

Future Cities: Smart, Resilient, Inclusive and Sustainable



FIWARE



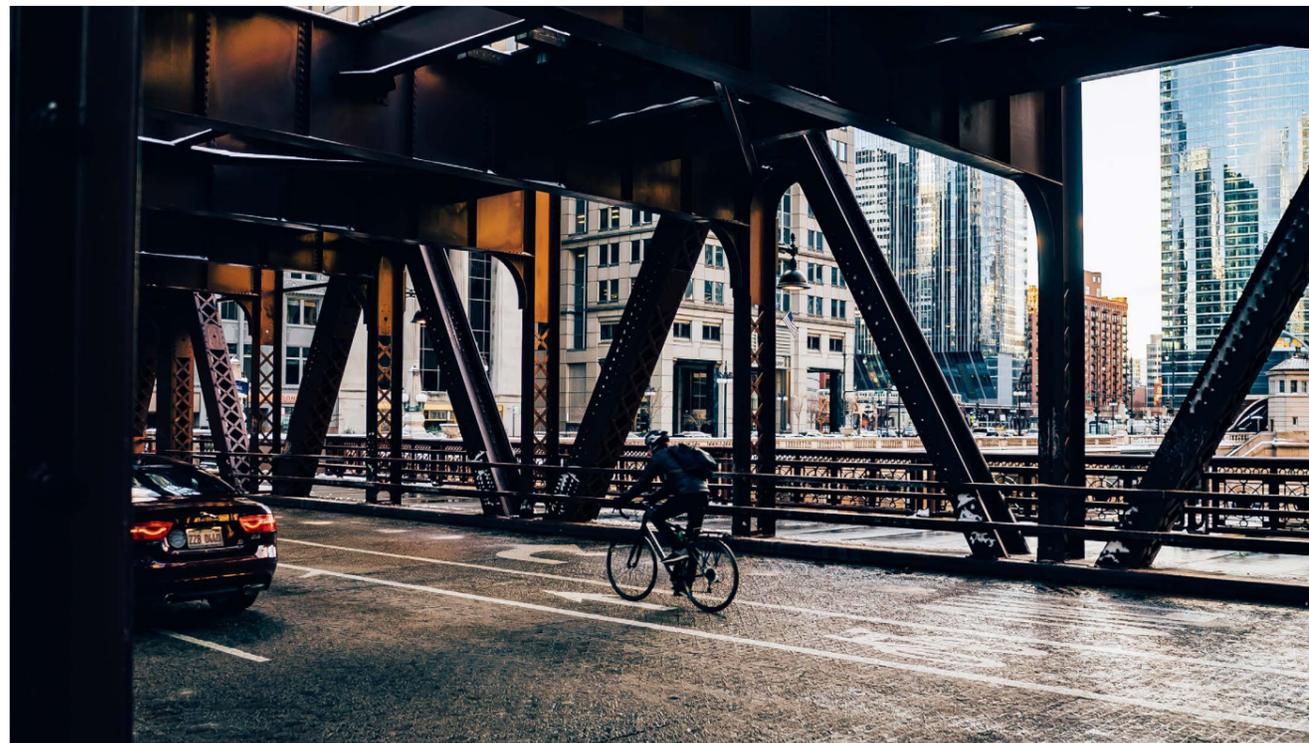
Our Future Water



C O N T E N T

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Our cities today, faced with environmental, economic, and social challenges, need to become future cities that are smart, resilient, inclusive, and sustainable.

By Robert Brears, Our Future Water

Today, 55 percent of the world's population lives in urban areas. By 2050, this figure is projected to increase to 68%. Estimates show that urbanisation, along with rapid population growth, could see the world adding an extra 2.5 billion people to urban areas by 2050. By 2040, the world is projected to have 43 megacities with more than 10 million inhabitants.

While our cities are the engines of global economic growth, accounting for more than 80% of GDP generated worldwide, the world is failing to achieve Sustainable Development Goal 11 of 'inclusive, safe, resilient, and sustainable cities'. Inequality is greater in urban than in rural areas, with the Gini coefficient of income inequality

higher in urban areas in 36 out of 42 countries with data.

Currently, cities are using around two-thirds of global energy and producing 75% of greenhouse gas emissions. At the same time, climatic extremes, including floods, droughts, and storms have costly impacts on cities' basic services, infrastructure, housing, human livelihoods, and health. Finally, it is estimated that annual resource requirements of urban areas are estimated to increase from 40 billion tonnes in 2010 to nearly 90 billion tonnes by mid-century, resulting in resource scarcity as well as environmental degradation, including water contamination and biodiversity loss.





Smart, Resilient, Inclusive, Sustainable Cities

In this context, cities need to become smart (by enhancing resource efficiency, reducing material usage, reducing greenhouse gas emissions), resilient (to climatic extremes), inclusive (socially cohesive — sustainable development pillar of social), and sustainable (by reducing ecological footprints, enhancing biodiversity, generating green jobs and green growth).

The concept of Smart

Sustainable cities have emerged as a result of three global trends converging the diffusion of sustainability, rapid urbanisation, and the rise of Information and Communications Technology (ICT). The concept of smart, sustainable cities revolves around leveraging the advancement and prevalence of ICT in the transition towards sustainable development in the urban context. One of the most common applications of ICT in urban environments is the Internet of Things (IoT) and related big data applications.

Internet of Things

The IoT can be best described as a worldwide network of uniquely addressable interconnected objects, based on standard communication protocols. A smart environment is, therefore, one where our physical world is interconnected with sensors, displays, and computational elements embedded in everyday objects. The application of IoT is broad and includes improved energy efficiency, smart metering and smart grid infrastructure, environmental monitoring and forecasting, precision agriculture, among others.

Big data

The term ‘big data analytics’ refers to any vast amount of data that has the potential to be collected, stored, retrieved, integrated, selected, pre-processed, transformed, analysed, and interpreted for discovering new or extracting useful knowledge. With the use of sophisticated and dedicated software applications and database systems, run by machines with very high processing power, large amounts of urban data can be turned into useful knowledge. This, in turn, allows for well-informed decision-making and enhanced insights into various urban domains, such as transport, mobility, traffic, environment, water, energy, land use, planning, and design.

