

# GREEN DIGITAL CHARTER



## COLLECTION OF CASE STUDIES 2015

European smart cities using ICT





• REYKJAVIK

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• ZARAGOZA

• BARCELONA

• VALENCIA

• MURCIA

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• BURGAS

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## ABOUT THE GREEN DIGITAL CHARTER

The Green Digital Charter is a political declaration committing cities to working together to deliver on the EU climate objectives through the use of information and communication technologies (ICT). It promotes progress in tackling climate change and improving the quality of life in cities through the innovative use of digital technologies. In addition to a range of statements and objectives, the charter contains three specific commitments. Signatory cities agree to:

- work with other Green Digital Charter signatories on ICT and energy efficiency
- deploy five large-scale ICT for energy efficiency pilots per city within five years from the charter's signature
- decrease ICT's direct carbon footprint per city by 30% within ten years from signature

Already signed by 50 major European cities, the charter is open to local authorities regardless of the stage of implementation of their energy and climate policies. For more information on the Green Digital Charter, please visit [www.greendigitalcharter.eu](http://www.greendigitalcharter.eu)

## ABOUT GUIDANCE

Funded by the European Commission's Horizon 2020 research and innovation programme, GuiDanCe aims to support the coordination and further development of the Green Digital Charter.

GuiDanCe aims in particular to:

- strengthen the engagement of GDC signatories to create a club of cities that work together towards their GDC commitments
- improve existing tools and services and their impact on GDC signatories
- promote GDC signatories' activities within and outside the EU

## PURPOSE OF THE CATALOGUE AND HOW TO USE IT

This catalogue includes case studies and projects at the inception phase prepared by the GDC signatories within the framework of their ICT for energy efficiency-related commitments. ‘Case studies’ are implemented actions associated with green digital development, while ‘projects’ include planned actions in key policy domains.

The studies are presented in the following categories:

- **Cross-domain.** Green digital activities that cut across two or more application areas
- **Buildings.** These green digital activities encompass measures taken in municipal buildings and facilities, tertiary (non-municipal) buildings and facilities as well as residential buildings
- **Energy.** Green digital activities in energy include measures relating to energy and electricity production and distribution
- **Green ICT.** Green digital activities focusing on sustainable and environmentally-friendly ICT equipment and technology
- **Street lighting.** Green digital activities such as the implementation of sensor-based lighting systems, and establishing territorial cooperation for smart lighting systems
- **Transport.** Green digital activities in transportation encompass soft (non-motorised) modes, public and motorised private transportation, mobility management, and logistics and freight
- **E-participation.** Green digital activities supporting citizen engagement by making city decisions accessible in open data format and by developing tools for mapping locations of environmental or social value
- **Waste management.** Green digital methods to manage paper resources and intelligent waste collection systems

Each city profile includes relevant web links and contact information to help you plan and organise your own study tour.

## DISCLAIMER

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union. The European Commission is not responsible for any use that may be made of the information contained herein.



The background is a solid teal color with a subtle geometric pattern of thin, light-colored lines forming various sized triangles and polygons across the entire surface.

**CROSS-DOMAIN**

## TRISTAR INTELLIGENT TRANSPORT SYSTEM

Gdynia and its Tricity partners Gdansk and Sopot have jointly implemented an intelligent transport system (ITS) dubbed Tristar with the aim of reducing traffic on already congested roads.

The three cities had very similar traffic problems to deal with: congestion, frequent accidents with high associated costs, and no real-time information on public transportation or traffic conditions. The ITS has solved all these issues. Tristar integrates the following services: public transportation management, rescue management, transportation information and goods traffic management. Bitcarrier, a leading provider of real-time traffic management systems, has devised a traffic surveillance solution that is also capable of calculating travel times between different addresses in these cities.

Bitcarrier's solution enables the authorities and infrastructure operators to optimise the flow of traffic by providing real-time information on travel times, average vehicle speed, traffic density and vehicle routes. It includes an incident and congestion detection and alarm system that also predicts traffic density.

Based on the analysis of these data, the authorities can develop strategies for increased reliance on public transportation services while reducing traffic density and the number of accidents, making travel time shorter and slashing CO<sub>2</sub> emissions.



Contact person:  
Lukasz DABROWSKI  
*Assistant for renewable energy*

Ulica 10 Lutego 24  
81-364 Gdynia - Poland

[l.dabrowski@gdynia.pl](mailto:l.dabrowski@gdynia.pl)

[www.tristar.gdynia.pl](http://www.tristar.gdynia.pl)



# LISBON, PORTUGAL

CROSS-DOMAIN

## SHARING CITIES

Sharing Cities is a collaborative initiative of major European cities, industry and research partners, who commit to exploring new, innovative and better ways to make the continent's cities 'smarter'.

Lisbon's demonstrator area (ten square kilometres, with 100,000 inhabitants) is a strategic location, stretching from the riverfront to the centre of the city and including the main tourism and historic districts. The demonstration area is also a low emission zone. The challenges stem from its particular orography, the historic nature of its buildings and an ageing population. The downtown area of Lisbon, together with the Royal Borough of Greenwich in London and Porta Romana/Vettabbia in Milan, will address the objectives of the Sharing Cities project by implementing a set of 'digital first' and interconnected measures:

- retrofitting of buildings
- integrated energy management system
- e-mobility
- smart lampposts with traffic sensors, wifi and EV charging points

The energy performance of buildings will be optimised with smart metering and by mapping consumption and production. Road traffic control systems and adaptive street lighting will be installed, air quality will be monitored, and ICT-based electric vehicle charging stations will also be deployed.

The project's objectives are in line with Lisbon's Governance Plan and the Lisbon 2020 Strategic Plan, whose cornerstone is the city's Integrated Operations Centre (COI), which will be responsible for providing the required management information and intelligence.



Contact person:  
Teresa ALMEIDA  
Coordinator

Câmara Municipal de Lisboa  
Equipa de Missão Lisboa  
Europa 2020  
Campo Grande, 25 - 2ºAndar Bloco E  
1749 - 099 Lisbon - Portugal

+351 217 988 659  
+351 217 988 086

teresa.m.almeida@cm-lisboa.pt

## MORGENSTADT CITY LAB

Prague and Germany's Fraunhofer Institute are partners in the Morgenstadt - City of the Future joint research project. Shaping the future of cities and implementing innovations tie in with the Smart Cities and Green Digital Charter objectives. Prague is involved in Module 3 of the project (Strategic Project Development - City Labs). It has drawn up a city profile and a strategic roadmap on the basis of data analyses and discussions with over 60 stakeholders (city, research community, private sector and NGOs). The proposed projects are: Innovation Think Tank, Innovation District, Smartification of the City Centre, Energetic Refurbishment of Public Buildings, Multimodal Transportation App, Integrated ICT-based Management System for the City Administration and a Data Analytics Centre.

