smart taxi stand system (Barcelona)

Involved partners: CENIT, (cellnex) Retevision, Barcelona city council, Urbis Up

BARCELONA

Results: The main tasks carried out have been the search and finding of the appropriate taxi ranks to install the technology to monitor vehicles and the review of all technologies available to monitor vehicle presence as well as the wireless communication systems and the final installation of the sensors. In collaboration with the taxi institute and Cellnex Telecom, three taxi ranks were selected in the area of Sant Martí as shown in the picture below.



Image of the location of the three monitored taxi stations

In order to remotely visualize the availability of taxis, different technical solutions have been analyzed. The main solution considered consists of the deployment along the taxi stands of sensors that detect the presence of vehicles. Regarding the connectivity of these sensors, the analysis made during the preparation phase considered a network based on LPWA (Low Power Wide Area) the best option, in particular the SIGFOX solution, which has been designed for the Internet of Things connectivity and absolutely fits the technical theoretical requirements of this measure: low power consumption, coverage range and minimization of interference. Due to the technical features of this technology, the battery of the sensors is expected to last for years. Furthermore, since Cellnex Telecom already deployed a SIGFOX network in Barcelona, the scalability of the solution and the cost-efficiency are guaranteed.

Having performed this analysis, 29 sensors were installed in March 2017. Currently the provider of the sensors, Worldensing, has been doing test jointly with Cellnex to ensure connectivity and the correct performance of sensors. CENIT has analyzed how to use the

information that will be gathered (presence or not of a vehicle). The development of the app will start soon.

Next step: After finishing with the physical installation of sensors, we continue with tests to ensure connectivity and the correct performance of sensors. The app to monitor the parking availability is under development.

Time schedule: Data integration is expected to be finalised during the last part of 2017.

Risks: There are no unforeseen risks.

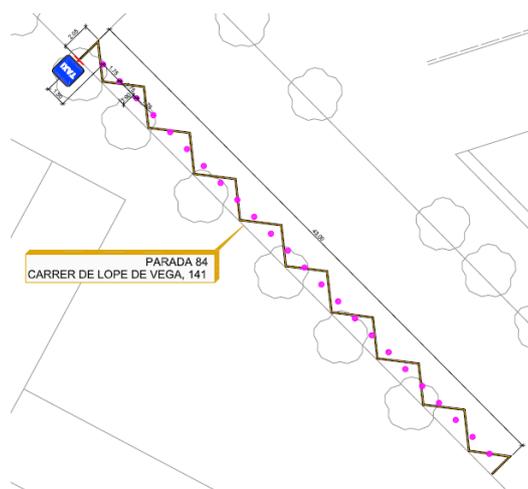


Image of the sensors distributed along a taxi station.

WP5 Technical validation, social & economic validation

Results: During the first year the work within WP5 has been focused on setting up the evaluation plan. Several meetings and workshops were held during the first four months of the project to meet all partners in all three cities and discuss and clarify the distribution of work concerning the evaluation and validation of the measures. The WP5 team gathered more details about the measures to be able to set up the evaluation plan. In the Steering Committee it was decided to push the acceptance of the evaluation plan from M8 to M6. A draft version of the plan was therefore prepared and distributed in mid May 2015. However, at the plenary meeting in June it was realized that certain points in the plan could not be agreed on, partly because of uncertainties of the planned actions in WP2–4. It was therefore decided to leave to the Steering Committee to take the decision on the final evaluation plan. During the fall of 2015, most of these remaining points of discussion were solved, but additional points were raised.

At the Steering Committee meeting in December 2015, the main remaining issues concerned the evaluation of measures related to WP2 in Barcelona. A meeting to solve these issues was held in January 2016 and the evaluation plan was established at the Steering Committee meeting held later in the spring. At the same time it was realized that changes in the implementation of the measures would require additional changes in the evaluation plan. It

is therefore now accepted that the evaluation plan will be a living document which will need amendments or changes to match changes in WP2–4.

In June 2016, WP5 presented D5.3 Guidelines for Monitoring and Evaluation. This document gives support on how WP5 wants to see the cooperation with the partners in the WPs on the evaluation. During the fall/winter of 2015/16 WP5 had physical meetings with partners in each of the cities to clarify the reporting and allow for discussion about the evaluation and reporting of results. In line with what has been written in the Evaluation Plan, each partner is expected to deliver to WP5 an Evaluation Strategy which more in detail describes how the partner, within the requirements of the Evaluation Plan, wants to perform the evaluation. These strategies are to be accepted by WP5 before the General Assembly in Cork in the beginning of June 2017.

Next step: The contacts with partners will continue to ensure that the evaluations are proceeding as expected. Annual visits of the three cities are planned. Continuous reporting of the results for each Measure is requested and foreseen each six months.

Time schedule: Continuous reporting from each Measure to WP5 is requested by end of September and March each year. The reporting should be in the form of a written report which is updated, but not completely re-written at each occasion. At the end of the evaluation period, these periodic reports will have evolved into the final evaluation report.

Risks: The risks are that

- owners of data may not be willing to share. Legislation requires in many cases a written consent of the owner to access e.g. data on energy use;
- difficulty of evaluation of low quality data due to problems with sensors or with measurement methodology;
- difficulty of evaluation of data due to scarcity of data;
- difficulty in estimation of the effect of the Measure when upscaling or when applying the measure to a different location.

WP6 Economic validation and analysis

Results: IESE's team has attended all the workshops in the three sites Stockholm, Cologne and Barcelona in order to fully understand the details in the proposed Smart Solutions. During the visits the team has been collecting information through informal meetings with local partners and site managers.

According to the collected information and IESE's expertise and knowledge, the team prepared the first draft of the evaluation plan (deliverable 6.1). After sending it to all partners, IESE collected questions and suggestions from all partner and proceeded to adapt the draft to the partners needs trying to minimize the impact on the final results. Finally, the evaluation report (deliverable 6.1) was approved during the General Assembly in Cologne in June.

IESE has been participating in all the Steering Committee meetings and all the meetings in Barcelona (once a month) to stay informed on the stage of development of each measure. Furthermore, IESE has started the task to review academic literature regarding business models for innovative solutions and linking it to GrowSmarter solutions.

During the General Assembly in Barcelona in June 2016, it was approved that instead of doing the economic evaluation by solutions, it will be done by measures. IESE will analyze all the measures and settled which ones have, by their own, a business model, and which ones need to link with other measures to have a business model.

IESE has started to collect economic data that will allow for a financial & economic evaluation (Deliverable D6.3). That is why we have asked the partners to give us the economic & financial data related to their measures.

IESE has started to work on Deliverable 6.2 (Lighthouses cities market introduction), that has the purpose to present the business models related to the measures included in the 12 solutions. IESE will identify the different business models that appear in the several measures and we will share it with all the industrial partners. It is crucial to agree with the several partners of the project on those business models, as it is the backbone to do the financial & economic evaluation (Deliverable D6.3).

During the General Assembly in Cork (May–June 2017) IESE will be organizing a Workshop for the Lighthouse cities, the industrial partners, Follower cities and other EU funded Smart cities projects. As said previously, as part of the economic evaluation working package, IESE will began defining the different business models, as it is crucial to understand how the measures implemented in GrowSmarter can work in a competitive environment. During the workshop, IESE will discuss the business models with the objective to improve them and to agree with the several partners of the project on those business models.