Sensor technology

One of the core enabling technologies of the IoT, sensor technology is utilised to collect large masses of urban data that serve as inputs for big data applications. Big data involves a wide variety of sensors — devices that detect or measure a physical property or some type of input from the physical environment — and then indicates or reacts to it in a particular way. The output is a signal in the form of a human readable display at the sensor location or of a recorded data that can be transmitted over a network for further processing. Common sensors include:



- Location sensors (e.g. GPS)
- Optical/vision sensors (colour, IR, and UV)
- Light sensors (e.g. photocells)
- Sound sensors (e.g. microphones)
- Temperature sensors (e.g. thermometers)
- Pressure sensors (e.g. barometer)
- Motion sensors (e.g. speedometer)
- Identification and traceability sensors (e.g. RFID, NFC)

Resilient

Resilience can be defined as “*the ability to cope with, and recover from, disruption, and anticipate trends and variability in order to maintain services for people and protect the natural environment, now and in the future*”. Therefore, cities — which comprise physical and technological infrastructure and residents — survive shocks and stresses, people and organisations can accommodate these stresses in their day-to-day decisions, and institutional structures continue to support the capacity of people and organisations to fulfil their aims.

Inclusive

In order for future cities to provide opportunities and better living conditions for all, they need to be inclusive spatially, socially, and economically, specifically:

- *Spatial inclusion*: Urban inclusion requires citizens to have access to affordable necessities including water and

sanitation;

- *Social inclusion*: An inclusive city needs to guarantee equal rights and participation for all, including the most marginalised;
- *Economic inclusion*: Creating jobs and providing residents with the opportunity to enjoy the benefits of economic growth is a vital component of overall urban inclusion.

Sustainable

For cities to be sustainable, the ‘take-make-waste’ economic framework — where natural resources are taken from the environment, converted into goods and services, from which large amounts of waste is returned back into the environment, causing irreversible environmental damage — needs replacing with the circular economy model.

Under this concept, resources are kept in use for as long as possible, values are extracted from them while in use, and products and materials are recovered and regenerated at the end of each service life. The ultimate aim of the circular economy model is the decoupling of economic growth from resource use. The notion of decoupling is that economic output shall continue to increase at the same time as rates of increasing resource use and environmental impact are slowed, and in time brought into decline.



FIWARE: Transforming cities into smart, resilient, inclusive and sustainable cities of the future

As the world's population rises at an unparalleled speed, and the earth's natural resources become rather limited, ICT-based solutions, with technologies such as big data, IoT, artificial intelligence (AI), and robotics - to mention but a few - have become the backbone of our social sphere as they attempt to tackle contemporary problems, stemming from large crowds living in relatively small spaces.

By **FIWARE Foundation**

By introducing disruptive solutions for irrigation systems, air quality, water shortages, resilient sewer systems, public transport, e-government, and open data projects — among others — smart solution providers (coupled with innovative processes) offer a helping hand to public service providers to improve the daily life of citizens and strive to make cities more smart, resilient, inclusive and sustainable. The task surely isn't a straightforward one and requires a wider range of collaborative approaches, supported by a broad variety of stakeholders (private businesses, not-for-profit organizations, social enterprises, citizens etc.).

Together with its 350+ global members and partners, FIWARE Foundation drives the definition and the open source implementation of key open standards that enable the development of portable and interoperable smart digital solutions in a faster, easier, interoperable and affordable way, following an open source approach that avoids vendor lock-in, whilst also nurturing FIWARE as a sustainable and innovation-driven business ecosystem.

Why are standards important? Common standards for Application Programming Interfaces (APIs) and data models are at the heart of platforms and digital infrastructures, enabling the

interoperability and portability of solutions. In order to successfully make it into the market today, new smart services and solutions must be able to securely communicate with other services and devices, traversing a multitude of infrastructures and systems. This way, solution providers benefit from knowing that their solutions can be connected with other applications or pieces of software — already developed and widely available — or replicated for multiple customers with rather low adaptation costs.

Over the next pages*, **Franck Le Gall** and **Philippe Cousin**, **Andrea Gómez** and **Antonio Jara**, **Francisco Salas**, **Jim Craig**, **Pieter De Jong**, **Paolo Nesi**, **Spiros Mazarakis**, **Laura Machado** and **Marcos Marconi**, from the ever-growing FIWARE Community elaborate on how FIWARE has become a leading voice in establishing the fundamental context management standards needed for the creation of interoperable platforms and digital infrastructures. The stories featured below are just some of the many practical examples of how FIWARE, with solutions ranging from traffic management to air pollution, is helping cities to deliver their digital strategy and drive the advancement of an information society, in turn, leading cities into the smart digital future.



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Getting more from your data through standardized context management with Stellio