Prague started to implement the project in November 2015. The multimodal transportation app tackles congestion and traffic in the city and encourages citizens to use alternative modes and reduce motor vehicle use. The app simplifies public transportation use and promotes behaviour change for sustainable mobility.

A series of measures will also be implemented within the framework of Triangulum, a related Horizon 2020 project (one of the three EU-funded Smart Cities and Communities 'lighthouse' projects). Smart solutions implemented in flagship cities - Eindhoven in the Netherlands, Manchester in the UK and Stavanger in Norway - will be replicated in follower cities Leipzig in Germany, Prague in the Czech Republic and Sabadell in Spain. The project is coordinated by Fraunhofer IAO in Stuttgart and supported by the Steinbeis-Europa-Zentrum.



Contact person:  
Klara NOVAKOVA  
*Project coordinator*

Prague City Hall  
Mariánské nám. 2  
110 01 Praha 1 - Czech Republic

+420 602 429 539

[k.novakova@praha.eu](mailto:k.novakova@praha.eu)

[www.praha.eu](http://www.praha.eu)  
[www.morgenstadt.de](http://www.morgenstadt.de)  
[www.triangulum-project.eu](http://www.triangulum-project.eu)

# STOCKHOLM, SWEDEN

CROSS-DOMAIN

## GROWSMARTER

Stockholm is a leading partner in the GrowSmarter project, which aims to:

- improve the quality of life of European citizens by offering better mobility and housing solutions, upgrading urban infrastructure, lowering energy bills and creating up to 1,500 new jobs (demonstration level)
- reduce the environmental impact by decreasing energy needs by 60% and greenhouse gas (GHG) emissions even more through the use of renewable energy sources
- promote sustainable economic development by demonstrating and preparing a wider rollout of smart solutions

In three 'lighthouse' cities, GrowSmarter will demonstrate 12 smart, integrated solutions that could eventually be rolled out to wider markets. These solutions will be easy to examine and evaluate by the five 'follower' cities and by other European and international experts. All these smart solutions follow the specifications laid down in the strategic development plan for 'lighthouse' projects and enable the follower cities to replicate them.

The solutions seek to solve common urban challenges, which include:

- retrofitting and renewal of existing buildings: GrowSmarter demonstrates the cost-efficient renewal of 100,000 square metres of nearly zero or low-energy districts, reducing energy demand by 70-90%
- installation of integrated infrastructures for ICT, street lighting, smart grids, district heating and smarter waste handling
- offering sustainable urban mobility services (passengers and goods) integrated in smart grids and running on biofuels made from household waste, thereby reducing emissions by 60%

The simultaneous involvement of the cities, major industrial partners and leading research organisations guarantees that the solutions will be validated by independent research bodies and transformed into smart business solutions by industry for wider rollout in Europe.



Contact person:  
Anette RIEDEL  
*Professional communicator  
Environment and Health Administration*

Tekniska nämndhuset  
Fleminggatan 4 - Box 8136  
104 20 Stockholm - Sweden

[anette.riedel@stockholm.se](mailto:anette.riedel@stockholm.se)

[www.stockholm.se](http://www.stockholm.se)  
[cordis.europa.eu/project/rcn/  
194441\\_en.html](http://cordis.europa.eu/project/rcn/194441_en.html)

## FIWARE PLATFORM

Valencia City Council, in cooperation with Telefónica, was the first in Spain to centralise all of its municipal information through a smart city technological solution in 2014. The software uses 350 sensors that manage the city's municipal services. Traffic, street lighting, gardens, local police, pollution, cleaning and waste collection and weather services are constantly monitored through a network.

Using this platform, the capital of the Valencia region can manage all its public resources, thereby improving the efficiency of transport, energy and environmental services.

Constant access to real-time information enables city managers to cancel automatic irrigation on rainy days, change traffic signals to let ambulance through, turn on street lights on a cloudy day to improve visibility or notify drivers of available parking spaces.

Telefónica's Internet of Things (IoT) platform adheres to the specification of the European FIWARE standard. The platform is offered as a service from Telefónica Cloud. The open innovation ecosystem created around FI-Lab (FIWARE's online experimentation lab) simplifies the use of open data generated through the platform, allowing collaboration with entrepreneurs in Valencia and boosting ICT services in the city.

The FIWARE platform also enables public services to measure and track CO<sub>2</sub> emissions. The real-time data provided by the sensors make it easier for the city authorities to reduce emissions from public services, such as street lighting. These data are easily accessible through the open data website.



Contact person:  
Anna Melchor Pérez  
*Smart city programme officer*

Fundación InnDEA Valencia  
C/Antiga Senda de Senent 8, 4º Izq  
46023 Valencia - Spain

+ 34 963 910 477  
+ 34 963 918 717

[www.fiware.org/tag/valencia](http://www.fiware.org/tag/valencia)  
[gobiernoabierto.valencia.es/en](http://gobiernoabierto.valencia.es/en)



**BUILDINGS**

### SMARTSPACES - SAVING ENERGY IN PUBLIC BUILDINGS

The SMARTSPACES project aims to enable public authorities across Europe to significantly improve energy management in public buildings. The implementation of operational services includes 11 pilot sites with more than 550 buildings in eight countries (the United Kingdom, France, Germany, Italy, Spain, the Netherlands, Turkey and Serbia) used by almost 20,000 professionals and staff and by more than 6,000,000 visitors each year.

The SMARTSPACES energy optimisation service is a comprehensive approach to exploiting the potential of ICTs, including smart metering for energy saving in public buildings. Aiming to significantly reduce the public sector's energy consumption in order to meet the overall emission reduction targets, the project will build on existing services to develop a comprehensive SMARTSPACES service providing feedback on energy consumption.

The range of public buildings where the SMARTSPACES service will be implemented and operated is wide and includes city administration buildings, office buildings, museums, university buildings as well as schools, nurseries and sports and event centres.

The SMARTSPACES pilot sites are located in large European cities like Milan, Birmingham, Bristol, Istanbul and Belgrade, but also in mid-size cities like Leicester, Hagen, Lleida, Murcia, Venlo and Moulins.



