



# SMART DIGITAL ECONOMY

## WHAT HAS OPEN SOURCE GOTTA DO WITH IT?



This White Paper is a collaboration between FIWARE Foundation  
and the Open Compute Project Foundation.

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## FOREWORD

By **Jonathan Reichental, Ph.D.\***

Best-selling Author, Professor, Founder of Human Future

The 21st century will be the century of cities. For the first time, a large majority of humans will be born into and live out their lives in an urban environment.

While acknowledging a rocky road through the industrial revolutions, on balance, our cities have served us reasonably well and lifted billions out of extreme poverty. There's a good story to tell in many areas of the human experience, but the challenges we face today and, in the future, will be more complex than ever.

Given the urgency and extent of issues our communities face, we must work together in new ways to build a better, more inclusive urban future. From areas such as transportation and energy, to the climate emergency and more, this is not a time for small ideas. We've entered an age that requires us to deliver bold and ambitious outcomes.

As this White Paper vividly illustrates through many inspiring examples from the FIWARE Community, governments and providers engaged in open and collaborative efforts using innovative platforms offer remarkable opportunities to deliver on the promise of a better tomorrow.

Getting different results means thinking differently and not repeating the negative patterns of the past. The scale of each of the major urban challenges ahead is too great for any single person or organization to take on.

As humans, we are at our best when we confront realities together, collaborate and share, and open ourselves to new ideas. Today's hyperconnected world has provided us with open platforms for positive, inclusive change. Let's choose to embrace them.

Together we can build a better world. A future world that belongs to cities.

\* A multi-award-winning technology and business leader whose career has spanned both the private and public sectors, Dr. Jonathan Reichental has been a senior software engineering manager, a director of technology innovation, and has served as Chief Information Officer at both O'Reilly Media and the City of Palo Alto, California. Dr. Reichental is the founder of advisory, investment, and education firm [Human Future](#), and also creates online education for [LinkedIn Learning](#). He has written three books on the future of cities, namely: [Smart Cities for Dummies](#), [Exploring Smart Cities Activity Book for Kids](#), and [Exploring Cities Bedtime Rhymes](#).



## OCP Building Block Of Future Carbon Neutral Data Centres

By **Stefan Frenzel\***

Director DACH Region, Open Compute Project Foundation

### Overview

The Open Compute Project (OCP) is a collaborative community focused on redesigning hardware technology to efficiently support the growing demands on compute infrastructure. Since more and more data and services move to the cloud and bring connectivity to the world, there is clearly a need to do it in the most efficient, economical, and sustainable way.

For that reason, data center hardware has to become a commoditized and evolving set of products optimised for these challenges. However, OCP strongly believes that an open collaboration is the very best way to get there. To ensure a level of consistency in our contributions, OCP requires that all contributions meet at least three out of the five core OCP tenets: efficiency, scalability, openness, impact and sustainability.

Sustainability has become OCP's fifth core tenet at the end of 2020, due to the increasing impact of data centre sites worldwide to the environment. Based on IT experts, by 2025 data centres and related IT infrastructure will consume around 4,5% of the world's power and with CO2 emissions already returning to pre-pandemic levels currently on a global scale of 2% - equivalent to the world's entire airline industry.

The above topic stands in big contrast to the green deal initiative of the European Union to ideally make all data centres carbon neutral by 2030. As a consequence, to live up to the EU's green deal objectives the data centre industry has to reduce their climate footprint by further deploying open source software and hardware.

At the same time, they ought to use renewable energy, circular economy gear, combined heat compute (CHC – waste heat usage) and ideally replace concrete and steel constructions with wood.





### The next wave of business innovation

Additionally, technologies such as Artificial Intelligence (AI) will need to be leveraged, which will undoubtedly have a large impact on the data centre industry. There is clearly a momentum: data centre providers are, at least, thinking of these advanced workloads and a lot of the discussion is happening among the larger data centre operators.

AI represents, in my opinion, the next wave of business innovation. The advantages it provides in terms of operational cost savings, additional revenue streams, simplified customer interaction, and enhanced efficiency are huge.

Therefore, it is not a surprise that major tech companies have embraced AI, which also means adopting a different way of thinking about data centres' designs and implementations.

As a matter of fact, data centres will have to be super-efficient, highly fibre-meshed, ultra-low latency, East-West spine-and-leaf networks that accommodate your day-to-day production traffic while supporting machine learning training in parallel.

Furthermore, talking about new technologies and innovations, the concept of smart cities with the development of wireless and fibre optic technologies, the communications infrastructure of today's cities present, in my view, exciting possibilities for urban planners and, of course, its inhabitants. Undoubtedly, data centre sites will play a vital role in their success.

### Post-pandemic life continues to reestablish the urban landscape

The potential of modern and sustainable smart cities seems to be obvious for everyone. People are realising, more and more, how important green, smart cities are. Even more importantly, the secure data centre infrastructures that

*“There is a current absurd idea that the data our healthcare systems produce should get commoditized and open access to lifesaving knowledge - embedded within that data - should be closed and privatised. I have set up a non-profit open source organisation that builds the open alternative. It focuses on democratising AI in healthcare by creating data commons and open source pre-trained AI models. With this open approach we can all innovate towards a more equitable and sustainable society.”*

**BART DE WITTE**

Founder, [Hippo AI Foundation](#)



support them are inevitable, especially as post-pandemic life continues to reestablish the urban landscape.

