95th ASTEE conference

Issy-les-Moulineaux 31 May to 3 June 2016

INTRODUCTORY DOCUMENT

# TERRITORIES IN TRANSITION

## Placing digital intelligence at the heart of public utilities

astee association scientifique et technique pour l'eau et l'environnement

Ville d'Issy les Moulineaux

Syndicat des Eaux d'Ile de France – SEDIF – Service public de l'eau

SIAAP – Service public de l'assainissement francilien

syctom l'agence métropolitaine des déchets ménagers

VEOLIA

95th ASTEE conference

Issy-les-Moulineaux 31 May to 3 June 2016

INTRODUCTORY DOCUMENT

# TERRITORIES IN TRANSITION

## Placing digital intelligence at the heart of public utilities

Document coordinated by Philippe Marest and Olivier Pascal
Editorial secretariat by Carine Morin-Batut and Antoine Sourdril

With the support of ONEMA Office national de l'eau et des milieux aquatiques

Graphic design: idbleue (Sablé) – Video interviews: Slot B
Photos: Depositphotos.com, ForCity, Pons M-N., Saint-Gobain PAM, SEDIF, Slot B, Sourdril A., SUEZ, Veolia, Wikimedia Commons

# Document coordinators

## Philippe Marest

***Vice-President* for Local Authorities, Nantes Métropole***

Philippe Marest is Vice-President for Local Authorities at the ASTEE (French Scientific and Technical Association for Water and the Environment) and Deputy Director-General for the Environment and Urban Services of Nantes Métropole and the City of Nantes. He headed up the initiative which saw the European Commission name Nantes as the European Green Capital of 2013. Over his career he has held a range of positions, at the Inter-département Institution for Dams-Reservoirs of the Seine Basin, for the City of Paris and then Reims Métropole as Deputy Director-General for Water and Environment. He has an engineering degree from the Ecole des Ingenieurs de la Ville de Paris and a PhD in information technology from the University of Paris-Dauphine.

## Olivier Pascal

***Consulting engineer – specialising in the overall ecology of major urban systems***

Olivier Pascal oversees the ASTEE working groups bearing on operational urban planning and provides consultancy services for NGOs dedicated to urban services in shanty towns.
He has gained experience through projects that he has headed up for public authorities (France, Germany, tropical or equatorial countries), during a career stint in the Veolia Group where he held the position of Water and Sewerage Utility Operations Director, as well as when Director of the Berlin Centre of Competence for Water at the time of its founding. He has an engineering degree from the Ecole Polytechnique, Ecole Nationale des Ponts et Chaussées and an economics degree from the University of Paris-Dauphine.

# Editorial secretariat

Carine Morin-Batut, Director-General* and Antoine Sourdril, Policy Officer*

# Editorial board

Decisions over the publication's layout and contributors were made by an editorial board made up of the following members:

- Jean Baron, Eau de Paris, Chair of the Network Protection and Corrosion Committee*
- Christophe Bonnin, Veolia, Chair of the Drinking Water Committee*
- Marc Cheverry, Ademe
- Célia de Lavergne, Paris City Council
- Philippe Dupont, Onema, Chair of the Aquatic Environments and Water Resources Committee*
- Christine Gandouin, SUEZ Consulting, Chair of the Sanitation Committee*
- Nicolas Gendreau, Bordeaux Métropole
- Philippe Guettier, Partenariat Français pour l'Eau (PFE)
- Anne Guillon, Département des Hauts-de-Seine
- Pierre Hirtzberger, Syctom
- François Leblanc, Eau de Paris
- Philippe Marest, Nantes Métropole, Vice-President* for Local Authorities
- Carine Morin-Batut, Director-General*
- Fabrice Nauleau, Saur
- Olivier Pascal, Consulting Engineer
- Gérard Payen, Aquafed, Chair of the European and International Affairs Committee*
- Denis Penouel, SIAAP, Chair of the Paris region section*
- Thomas Perianu, SUEZ
- Christophe Perrod, SEDIF
- Marie-Noëlle Pons, CNRS, University of Lorraine, Chair of the Research Committee*
- Pierre-Alain Roche, MEEM/CGEDD, President*
- Frédéric Roux, Syctom, Chair of the Waste and Materials Recovery Committee*
- Pascal Soukatchoff, Saint-Gobain PAM, Treasurer*
- Antoine Sourdril, Policy Officer*
- Jean-Pierre Tabuchi, SIAAP
- Jacques Tcheng, Secretary*
- Jean Philippe Torterotot, MEEM/CGDD, Vice-President* for Research

** ASTEE*

# CONTENTS

# 107 Chapter 5
# Which stakeholder transitions for this digital transition?

# FOREWORD

Pierre-Alain Roche,
MEEM/CGEDD,
ASTEE President

*At the very end of the corridor hung a portrait of a very fat women in a pink silk dress.*
*"Password?", she said.*
*"Caput draconis", said Percy, and the portrait swung forward to reveal a round hole in the wall.*[2]

**Pierre-Alain Roche is President of the ASTEE, Coordinator for Water and Biodiversity at the CGEDD within the French Ministry of the Environment, Energy and Marine Affairs and Member of the Environmental Authority (Ae).**

**He is also a lecturer at the Ecole des Ponts-Paristech and Ecole Polytechnique, member of the PFE Board and sits on the World Water Council Board of Governors. He has co-authored a number of recent reports in the water sector[1].**

These paintings that come to life and interactive books in the adventures of Harry Potter, whose three-dimensional characters can move freely and strike up conversations with you, are far closer to becoming reality today than you might think.

The ASTEE can prove it. It invites you to embark on an augmented reading experience of this document: through your smartphone, tablet or a simple click on your computer, requiring no effort – not even a whisk of the magic wand that helps you to do innovative miracles in your day-to-day working life – this digital book will come alive with engrossing interviews. Do not fear, the characters within won't come after you to see whether you've been paying attention. On second thoughts…


youtu.be/L1JHNtp8PgU

1. *« Mission pour un projet de territoire du Tescou (Midi-Pyrénées)-gestion des ressources en eau »*, 2015: http://www.cgedd.developpement-durable.gouv.fr/IMG/pdf/009953-02_rapport_cle2833be.pdf
   *« Propositions pour un plan d'action pour l'eau dans les régions et départements d'outre-mer »*, 2015: http://www.cgedd.developpement-durable.gouv.fr/propositions-pour-un-plan-d-action-pour-l-eau-dans-a2101.html
   *« Eau potable et assainissement, à quel prix ? »* CGEDD-IGA report, 2016: http://www.cgedd.developpement-durable.gouv.fr/IMG/pdf/010151-01_rapport_cle2b7248.pdf
2. *Harry Potter and the Philosopher's Stone*, J.K. Rowling, 1997

# GENERAL INTRODUCTION

## Working towards smart cities

Philippe Marest

Olivier Pascal

In some ways the ideas brought together in this document pave the way ahead in terms of fast-track development of *digital* technologies and the ultimate advent of *smart cities*.

The connection between *digital* and *smart city* is a major concept for anyone wishing to understand and act in the present-day urban engineering landscape. Accordingly, the UN has tasked the UIT – International Telecommunication Union – with developing an index assessing the smartness of cities: the UIT is working on standardising the basic indicators of this index, which include water management, sustainable buildings and data management and protection for example[3].

In this respect, a smart city equals a sustainable city; it is a city which has the means to ensure local management of the resources and space necessary for human life and for urban areas to function. These means can also be used to anticipate risks and protect residents from the consequences of sudden natural or human upheavals in their environment. Sustainable cities, and more broadly territories, are efficient and safe.

This definition of *smart city* is very much on international agendas. It is being addressed in major cities worldwide[4] under the impetus of international groups, young start-ups or such cooperation programmes as the European programme "Smart Cities and Communities". Within France, this concept has currently been incorporated into the Government's roadmap on digital technology, the call for *digital neighbourhood* proposals (now *French tech*[5]), and the *Investments of the Future* programme with the roll-out of the smart meter.

In practice, these programmes factor in urban and environmental public utilities as a key component of a thriving smart city, and the many changes brought about by the uptake of digital technologies in such services only fully make sense when viewed as part of the overall picture of what constitutes a smart city.

We are witnessing the dawn of a powerful, multiform movement which we sense may provide solutions to the planet's runaway urbanisation, with the challenges this brings in terms of anthropic pressure, climate change, social balance and natural resource management. But this movement is also at risk of being undermined, if we overestimate the extent to which it can be effective.

### THE DIGITAL TRANSITION AND URBAN PUBLIC UTILITIES

Amid growing urbanisation, dwindling resources and a changing climate, the infrastructure enabling our public utilities to operate is also changing, particularly along with its core control and supervision systems thanks to digital technology. Digital technology can also be used to create links between these services and their users or the other urban amenities within the vicinity. Present-day water mains, waste management systems and electricity grids have changed beyond all recognition since the 1950s.

New technology hits the market or emerges from laboratory settings on a daily basis: energy, organic, eco-technology, new materials, nanotechnology and so on. Although the digital technology contributing to these changes has long been part of our lives with the advent of computers, the digital movement has been picking up pace these past 20 years – driven not

3. https://itunews.itu.int/Fr/5385-Villes-intelligentes-et-durables-une-feuille-de-route.note.aspx
4. http://www.usine-digitale.fr/article/carte-67-villes-qui-osent-l-intelligence.N280033
5. http://www.economie.gouv.fr/l-initiative-quartiers-numeriques-devient-la-french-tech

just by generic innovations but also by innovations that are specific to a service, its context and determining features, technology, processes, management and governance methods.

The digital transition entails equipping ourselves with the means to group together and direct all these changes towards an overarching goal – one such example being to contribute to a smart sustainable city.

By choosing to shed light on the characteristics, ins and outs of such a digital transition, the 2016 conference builds on a thought process first initiated back in 2013 on sustainable and responsible cities and continued in 2014 on innovation in local public utilities in relation to the environment and then in 2015 on efficient, safe cities and territories.

## A NEW APPROACH TO DESIGNING CITIES AND TERRITORIES

Together with digital equipment for citizens, which is also on a swift upward trend, the digital transition is stirring up aspirations and expectations that, as public utility use and behaviours evolve, our impact on the environment will also be significantly reduced.

In an urban and territorial model which takes optimum resource management on board and where relations with users are interactive and mobile, inhabitants are both *consumers* of information to guide them in their day-to-day lives and *producers* of information via social networks and mobile services and by new forms of cooperation to develop joint projects between multiple territorial stakeholders.

This new approach to designing cities and territories enhances human intelligence with the myriad links and resources of digital technology. It holds the promise of more effectively meeting inhabitants' expectations whilst protecting their health and respecting their privacy.

## BETWEEN PROMISES OF A WONDERFUL WORLD AND THE NIGHTMARE OF "1984"

The digital age is all about our society living in real-time, in the here-and-now. It sometimes sparks heated debates between promises of a wonderful world and the nightmare of "1984" described by George Orwell. Somewhere between these two extremes there undoubtedly lies a happy medium, or expectations to be met at any rate. A digital territory is not an end unto itself but a springboard for practising sustainable development, improving quality of life and respecting citizens. As such it cannot be boiled down to a mere accumulation of techno gadgets or a connected space. Digital technology must also be looked at as part of the longer-term picture of building the sustainable city, managing urban utilities and the environment. There are connections to be found in this regard.

This new reality makes an across-the-board approach all the more necessary, where the stakeholders of a territory and its activity sectors are all closely involved at varying spatial and temporal scales. It calls for public policy to be implemented in an overall economy of urban management and planning, and no longer solely as a juxtaposition of sector-specific policies. How decision-making powers of all kinds are shared out among the diverse local authorities is obviously of genuine significance for promoting such system-wide public policymaking.

## WHAT DO RESIDENTS EXPECT FROM DIGITAL TECHNOLOGY?

Effectiveness, optimisation, business… does this sum up the expectations of stakeholders and residents? Several signs suggest that they want two experiences at once: effectiveness and an element of surprise. So it's not as simple as all that. But what is clear is that they would like to have a bit more say in decisions affecting them. Are e-democracy and its digital tools the answer, then, to make it easier for citizens to participate more widely in city life? With this in mind, does the public's active involvement through online fora and questionnaires, modelling and virtual experimentation to address complex phenomena really enable the requisite leaps and bounds to be made for citizens to be brought on board in the decision-making process?

The first feedback received brings home the importance of coordination between data producers and between economic, institutional and associative stakeholders. The progression of digital technology towards smart cities is ensured through technological progress, but cannot turn a blind eye to a wider thought process driven by the social sciences.

## HOW ARE PUBLIC AND PRIVATE STAKEHOLDERS MANAGING THE DIGITAL TRANSITION?

Between social emergencies, ecological emergencies and the digital revolution, the stakes are getting that little bit higher by the day. But the transition we are going through today is more than a mere sum of its parts: ecology plus energy plus digital, etc. It's a broader transition, involving society as a whole, bringing with it the need to review our lifestyles, habits and traditional growth models. In this context, how are public utilities handling the digital transition and turning it to their advantage? What are the impacts for the three main groups of stakeholders within the triangular urban utility organisation model in France?

How can we manage digital risks and difficulties, in terms of systems interoperability, dependence on a particular technology, personal data confidentiality or hacking threats? Likewise, how do small and large businesses alike make their technical and commercial choices in sectors at risk of early obsolescence and where value chains are constantly being overhauled, sowing doubt in the capitalisation of expertise?

Publicly and privately managed public utility stakeholders require specific answers to these questions. Amid these burgeoning requirements and technological possibilities, we urgently need a new, or at the very least broader, vision of urban engineering that gives precedence to across-the-board evaluations that are as system-wide as possible.

