Interviews with Replicate partners

REPLICATE

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement Nº 691735

The European REPLICATE (Renaissance of Places with Innovative Citizenship and Technology) Project is a lighthouse project of smart implementations through the Horizon 2020 programme (SCC1 Smart Cities and Communities call). REPLICATE is led by the city of San Sebastian, and is a project coordinated by Fomento de San Sebastián.

The project aimed to develop and validate a sustainable city business model in the lighthouse cities (pilot) of San Sebastian (Spain), Florence (Italy) and Bristol (United Kingdom), to improve the transition process towards a SmartCity in the fields of energy efficiency, sustainable mobility and ICTs/Infrastructures, accelerating the deployment of innovative technologies, increasing the quality of life of the citizens, and influencing the replication process. Furthermore, the life quality of citizens throughout Europe is being increased through the project, showing the impact of the innovative technologies used to co-create Smart City services for citizens, and test the optimum process to replicate the successes in cities and through cities. The and has a budget of over 29 million euros for the three cities. The consortium is made up of 38 partners: public organisations, multisectoral companies and universities. Implementations are being carried out in the three lighthouse cities and the three fellow cities: Essen (Germany), Lausanne (Switzerland) and Nilüfer (Turkey) have also participated.

Several interviews to the project partners have been carried out during the project lifetime. The aim of this brochure is to gather those interviews.

39 partners

The Replicate project partners consist of 39 European cities and industrial companies:

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Donostia / San Sebastian

ENERGY EFFICIENCY

Building retrofitting
District Heating
Demand Side Platform

Building Retrofitting

156 buildings and 34 commercial premises retrofitted and connected to the District Heating

FOMENTO SAN SEBASTIAN and GIROA-VEOLIA

Where is the neighbourhood where the retrofitting implementation is being deployed?

In the residential area of Txomin neighbourhood that is located in the Urumea Riverside District, where Replicate project actions are mainly taking place. The Urumea Riverside District covers three sites with a surface area of around 200 hectares: residential area (Txomin neighbourhood), Industrial Park (Poligono 27, which has a capacity for 350 companies with 4,500 people) and a natural park (Ametzagaina, carbon reserve).

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Which were the main problems of the district?

One of the buildings before and after the retrofitting intervention (this is a prototype picture, no the final result)

The River Urumea crosses the district acting as the main axis of the district, which also represents a barrier, as well as being the cause of the area's flooding problems. This area was urbanised during the first half of the 20" century, with low energy efficiency buildings, whereby it has connection problems with the city centre and is at risk of social exclusion. Regarding the buildings to be retrofitted they have been drafted between the years 1965 and 1977, which means, they should not be subject to any regulations of thermal conditions in buildings (NBE-CT-79, came into force in 1981). The constructive solutions that were carried out in those years did not include any type of insulating material.

What has been done?

To address the problem of the district, San Sebastian City Council defined a special Urban Plan for the regeneration of the district in 2008, responding to the flooding problems, fostering the regeneration of the residential area, improving its connection with the city centre and fostering the transformation of the area's economic activity from the traditional industry to services-oriented activity.

On the other hand, the city of San Sebastian, through Fomento de San Sebastian, designed a Smart Plan for the city with an Action Plan for 2016-2020, in which an integral plan for the city's smart strategy was established with the main challenge of establishing a strategic line with shared objectives and to give coherence and coordination to the public action. An Energy Master Plan for the Urumea District was also developed adopting a 'systems thinking' methodology in combination with open-data sourcing to achieve carbon reduction targets and overcome the barriers to energy efficiency. (STEEP project- Systems Thinking for Efficient Energy. Planning, project within the Smart Cities call of the 7th FP of the EU)

How does Replicate contribute to the district?

The Replicate project actions deployed in San Sebastian have the aim of turning it into a smart district close to zero emissions, constituting a district brand in sustainability. The actions that are being implemented within the Replicate project framework for the development of the smart district include energy efficiency, sustainable mobility, and ICTs and Infrastructures actions.

How will the neighbours of the retrofitted buildings be benefited from energy efficiency actions?

156 households and 34 commercial premises are being benefited from the retrofitting actions that include the facade and roof insolation, window replacement and actions on the ground

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floor as well as the connection to the District Heating. Thanks to these improvements the neighbours are being benefited with reduction of noise and increase of efficiency, cost savings, increase of the dwellings value and integration in the area, among others.

How is the process being carried out?

Giroa is the partner in charge of the retrofitting implementations. Together with Fomento San Sebastian the meetings with the neighbours have been held. The effort on engaging the neighbours has conducted to very positive results. The retrofitting works have already started, the facade and roof insolation are being carried out, followed by the substitution of the old boilers and the connection to the District Heating. The works on one of the doorways are almost finished.

The buildings to be retrofitted

District Heating System

Centralised thermal energy system for domestic hot water (DHW) and heating for 1,389 new homes and 156 retrofitted homes

FOMENTO SAN SEBASTIAN

What energy actions have you been developing for the Replicate Project?

We plan to service more than 1,500 new properties and 156 existing dwellings, supplying them with the latest generation model solutions in the form of two Biomass boilers, as well as two gas boilers.

We have been working on a great number of things on the Urumea riverside district, as well as trying to revitalize the district of Txomin and Polígono 27. But I would like to focus this short interview on District Heating.

During 2018, our sights have been set on the imminent completion of the District Heating which is a crucial milestone on the Urumea´s smart district strategy. Among other things, the general structure of the building has been built, the boilers are ready to be installed, several contracts have been signed with third parties and control procedures have been established.

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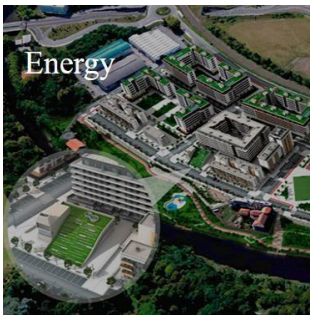
What positive impacts have these actions achieved and what beneficial outcomes do you foresee in the future?

There are two primary impact groups we are aiming to satisfy with these implementations: The environment and the people living and/or working on the district.

Once the work has been completed, tested and refined, we plan to reduce CO2 emissions by up to 85%. 90% of the energy will be renewable and there will be a reduction of 35% in primary energy consumption compared to now.



These measures will provide users with a greater guarantee for quality of services and better prices, since power generation will be more efficient and cheaper on the long run.

Demand Side Platform

Tool to generate recommendations to residents for better use of energy and to foster sustainable behaviour and savings

TECNALIA

What does the Energy Demand Platform consist of?

This is a tool that offers information on the consumption pattern to residents of Txomin neighbourhood. The aim is to make the residents aware of saving potentials in their heating consumption (according to studies up to 10-15% of saving can be achieved). The effectiveness of these tools depends on available data. In this case what was very challenging was to provide them with interesting information obtained only from consumption meters without inner temperatures, set points etc. The tool provides information about the consumption pattern, consumption compared to similar patterns, it presents a breakdown of the hot water and heating consumption, etc. The system also provides information to the operator in terms of consumption forecasts on weather data.

What advantages can the demand side platform offer?

For users the main advantage is a better knowledge of their consumption patterns. This is something that can help them to change their consumption behavior specially f they see that other households are more sustainable. From the technical point of view the tool includes the possibility of generation of interesting data with nothing but the meter itself. And not only for the final users but also for the operator of the district heating.

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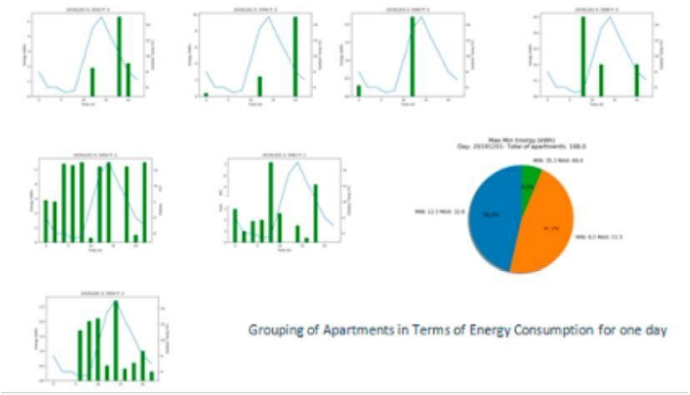
Which is the link of the Demand Side Platform with other implementations in Replicate project?