In summary, movie-streaming, video-meetings, autonomous vehicles, smart cities, online banking services etc. are just a few examples of products and services that require compute power, handled in data centres around the globe. All of which are making data centres a fast-growing industry.

Open source hardware and software is not the only one but an important building block, apart from renewable energy, circular economy gear, making use of waste heat, replacing concrete and steel constructions with renewable material like wood etc. which will enable data centre sites to operate more efficiently and sustainably.

Therefore, it is not one component, but the combination of all the above-mentioned elements that has the power to make the difference.

*“We risk making data the next single use of plastic and need to consider the sustainability by design in both public and private sector build out. This will have the consequence of elevating the role of Open Technology, being open source software, hardware and data, in any sustainable future.”*

**AMANDA BROCK**

CEO, [OpenUK](#) and member of the Advisory Board at the UK Energy Digitalisation Taskforce (EDiT)

\* An international executive based in Munich (Germany), Stefan has many years of experience in marketing, business development and a high IT/technology affinity. In 2018, he founded the consultancy firm [DME](#). At the beginning of 2020, he joined the [Open Compute Project Foundation](#) (OCP) where Stefan has been helping to create worldwide awareness and drive adoption of OCP by working closely with the rapidly growing open source hardware community and the data center industry. Connect with him via [LinkedIn](#).



## From Smart Digital Societies to Green Economy: Best Practices from the FIWARE Community\*

By **Val De Oliveira**, Media Relations - PR & Marketing Manager, [FIWARE Foundation](#) & **Robert Brears**, Author, and Founder of [Our Future Water](#)

Let's picture for a second that you've been tasked with designing a brand new city or even redesigning an existing one, from the ground up, in order to tackle overpopulation, heavy air and noise pollution as well as inconvenient public transport - to mention but a few issues that affect 10 out of 10 metropolitan areas these days.

All in all, your concept must not fall short of achieving the **UN Sustainable Development Goal 11** which is about "making cities and human settlements inclusive, safe, resilient and sustainable." In this context, your new city must be **smart** (by enhancing resource efficiency, reducing material usage, reducing greenhouse gas emissions), and **resilient** (to climatic extremes).

Your concept must also tackle **inclusiveness** (socially cohesive — the sustainable development pillar of social), as well as **safeness** and **sustainability** (in the sense of ensuring access to safe and affordable housing, reducing ecological footprints, enhancing biodiversity, generating green jobs and green growth), whilst also also being cost-effective to meet today's market needs.

*"Smart cities focus on a more sustainable agricultural production, reducing carbon footprint and food waste, while aiming for delivery via short supply chains. This asks for an evolution towards optimised Farm2fork chains in the regions. Innovative open source strategies such as those promoted by FIWARE Foundation are required to allow such dynamic collaboration between small stakeholders and consumers."*

**FIWARE SMART AGRIFOOD COMMITTEE**

You have been allocated a large team and a budget is in place. Sounds straightforward, right? Well, simulating how this city may work in the real world is vital to ensure that you are covering all the bases. One may wonder, for example, when put to the test under a different climate, how might this new city concept work? If it is to be cost-effective, what piece of tech should you consider to ensure it runs efficiently?

Are there any **circular economy principles** that could be applied to the city prototype so that it is designed for reuse and



circulation of products and materials? From budgetary constraints and a lack of technology-savvy teams to finding that one solution that works across all sectors of the economy, you may soon realise that delivering your vision may require more than just an outstanding concept, a committed team and a rather generous budget.

### Open source at the forefront of innovation

On that note, open source software and open standards can lend a helping hand. For example, **open standards** allow for the integration and control of a variety of smart cities, energy and industrial products, enhancing energy efficiency, reducing emissions, whilst also streamlining both private business and public administration processes.

Without these standards, new code would have to be written each time a component needs to talk with another. Also, **open source software** provides a foundation that anyone can build atop, providing a platform for SMEs, large companies and entrepreneurs to integrate their technology products with.

**FIWARE** was born with the ultimate goal of creating an open sustainable ecosystem around public, royalty-free and implementation-driven software platform standards, thereby easing the development of smart solutions, as well as supporting organisations and cities in their digital transformation.

From a technical perspective, FIWARE brings a curated framework of open source software **components** - which can be assembled and combined with third-party platform components to build platforms - that facilitate the development of smart solutions and the integration of systems within smart organisations across

*"ARC observes that the FIWARE open-source platform has increased in maturity, both in terms of technology readiness for smart industry applications and as a globalizing organization. The market vision and technology concepts seem very sound and promising to us. We encourage users to interrogate companies and applied research organizations about their experience with FIWARE and determine how the platform can add value. Because FIWARE is an open-source platform, the cost of using the technology is limited to building knowledge and implementing applications, a considerable advantage."*

**VALENTIJN DE LEEUW**  
Vice President, [ARC Advisory Group](#)

Visit the [website](#) for the full article.



multiple application domains, such as cities, manufacturing, utilities, agrifood, etc.

Together with its 500+ members and partners, FIWARE Foundation has decisively contributed to the development of reference standards, following an implementation-driven open source approach: the [ETSI NGSI-LD API standard](#). Additionally, it has also accomplished this with the Digital Twin data models published under the [Smart Data Models initiative](#).