Next step: We continue with the work on Deliverable 6.2 (Lighthouses cities market introduction) based on the results obtained during the first workshop (31 May 2017 in Cork) and the feedback from the partners. We further continue with the collection of economic data in the frame of Task 6.3. Lastly, we prepare the second workshop in the frame of Task 6.4 that will take place during the first part of 2018

Time schedule: Delivery of D6.2 – M30 (December 2017). No delays are foreseen. Second workshop in the frame of Task 6.4 (first semester 2018)

Risks: Economic and financial information: barriers on data collection. As WP6 leader IESE Business School is in charge of the financial and economic evaluation of solutions. During the financial and economic data collection we have encountered some barriers from some partners that are reluctant to share their economic information with us. The main reason to this behavior is claiming the need for business secret to avoid sharing information with competitors outside the project (See section 4.3).

WP7 Replication in Follower cities

Results: Until May 2017 (29 month) work within WP7 has focused on:

- The establishment of multi-stakeholder Smart City Liaison Groups in the Follower cities (Task 7.1) to meet, follow and replicate the demonstration process of Lighthouse cities
- The development of comprehensive first and specified second replication assessments by each Follower cities to successfully replicate selected solutions (Task 7.2)
- The conceptualisation and implementation of a capacity development programme for Follower cities (Task 7.4)
- ICLEI/REC facilitating and providing ongoing support to Follower cities' Smart City activities
- Coordination of the WP7 in the context of GrowSmarter and other SCC Lighthouse cities projects with a particular focus on replication and knowledge transfer

Following individual consultations with the Follower cities, together with a meeting within the kick-off event in Stockholm, ICLEI developed a template for the first replication assessments (D7.2 – initially called baseline assessments). This template was refined and specified for the second replication assessment in 2017, but maintained the five main sections to describe:

- Smart City Liaison Group members
- Smart City Replication Profile – Mapping the overall framework conditions and potentials for replication within the city territory
- Smart Solutions Selection – Description of replication potential of selected smart measures/bundles within the 12 Smart Solutions of the Lighthouse cities in Follower cities
- Smart District Replication Profile – Per potential replication site/district: Mapping of district related framework conditions relevant for the replication of the selected solutions/measures
- Smart Solutions Specifications – Assessment and adaptation of specific smart measures/bundles towards the most effective deployment and integration at site/district level

With the assistance of ICLEI and REC, draft versions of the first and second replication assessments were prepared by the Follower cities (including their Smart City Liaison Groups) within the first five months and in spring 2017. The Lighthouse cities reviewed and gave input to the Follower cities replication assessment. Comments from the Lighthouse cities focused on identifying areas where they may be able to contribute assistance to the Follower cities, and additionally, where Follower cities experience could be valuable to the Lighthouse cities. Based on the initial interests and needs of the Follower cities and outlined in the replication assessments, ICLEI conceptualised the capacity development programme and discussed it with the Follower cities and REC during individual exchanges and a joint (1st GrowSmarter) webinar on capacity concept for smart replication in October 2015.

Subsequently, the WP focused on the implementation and constant refinement of capacity building activities for the Follower cities. The improvement is based on individual consultations with the Follower cities by phone, e-mail and during meetings as well as joint exchanges with all Follower cities and ICLEI/REC during the General Assemblies (in February 2015 in Stockholm, June 2015 in Cologne and June 2016 in Barcelona) and study tours (October 2016 in Stockholm and April 2017 in Cologne). This close interchange is foreseen to continue as it has proven to be valuable in content (e.g. update on status of interests and needs for replication) as well as creating opportunities for the Follower cities (e.g. 4th General Assembly took place in Cork due to intervention and one other is potentially foreseen in a Follower city).

The main occasions for a facilitated knowledge transfer (mostly by WP7 coordinator) between the Lighthouse cities and Follower cities and including industry partners and stakeholders were:

- Study visit elements during General Assembly in Cologne, June 2015
- Road to replication workshop at Urban Futures in Berlin, November 2015
- Urban Future event in Graz, March 2016
- 2nd GrowSmarter webinar on fast charging infrastructure, March 2016
- 3rd GrowSmarter webinar on integrated infrastructure for Smart cities, May 2016
- 1-day Study Visit – Stage I in Barcelona during General Assembly, June 2016
- 4th GrowSmarter webinar on Stakeholder engagement and communication strategies and techniques prior, during and after smart refurbishment, September 2016
- Building Sustainability (SGBC 16) event in Stockholm, October 2016
- 1-day Study Visit – Stage I in Stockholm, October 2016
- Local Renewables event on *Energising the Smart City and Region*, in Freiburg/Basel, October 2016
- 5th GrowSmarter webinar on *Shared mobility services in Cities*, November 2016
- 6th GrowSmarter webinar on *Monitoring and Evaluation of Smart Cities Solutions*, with contribution from REMOURBAN, March 2017
- SCC Clustering Meeting organised by REMOURBAN in Nottingham, March 2017
- 2-day Study Visit – Stage I in Cologne, April 2017
- 2-day Study Visit in Cork, May/June 2017

In a nutshell, Follower cities have reported good progress and in some cases even physical replication of smart solutions related to the GrowSmarter activities and knowledge transfer.

Cork

Cork has committed to explore replication opportunities for five Smart Solutions:

1. Efficient and smart climate shell refurbishment

Energy quality assurance efforts done at Wolfe Tone Street will introduce into the project management teams an Energy Advisor for each other project. Meanwhile, at

Sarahville Place, climate shell refurbishment measures will be done to improve energy efficiency in a block of 9 apartments, as well as a passive rainwater-harvesting system (also at Sunview Fairhill).

Meanwhile, similar efficient and smart climate shell and equipment refurbishments are being done for residential and tertiary buildings:

- *Ard bhaile/Gleanamoy Lawn* (social housing) had a “deep retrofit” in 2016 through the Better Energy Community (BEC) scheme, with 2.9GWh combined energy savings. 197 residences received heat pumps and efficient lights. The community centre received a 12kW heat pump, LED lighting and insulation of hot-water pipes and walls. In 2017, 54 more apartments will be retrofitted with heat pumps, LEDs and window/door upgrades.
- *Leisureworld public swimming pool Bishopstown* upgraded to LED lighting in 2016, using a Pay as You Save (PAYS) model which then required no capital upfront by planning for initial costs to be paid from the savings accrued over a 5 year timeframe. Furthermore, the pool is now upgrading (by August 2017) to 2 high efficiency boilers and installing 4 new pumps – projected combined savings are 887,000 kWh (~20% onsite energy usage).
- *Cork City Central Library* will undergo a major energy efficiency upgrade in 2017, replacing an old boiler and central heating system with an efficient aero heat pump system. The library will also install LED lighting and a PV array. Combined projected savings are 285,785 kWh (~30% onsite energy usage).

4. Smart local electricity production and integration with buildings and grid

Ballyvolane Firestation deployed a 10.5kW PV system, connecting 42 PV panels to a string-inverter, predicted to save 24,000 kWh per annum (~15% onsite energy usage).

5. Smart lighting, lampposts as hubs for communication

A series of pilot Centrally Managed Systems (CMS) for dimming/trimming of lighting have been implemented, though at present, factory-set profiles are still the preferred method. Meanwhile, options for using streetlights as wifi-to-grid connectors and electrical charging stations are still under consideration. Similarly, options for using smart meter information analysis and actuators are under consideration in the context of the National Programme of Energy Efficient street lighting upgrades, on which Cork City Council is an active participant.

11. Alternative fuel driven vehicles for decarbonizing and better air quality

“ESB ecars” is the operator of rapid charge points (RCP) for eTankE electric charging at key interchanges. Meanwhile, the installation of CPs in multi-storey car parks is now in progress, while combining additional CPs with a payment system for Park+Ride is being considered for the long term. Cork City Council has also facilitated the installation of on-street EV fast Charge Points (FCP), operated by the national operator of the EV-charging network, “ESB ecars”. Finally, Gas Networks Ireland (GNI) are now installing a network of CNG refuelling stations to include another nearby facility, located at *Little Island* in County Cork.