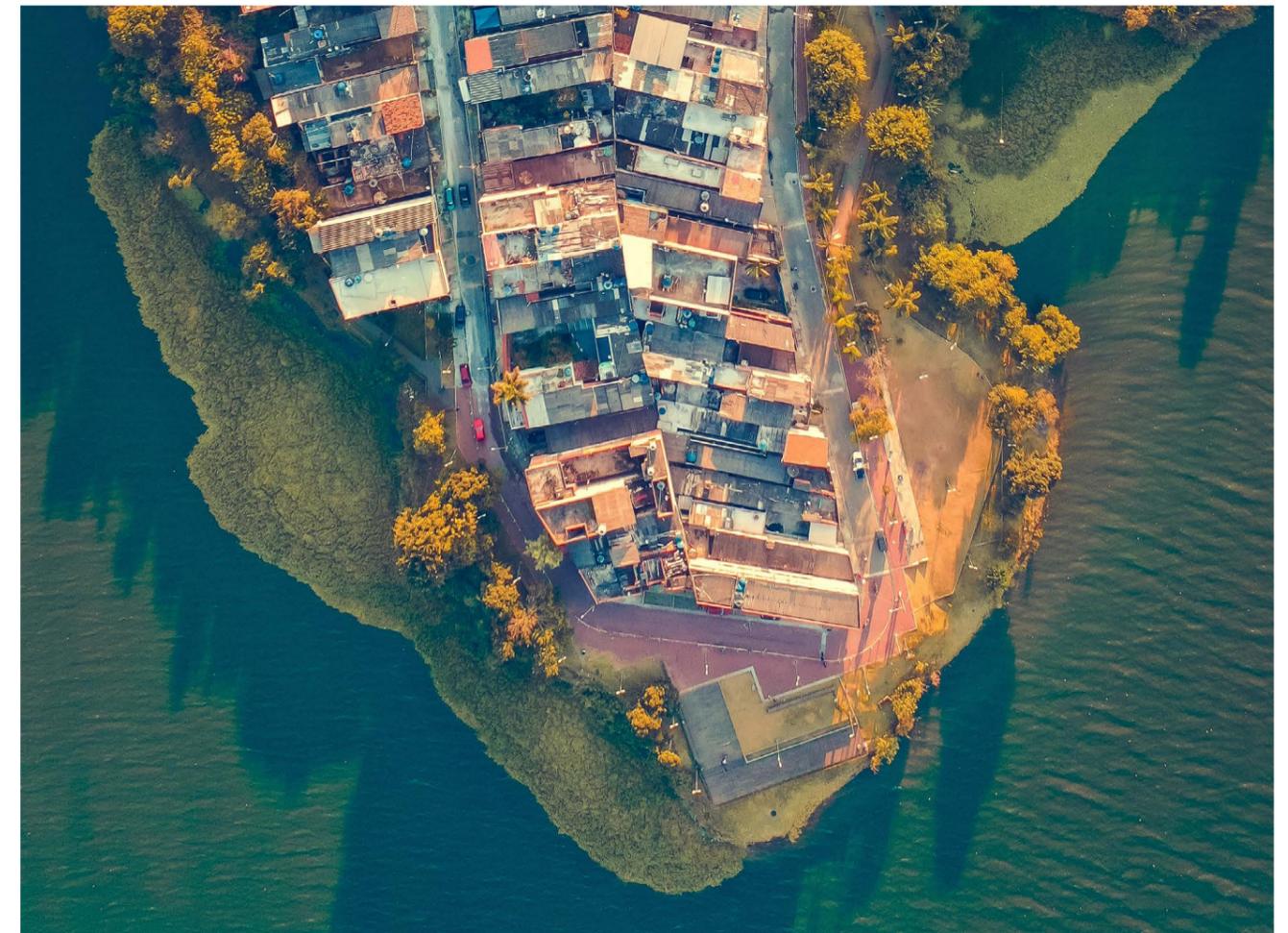
There is a growing tendency to collect and accumulate data, with data holders proud to showcase their data sets. However, the bad news for them is that it will be hard to exploit the true power of data if no emphasis is placed on the validity of data, cross-data models or additional information such as semantics, which has the potential to turn data into powerful assets.

By **Franck Le Gall** and **Philippe Cousin**, Easy Global Market (EGM)

To enable the power of data, **EGM**, in line with the FIWARE open source model and the ETSI NGSI-LD specification, has developed an intelligent and context-aware data broker, **Stellio**. It was **ETSI**, the European Telecommunications Standards Institute, and a strategic partner of FIWARE, that once stated “data without context are meaningless”, and we could not agree more.



Image provided courtesy of EGM



Driving the materialization of global, open standards, based on open source

The product is in line with ETSI's Industry Specification Group (ISG CIM), which was born out of a request from the European Commission towards the definition of a standard Context Information Management (CIM) API with FIWARE NGSI as a candidate. In the beginning of 2019, the so-called ETSI NGSI-LD API specifications came into the market.

This standard provides a cross-domain data model built upon semantic web (linked data) principles as well as a query-subscribe API, allowing different services to dynamically exchange contextualized information. It supports centralized, federated, and distributed architecture to fit any deployment plan within or across organizations.

The recent months have witnessed a rapid increase of interest to adopt the NGSI-LD specification, which is even now a European recommendation for the Living-in community.

The Stellio broker is under active deployment and use with several partners and customers. The latest deployments are to optimize water consumption in sport fields irrigation, reduce food waste within connected school canteens, optimize the facilities' energy management or collect Smart Meter data to optimize water consumption in a district.

Next steps are being undertaken in the aqua3S and Fiware4Water research projects to build digital twins of water facilities (i.e. water network) dynamically connected within the NGSI-LD infrastructure.



HOPU, a SME working in urban sustainable indicators for smart cities

The company follows the FIWARE open source approach and contextualizes their devices data with datasets from water consumption (utilities), social networks, urban health, mobility, and socio economics, thereby creating models on its impact, influence, and origin of emissions.

By **Andrea Gómez** and **Antonio Jara**, HOPU

With the objective of turning Europe into the first climate-neutral continent, and fostering a modern, resource-efficient and competitive economy, the [European Green Deal](#) includes, among many other topics, the [European Climate Law](#) that aims to legally ensure that cities work towards a neutral gas territory. As part of this commitment, the [Innovation Fund](#) is dedicating 10 billion Euros to reduce emissions, with 60% of the budget dependent on the results.

A byproduct of this is cleaner air. But before emissions can be reduced and air quality improved, establishing indicators to measure progress is key. Ensuring that actions are based on data is, therefore, vital. ICTs can help accomplish this in many ways. There are many potential areas of application, including digital transport solutions, decentralised energy systems, and smart climate-neutral communities.

Climate change mitigation is a global challenge, and evidence-based plans are crucial to make it effective. HOPU, a Spanish company specialized in smart city solutions, meets this challenge with its AI, IoT and FIWARE-based solutions for public administrations, simplifying the decision-making process