Contact person:  
Nikki SPENCER  
*Digital projects manager*

Digital Birmingham  
Birmingham City Council  
1 Lancaster Circus  
Birmingham B2 2WD - United Kingdom

+44 121 303 8779

[digital@birmingham.gov.uk](mailto:digital@birmingham.gov.uk)

[www.smartspaces.eu/project](http://www.smartspaces.eu/project)  
[digitalbirmingham.co.uk/project/smartspaces](http://digitalbirmingham.co.uk/project/smartspaces)

## 3E HOUSES

3E Houses (Energy Efficient e-Houses) was an EU-funded project in 2012-2013 linking Bristol with cities in Spain, Germany and Bulgaria in their quest to help social housing residents reduce their energy consumption by up to 20% in the course of one year.

The project was run by Knowle West Media Centre, with Bristol City Council, Toshiba Research Europe Ltd (TREL) and local IT services company IP Performance participating as partners.

Smart meters were installed in 100 social houses across the city, and the residents could monitor their electricity and gas consumption in real time on touch-screen tablets, for which Knowle West Media Centre developed a compelling and intuitive user interface to boost participation and impact.

- **People:** The effectiveness of any ICT solution is determined by its ability to engage people, to create awareness for the specific issue at hand and for the general goals of the project.
- **Technology:** The success of a project depends largely on the type and quality of the technology used. The aim of 3E Houses was to encourage long-term behaviour change, and thus the technology employed here had to be simultaneously efficient in monitoring energy consumption and fun to use for the residents.
- **People and technology:** The 3E Houses project aimed to reduce energy consumption through raising awareness and providing clear information to consumers. This involves creating synergy between technology and people.

Making a success of projects like 3E Houses is not simply down to selecting and deploying the right technology. Any project aiming to bring about behaviour change needs to build a relationship with the participants and develop a deep understanding of the context and the motivations in order to be able to increase the levels of engagement and participation. Users need to feel that their participation is valued and that their input can have a real impact.



Contact person:  
Kevin O'MALLEY  
*City innovation team manager*

Engine Shed, Station Approach  
Bristol BS1 6QH - United Kingdom

+44 117 35 21055

kevin.omalley@bristol.gov.uk

www.3ehouses.eu  
[http://cordis.europa.eu/project/rcn/191720\\_en.html](http://cordis.europa.eu/project/rcn/191720_en.html)  
<https://vimeo.com/70640641/66542877/72420520>



## FIESTA - SAVE ON HEATING AND COOLING

While the household sector has achieved the largest energy efficiency improvement in recent years, it is still responsible for 29% of the overall consumed energy in Europe. Heating and cooling account for around 66% of the total energy use in a typical home, making it the largest energy expense for most families.

Families with children are at the core of the FIESTA project funded by the Intelligent Energy Europe programme. The project aims to reduce energy use and related emissions by fostering improvements in daily habits, targeting in particular the use of home heating and cooling systems.

FIESTA brings together 19 partner institutions from five Southern European countries (Spain, Italy, Croatia, Bulgaria and Cyprus), all committed to supporting families in their quest to reduce their home energy consumption. An Energy Help Desk has been established in each partner city assisting families in achieving tangible energy savings. A major part of the FIESTA project is devoted to an information campaign on energy efficiency and on ways to measure and monitor domestic energy use via online tools for visual content

Burgas updates its Sustainable Energy Action Plan every two years. In the framework of this project, the city will install its first solar tree that would be used to charge electric bicycles, wheelchairs and other electric devices.

INTELLIGENT  
ENERGY  
*Families*



Contact person:  
Maya VELCHEVA  
*Director European policies and programmes*

26 Alexandrovska street  
8000 Burgas - Bulgaria

+ 359 56 841164

[m.velcheva@burgas.bg](mailto:m.velcheva@burgas.bg)

[www.fiesta-audit.eu](http://www.fiesta-audit.eu)



### VERYSCHOOL - ENERGY MANAGEMENT IN SCHOOL BUILDINGS

The VERYSchool project aims to integrate smart LED lighting, smart metering, building energy management systems (BEMS), energy simulation and energy action management software tools into a platform called the Energy Action Navigator (EAN) and demonstrate the results at four pilot locations in Europe. The available budget is €2,860,000. A pilot test conducted at a school in Genoa resulted in savings of up to 33% in electricity costs and up to 20% in heating costs.

The EU's VERYSchool CIP-ICT-PSP project, coordinated by the Energy and Sustainable Development Agency of Modena, aims to encourage energy efficiency at schools. It brings together 12 partners from eight EU countries. VERYSchool is a result-oriented project focused on pilot demonstration and validation actions, with the EAN at its core.

EAN is a software tool that integrates mature (already existing) hardware and software technologies, monitoring and control systems (air conditioning and lighting), as well as energy simulation and action management tools that meet the ISO 50001 international energy management standard. Its main objective is to help all stakeholders define an energy management programme and implement an effective energy management system for schools at both local (buildings) and territorial levels.

The tool is conceived to be easy to use and install and return on initial investment is expected in maximum three to five years. In Genoa, the project will also seek to monitor electricity and thermal energy consumption and assess the condition of the affected buildings (insulation, windows, etc.) to enable the planning and coordination of future interventions and investments.

The project will aim to establish an energy efficiency office charged with planning future investments and interventions based on the results of the technical and financial monitoring. The energy management system has already been installed at four pilot schools in Lesa, Genoa, Plovdiv and Lisbon.



Contact person:  
Alfio GALATÀ  
*Project coordinator*

Energy and Sustainable Development  
Agency of Modena

[agalata@aess-modena.it](mailto:agalata@aess-modena.it)

[www.verschool.eu](http://www.verschool.eu)

## FUTURE CITY GLASGOW - ENERGY EFFICIENCY DEMONSTRATOR

The Future City Glasgow energy efficiency demonstrator project utilised integrated technology to promote and enhance energy efficiency in buildings and housing. It included a tenement housing retrofit project (delivered in partnership with the University of Strathclyde), which sought to:

- pilot a remote monitoring programme, testing the effectiveness of insulation methods for tenement flats and other construction types
- create a database enabling decision-making about how and where to apply insulation measures using real-time data

The project's outputs include:

- installation of bespoke sensors to facilitate the understanding of the various impacts of retrofit insulation (including energy savings)
- development of a database of building types and insulation systems demonstrated to improve living conditions and reduce energy consumption
- development of a methodology to deploy remote sensor technology across homes in Glasgow and drafting of supporting legal documentation required to collect and analyse the data
- clearer understanding of ways to improve energy efficiency
- sharing of the monitoring and assessment methodology with Glasgow City Council's Housing Department, along with bespoke software designed to interpret data culled from the sensors. As a result, all future insulation projects funded by the council will be required to install sensors
- sharing of data collected with local housing associations to enhance their understanding of their building stock



Contact person:  
Gavin SLATER  
*City energy and carbon manager*

Sustainable Glasgow  
Land & Environment Services  
Glasgow City Council  
Exchange House  
231 George St. - Glasgow, G1 1RX  
United Kingdom

+44 141 287 8347

Gavin.Slater@glasgow.gov.uk

futurecity.glasgow.gov.uk

# RENNES, FRANCE

## BUILDINGS

### OPEN ENERGY DATA

A joint project between Rennes Metropole and Télécom Bretagne (a leading French grande école), the objective of Open Energy Data is to study the feasibility of a home tracking module for personal electricity consumption using open data format. The project aims to enable citizens to reduce their energy consumption. A new network technology (LoRA FABian) to be used for collecting data and an open source platform to manage and visualise big data are currently being developed by Télécom Bretagne.