12. Smart mobility solutions

Cork will replicate measures to enhance the level of service and options available for sustainable transport options downtown, especially relating to e-bike and cargo bike pools and sharing systems to be used for distributing goods within pedestrian zones. Meanwhile, Cork's public bike scheme, operated on behalf of NTA, continues to function successfully, as do the free parking spaces provided in city car parks for those involved in car sharing.

Otherwise, the knowledge gained by Cork's participation in the "Green eMotion" project on e-mobility, finished in 2015, has led to the deployment of Pedelecs and EVs for the Council's own vehicle fleet, used for site inspections and monitoring (e.g. street lighting, fibre optic sites, VMS signs, RTPI at bus stops, traffic signal junctions).

Graz

Graz prepared two replication assessments which detail the potential for integrating existing and future infrastructure with the chosen solutions from the smart city demo sites. Since the three Lighthouse cities have already started to implement their smart solutions, Graz is interested in the evaluation results expected in 2017/18 as a basis for further planning, including through its Smart City Liaison Group. In the meantime, Graz has contributed to GrowSmarter dissemination activities via webinars and presenting the project to a broader audience at a special session of the Urban Futures Global Conference (March 2016) in Graz.

In order to provide some context, it's worth highlighting selected activities at the Smart city demo site *Waagner Biro*, which have been implemented since GrowSmarter began:

- Urban development contracts with private investors concluded to secure innovative measures and quality of living in regards to mobility, public space, etc. (meanwhile, the contractual phase for the second Smart city demo site *Reininghaus* has begun).
- The *Science Tower* (science-tower.at), the world's first building to integrate energy-glass (transparent panes of Grätzel PV cells), finished construction as a smart city laboratory for innovative building and energy technologies – official opening in autumn 2017.
- An application for ERDF to fund the *Smart City School Campus* is planned for autumn 2017. Phase 1 (the elementary school), and phase 2 (the secondary school) should finish respectively in 2019 and 2022 – in the meantime, public use of area is still intended.
- Planning of the tramway extensions to the demo sites will go underway in 2017.

1. Efficient and smart climate shell refurbishment

Though there are currently no specific climate-shell refurbishment projects by the municipality, the mid-term goal is to include GrowSmarter solutions into a refurbishment strategy for Graz – more information from Lighthouse cities and industry partners on feasible business cases and cost-benefit evaluations would prove useful for convincing decision-makers.

3. Smart, energy saving tenants through information

Similarly, despite no concrete municipal projects focused on energy-saving tenants at the moment, Graz plans to eventually propose such systems to the municipal housing company, though more information from Lighthouse cities and industry partners on feasible business cases and cost-benefit evaluations would prove beneficial.

6. Waste heat and local heat integration by new business models

Two contracts have been made with industries for supplying waste-heat to the district heating system, though some legal challenges concerning guaranteed supply still need to be addressed. Other than information on business cases and cost-benefits, Lighthouse cities' and industry partners' experiences regarding legal aspects would prove useful.

8. Big data protocol for saving energy and improving the quality of life

A digital agenda and data guidelines have been established for applying protocols and procedures to municipal projects. Nonetheless, Graz could still benefit from lessons learned by Lighthouse cities and industry partners related to data aspects and technology provider contracts.

9. Sustainable delivery

Since 2012, Graz has participated in EU-projects to implement the sustainable urban transport of goods (www.smartset-project.eu and novellog.eu). The municipality's mid-term goal is to establish pilot microhub(s) for the Smart city demo sites, but Graz still needs more information on business cases and cost-benefits from Lighthouse cities and industry partners.

12. Smart mobility solutions

For Graz's Multimodal Transport Hubs (KombiMo II/TIM, www.tim-graz.at), first realised in autumn 2016, further implementation of 3-4 more hubs - (e-)car-sharing, e-taxis, e-charging stations, bike-sharing - in the whole city will happen in 2017, and at the Smart City demo site *Waagner Biro* in 2018. ERDF-funded knowledge-transfer of the TIM-system and planned pilot replications will continue at further peri-urban sites until 2019. Beyond information on business cases and cost-benefits, Graz could benefit from knowledge about Lighthouse cities' and industry partners' experiences in implementing and promoting such concepts.

Porto

Due to Porto's interest in replicating solutions implemented by the Lighthouse cities, an analysis of their solutions was carried out, as well as the creation of a local liaison group which is preparing a report evaluating possible replications in Porto. Furthermore, project dissemination (via presentations, meetings, workshops and hackathons) was done to promote awareness among local stakeholders e.g. a set of four meetings in February 2017, in collaboration with the Porto Innovation Hub project, (Energy efficiency and low carbon on the 7th February 2017, Urban Climate 8th February 2017, Renewable energies 9th February 2017, waste and City 14th February 2017) about ongoing and future projects on sustainability, smart lighting, energy, waste and water management. In addition to this, a

partnership was made with the Smart Impact project, the Urbact Local Group, a group of Porto stakeholders to prioritize and develop foreseen activities. Finally, the 2nd replication assessment report will be made available at the end of June including selected activities as the basis for solutions to be implemented.

3. Smart, energy saving tenants through information

Porto plans to establish a platform for smart citizens (especially in the Damião de Góis neighbourhood), companies and public organisations to reduce utility costs (for water, gas and electricity) and for a more sustainable usage. Other than just utilizing tools to monitor and compare consumption patterns among users, the general plan is to foster a sense of competition among users (e.g. making use of gamification principles).

5. Smart lighting, lampposts as hubs for communication

Porto intends to install modern lampposts which not only are more efficient, but are even able to contribute to local energy production. At the moment, 2 pilots will deploy 13 units which utilize LED lighting to save energy, but whose electricity demands are covered by self-consumption from storage in local batteries kept full by a specialized device (e.g. “OmniFlow”) generating electricity from micro-PV and micro-wind – though at the moment, these pilot lampposts will function as remotely-managed off-grid units, eventually they may be integrated to contribute electricity directly to the grid. Optional hardware, which may or may not be integrated, includes environmental sensors, cameras, small cellphone antennas and/or Wi-Fi antennas.

7. Smart waste collecting, turning waste to electricity, heat and biogas for vehicles.

Trash collection in Porto will be modernized following the results of an efficiency study which was conducted. One of the main proposals, currently under evaluation, is to install sensors in waste dumpsters, through which optimized routing of garbage trucks can be managed efficiently.

8. Big data protocol for saving energy and improving the quality of life

Porto developed an Urban Platform in 2015 (and upgraded in 2016) based on big data, predictive analyses and holistic management as an integrated system addressing multiple sectors: security (with the police), emergency services, mobility/traffic and the environment (e.g. energy and waste). Furthermore, Porto makes use of an online Open Data Platform (dadosabertos.cm-porto.pt), whose first phase is complete (with 800 datasets), and the second phase will integrate 400 more open datasets until 2018. Finally, it's worth mentioning the annual hackathons, since 2015, which Porto sponsors (“Hackacity”) to develop solutions using big/open city-level data, including cooperation with other cities around Europe and Brazil.