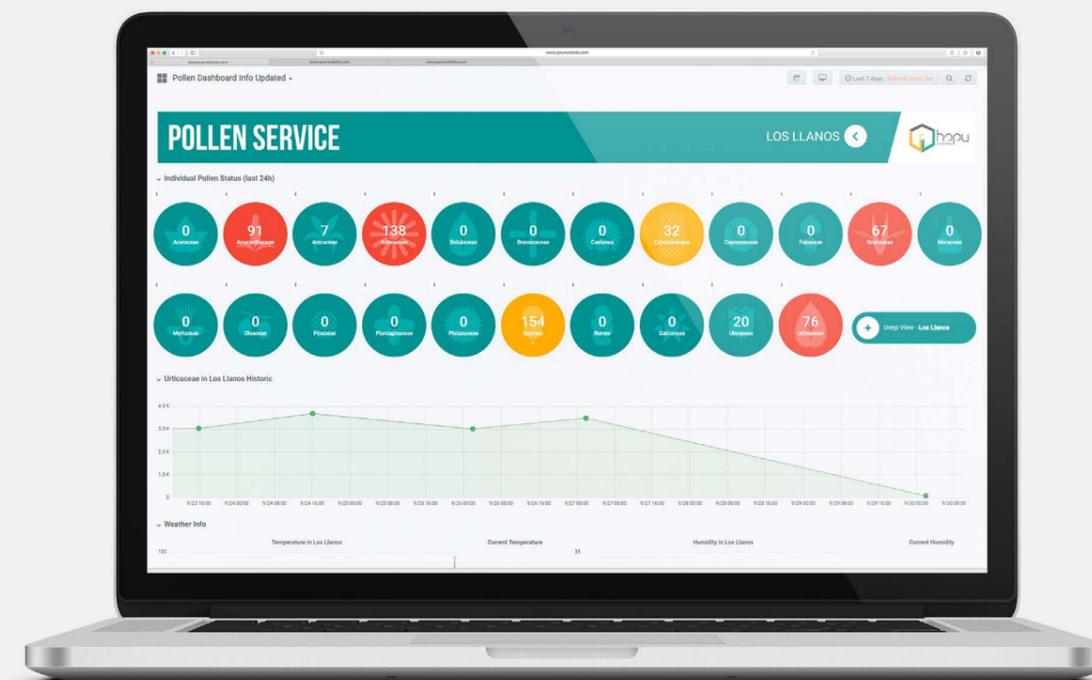
for cities striving to reduce pollution.

HOPU's solution allows cities to collect, analyze and visualize — in a simple manner — a large amount of environmental-related data (coming from air quality monitoring, utilities, social media, etc.). Currently in use, for example, in Bruges and [Mechelen](#) (Belgium), the solution offers clear indicators to facilitate the understanding of the environmental state within cities.

Specialized in providing high-quality and contextual data about cities' environment, HOPU manufactures IoT-based environmental monitoring devices to measure gas pollution, particulate matter (pollen, dust), VOCs

(odors), weather, noise, and people flow. The company follows the FIWARE open source approach and contextualizes their devices data with datasets from water consumption (utilities), social networks, urban health, mobility, and socio economics, thereby creating models on its impact, influence, and origin of emissions.

HOPU solutions have been developed hand in hand with decision-makers to ensure that they are understandable and intuitive. The company is currently working with 30+ cities such as [Cartagena](#), [La Palma](#) (Spain) as well as in flagship projects such as the monitoring of nanoparticle pollution in Madrid. Find out more [here](#).



*Pollen indicators for La Palma (Canary Islands)
Image provided courtesy of HOPU*



Málaga: delivering sustainable environments for business growth and citizens' high well-being

Located on the southern coast of Spain, the city has gained a reputation for forward-thinking businesses model that includes a solid local economy, an entrepreneurial mindset and its citizens' voice.

By **Francisco Salas**, Promálaga

When one arrives in Málaga, its stunning coastline, the surrounding mountains and the friendliness of the locals are captivating. Then, something else stands out. Despite being one of Europe's oldest cities, Málaga exhales modernity and digital innovation and for the past years, the city has moved away from simply being the gateway to the sunny Costa del Sol.

Revamped and revitalised, Málaga is

now home to the Technology Park in Málaga, which includes 630+ companies and 20,000+ employees, developing solutions for energy efficiency, urban services, communications and tourism. It is no wonder the city has been awarded the title of 2020 European Capital of Smart Tourism (alongside Gothenburg).

Long-term planning

Its achievements were not an over-

night success. They are the result of the city's ambitious smart and innovative vision, whose overall strategy is aligned with the UN Sustainable Development Goals. Málaga's forward-looking approach was spearheaded by the 2009 Málaga Smart City project and expanded by the city's [Innovation Strategic Plan 2018-2022](#) which encourages the creation of solutions on urban life, citizen participation, e-government and open data projects focusing on making the city more innovative, inclusive, technological and smart.

A city Powered by FIWARE

Committed to providing useful data sets to its citizens, the city has initiated its own [Open Data environment](#), which generates information sources, specifically data, which are open to the public and above all, can be downloaded by any company, professional individual or citizen, and used for any purpose. A FIWARE user, the city encourages solution providers to develop applications — in an easy and replicable manner — on top of the FIWARE platform,

integrate [city data](#) into it and hence, boost the local economy.

Similarly, with [CityGO](#), a “Powered by FIWARE” transportation planner and intelligent mobility solution developed by [Atos](#) (a FIWARE Platinum member), locals and visitors find the best route — and the means of transport — to get from A to Z, based on real-time information. From inputs on trains, buses, and the nearest public bike rental station, to available parking spaces, everything is managed in real time. The solution's dashboard monitors the flow of citizens within the city and supports Málaga's decision-makers in making educated decisions about its transport planning.

The city also houses [FIWARE Zone](#) — one of FIWARE's [global iHubs](#) — which provides training sessions, mentorship and webinars on smart digital solutions for the local SME and startup scene. The iHub also facilitates startups' connections with research institutions, private and public companies as well as accelerators.

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Image provided courtesy of Promálaga





Red Hat

Making water personal

Creating a community hub that delivers fresh water, news, and information, using open source and IoT is of essence.

By **Jim Craig**, Red Hat

Water is precious, and with record droughts being experienced around the world, a worsening climate crisis makes it more so. We, in the technology field at Red Hat, are working hard to help in areas such as water stewardship, quality, and management. Cartagena, in southeastern Spain, exemplifies this commitment. Previously suffering from air quality and water shortages, the town now better manages its water supply and improved air quality.

Smart, or impersonal?

One of the challenges of technology is to be easy to use, and ideally, invisible. When done right, this works well, with humans and machines working in perfect harmony. Taken too far, however, and it can leave us, humans, feeling powerless and frustrated, unable to “look inside” the proprietary box to understand why we got the result we did.