## DATA UTILISATION: A NEW FRONTIER

The first connected city applications via "smart" networks are already either in the pipeline as part of demonstrator projects or up and running in real life. They often pose an industrial challenge as regards the sheer amount of hardware brought into play. They must enable reliable information to be collected and huge volumes of data to be accessed. Platforms seem to represent a genuine form of alternative social innovation for producing services that provide collective value. Agriculture is also going digital with a view to promoting economically and ecologically optimised and high-performing crop systems.

Down the digital road, stumbling blocks often crop up in research, accessibility and data management. The question of how the data collected can be made best use of, given the staggering development costs, remains. Are "hackathons" able to enlighten us on this matter?

## LOTS OF QUESTIONS REMAIN BUT SOME ANSWERS ARE FORTHCOMING

Digitisation is bringing about a technological revolution, impacting as it does every single area of the economy. This must be taken into account, with potentially radical changes being made. Models and organisations are already being upended by this new revolution. What if we were to look at the digital question from less of a technical angle and more from the point of view of the economic organisation of services and overhauling of value chains? Are we seeing an "uberisation" of public utilities as a result?

Many questions persist over the added value of these emerging technologies, concerning the main pitfalls to avoid, new fields to explore, social acceptability and protection of privacy among others. At the end of the day would smart territories end up being no more than a technocratic utopia?

The stakes and swiftness of these developments are such that it is crucial to inform, put heads together, question and anticipate the prospects opened up by smart cities.

This is the whole point of the ASTEE's 95$^{th}$ conference on digital intelligence at the heart of public utilities. What this introductory document sets out to do is to help shed light on a constantly evolving state-of-the-art and to ask the "right" questions as to the new issues at stake and challenges of the digital transition. The contributions that follow provide the conference with food for thought on these questions and attempt to offer up a few answers.

# Chapter 1

## Outlook

# INTRODUCTION

The creativity of *homo urbanus* is the driving force behind the digital rise to stardom and this creativity can be traced back a long way, as illustrated in the retrospective of urban inventions presented by Marie-Noëlle Pons. It is evidently at work at the ASTEE and the theme of digital intelligence – before representing a cause to which this conference's stakeholders have rallied – has inspired such specific groups as scientific and technical committees for sanitation, waste and materials recovery. They are all showing that the digital revolution is already making its mark in their sectors with the promise of more to come. These are the promises that our young professionals at the ASTEE are setting their imaginative minds to exploring.

# Back to the future: the city of tomorrow seen yesterday



By Marie-Noëlle Pons, Process Engineering and Reactions Laboratory, CNRS, University of Lorraine, Nancy

**With the light literally coming on in terms of the properties of electricity and magnetism in the 19th century, the imaginations of such authors as Jules Verne (1828-1905) and Albert Robida (1848-1926) were fired in their descriptions of the city of tomorrow, especially Paris. Paris in the Twentieth Century (1960 to be exact) was dreamt up by Jules Verne in a science fiction novel for youngsters, probably written circa 1860, but which was not discovered and published until 1994. Twenty years later, Albert Robida described life in the 1950s, first in "The Twentieth Century" which came out in 1883, and then in "Electric Life: The Twentieth Century", published in 1892. Robida was also a illustrator and illustrated his books, allowing him to more accurately depict the modern world as he saw it. For Verne and Robida alike, the notion of network is a fundamental one: transport network, information network.**

To cope with ever more traffic on the roads, Jules Verne describes four metropolitan rail circle lines built in 1913 and elevated railroads, whose convoys would have transported a thousand passengers every ten minutes and which had a propulsion system based on magnets and compressed air. The Paris metro did not come about until 1900, ready for the opening of the Summer Olympics, but the London tube, admittedly underground, was first operated in 1863 and could provide inspiration for Verne. The Paris metro comprises 27 elevated stations, built between 1902 and 1909 on lines 2 and 6. The elevated stretches of the Paris metro, much like Chicago's oldest elevated subway line in the Loop, match up pretty well with the way the author imagined them, with elegant metal arches that would have provided pedestrians with shelter from the rain and sun.

In this day and age we are still a long way off being able to transport people by compressed air: the basic concept has been around since 1853 when the invention of a pneumatic message system by Scottish engineer William Murdoch, back in the 1800s, was used to propel a message in a cylinder through a tube between the London Stock Exchange and the city's main telegraph station. The Hyperloop, the brainchild of Elon Musk to connect Los Angeles to San Francisco at a speed of 760mph in travel capsules of four to six people, builds on this very idea, but is yet to become a reality. In the Parisian region, the Regional Express Network (RER) branches out more in the shape of a star: when you consider that the A line, with its million passengers per day and 580 trains, transports some 1,500 people by rail every two minutes, Jules Verne's descriptions do not seem quite so far-fetched after all!

For his part, Albert Robida came up with a whole system of tubes, primarily at the surface, for long-distance journeys making use of compressed air and electricity: 25 minutes for a journey from Brest (at the far north-western tip of France) to Paris by express tube. This is much faster than our high-speed trains (which take four and a half hours to cover the same distance)! The same system of tubes, but underground this time, would have made it possible to deliver any package to Paris, doing away with the need for lorries. Passenger transportation via tube would have been driverless, drawing a parallel with how some of our automated metro systems work (VAL for example). Maglev, the premises of which were set out by Verne, has not taken off as hoped, with only a few lines in operation, mainly in Asia (China, Japan, South Korea).

In Robida's "The Twentieth Century", a deep-sea tube running for almost 5,000 miles would also have connected Brest to Panama, with an undersea stopover near the Azores – 1,118 metres below sea level. Ocean Spiral, the underwater city envisioned by the Japanese company Shimizu for 2030 and destined to accommodate 5,000 residents, would comprise a 500-metre wide sphere – the same diameter as the iron bell dreamt up by Albert Robida.

For the latter, the solution to the congested streets of Paris lay in developing air transport. His aircraft (named aérocab, aérofiacre, omnibus-aéroflèche and ballons-réclames, etc.) are, for the most part, airships in his first novel but are more akin to aerodynes in his 1892 novel. The first flight by steam-powered aircraft, Clément Ader's Eole, took place in 1890. Similar development in urban aeronautics has not happened. And yet the idea of a hybrid car-plane is being floated and Xplorair, capable of flying at over 120 mph, could be operational by 2020. At the same time the development of drones, particularly for delivering parcels, is gaining traction. In Robida's work, the development of urban air transport had a major influence on urban architecture with the construction of enormous landing stages (500 metres tall for the Chatou piers). Incidentally, Notre-Dame, Arc de Triomphe and the Eiffel Tower (built in 1889) as well as the Saint-Jacques Tower are all crowned with immense steel structures. Glass and pasteboard were two more materials Robida favoured in the construction of buildings. Whilst his prediction for glass has come true, our walls still are not really built from cardboard. And he makes no mention of aluminium anywhere. Until 1886, this was very costly to produce. Its large-scale use in the construction and aeronautics sectors alike was finally made possible thanks to the electrolysis of alumina (aluminium oxide) dissolved in cryolite (a mixture of aluminium fluoride and sodium), developed by Héroult and Hall in 1886, and then the Bayer process in 1887, entailing the production of alumina from bauxite.

It was not until the late 19th century that public electric lighting would begin to develop and replace gas lamps. Jules Verne came up with the idea of using mercury lamps, the first examples of which date back to the turn of the 18th century, for brightly illuminating streets where hydrogen-powered cars were in circulation. Verne was familiar with Etienne Lenoir's principle of the "electric spark-ignition internal combustion engine fueled by coal gas" (patent registered 1860) and had considered its applications concerning hydrogen. The use of hydrogen for powering vehicles today is still in its infancy.

The Louvre Pyramid (Photo: M-N. Pons)

Regarding urban planning, Robida had also given thought to the development of artificial islands: man-made islands to seek refuge on in the event of shipwreck, as well as a sixth continent, formed by linking up the Polynesian islands to absorb the growing population. The concept of artificial islands is not new, but the recent developments of such impressive structures as Palm Islands in Dubai, Federation Island in the Black Sea (designed by Erick van Egeraat) and the reptilian structures by Adriaan Geuze in the Netherlands are proof that Robida's ideas in this area were not pipe dreams.

There is no doubt that where the visionary ideas of Verne and Robida really hit the nail on the head was in telecommunications – even if the technical details provided by these two authors in their works remain sketchy. Optical telegraphs took off commercially in the late 18th century on the back of Claude Chappe's achievements. From the 1830s several inventors played a part in bringing about electric telegraphs. The precursor of the fax, the pantelegraph, was invented in 1856 by Giovanni Caselli. Verne indicated that, during an important experiment conducted in 1903 (so forty years after he wrote his novel), two experimenters sent a telegram around the world using the telegraph network. The first Belinograph (wirephoto machine invented by Edouard Belin) did not come about until 1908: this was used to send photographs remotely and was the precursor of the photocopier. The telephonoscope features prominently in Robida's work. With its crystal screen, it was used to broadcast sound (music, words) and images live between two emitters/receivers. Concerts, "televised" news and plays could all be broadcast.

The very first ideas sketching out these devices surfaced in the work of Graham Bell, Thomas Edison and Clément Ader in the 1880s. The applications as envisaged by Robida have evolved into television, videoconferencing and online phone calls or video.

Paris below street level in Albert Robida's "Electric Life" was a cluttered hive of activity with water mains, the lighting network, sewers, the various transport tubes and let's not forget the Food Company. That's right: residents no longer needed to cook as "ready-meals" were delivered via specific pipes. The latter apart, the illustrator was pretty spot-on in his forecasts. The Paris Robida drew was also criss-crossed by myriad telecommunications cables and transport tubes.

So did the authors of the late 19th century have a realistic vision of today's world? In some respects yes, such as the expansion of transport or telecommunications networks of all types. Others were not predicted, one example being urban transport by cablecar or cableway. And still others – along the lines of underwater cities, the development of customised air transport and pneumatic transport – form some of our future ambitions.

Tour Eiffel (Photo: M-N. Pons)

# BIBLIOGRAPHY


Compère D. (supervised by) (2006), *Albert Robida, du passé au futur,* Encrage/Les Belles Lettres.

Habrias H., *Jules Verne et la binarisation*, http://liris.cnrs.fr/~cnriut08/actes/articles/136.pdf (téléchargé le 30/12/2015).

Musk E., *Hyperloop Alpha*.

Robida A. (1883), *Le Vingtième Siècle*, Ed. Decaux, Paris.

Robida A. (1892), *La Vie Electrique : Le Vingtième Siècle*, A la Librairie Illustrée, Paris.

Verne J. (1994), *Paris au Vingtième Siècle*, Hachette Livre/Le Cherche-Midi, Paris.

Xplorair, https://fr.wikipedia.org/wiki/Xplorair (consulted on 1/1/2016).

# The sanitation sector is going digital

By the ASTEE's Sanitation Committee

**Digital technology has won over the sanitation sector, streamlining our practices and facilitating information sharing in a way that was inconceivable only yesterday. There is a tangible sense of possibility and progress in the air. Let's have a look at the opportunities that are now within our reach, take a step back to detect what makes them truly relevant and see how our practices are on the move.**

## MORE DATA WITHIN EASIER REACH!

### INITIATIVES TO INTRODUCE DIGITAL TECHNOLOGY INTO THE WORLD OF SANITATION ARE ALREADY ON A ROLL

If you'd like to find out the quality of Marseille's bathing water, download the Marseille InfosPlages app on your smartphone, and choose your beach in full knowledge of the facts.

If you're moving to the Hauts-de-Seine *département*, check out Open Data Hauts-de-Seine from the comfort of your own home to get the lowdown on rainfall data, roadworks in the *département* or locate foul (or sanitary) sewers – all available on this one website.

If you have a private sewage treatment system but are no expert when it comes to treatment, here again there's no shortage of apps to make your life easier and provide you with the key information you need to ensure that your on-site system is working properly.

We could cite all manner of varied examples: the myriad advantages of digital tools are being tapped into to bring data within easy reach of everyone. If we are to achieve effective management overall, then we need to disseminate information more effectively to raise users' awareness and improve their understanding of sewer systems.

An analysis of the traffic on these websites reveals the needs and interests of users:

the beach app was downloaded 5,000 times over a two-month period.

### DATA EVERYWHERE?

Equipping a network with tools, repatriating measurements and subscribing to Internet services have never been easier ... This is a godsend for the smallest sewerage utility providers for carrying out monitoring and diagnoses by using such technology, which enables them to save on data transmission investments. There's no need for endless supervision equipment to be alerted when a particular site has gone over its limits. Closer surveillance of networks or systems also helps to detect progressive overloads, predict the likelihood of a breakdown and decide to carry out preventive equipment replacement. These are all opportunities to make detecting problems easier and improve the performance of our networks across-the-board: optimisation is now within our grasp.

### OPEN ACCESS DATA, FOR WHOM?

Since data sharing has now become something everyone can do, anywhere, how should these mountains of data be made accessible? The challenge to take up is to ensure that the information distributed:

- **makes sense, for the audience is multi-faceted – professionals and laymen alike**. While there's little point in displaying such variable values as measurements bearing on flows, pollution or the filling of dustcarts, with no prior processing or characterising, in open access to your average person on the street,

- **is relevant and accurate. A particular piece of data may be missing, incorrect or come from an unreliable source** (pooling of household weather data for example), and such uncertainties need to be factored in when processing it, and accepted;
- **respects individual liberties: the information technology and civil liberties Act, technology and digitisation now make it possible to obtain exact data of a very personal nature ("tell me what you object to and I'll tell you who you are")**;
- **takes on board the most pressing situations, the major risks and crisis management in sanitation** (flooding, major pollution, explosions, attacks, etc.).

# MORE NEW TECHNOLOGIES ARE GIVING OUR PROFESSIONS A GOOD SHAKE-UP

## SAFER AND MORE EFFECTIVE INTERVENTIONS

"Working in the sewers is a risky job any day of the week" – we don't doubt it. New technologies are making swift, constant headway, already – but even more so tomorrow – offering us investigative tools that are more compact, less cumbersome, easier to handle, low-cost and able to "replace" human intervention. Mobile cameras followed by drones will carry out site visits, thus distancing human workers from risk: visits during rainy periods or under conditions that are conducive to the formation of H2S for example. Technology is coming to our aid on safety matters.