11. Alternative fuel driven vehicles for decarbonizing and better air quality

Porto already makes use of 16 municipal e-vehicles (e.g. for waste collection in city centre zones), but has set a target of having 70% of the municipal fleet to use alternative fuels. At the moment, many new vehicles (63–69 hybrid e-/diesel units and 192–205 e-units) have

already been, or soon will have, ordered to replace existing diesel ones – this 10 million EUR investment is expected to lead to 450,000 liters of fossil fuel and 2,300 tons of CO₂ avoided (until 2022), as well as 600,000 EUR savings per year to the municipal budget. Furthermore, Porto has set a target of 90% among public buses to switch to either gas (173 buses) or electricity (15 buses) by 2019, using a 46.7 million EUR investment – at the moment one e-bus from a Portuguese manufacturer is being tested along an actual route in Porto.

Suceava

Update of progress in the implementation of the project:

1. Efficient and smart climate shell refurbishment

Over the past 5 years, there have been ongoing energy-efficiency renovations (0.864 million EUR funds from the national government) of 380 apartment buildings to reduce energy losses in the structure and heating systems. Meanwhile, at the moment Suceava is developing technical documentation for ERDF-funding to renovate educational infrastructure (to reduce energy consumption and improve efficiency), 20 more apartment buildings (heat recovery and green energy production) and the Town Hall building. We expect to send the applications for ERDF-funding soon, and if successful, to start implementation in 2018.

3. Smart, energy saving tenants through information

During the next 4 years, Suceava plans to develop pilot HEMS for public buildings (schools, cultural centers, apartment buildings) in order to promote “smart energy behaviour” leading to reduced energy consumption, friendly environmental attitudes and also gauge citizen interest in future energy efficiency measures. Technical documentation is also being designed to renovate one municipal building for cultural, social and administrative activities in one of the less-developed neighbourhoods of Suceava – the documentation also includes measures for efficiency, alternative energy sources and HEMS.

Since January 2017, Suceava has been a partner in the INTEREG project MOLOC¹, which will develop a local integrated plan, including residential/public building efficiency. This plan will be used to apply for funding of efficiency projects. As part of MOLOC, a local support group will facilitate dissemination related to energy-saving behaviour, equipment and technologies.

4. Smart local electricity production and integration with buildings and grid

Local strategies and development plans include measures to increasing local RES electricity, and for this reason the following actions will be implemented over the next years:

- A photovoltaic (PV) grid to cover the municipality’s own needs – ERDF funds til 2018.
- Renovation of the municipal-owned Bazaar Commercial Centre to improve its lighting, reduce energy losses and introduce geothermal heat pumps to cover its own heating needs (co-financed 80% by the Swiss government through the SRCP).

• ¹ MOLOC: “Low carbon urban morphology. New urban morphologies, new governances, new challenges for cities in energy transition”

- Main city markets to be renovated, including energy-saving systems, recycling facilities and freight-mobility plans (funding from the URBACT Programme 2007–2013 and ERDF). The Integrated Sustainable Development Strategy 2016–2023, approved in April 2017, includes a number of actions related to RES-production, energy efficiency and energy-saving systems to be implemented at the local level in the private, residential and public sectors.

5. Smart lighting, lampposts as hubs for communication

Over the past 3 years, Suceava has successfully renovated its public lightning system (24 km network), replacing old lamps with new, energy-saving ones and instituting a management system to reduce energy consumption and increase efficiency (1.2 mil EUR of ERDF funds). In 2014, Suceava expanded on this by starting to replace the entire town's public lamps with LED ones (3.2 million EUR, co-financed 80% by the Swiss government through the SRCP) – over the past 7 months, more than 35% (over 1,600 units) of the LED lamps have been installed, and it is expected that all 4320 units will be replaced by the end of 2017.

In May 2017, Suceava received approval from the Swiss government for additional co-financing (85%) to replace 9,221 existing lights in public schools with LED systems. Implementation will start later in 2017 and will significantly reduce local energy use.

11.5 Smart charging of electrical vehicles

In 2013 and 2014, Suceava secured about 3.8 million CHF from two grants (80% co-financing by the Swiss government through the SRCP), to be Romania's first city systematically promoting electric vehicles (EV): 15 electric vehicles purchased for the municipal fleet; installing 28 public standard/fast charging points (CP), and 56 parking spaces, for EVs; opening a PV-fed e-docking system for charging/sharing/renting 10 e-bikes; and dissemination activities to stimulate electric vehicles' use among private/public owners and institutions.

Upcoming activities relate to the development of local/national electric vehicle markets, with car dealers and companies installing/maintaining CPs. Suceava will implement a car-sharing concept for electric vehicles, including public dissemination campaigns to change behaviour/perceptions about electric vehicles, so as to increase the number of electric vehicles both locally and nationally:

- 12 additional electric vehicles –charging points will be completed by June 2017, and 16 more by November 2017;
- 7 more electric vehicles will be operational by October 2017;
- more e-bikes and e-docking points will be available by September 2017.

7. Smart waste collecting, turning waste to electricity, heat and biogas for vehicles

Since 2013, Suceava has a city CHP power plant using only biomass. This PPP-project is considered to be a starting point for increasing RES production at a local level. Meanwhile, in 2011 a major waste management project began at the county level (2.3 million EUR from ERDF funds), including transfer stations for waste, a new landfill (with a biogas plant) and modern systems for environmental protection and recycling facilities. At the moment,

Suceava is working on tender documentation for local waste management, including facilities for separated waste collection to increase recycling levels and reduce the consumption of raw materials. There will also be underground waste bins installed, expected to significantly reduce negative impacts to livability and the environment.

10. Smart traffic management

Suceava intends to apply for ERDF funds for improving its public transport system, including to fund intermodal points and transfer facilities (park and ride), as well as a modern monitoring/control system for traffic signals, providing users with real-time traffic information so as to reduce fuel consumption, traffic congestion and emissions' impact on the environment and public health. Technical documentation is being designed for a project (expected to start in 2019) on smart traffic lights and real-time information/CCTV systems.

11. Alternative fuel driven vehicles for decarbonizing and better air quality

A feasibility study and technical documentation prepared as part of two 2013 grants (3.3 million CHF, co-financed 80% by the Swiss government through the SRCP) have allowed the municipality and local public transport company to successfully apply for ERDF funding to implement their e-mobility concept for public. The 22.4 million EUR which ERDF has allocated will allow Suceava to introduce ~40 e-buses, an e-ticketing system and charging stations for the e-buses. The replacement of the existing buses will significantly reduce traffic emissions and improve rider-usability. The technical documentation is finalized and the grant contract should start in the first half of 2018.

12. Smart mobility solutions

Suceava finalized the construction of ~15 km of cycling lanes in the city centre (using ERDF funds). Likewise, the construction of an underground parking facility (for 164 cars) in the city center and the renovation of the downtown pedestrian area, reduce traffic congestion, emissions and encourage alternative mobility (11.4 million EUR from ERDF funds).

More recently, newly-purchased municipal electric vehicles will be used for promoting car-pooling among public servants, citizens and private companies, including the designation of electric vehicle parking spaces. Furthermore, the e-bikes which will be available in Suceava later in 2017 will be used to promote alternative mobility among citizens and tourists through a local rental system, taking advantage of planned bike-lane extensions.

Citizen engagement for smarter use of road space

The City Urban Plan will be redesigned to incorporate innovative parts of the new Sustainable Urban Mobility Plan (SUMP). This first SUMP (2017) considers public and private companies, public transport and other stake holders roles and it outlines specific actions and indicators concerning: alternative mobility, alternative vehicles, infrastructure for pedestrians and bikes, parking strategies, facilities for EVs and alternative car-using schemes (e.g. car-sharing).