### Food for thought, tech for good

But this may yet not be enough. Cities face different challenges across the spectrum, so the one-size-fits-all approach is doomed to failure. In that respect, solution providers, public and private stakeholders, the academic field, nonprofit organisations and citizens must join forces and consistently co-create, [share best practices](#), in an attempt to make technology and urban development more inclusive and agile.

COVID-19 has shown that structures that are able to respond quickly to emerging challenges and opportunities will clearly have an advantage. Guided by a growing need for agility and responsiveness, more than ever before, organisations and individuals are seeking solution providers and app developers that go beyond simply using state-of-the-art tech.

They are in the pursuit of providers that design solutions that can navigate in complex landscapes and interact with diverse environments that are composed of people, places, processes. The continued adoption of analytics in city governments is certainly not slowing down and speaks volumes about the innovative tools and solutions available to cities.

As more sophisticated technologies such as machine learning, [AI](#), and [Digital Twins](#) are deployed, discussing how such practices are effectively reshaping urban policy and the role played by open source development and open innovation must be on everybody's mind.

The topic is a constant for the [FIWARE Community members](#) and they certainly bring a thing or two to the discussion table. In the spirit of collaboration that this community fully embraces, this White Paper has been produced in a collaborative approach with members and partners of FIWARE Foundation.

Their contributions will walk you through city-level projects alike to convey the potential of data and tech-enabled innovations for city governance.



# BEST PRACTICES

FROM THE FIWARE COMMUNITY\*



\*Disclaimer: The following views and opinions expressed in this publication are those of the authors. They do not purport to reflect the opinions or views of FIWARE Foundation or the Open Compute Project Foundation. Liability claims against the author, which refer to material or non-material damages, which were caused by the use or non-use of the provided information or by the use of incorrect and incomplete information, are generally excluded, unless there is no evidence of intentional or negligence of the author.



## Open Innovation for Smart Societies

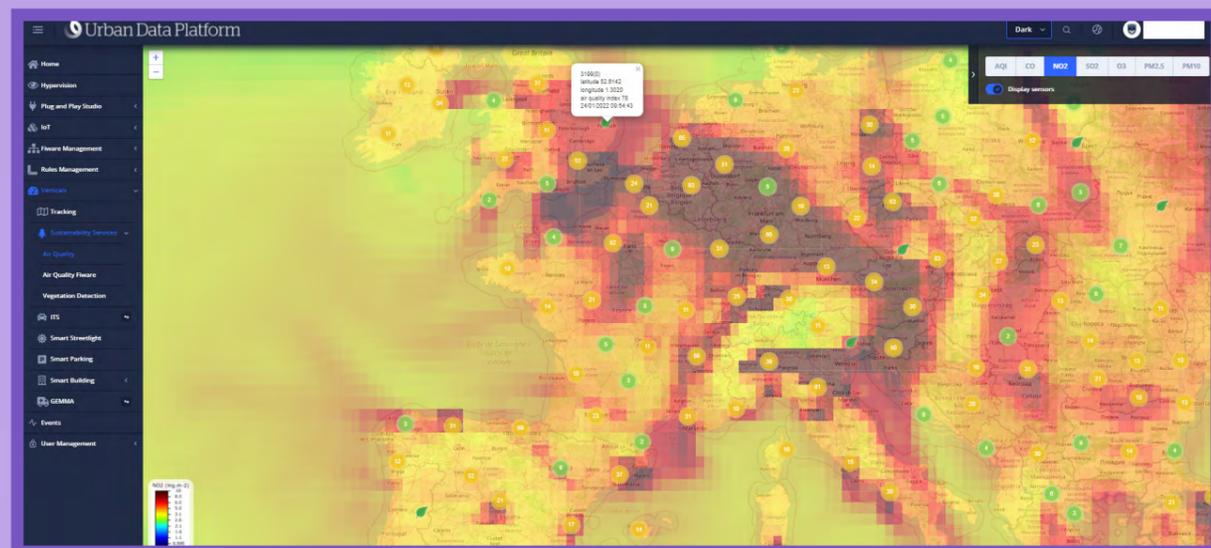
*Unleashing the power of open data, standards and open source technologies to support governments' key decisions.*

By **Clara Pezuela**, Innovation Officer at Public Sector and Defense Industry, **Atos**

Cities and local authorities often struggle to decide on the best strategy and supporting tools which can help effectively monitor and manage a city's resources. Even though providing the most valuable services for citizens at an optimized cost - and in alignment with climate sustainability - should come with the territory, the job isn't exactly short of challenges.

Different approaches are possible and are currently being put to the test across the globe. However, at **Atos** we are convinced that the creation of an open innovation ecosystem around the city that: 1) puts citizens at its core; 2) works under a clear governance of data; and 3) relies on an open and standardized **data platform** is the most promising approach for all the parties present within cities.

Open data, especially in the public sector, facilitates the use and the possibility to combine with other data sources (perhaps not public), unleashing its full power. Open standards, like NGSI implemented by the **FIWARE Context Broker**, allows the interconnection of digital platforms since all the data is normalized to the same format and using the same **FIWARE Smart Data Models**.



*Image provided courtesy of Atos.*



Finally, as cities are entirely composed of various parts and actors, open source data platforms foster collaboration between these diverse ecosystems and avoid the predominance of a single player. An illustrative example: by combining the monitoring services of **Copernicus** regarding CO2 emissions, with data coming from sensors in land for traffic flow, the impact of traffic on air quality can be directly witnessed.