Thanks to mobility tools in conjunction with GISs, field interventions are becoming more effective:

- Easier to plan, for managing interventions, pinpointing location (viewing the surface area with the networks overprinted) and completing the visit report (no more having to fill everything in again once back at the office): in this way we can improve the investigation and analytical processes ;
- Better-equipped and connected, specialists are able to share their expertise on-site, for example: by providing remote assistance in automation with eyes on the cabinet in real-time, to get a pumping installation quickly back up and running... Our pumping stations are decking themselves out in augmented reality!

Field observations are becoming actions and these kinds of new technology are ushering in quicker decision-making and shorter lead-times. But these changes must come hand-in-hand with a recognition and, when necessary, development of skills. The professions as we know them are changing accordingly.

## JOB DESCRIPTIONS ARE BEING REWRITTEN

Investments on equipment on the one hand and training and changing methods on the other. Workers are mostly taking a positive view to the digital transition: these tools, on which the private sphere has a firm handle, are gradually being adopted in day-to-day professional practices. The way tasks are shared out is going to change – new ones are entering the scene while others will be phased out:

- Presurveillance that networks are working properly by sensors will require fewer systematic visits and, as such, allow visits to be focused on sites experiencing problems;
- Handling of more technical devices: operating of drones, drawing up of "snapshot" reports, etc.;
- Quicker decision-making on-site for swifter action, which is coinciding with the trend for digital natives to "have everything at their fingertips".

For the same number of jobs, new technology is paving the way towards more reliable, better-performing networks with wider areas of coverage.

## MULTIPLE FORMS OF COOPERATION

The tasks and methods involved in our work are changing and information-sharing is now possible, desirable and desired. Collaborative platforms are becoming more accessible and major structures are being designed, built and operated with platforms that incorporate plans and interventions. BIM (Building Information Modelling) is branching out into more varied infrastructure than "pure buildings". Here again, the transition is in progress, with the merits gradually becoming ever clearer of all stakeholders across the board coordinating for the sake of anticipating anchor points, fine-tuning concepts and conducting joint inspections between the customer, main contractor, company and even user. The project gains from each stage.

### NEW WAYS OF COMMUNICATING

When distance separates the various stakeholders, digital technology can bring them closer together. The traditional meeting model is changing with more telephone and video conferences. Savings on travel expenses, able to rally stakeholders around specific points, efficient, file-sharing, annotations in common … the pros of remote meetings seem to outweigh the cons. They call for all participants to be extra attentive and not to let their concentration waver. The ASTEE's Sanitation Committee is promoting these new methods for its plenary meetings to benefit as many participants as possible.

### BUT DON'T GO DIGITALLY OVERBOARD

We don't want to be conducting our jobs and our relations in an entirely "virtual" manner: let's keep a physical grip on things.

Digital technology is placing so much information at our disposal that we risk zooming too much in on the detail, and losing sight of the appropriate macroscopic picture. Giving up thinking things through at the right scale, whether in terms of geography or time, can have far-reaching consequences. Even if we are instantly able to get the measure of the situation, analysing it at this pace does not end up being any more relevant. Let's not lose our practical sense, we should still spare a thought for how systems work overall and for the costs of clogging up data centres.

Digital tools assist us in endless ways, but they are not a substitute for human action and analysis.

New technology and equipment now comes out at such a breakneck pace – a tablet becomes outdated within six months – that the sustainability and life cycle of solutions warrant consideration: How can we manage this mindset of full steam ahead? Must we succumb to the latest innovations the moment they hit the shelves? How can we ensure that the means chosen can survive the long haul, both in terms of development and equipment? How can we guarantee that the solutions adopted will be forward-compatible? Will our solutions always need upgrading before we've got our money's worth?

## SO...

Change is afoot in our professions, with the digital transition well on its way. This is a good and necessary thing as our sewerage systems are becoming more efficient and the benefits are undeniable. So instead of letting this sense of possibility pass us by, why don't we climb aboard the opportunities to change presented by this new technology and see where they take us… while not letting our guard down.

# Digital technology and waste management: a transition in progress?

By the ASTEE Waste & Materials Recovery Committee

**If ever there was an example of a business that could be described as "brick and mortar", in the most basic sense of the expression, then household waste management – with the traditional, physical resources and tools it uses and conventional techniques and processes it implements – surely fits the bill.**
**And yet the digital revolution has not passed this sector by. Quite the reverse in fact, as the growth in digital techniques – IT and the Internet in particular – has significantly changed the way this profession is carried out too! Let's have a look at a few examples to see how digital technology has shaken up the waste industry over the past few decades.**

Household waste is usually collected via kerbside services; these are reliant not only on costly equipment – a collection vehicle fitted with a container press – but also on significant manpower (generally a three-man crew). Suffice to say that this public service, currently provided to the whole of the population, puts a significant burden on local finances, and it's only natural efforts are being made to make it more productive. Along these lines, the "bin lorry" route must be determined to ensure the greatest amount of waste can be collected along the way, in as short a time as possible. Optimising collection routes has therefore been a constant priority. Back in the 1970s, this involved specialists (who weren't yet referred to as logisticians) in operations departments poring over Ordnance Survey or town and city maps and, armed with pencils and an opisometer, marking out on tracing paper the route they considered to be the most cost-effective, based on their professional experience and local knowledge.

Map data at this time was mainly stored in paper format, and route optimisation software was still a figment of our imaginations … When the very first versions of such software did become available, data input into them was so time-consuming and complex that they posed no immediate threat to human sagacity (or, indeed, supremacy)!

Kerbside collection of household waste does have one undeniable advantage, however: the collection vehicle routes can be optimised once and for all, with each round being set in stone as it were (except, of course, when there are changes in residential zones, urban planning or traffic diversions). The same cannot be said of bring banks, dotted about here and there on the side of the street for collecting glass, packaging and newspapers. In this instance the bins are filled in a more irregular, random manner, and a set route, determined so as to avoid any sporadic overflow, will often result in the collection vehicle returning from its round only half-full. Significant improvements have therefore been made in this regard, one example being the design of systems that measure how full each bin is, and which replan each route to ensure the collection lorry returns with a full load. The emergence of underground recycling banks where residents can also bring their residual waste makes this kind of system even more necessary.

Nowadays, geographic information systems (GISs) have developed, embedded navigation systems have become more widely accessible and most waste collection vehicles are equipped with geolocation systems. These are particularly handy for pinpointing the best located vehicle for responding as promptly as possible to an industrial customer who makes an urgent call for his waste container to be emptied.

Staff and trade unions alike have voiced their alarm at times over the surge in uptake of such geolocation systems, which they feared might become a means of surveillance, or even policing – in a profession where their relative leeway had always been one of their key strengths…

Citizens have long been accustomed to having to fund the service getting rid of their waste out of their own pockets,

via a household waste removal tax. Calculated on a property tax basis, the problem with this is that it does not factor in the actual size of households or the amount of rubbish actually taken in hand by the removal service. This explains why there have been moves over the past few years to replace this tax with a pay-as-you-throw (PAYT) scheme, in which households are charged for the amount of waste they produce. The aim is to encourage users to change their habits and to see their bill cut accordingly. But to be able to determine the exact amount to be indicated on this bill, it must be possible to accurately measure the amount of rubbish left out for collection: collection vehicles are therefore fitted with on-board weighing systems that record the weight of the waste and identify which household it came from thanks to electronic chips on their wheelie bins. But negative spin-off effects and the risks of uncivil behaviour should not be underestimated in this context – nor should the fairly high costs associated with these new schemes!

Processing techniques are also being influenced by digital progress. In waste incineration plants in the past, it used to be taken for granted that the overhead crane operator was someone the business couldn't do without: tasked with operating the grapple that transferred the refuse from the pit to the furnace feed chute, he not only had to demonstrate a firm, unfaltering grasp in the handling of this enormous tool, but also had to keep repositioning the refuse in the pit and above all to mix it so as to homogenise the mass of waste and regulate its calorific value – a prerequisite for obtaining regular, complete burning. This is another example where the crane operator relied on his eyes and experience to carry out this key link in the overall operations chain. Fast-forward to the here and now, however, and it won't take you long on a visit to a waste incineration plant to notice that the overhead crane operator's seat these days is often empty: the grapple is now operated and the waste handled by special software which makes use of embedded radar on the overhead crane! As such, digital technology has well and truly infiltrated all the systems for regulating waste energy recovery units, making it possible to ensure effective combustion management and operation of flue gas cleaning systems. This guarantees not only improved energy efficiency but also a reduction in polluting emissions from chimney stacks. Some installations also feature infrared cameras with a view of the fire, thereby helping to optimise combustion using fuzzy logic software which adjusts furnace regulation.

Digital technology also made an appearance in selective collection sorting centres in the noughties, with the introduction of optical sorting. The techniques have since come on a long way and can now tackle such new challenges as sorting new plastics – this means the recycling guidelines can now be extended and high calorific value waste streams prepared.

The digital transition should in turn lead to economic decoupling or dematerialisation. The first thing to note is that this process does not just involve going paperless and introducing electronic data management instead, but more generally using fewer materials for a given function. This can be achieved in different ways: replace possession of an actual piece of equipment with the purchase of the only service it provides, or share and borrow products for example. None of these new practices would be possible without the connectedness enabled by modern information technology. With respect to our processes doing increasingly away with paper, although we no longer go as far as insisting today that this will help to save natural resources as much as hoped and contribute to sustainable development targets, what we can be sure of is that it will significantly change waste composition: with e-readers and other tablets replacing books and the written press, fewer materials need recycling but recycling manufacturers are facing new challenges – along the lines of recovering rare and costly materials without which the digital economy cannot function.

The cities of tomorrow will become ever more "connected", and this phenomenon will even extend to linking up services that are, by definition, different. It will, for example, soon be possible for consumers' water meters to be read automatically when the collection vehicle for household rubbish comes by, thanks to the embedded receiver equipping the lorry and to radio transmitters equipping water meters. In the same way, residents will be able to use their smartphones to find out what day the bins are emptied or bulky waste items picked up, as well as what time the household waste recycling centre is open. In some local authorities, users can already arrange for their bulky waste items to be collected simply by filling in an online request form.

The benefits we reap from the digital revolution will go far beyond more effective waste management and making life easier for citizens. A network of sensors will be busy gathering and analysing mountains of data to improve every single area of urban life, whether to do with the traffic, energy consumption, public transport, healthcare, waste management or pollution reduction.

The digital transition goes hand-in-hand with the energy transition. As we wake up to the limits of our world and the dwindling of its finite resources, we urgently need to build a new production and consumption model: with the help of digital technology we will be able to optimise energy consumption, improve waste management and progress towards a circular economy.

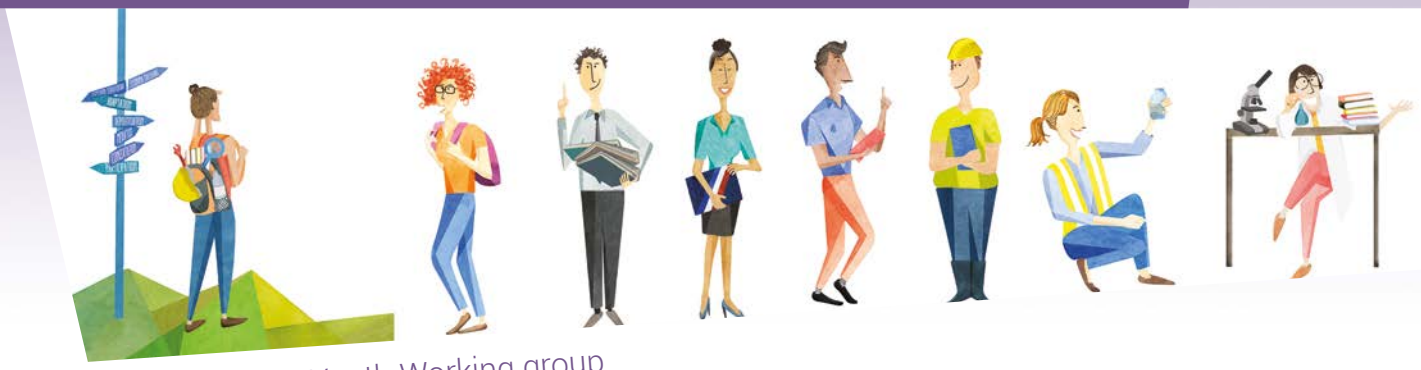
Data concerning urban waste collection, processing and recovery will tie in with municipal Big Data to populate the public utilities and environmental targets dashboard, which everyone will be able to consult on their smartphone.

The 95th conference of the ASTEE is a good opportunity for reflecting on what the public waste management service is doing to adapt to and benefit from the digital transition. Would we be wise to question the risks of abuse that such a connected urban system could pose in terms of hard-won freedoms … Might we see a new type of totalitarianism emerge, akin to what the writer George Orwell already described back in 1949 in his science fiction novel "1984"?

Or, on the other hand, should we conclude that digital intelligence has unfinished business in this sector when we consider the groundbreaking changes that this technology has wrought in other areas?

Where there can be no question is that this incorporation of digital technology in our urban lifestyles will help to bring about safer, healthy cities – on the advent of which the ASTEE's last conference had focused!

# Digital technology and the management of water, sanitation and waste: the outlook for young professionals



By the ASTEE's Youth Working group

**City living as we know it is changing with the spread of smart services. Public water, sanitation and waste management utilities are directly concerned by these new developments, which combine high quality with environmental friendliness. It is therefore up to all of the stakeholders involved in such services to consider how the development of so-called smart technology (smart cities, smart grids, smart meters, etc.) will impact sustainable public utility management.**

In this regard, as members of the ASTEE's Young Professionals' group, we would like to present some aspects of our take on the stakes and opportunities inherent in the digital age. IT experts we are not, nor are we fully-fledged professionals in this area yet.