There are two main links with other implementations in Replicate project. The first one obviously related to the pilot of San Sebastian where it is implemented. The implementation is part of the strategy for the neighbourhood of Txomin-Enea which includes not only energy actions but also mobility actions and ICT actions. In particular by providing citizens with more information on their consumption behaviour on the thermal side which is directly linked with the district heating intervention also part of the pilot. Within the strategy these type of tools allow citizen awareness and can bring savings through changing consumption patterns. The second one would be more transversal and gives the opportunity to participating cities (other lighthouse cities and fellow cities) to learn on how to implement these tools and what are the benefits of their use. This learning process is also very valuable for replication possibility and spreading these tools to other cities.



Grouping of Apartments in Terms of Energy Consumption for one day

Which impacts will the DSP generate?

It creates a single IT platform that shows the benefits of energy consumption tackled as a holistic point of view including producer and users in an integrated approach. Reduction of CO2 emissions could be expected due to reduction of end-user's energy consumption and optimisation of the DH operation strategies due to DH power requirements forecasting. It enhances end user awareness of energy consumption patterns and reduction of consumption costs.

Electric Buses

2 electric buses acquired and 2 charging stations installed

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DBUS

What mobility action have you been developing for the Replicate project?

Our work on mobility actions during 2017 and these few months of 2018 is pretty varied. During this period, DBUS has continued monitoring the results of the two 100% electric buses implemented in line 26-Amara-Martutene in July 2016, and has done several adjustments in order to increase the electric daily autonomy of the buses in coordination with the manufacturer. Improvements in traction system, climate control system, demisting system and changes on the working procedures have been done.

What positive impacts have these actions achieved and what beneficial outcomes do you foresee in the future?

Our I can share some facts and figures from our yearly reports from July 2016 to January 2018 on the matter.

The e-buses running on our lines drove 116,700 kms during this period and has been estimate a tCO2 emission reduction of 140 (1.200grCO2/km). Additionally, another e-bus has been bought out of the REPLICATE´s project and therefore these data in general terms is better since the total tCO2 emission reduction has been of 216.

With the implementation of new mobility actions, and the purchasing of new electric-hybrid buses, we hope these figures will keep on improving on the following years.

Municipal EV fleet deployment

4 electric vehicles for municipal fleet and 6 e-motos for mobility agents

Private EV fleet deployment

E-taxis and surveys

Smart Mobility Platform

Sustainable transport management system

REPLICATE

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IKUSI

Ikusi has been developing the Smart Mobility Platform in the city of San Sebastian. How does it work?

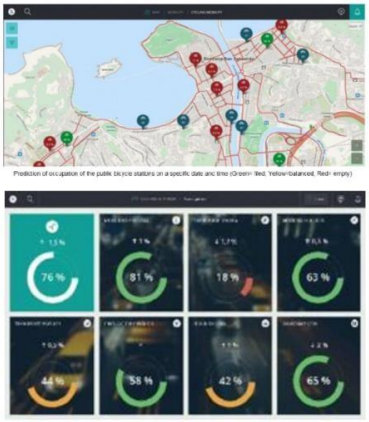
The Smart Mobility Platform monitors and manages a large volume of data coming from multiple sources and centralizes, processes and exploits data multimodality with advanced Business Intelligence and Big Data Analytic tools. This allows managers, city planners, service operators and municipal authorities to visualize the information in a simple way, understanding better the reality of the state of mobility and provides insights adapted to the need of different municipal departments.

What positive impact has the implementation generated and what beneficial outcomes are foreseen in the future?

The mobility platform allows municipal planners and operators to have an instrument to check mobility indicators and receive alerts in real time for the proper management of urban mobility services, so it leads to a more effective planning and decision-making process. Consequently, a better transport planning and an improved quality of all the services related to sustainable mobility, based on the information collected and elaborated by the platform, can change citizens transport behaviors and reduce the need to own/use a private car. This change in the behavior, resulting from a better management of the mobility related services, means lower CO2 emissions levels, so it would also be beneficial to mitigate climate change.

Which is the replication potential of this implementation?

The platform has been designed as a highly replicable solution, and the data models created for San Sebastian are applicable to other cities. With the integration of the corresponding data provider systems, an instance could be configured for each city. It can also be easily scaled adding other data sources not directly related to mobility but to other management areas for the municipality. Furthermore, the architecture of the platform is designed in a modular way so that, without needing to modify the same, it can scale its processing and storage capacity and respond in real time to a greater number of sensors and actuators without affecting its performance.



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What difficulties have you had to face during the development of this platform?

One of the biggest challenges of the project has been the processing and modelling of the information that add value to urban managers according to the available data. It has been addressed an important phase of technological and business consulting to establish the precise information, at the appropriate levels of aggregation based on the needs of each departmental technician (global city scorecard, specific process indicators with capacity of different filters, generation of periodic reports, etc.).

Smart City Platform

Smart City Platform deployment with integrated services

Development of services from mobile data

Urban mobility based on operational information

EUSKALTEL

What are or have been the main tasks of Euskaltel in the San Sebastian pilot?

Traditionally the most common methods for gathering information on mobility behaviour have been interviews, questionnaires and surveys, all of them facing a number of limitations relating to its accuracy, representativeness and reliability. In the project framework, the aim of Euskaltel was to obtain an aggregated characterization of urban mobility based on operational information from mobile network companies. Analytics of this data can provide very exact information about means of transport, origin-destiny matrix, etc.

Euskaltel has develop a solution to provide real-time knowledge of urban mobility in San Sebastian pilot. To achieve this goal, a Data Lake, the Big data infrastructure built to store and transform the data coming from the network into people movement information, and a set of mobility analytics algorithms, have been developed, defined to extract aggregated information. Additionally, an Application Program Interface for the information of the third parties (in this case, San Sebastian Municipality) is now available.

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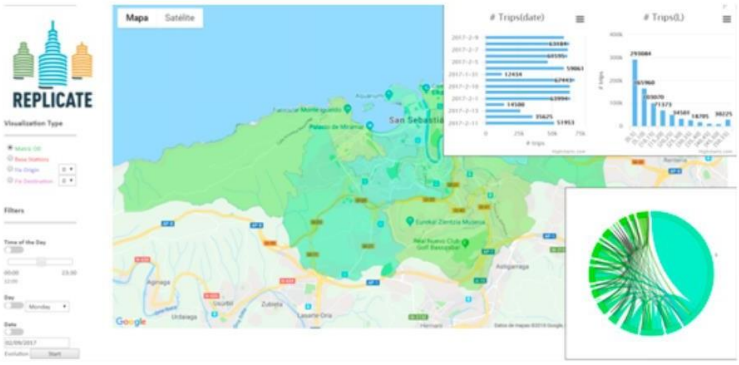
Based on the data managed by, Euskaltel, advanced data analytics methods can provide very exact aggregated information about mobility of people in the city as mobility heat points, origin-destiny matrix, etc.

When implementing Big Data for Mobility Services, did difficulties arise? Which? How were they solved?

Guaranteeing the privacy of all Euskaltel clients was key, so that it can be guaranteed that individuals are not traceable in an isolated way. Guaranteeing the privacy has been one of the great challenges of the project. The main regulation related with the analysis of location based in mobile devices is the General Data Protection Regulation

(EU) 2016/679 ("GDPR"). This is a regulation in EU law on data protection and privacy for all individuals within the European Union (EU) and the European REPLICATE Economic Area (EEA). According to this regulation, a Privacy Impact Assessment (PIA) was carried out in Euskaltel to ensure the absence of risk of privacy loss for the end users.

How does Big Data for Mobility Services work? What does it need to work?



Visualization layer-Analysis of the movement of citizens based on the mobile phone signal

We are using two different data to provide this service. On one hand, the Call Detail Records (CDRs) which stores details of the data sessions as the type of a call connection and its duration. in the case of Replicate the user ID, the serving base station id and the hour of the day at which the connection is performed are used. These data constitute the largest part of the data used. On the other hand, we use Euskaltel "WIFI Kalean" data. WIFI Kalean is a service that allows Euskaltel clients to share their private WIFI spots, splitting its Wifi in two parts; one private for their own use, and another public, shared between all the customers of Euskaltel. The clients who use this service share the usage of the routers with the rest of the users in such a way that a user can use a router placed in some other user home in a transparent way. In this case we use the MAC of the WIFI, the user id and the hour of the connection.