Valletta

During this period, Transport Malta has been researching what Lighthouse cities have been developing and which technologies are being used both for the immediate and mid-term future of the electric vehicle sector. We participated in the three webinars organised by GrowSmarter and which were useful in terms of sharing best practices and learning from other cities' experiences. Furthermore, with the assistance of various partners within GrowSmarter, a consultant engaged by Transport Malta is carrying out fact-finding research on technological advancements, mapping formulas and the cost-effectiveness of the measures to be included in the replication assessment report to be delivered as part of this project.

11. Alternative fuel driven vehicles for decarbonizing and better air quality

Transport Malta has begun mapping the exact locations of 400 charging points in and around Valletta. The contracted consultant will compile a cost-benefit analysis assessing the charging points mapping exercise. The mapping process, which started in June 2017, includes consultation with all local councils within the region (as the main stakeholders), as well as with the national electricity provider (to help find the best locations for the planned charging points also in terms of power infrastructure), internal consultations within Transport Malta and the Planning Authority. The mapping exercise is nearly complete and has identified and plotted all potential charging point locations using GIS.

Furthermore, a mix of various types of charging points has also been identified according to the expected and analyzed demands per location for the first phase of Malta's national deployment. This rigorous and in-depth process ensures that each location has adequate electricity needed for each type of charging point. Transport Malta is now in a position to start publishing the respective tenders for each deployment from early 2018 til 2020 to complete the national electric vehicle charging network (procurement of each phase will commence subject to the provision of funds to Transport Malta from the central government).

In addition to the gap analysis, and implementation and procurement plans, Transport Malta carried out a short study on the introduction of hydrogen as a transport fuel. This study identified two options, a short-term solution and a medium-to long-term one. It is important to note that Transport Malta considers hydrogen as part of its e-mobility promotion.

12. Smart mobility solutions

Transport Malta published a tender in late 2016 to introduce e-car sharing services nationwide. Now that the offers have been evaluated and an operator has been chosen, the government will allocate exclusively to the selected operator three public parking spaces per vehicle in their fleet nationwide, not just for the Valletta region, though the tender did indicate many specific sites and locations in and near Valletta as mandatory. It is expected that the operator-finance service will be functional once the contract is signed.

Similarly, another tender has been drafted and sent for publishing to introduce a national bike and e-bike sharing programme all over Malta, especially in the Valletta region where demand for such a service is considered to be high.

Capacity building and replication process

It should be emphasized and apparent by the summary report of the Follower cities that the capacity building and replication process is not a one-way exchange from the Lighthouse cities to the Follower cities, but was deliberately designed to provide the Follower cities with possibilities to also feed their own experiences into the Lighthouse cities demonstration process. Moreover, other cities and smart city stakeholders benefit from the programme, in particular the members of the City Interest Group, for instance by attending the GrowSmarter webinars, study tours or events.

Further potential to use the gained experiences and thus enable more cities in Europe to replicate GrowSmarter solutions is explored and identified. The first coordination meeting has taken place in Eindhoven in May 2016 and further teleconferences and meetings to utilize synergies and increase the impact of the European Smart City and Communities Initiative are foreseen.

Next step: All Follower cities are currently updating their replication assessments, reflecting on both the progress made within the Lighthouse cities and also developments within their own cities. The capacity development programme will continue, with an expected four thematic webinars per year.

Time schedule: The timetable for the remaining study visits is currently under development.

Risks: Currently, WP7 risks remain largely hypothetical. The updated replication assessments will further clarify the relevance of the demonstration measures and their potential replicability in the Follower cities, and by extension, other European cities.

WP8 Dissemination

Task 8.1 Communication and dissemination strategy

The dissemination plan has been implemented over the course of the second year, with minor adjustments to reflect the needs of the project. Local dissemination partners have produced communication strategies for 2016–2017. Quarterly dissemination meetings with the Lighthouse cities have been organised to ensure oversight of dissemination activities (See Table). Minutes from these meetings are written and added to ProjectPlace. GrowSmarter has participated in the teleconferences (listed below in table) with other SCC1 projects and given feedback and input into the communication strategy that has been developed by this group.

Meeting	Date	Venue
Communications workshop	01.06.2016	Barcelona
Communication leads TelCo	23.09.2016	virtual
Communication leads TelCo	17.01.2017	virtual
Communication leads TelCo	11.04.2017	virtual

Meeting	Date	Venue
1st DLG TelCo	08.03.17	Virtual
2nd DLG TelCo	27.04.17	Virtual

Task 8.2 City interest group

A concept for the City Interest Group was developed prior to the Urban Futures conference in November 2015, where it was launched within a session targeting Follower cities in Lighthouse city projects. To date, the following 16 cities are part of the City Interest Group and make use in particular of the GrowSmarter webinars, workshops and study tours:

- Alba Iulia, Romania
- Cascais, Portugal
- Lens, France
- Leuven, Belgium
- Ludwigsburg, Germany
- Murcia, Spain
- Reykjavik, Island
- Sant Cugat, Spain
- Trondheim, Norway
- Southend-on-Sea, UK
- Seven members of SOS (Association of Municipalities and Towns of Slovenia)
- Vejle, Denmark

Task 8.3 European workshop series

Following the GrowSmarter sessions organised within the first reporting period (Urban Futures, Berlin & Building Sustainability, Stockholm), a third workshop session was organised as detailed in the table below.

Workshop: Local renewables, energising the smart city and region	Description
Where	Freiburg/Basel
When	26-28 October 2016
Focus	What are the opportunities and limitations of new technologies for urban energy transformation? What is the role of social innovation and citizen engagement?
Target audience	Political and technical decision-makers of cities and regions and their stakeholders in the energy transition
Activity	GrowSmarter session
Website	More details here
Contact	Carsten Rothballer (carsten.rothballer@iclei.org)

ICLEI has coordinated the organisation of a series of events showcasing the smart city projects to take place at the European Sustainable Energy Week. These include:

- Policy session: 1.5 hour session on Smart Cities and replication potential
- Networking village: for a stand during a half day in the networking village.
- Photo exhibition in Brussels: ICLEI has been invited to in a photo exhibition in Brussels [Visualizing Energy](#), GrowSmarter is one of the projects which will be publicised.

Task 8.4 Study visits

As outlined in Deliverable 8.8, study tours have been organised for the Follower cities and City Interest Group members' to provide opportunities for direct dialogue with business partners from the consortium and to assess the replication potential of specific and/or combined smart solutions in their local contexts (See table below). Where possible these have been held back-to-back with major events.

Study Tour	Back-to back with	Date
GrowSmarter Study Tour to Cologne site	GrowSmarter General Assembly Cologne	08./09.06.2015
GrowSmarter Study Tour to Barcelona site	GrowSmarter General Assembly	01.06.2016
GrowSmarter Study Tour to Stockholm site	Building Sustainability SGBC16	20.10.2016
GrowSmarter Study Tour to Cologne site	SmartCity Conference Cologne	26/27.04.2017

Task 8.5 Website and mass electronic dissemination activities

All templates (Word, PPT, brochure, have been reviewed for visual identity and updated to incorporate new logos from the project partners. A second batch will be printed for the next project meeting in Cork. ICLEI has also regularly given input into the branding of measures.

Digital media channels have been set up for the project and are maintained with regular updates (see schedules for update in table below). KPIs from these channels indicate a marked increase in engagement:

- Website: unique visitors >1000/month), 24509
- Social media channels >280 followers (Y1), 727 followers (Y2)
- Video footage >300 views (Y1) 3567 views (Y2)
- Mailing list to receive e–updates 240+ (Y1) 500+ (Y2)

Updates are also shared through relevant LinkedIn groups and PPTs from the WP7 webinars have been uploaded onto Slideshare and shared via the website.

Blog posts & e–updates providing updates on the progress of their local worksites have been delivered by each Lighthouse city on a tri–annual basis. These have been reviewed, edited and promoted by ICLEI.