But what we do already have is some experience with managing water, waste, sanitation and IT, and we feel personally concerned by these issues. Especially since we are part of the "connected generation"!

What limits and opportunities can we make out in the digital transition in terms of water, sanitation and waste services? How can these be measured? What tools can we use? What might a short- and long-term strategy concerning the future of these services look like?

## DIGITAL TECHNOLOGY: BETTER AND FASTER, NEW OPPORTUNITIES FOR PUBLIC UTILITIES

Because we are able to find out and analyse each parameter of public utility management in real-time with digital technology, water, sanitation and waste professionals can be hugely more effective in solving the problems they encounter on a daily basis. In this respect, digital progress can be seen as a means of optimising the way public utilities are currently managed. Accordingly, smart technology will be able to help protect the environment and improve our understanding of the pressure planetary resources are under – which is surely set to rise in the years to come.

If we take the example of drinking water grids, the effective prevention of leaks and real-time distribution of the resource on a priority use basis will no doubt become necessary given the reality of water shortages coupled with increasing demand. New smart grids will be capable of detecting leaks and, to a certain extent, anticipating them. 25% of water loss on average is currently due to grid leaks in France[6].

Regarding sanitation management, new applications are already making it possible to adapt grid capacity to the volume of effluent received, with a view to improving wastewater treatment plant activity. As such, the city of South Bend in the United States has installed smart valves which adapt to the weather and the information transmitted by the

6. La diminution des fuites dans les réseaux, site du MEDDE, Eau et biodiversité, 21 mars 2013, http://www.developpement-durable.gouv.fr/La-diminution-des-fuites-dans-les.html

sensors on the grid[7]. In this way it has been able to significantly reduce its overflows.

Similarly, it looks likely that waste managers will have to treat higher volumes whilst being bound to meeting ever tighter reduction targets. With the development of connected bins, estimating the volume of waste per household, optimising collection and setting up PAYT schemes have already become a reality. The Nice Urban Area Community has trialled this by fitting its collection vehicles out with Sat Nav systems and 57,000 electronic chip- (or "bin bug") fitted bins[8].

More effective natural resource management and greener public utilities are not the only opportunities up for grabs as far as digital technology is concerned. These also include substantial economic savings – if the most recent analyses are to be believed. Transport and collection optimisation in Groningen, the Netherlands, helped the Council to save almost EUR 100,000 thanks to the installation of connected bins[9].

What's more, "a recent survey of water utilities found that utility companies could save between $7.1 billion and $12.5 billion each year by using smart water solutions"[10].

The opportunities presented by the development of digital technology will, in turn, require service operators to acquire new skills and to write up new job descriptions. This is where we come in.

## NEW PROFESSIONAL OPPORTUNITIES

Public and private stakeholders alike are brimming with ideas of digital development initiatives at all scales.

Some of the corporate giants in France are currently working on projects in this context (for example: Ondeo at SUEZ and m2ocity at Veolia and Orange), and new start-ups are also sprouting up (such as éco.Déchets which specialises in optimised household waste collection). Local authorities are also getting involved, for instance Grand Lyon with the ECONO and Téléo projects (headed up by Veolia). The former is equipping the water grid with sensors to enable round-the-clock surveillance, while the latter enables users to track online how much water they're consuming. At European level, the "SmartWater 4 Europe" project is encouraging digital innovation in the water management sector while, at international level, the "Smart Cities Council" brings together several industrial concerns in a shared commitment to building smart and sustainable cities.

All of these initiatives are confirming the need for new professional profiles. In the ASTEE's young professionals' guide, Lucie Wable, recruitment officer for SUEZ Consulting, says that they are "looking for multi-skilled engineers and specialists, […]". The engineering sector has been turned on its head by the digital revolution, and our working tools and methods are now completely different. These new key skill sets have thus become necessary to take this new digital dimension on board[11].

7. IBM's smart tech aids water management, Heather Clancy, GreenBiz, july 2013, http://www.greenbiz.com/blog/2013/07/10/ibm-smart-water-tech-m2m
8. Innovations numériques, Métropole Nice Côte d'Azur, 2014, p.9
9. Vodafone Mic-O-Data case study, Vodafone Global M2M, 2014, p.5
10. BIS RESEARCH PAPER NO. 136, The Smart City Market: Opportunities for the UK, Department for Business Innovation and Skills, October 2013, p.10
11. Guide du Jeune Professionnel, la gestion de l'eau, de l'assainissement et des déchets : des métiers d'avenir, ouvrages collectif, ASTEE, 2016, p.43

These new jobs will develop in direct line with IT. For example, data scientists will be tasked with processing the masses of data collected, which should make it possible to optimise certain utilities by linking up waste and sanitation data for example. Likewise, relations with users will also change as we go ever more digital. It will therefore be worth developing community manager positions to liaise between services and users and to make interfaces more user-friendly.

Technical and academic training programmes as well as continuing professional development courses provide a good illustration of this change in practices and expectations as regards the skills of tomorrow. For instance, a Bachelor in Digital Cities & Sustainable Development is now available at the IT Paris Eiffel (IT School of the ECE Engineering School in Paris) and a CREACITY Specialist Master can be taken at Poly Tech Lille. Both of these degrees teach environmental and digital skills. What is striking about them both is that the former approaches the environment from the IT perspective, while the latter takes engineering as its starting point to address the digital dimension. These are just two among many other programmes that are intent on developing the skills of tomorrow.

Our generation has grown up using digital tools and, as such, their use will come more easily to us and we won't fail to seize the myriad professional opportunities that are emerging.

> "Digital intelligence is our future.
> We are born and live with it."
>
> MARIE-FRANCE BARRAULT, STUDENT AT THE ESAIP*

## INVENTIONS STILL TO COME...

When we think about the digital transition's impact on urban environmental utilities, why not give free rein to our invention ideas? This leap forward in space and time also plays a part in questions on the future of utilities and of our professions...

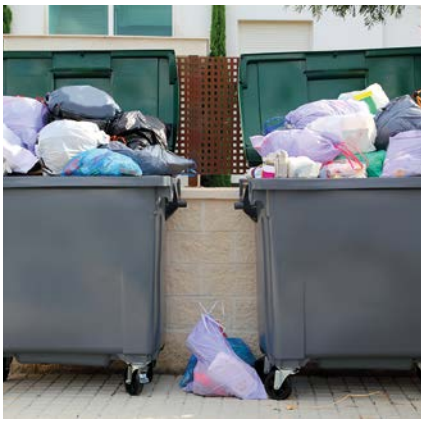
What would you say if we were to tell you that technicians could soon be working inside a smart vehicle connected to the grid 24/7? This way they would be given advance warning of the type of leak, the intervention equipment required and any pollution generated. This is only just round the corner, as digital models in augmented reality can already detect cables and grids through walls14.

Some are envisioning the possibility of connecting toilets to be able to regulate wastewater intake in line with the weather.

Digital technology could make it easier for the three environmental utility types to work together, which would pave the way to ecological sanitation of the future whereby waste collection, sewerage and water management are combined.

Indeed, sanitation in the future could involve separating out urine and faeces, which calls for a fresh approach to wastewater collection so as to link it up with waste management in keeping with the water cycle.

The way public utilities are currently managed will need rethinking from scratch with this in mind. Users today may well be tied down to using the public utilities provided because their infrastructure is so widely developed (grids, collection vehicles, etc.), but it is not unrealistic to imagine the "uberisation" of public utilities where citizens would be able to choose who they want to manage their waste. For drinking water, however, the efficiency of water networks, compared with that of other systems, is such that it is not about to be tinkered with anytime soon. The opportunities opened up by digital technology are therefore immense and appealing. That said, diving in headfirst without the proper groundwork or hindsight is not an option for us.



> "A good example [of the opportunities opened up by digital technology] would be anomaly detection in terms of water quality or leaks on a network, without requiring any human analysis."
>
> AURÉLIEN COHU, SYSTEMS RELIABILITY ENGINEER (EFFLUENTS AND ENVIRONMENT) FOR EDF

12. Le Moniteur n°5833, 11 September 2015, les dossiers de la rentrée article : Numérique, le BIM un atout pour la gestion du patrimoine, Julie Nicolas, p.68

# DIGITAL DEVELOPMENT IN THESE UTILITIES IS NOT WITHOUT ISSUES – OR LIMITATIONS

There's great potential admittedly, but the question marks have not gone away.

Topping the FAQ list is the justification for collecting data in real-time about users' consumer patterns. Who can access this data? Within what limits? And to what end? Consideration must first and foremost be given, therefore, to the use that is going to be made of such data. For whilst open data may, on the one hand, spur innovation and the development of new services, on the other hand it also risks violating user privacy. It is therefore important to give thought to the possibility of users fully or partially deactivating their connection when they want to, for example via physical switches or settings screens.

Although present-day technology is advanced enough to be able to secure all types of network and data, cybersecurity is a serious issue to be ignored at our peril. State surveillance of utility operators' practices therefore strikes as inevitable.

On this subject, the ANSSI (French National Cybersecurity Agency) is currently in talks with public utility operators about improving the security of their information systems[13]. Especially since the data management giants today are supranational firms (Google, Amazon, etc.). National sovereignty with respect to the use of this data will consequently be of legitimate concern.

> "Digital and information technology already form an integral part of our course; we will have to be completely literate in them to succeed professionally."
>
> ALEXIA LEYRET, STUDENT AT ENSCR*

Next, given the sheer amount of data that can potentially be recovered, it will be necessary for the public utility manager to be able to make out which of the measurable datasets will genuinely be of most use. This is because the cost of installing smart meters will only be justified if they actually enable a better public service to be provided – with the pros clearly outweighing the cons as far as all the stakeholders and dimensions of the utility are concerned. We already have data management firmly under our belts today, of that there is no doubt. But it is equally important to bear in mind the amount of energy data servers need to function, both as regards the cost and the carbon footprint. We need to consider utility digitisation in terms of the whole of the information system chain – from collection right through to use.

From a completely different perspective, we often see digital technology as a source of new jobs. But does it not also do away with jobs? Digitisation could have a direct impact on low-skilled jobs that are nonetheless necessary for general interest missions, such as sorters, binmen or sewer workers. For example, the human qualities of inspectors are often relied on when water supplies are cut off and for informing the communities concerned, and water quality analytical technicians adjust their analyses in line with requirements and the circumstances.

Last but not least, the digital transition also throws up questions about the accessibility of public utilities in their new form. Digital development could indeed lead to users receiving a better service overall (real-time monitoring of consumption, alerts in the event of leaks, easier payment of bills and so on). But such installations do not come cheap, and require a certain familiarity with the digital jargon to boot, which all means that "smart" technology is not necessarily accessible to all public utility users. Is there not a risk, therefore, of the usual social divisions being compounded by a further segmentation between the best connected and the least equipped users (or territories)? This is why the basics of digital technology must be taught at as young an age as possible on a par with reading and arithmetic. There is not a profession or a moment in our everyday lives today in which digital technology is not making its mark, and it is vital that all citizens be equipped with the tools for confronting this digital revolution. Very careful attention must then be paid to the interactive relations between users and operators, since users are becoming at once consumers and producers of information.

The technological possibilities are not unlimited, however, and public utilities need to take a slowly-but-surely mentality to the digital transition, and get all the specialist professions involved across the board: computer scientists, water engineers, water chemists, etc. If we want the digital transition to be a success, on top of "going smart" we also need to "think smart"!

13. Cybersécurité et loi de programmation militaire : préparation des règles de sécurité, ANSSI, http://www.ssi.gouv.fr/actualite/cybersecurite-et-loi-de-programmation-militaire-preparation-des-regles-de-securite/, December 2015

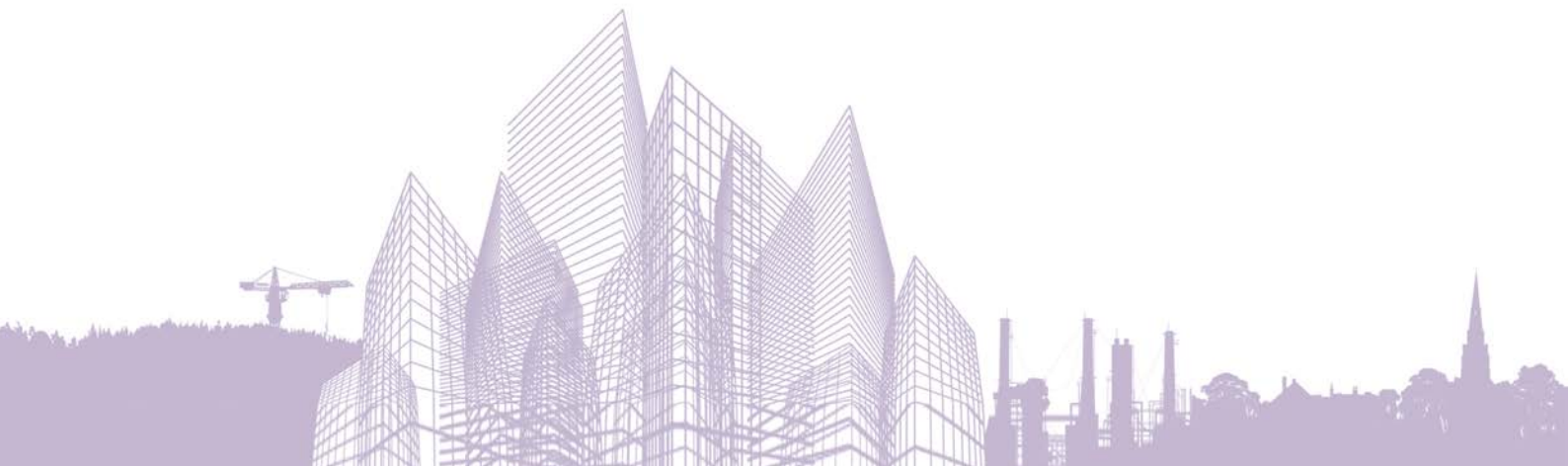
# CONCLUSION: ASSESS AND DEBATE

The widespread digitisation of the way public water, sewerage and waste utilities are managed is now a fact of life – part and parcel of the new direction our society is now heading in. This transformation is still raising many hands for all that – particularly among young professionals even if they are already clued up to such matters.