The physical localization of the base stations and WIFI routers, allow locating the users to be able to estimate their trips. All these data are store in HDFS filesystem using and HBASE database in such a way that the information can be processed and available for the different purposes of mobility service. The collected data are cleaned from jumps, not representing real transitions from different zones, and trips are computed: a trip is considered as a set of connections with

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base stations or WIFI Kalean routers of the same mobile device which are temporally ordered, a displacement is produced, and consecutive measurements are not distant apart in time. The data trips collected are aggregated in the matrix and elaborated. The results are represented in a map, for further usage.

Which are the most important advantages that this type of systems can bring to the city of San Sebastian?

One of the main success is the data richness and large overage of Euskaltel in the pilot geographical scope and the possibility to gather information about pedestrians and private vehicles movements in a no-intrusive way and without deploying additional infrastructure. Municipal planners can benefit of a great quantity of reliable data and information, on which they can base decisions and improve so the quality and effectiveness of the interventions and initiatives adopted. For example, a good understanding of the demand and mobility needs in the city, contrasted with the current transport offer, could identify neighbourhoods or areas with particular needs.

Furthermore, the possibility of aggregating mobility information allows a continuous monitoring of the Urban Sustainable Mobility Plan indicators, giving the possibility to adopt corrective/improving actions and improve therefore urban sustainability, in environmental, social coexistence and economic terms. Lastly also SMEs might have access to citizens and tourists transport behaviours data. With this information SMEs can implement performances more attractive for tourists, offering promotions, and they can measure the impact of their marketing campaigns.

Linked Open Data deployment

Development and deployment

EUROHELP

Eurohelp has developed the Linked Open Data in Replicate project, what is exactly Linked Open data?

Linked Open Data (reducing it to the field of data sharing between cities) consists, basically, on connecting data from city to city through the Semantic Web, in order to make information interoperable across cities. As a definition, it is data based in non-proprietary formats (such as RDF) that should be machine and human readable in order to foster its reutilization. It should also be easy to access via HTTP or web, reusable without restrictive licenses and it should have no cost for users. However, it is up to the data owners to adhere a license for consumption/access to the datasets with or without cost to the final user.

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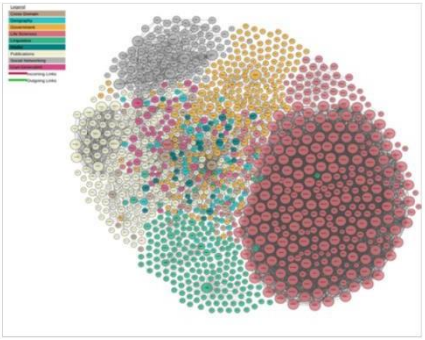
What positive impacts have the implementation generated and what beneficial outcomes do you foresee in the future?

The implementation of a Linked Open Data infrastructure has highly contributed to create better planning and decision making since its availability and, above all, the interoperability of data among cities increases the ability of the city managers to assess the state of the city and build more sophisticated analysis tools. It has also led to increased levels of transparency and it allows fostering the citizens' participation and organizations' access and use of the published data.

Which are the main difficulties and barriers in the Linked Open Data?

The main issue is that Linked Open Data is still an unknown paradigm for most Public Administrations and the generated improvements are often perceived in a long term, indirect way. Linked Open Data conversion is, in fact, the final phase of the whole data treatment process, which requires complex technological skills, having that there are not many analysts and developers available. However, the knowledge on the matter is increasing and it has been beneficial to position San Sebastian in the Linked Open Domain.



Which is the replication potential of this implementation?

Interoperability is an increasing feature requested by IT Departments all across Europe, and having some public data that can (and should) be shared among organizations, Linked Data capabilities are almost a must. Open Data Euskadi, part of the Basque Government's' web solutions, has already some of their datasets converted and published as Linked Data thanks to some developments carried out by EUROHELP, who replicated the solution implemented within Replicate.

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Citizen Participation Platform

Several citizen participatory processes

What is the purpose of the Citizen Participation Platform?

The aim of the Citizen Participation Platform is to engage citizenship by fostering citizen participation through new technologies, avoiding face-to-face surveys and voting processes, to foster data publication and participation of citizens, and to develop and efficient information management, data sharing and decisional process.

What positive impacts have the implementation generated and what beneficial outcomes do you foresee in the future?

The implementations of the citizen participation platform foster social inclusion since all citizens are called to express their opinion on specific issues and proposals. It also allows a better planning and decision-making process increases and the likelihood of access in the policy implementation phase. Lastly, it encourages political stability as it is a process based open shared choices by incorporating the preferences of the interested communities. For this reason, the decisions adopted are more stable and have a greater capability to face changes that occur over time.

Which is the replication potential of this implementation?

Engaging citizenship is becoming a main concern in almost every municipality so it was no surprise that this implementation has proven itself to be a highly replicable solution as Eurohelp has been working on implementation citizen participation platform in different scenarios and for different clients: Diputación de Álava/Araba, Diputacion de Gipuzkoa and Diputación de Aragón.

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High-Speed Mobile Network

A wireless communication network throughout the Urumea Riverside District deployed

SISTELEC

What is the purpose of the implementation?

SISTELEC TELECOMUNICACIONES S.L. has been developing a wireless broadband network, based on manufacturer's technology CAMBIUM NETWORK, throughout the Urumea Riverside District. This network increases the network capacity and security, supporting the connectivity of the district with the entire city of San Sebastian. Fomento San Sebastian is responsible for Municipal Telecommunications Infrastructures in the city.

The main purpose was to provide a future proof backhaul platform that was able to provide several and very different services from the lighthouse cities to the final users such as citizens, small business and other services providers. The project provides a wide access to both municipality services but also to other project partners in order to get a transparent network through high-speed broadband wireless network. So other services could be deployed, quickly, without incurring new costs and in an easy way. Just a wireless subscriber module is needed to get access to the wireless IP network. Thus, generate a great infrastructure to deploy current and future proof services and projects that will be supported by the broadband wireless network.

What is the difference between previous wireless technologies and this wireless broadband network?

This intervention aims at installing the best in class of current market provider technology based in the in order to deploy a multipurpose backbone network that can support several high bandwidth and low latency services like video surveillance or digital voice calls. The difference between the previous wireless technologies and this wireless broadband network, will be the scope and its bandwidth: It offers transfer rates of 300 Mbps and distances up to 30 km from a base station.

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What positive impact has the implementation generated and what beneficial outcomes are foreseen in the future?

Improvement of connectivity coverage technology and improvement of the spectral efficiency of the connectivity network is achieved. Thanks to monitoring software installed to manage the network, the wireless broadband network, increases synergies and efficiency which means reduced costs. The wireless broadband network also increases network capacity and security, supporting the connectivity of the district with the entire city. Businesses with special connectivity needs can be launched successfully in those areas where wired networks are not available or expensive to deploy.

Which is the replication potential?

The solution is highly replicable in cities where its orography is mountainous, taking advantage of elevated locations that provide strategic points to generate total coverage in the city. The use CAMBIUM NETWORK 's technology was determined by the specific orography of San Sebastian, in which there are hills at a maximum 250 meters high, (Gudamendi or Ulia), that allows optimum coverage. In this way, the use of high-speed broadband wireless network is the ideal solution to generate a total coverage model that could be useful to deploy IoT and M2M services, like fixed devices and mobile sensors. REPLICATE project lets to Fomento San Sebastian to continue with the deployment of the broadband wireless network to other areas without coverage and to enhance the actual wireless broadband network service area.

Smart Lighting

Intelligent Public Lighting System and IP services in Poligono 27

LEYCOLAN

What ICT action have you been developing for the Replicate project?

Last year extensive work has been conducted on substituting the traditional lighting grid for LED lights; we have also set up motion detectors and sensors which adjust their brightness of the streetlights depending on the situational weather and transit.

We have also implemented systems for vehicle counting and speakers inside the district to alert the citizens in case of emergency."