Contact person:  
Catherine BRENDAN  
*Climate and energy officer*

4 avenue Henri Fréville  
35207 Rennes - France

+33 299 866 374

[b.catherine@rennesmetropole.fr](mailto:b.catherine@rennesmetropole.fr)

## iURBAN - CHEAPER, CLEANER ENERGY SERVICES

One of most important objectives of the iURBAN project is to use ICT to reduce energy consumption and CO<sub>2</sub> emissions in a quantifiable manner.

Within the framework of this project, 16 buildings owned by the city of Rijeka and ten facilities of local utility company Energo are equipped with smart meters. These feed real-time information on energy consumption into the innovative iURBAN eNergy software platform, which integrates Rijeka's ICT energy management systems.

The core of the iURBAN tool is a smart urban Decision Support System (smartDSS). The operating system behind this customised energy management and control platform is designed for the Internet of Things (IoT) concept and is tailored to the needs and requirements of smart cities.

The city's administrators may access the system to gather information for reporting purposes, to aid the decision-making process or to monitor trends. iURBAN is expected to become a powerful tool to support the development of urban policies and strategies.

The iURBAN platform's new features (ability to handle variable tariffs, demand response or user engagement), coupled with new business models, are expected to reduce Rijeka's primary energy consumption by 10-20% and greenhouse gas (GHG) emissions by 5-10%.



Contact person:  
Tatjana PERŠE  
*Head of e-government unit*

City of Rijeka  
Korzo 16  
Rijeka - Croatia

+385 51 209 337  
tatjana.perse@rijeka.hr

[www.iurban-project.eu](http://www.iurban-project.eu)

# ZAGREB, CROATIA

## BUILDINGS

### ZAGREB ENERGY EFFICIENT CITY (ZAGEE)

By the year 2020, the capital of Croatia aims to reduce its CO<sub>2</sub> emissions by 21% through energy efficiency measures and the use of renewable energy sources. It also plans to improve the energy performance of public buildings.

Buildings are responsible for around 65% of Zagreb's total energy consumption - and this is where significant savings can be achieved. The city also aims to set an example by encouraging consumers to use energy more efficiently and to switch to renewable energy sources.

The ultimate goal of the Zagreb Energy Efficient City (ZagEE) project is to save energy through the implementation of economically justified, energy efficient technologies and measures in publicly owned buildings and other facilities.

The project is co-funded by the EU's 2012 Intelligent Energy Europe (IEE) programme. ZagEE seeks to encourage investment in local energy projects and will allocate grants, finance technical assistance and assist in the drafting of documentation for the energy refurbishment of buildings. This will enable the beneficiaries to seek funding for their projects through banks and EU funds.

The value of the ZagEE project is €1,813,438, and total planned investment worth of work on the realisation of the planned measures for which technical documentation will be produced amounts to €29,379,114. The return on investment without using the grants is approximately 13 years.



Contact person:  
Sanja MALNAR NERALIĆ  
*Senior advisor to head of office*

City Office of Energy, Environment  
and Sustainable Development  
Dukljaninova 3,  
10 000 Zagreb - Croatia

+385 1 658 5033

[sanja.malnar-neralic@zagreb.hr](mailto:sanja.malnar-neralic@zagreb.hr)

[zagee.hr/?page\\_id=520&lang=en](http://zagee.hr/?page_id=520&lang=en)



The image features a dark blue background composed of numerous triangles of varying sizes, creating a low-poly or crystalline geometric pattern. The triangles are separated by thin, slightly lighter blue lines. On the right side of the image, the word "ENERGY" is written in a clean, white, sans-serif, all-caps font.

ENERGY

## ODYSSEUS - HOLISTIC ENERGY MANAGEMENT SERVICES

The objective of the Odysseus project is to develop a dynamic open system to enable holistic energy management services. The expected achievements are:

- integration scenarios
- open integration platform
- holistic energy management system
- validation

The concept of holistic energy management entails the monitoring of energy system operation according to dynamic energy profile information for all relevant energy nodes and the conditions and behaviour of all these nodes.

Based on real-time information and the integral monitoring of planning, problems can be identified and recommendations made for resolution and optimisation. The latter applies to real-time events and strategic decisions, such as adding or changing nodes, changing connections, etc.

The open integration platform will capture all energy node information in a dynamic energy profile card that uses the taxonomy of energy node types and associated properties. All data will be stored in an open standards/open source spatial database accessible via standard interfaces. The system will be flexible, interoperable and adaptable.

The project includes two city pilots in Manchester and Rome. The Manchester pilot is focused on the Town Hall Complex and on modelling a proposed heating network for the city.



Contact person:  
Martine TOMMIS  
*Principal resource procurement officer*

Manchester City Council  
Desk123, Level 5, PO Box 532  
Town Hall Extension  
Manchester, M60 2LA  
United Kingdom

+44 161 234 34006  
m.tommis1@manchester.gov.uk

[www.odysseus-project.eu](http://www.odysseus-project.eu)



# ROUBAIX, FRANCE

## ENERGY

### SMART GRID OF PUBLIC BUILDINGS

Roubaix has around 150 public buildings, including a stadium, schools, sports areas and administrative and residential buildings.

In order to monitor and eventually reduce the energy consumption of these buildings, the city plans to install sensors that will send consumption data to a central platform. Some of these data will be sent as open data to allow new apps to be created and used.

The project will be implemented in two stages. First, the sensors will feed data into the platform (one-way communication). Once the system is secure enough, bi-directional communication will be enabled to allow for planning a grid.

The tentative budget is €180,000 for the next five years.



Contact person:  
Alain BERNARD  
*Energy manager*

17 Grand Place  
59100 Roubaix - France

## ENERGY EFFICIENCY IN SOCIAL HOUSING (E3SOHO)

Zaragoza partnered with Warsaw and Genoa to implement the Energy Efficiency in European Social Housing (E3SoHo) EU project. The aim was to implement and demonstrate in three social housing pilots an integrated and replicable ICT-based solution that could significantly reduce energy consumption in European social housing and could also improve the management of the energy production systems already installed.