The legitimacy and opportunities associated with digital technology must be looked at from an overall and scientific perspective to guide us in our discussions on the different ways public utilities are going to be affected. All of the stakeholders concerned need to be invited to the discussions table in this regard.

These national discussions on digital technology should ideally then continue by branching out to address other topics – public utilities included. Digital development is affecting each and every user of public utilities, each and every stakeholder, and should not, therefore, remain solely a matter for experts. It needs to stay firmly in the public arena!

* ESAIP: Angers Graduate School of Engineering
* ENSCR: Rennes Graduate School of Chemical Engineering



# Chapter 2

## To pull off the digital transition, don't we first have to change the way we design our territories?

# INTRODUCTION

The ideas put forward in this chapter all highlight the far-reaching, radical nature of the changes the digital transition is having on territories and public utilities because these impacts are all-encompassing. We're talking about a full-on "revolution" here, which brings with it great potential but also its fair share of sensitive sociological challenges, as illustrated by Alain Rallet and Alain Bourdin.

This two-sided process corresponds to the theory of creative destruction described by Schumpeter, in which innovative economic models and products sweep aside the existing models and products, with the result that economic professionals suddenly become unqualified (in terms of expertise, geography or competitiveness) and lose their jobs. But in this case the social changes wrought by digital technology are also affecting the behavioural environment of citizens and the way in which their reference territories are evolving – both physically and qualitatively speaking.

By looking at both the up- and downsides of the advent of digital technology, the conditions required for its smooth, positive transition can be identified – particularly to steer it towards smart cities and territories and towards smart (or "augmented" to draw a temporary conclusion) urban public utilities.

"Systemic view", "bringing down barriers" and "inclusion" thus strike as key words to describe the possibilities of digitisation; these are all terms, incidentally, which came to mind concerning the conditions for constructive innovation of urban public utilities following the ASTEE's last conference, according to the position paper that was written in connection with this subject[14]. These key words are justified for two reasons:

- first, because the sheer number and overarching nature of impacts demand a holistic approach to urban management, addressing key functional challenges that concern not just economic, sociological or urban utility experts, but also users for the points that interest them (Alain Bourdin reminds us that you can't decide what is going to make people happy and, in a later chapter, Sylvain Rotillon points out that not everyone is prepared to speak out on just any subject); the different levels must also communicate with each other.
- second, because digital technology provides such cross-cutting tools that can help gain systemic insight into the urban challenges and promote innovations to meet these challenges; this is the view that Jean-Louis Missika takes (Deputy Mayor of Paris).

This being so, how can this systemic and inclusive view be promoted?

A general epistemological picture is painted by Florent Boithias's text (Cerema).

Given the significance of inclusion and cultural adjustment processes, this next chapter is given over to different takes on this subject: intergenerational groups where members have wide-ranging experiences and roles for coming up with joint ventures or taking all-encompassing views on board in more sector-specific projects. This increasing cultural adjustment reflects, in practical terms, the need for a ready ear and inclusive attitude.

But digitisation is already making it possible to implement forward planning and system-wide management of territories and their resources and services, as evidenced by the digital models of territories (Laurent Vigneau, Artelia) or system-wide urban modelling tailored to the water sector (Forcity, SEDIF, VEDIF).

14. Document can be downloaded at: http://www.astee.org/position-paper-de-lastee-sur-linnovation

# What impact is digital technology having on territories and public utilities?



By Alain Rallet, University of Paris Sud

## GOING DIGITAL: A TECHNOLOGICAL REVOLUTION

You can tell a technological revolution is in progress by the way it affects all economic activities, social relations and organisations. The English term to describe this phenomenon is General Purpose Technologies (Bresnahan & Trajtenberg, 1995), i.e. technologies that can be used in any sector. Digitisation is one such revolution as it is having an impact on all activity sectors and, as such, on the way in which local public utilities are being designed, produced, distributed and used. The changes are only just beginning, however. There is much uncertainty over the use that is to be made of these technologies and the utility innovations that may result, as well as over the way in which territorial institutions and organisations are able to take these quite possibly radical changes on board. Other sectors have already tested the "disruptive" nature of digital technology, for example the cultural industries or, more recently, such professions as taxi companies. There is no reason for the same not being true, to varying extents, of other sectors like the health service, education or public utilities.

## GETTING THE MEASURE OF POTENTIALLY RADICAL CHANGES

Economist Joseph Schumpeter (1942) described this type of radical innovation as "creative destruction". As far as the impact digital technology is having, it is as if we are now in midstream. We have a clear idea of the way it is shaking up business as usual. For example, sensors and digital terminals now send the data urban utilities need to them instantly, making the costly information systems of the past obsolete for the most part. But we are not so clear on the "creation" process of new utilities. The stakeholders are right in the throes of the transformation process, their respective place is hazy, the ecosystems are not properly configured and the economic models have barely left the drawing board. In light of this, there are all manner of possible scenarios and the local public authorities are at pains to anticipate the right courses of action.

## FINDING MIDDLE GROUND BETWEEN FAST TECHNOLOGICAL CYCLES AND LONG-TERM PHYSICAL INVESTMENTS

The position local authorities find themselves in is in no way helped by the fact that digital technology is progressing at a phenomenal pace that is showing no signs of slowing down. This is unique to this particular revolution, illustrated by Moore's famous law. Barely has one technology been adopted than another appears. And yet investments in new services are particularly heavy when they are made in well-established local technical facilities. The cycle of digital products and services is at stark odds with that of territorial investments. One way of handling this fact is to separate the services from physical infrastructure by entrusting them to stakeholders who are able to take on the risk. This is why there is strong pressure to have it delegated to the local authorities, in the same way as their involvement in broadband (high speed and very high speed) networks.

This is a general trend of digitisation: the winning stakeholders (from Google to Facebook, not forgetting Blablacar and Uber) are not developing locally-established infrastructure. This has earned them the description "Over The Top" (OTT). These are software platforms which owe their success to the networking role they play. Their strategic positioning right at the heart of the digital economy enables them to capture the value created by new services. This would not be a problem were there a mechanism in place for redistributing this value for the benefit of the stakeholders at infrastructure level, but this simply isn't the case. For example, public institutions are tending to open up their databases (Open Data) for the sake of transparency and encouraging innovation. This is all well and good but such action without taking precautions can play right into the hands of OTT stakeholders without them returning part of the value created by the use of such data to the very people who are financing the production and upkeep of the databases.

## A WIDE DIVERSITY OF SERVICES AND STAKEHOLDERS UNDER THE UMBRELLA TERM "SMART CITIES"

The scope of innovation in the territorial sphere is fairly well defined by the expression "smart cities", which refers to the emergence of innovative local services that rely on the pervasiveness of information technology (its propensity to invade all sorts of devices, making them "smart"), the connectivity of networks (telecommunications as well as electricity, water and transport for example) as well as the ability to process masses of information (Big Data) (Attour & Rallet, 2014).

Services cover different sectors and call on different stakeholders in part. They concern:

- "smart" management of urban utilities (water, electricity, telecommunications, waste, transports, etc.). The aim is to optimise the various grids (smart grids). The grid operators and local authorities are the main stakeholders in this respect.
- management of urban equipment (smart buildings, public infrastructure, etc.). Construction and civil engineering firms, residential building equipment suppliers, users, local authorities and grid operators all have their part to play in reducing their carbon footprint.
- mobility, whether we are talking about mobility aids (traffic regulation, passenger navigation, multimodality, unoccupied parking spaces, hire or sharing of transport means and so on) or services while on the move (for example access to information sources, geolocation services, augmented reality, or payment). A wide range of stakeholders are involved in providing these services, including grid operators, urban data custodians, motor vehicle manufacturers, user communities, municipal services, banks and standardisation bodies.
- to a large extent, services providing greater insight into territories thanks to the processing of public information that was previously unavailable or unused as well as information generated by end users. The former case covers Open Data. The latter seeks to decentralise the production of urban information by user communities (transport networks, municipal services, restaurants and so on) and to create services based on individual interactions (such as sharing of childcare after the school day, neighbourhood car sharing or local trade or service provision systems) through digital platforms.

# THE DIFFICULTIES OF SERVICE INNOVATION IN LOCAL ECOSYSTEMS

Developing these services is no walk in the park, for a great many different stakeholders are involved in their design and provision as we have just mentioned, including local authorities, users and user communities, grid operators, data custodians, urban infrastructure managers, diverse companies and technical organisations (standardisation). These stakeholders, each with the necessary specific expertise or resources for innovation, need to work together if there is going to be any chance of innovation coming about and, more than that, actually reaching the market. It is worth their while without exception, and yet they are often in competition to seize hold of the added value of innovation for themselves. This results in the classic hold-up problem (fear that the value gained by the stakeholder does not match up to the investment made or the value gained by other stakeholders). Each stakeholder decision nonetheless depends on the others' decision because of their complementary situation. Therein lies a chicken and egg dilemma: why invest in producing an aspect of the ecosystem if the other stakeholders have not already done so and vice versa?

Data sharing with a view to developing a multimodal mobility service is a good example of this problem. For a multimodal service to exist, public or private transport data custodians need to agree to share this data. But this very data is an essential asset for these public operators or companies, which are sometimes complementary and sometimes competitors. They will only agree to share such data if the way it is shared furnishes them with guarantees concerning its ownership and the financial returns they expect. In a nutshell, what is required here is a cooperative solution similar to the one set up by banks through an EIG to carry out the launch of debit cards. An EIG is a platform that solves the problem of coordination between the banks, traders and consumers underpinning the innovation. In the realm of urban utilities, the problem is not as clear-cut, as the operators are more disparate and more numerous than in the banking sector.

This explains why such services are so slow forthcoming when the technology is already available and busy working towards new services. We could mention the very slow development of apps using NFC (Near Field Communication), a technique for transferring information from one terminal to another, which haven't really made any progress over the past decade or so.

The problem of smart cities is not so much a technical one as one concerning the economic organisation of services and the setup of collective goods (a shared database for example) necessary for the provision of services (bearing on mobility for example). In this context, the public authorities have a key role to play in encouraging long-term cooperative solutions. They are doing this through an array of pilot schemes, but very few services make it through these trial stages to be extended at a wider scale.

## SMART CITIES OR SMART CITIZENS?

Not only does digital technology help to make existing local grids more effective and to improve them by adding new services, it also provides an opportunity to completely review the way services are produced and used. We will therefore now compare two ways of perceiving the impact digital technology is having on territories.

The prevailing version of smart cities is one which simply extends to the supply of digital technology a traditional idea of the territory perceived as a complex set of flows that need optimising. This is the realm of territorial engineering. In this approach, the individual does not have any active part to play as the point is to extract the information generated by his or her behaviour, perform automated processing of this information and return recommendations to the individual that guarantee the optimisation of flows. This approach applies just as much to travel as it does to electricity consumption and waste management.

There is another way worthy of our attention: that of smart citizens. Digital technology currently offers up other means of coordinating people to achieve a collective outcome than through coercion or market prices. Platforms enable individuals to interact to produce collective services: car-sharing, jointly producing and sharing information, developing local services, encouraging pro-social behaviour (well-being, new consumer habits, waste management, community living, etc.).

This option requires a reversal of perspectives. In the traditional way of seeing things, individuals are above all driven by selfish motives. To adopt economic jargon, individuals are producers of negative externalities (congestion, pollution, etc.). They therefore need disciplining through regulations or taxes. But let us allow for a different viewpoint: one in which individuals would be capable of more than what the traditional perspective reduces them to. For we should not dismiss the hypothesis according to which individuals genuinely wish to improve their travel experiences as they are fed up of the status quo, but don't know where to begin. They are faced with a sense of collective powerlessness. The challenge is to overcome this powerlessness and to make individuals producers of positive externalities,

i.e. to base the improvement of social well-being on individual interactions. The way to do this is to develop platforms that bring them into contact with one another and facilitate their coordination efforts. This scenario is well worth exploring, not only to provide individuals with services as a certain number of digital platforms are already doing (Blablacar and AirBnB to give but two examples), but also to reduce congestion, pollution and energy consumption, improve waste management, fund certain joint ventures and forge community ties within territories among other things. Territories should devote close attention to these forms of social innovation that platforms represent as they are another way of producing common interest services.

## BIBLIOGRAPHY

**Attour A. & Rallet A. (2014), *"Le rôle des territoires dans le développement des systèmes trans-sectoriels d'innovation locaux : le cas des smart cities"*, with A. Attour, *Innovations*, n° 43, 253-279.**

**Bresnahan T.F. & Trajtenberg M. (1995), *"General purpose technologies: Engines of growth"*, *Journal of Econometrics*, vol. 65, p. 83-108.**

**Schumpeter J. (1942), *Capitalism, Socialism and Democracy*, trad. fr., Paris: Petite bibliothèque Payot.**

# The urgent need to equip the smart city with social intelligence



By Alain Bourdin, Lab'urba, École d'Urbanisme de Paris, University of Paris-Est

**The organisations of the ASTEE conference talk of a "…new urban and territorial model [which] is characterised by optimum resource management and by interactive and mobile relations with users where inhabitants are both consumers of information to guide them in their day-to-day lives and producers of information via social networks and mobile services, and by new forms of cooperation to develop joint projects between multiple territorial stakeholders". There is nothing shameful about this technocratic utopia – which sometimes overestimates a few weak signals. But to recognise it as such requires us to ask different questions: instead of talking about a future which will be shaped by the sole force of technology and sound management, we need to talk of a possibility that we must be able to turn into a shared project to have the slightest chance of coming to pass.**

For all that a utopia is rational and "virtuous", we should be careful not to give it more credit than it is due: if the generous Communist utopia begat the Gulag, is this solely because of unfortunate historical circumstance and because Stalin was a monster? Did Robespierre only have people killed in his name for the greater good? No: you can't decide what is going to make people happy and society can't be changed by decrees.