E-update	Date	Open rate, %	Click through, %
4th #EUGrowSmarter e-update	6.2016	36	14
5th #EUGrowSmarter e-update	11.2016	37	9
6th #EUGrowSmarter e-update	3.2017	40	15

To date, fourteen press releases have been produced at a project level by ICLEI (see Del 8.9: Press releases) since the start of the project in January 2015, the first three covered:

- Launch of the City Interest Group – Free support for smart cities of the future
- Launch of the SCC1 Manifesto

A further ten press releases (see Del 8.9: Press releases) have been prepared by the sites: Stockholm (4), Cologne (3) and Barcelona (3). These press releases covered:

- 2015.11.02_[BARCELONA]_GrowSmarterLaunch
- 2016.08.30_[COLOGNE]_Finnish Delegation
- 2016.09.21_[STOCKHOLM]_Silver Spring Networks Announces Expansion to Stockholm
- 2016.09_[STOCKHOLM]_envac-återvinningskalas_Tvärbanan till hållplats Valla Torg
- 2016.10.10_[COLOGNE]_Zukunftsweisender Klimaschutz Köln-Mülheim
- 2016.11.01_[BARCELONA]_PressRelease_SmartCityEXPO
- 2016.12.07_[COLOGNE]_Peruanische Schüler
- 2016.12.15_[STOCKHOLM]_Ferroamp-Veolia
- 2016.12.15_[BARCELONA]_PressRelease_FastEVChargingStations
- 2016-11-15_[STOCKHOLM]_Skanska-renoverar

The project has been successful in placing articles in a number of European/international publications such as: *Horizon 2020 magazine*, *EU Observer*, *SCIS Magazine*, *Cities Today*, *Eltis*, *CSR Turkey*, *Government Gazette*, *Government 20*, *Business Today* as well as other media such as in TV by the BBC. A summary of all GrowSmarter press activity can be seen on page 24.

A series of fact sheets have been produced by the worksite managers in collaboration with ICLEI on the smart technologies' implementation taking place in the three GrowSmarter Lighthouse cities of Stockholm, Cologne and Barcelona. The fact sheets' areas of focus, showcasing some of the twelve GrowSmarter City Solutions, go from advanced information and communication technology and urban mobility, to incorporating renewable energy sources directly into the city's supply network. All fact sheets are online at: www.grow-smarter.eu/solutions since the start of January 2017 and have been downloaded more than 350 times. The fact sheets are:

- Climate shell refurbishment – Cologne
- Energy quality assurance
- Re-build an industrial site: Ca l'Alier – Barcelona
- Efficient and smart climate shell and equipment refurbishment – Barcelona
- Efficient and smart climate shell refurbishment of residential buildings – Barcelona
- Efficient and smart climate shell and equipment refurbishment of tertiary buildings – Barcelona
- Construction consolidation centre
- The Active House
- Hubgrade – Energy Saving Centre
- Home Energy Management System (HEMS)
- Virtual Energy Advisor
- Residential Estate Management

- Smart Energy & Self-Sufficient Block
- Smart LED streetlighting
- Combined electrical charging and street lighting poles + Wifi-to-grid connection – Stockholm
- Smart Meter information analysis and actuators
- Smart local thermal districts
- Smart waste management
- Big open data platform – Barcelona
- Urban Traffic
- Communal service boxes for sustainable deliveries
- Normal charging infrastructure for electric vehicles
- Fast charging infrastructure for electric vehicles
- eTankE
- Alternative fuels for heavy duty vehicles
- Green parking index

Local events in the demonstration sites

Results: In Stockholm a citizen engagement event was organised in Valla Torg in September 2016. The event was successful with around 500 visitors and positive feedback. The event was also the launch of the refurbishment in Valla Torg, and the audience had the opportunity to get information both on the GrowSmarter project and the different smart solutions from our partners, and to visit the exhibition apartments.

In coordination with all Cologne partners, RheinEnergie organized an event November 2015 to inform and involve the tenants and residents in the Stegerwald community. The goal of the event was to increase the acceptance and the active contributions by the tenants to measures such as SmartHome, car sharing, public transportation etc. The tenants and other interested people were taken on a journey into the future of their residence. Within the event the tenants were informed about the GrowSmarter project partners and their respective roles. In connection with the event, RheinEnergie produced a short explanatory film of the relationships and measures of all project partners. Local newspapers were present and reported about this event. The event was also documented by our Community Reporters. They produced a video that was shared through you-tube. Cologne plans to repeat a similar event for the tenants of the Stegerwaldsiedlung in 2018.

A representative from GrowSmarter has been on site regularly and bi-weekly since January 2016, to receive and evaluate questions and suggestions from the tenants and residents.

Several local newspapers published articles, describing the project and announcing events which were performed to disseminate GrowSmarter. In addition, groups of students or participants from other cities have been received and introduced to the GrowSmarter and SmartCity measures in Cologne since the start of the project.

The City of Cologne also presented GrowSmarter in local government committees, such as in Mülheim as well as in political bodies representing the citizens with topics such as the environment, urban development and transportation.

Local events were organized in Canyelles and Big Blue in late 2016 and early 2017, respectively, to meet local tenants. Gas Natural Fenosa on one hand and IREC and the Barcelona City Council on the other arranged these events to explain GrowSmarter and the evaluation of measures that would be done to quantify the impact of the retrofitting works. The meetings were taken as an opportunity to reinforce the relations with local tenants and their indispensable collaboration for the evaluation of measures. Also, Gas Natural Fenosa found the opportunity to gather feedback from the tenants to produce the second release of the Home Energy Management System.

Dissemination activities in Follower cities

The GrowSmarter project is featured on the Malta National Electromobility Website (<http://electromobility.gov.mt/en/Pages/GrowSmarter---Horizon-2020.aspx>), a website which is hosted by Transport Malta and contains all information related to electromobility in Malta. The GrowSmarter project is constantly updated with project progress and media material.

Next steps:

- Develop local action plans for the dissemination of smart solutions during the demonstration phase
- Continue blog updates, website developments, social media activities and presence at European and international events
- Finalise smart solution fact sheet series
- Organise a European workshop within the European Sustainable Energy Week (EUSEW), and plan for the final workshops, and the remaining study visits in the Lighthouse cities

Time schedule: Ongoing throughout the period.

Risks: The solutions are only disseminated in the national country, hence the continued efforts to co-ordinate communication activities and promote project results at the European level is essential.

7. IMPACT

GrowSmarter is basically still in the implementation phase so the environmental impact and the impact on the quality of life as well as the impact on sustainable economic development are not yet fully visible. The preparation of the measures has required an integrated process within the cities, so GrowSmarter has had an impact in this perspective.

The cooperation between the industrial partners has an impact on the transfer of knowledge between the different entities as well as the cooperation between cities and industrial partners. All dissemination and replication activities have an impact on inspiring other cities to follow the intentions of the project, especially among the Follower cities and the City Interest Group.

The process of implementing new smart solutions in existing areas is expected to give a great impact. Normally new solutions are used in newly built areas but it is essential to demonstrate them in existing areas as most of the urban areas are already built, so to get an impact in cities that's where we need to change behavior and reduce GHG emissions.

In Stockholm, the private Condominia BRF Årstakrönet was first in line to have the European Innovation Award winning EnergyHub system installed by Veolia FM AB. The EnergyHub system offers a new approach to optimize the electricity use in a building. It is maximizing the investment in solar power but also an adaptive current equalization system, a unique system called ACE. Ferroamp is introducing a smart flexibel technology that increases the output of the electrical system. The heart of the system is the power module, a 3 x 5 A (3.5 kW) three phase, scalable bi-directional power inverter. The power module converts the DC energy from the solar panels and energy storage into AC energy that can be used in the building or sold to the electric grid company. The EnergyHub inverter has a function that convert AC from the electric grid into DC to charge the batteries in the energy storage.