E3SoHo has delivered a refined, integrated, interoperable, replicable and cost-efficient ICT solution and has also raised tenants' awareness and promoted behaviour change toward energy efficiency. The solution enables owners/managers to remotely monitor and visualise the aggregate energy production and usage of the buildings.

The ICT solution has been successfully deployed in 62 dwellings at all three pilot sites, including Zaragoza. The interoperability of the solution has been tested at two different levels: integration with a single data processing and storage platform (iEnergy) of metering and sensing equipment from different vendors, and integration of the different user interfaces for tenants and building owners/managers.

The ICT solution has delivered tangible results: over the period of one year, two-thirds of the dwellings at the Zaragoza pilot site have reduced their consumption of at least one type of energy. As a result, global savings reached 7% (10% for heating and almost 8% for electricity).

Along with its sister ICT PSP projects, E3SoHo has also delivered a common methodology for the design, implementation and monitoring of ICT solutions for energy efficiency in social housing.



Contact person:  
José Luis BURÓN  
*Director, ICT group*

ACCIONA Infraestructuras S.A.  
Valportillo Segunda 8, ICT Group  
28108 Alcobendas (Madrid) - Spain

+34 91 791 20 20  
joseluis.buron.martinez@acciona.com

[cordis.europa.eu/project/  
rcn/191808\\_en.html](http://cordis.europa.eu/project/rcn/191808_en.html)



**GREEN ICT**

## GREEN ICT

Since 2008, Linköping has been measuring the ICT environment's energy consumption, cost and carbon footprint. Over the years (in 2008, 2013 and 2015), further ICT equipment have been added to the project. For instance, between 2008 and 2013, the number of computers used by the city increased by 4,000 units (40%), and these as well as all the networked equipment, projectors, smart phones and surf pads were included in the measurements. Despite all this expansion, the city's total energy consumption did not increase.

In 2015, all equipment used by students and other private individuals in public wifi zones (25,000 units per day) were also added to the project. While the number of units measured increased threefold between 2013 and 2015, their total energy consumption grew by 30% only (totalling €80,000).

At the same time, the city's data centre consumes 8% less energy. The data centre is run by carbon neutral hydropower, and the city's total ICT footprint has overall decreased by 30% over 2013. Linköping plans to run a new measurement in 2017.



Contact person:  
Fredrik ERIKSSON  
*ICT strategy officer*

+46 13 26 33 53

[fredrik.c.eriksson@linkoping.se](mailto:fredrik.c.eriksson@linkoping.se)

# MALMO, SWEDEN

## GREEN ICT

### GREEN DIGITAL CITY

Malmo signed the EUROCITIES Green Digital Charter in 2010 and thereby committed to decreasing the direct carbon footprint of ICT products by 30% by 2020. The city's green ambitions and achievements were nationally recognised in 2013, when Malmo reached the impressive level of 98% of environmentally labelled IT products. The new raised standards in green procurement of IT products introduced in 2012 are estimated to save Malmo over €500,000 each year.

For several years, Malmo has made decisions in a life cycle perspective when purchasing ICT products/solutions, such as desktop and laptop computers, network printers and monitors.

Energy and resource optimisation are key considerations when choosing a supplier. We avoid purchasing equipment that contain hazardous materials or were produced in an unethical manner. Malmo will only purchase products that come with recognised third-party environmental certifications, such as those of Germany's Blaue Engeln or TCO Development. Today, over 90% of the products used by the city are environmentally certified. Between 2010 and 2014, the related expenditure decreased by SEK5 million (€535,000) per year.

The digitalisation of the city's administration has greatly contributed to energy and resource optimisation and has produced economic and environmental benefits. Several projects are in the pipeline to support the city's further development. Malmo is in talks with Atea, its chosen ICT supplier and logistics partner, on ways to manage the city's digital assets in a sustainable way.



Contact person:  
Ulf LINDEROTH  
*Communications Department  
Malmo stad*

August Palms plats 1  
205 80 Malmo - Sweden

+46 40 341728

[ulf.linderoth@malmo.se](mailto:ulf.linderoth@malmo.se)

[www.malmo.se](http://www.malmo.se)

## SUSTAINABLE IT - GREEN LAB CENTER

Nantes Metropole aims to involve local stakeholders in the realisation of the Green Digital Charter's objectives. The city has erected a 6,600 square metre building called Hub Creativ to support the development of innovative projects in the digital sector, and has also developed a roadmap on sustainable IT in cooperation with the Green Lab Center, hosted by Hub Creativ.

The Green Lab Center is a unique cluster bringing together businesses, academics (higher education institutions, universities, research laboratories) and associations to promote innovative and sustainable green IT projects. One of the main objectives of this association of local and regional IT actors is to reduce the environmental impact of ICT by improving the energy efficiency of IT systems.

The cluster has already developed ten demonstration projects covering all aspects of green IT (awareness, measurement, implementation and evaluation). One of these is the Green Code Label, the first global ecodesign certificate issued to institutions and companies that operate energy efficient websites.

The Green Lab Center is also a venue for trainings, exchanges and R&D activities. For example, it co-organises the Green Code Lab Challenge, the greatest international ecodesign software challenge. In 2015, 450 students and professionals from seven countries had 48 hours to optimise Internet of Things (IoT) software.



Contact person:

- Mathieu CLAVIER  
Digital Department head of services  
Tour de Bretagne, Place de Bretagne  
44000 Nantes - France  
+33 240 996 991  
mathieu.clavier@nantesmetropole.fr

- Thierry LEBOUcq  
Green Lab Center - president  
6 rue Rose Dieen-Kuntz  
44300 Nantes - France  
glc@greenlabcenter.com  
[www.greenlabcenter.com/en/le-green-lab-center/unik-cluster](http://www.greenlabcenter.com/en/le-green-lab-center/unik-cluster)  
[www.greencodelab-challenge.org](http://www.greencodelab-challenge.org)  
[www.webenergyarchive.com](http://www.webenergyarchive.com)



# STREET LIGHTING

### STREET LIGHTING REMOTE MONITORING AND LEDs

Birmingham City Council has teamed up with Amey plc (its Private Finance Initiative partner responsible for highway maintenance and management) to perform a major infrastructure upgrade of all of Birmingham's 45,000 street lights to energy efficient LED (light emitting diode) lighting with remote monitoring and dimming systems.

The implementation of this ground-breaking, future-proof programme to retrofit LED technology across the city was the largest such undertaking in Europe. LED semiconductors represent as much of a step change in technology as the move was from candles to gas lamps in the 19th century and from gas to electric lighting a hundred years later.