I am not making a profession of faith in immobilism here: I wonder how on earth I managed in a time before computers, internet and, more recently, smartphones. I dream of having a car that can drive itself and of navigating through an ocean of connected things. I am more than convinced that we are on the verge of an urban utility revolution. We cannot simply settle for one-sided, irenical approaches, however: the possibilities are endless, the uncertainty great and the unexpected consequences too many to count – and not all positive. At risk of being branded a pessimist, I would like to underscore three questions to which answers must be found to imagine the relationship between digital intelligence, public utilities and territories.

The first has to do with our idea of change and innovation. The digital divide strikes as a social (everyone must be given the material means to be able to access digital technology) or generational problem (it's only a problem for the older generation) and we forget that although young people who have grown up in the digital age find it much easier to use these tools than their elders, their access and the use they make of them still differ widely on a cognitive level. More generally, we overestimate how easy social changes are to assimilate. Whether our focus is on organisation, viewpoints (social images, ideologies, beliefs and values) or lifestyles, a society (assuming that this term has a clear meaning today) is a multi-layered structure:

those closest to the surface never keep anything for long – changing with the latest fashion, innovation, information –, while those with the deepest roots take a much longer-term view of things. An innovation (whether or not technological) will be all the more successful if it meets the expectations of these latter layers or it may only work in the superficial layers (gadget effect). A combination of the two (following the example of the mobile phone) is the ideal solution. Given the very fast transformations of technology and the significance of the range of new services or products, we would do well to give thought, on the one hand, to the inertia inherent in large institutions and, on the other, to the overdevelopment of the gadget effect. The first refers to one of the fundamental dimensions of contemporary public action: the connection between the long and the short term, when it is quite possible for them to be at odds with each other. Here, the question concerns linking up very fast processes (the development of digital technology in this instance) and slow changes (for example that of the conception we have of space). In other words, how can we involve users in the systems of the "smart city" without them

losing sight of the points of reference with which they develop their behaviour and the meaning of these? Convenience – although a key factor – is not enough. The risk, then, is that all attention is focused on only the most superficial layers, which are the most susceptible to passing trends or simply most likely to succumb, which are very easy to mobilise – especially via social networks. And this triggers a full-on spiral effect which can result in a disorganisation of behaviour, addictive phenomena or a dissociation between different levels of practice: ritualism or immobilism in some areas, an innovation craze in others.

The second question concerns the ways in which innovations and particularly new services are grasped – in terms of both control and how they are understood. In societies of individuals such as ours, control is a central point, at the individual or living unit level: how can we gain control over our living environment, and how can we exercise self-control? To what extent does the smart city allow such control, which is not the same thing as making life easier? Receiving a bill in the post, writing a cheque and sending it takes a great deal longer than online payment in response to an email – an easier solution by far. But such facility does not necessarily improve control: it is quite possible that when actions become so automatic, the little rituals or calculations that once backed up and ensured careful management of a personal or family budget are forgotten. With respect to urban services, it could be said, for example, that having our energy consumption available at our fingertips surely helps us to control it. That may be, but it perhaps also complicates our day-to-day routine (how many things do we have to be thinking about every minute of the day?) and may eventually become a source of anxiety. If people don't make use of this new possibility and continue to open wide their windows in low energy apartment buildings, maybe it's not just because they haven't been shown how to use it.

To grasp something it's not enough simply to control it – we also need to understand it, i.e. be able to pinpoint a purpose, a habit, a choice within a given setting of values (in the broad sense of the term). Moral, political and religious values as well as a symbolic geography and shared, or collective, picture. So, achieving resilient cities may well be a key challenge for public action, but this does not mean anything in itself: the city needs to be presented as part of a bigger picture and symbolism. The same could be said of smart cities. A bigger picture and symbolic geography (that of hubs or meccas) only exist if we are able to apply our imagination(s) to them. The energy transition, smart city or resilience – spoken about in rational or activist discourse in reference to extremely vague values which, despite the plethora of video images we associate with them, do not seem to be rooted in any graspable form of reality (the future of humanity) – are lacking in imaginative input. This also explains why coming up with a plan for society is proving to be such an uphill struggle. And probably also why we prefer work by artists who are better at revealing these imaginative ideas than they are creating them.

The third question concerns the link between territories and lifestyles. Each of us lives in one or more "settings" that we share more or less with others: this refers to all of the items and places, living beings, information and significations that we connect together through our habits. These settings, which are more or less multiple and unstable, are a blend of the real and the virtual (with the line

between them getting ever finer by the day). The most stable aspects of the habits forming them represent a lifestyle, i.e. an organisation of everyday life which interacts for better or worse with the many pressures. Lifestyle defines the framework of meaning which applies to this. The various degrees to which a lifestyle is structured range from a completely ritualised one which abides utterly by one particular way of living – for example that of monks living in a monastery – to the opposite extreme where certain individuals no longer exhibit any sort of definable lifestyle because they are no longer able to behave in a fitting or coherent way amid life's ups and downs. All lifestyles are lived out in a spatial setting through living territories. These exist at various levels[15] and their ability to adapt and change these days depends above all on travel modes. Tomorrow, digital technology will increase this ability – a process that is already in motion in fact – for example by reducing a share of journeys made in connection with physical procurement and no doubt with work. There is already something individual about living territories (or at the living unit level) and the areas they cover, which give rise to the notion of living zone, have partly been shaped by travel requirements (trips to shopping centres for example). Digital technology may increase this trend to become ever more individually-focused. At the same time, in terms of the services available, a range of digital services will develop with no territorial affiliation, within which people will surf freely just as they do so already. In the long term, territorial reality as we know it will probably become less important – making way for something else, but what? That is the big unknown.

In the more immediate future, we have not yet fathomed how to manage without a territory-based model of organisation, which administers social groups and through which citizenship and the "legitimate use of physical force" are exercised. Social cohesion, which inevitably becomes problematic in social contexts of individuation and globalisation, still needs a minimum of territorial moorings.

That makes for a lot of territories, of very different types. As I see it, a major challenge for digital services is to show whether they are going to help (and how) these disparate territories to find common ground or rather, by going too fast in the direction of the historical trend of the end of territories, only end up further exacerbating the tensions between them.

15. Le Moniteur n°5833, 11 September 2015, les dossiers de la rentrée article : Numérique, le BIM un atout pour la gestion du patrimoine, Julie Nicolas, p.68

# Smart cities: a key territorial strategy management tool for local authorities



By Florent Boithias, Cerema

## SMART CITIES: A MODEL FOR THE SUSTAINABLE DEVELOPMENT OF CITIES AND TERRITORIES...

It isn't easy to give a clear definition of the notion of smart city. Indeed, a universally recognised definition cannot be found in any accreditations, standards or regulations. One way of defining a smart city is to look at what it strives to achieve:

- Improve the quality of life and the living environment;
- Make the territory more efficient and reduce its environmental impact;
- Facilitate mobility for all sections of society;
- Develop an innovative and high-performing economy;
- Make the territory resilient to risks and climate change;
- Improve the territory's governance, transparency and management.

These aims bear on environmental, economic and social sustainability, as well as resilience, which draws parallels between smart city and sustainable city.

Nevertheless, the notion of sustainable city does not seem to be fading completely amid the advent of the smart city, most likely because its aims are more directly perceptible by the general public than those associated with the smart city.

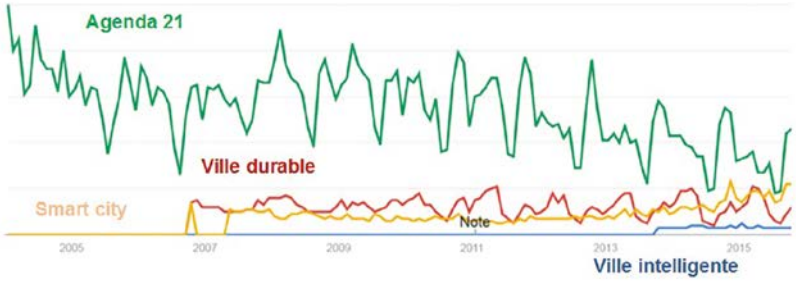



Figure 1: Changes in interest for "agenda 21", "ville durable", "smart city" and "ville intelligente" searches from 2004 to today, on the Google search engine in France

# ...WHICH EMBRACES THE NEW OPPORTUNITIES AND NEW CHALLENGES ASSOCIATED WITH THE DIGITAL TRANSITION

The smart city nevertheless exceeds the sustainable city in that it fully embraces the new opportunities and new challenges brought by the digital transition in recent years. Unlike the sustainable city, this digital transition does not have any intrinsic aim or ideal to achieve. It therefore refers to a set of new urban technologies, which we could call "digital city" or "connected city", which must be harnessed for the benefit of urban sustainable development. In this way, put simply a smart city can be defined as the result of a sustainable city and digital city coming together.

## SMART CITY = SUSTAINABLE CITY + DIGITAL CITY

That said, the digital transition is also bringing with it its fair share of new challenges. "For the first time since the political organisation of societies first came about, the public authorities are having to deal with technical developments that they do not have complete control over" (Vidal). Newcomers to the planning and development sector are adept at new technologies though, and this is placing them at loggerheads with the traditional stakeholders. Yes, digital technology is certainly helping to optimise public action and bring about a new range of services, but at the same time it is running the risk that traditional services become "uberised" to adopt an increasingly popular expression, and that these services end up being transferred to the private sector. Along the same lines, the digital transition is creating an equality gap in terms of access to and grasp of new technologies within city and territory residents which could generate spatial and social divisions.

The approach this article takes to analysing the notion of smart city, from the angle of what it strives to achieve and by comparing it with the notion of sustainable city, reveals a territorial development method based on three pillars:

1. **Integration:** focusing on use, this completely does away with models organised on the basis of a silo mentality, replacing them with cross-cutting, system-wide approaches;
2. **Inclusion:** this collaborative approach brings together socioprofessional stakeholders and researchers within an open and shared form of governance that takes the local context into account as far as possible;
3. **Innovation:** particularly on the basis of new technologies, this brings about new ways of governing, managing, trading, creating value, etc. which are significantly changing users' experience of their city or territory.

# VARIED TERRITORIAL STRATEGIES BLENDING COLLECTIVE INTELLIGENCE AND ARTIFICIAL INTELLIGENCE

The system-wide approach to supplying public services and a more open form of governance are ways of meeting the need to tap into the "collective intelligence" of territories. Technological innovation, meanwhile, can be understood as the introduction on a much larger scale of "artificial intelligence" in the supply of public services. What local authorities therefore need to do is use the latter for the benefit of the former, and vice versa. Keeping things simple, we might therefore define the intelligence of cities and territories as follows:

## INTELLIGENCE OF CITIES AND TERRITORIES = COLLECTIVE INTELLIGENCE + ARTIFICIAL INTELLIGENCE

This definition paves the way for different types of local authority strategy according to two axes, or criteria, which characterise the extent to which projects demonstrate collective and artificial intelligence (see Figure 2).

Tapping into collective intelligence, for which Pisani has coined the term "Participolis", makes projects more acceptable to society by involving the various stakeholders very early on in a bottom-up approach. The use of artificial intelligence ("Datapolis" in Pisani's words, or "neo-cybernetics" to use Picon's term) in a top-down approach this time, calls more on private stakeholders who are likely to bring their own funding to the table.

Given their tightening purse strings, it is in local authorities' best interests to attract private investments to their projects. However, this can lead to the public authorities relinquishing some control over policies conducted in their territories, and citizens' needs no longer taking top priority.

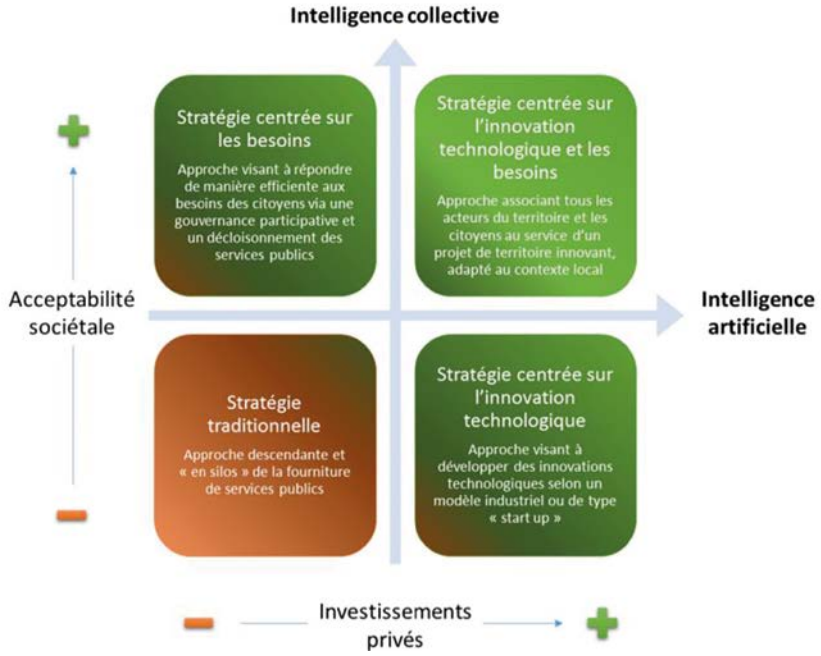



Figure 2: Plan positioning local authority strategies according to the predominance of artificial and/or collective intelligence

## CONCLUSION

The challenge for local authorities today is therefore to maintain the upper hand over their development strategies and their independence vis-à-vis private stakeholders – all the while being in a position to seize the opportunities offered by the digital transition.