I liked this article, by Anna Lisa Boni, Secretary-General, EUROCITIES, where she uses the term “City-led, citizen-focused.” In the technical world, we refer to this as “user-centric” design, and in the public sector world “citizen-centric” design. We are seeing more and more of this co-creation, with a blurring of lines between “business” and “technical”, as exemplified by the rise of the “citizen developer and the tech-savvy process expert”.



Image by [InfoCilento](#)

Water as a meeting point?

History shows that water is vital to our existence and central to communication. From meeting at watering holes, to the development of towns and cities on rivers, and seafronts, water has provided the core around which major cultural, economic, and recreational activities have evolved. An ecosystem of interconnected devices and sensors is most effective when there is a common, global purpose - like water - opening up avenues for advancing outcome-based innovation that improves our quality of life.

Our smaller scale, modern-day equivalent could be “water cooler” conversations. BrianzAcque, the Italian water and sewage utility might just have scaled up the water cooler conversation to the 900,000 citizens it serves in the Monza and Brianza re-

gion. Still and sparkling water is dispensed through 69 self-service case dell’acqua water kiosks (in which quality drinking water is available through kiosks equipped with filtration and supply systems) and a further 62 water dispensers, purchased using a rechargeable payment card.

The kiosks provide a meeting point for citizens, sharing information on local events, opening times, and traffic conditions. Using IoT, kiosks are easily managed, providing real-time, relevant information on water consumption and quality, such as pH and mineral levels, and card payment information.

Learn more about the BrianzAcque story and how Red Hat can help you deliver your vision of a city that is resilient, smart, inclusive and sustainable.



SCOREwater: a collaborative approach addressing climate resilience, water pollution, and the livability of cities

Want a successful smart water approach focused on the challenges of cities? Then, be open, build a community and collaborate. This approach is integrated into the EU Horizon2020 research and innovation project, SCOREwater.

By **Pieter de Jong**, Future City Foundation

The SCOREwater mission is to connect governments, universities, urban developers, citizens, and technology professionals within the water sector to develop and test water-related smart digital solutions and best practices to strengthen cities' resilience.

So far, Amersfoort (Netherlands), Barcelona (Spain), and Gothenburg (Sweden) are experiencing this approach, first-hand. These cities, with their varied climate and social conditions, cover most of the city typologies in Europe. Therefore, they are good places for SCOREwater validation. The Amersfoort case focuses on flood pre-



Image provided courtesy of the SCOREwater Project

vention and climate resilience, whereas the Gothenburg case aims for water-safe infrastructure projects. Meanwhile, the Barcelona case is all about resilient sewer systems through sewer sociology.

With regards to the latter, their focus is on the sewer system, which can be seen as an untapped source of information. Sewage contains valuable information about the lifestyle habits and waste management practices of inhabitants. Amongst other things, this information can be used to:

- i) monitor at a fine spatial and temporal resolution the consumption pharmaceuticals;
- ii) prevent discharges from households of wet wipes, oils, and greases to the sewer system that damage the network and may cause blockages;
- iii) decrease sewer maintenance costs by having a well-monitored system that allows preventive maintenance to be carried out in order to reduce non-scheduled maintenance.

Building one data marketplace

Lots of data are being gathered within the three cities participating in the project. This data will be made accessible in one location, the SCOREwater data marketplace. This will help to ensure the continuity of the solutions being developed on top of this data.

This data marketplace will combine heterogeneous data from various sources into easy to use APIs by harmonizing and standardizing the metadata and data, and publishing them in an easy to use smart water platform. This marketplace will transcend the SCOREwater project and make it accessible for all parties working towards a water-smart society. The SCOREwater project uses the open standards provided by FIWARE Foundation to enable rapid data and information transfers between all involved parties.

Learn more about the project and the solutions begin developing by downloading the overview of the first year of the project [here](#). Alternatively, visit the [website](#).

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Creating sustainable and resilient sentient cities

The Snap4City open framework enables the creation of sentient, sustainable and resilient cities.

By **Paolo Nesi**, Snap4City

How can we create smart solutions and systems to optimize resources, increase citizens' quality of life, and boost sustainability, and what is the impact of such solutions on cities and inhabitants? Predictions of diffusions for particulates in cities allow citizens to plan their walks and jogs more efficiently (see [TRAFAIR CEF Project of European Commission](#)).

Predictions and reconstructions of traffic patterns help inhabitants save time and fuel when reaching their final destination (see [Sii-Mobility MIUR](#)). Smart solutions can make predictions of parking and bike-sharing services, allowing final users to reduce the time spent searching for a parking spot, whilst also estimating, in real-time, air quality indexes, and monitoring other environmental variables. The Snap4City framework enables the creation of such smart solutions with dashboards and mobile applications that help cities in their transition to sustainable and resilient sentient cities.

Several countries in Europe such as Italy, Belgium, Sweden, France, and, Spain, are already positively impacted by dashboards for decision-makers and city operators, both on the web and in control rooms (see [REPLICATE EC](#)), mobile apps and special IoT devices created to ease the lives of millions of citizens Europe-wide. One of such IoT devices is a solution to monitor the flow of people in Antwerp, helping city operators and citizens to identify the days and times of the heaviest flow.



Image provided courtesy of Snap4City

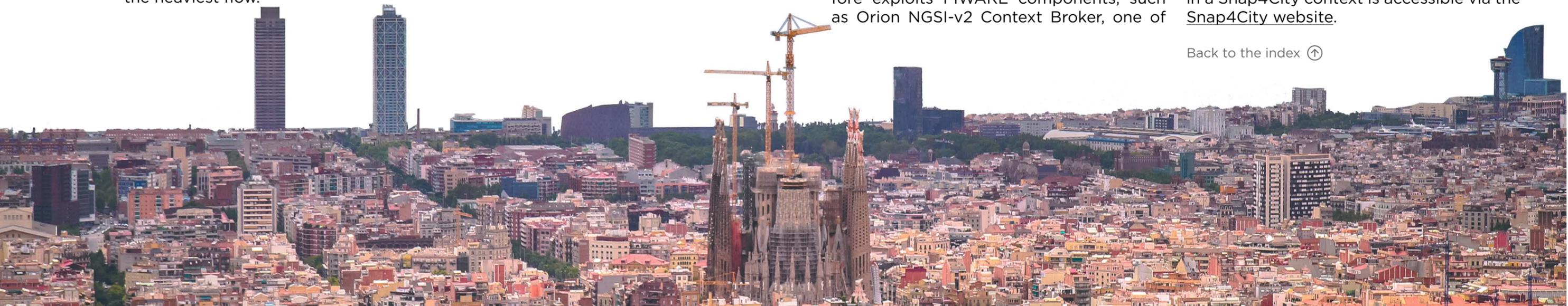
In this regard, [DISIT Lab of the University of Florence](#), the main Snap4City operator, supports the development of data-driven strategies that contribute to the European Resilience Management Guidelines for cities (see [RESOLUTE EC](#)). The guidelines have been made operative by the implementation of data flows from IoT devices, open data towards Snap4City dashboards, and other smart decision support tools based on FRAM and systems thinking.