Operators use smart controls to adjust lighting levels remotely in real time via wireless connections. This new system increases energy efficiency by 50% and cuts costs in half, resulting in savings of around £2 million (€2.6 million) a year through:

- improved optical controls
- ability to dim street lights
- increased reliability and reduced maintenance costs (average 24-year lifespan, remote detection of faults)
- directionality - uniform lighting improves visibility
- increased safety for road users, pedestrians, cyclists, etc.
- reducing sky glow and obtrusive light



Contact person:  
Nikki SPENCER  
*Digital projects manager*

Digital Birmingham  
Birmingham City Council  
1 Lancaster Circus  
Birmingham B2 2WD - United Kingdom

+44 121 303 8779

[digital@birmingham.gov.uk](mailto:digital@birmingham.gov.uk)

[birminghamnewsroom.com/city-is-shining-thanks-to-10000-eco-friendly-leds](http://birminghamnewsroom.com/city-is-shining-thanks-to-10000-eco-friendly-leds)  
[www.amey.co.uk/media/1451/birmingham-highways-maintenance.pdf](http://www.amey.co.uk/media/1451/birmingham-highways-maintenance.pdf)





TRANSPORT

## COMPASS4D

Cooperative Intelligent Transport Systems (C-ITS) are gaining increasing importance in the transport sector. These systems enable vehicles to communicate with each other and with the road infrastructure. C-ITS services also advise drivers on how to act in specific situations, for example when there is a hazard ahead on the road or another vehicle runs a red light.

Compass4D offers three services: Red Light Violation Warning (RLVW) to prevent and reduce the number and severity of collisions; Road Hazard Warning (RHW) to raise drivers' attention level by alerting them to road hazards or traffic jams; and Energy Efficient Intersection Service (EEIS), which aims to reduce vehicles' CO<sub>2</sub> emissions and energy use at signalised intersections. Certain vehicles (heavy goods vehicles, emergency vehicles, public transport vehicles) will receive 'green priority' at traffic lights to reduce stops and delays. The related Green Light Optimal Speed Advisory (GLOSA) service will provide traffic light phase information and advice to drivers on the best deceleration strategy to approach the intersection.

Bordeaux is one of the seven pilot sites (along with Copenhagen, Helmond, Newcastle, Thessaloniki, Verona and Vigo) with the deployment of seven roadside units and ten vehicles with on-board units and smartphones.



Contact person:  
Christophe COLLINET  
*Digital planning director*

Municipality of Bordeaux

[c.colinet@mairie-bordeaux.fr](mailto:c.colinet@mairie-bordeaux.fr)

### SMART TERMINALS FOR ATTRACTIVE PUBLIC TRANSPORT

Funded under the South East Europe Programme, Burgas has developed a Sustainable Urban Mobility Plan for the period 2014-2020, which sets out a comprehensive long-term strategy for the sustainable development of urban transport and mobility in the city.

The plan's stated objectives include:

- creating a framework for a seamless journey to all passengers, with special regard to commuters and long-distance travellers
- raising the share of public/collective transportation modes
- introducing attractive and sustainable public transport solutions and services

To improve mobility and accessibility and to increase the efficiency and cost-effectiveness of the transportation of persons and goods, Burgas has developed an interactive smart mobility terminal and a mobile application. The interactive smart terminals offer all-round information to travellers during their journey, integrating the different modes of transport available in the city at interactive information points.

Residents and tourists can browse through public transport information, plan their journey, consult interactive maps, check out ongoing events and fairs, view live flight arrival and departure times or find emergency numbers.



Contact person:  
Zoya STOYANOVA  
*Senior expert investment projects*

26 Alexandrovska Street  
Burgas 8000 - Bulgaria

+359 56 907 430

[z.stoyanova@burgas.bg](mailto:z.stoyanova@burgas.bg)

[travelburgas.eu/en](http://travelburgas.eu/en)

## ELECTRICITY - ELECTRIFIED PUBLIC TRANSPORT

The ElectriCity project, comprising 14 partners, has established a demonstration area for electrified public transport in Gothenburg. Between June 2015 and 2018, the city's new bus line 55 is served by three all electric vehicles and seven plug-in hybrids produced by Volvo. Charging stations have been installed at both termini (Johanneberg and Lindholmen) by the city-owned energy company Göteborg Energi. At Lindholmen, a unique indoor terminal offers travellers a chance to have a coffee or pick up parcels in an atmosphere similar to a library. Some of the bus stops and all the buses offer free wifi access and travellers can also charge their mobile phones on the go.

Line 55 is not a public procurement project. It is a partnership between Volvo, the public transport company Västtrafik and the operator Keolis. The bus stops have been installed by Västtrafik and real estate developers Chalmersfastigheter and Akademiska Hus in cooperation with Gothenburg's Municipal Traffic Department.

The buses run on renewable electricity, mainly from hydro and wind power, and also hydrotreated vegetable oil (HVO), a renewable diesel fuel. Utilising zone management, the hybrids run at low speed and on electricity in sensitive areas.

Digital data are available in an open innovation platform for all those wishing to contribute or participate. The platform provides information on buses, bus stops, charging stations and other sections of line 55 as well as on public transport in the Västra Götaland region. Real-time information, such as the GPS location of a bus or the temperature inside the vehicle, is made available via a special app. ElectriCity is a cooperation framework financed from separate budgets and run by a steering committee and a partner group. It is open to new partners interested in contributing to innovative electro mobility development.



Contact person:  
Anna COGNELL

City of Gothenburg,  
Environment Administration  
Köpmansgatan 20  
404 82 Göteborg - Sweden

+ 46 31 368 0390

[anna.cognell@stadshuset.goteborg.se](mailto:anna.cognell@stadshuset.goteborg.se)

[www.goteborgelectricity.se/en](http://www.goteborgelectricity.se/en)  
[www.greengothenburg.se](http://www.greengothenburg.se)  
[platform.goteborgelectricity.se/en](http://platform.goteborgelectricity.se/en)

# MURCIA, SPAIN

## TRANSPORT

### MUYBICI BICYCLE SHARING SYSTEM

MUyBICI promotes the use of bicycles as a clean, efficient and healthy mode of transport in the city, contributing to reduced CO<sub>2</sub> emissions and sustainable urban mobility. In operation since 2015, with initially 600 bicycles, 60 docking stations and 1,200 docking slots, the system aims to reduce private car use and encourage people to switch to non-motorised and public transport.