Cerema, with strong territorial roots and proven expertise in territorial development, the environment and data management, is now busying itself in matters to do with smart territories and cities by raising local authorities' awareness of the new challenges and providing them with the methodological bases they need to see their projects through.

## BIBLIOGRAPHY


Advancity (2015), *Vademecum Innovation et villes durables : repères pour l'action.*

Fing (2015), *Transitions – Cahier d'enjeux et de prospective.*

Gintrand F. et Nguyen D. (2015), *La "smart city" n'est pas si "smart" que ça*, slate.fr.

Picon A. (2013), Smart Cities – *Théorie et critique d'un idéal auto-réalisateur*, Editions B2.

Pisani F. (2015), *Voyage dans les villes intelligentes : entre datapolis et participolis*, Netexplo.

Scottish Cities Alliance (2015), *Smart Cities Maturity Model and Self-Assessment Tool.*

Vidal P. (2015), *Présentation au séminaire de prospective territoriale du CGDD*, 27/11/2015 à Paris.

Ville de Paris (2015), *Paris intelligente et durable.*

**By Jean-Louis Missika**, Deputy Mayor of Paris in charge of Urban planning, Architecture, Grand Paris projects, Economic Development and Attractiveness

# PARIS, A SMART AND SUSTAINABLE CITY

With the development of digital technologies, the way cities are managed is changing beyond all recognition. Jean-Louis Missika talks about what the digital transition means in practice for the city of Paris, beginning with the way it ties in with the energy transition. He reminds us how relations with users have been completely transformed since digital technology came into play, and how the city has seized the opportunities in this regard to enable Parisians to play their part in jointly constructing and managing the city. Missika also highlights the importance of open data and data analysis – two ideas central to the digital transition. He ends by sharing his view of the smart and sustainable city.


youtu.be/5SvlIY-cqLE

> “Shaping a smart and sustainable city is all about trying to encourage people at a very early stage – who often aren't used to working together – to do just that, right from the outset, the aim being to make their joint project smarter and more sustainable.”

### DANS MA RUE

“Dans Ma Rue Paris” is an app the Paris City Council is testing out. It enables users, anywhere in Paris, to bring anomalies observed in public areas to the attention of the nearest and most qualified technical department to analyze and process them.

**Available on Android and iOS**

### PARISDATA

The City of Paris Open Data policy website where all of the data sets published by the city's departments under an open licence can be found.

**opendata.paris.fr**

### BUDGET PARTICIPATIF

“Paris Budget Participatif” is the City of Paris website where Parisians can decide how 5% of the investment budget is to be used between 2014 and 2020 – which amounts to some half a billion euros.

**budgetparticipatif.paris.fr**

### MADAME LA MAIRE, J'AI UNE IDÉE

"Madame la Maire, j'ai une idée" is a website encouraging broad participation on the part of citizens. All Parisians have the chance to submit their ideas and projects for their city on an array of themes. The ideas submitted can be discussed, added to and improved in a collaborative approach driven by the collective imagination.

**idee.paris.fr**

### REINVENTER.PARIS

Call for innovative urban projects: 23 sites available to all professionals for bringing their talents to bear and developing outstanding projects.

**reinventer.paris**

MAIRIE DE PARIS

# From planning to staging: how territorial digital models can help promote urban services



By Laurent Vigneau, Artelia Ville & Transport

## SANTIAGO DESEADO, OR THE TECHNOLOGICAL ADVENTURE OF URBAN SERVICES

In 2014 the French State commissioned the STGO consortium[16] lead by Artelia with producing a digital model designed to showcase French expertise in Sustainable Cities to the export market.

But just where are we at in terms of French excellence in sustainable cities: our major urban utility corporations? Our digital innovation? Our start-ups? Our perception of the city? Our urban projects? Our engineering in terms of heritage and tourism? Our urban renovation? Our governance?

Only one thing is sure: with a world-city like Paris, a dozen large urban centres, 270 towns with more than 30,000 inhabitants as well as our tropical cities overseas, France hosts a unique urban culture. And we were going to prove this in Santiago (Chile), a partner city.

## THE FOUR SIDES TO THE CITY AND ITS STAKEHOLDERS

The sustainable city demonstrator is the fruit of constant consultation with the Santiago departments and Carolina Toha, the city's Mayor, whose investment in research is praiseworthy indeed: the demonstrator has been designed by and for an elected female representative of a large urban area. It is underpinned by the day-to-day realities of the city and meets the precise needs of its services and inhabitants.

This Franco-Chilean joint venture focuses on four lines of thinking:

### 1. SCAN

Elected representatives and citizens alike are eager to know how their city is performing and to understand which subjects require priority action.

The interactive 3D stroll in the demonstrator sweeps over ("scans") the city's characteristics, now and in the future, and provides all of the information required to craft a sustainable and inclusive urban policy.

11 keys to a sustainable city open doors along the way to the urban, social, economic, environmental and cultural factors that are crucial to the city's existence.

70 indicators assess Santiago's performances and compare these with other cities, forming a comparative database intended to be added to over time so that it ultimately provides a global benchmark on the city.

16. Artelia; Veolia (2EI); Architecture-Studio; Arte-Charpentier; Siradel


The 11 keys to a sustainable city: the framework behind the whole demonstrator

## 2. STRATEGIES

Based on the results of the Scan, it is possible to consider the joint development of solutions around an integrated urban strategy. In Santiago, Carolina Toha has decided to use this approach for the urban motorway Panamericana which cuts the city in two – resulting in a social and spatial divide.

Two urban projects have been staged and assessed over a 350-hectare site. Through the strategies developed, the demonstrator gives visitors the chance to see what these different urban development scenarios would look like by comparing their impacts.

## 3. SOLUTIONS

The demonstrator goes even further by presenting the most innovative urban solutions within the development project and their benefits in terms of improving how a city is run, its living environment and the use made of it.

These solutions are spelled out across the 11 keys to a sustainable city which bring together 40 solution packages. 70 factsheets back up this interactive exhibition of urban solutions.

## 4. HOW FRANCE CAN HELP

The demonstrator's catalogue is a fully-fledged showroom of the services available in France, collected over a public website.

130 companies are thus listed in the demonstrator, offering 200 products in all, across eight different themes.

# DIGITAL INTELLIGENCE AND URBAN SERVICES: WHAT WE CAN LEARN FROM RESEARCH

## DIGITAL MODELS ARE A POWERFUL TOOL FOR GETTING TO GRIPS WITH A CITY'S COMPLEXITY

Santiago Deseado is an undeniable technological feat in the way it combines the production of 3D data, incorporation of all sorts of information from a wide range of sources, visualisation of the urban project and the design of optimised 3D browsing in real-time for viewing the possible solutions. All to ensure a user experience that is as instructive as it is enjoyable.

For the first time the demonstrator brings together such different stages of a sustainable city as identification of challenges, intercomparison of cities, design of an urban project, innovative urban infrastructure – right down to the company that is able to provide a solution to each need.

This federation of stakeholders, scales and products, organised according to a clear, illustrated and coherent process, shores up the sustainable city policy, communicates it and incorporates it in a shared process between services and citizens.

It has also enabled Carolina Toha to gain a very complete picture of her city's performances, its end goals and the means to achieve these through the 11 keys to a sustainable city. A presentation by the Mayor at the Grand Palais for the 2015 Paris Climate Conference, on 8 December 2015, showed just how effective digital models are at getting messages across and at connecting up the different subjects forming the backbone of a sustainable city – all the while addressing each of their complexities for all that.

Our number one aim was that the demonstrator be the tool of elected representatives and that it present their vision of a sustainable city to technical audiences, partners and citizens.

## PROMOTE THE POSITIVE CHAIN OF A CITY'S CO-DESIGN

French expertise as regards sustainable cities mainly concerns our methods for placing human, economic and


environmental subjects in their proper context, our ability to translate these into a partnership-based urban project and our excellence in terms of building or operating urban services.

The demonstrator links all of these various aspects together with coherence ensured across the board. It shifts from one setting to the next coherently and smoothly.

This means that the decision to develop such and such a service is no longer isolated in its sector-specific purpose, but backs up an overall urban project which itself stems from a complete territorial analysis.

Each of the city's themes is thus accentuated by its environment and the part it has to play in an overall development process.

In Santiago the demonstrator is now considered a must-have tool for federating the city's different departments which previously got on with their own work without consulting each other. Artelia is an engineering partner involved in a great many Eco-City and Eco-Neighbourhood projects where the biggest challenge is always how to remove the barriers between subjects and stakeholders: the demonstrator lends an invaluable hand in the system-wide management of cities.

## STEPPING UP THE ROLE OF PUBLIC UTILITIES

Using the sustainable city demonstrator is a way to present the urban utilities in a logical continuity of the scan of the city's performances and associated urban projects.

As such, these are no longer studied on a one-to-one basis, but during a stroll through an interactive urban project resulting from the objectives identified in the Scan.

Each urban utility thus becomes the consequence of an overarching policy that it helps to achieve. It is no longer an isolated product addressing but one of the city's themes.

This is what constitutes the demonstrator's main strength as a showcase of French expertise on urban utilities:

The 70 technical solutions, grouped under 40 solution packages, open and close along an interactive 3D stroll to contribute to the overall increase in urban performances decided beforehand and recommended in the urban project.

In this way, public utilities become interactive and connected in a common process that is very easy to communicate and has garnered the approval of elected representatives.

# TO SUM UP...

What the digital urban model does, therefore, is to link up the city's intelligence with all of its public utilities by clarifying the contribution each one makes to overarching sustainable ambitions. This is a new way of designing the city, no longer on the basis of an overall project underpinning the utilities, but in a process where the focus is constantly switching back and forth between planning, urban projects and public utilities.

This has all only recently been possible thanks to the 3D visualisation of actions, data and services. It is along these lines that we believe the way cities are designed will change considerably – progressing from the planning of wishes to the staging of choices – by encouraging the necessary confrontations for participatory cities to emerge.

## WANT TO FIND OUT MORE?

**Watch the film on the Santiago demonstrator on the Artelia Group's website, under Vidéos: arteliagroup.com/fr/telecharger-publications/videos**

# Achieving shared intelligence of complex phenomena through virtual experimentation: the example of runoff and erosion in a small watershed

By Patrice Garin, IRSTEA UMR G-EAU; Véronique Souchère, INRA UMR SADAPT; François Ouvry, AREAS and Vincent Martin, AESN

## INTRODUCTION

Digital intelligence is supposed to boost human intelligence – particularly when broaching the subject of territorial management. The aim would be to increase the amount of information available, its process and dissemination, by taking advantage of technological (Web 2.0, social networks, Big Data, smart devices, etc.) social (e-democracy, smart cities, etc.) and regulatory (Open Data, etc.) developments alike. We must be careful, however, that the recurring challenge of a shared, and therefore debated, understanding of the complex social and ecological processes behind the problems in territories does not get forgotten about in amongst these masses of information. Digital intelligence efforts must also be directed towards developing opportunities for different takes on the dynamics observed to be compared – in contexts where knowledge and expertise are scattered between numerous stakeholders and institutions within territories. Such intelligence needs to help these myriad stakeholders to take a joint, non-sector-specific approach to exploring the development options and their technical, economic and social consequences at different scales. Training them in understanding phenomena and in the range of possible solutions is the first step to getting a new form of management underway in watersheds based on "hydrosolidarity" (upstream/downstream; urban/rural, etc.).

With this in mind a research-action initiative has been launched on the problem of erosive runoff in the Pays de Caux region: the SURGE project as part of the larger Water and Territories programme (Arnould & Gascuel, 2016). The aim is to develop a teaching aid on the interactions between the biophysical processes of water flow, technical and economic arguments of several different stakeholders (farmers, mayors, landowners, etc.) and public policies (agriculture, urban planning). The approach entailed a companion modelling approach and jointly developing with the stakeholders concerned a tool for working together on the challenges of erosion, gentle hydraulics and urbanisation. The tool is presented in the form of role playing game (Ruis'eau) as a way for farmers, mayors, watershed and water authorities to discuss and share ideas. It includes a computer module for simulating erosive runoff and its economic and social consequences from the scale of the farm to the water utility and right up to sub-watershed level. The digital tool thus supports a social learning platform which displays the stakeholders' arguments and constraints as well as the individual and collective effects of development scenarios designed by the participants.

## EROSIVE RUNOFF IN THE PAYS DE CAUX REGION

The Seine-Maritime département in the north of France is often affected by recurring problems linked to erosive runoff (gullies, muddy floods, turbidity of drinking water, etc.). Expanding ploughed fields and urban areas upstream of watersheds, to the detriment of grasslands, are exacerbating the damages downstream (muddy floods, sharp rise in the turbidity of water, etc.). The reasons behind these changes in land use are primarily economic: stockbreeding is not as profitable for the farming sector as arable crops and such land is not worth as much in a context of high urbanisation pressure. These short-term economic arguments of farmers and municipal mayors upstream are only partly offset by territorial planning tools (PLU, SCOT, SAGE or river contract in France).