The second use is adaptive current equalization (ACE). The ACE allows for a more efficient use of a three phase supply. EnergyHub ACE transfers energy between the phase conductors.

Benefits are:

- Main fuse overloading avoided
- Possibility to reduce the main fuse getting a lower fix fee in several applications
- Reduced distribution losses
- Simple installation
- Transparent to existing loads
- Prevents over currents from all loads in the installation

Veolia provides an adaptive technology for central control system for heating. Temperature sensors inside the building in a number of apartments and a traditional outdoor sensor uses weather forecasting. The system generates a more stabile indoor temperature and benefit better from internal loads and heating from the sun. The energy savings of this solution has been as expected 10–15 %. The City of Cologne and its partners are forerunners in the field of mobility stations in North Rhine–Westfalia and Germany. The City of Cologne has

identified 9 possible spots for mobility stations. The installation is an achievement far beyond the grant agreement.

A number of unforeseeable legal stumbling blocks were identified and solutions have been provided. The legal difficulties were reported to Düsseldorf (State Capital) and the Federal Transportation Agency for future amendments of the state legislation. This was a significant help for current and future installations of mobility stations and is considered an icebreaker for other municipalities in North Rhine–Westfalia. GrowSmarter is helping to create an eco-mobility-friendly legislation and has had an impact on finding a common approach in the region for how to visualize mobility stations. A sign has been developed for the general usage in North Rhine–Westphalia in the same way as the metro sign.

Cologne's mobility stations have also had an impact on the overall transportation approach within the city departments. A broader concept for the placement of mobility stations across town has been kicked off by the GrowSmarter mobility stations and is in development.

8. DEVIATIONS FROM ANNEX 1 (IF APPLICABLE)

8.1 Tasks

WP1 Project management

Task 1.1 – Technical and administrative co-ordination

All set. The Inception report and the Data Management plan were rejected after the periodic report and are now revised and submitted but not yet approved.

Task 1.2 – Financial coordination

All set.

Task 1.3 – Quality assessment

All set.

Task 1.4 – Internal project communication

All set.

Task 1.5 – Represent the project

All set.

Task 1.6 – Local coordination

All set.

Task 1.7 – Local dialogue

This process has started in all sites. In Cologne an event to introduce the tenants to the implemented solutions was carried out successfully. In the site, a café is launched where the City of Cologne is available for any questions from the tenants. Several tenants are engaged in being a community reporter informing the neighbours on what happens in the area. In Stockholm, a recycling event was arranged so the tenants got a platform for selling the stuff they do not need any longer as they need to move out during the refurbishment. The show apartments were open and the industrial partners informed about the Smart Solutions to be implemented in the area. In Barcelona, GNF has arranged several meetings with the tenants to inform about the energy saving measures planned.

WP2 Low energy districts

Task 2.1 – Prepare the realization

All set. However, there will be delays in all three sites, but this does not affect the monitoring as there are similar buildings to measure for two years' time. *Task 2.2 – Implementation*

- In all three sites there are completed refurbishments: Årstakrönet in Stockholm, the first batch in Cologne and in Barcelona Canyelles and Melon district. The process to sign the certificates will start in June by KTH. Most of the remaining buildings will be refurbished

before the end of 2017.

- The Consolidation center is up and running.
- Smart energy saving tenants. In Stockholm the Active House is installed in a show apartment in Årsta. In addition, Fortum is planning for implementation of Active House solution in 54 apartments in Årsta. In Cologne 50–100 apartments will get SmartHome equipment to save electricity for heating. A demonstration site showing these measures has been implemented in the Stegerwaldsiedlung. AGT presented its Smart energy solution live as part of the event for the tenants in the Stegerwaldsiedlung. In Barcelona, the Virtual energy advisor was installed in approximately 400 dwellings and the Home management system was commissioned by GNF in 200 dwellings.
- The virtual powerplant solution is partly installed in all three sites.

Task 2.3 – Monitoring and evaluation

All partners have developed an evaluation strategy based on the evaluation plan developed by KTH. Some restrictions will occur regarding the monitoring because improvements from the tenants and house owners are needed.

Task 2.4 Conclusions

Future task.

WP3 Integrated infrastructure

Task 3.1 – Prepare the realization and perform procurement

All set.

Task 2.2 – Implementation

- The implementation of the smart lighting systems in Stockholm is completed. In the Slakthusarea, Internet of Things applications and solutions have been built on top of the optic fibre network using various furniture and traffic poles in the urban environment. In Cologne, lampposts in combination with charging stations are going to be installed as well as non-certified smart meters in order to evaluate the needed data. In Barcelona, the municipality has approved the “add-on” option to deploy the Smart Tower solution to convert the traditional lamppost in new telecommunication micro-sites, offering space for communication devices and sensors. The Multiservice Concentrator (MSC) is the central element that will collect and upload data from several meters and sensors in Barcelona. The device is now adapted for implementation. The installation will take place in five secondary substations in the 22@ district of Barcelona.
- In Stockholm, Fortum Värme has installed and commissioned the heat recovery system for district heating for a supermarket, a data center is connected in June 2017. In Barcelona, the buildings which are going to be used to implement the measure will be Melon District (M1.1), Canyelles (M1.1), H10 Hotel (M1.1) and all the buildings of the M4.2. These buildings are not in the same island, so the analysis will be carried out virtually, and starts by the end of 2017. Ca l’Alier will, by 2018, be connected to the existing district heating and cooling network Districlima that valorises heat from solid

urban waste.

- In Stockholm, the installation of the smart waste collection system has started.
- In Stockholm, the “Movement of Pedestrians/Bicyclists” will be extended with sensor measurements of the flow of vehicles together with a weather data source to better understand how the weather influence the flow and mix of transportation modes as well as emission levels. In Cologne, during the first year, 3 apps and prototypes were developed for measure 8.1; The Urban Traffic app, Urban Environment app and the Urban cockpit. Since November 2016 the integration of the 3 apps into 1 app is ongoing. Further data sources are integrated as soon as they are available. In Barcelona, a working document “Architecture of the GrowSmarter-BCN platform” has been produced in order to coordinate the tasks of the measures that produce data and the measures that consume data (data producers/consumers) and in coordination with the tasks of Measure 8.4 information has been collected from different measures (from WP3, WP2 and WP5). BSC has finalized the development of the urban semantic model. As part of the validation and testing phase they are currently gathering a list of queries from all local partners involved and collaborating with Cologne. The development of a semi-automatic mapping tool between schemas is implemented. The ontology navigation and search tool developed will provide graphical access to the Urban Ontology, so the user can browse concepts and find relationships in the model.

Task 2.3 – Monitoring and evaluation

All sites have been involved in developing the evaluation plan and the partners have developed evaluation strategies based on the evaluation plan. Monitoring started in December 2016.

Task 2.4 Conclusions

Future task.

WP4 Sustainable urban mobility

Task 3.1 – Prepare the realization and perform procurement

All set.