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During the last period, the monitoring system continues collecting data and analysing the installation energy consumption data for its storage and processing. It is possible to analyse the energy consumption behaviour depending in the presence detection, and it is expected to be able to optimize the energy consumption on the base of the analysis of these data.

What positive impacts have these actions achieved and what beneficial outcomes do you foresee in the future?

Last Right now, these measures have saved the district up to 60% of energy consumption. We expect this number to keep rising in the upcoming years until it reaches an estimated 75%.

On 2017 kwh consumption went down 50% on average. For 2018 we estimate these averages to increase at least 10%, putting the energy saved on an average of 60%. Our goal, as previously stated, is to reach 75%; but we will only be able to reach this goal once the system has been tested and refined.

Of the energy we have saved, we can attribute at least 60% of it to the transition from traditional streetlighting to LED lights, the other 40% has been achieved thanks to the motions sensors and systems we have put in place.

In the near future, we estimate the district's CO2 emissions to also go down by 63%, as well as a reduction on the running costs of 57% thanks to our reduced energy needs, which can be translated savings of 5,000€ annually. The maintenance costs will be halved.

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Florence

ENERGY EFFICIENCY

Building Retrofitting and District Heating
Smart Grid and Demand Side Platform

Building Retrofitting and District Heating

Social housing: 300 dwellings with 700 people

MATHEMA

What Energy action have you been developing for the Replicate project?

The 2018 is the year of deployment: the smart district pilot is entering in reality. The Final project of the energy efficiency retrofitting and district heating is now ready: after closing the public tender for the insulation of the buildings (first phase of the project), 21 technical and economic offers were presented and evaluated according to the European and national rules.

Two buildings, 300 dwellings, 700 people: these are the numbers that the energy efficiency public works, starting with the insulation, involve. But it is needed to be aware about the right behaviour to have a real smart house: we need smart people. To help to be sustainable, smart Info are going to be deployed for 600 homes to get aware about the electric consumption and have the opportunity to monitor in real time and a specific app for consumers is going to be

REPLICATE

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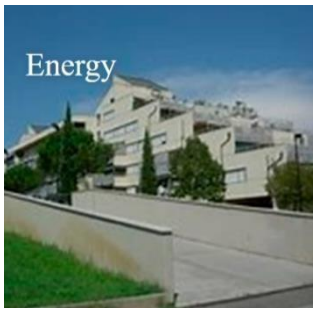
realized. Apartments at Le Piagge have been visited, where the first Smart Info deployment is foreseen and the energy app is being tested and its operational use is expected by the summer, allowing to account directly the electric data from the smart info of those who decide to register.

The app whose "energy hero" is the main character of a game, provides "coins" for withdrawing prizes and is open to all those who want to learn while having fun. The new EU discipline imposes a different approach in the processing of personal data, provides new requirements and, based on the new rules, a mandatory update is started, taking into account also the energy data resulting from the smart info and their treatment in the app."

What positive impacts have these actions achieved and what beneficial outcomes do you foresee in the future?



The aim of the energy actions is to develop an energy efficiency system that allowed to saving consumptions and saving energy bills for tenants thanks to retrofitting and thermal seasonal energy storage, that is serving an area of 20000m2 of intervention. Public works is needed but additional services for city users are needed too to ensure the results and to promote the correct behaviour in all the houses of the city: tools as smart info and energy app for citizenship are needed to give clear information about domestic consumption enabling the customer to increase awareness and knowledge on how they are consuming and become smarter.

Smart Grid and Demand Side Platform

E-DISTRIBUZIONE

What positive impacts are expected to achieve and what beneficial outcomes (both economic and environmental) do you foresee in the future?

The activities implemented by E-Distribuzione in the project will provide different benefits such as an increasing of the overall quality of the electric distribution grid's service, reducing outages' number and duration thus impacting positively final customers, while reducing CO2 emissions fostering electric mobility and more positive behavior in the energy usage thanks to the smart info.

What kind of installations do you carry out?

We are carrying out 3 different types of activities:

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- Smart Grid implementation — E-Distribuzione is implementing a resilient and performing Smart grid through an innovative remote-control system with high-performing broadband communications technology, which will provide real-time network data to the control center to improve the monitoring of the network. Thanks to the development of a new advanced automation, for the automatic detection and isolation of a fault in the grid (SFS —Smart Fault Selection) it is possible to reconfigure the grid in a faster way, improving service quality and reducing energy outages, based on logic coordination between protection systems, in order to optimize the time equivalent of an electrical fault extinction and consequently reduce the equivalent customer moment.

- Installation of Fast recharging infrastructures for electric mobility — E-Distribuzione, in collaboration with the Municipality of Florence, has installed 6 fast recharge stations for electric mobility (Fast Recharge Plus 1G) aimed at serving and satisfy the needs of mobility and recharging of taxi fleet.

- Smart Info distribution — E-Distribuzione, within the scope of the project, will distribute 600 smart info to final customers, thus enabling energy efficiency services. In fact, the smart info supports citizens in becoming more aware of their consumption and consequently giving them the possibility to modify their energy behavior leading to cost savings.

How many people are expected to be reached by the end of the project?

Regarding electric mobility all the electric taxi fleet has been impacted. We are talking about 70 taxis. Regarding smart info it will be distributed to 600 final customers while smart grid implementations will cover all the citizens living in the pilot area, quite 10.000 inhabitants.

Which are the tools which help saving energy and how do they work?

The main device deployed in the project which supports and facilitates energy saving is the smart info. Such device, communicating with the smart meter, allows customers to visualize in a simple and clear way their electric E-distribuzione consumptions during the day (splitted into the 3 energy band foreseen by the authority), having the possibility to compare historical data and thus understanding energy behavior. The aim is to increase customer awareness for a better energy usage.

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SUSTAINABLE MOBILITY

Electric vehicles fleet
Transport infrastructure adaptation
Advanced Mobility Services for citizens

Electric Vehicles Fleet

E-taxis

CONSIGLIO NAZIONALE DELLE RICERCHE - CNR

What research methodology do you use in this project?

We apply classification, prediction and pattern discovery tools on data provided by the Municipality of Florence, describing the traffic flows between city zones during a typical peak hour, and the Enel-X partner, about the usage of public charging stations in Florence. The goal: to understand and possibly predict how the drivers of electric vehicles use the public recharging infrastructure and to build a set of what-if scenarios considering possible evolutions of the electrical mobility landscape in Florence.

Which have been the most significant results found in this project?

The most of the stations in the public recharging infrastructure in Florence serve one or two electric vehicles every day, but most of the time that electric vehicles spend connected to public charging stations they are idle because they are left plugged even if fully charged. Furthermore, our what-if analysis suggests that the current system can have some difficulties to support a significant increase in EV traffic without service disruptions due to a lack of free charging stations when requested. The REPLICATE project will have a very positive impact by deploying faster-charging technologies or increasing the number of charging points. However, it would also be important to design city-level policies to limit the idle parking times to effectively support the charging demands due to the increased popularity of EVs.

Which point did you find the most interesting to investigate?

We believe that it is of paramount importance to develop suitable prediction models to infer how the mobility of people in the cities may be influenced in the use of electric vehicles or the activities they due during their movements. The combination of heterogeneous data about urban traffic features, sociodemographic indicators and operators of charging infrastructure can definitively boost the accuracy of these models, and help in explaining the behaviours of the

REPLICATE

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drivers of electric vehicles. We also believe that these tools can be key enabler for making the planning of future public charging infrastructure more sustainable and efficient.

Do you think the data obtained will vary significantly from here to 5 years?

The fraction of people using full electric cars for their daily trips is rapidly increasing but it is still low (<1%). Thus, electric mobility can be still considered a weak signal in the urban mobility landscape. Moreover, the deployment of fast charging stations is reducing the time needed to fully recharge the battery of an electric car. Thus, we expect that the data about the usage of the charging infrastructure will vary in the next 5 years as these transformations take place. Finally, the increasing role of shared mobility services, e.g., electric car sharing, may have also a non-negligible impact on changing the inter-city mobility demands, and consequently the charging demand of electric vehicles.

Transport infrastructure adaptation

Recharging stations

E-DISTRIBUZIONE

What Mobility action have you been developing for the Replicate project?