To know more about Atos's Urban Data Platforms, visit our [dedicated landing page](#).





## Using Open Innovation to Bring Password-less Authentication to NRW

*The XignSys Citizen ID is an innovative authentication tool for government services created using open source innovation and open standards.*

By **Joe Appleton**, Editor, [bee smart city](#)

Easy access to e-government services is an essential part of smart city development. As more services become digitised, citizens find themselves dealing with yet another set of credentials that can easily be lost or forgotten. When it comes to administration services, forgotten credentials can quickly escalate into a bureaucratic nightmare.

Open authentication is an important requirement for the [German government's Online Access Act](#), and each state has been charged with providing digital access to federal, state, and local services in the most secure way possible, but in a manner that provides equal access to all citizens.

North Rhine Westphalia (Germany) has launched a call for open source innovation solutions that followed open and interoperable guidelines that could be replicated across the state. [XignSys](#), a startup specialising in authentication, answered the call with an innovative password-less solution: Citizen ID ([Bürger ID](#)).



Image provided courtesy of XignSys.



[XignSys's XignIn City solution](#) uses a centralised identity management system, using data from City Hall, effectively reusing a citizen's existing information to provide a secure multi-factor login service with no monotonous re-registering required.

Thanks to the use of standard protocols, such as Open ID Connect and other authentication services, Citizen ID can be integrated into existing frameworks, promoting cooperation between government agencies and preventing the creation of unnecessary data silos.

Citizen ID has been deployed in the City of Gelsenkirchen (North Rhine Westphalia), where [bee smart city](#) - a FIWARE Foundation Community Partner - has supported the city to write its [digital strategy](#) to embrace solutions like Citizen ID. In addition, [bee smart city](#) has been advising the cities of Oberhausen, Bochum, and Duisburg on how to get their digital vision off the ground.

[bee smart city](#) and FIWARE Foundation have worked together indirectly in the past but will move forward from 2022 onward on a more active, strategic basis.

**JUNG-SOOK PARK**  
Secretary General,  
[WeGO](#) | World Smart  
Sustainable Cities  
Organization

*“Future smart city development must focus on two key aspects: citizen-centricity and ethical digitalization. Open source as a framework can essentially help us achieve these goals by finding solutions collaboratively and in a transparent way.”*



DSBA



## DSBA: The Alliance That's Putting Data Spaces Into Perspective

*With everyone currently talking about data, representatives from the Data Spaces Business Alliance tell us why Data Spaces have become primordial.*

By **Ana Garcia Robles**, Secretary General, **BDVA**; **Ulrich Ahle**, CEO, **FIWARE Foundation**; **Francesco Bonfiglio**, CEO, **Gaia-X** & **Lars Nagel**, CEO, **IDSA**

In the past two years, working from home, online access to public services and shopping have skyrocketed. So has the dialogue on data. It may strike some that not only the industry, but the entire world has started chatting about data too. It does not surprise us at all.

If we are to develop new business models driven by a digital paradigm, then **Data Spaces**<sup>1</sup> are the answer. Unlike data analytics, big data, data sharing and other data-driven technology models, Data Spaces allow the creation of a real digital twin of physical ecosystems.

By bringing together data providers, users and intermediaries, Data Spaces create common places where relevant information can be exchanged across a



DSBA CEOs (left to right-hand side): Ana Garcia Robles, Ulrich Ahle, Lars Nagel and Francesco Bonfiglio. Image provided courtesy of DSBA.



value chain to extract value, in an interoperable, sovereign, and trustworthy manner.

To help deliver this vision, in September 2021, the Big Data Value Association (BDVA), FIWARE Foundation, Gaia-X, and the International Data Spaces Association (IDSA) created the **Data Spaces Business Alliance** (DSBA), to foster open and secure digital ecosystems, in which organisations and individuals can securely unlock the full value of their data.

A classic example of the collaborative open working practices valued and cherished by the members of our respective ecosystems, the Alliance is driving awareness, evangelization, and enabling the leap from use cases to business cases across all industries.

Its latest outcomes have been presented at the Alliance's 'Brokering Event for European Data Spaces', on December 16, 2021. The event registered 550+ active participants, and allowed attendees to engage with the DSBA communities. The result? 300 matchmaking activities, 100+ one-to-one meetings and 60+ pitches.

Over the next months, we will scout for Data Space potential projects across Europe, synergize on assets and teams across the associations, and accelerate the materialisation of concrete business services that are Gaia-X compliant and implement the principles of Data Spaces. Wanna be part of this? Visit the [website](#).