Five of MUyBICI's docking stations are powered by solar energy, and there are five charging points for electric bikes. The bicycles are moved from one docking station to another in zero emission electric vehicles, saving 4,800 kilograms of CO<sub>2</sub> emissions per year.

The system entails no cost to the municipal budget and operates 24/7, 365 days a year. Bicycles can be rented using a smart card, which is also valid on bus and tram routes throughout the city. A dedicated app that works on all current mobile platforms provides real-time information about bike and station availability.



Contact person:  
Maria Cruz FERREIRA-COSTA  
Managing director of ALEM

Local Energy and Climate  
Change Agency of Murcia  
C/Azarbe del Papel 22  
30007 Murcia - Spain

+34 968 200 293

[direccion.agenciaenergia@ayto-murcia.es](mailto:direccion.agenciaenergia@ayto-murcia.es)

[www.oficinabicicletamurcia.info](http://www.oficinabicicletamurcia.info)

## ELE.C.TRA. - ELECTRIC CITY TRANSPORT

The overall objective of this project is to promote a new urban mobility model, and thereby to improve the quality life of citizens. It seeks to reduce fossil fuel consumption and pollution, and increase the energy efficiency of passenger transportation in the city.

In cooperation with private companies, Murcia City Council promotes the daily use of electric scooters in the city. One of the project's goals is to change the behaviour of the citizens and tourists towards sustainable and user-friendly means of mobility.

An app for mobile devices developed specifically for this project provides real-time information on the availability of electric motorcycles in Murcia.



Contact person:  
Maria Cruz FERREIRA-COSTA  
*Managing director of ALEM*

Local Energy and Climate  
Change Agency of Murcia  
C/Azarbe del Papel 22  
30007 Murcia - Spain

+34 968 200 293

[direccion.agenciaenergia@ayto-murcia.es](mailto:direccion.agenciaenergia@ayto-murcia.es)

[www.kionetworks.com/centros-de-datos](http://www.kionetworks.com/centros-de-datos)  
[www.energiamurcia.es](http://www.energiamurcia.es)  
[www.electraproject.eu](http://www.electraproject.eu)

# REYKJAVIK, ICELAND

## TRANSPORT

### PUBLIC TRANSPORTATION APP

Since its launch in November 2014, the public transportation app for city buses in Reykjavik has been downloaded more than 85,000 times, which is a major feat for a country of 330,000 people.

The experiences obtained during the first year of the app's use are very promising. Those who use the app tend to rely less on plastic cards and paper tickets, and the need for timetable booklets and displays has also diminished. Another surprising but very welcome benefit is that the app demonstrably attracts new customers (over 3% increase in 12 months).

In the first year, the tickets sold through the app accounted for 14% of the total revenue, even though the only option was to buy single journey tickets. Monthly bus passes went on sale via the app in November 2015. In 2016, ticket sales through the app are expected to increase to 30% of the total.

The app also provides real-time bus arrival times, as well as location tracking, bus stop locator and journey planner services. Travellers in Reykjavik can access this service in Icelandic and English.

The app has won the Icelandic Web Award and the NEXPO Award.



Contact person:  
Daði INGÓLFSSON  
*Head of IT*

Strætó bs. / City buses  
Thonglabakka 4  
Postbox 9140  
129 Reykjavík - Iceland

+354 5402 700

dadi@straeto.is

bus.is

### ELE.C.TRA. - ELECTRIC CITY TRANSPORT

This project focuses on developing an innovative and easy payment solution in the form of a common electronic card system. A multifunctional card can be used to pay for public transportation and parking services, to register for different social services (e.g. catering), or to access different kinds of discounts for certain social groups.

The objectives of the project are threefold:

- rationalise the organisation of public transportation
- reduce the city's energy consumption
- provide greater convenience for residents

Launched in 2007, the project aims to create an efficient and inclusive electronic payment system for public transportation in Riga.

The implementation of the new system did not bring about a price increase, and discounts on fares specified in Riga City Council regulations also remain in place. Only the means of payment has changed.

The e-ticket allows passengers to save time when buying tickets, solves the problem of the availability of paper tickets in retail outlets and requires no cash. An e-ticket remains valid for 12 months, except when the price of the ticket type changes or the ticket type is cancelled.



Contact person:  
Marika BARONE  
*Deputy head*

International Cooperation  
and Coordination Division  
Foreign Affairs Office  
Riga City Council  
Ratslaukums 1  
Riga, LV-1539 - Latvia

+371 67105652

marika.barone@riga.lv

[www.stepupsmartcities.eu](http://www.stepupsmartcities.eu)  
[www.rigassatiksm.lv](http://www.rigassatiksm.lv)



# SKOPJE, FYR MACEDONIA

## TRANSPORT

### AUTOMATED TRAFFIC MANAGEMENT PROJECT

The city's new automated traffic management centre, built on Urban Traffic Optimisation by Integrated Automation (UTOPIA) architecture, is a fully adaptive system that controls traffic signals at 90 intersections.

The system utilises 900 inductive loop vehicle detectors, a 50-kilometre fiber optic cable network, a closed circuit television (CCTV) traffic monitoring system with 50 cameras and five overhead variable message signs.

The system also monitors the environmental impact of traffic using three sensors that measure the quality of air at three intersections. It gives priority to public transport vehicles at all 90 intersections using the Automatic Vehicle Location (AVL) technology. Preliminary studies indicate that adaptive traffic control can reduce travel time by as much as 20%.



Contact person:  
Lovren MARKIC  
*Head of International Relations  
Department*

City of Skopje  
ul. Ilindenska 82  
1000 Skopje - Republic of Macedonia

+389 (0)2 32 97 235  
lovrenm@skopje.gov.mk

### MULTIMODAL NETWORK MAP

Over half of the three million daily trips registered in Turin are by car, clogging the metropolitan area's vital transport arteries, deteriorating air quality and lengthening individual trips.

To support its new sustainable urban mobility plan and boost the attractiveness of Turin's extensive public transportation network, the local authority has decided to develop a multimodal network map covering the entire metropolitan area. Aimed at city planners and transport operators, it would highlight gaps in public transportation, suggest improvements to the urban transport infrastructure and help identify new points of modal interchange.

The Optimise Citizen Mobility and Freight Management in Urban Environments (OPTICITIES) project will support the development of the multimodal map by collecting and processing geo-referred information on all modes of urban transportation, road traffic, points of interest (POIs), planned events and road accidents. The data will be visualised by transport operators as superimposable real-time urban mobility layers. The tool will then highlight potential intermodal connections, analyse the reachability of POIs and generate travel time information using different modal combinations. All this will enable Turin to invest in infrastructure at highly congested modal interchanges, identify accident blackspots and plan public transportation capacity.