On track to the zero-emission urban mobility: this is one of the targets of the smart city plan of Florence and e-mobility is a priority. The actions of the project are strategic in the roadmap of the city towards the Sustainable Development Goals. 6 superfast recharging stations have been put in place: 2 more than what previously planned in the project, because of the high demand by e-taxi driver associations and due to the number of e-taxi already circulating in the city (now 74).

Moreover, the app for taxi recharging management system is being evaluated for updates together with taxi drivers. A technical report on main standards for charging stations of electric vehicles and hybrid plug-in was developed to define the next tendering process for another 40 recharging stations.

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What positive impacts have these actions achieved and what beneficial outcomes do you foresee in the future?

Transport network modernization is the strategy of the city: a set of push-pull actions are provided to reduce the Co2 emissions, the PM10 emissions and the private vehicle use, especially the traditional/thermic one.

The public transport needs to be improved and reinforces, with special reference to electrical one as the taxi fleet or the tramway system, in order to be considered the natural choice by city users. This will improve the quality of life of citizens in terms of sustainability and liveability and able to make a more efficient energy use in the transport sector, even the private one thanks to the public multi-vendor recharging stations.

ENEL X

Enel-X is involved with mobility actions in the city of Florence, butin which way?

Enel X's goal is to provide the country with a capillary network of recharging points that eliminates fear of running out of energy and not having an infrastructure nearby. For this reason, Enel X's business line dedicated to innovative products and digital solutions launched an ambitious plan to increase the number of public charging infrastructures. The program foresees an investment of between 100 and 300 million €. In REPLICATE project, the district has become part of this ambitious plan with about 40 additional public charging points installed by Enel X interoperable with dozens of operators (Mobility Service Provider) at international level, to ensure the recharge service to foreign and domestic customers of other operators active in Italy. The EMM management system provided is the same also for the Fast recharges dedicated to taxi fleet, able to exchange information about charging availability and booking with the project App and platform.

How useful do you think the installation of these charging points can be?

Enel X, as well as the municipality of Florence, strongly believes in the key role of electric mobility for the development of new smart cities. Thanks to the pioneering experience and important investments made in the field of private electric mobility, today Enel X is ready to offer green transport solutions to a wide public, promoting the transition to the electric public transport.

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Is there an estimate about the reduction of emissions after the installation of the mentioned charging points?

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Is there any kind of threat or risk to this system of vehicle energy recharging?

As mentioned before, after the pandemic e-mobility is expected to come back to its increasing trends and even boost them, especially at urban level. The threat could consist in the market of charging point which is constantly evolving and Enel X is ready to adapt the infrastructure plans and the product portfolio to the electric vehicle fleet evolution (i.e. to the number and type of electric vehicles that are placed on the market). At present the Enel X Italian infrastructure plan is in line with the needs of electric vehicles expected by 2025 (more than 700,000 BEV and over 200,000 PHEV) and 2030 (4.4 million BEV and 915,000 PHEV). Keeping in contact with the automotive market and collaborating with the main car makers and car rentals gives Enel X the opportunity to be always up to date with new technologies in the charging field.

Advanced Mobility Services for citizens

New services provided

REPLICATE

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Local IT Systems integrated with ICT Smart City Platform concept

Smart City Control Room

SPES CONSULTING

After 5 years working for REPLICATE, what do you think have been your best contributions to the project?

Thanks to its technical background but also to the experience with public authorities, SPES has played the role of "facilitator" connecting different departments and integrating branches of technical expertise (buildings and plants, grids, lighting, vehicles, infrastructures for recharging or data collection, ICT platforms) as well as different points of view (market and public sector), "translating" the respective needs and trying to optimise processes and results. In a complex project like this, it is important to have "an independent" referent who can support with its analysis the decision making and the management processes following all the activities and providing experience to overcome the problems and barriers.

The activities started with the support to the development of the three Smart City Plans in FP7 STEEP, Roll-out plans integrated in the lighthouse cities programs and regulatory framework at short-mid or even long term was SPES' last challenge in Replicate project.

Regarding your area of activity, have you detected any other possible improvement points in the city of Florence? Which?

The main target now is the extension of the activity in terms of timeline addressing even more ambitious objectives for 2030 or 2050, territory involving more citizens also in the metropolitan area and influence including more topics from the sustainable goals' framework.

What difficulties have you had to face, or continue facing, while you were working for REPLICATE?

"Integration" is our key. The main difficulties were to motivate heterogenous stakeholders in working together and to facilitate communication between different skills targeting a unique vision. The other issue was to "integrate" findings from pilot tests in the planning/programming framework at different level to multiply the results for a wider audience and long time.

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Now that the project is closer to ending its activity, which are the main conclusions that SPES Consulting draws?

Our main goal was to understand what a smart city is in practice and how we could export this experience to the other cities and towns we're working with. The conclusions, reported in our last deliverable D7.6, are a smart city model where factors we called "enablers" play a fundamental role in supporting the transition and all impacts, even external, should contribute to the selection and prioritisation of the planned actions. There is no a copy paste solutions, but a common winning approach: in principle a smart city is a dynamic and liquid framework whose main strength lays in the links and connections built at every level (administration, stakeholders, plans...) which allow a higher integration and adaptation potential of this structure to upcoming needs of its citizens.

THALES

Which are the most important advantages that this type of systems can bring to the city of Florence?

In our opinion the most important advantage that this type of system can bring is the deployment of innovative technologies and solutions to significantly increase resource and energy efficiency, improve the sustainability of urban transport and drastically reduce the gas emissions. In fact, to provide cities with comprehensive, dynamic command and control platform allow them to adopt a holistic management of the various services.

What difficulties have you had to face, or continue facing, while you were designing this kind of system?

It has been difficult to deal with the various vertical development trying to keep a homogeneous approach to cybersecurity aspects. In addition, it remains difficult to design a smart city project which could easily/fully replicable in other cities/projects: we believe a significant effort in standardization is needed also to improve market efficiency.

In addition, a special issue aroused during the project: the Covid19 Emergency. In fact, this type of project is based on the brainstorming between several partners and the distance and the absence of face-to-face meeting have been a strong brake on the circulation of ideas, only in part overcome by remote collaboration approach and tools adopted.

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How is this system different from others already existing in the market?

In our experience this project has the characteristics of a lighthouse project form many reasons:

- The span of the addressed themes, the comparison between different experiences, contexts, rules, cultures etc
- The many vertical applications
- The aim to build a powerful tool (platform) for the city management which must be agile, dynamic, modular, enabler for collaborative approaches between different services,
- The consideration of privacy and cybersecurity aspects as an enabling parameter for an operative service and future developments
- And finally, the effort of 39 Partners represents (we presume) a model in its segment.

Regarding your area of activity, have you detected any other possible improvement points in the city of Florence? Which?

Smart city solutions are never static and the adoption of the REPLICATE project results in live and operative services will suggest improvements and new needs. We remain committed to bring our contribution to safer, smarter and more liveable cities also by collecting our experiences from worldwide projects (like Singapore, Mexico City etc).

Networking sensors and capillary networks

IoT system: Irrigation, benches, bins and totems

TIM

What kind of actions are you developing in the city of Florence?

We are supporting the city of Florence in deploying the following services: smart waste, smart green and smart benches in museums. We provided the so-called TIM City Link, a totem that uses the three available displays in order to supply Internet Navigation Capabilities by WIFI, VoIP phone calls, smartphone wireless re-charging and Advertising.

Telecom also integrated into Florence the ICON (IoT Connectivity Platform), that collects sensor data from IoT networks (in particular, from smart waste, smart bench and smart green use cases in a near future), and provided a NB-IoT network coverage.

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What positive impacts are expected to achieve and what beneficial outcomes do you foresee in the Future?

In the case of smart waste, we expect a reduction of costs and an increase in the effectiveness of the waste collection process, in order to avoid emptying the bins when they are not full, but also trying not to leave them full for a certain time, since this usually causes damages to the ground. For smart bench, we expect an increase of customer services in the museums that expectedly lead to a higher income. Finally, we expect a drastic reduction of water consumption and an increase of cultivation efficiency (fertilization techniques, for example) for smart green. For the TIM City link we expect to provide citizens and tourists with advanced services that can be also provided directly by the city.