*"Gaia-X believes that Europe should follow a clear open source software (OSS) strategy, with regards to its data and software infrastructure. OSS is a trust anchor in itself, since anyone can add contributions to the source code. By doing so, it activates an appropriate reaction to answer to the fact that in Europe, there isn't a single agent willing - and capable of - investing the required resources needed to build a competitive alternative to hyperscaling platforms on its own."*

### HUBERT TARDIEU

Gaia-X Independent Board member, and former Chairman of FIWARE's Board of Directors

<sup>1</sup> Nagel L., Lycklama D. (2021): Design Principles for Data Spaces. Position Paper. Version 1.0. Berlin. DOI: <http://doi.org/10.5281/zenodo.5105744>



## FIWOO

### Alcázar de San Juan: A Smart City Reference for the 22nd Century

*The city has chosen FIWOO to build an appropriate operating environment to aid economic development, reduce environmental impact and offer a better quality of life to its citizens.*

By **Jose Benitez**, CEO and **Carlos Corrales**, COO, both at Secmotic;  
**Luis Romero**, Managing Partner, Emergya Grupo  
& **Manuel Giménez**, Product Manager, FIWOO

Located in the Castilla-La Mancha region (Spain), Alcázar de San Juan is often associated with Miguel de Cervantes' famous character Don Quixote. While its traditional landmarks are part of the city's cultural heritage, Alcázar de San Juan's ongoing urban development has an eye into the future.

Implemented as part of the EU's urban policy in Spain, namely, SUDS/EDUSI - Strategies of Sustainable Integrated Urban Development - the city sees its smart city strategy as a tool to improve the social and economic well-being of its citizens and as a way to effectively and sustainably leap into the digital age.

Committed to innovation and the use of new technologies as key elements for sustainable development models encouraging job creation, boosting economic activity and the smart management of the city, Alcázar de San Juan's city council is on a mission to become smarter.

FIWOO, an open, scalable, robust, secure, interoperable and integrable platform - based on the open source platform FIWARE and its main reference standards - has positively impacted the city's recent digital transformation.

Developed by the Emergya Grupo and Secmotic, FIWOO has been instrumental in the implementation of 1. a smart city platform that serves as a single system and connects all smart systems within the city; 2. the supply and



Image provided courtesy of FIWOO.

implementation of an open data portal enabling the publication of open data to the public; and 3. the expansion and improvement of the city's ICT infrastructures.

The following benefits have so far been drawn from this project:

- Increased efficiency and transparency of the city's public services;
- Greater access to information, content and knowledge, which stimulates the development of innovative services and new business models and improves social welfare;
- Boosted collaboration, participation and social innovation.

Learn more about the project and FIWOO solutions on our [website](#).



*“Our cities are facing numerous challenges, including extreme weather events, environmental degradation, and resource scarcity. Open source software plays a vital role in ensuring our scarce resources are used more wisely while, at the same time, enhancing our resilience and protecting the natural environment.”*

**ROBERT BREARS**  
Author and Founder of  
Our Future Water



## Slovenia: A Reference Country for Open Source and Open Standards

*The first country in Europe to have requested its cities to use the CEF Context Broker and apply MIMs when implementing strategies for smart cities and regions, Slovenia is laser-focused on value-added applications.*

By **Andreja Lampe**, Cluster Manager and **Gaber Terseglav**, Consultant, both at [ICT Innovation Network - Slovenia](#) & **Flavio Fuart**, Coordinator, [Gaia-X Hub Slovenia](#)

Having held the Presidency of the Council of the European Union until December 2021, Slovenia is no stranger to the smart city concept. Implementing smart digital strategies, stronger infrastructure, cross-border data flows and effective standardization for a sustainable and more resilient economy were some of the Presidency's agenda.

With France now inheriting the Presidency, Slovenia keeps focused on the topic, especially with regards to bridging the interoperability gap between its various vertical solutions. The reality is that, even when different solutions do flourish, they are not interoperable, hampering the potential innovation derived from data sharing.



Chamber of Commerce and Industry of Slovenia's headquarters in Ljubljana: Both the ICT and GAIA-X Hub activities are coordinated by the Chamber.  
*Image provided courtesy of the Chamber of Commerce and Industry of Slovenia.*



Looking into addressing this issue, Slovenia's main stakeholders - including the Ministry of Public Administration, the ICT Innovation Network (a [FIWARE Foundation](#) member), the Association of Municipalities and Towns and industry representatives - have been focusing on defining a common set of standards and underlying technologies.

Slovenia's municipalities and their stakeholders have been asked to support interoperability via the [CEF Context Broker](#). Based on FIWARE components, it is in line with OASC's Minimal Interoperability Mechanisms ([MIM2](#)), a set of practical capabilities based on open technical specifications including FIWARE NGSI-LD and MIM2 ([Smart Data Models](#)).

This sets the future stage for a nationwide interoperable data space and enables the development of new cross-sector business models and services. The strategy has paid off already: several public tenders for smart city solutions have already required compliance with the [FIWARE Reference Architecture](#).

The fusion of different vertical solutions into new value chains offers new services for end-users and has a long-lasting positive impact on the national economy. Municipalities will control digital solutions intermobility by enforcing clear standards and guidelines. The data will also fuel the national public open data portal and enable the reuse of public data to boost the data and digital economy.

To learn more about the ICT Innovation Network visit the [website](#).