Task 2.2 – Implementation

- In Stockholm, delivery boxes are planned in the entrance of one of the refurbished buildings and the measure will be implemented in the autumn when the tenants have moved back. In Barcelona, a location for the micro distribution of freights has been decided. As an add-on to the measure, the distribution electric vehicles will transport a device able to monitor the environmental parameters. The data will be used to perform a better management of the distribution vehicles.
- In Barcelona, the implementation phase for traffic management consisted in building the model of the area that is going to be studied. All traffic lights times are being introduced, as well as the direction of the flow of each street and the number of lanes. In

Stockholm, the travel demand management aims to follow up and influence changes in travel behaviour to a healthier and environmentally friendly travel. A beta version of a mobile application will be finished June 2017 and ready for implementation October 2017 where test users in Årsta will start using the application. Insero, together with EWF Institute and Audi, is implementing an information system for drivers. Through a special device in the car, the driver will receive information about what speed to drive in order to reach a green light at the next junction. This information tool will be tested in two cars starting in April/May 2017. For the signal priority for heavy vehicles with alternative fuels the route is established and the equipment in the trucks is soon to be installed. The demo will start after some technical issues with e.g. firewalls are solved.

- In Stockholm, the result so far concerning the filling station for heavy vehicles is one inaugurated station north of the city. The station provides ED95, biogas and HVO. In addition, there are signed agreements between the City of Stockholm and fuel station owners that altogether add up to 10 refuelling alternatives. Fortum has successfully installed and commissioned a fast charger in Årsta. Fortum is also following the construction plans by Skanska to install 5–10 normal chargers in Valla Torg and the chargers for Årstakrönet area are under development. In Cologne, most of the mobility stations are in place and RheinEnergie has implemented several charging stations. E-bikes are scheduled to be implemented soon. The development of mobility stations and E-car sharing in GrowSmarter currently serves as a role model for the entire City of Cologne in order to improve traffic flow. In Barcelona, Endesa has implemented all five charging stations. Three–four charging points for the electric tricycles are made adaptable to electric bicycles and motorbikes to be available for citizens. In Barcelona, the CNG filling station will be installed in Horta–Guinardó district, as near as possible from Passeig de la Vall d’Hebrón Avenue where a high pressure gas pipe is located. Currently, GNF is under negotiation with Barcelona City Council in order to fix the final location for this measure, after several months of deliberations.
- In Stockholm, the planning of the siting of parking lots in the area is completed and the number of charging stations for cars and their location in the area of the Valla Torg is decided. A partner for the electrical car pool is decided who will deliver two electric cars. Regarding the cargo bike pool, a partner is not yet found. The timetable is to start at the end of 2017, when the tenants have moved back to their apartments. In Cologne, three large mobility stations have been implemented and six smaller are implemented or are currently being implemented. Cambio include conventional car sharing cars as well as electric cars and KVB includes bike sharing. Ampido provides parking booking service. In Barcelona, in collaboration with the taxi institute and Cellnex Telecom, three taxi ranks were selected to install the taxi stand system in order to remotely visualize the availability of taxis and 29 sensors were installed in March. The development of the app will start soon.

Task 2.3 – Monitoring and evaluation

All sites have been involved in developing the evaluation plans and the partners have developed evaluation strategies. Monitoring, data collection has started in 2016 for the measures in operation.

Task 2.4 Conclusions

Future task.

WP5 Technical validation, social & economic validation

Task 5.1 – Elaborate an evaluation plan

The evaluation plan should have been delivered in M8 according to the original schedule. A draft was presented in May, i.e. M5, to be accepted at the plenary meeting in M6. However, some partners had additional comments on the plan and it could not be decided on at this point. Extra resources have been spent within WP5 to try to come to an agreement with all partners. The Commission rejected the submitted plan. It is now reviewed and resubmitted.

Task 5.2 – Coordination of monitoring and evaluation activities

Started in 2016.

Task 5.3 – Validation, assessment of robustness, replicability and potentials of market uptake and upscaling

Future task.

Task 5.4 – Recommendations for policy makers and practitioners

Future task moved to WP1.

WP6 Economic validation and analysis

Task 6.1 Economic analysis and validation of the smart solutions

Started in 2016 where meetings with partners were arranged in the sites and in February 2017 a template was sent out to collect the financial data from the partners.

Task 6.2 Development of Smart Business Solutions together with the industrial partners

Started in 2016 where the business solutions were discussed with the partners at the site meetings and a draft of the Lighthouse city market introduction was discussed during a workshop at the General Assembly.

Task 6.3: Fine-tuning the business models with the follower cities

Future task: IESE has already started the collection of the economic data that will allow to do the financial & economic evaluation to check the quality of collected data and detect in advance possible barriers that may arise during this process (see section 4.3).

Task 6.4: Smart City market introduction workshop series

Started in June 2017 where the first workshop was arranged back to back with the General Assembly in Cork.

WP7 Replication in Follower cities

Task 7.1: Smart City Liaison Group – Establishing stakeholder engagement & monitoring of Lighthouse city implementation

Liaison groups are formed in the Follower cities and their work will continue through the whole project.

Task 7.2: Replication assessments in Follower cities

All set.

Task 7.3: Updating replication plans

A revised version of the replication assessment was presented at the General Assembly and will be submitted in June 2017. *Task 7.4: Capacity development programme for Follower Cities*

The programme is set.

WP8 Dissemination

Task 8.1 Communication and dissemination strategy

Submitted.

Task 8.2: City Interest Group

Seventeen cities signed up so far: Alba Iulia, Cascais, Lens, Ludwigsburg, Murcia, Reykjavik, Sant Cugat, Trondheim, Southend-on-Sea, Vejle and seven members of SOS (Association of Municipalities and Towns of Slovenia),

Task 8.3 European workshop series

A variation to the work programme for this activity is proposed. Rather than organise four distinct workshops in what is already a crowded calendar of smart city related events, it is proposed that instead resources are targeted at incorporating GrowSmarter workshop elements into a greater number of relevant events. In this manner, it is expected that a greater number and a greater variety of stakeholders can be reached.

This approach has already been followed within the Urban Futures conference, European Innovation Partnership on Smart Cities and Communities (EIP SCC) 2016 General Assembly, Eindhoven, 24 May – Focus: Replication, Building Sustainability SGBC16 Conference, Stockholm, October – Focus: Low energy districts and theLocal Renewables 2016, Freiburg and Basel, 26–28 October – Focus: Small-scale RES installations

Task 8.4 Capacity building/study visit series

The first study visits have been arranged in all three sites.

Task 8.5: Website and mass electronic dissemination activities

Up and running.

Task 8.6 Ensure links to other European activities

Cooperation with other smart cities projects is on-going. It started in Urban Futures conference in Berlin and has continued through The Building Sustainability conference, Barcelona Smart City Expo and at EUSEW in Brussels ICLEI has initiated a session and booth in cooperation with the other projects.

8.2 Use of resources

In the first periodic report, covering the period January 2015 to June 2016, the use of resources was followed up per partner. Costs were compared to the total budget and the reported effort in person months was compared to the total planned effort. In total, 16% of the overall budgeted costs was reported and 36% of the person months was reported. Due to the fact that no buildings were finished by M18, the total costs reported were much lower compared to the reported person months. Those partners reporting more than 40% of their budgeted costs or planned effort had to explain the reasons why and state if it would imply any difficulties in completing the planned work. The partners concerned reported that the reported use of resources would not affect their ability to carry on with the project and that they were devoted to carry on with their tasks. Moreover, by June 2017, the first buildings in Stockholm, Cologne and Barcelona will be ready and costs for energy efficiency measures in buildings will be reported for the first time in the project. As a result, the cost follow-up will show a more accurate picture of the overall use of resources for the project. During the second periodic reporting period, covering July 2016 to June 2017, the internal detailed cost follow-up document has been updated by the partners with the costs reported in the first periodic report. After the second reporting period the project will have passed 50% of the time and a thorough budget review will be performed.