Powered by FIWARE, Snap4City sees the added value of open standards and therefore exploits FIWARE components, such as Orion NGSI-v2 Context Broker, one of

the FIWARE NGSI Context Brokers. Open source approaches support cities in their transformation journey with minimum effort but great impact. FIWARE NGSI Context Brokers enable the gathering of data from a large range of IoT devices and networks, independent from the data domain. In addition, open source tools to implement smart city solutions can be used from the cloud or installed in the city cloud, and they are [GDPR compliant](#), by ensuring data sovereignty.

More information on the above scenarios in a Snap4City context is accessible via the [Snap4City website](#).

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uni.systems

Smarter cities to live in

Water consumption, waste management, and parking resources are only a few of the areas that municipalities are striving to optimize.

By **Spiros Mazarakis**, Uni Systems

As traditional city models are becoming obsolete, municipalities are pursuing transformational projects to keep up with the digital revolution. Unrolling a Smart City ecosystem is the kick start for traditional city models and the issues that cities and municipalities have been trying to resolve for decades. Our digital era allows governing bodies to take action in a more efficient manner, while making use of more information to make educated decisions for their citizens.

Therefore, smart, digital operational features and back-office systems are of utmost importance for the creation of a smart ecosystem. On that note, based on its Local Government Information Management Systems and FIWARE's open source framework, Uni Systems has created the intelligent and integrated City2Live Urban Platform that has been actively contributing to the creation of the cities of the future.