*“Open source is a catalyst for change, enabling fast but incremental innovation in many industrial sectors. It maximizes the benefits of the data-driven economy, by leveraging openness and trust, promoting competition, and progressing towards a concrete digital autonomy for Europe.”*

**ANGELO MARGUGLIO**  
Co-chair, [FIWARE Smart Industry MSC](#) and Research Area Manager; Head of the “Digital Industry and Agrifood” R&D Unit, [Engineering](#)



# NEC

## Fine-grained Mobility CO2 Footprints for Cities Meet Data-driven Demand and Supply Changes

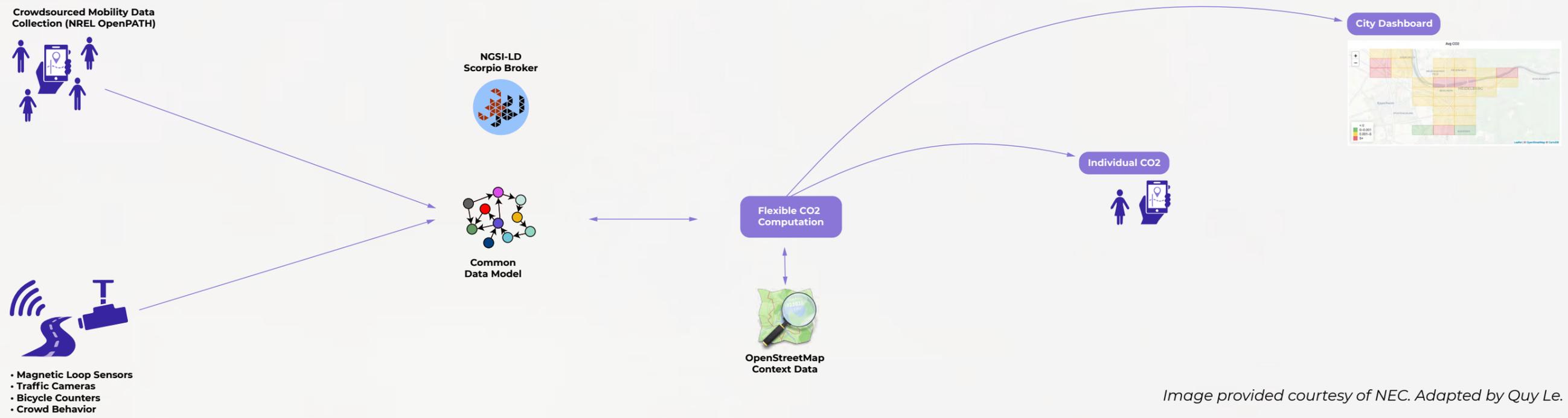
Find out how the Mobility Data Toolkit - part of the Connecting Europe Facility project ODALA - is delivering better mobility.

By **Jonathan Fürst**, Senior Researcher, **Benjamin Heben**, Research Scientist & **Ernö Kovacs**, Senior Manager, IoT Platform Group, [NEC Laboratories Europe](#)

Human mobility is a major driver for carbon emissions, accounting for roughly 29% of total economy-wide greenhouse gas emissions in the US and Europe. Therefore, human mobility is a key domain to fight climate change.

A large amount of these emissions occur in cities. However, citizens and city administrators may not fully comprehend their personal CO2 footprints. How much CO2 does one emit for his or her daily commute? How much could one save by switching from car to public transportation? What effect do e-scooters have on carbon emissions? How do new parking policies affect emissions? The questions keep pouring in from all corners.

In order to provide practical answers, we need data-centric, Machine Learning supported solutions that compute fine-grained and continuous CO2 footprints. These footprints can provide incentives to change individual behaviour and inform city-wide demand and supply changes (e.g., new bus routes, infrastructure changes).



On that front, as part of the Connecting Europe Facility (CEF) project ODALA, NEC is developing the Mobility Data Toolkit (MTK). NEC's MTK combines live data from existing city sensors, such as magnetic loop sensors, bicycle counters or traffic cameras, with crowdsourced data collected from individuals' smartphones.

NEC has implemented the MTK using the inhouse and open sourced Scorpio NGSi-LD data broker, existing FIWARE Smart Data Models and the open source mobility crowdsourcing solution OpenPATH, maintained by the National Renewable Energy Laboratory (NREL). The MTK will be deployed in several European cities such as Kiel and Heidelberg (Germany) and help them to make the jump to Net-Zero Carbon Cities in the coming years.

To find out more on this project and the role played by NEC, visit the [website](#).

*“Solving the world’s solvable problems requires all of us to bring together elements of the economy, environment, and society. Using a circular economy framework will help us to realize a digitally enabled growth, that is both restorative and regenerative by design. When we think about how we can solve the challenges that face us today, it is essential that this innovation is, and remains open source, and accessible to everyone.”*

**DEIRDRE WHITE**  
CEO, [PYXERA Global](#)



## Open Source is Innovation. Innovation is Open Source

*Open source is where software innovation happens, but open source isn't just about code: it's a set of principles that define how different people collaborate together.*

By **Jim Craig**, Product Manager, [Red Hat](#) Global Public Sector  
& **Leslie Hawthorn**, Senior Manager, [Red Hat](#) Open Source Program Office

At Red Hat (a [FIWARE Foundation](#) Platinum member), we know community engagement creates the best outcomes, so we're excited to share the story of a physical community: Veberöd, a Swedish smart village. Its visionary leader, Jan Malmgren, epitomizes the principles of open collaboration and mutually shared value.

Malmgren is completely transparent amongst a wider community of 5000 villages, sharing his vision for the smaller scale smart city, and nurturing ongoing collaboration by constantly iterating on community feedback.

Veberöd has a fully-featured digital twin. [FIWARE](#) enables smart trees, cattle watering, traffic monitoring, water quality, and cycle security amongst their smart service offerings. It has trailed virtual reality doctors' visits and medicines delivered by drones to housebound patients.