The measures to ease traffic congestion and optimise network operations are expected to reduce CO<sub>2</sub> emissions by 1.5 million tonnes per year.



Contact person:  
Bruna CAVAGLIA

Servizio Mobilità - Direzione  
Infrastrutture e Mobilità

[bruna.cavaglia@comune.torino.it](mailto:bruna.cavaglia@comune.torino.it)

[www.opticities.com/pilot-cities/torino](http://www.opticities.com/pilot-cities/torino)

# E-PARTICIPATION

## +SUSTAINABLE BARCELONA MAP

An interactive, virtual map, as well as a social network, +Sustainable Barcelona Map introduces the city's initiatives and places of interest with environmental and social value. The map is a participatory tool aiming at gathering initiatives, resources and experiences that may be useful to the public.

Among others, the map can be used for locating sustainable shops, services and businesses, environmental facilities or wildlife refuges in the city. Whether public or private, all these features add a green economy value and improve the urban environment by building a fairer and more inclusive social structure and enriching the wider community and the local neighbourhood alike.

The content of the new map is built through collaborative workshops involving the citizens, who can consult a calendar for upcoming workshops in their neighbourhood and can propose points of interest, upload photographs or write stories. They can also organise new workshops, assist with project coordination or take part as experts. Schools can use the map as a teaching resource, thereby promoting student participation.

The map is the city's contribution to the international Open Green Map initiative, in which over 850 cities from 65 countries participate.



Contact person:  
Montserrat MATEU & Irma VENTAYOL

+34 932 564 430

[lafabricadelsol@bcn.cat](mailto:lafabricadelsol@bcn.cat)

[smartcity.bcn.cat/en](http://smartcity.bcn.cat/en)

### OPEN AHJO CASE MANAGEMENT SYSTEM

In 2011, Helsinki introduced a case management system to facilitate decision-making in the city. Ahjo covers the whole process from initiation to implementation and contains all the proposals and decisions, including statements of reasons, made by the city's organs and officers. Its purpose was to improve the processes and procedures, eliminate redundant work and increase productivity (e.g. by centralising the registry).

Two years later, the city inaugurated Ahjo's open programming interface, Open Ahjo, which makes the decisions accessible as open data in machine-readable format. Open Ahjo makes the city council, city board and committee agendas, minutes, appendices and office holder decisions searchable. The City Executive Office's partners included Ahjo deliverer Tieto, Helsinki Region Infoshare (HRI), Forum Virium Helsinki and developer Juha Yrjölä.

Open Ahjo offers a unique opportunity to utilise the data associated with the city's decision-making processes in different kinds of applications and make them interoperable with other data sets, such as the city's economic data. Data associated with decision-making had previously been published on the city's website in PDF and HTML formats, but specific decisions and processes were rather difficult to find and follow. The new interface enables the creation of user-friendly applications, such as adding feedback or comments.



Contact person:  
**Katja RAISANEN**  
*Senior advisor*

City of Helsinki, Executive Office  
Finland

+358 408 094 352

Katja.Raisanen@hel.fi

[dev.hel.fi/apis/openahjo](http://dev.hel.fi/apis/openahjo)  
[dev.hel.fi/paatokset](http://dev.hel.fi/paatokset)  
[www.hri.fi/fi/sovellukset/ahjo-explorer](http://www.hri.fi/fi/sovellukset/ahjo-explorer)



# WASTE MANAGEMENT

### BIG BELLY BINS

Big Belly Bins are solar powered 'smart bins' equipped with a compactor and wifi to give waste collection service providers intelligence about the actual demand for collection. Waste collection service providers can:

- monitor real-time levels of waste in the smart bins
- locate the smart bin that needs collection
- organise waste collection depending on the levels of waste in smart bins

The Big Belly solar compactor consists of a solar panel powering a 12V battery, which in turn provides the power for an internal compactor. There are two volume sensors within the bin and when the rubbish reaches a certain level, the sensors trigger the compactor. This mechanism increases the storing capacity of the bins to 800 litres of waste, 6-8 times that of a traditional litter bin.

An additional wireless monitoring system enables the Big Belly, when it fills to 85% of its capacity, to send a text and/or e-mail message to the relevant division informing them that it is ready for emptying. Optional extra sensors provide smart info, such as on air quality, sound monitoring or travel times between locations, while optional equipment provides free wifi within a 25-metre radius. These smart bins were designed to improve service efficiency by the use of a compacting technology that extends the period between emptying and a web-based application that enables the central management of the disposal system.

The aim of the project is to identify a sustainable and efficient method of waste management and thereby to create a better environment for the residents (i.e. cleaner streets and public places, less annoyance due to traffic and noise of collection), as well as to optimise the costs of waste management and obtain 'smart info'. Currently there are 401 Big Belly Bins installed in Dún Laoghaire-Rathdown County. The project is managed by the county council's environment department.



Contact person:  
**Jamie CUDDEN**  
*Smart city coordinator*  
*Chief Executive's Office*

Dublin City Council  
Dublin 8 - Ireland

+353 222 3081

jamie.cudden@dublincity.ie  
[www.smartdublin.ie/smartstories/  
big-belly-bins](http://www.smartdublin.ie/smartstories/big-belly-bins)



# RIJEKA, CROATIA

## WASTE MANAGEMENT

### PAPERCUT

Committed to lowering printing costs by changing the behaviour of its employees, the City of Rijeka has implemented the PaperCut print management solution to automatically monitor and manage printing, control the costs and reduce the associated environmental impacts.

In just a few months of use, PaperCut has helped the city administration reduce its printing costs by 30%.

The software is intuitive and easy to use. The Windows-based PaperCut client software provides easy access to printing information and enforces cost effective printing based on type and volume. Logged-in users can track the environmental impact of their printing-related actions, and the administrators can also monitor and manage all printing activity.



Contact person:  
Tatjana PERŠE  
*Head of e-government unit*

City of Rijeka  
Korzo 16  
Rijeka - Croatia

+385 51 209 337

tatjana.perse@rijeka.hr

[www.papercut.com](http://www.papercut.com)







# GuiDanCe

Support the coordination of cities' activities  
via the Green Digital Charter



GuiDanCe has received funding from  
the European Union's Horizon 2020  
research and innovation programme  
under Grant Agreement N° 653640

**Green Digital Charter  
contact point**

[info@greendigitalcharter.eu](mailto:info@greendigitalcharter.eu)  
[www.greendigitalcharter.eu](http://www.greendigitalcharter.eu)

c/o EUROCITIES  
Square de Meeûs, 1  
B-1000 Brussels  
Tel: +32 2 552 08 88

February 2016