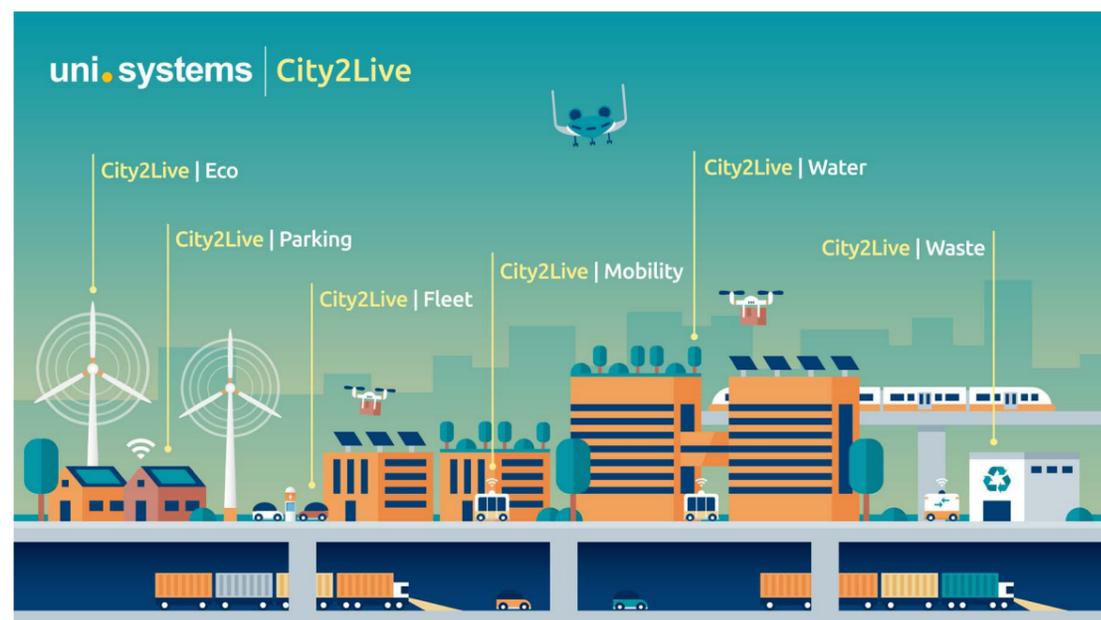


Image provided courtesy of Uni Systems

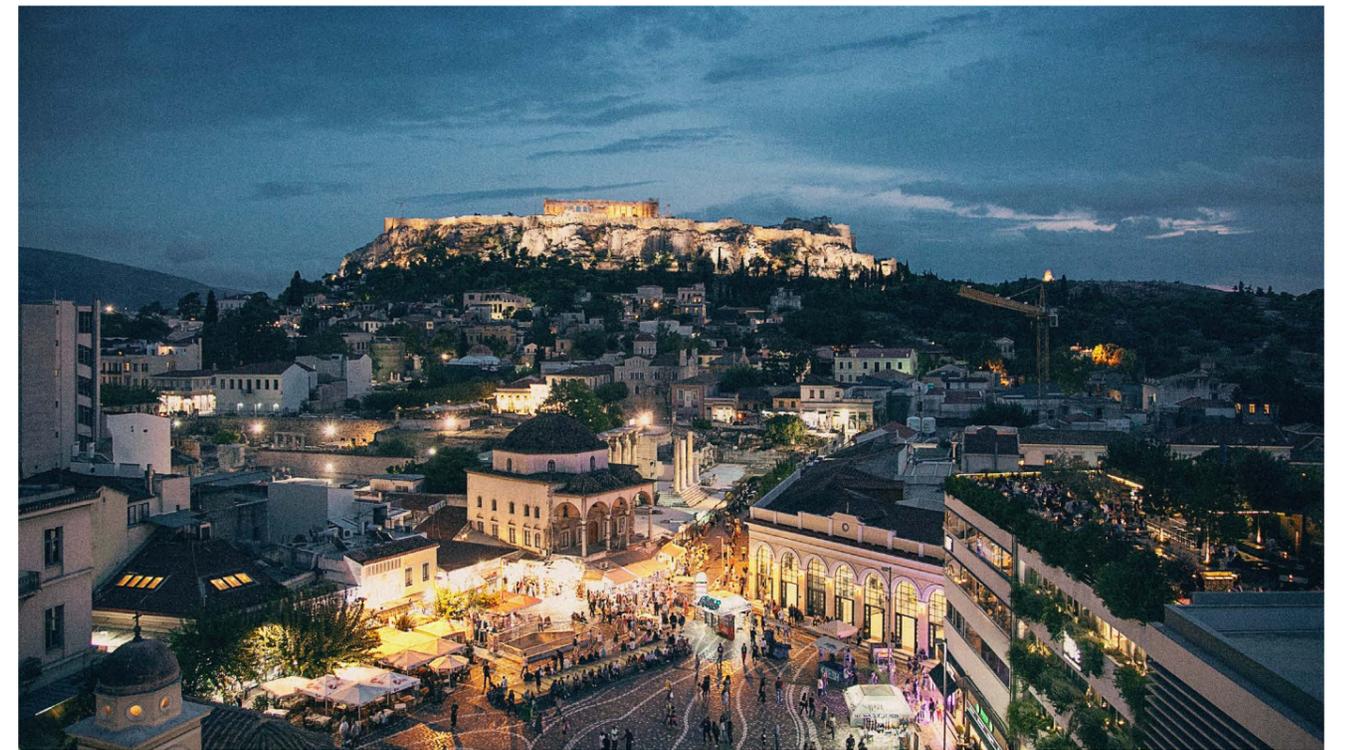


Image provided courtesy of Uni Systems

City2Live offers customizable solutions for all available resources needed for the operation of Smart Cities. City2Live extensions of eco, mobility, water, fleet, parking, and waste, facilitate optimal management and monitoring of all vital aspects that aim at differentiating themselves from the traditional and monolithic cities of the past. By capitalizing on both the established IoT Innovation Cluster and its strategic partnership with FIWARE, Uni Systems delivers strategic guidance to municipal governing bodies in their decision-making process, and the efficient use of all public resources.

With the use of existing tools and newly developed interfaces, municipalities are creating network connections among digital applications, gathering valuable large-scale data, and allowing the real-time monitoring of Smart City operations. The municipality administration bodies will instantly resolve problems as they arise or even predict breakdowns and avoid them altogether, while citizens will enjoy optimal services.

As a practical example, Uni Systems is currently deploying a City2Live | Water solution pilot in one of Athens' largest municipalities. The pilot aims at demonstrating the capabilities and the potential of the solution's interoperable and standardised interfaces for both water end-users (municipality, water authorities, residents and consumers), and solution providers (private utilities and developers).

Faster response to events (customer leaks), predicting short-term water demand, and a refined understanding of leakage at households and area level for reporting are some of the outcomes already witnessed in the pilot. In this era of widely available data, providing efficient, high-quality, and cost-saving services, while also prioritizing energy efficiency, is being one-step ahead.

For more information on how Uni Systems is helping municipalities to deliver their digital vision, and accommodate its citizens, click here: www.unisystems.com.



FIWARE and VM9: Paving the way to a smarter and sustainable Rio

As a worldwide concern, climate change impacts the city of Rio de Janeiro and its nearly 7 million citizens where urban vulnerability to severe weather events is notorious.

By **Laura Machado** (Rio de Janeiro Operations Center) and **Marcos Marconi** (VM9)

The Innovation Program of Rio de Janeiro's Operations Center (COR)* — which is part of the agenda of Iplan-Rio and LabGov.Rio (an Innovation Laboratory with 2800m2 of building area and the potential to host up to 144 startups and become the largest innovation center in Latin America) — has transformed Rio (Brazil's second most populous city) into an innovation hub and is a reference in Brazil and Latin America.

Paving the way to a smarter and sustainable Rio

In 2018, COR started promoting the “COR Challenge - Smart City, Smart People”, an open innovation and co-creation project, where academics, startups, and citizens create innovative solutions to solve some of the city's problems.

The most recent edition of the challenge addressed the impact of climate change on the city's public transport system and one of the solutions was developed by VM9, a FIWARE Gold Member. The company, which spe-

cializes in IoT, AI, Geostatistics, and structuring of Data Lakes, created a platform that detects anomalies in the city's bus system, remotely and automatically, in real-time, from cross-referencing multiple data sources.