The sensors and the [FIWARE-based IoT platform](#) used by the city have been deployed by [Sensative](#) - also a [FIWARE Foundation](#) member - a Swedish company supplying IoT solutions for smart cities, buildings, and homes. Veberöd also runs a Fab Lab where 3D printed designs to improve citizen experience are released early and often.

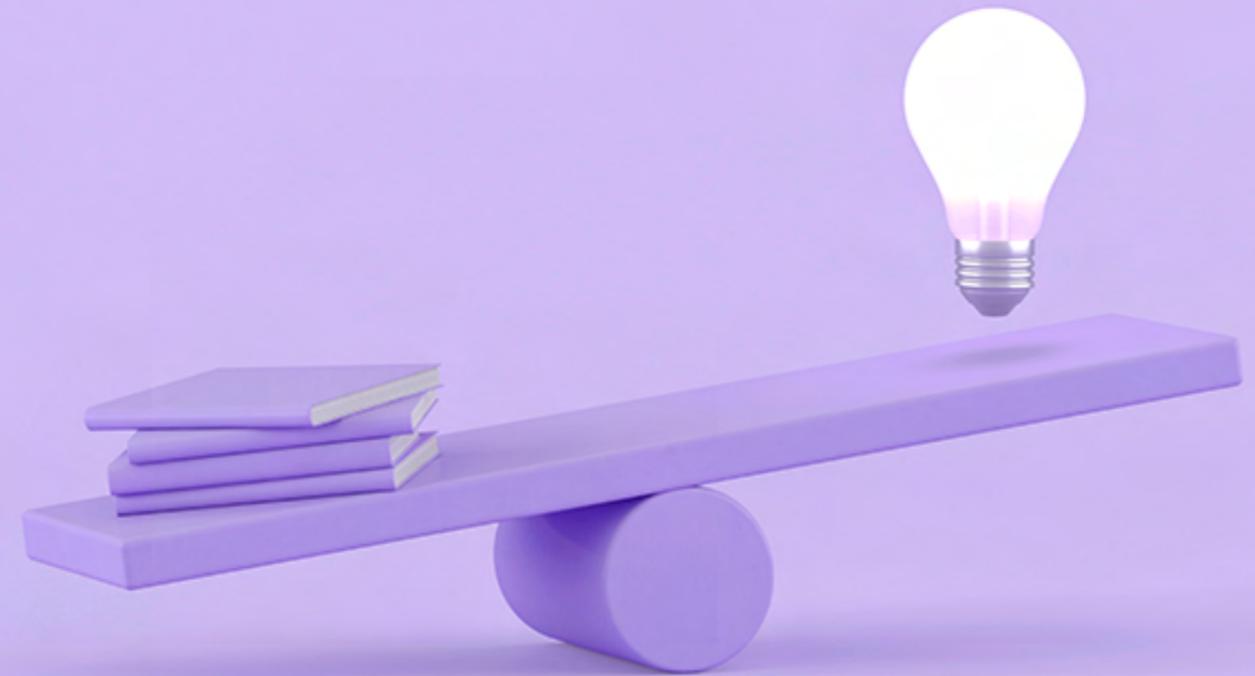


Jan Malmgren, *Smarta byar*



By living the principles outlined above and insisting on an inclusive, iterative process, this open approach ensures good ideas can come from anywhere, and only those for the greater good are enacted for this region where the population is expected to double in the coming years.

Go [here](#) to learn more about open innovation at Red Hat.



*“Open source software is a key element of open innovation at university level. The availability of source code provides access to organisations and teams within universities to collaborate, share expertise and support innovation at the research phase. This helps open innovation and promotes the collaboration between internal and external technologists as a mutually beneficial measure, and facilitates the possible exploitation through university spin-offs.”*

**Prof. ANTONIO SKARMETA**  
University of Murcia  
and member of the  
[FIWARE Scientific  
Advisory Board](#)



## Open Mobility Innovation for Smarter Cities and Economies

*Only through openness can mobility become as seamless as citizens and authorities require it to be in today's smarter, more sustainable cities.*

By **Luke Antoniou**, Senior Editor, [SmartCitiesWorld](#), a FIWARE Media Partner

The advent and promotion of open source data, applications and APIs has played perhaps the most significant role to date in signalling a revolution in smarter, better integrated mobility services to benefit both transport and city authorities, as well as end users of mobility services.

In breaking down silos and encouraging standardisation and openness in the development of mobility solutions, cities and innovators have proven that shared urban transportation can play a huge role in decarbonising our urban centres – though progress must continue to be made throughout 2022 and beyond.

The information provision that open source innovation delivers not only enables the integration of mobility services for citizens to book and plan urban travel, but it also offers transparency to authorities and third-party technology vendors to do more with their resources and, in time, opens up the opportunity for improved information sharing frameworks and collaboration.

What's more, with mobility providing links to our major urban economic centres, openness in mobility innovation leads ultimately not only to a

healthier digital economy, but a more robust global economy overall.

For more on urban mobility innovation and its role in developing smarter, more sustainable cities and a stronger global economy, click [here](#) and become a SmartCitiesWorld member today.