How many people are expected to be reached?

All the Florence citizens plus the tourists.

In which way do you think mobile telecommunications and media can help raise citizens' awareness?

Mobile communication (with its own IoT Networks) is a basic and fundamental enabler for the evolution of an urban area towards a smart city. One of the main objectives of smart cities is to increase citizen quality of life by decreasing the complexity and costs that the main city processes involve (such as waste, traffic, resources and citizen safety management). In this sense, mobile communication and media can be used to raise citizens' awareness and send them information on different devices: smartphone, smart bench, TIM City Link and Digital Signage.

The use of smartphones connected to mobile networks and/or WIFI coverage, and city apps are the basic tool to reach citizens. Therefore, media shall be defined and published on the mobile apps to inform, to drive and to help raise citizens' awareness about all the smart services provided by the city.

Digital services

GoalGreen app and Fast Booking app

Smart Lighting

Refurbishment of 1000 lampposts, 4 LTZ smart gates, adaptative lighting and 30 cameras

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement Nº 691735

TIM

What ICT action have you been developing for the Replicate project?

Beside the ICT draft smart city platform that has been started and allows the data center to test the functionalities at city level, IoT applications have been deployed. A smart waste testing has been done in Santa Maria Novella square, new smart benches equipped with sensors and functionalities will be placed at the Cascine park after the first installed and in use at the Museum of 900, the final project of the smart irrigation has been defined for launching the tendering process.

Additionally, two digital location of TIM city link have been placed: it is an innovative example of urban infrastructures that combines the traditional public telephony cabins with new digital technologies. Public services, beside phone calls, are provided by the TIM city link i.e. transport information, event in the city, wi-fi and video surveillance. The public tender for the purchase of led lights is now closed, the contractor already selected and the replacement of traditional lights with led is in progress.

In total, the positioning of 30,000 LED lights is planned, of which 1000 as project objective. After the LTZ, public selection is now underway for light video surveillance systems as an added value of the smart lighting system together with WIFI and sensors."

What positive impacts have these actions achieved and what beneficial outcomes do you foresee in the future?

ICT and technologies are the amazing tool that permit us to achieve better and faster a city really smart: make the city easier for citizens and city users, make the decision makers and the managers able to get feedback on real time on what is going in the city and have the opportunity to make people as an active and fundamental actor of the development of the place we live giving services when they want and where they need is the real benefit of the city of tomorrow working today.

Thanks to technologies we are able to put together services and achieve more results: the lamppost is a perfect example. It is not just a question of led system: not only less co2 emissions (-12.000tco2/year totally), less consumption and less expenses (-40% for the total project) and less trouble shouting but also benefit of road safety, increasing the possibility, for those driving and moving at night, to better distinguish obstacles and road signs and Keep all lights on overnight and new tools for environmental or acoustic monitoring of the city and new services to citizens (WIFI, security, etc.) thanks to the "sockets" (connection points) present on each luminaire.

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Bristol

Building Retrofitting

160 measures installed to 151 Homes

Smart Homes

151 homes have had smart appliances installed

What positive impacts are expected to achieve and what beneficial outcomes (both economic and environmental) do you foresee in the future?

The main positive impact that Smart Homes want to achieve is a reduction of energy consumption not only in the households but also as a neighbourhood. Other impact that we expect to achieve is to educate in energy usage reduction, not only the participants but also all the people that attend events.

REPLICATE

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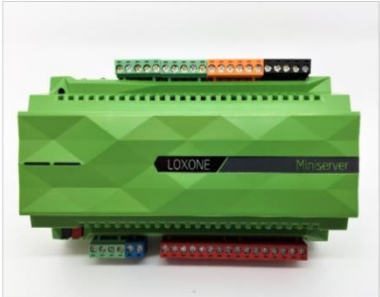
What kind of installations do you carry out?

A household, once is eligible, has the right to change an old appliance (A or below rated) for a new smart one A+++ rated. The smart appliances that are given are either washing machine, tumble dryer and dishwasher. These are Samsung appliances that come with a phone APP to control and use them in a smarter way.

In addition, households receive a Loxone Equipment, which records energy data, and later in the project will be used to control household preferences around using the smart appliances. The equipment involves a Loxone Miniserver that collects all the data and sends it to your phone, a Raspberry Pi that allows Miniserver software remotely, a Smart Plug which monitors data from your smart appliance, to show how much electricity it uses, an IR Reader that records electricity data from your whole house and a Loxone app to control all the equipment. All these appliances need an internet connection to work in smart mode. In case any household does not have it REPLICATE provides and pays for it. In addition, households that do not have any smart phone or table they receive one also to manage the appliances.



How many people are expected to be reached by the end of the project?

REPLICATE is going to provide 150 households with smart appliances and smart home kits. However, based on the different marketing and communication campaigns (E-bulletin, the Connecting Bristol web site, events and workshops, Facebook and Twitter adverts, community organizations and flyers) that have been developed, we can happy and proudly say that almost 40.000 people have been reached until now.

Which are the tools which help saving energy and how do they work?

Community Engagement and Warm Up Bristol have been the nexus between citizens and REPLICATE-Smart Homes project. Community Engagement has been in charge of initial contact with the target group of people. Their main task has been to attend and organize different type of events and workshops to inform and raise awareness of REPLICATE and energy usage. They have also developed a community energy champions programme. Once the households show interests online or offline, Warm Up Bristol is in charge of contacting them to check their eligibility and interests. If households are eligible WUB manages the whole process of organising the installation of the appliances in their homes. The Community Engagement Group helped to organise a co-design around the mobile future home.

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District Heating

Linking together the operational Heat Network connecting 13 social housing blocks with a new network

Renewable energies

Installation of a 130kW PV to a Lawrence Hill bus depot and 30 Solar PV installations for home owners

BRISTOL CITY COUNCIL

What Energy action have you been developing for the Replicate project?

We will provide some homes with low energy LED lighting and more energy efficient ways to heat your home, saving households money on their energy bills. A small number of suitable homes will also be offered solar panels and potentially battery storage.

At the moment we are testing the appliances that are going to be running at these houses, with ten early adopters acting as testers for us. The Smart City Platform has just completed its first stage of development; right now, it's integrated with Smart Home appliances and links to the EDMS.

What positive impacts have these actions achieved and what beneficial outcomes do you foresee in the future?

Some households in Ashley, Easton and Lawrence Hill could trial energy saving measures in their homes. Some homes could get solar panels (PV) to generate their own renewable energy. The energy could be stored in batteries to maximise energy savings and provide power at times when the sun is not shining and people need power – at night for instance!

We will be helping some homes to warm up with measures to improve insulation, retain heat and heat homes more swiftly and efficiently. Some households could benefit from the installation of LED lighting solutions for helping use electricity more efficiently.

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SUSTAINABLE MOBILITY

E-bikes & E-vehicles
Electric taxi-bus
Charging points

TravelWest Journey Planner
ParkUs Parking App

E-bikes

12 electric bikes delivered to 6 organisations

E-vehicles

Deployment of 11 electric vehicles (EV)

CO-WHEELS

What Mobility action have you been developing for the Replicate project?

We have deployed 10 e-bikes Staiger Sinus and Giant Prime, as well as 3 charging points at Brunswick Square, Stuart St, and Counterslip. These deployments are due to go live imminently. The Electric Vehicles are being sourced by us. Extensive work is being done to connect to the existing charging back office as well as work to develop the connections to the Smart City Platform and Energy Demand Management System. We are also planning the next phase, which will involve 7 charge point locations. We are also currently testing the ParkUs app.

Lastly, the Travel West Journey Planner is now live with extensive new multimodal functionality including links to real time locations of dock-less bicycles (YoBikes). You can learn more here.

What positive impacts have these actions achieved and what beneficial outcomes do you foresee in the future?

There will be an electric shared corporate pool bike scheme, electric car club vehicles and an electric taxi-bus. Some of these new transport options will also be brought together in a travel planning app and tools to give more ways to get around as well as making it easier for drivers to find a local parking space.

REPLICATE

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Electric taxi-bus

WeGo: The electric taxi-bus

ESOTERIX

How did the idea of creating an electric taxi-bus arise?