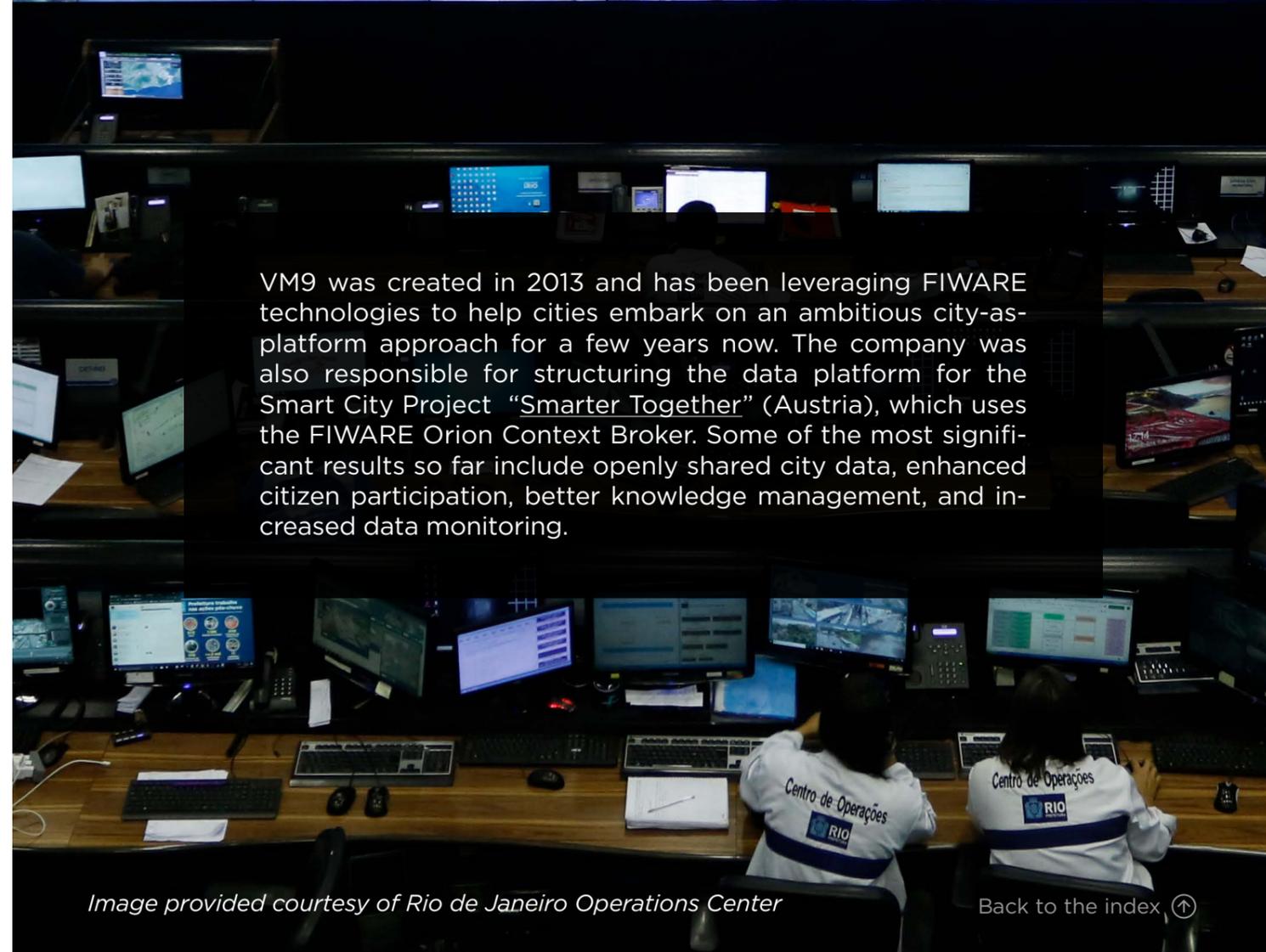
The platform uses the FIWARE Orion Context Broker, the core integration technology in any “Powered by FIWARE” architecture, adopted by the European Commission as a Connecting Europe Facility (CEF) Building Block within their Digital CEF (Connecting Europe Facility) program. The Context Broker is able to handle context information on a large scale by implementing standard REST APIs, easing the process of collecting, managing, using, and sharing data.

This will allow COR to receive ‘near’ real-time alerts and suggestions to each occurrence that impacts the traffic in the city. A solution based on the open standards promoted by FIWARE Foundation, the solution can be easily replicated, and hence benefit cities and citizens around the world.

*For almost 10 years, COR has been the headquarter for the integration of urban operations in the municipality. Over 24 hours a day, seven days a week, more than 400 professionals from 30 institutions take turns, monitoring and warning about risks and urgent measures that must be taken in the face of emergencies, such as heavy rains and traffic accidents.



CENTRO DE OPERAÇÕES PREFEITURA DO RIO



VM9 was created in 2013 and has been leveraging FIWARE technologies to help cities embark on an ambitious city-as-platform approach for a few years now. The company was also responsible for structuring the data platform for the Smart City Project “Smarter Together” (Austria), which uses the FIWARE Orion Context Broker. Some of the most significant results so far include openly shared city data, enhanced citizen participation, better knowledge management, and increased data monitoring.



About FIWARE

FIWARE Foundation is a non-profit organization that drives the definition and encourages the adoption of open standards — implemented using Open Source technologies and reference architectures — to ease the development of smart digital solutions across multiple domains, based on FIWARE technology. The foundation achieves that through the support of a fast-growing global community that shares a common vision and combines their efforts toward making FIWARE the Open Source technology of choice for industries, governments, universities and associations to reach their full potential and scale up their activities, thereby, entering new markets and growing their businesses. Founded in 2016, the foundation has Atos, Engineering, Red Hat, NEC, Telefónica and Trigyn Technologies among its Platinum members. For further information, visit fiware.org and follow us on [Twitter](#), [LinkedIn](#), [Facebook](#) and [Youtube](#).

About Our Future Water

Founded by Robert C. Brears, Our Future Water has been created to ensure water security for today's and future generations. This will be achieved by: bridging communities - water specialists, points of view, and generations; generating and disseminating knowledge through fact-based analysis; and advocating for water education at all levels to build a community of water leaders who can see and solve water challenges from various vantage points. Our Future Water has knowledge partnerships with the World Bank's Connect4Climate initiative and the OECD/UNEP/World Bank's Green Growth Knowledge Platform, and is a member of the UNFCCC's Paris Committee on Capacity-building Network. For more information, visit ourfuturewater.com, join Our Future Water's [LinkedIn group](#), and follow us on [Twitter](#), [LinkedIn](#), and [Facebook](#).

About Robert Brears

Robert C. Brears is the Founder of Our Future Water and Editor-in-Chief of the Palgrave Handbook of Climate Resilient Societies and the Palgrave Encyclopedia of Urban and Regional Futures. He is the author of [Urban Water Security](#) (Wiley), [The Green Economy and the Water-Energy-Food Nexus](#) (Palgrave Macmillan), [Natural Resource Management and the Circular Economy](#) (Palgrave Macmillan), [Blue and Green Cities: The Role of Blue-Green Infrastructure in Managing Urban Water Resources](#) (Palgrave Macmillan), [Climate Resilient Water Resources Management](#) (Palgrave Macmillan), [Developing the Circular Water Economy](#) (Palgrave Macmillan), and [Nature-Based Solutions to 21st Century Challenges](#) (Routledge). He is the editor of the [Climate Resilient Societies](#) book series published with Palgrave Macmillan. Robert is a contributing author for the World Bank's Water Blog, Asian Development Bank's Blog, United Nations Industrial Development Organization's Making It Magazine, and Green Growth Knowledge Platform. Connect with Robert on [LinkedIn](#), and follow him on [Twitter](#).

Editing: **Robert Brears** (Our Future Water)
Val De Oliveira (FIWARE Foundation)
Charlotte Kotterman (FIWARE Foundation)

Design: **Phuong-Quy Le** (FIWARE Foundation)



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