**SHULI GOODMAN, Ph.D.**  
Executive Director,  
[LF Energy Foundation](#)

*“The unprecedented actions necessary to rapidly draw-down reliance on fossil-fuels - first to 50% decarbonization by 2030 and then to 100% by 2050 - requires frameworks of governance and open innovation for technology investments. To succeed, we need all players to act in their own self-interest to transform individual, community, and corporate energy intakes and outtakes. At the heart of our strategy we need open source - permissive intellectual property rights - and open source foundations that can provide transparent mechanisms for governance enabling actors to freely invest, support, depend and use the shared digital building-blocks for the future.”*





## What Do DLTs Offer to Smart Cities Data Marketplaces?

*Distributed Ledger Technologies (DLTs) encourage all stakeholders in a city to publish their urban data, and by default, enrich the marketplace offer.*

By **Laura Rodríguez de Lope**, Senior Researcher, **Johnny Choque**, Senior Researcher, Ph.D. & **Luis Muñoz**, Professor, University of Cantabria, a partner in the TOKEN Project

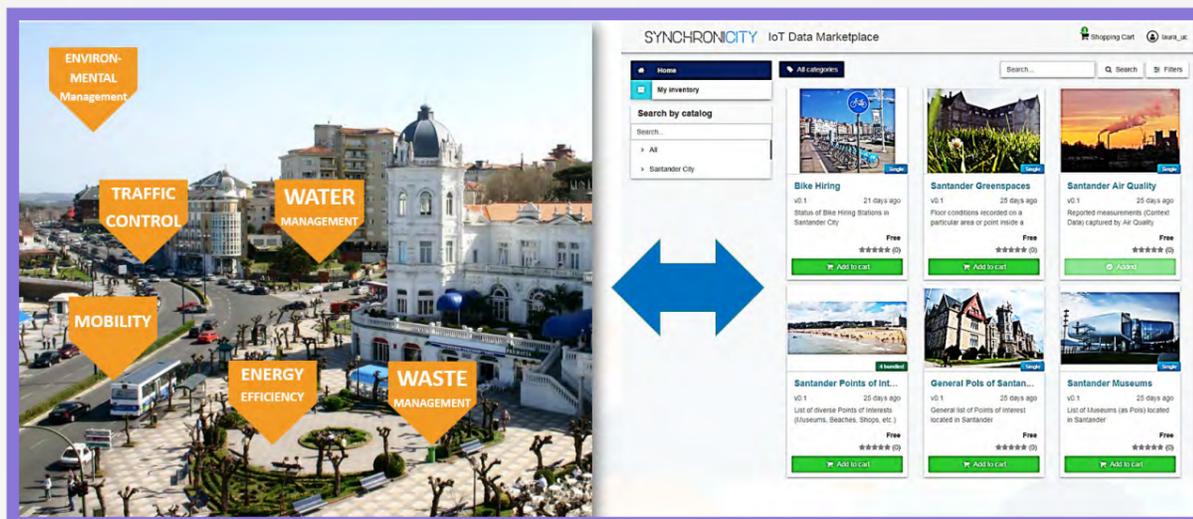
Digital ecosystems, such as smart cities or Industry 4.0, are characterised by huge amounts of data, which is currently becoming a critical asset for value creation in multiple operations. The effective production, sharing and consumption of such information by different players is gaining traction.

Under this scenario, issues such as immutability, traceability and the quality of information play a key role. To fill in the void, Distributed Ledger Technologies (DLTs) open a new dimension in data exploitation and bring new business opportunities

within the data economy context.

The TOKEN Project, funded by the H2020 framework program, offers a set of developer-friendly, plug and play services and open source components to easily integrate DLTs in public services.

For instance, this open source technology is helping SmartSantander Data Marketplace to fully take advantage of DLTs and smart contracts and consequently, offer urban data providers a better picture of how data sources are being exploited.



SmartSantander city services and Data Marketplace. Image provided courtesy of University of Cantabria.



By tracing the use of data while data consumers are able to demand a quality of service (QoS) ensured by service-level agreements (SLAs), the city ensures that urban data marketplace environments can be opened to new stakeholders beyond municipalities.

In this sense, companies, associations, and even citizens are encouraged to publish their urban data, and enrich the marketplace with the possibility of finally being compensated for their data.

In addition, the adoption of an architecture based on standard data models, FIWARE open source components and TOKEN services, plug and play and DLT agnostic, makes this solution easily replicable in other smart cities.

*“Not only does the open innovation model foster academia-industry effective partnership, but it also enables knowledge exchange and joint open source development. Acting as a driving force behind universities’ understanding and engagement with society’s everyday problems, open innovation supports the co-creation of innovative products and services, for the benefit of all industry sectors.”*

**Prof. THAIS BATISTA**  
Universidade Federal  
do Rio Grande do  
Norte (Brazil), and a  
FIWARE Evangelist



## About FIWARE Foundation

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 this 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, NEC, Red Hat, Telefónica** and **Trigyn Technologies** among its 500+ members.

## About the Open Compute Project Foundation

The Open Compute Project Foundation (OCP), was initiated in 2011 with a collaborative community of more than eight thousand engineers with a mission to apply the benefits of open source and open collaboration to hardware and rapidly increase the pace of innovation in near and around the data center's networking equipment, general purpose and GPU servers, storage devices and appliances, and scalable rack designs.

OCP's collaboration model is being applied beyond the data center, helping to advance the telecom industry and edge infrastructure.

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