The idea of flexible taxi-buses came about when founder David Stewart, a network optimization expert, became frustrated by the number of empty buses. He foresaw that the advent of GPS technologies and smartphones would enable better on-demand services. An electric taxi-bus was a natural extension of this as these became available.

How useful can an electric taxi-bus be in terms of helping the environment?

A bus emits approximately 1.3 kg/km; in theory an electric taxi bus saves all of this assuming the source of the electricity is renewable. However, there are further optimizations. A taxi-bus runs flexible routes according to passenger demand. It doesn't run traditional scheduled routes that must run irrespective of whether it has passengers.

How do you think the use of this type of transport will evolve during the next few years?

Passenger understanding of new service models and integration with purpose will improve. For example, people will order flexible first/last mile transport when they book tickets for say, a train or a trip to the cinema.

Is there any kind of threat or risk to this alternative way of transport?

Viability is a threat. What people are willing to pay for a trip is often significantly less than it costs, unless there is high vehicle occupancy, which, in turn, people don't always like. It's complicated! So holistic businesses models are needed to secure sustainability. These include contributions from all parties that benefit e.g., the train operating company or cinema pays a commission to the first/last mile operator.

Charging points

24 charging points have been deployed

REPLICATE

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TravelWest Journey Planner Development

Easy access to alternative and greener travel options

ROUTEMONKEY

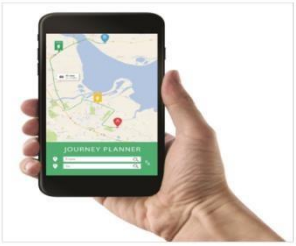
What is the purpose of the web portal and how does it work?

The Travelwest journey planner is part of the Travelwest website, the one-stop website for travel information in the West of England. Its aim is to provide users with all the information they need in the simplest way — to help make their life easier, healthier and save them money by encouraging them to choose sustainable travel options. It also aims to keep users informed about initiatives implemented across the West of England to promote sustainable travel relating to public transport, walking, cycling, car sharing and electric vehicles while also providing useful resources for schools, businesses and developers.

The Travelwest Journey Planning web app allows users to find their journey options, real time information for buses and trains, and their nearest bus stop or train station, bus service routes, and much more. Prior to REPLICATE, however, it had limited multimodal functionality and so only catered for a subset of journeys as it did not offer journeys with certain combinations of travel modes.

How many people are expected to be reached by the end of the project?

At the moment the journey planner is used by around 30,000 users per month. Its usage has been growing at a steady pace of 9% per month. Due to the small amount of data available at the moment it will be very difficult to estimate until 2021, but we could say that users are expected to be at around 38,000 by December 2019, taking into account saturation.



What actions are being made to break down socio-economic barriers for young people?

The Journey Planner user interface has been designed in ReactJS, making it a very fluid and light online experience that young people are now used to. There is also no cost for the use of our web app, and it adapts to any kind of device automatically, making it easier for everyone from any background to access it using a regular web browser.

REPLICATE

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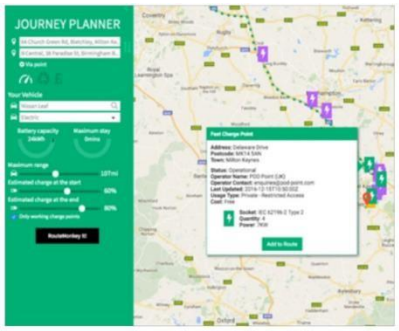
What positive impacts do you expect to achieve and what beneficial outcomes (both economic and environmental) do you foresee in the future?

Data from a variety of sources has been identified from a range of static and dynamic sources and then been brought together and repurposed using Route Monkey's algorithms to provide more customised journey solutions. The journey algorithm identifies alternative ways to break the journey and swap modes of transport, it is mode of transport agnostic and as such new transport modes can be added in the future to provide scale-up opportunities. Another area where REPLICATE has broken new ground is with the connection to live bike hire data. Through Route Monkey's connections to the live YoBikes, the journey planner is able to include cycle hire options with cycles that have non-fixed parking places. The principles developed through REPLICATE will also be adaptable as new live transport data streams become available. The creation of a flexible journey planner will allow for additional modal functionality to be added such as the green mobility options demonstrated in this project (On demand EV minibus and Electric Vehicle Car Club).



It is expected that providing users with better information will encourage people to use new travel modes and ultimately help reduce carbon emissions and congestion. This deliverable has successfully brought together a wide range of disparate data from a variety of providers and delivered it in an attractive, easy-to-use, personalised format.

UWE BRISTOL

UWE Bristol is undertaking planning, coordinating and analysis tasks towards effective monitoring and evaluation of the implementations, but how is doing it?

First, we need to make a distinction between monitoring implementations, and evaluating them. Put simply, monitoring involves observing them effects of an implementation through collecting or collating output data about the amount of use by citizens, or energy produced or consumed. Evaluation instead involves understanding the outcomes of an implementation, in terms of what the significance of the outputs is and how significant they are, and the context of the implementation that gave rise to them (such as barriers overcome and facilitating factors).

UWE, the University of the West of England, has sought to ensure effective monitoring and evaluation through promoting clear frameworks for data collection, or 'evaluation plans' for each measure, scheduling which data are required to monitor each implementation objective, and when those data should be sampled, if not continuously generated.

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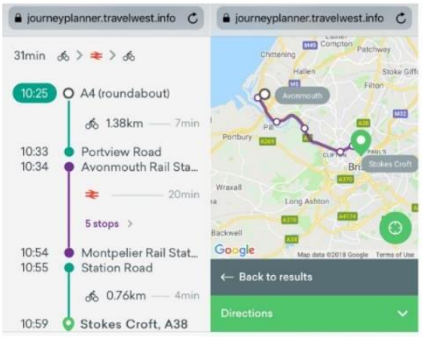
Which tools are being used for an effective monitoring?



UWE Bristol has advised on monitoring activities but it is generally for the partners actually delivering the demonstrations to generate and supply the monitoring data directly to those working in the monitoring Workpackage (WP10). In undertaking the evaluation work, UWE will be involved in interpreting monitoring data as it becomes available in the final stages of the project, but evaluation also requires qualitative and quantitative data from users and stakeholders involved in delivering the implementation.

A number of quantitative 4 1s8km surveys and qualitative interviews have been devised to date, which have either been undertaken by UWE, have been delivered with the assistance of our partners. These have included: Interviews with representatives of public health organisations providing e-bikes for employees' shared use; design and analysis of survey of e-vehicles users delivered via our project partner Cowheels (to be repeated in 2020); collaboration with Toshiba for a field-trial of the parking-search app, design of interviews for residents who have benefitted from smart appliances to understand their energy consumption behaviour (to be undertaken shortly); survey of users of the revised and extended TravelWest Journey Planner; qualitative experiential work with users of the WeGoelectric on-demand shuttle.

What positive impact has the implementation generated and what beneficial outcomes are foreseen in the future?

The hardest part of providing the evaluation capacity of a complex project like REPLICATE is that we have no direct control over the implementation, and often only weak influence. Due to the need to adapt plans for the interventions to the reality of the city, implementation plans change, often significantly, and the monitoring and evaluation must adapt at short notice. Another characteristic of our role, is that our main work starts as the work of others finishes. So, whilst other partners feel the project is drawing to a close, and maybe their budgets are largely spent, we need to ensure that we can complete our tasks with their support to ensure that the monitoring data continue to flow, and we can complete our surveys and interviews so as to understand the wider context in which those monitoring data are being produced.

Which point, regarding your area of activity, did you find the most interesting from the REPLICATE project?

Because as aforementioned we are still very much in the middle of our activity, with few final results it is hard to give a definite answer to this question for the REPLICATE project experience. However, it is always fascinating to understand more about the complexity of urban systems and how what appears to be a small change in one domain reveals complex relationships with

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others. For example, when installing a new street infrastructure such as a vehicle charging point, there are competing demands with existing uses of the public space, including parking and mobility on the pavement and with underground utilities, which variously need to be present to provide power, or should not be too close to provide a dangerous conflict. And human behaviour is another part of that complex system, which may respond in the way the planners and designers hoped, or somewhat differently, so that we may see 'rebound effects' which reinvest some energy savings in new consumer benefits. So, as a social scientist, REPLICATE has provided an interesting chance to unravel some of the urban 'threads of life's rich tapestry.

ParkUs Parking App

A parking app that helps you find a free car parking space quickly and conveniently before you travel

TOSHIBA

Can you explain, briefly, how does the ParkUs APP works? TOSHIBA

The ParkUs app works by anonymously collecting sensor data from a user's smartphone. An Al model is used for parking availability detection by recognising the behaviour of parking search i.e., cruising. Users can query parking availability at any destination and the app displays parking availability information using a heatmap on the users' smartphone. This heatmap is based on the parking search behaviour at the destination.

So, if want to use ParkUs, what do I need?

ParkUs app is freely available to download in the Google Play Store. It can be used anywhere in the world as long as there are other users of the app in the same area. ParkUs therefore has a very high replicability potential.

For sure, it will help us to save a lot of time. However, is there an estimate of the amount of CO2 emissions that we could avoid by using this app?

Yes, for the city of Bristol, where on average over 28 thousand daily journeys are made to the city centre, 790 metric tons of CO2 and £368,000 in extra fuel costs can be saved with ParkUs. This estimate is based on the observed average parking search times through several trials conducted in Bristol.

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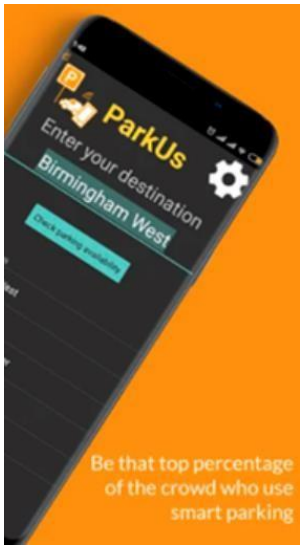
Finally, what is the expected scope of this project? Which are its expectations of use?



The main aim with ParkUs has always been to reduce CO2 emissions and fuel consumption for users. ParkUs heatmap can be used to warn users of low parking availability, effectively discouraging users from driving. In cases, where users who rely on driving to get to their destination, ParkUs can significantly reduce the parking search times and effectively reduce CO2 emissions.

ParkUs can also be used by transport administrators or event managers to manage parking in specific areas, such that users can spend minimal time searching for parking. It can both be exploited as a standalone service (as a mobile application) as well as through exploitation with other products, services and solutions including infrastructure-based parking management systems, navigation products, and city journey planners.

Smart Grid and Energy Demand Management System

Solutions for helping use electricity more efficiently

KWMC

What ICT action have you been developing for the Replicate project?

REPLICATE is working with cyclists, taxi drivers and a school to see how new technologies could help to monitor the problem of poor air quality and explore what we can do to tackle it. This is being done with the help of an air quality monitoring device.

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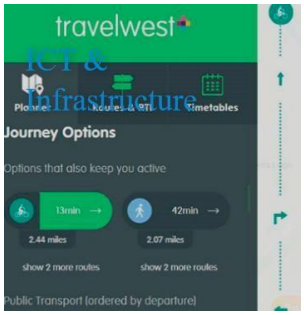
What positive impacts have these actions achieved and what beneficial outcomes do you foresee in the future?



Through a series of creative workshops and practical activities, we're building and testing new sensors that should give us a better idea of the scale of the issues on the districts. Prior to the REPLICATE Project commencing, residents of Ashley, Easton and Lawrence Hill worked with artists and technologists from Knowle West Media Centre to explore how new technologies could help to tackle issues identified by the community, including damp in homes.

During the early stages of the REPLICATE Project, air quality emerged as a factor that influenced the way people travel around the area. KWMC is now working with local people and project partners to explore the issue further and see how the technologies being tested in REPLICATE could help.

ZEETTA NETWORKS

What has been the biggest challenge you have had to face when developing an ICT Smart City Platform for REPLICATE?

Zeetta Networks operates in the cutting edge of networking technology innovation. Our ICT Smart City Platform that was initially developed as part for REPLICATE is based on open-source technologies which break the vendor lock-in and stimulate innovation. However, this open approach has been also the biggest challenge in establishing our technology solution in the market. This is because a lot of inertia and attachment to legacy systems make a switch to open solutions and open systems more difficult.

Part of this opposition to change stems from the "fear of the unknown" i.e., risks associated with new and untried technology. Our conclusion is that in order to successfully adopt open standards in Smart City deployments, legislation and attitude of local and central governments must change by mandating their adoption and including it in their procurement guidelines.

Zeetta Networks has been working on Network Operating System (NetOS®). What advantages can the system offer to REPLICATE?

Zeetta's Network Operating System (NetOS®) provisions and orchestrates connectivity services across a typical smart city network comprising various sub-systems such as fixed and wireless communications networks, smart meters, parking sensors, electric car charging stations, cloud data repositories etc. In a Smart City context, such as that proposed by the REPLICATE project, NetOS® plays the role of the City Operating System (CityOS) that enables virtualization of the network infrastructure and orchestration of services to transform the rigid network infrastructure into an Open Programmable Smart City Platform that:

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- Supports an open application development ecosystem.
- Is vendor-agnostic.
- Operates across different types of network technologies including wired, wireless and IoT.
- Enables all available, diverse network resources being efficiently utilised and used simultaneously by many users (i.e., support multi-tenancy).

How do you think the use of this type of system will evolve during the next years?

Zeetta's software products Visualise, Optimise and Automate are built around NetOS to address the market need for network automation tools that can manage efficiently the ever-increasing complexity of the communication networks. Network automation is a key enabler of digital transformation because it provides the ability to automate network operations for the provisioning, management and control of network resources according to business objectives.

It is estimated that network automation market is growing at a 48% compound annual growth rate (CAGR) and expected to reach $16.9bn by 2023. We are particularly interested in the emerging private cellular (LTE/5G) network market where our NetOS® technology allow the design, provision and management of network services across mixed-technology networks which may include Wi-Fi, Ethernet and cellular LTE/5G. Adoption of private cellular networks (PCN) is driven by requirements for enhanced security, wide coverage, predictive performance and mobility. Beyond smart cities, they are ideal for manufacturing (Industry 4.0) and transportation and logistics where we expect to see an increased demand and adoption in the next few years.

Regarding your area of activity, have you detected any other possible improvement points in the city of Bristol? Which?

The COVID-19 pandemic has demonstrated the importance of communication networks to the economy. However, as demand for connectivity increases networks become more congested, resulting in a poor user experience. This can become critical in many situations e.g.; first responders often have to compete with other network users for access. Dynamic and intelligent management of all available network resources can solve this problem by automatically prioritising and customising connectivity for different user groups, devices or applications.

Zeetta's software automation tools simplify network operations for enterprises and service providers so they can build and operate ICT networks easily without escalating CAPEX and OPEX. For example, Zeetta's Automate product delivers up to 50% reduction to the network roll-out costs by scheduling automated network changes and reduces configuration time by up to 90% using 'mode' management. So, Zeetta's software tools developed in the course of the REPLICATE project deliver a substantial improvement to the operational efficiency of Smart City networks and –as a consequence- reduce the environmental impact and the investment required to build and operate the network infrastructure.

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UNIVERSITY OF BRISTOL

What actions has the University of Bristol carried out in the REPLICATE project?

Contributed to SCP development and delivered the IoT/SCP integration mechanism, contributed to citizen sensing actions (esp. air quality sensor deployment and data visualisation), contributed to DSR experimentation design, contributed to mobility interventions and in particular e-bike tracking and finally, examined citizen learning outcomes.

How would you explain the ICT Smart City Platform concept?

A central point of urban data accumulation that could be used to develop rich insights into the effectiveness and consequences of interventions at scale in mobility, energy, air quality etc. monitoring.

How does that platform work? What does it need to get going?

The SCP leverages state of art technology such as FIWARE to support the collection of data from a multiplicity of sources (e.g., IoT sensors, CCTV cameras, smart meters etc.) and curate these centrally in order to enable insight development via simple and more complex visualisations and enables the application of further analytics where required.

Finally, which are its expectations of use?

The platform is used as a private testbed for innovation testing and experimentation with new solutions in a way that a sample of citizens can be involved to share insights and learning (as in e.g., our smart homes intervention).

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REPLICATE

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