What characterises this erosive runoff process is a separation between the runoff production zones upstream of watersheds and soil depletion zones downstream. Tackling it requires a coherent combination, watershed-wide, of actions falling within public policies that are too sector-specific (agriculture, urban planning, water management). And yet many sites demonstrate a lack of spatially organised actions founded on watershed solidarity. Erosion is not perceived to be a collective or public problem, rather no more than a private or local inconvenience between farmers, or between farmers and urban dwellers. It's not that easy to climb aboard a collective preventive approach when people do not feel personally affected to any great extent or are not aware of their own responsibilities. Watershed authorities therefore struggle to set up gentle hydraulic developments upstream to minimise the problems at source (such as grasslands in thalwegs and grass strips, hedgerows or fascines on ploughed fields). These give precedence to local curative solutions downstream (retention basins protecting residential areas). Devising a collective way of managing zones is therefore a real challenge, especially since this environmental management, which depends to some extent on the natural processes to be controlled, does not leave the stakeholders free to choose who they wish to work with. Given this context, consultation as a management approach makes every sense, with the creation of group discussion forums strongly encouraged. Within such groups, the participants – who are not initially aware that their interests may align – have a chance to compare their views of reality and to discuss an intersectoral action plan for sustainably managing the resource.

## COMPANION MODELLING

As part of the SURGE project (Water and Territories programme), a companion modelling approach (Etienne et al, 2010) has been launched in the territory of the Cailly-Aubette-Robec SAGE (Water Management and Development Plan). This approach has gone through several stages, alternating between field sessions and in-laboratory sessions. It began with a stage setting out to identify local stakeholders who were trained in the approach and with whom we share a challenge concerning this territory:

"How can gentle hydraulic developments be implemented in the Haut-Cailly territory, so as to limit the problems of erosive runoff and turbidity of water at abstraction points, in conjunction with larger-scale structures installed by local authorities to protect against more serious problems?" We then worked together on designing a conceptual model of how the territory functions and of how processes linked to runoff are triggered – in line with their experience and perceptions. This model was referred to for the participatory construction of a digital role-playing type animation device for: i) illustrating the phenomena of erosion and the effects of developments at plot level, as well as their continuities up- and downstream; ii) highlighting the competing and interacting forces between farming, environmental and urban practices; iii) and sparking debate about the possibilities/drawbacks of different forms of solidarity for reducing the risks of erosion.

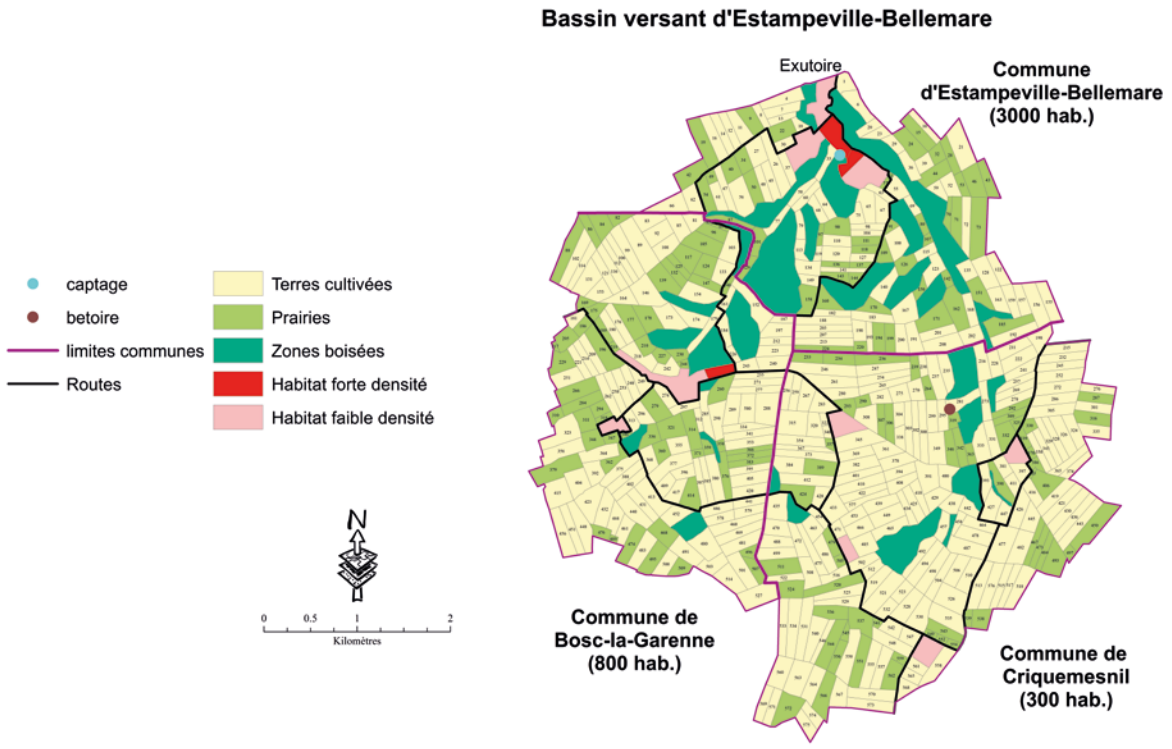



Figure 1: Land use map of the fictional watershed in the role-playing game "Ruis'eau"

# RUIS'EAU, A SHARED INTELLIGENCE TOOL FOR EXPLORING VARIOUS DEVELOPMENT OPTIONS

Over a period spanning eight years, the aim of this role-playing game is to put a concerted form of territorial management into practice so as to control flooding and muddy floods in urban areas, do away with gullies on farmland and improve the drinking water quality at an abstraction point. It allows thirteen players to explore the future of a small watershed covering some 2,500 hectares, typical of the watersheds found in the Pays de Caux region and subjected to the development decisions they make. On this small virtual watershed (Figure 1), by playing simplified roles of mayors, farmers and watershed advisors or water authority representatives, the participants are able to see the physical (runoff, erosion), economic (costs of pollution and other disturbances as well as of developments) and social consequences (protests from other players) of the personal or collective choices they make. The virtual territory, roles, actions and game formats have been designed so as to pit different uses within the system against one another while giving future players the opportunity to test their solutions (Figure 2). The game has deliberately been developed around an economic dimension, identified as the main obstacle to solidarity. The costs and revenues from the different activities are adjusted in line with real-life proportions. The farmers need to secure their income and the institutional players need to balance their budgetary expenditure. Farmers' incomes are calculated based on the type of holding, and vary depending on crop rotations and the size of gullies created by concentrated erosion, the land coverage of gentle hydraulic developments, the payment of easement fees associated with compulsory purchase orders or depending on the land transactions carried out. The water and watershed authorities do not have an endless flow of cash for implementing their developments, and need to prioritise certain choices over others. For the water authority, any debt is reflected in an increase in water bills.


Figure 2: Example of cards designed for negotiations and decision-making

All technical operations have a cost which varies depending on the type of development and type of agreement signed with the farmer (MAE, DIG, etc.). Flooding damage has a spin-off effect on municipal budgets. If mayors find themselves in the red, they can either impose a capital gains tax when land is sold off, or increase local taxes. The economic dimension must make it possible to put the shortfall into perspective and to decentralise the argument on technical and economic constraints. The game is innovative in the way it places the economic situation of farmers on the same footing as that of local authorities, with a particular view to facilitating a mutual grasp of each other's constraints. For each round, representing one year, the digital model brings together all of the players' land and development choices, calculates the erosion and the economic consequences for all of them and shares the findings with them via different indicators in the form of maps or figures. The players are then encouraged to discuss their individual and collective behaviours during this virtual interval before talking about their real experiences so as to continue the debate on the conditions for a solidarity-based approach to combating erosive runoff.

## SOME FEEDBACK FROM TERRITORIAL STAKEHOLDERS

The end of this research action meant that it could not be used with the farmers and mayors of municipalities actually affected. The game was put to the test and used with two participation groups of researchers and practitioners before being tested with the Seine-Maritime water stakeholders who had co-developed the model. Their reactions confirm at once the educational potential of this digital game to help the participants grasp the intricacy of agricultural and urbanisation dynamics, the importance of the different scales from the plot to the watershed and the contrasting arguments of the various stakeholders. They also highlight the importance of the participation group's capacity to explore development and planning options together – i.e. the chosen combination of solutions that still have too much to do with separate sector-specific policies: urban planning, agriculture and hydraulic structures. Information technology is a key tool at this "trial-and-error" stage bearing on these options, for calculating and showing what their multiple effects would look like, in different formats (indicators in the form of figures or mapping for example). In this way it provides food for thought for the different participants' arguments during the debating stages which conclude the exploration of options and thus helps to improve collective intelligence on a potentially controversial issue. Some limitations were raised however, for example they found the game a little too long for raising the awareness of so few farmers at each playing session, and organising the sessions was problematic, in terms of finding the expected number of participants. What now needs to be proven is that this knowledge and expertise gained through this group exercise for developing a virtual territory will actually be put to use when planning specific, practical action in watersheds where these issues are a problem.

Figure 3: Photos taken during a test-run of the game with researchers

## BIBLIOGRAPHY

**Arnould P., Gascuel C. (Dir Scient) (2016), *Eaux et territoires agricoles : dépasser les contradictions ? Résultats de sept projets de recherche*. Coll. "RéférenceS" - DRI/CGDD – MEDDE. Janvier 2013. ISSN : 2102-474X. 82 p.**

**Etienne M. (ed) (2010), *La modélisation d'accompagnement. Une démarche participative en appui au développement durable*. Editions Quæ, 384 p.**

# Systemic Urban Modelling tailored to the Water sector

By François Grosse, ForCity; Christophe Perrod, SEDIF and Denis Chanteur, VEDIF

Until the end of the 1990s, drinking water consumption per capita was on a constant upward trend in France. But this has since switched to a general downward trend, which can be explained by a great many factors including changes in household habits and domestic appliances which have become vastly more energy-efficient over the past two decades. For local authorities or delegates, hand in hand with this reduction in consumption comes a reduction in revenue, in a profession where fixed bills account for a significant proportion of costs. Decisions concerning plans to replace or extend structures, or concerning their size, become that much more complicated as a result.

What makes them more difficult still is that, on top of all this, there are pressures in terms of budget, regulations, the environment or acceptability – with society becoming ever less tolerant of mistakes.

More specifically within the Paris region (Île-de-France), the territory's geography will undergo substantial change over the next two decades with the plans for Grand Paris (Greater Paris). Modernisation of existing transport lines and construction of a new automated metro covering 205 kilometres around the capital, called Grand Paris Express and eventually calling in at 72 stations, between 2018 and 2030, will significantly redistribute the population.

This is because accessibility – i.e. the transport services available (how many, how often, etc.) is one of the determining factors when choosing where to live. As such, the arrival of public transport means will generate high demand for real estate which in turn will alter the way land is made use of, increasing urban density in highly accessible areas and dispersing craft or industrial businesses to the outskirts of these areas. In the same way, the sociodemographic distribution of these areas is going to shift towards a gentrification and increase in the average age (because of the statistically higher purchasing power of this age group). This means that needs in terms of services – schools or nurseries for example – will also change.

All of these facts and trends tell us that the requirement, i.e. the demand, for water across the territory is likely to alter dramatically in one way or another, and that this demand will stem from a whole host of antagonistic phenomena – most of which have nothing directly do with the water sector itself.

In light of this, it must be noted that new capacities are available for helping make the right decisions. These are associated with the breathtaking development of digital technology, and more particularly three phenomena:

- The development of M2M (Machine to Machine or Internet of Things) which has made it possible to run networks of water meters for a reasonable price to collect more reliable information at greater frequencies and thus to gain clearer knowledge and understanding of consumption patterns;
- The development of cloud computing, especially the capacities to divert memory or the calculation capacity on large-capacity remote terminal units. With this approach it is now possible to access amounts of data that were inconceivable just a few years ago, from a basic device (PC or tablet for example);
- The development of systemic modelling capacities thanks to which systems, actions and models can now be coupled and new solutions found, shaking off the narrow-minded silo-based approach by analysing scenarios according to several criteria.

It is in this context and with these facts in mind that SEDIF and Veolia got in touch with ForCity (a start-up offering an innovative systemic modeling approach). ForCity has been working in Lyon since 2014 on a project that Grand Lyon (Greater Lyon) had entrusted back in July 2014 to a consortium of companies represented by ForCity and made up of Veolia Recherche et Innovation, EDF and The CoSMo Company. The resulting project will be called MUG for *Modélisation Urbaine Gerland*. ForCity has acquired considerable expertise in modelling and model coupling. Its business purpose is to equip public decision-makers with a digital platform allowing them to simulate the possible impacts of their future development choices at the scale of the territory

of Gerland. What makes the platform original is the way it encompasses all urban sectors including transport, waste, water, energy, roads, cleanliness and business location for example.

In 2015 SEDIF, Veolia Eau, VEDIF and ForCity jointly embarked on a project to address these various issues by applying the systemic urban modelling approach to the water sector through an ambitious project called MUSE, which stands for *Modélisation Urbaine Systémique adaptée au domaine de l'Eau*.

MUSE sets out to develop, at the scale of the territory within SEDIF's remit (then to the Paris region as a whole), a prospective and interactive decision support tool specific to the drinking water distribution sector.

During the first phase of this project an initial design has been sketched out of a modelling chain combining a prospective urban model representing the changes in terms of a territory's population and activities, a drinking water consumption model and a hydraulic model for managing supply mains.

Indeed, the Grand Paris project will lead to new business hubs and centres of attraction in the Paris region, drawing more local residents to the first- and second-ring suburbs, particularly in areas within SEDIF's remit. Some of these high-development-potential areas are located at the end of distribution grids or on secondary grids with limited capacity, such as the Plateau de Saclay. It therefore needs to be possible for growth trends in these areas over the long term to be simulated so that the necessary adjustments to the grid or the way it is managed can be anticipated, in response to the local increase in needs.

Thanks to the solution developed through this partnership SEDIF is able to describe the "drinking water system" of its territory and to simulate a great many scenarios by planning key technical and political actions over time and incorporating these into scenarios bearing on the changing urban landscape which factor in the main decisions or main sector-specific developments external to the "drinking water" system.

SEDIF is using this decision support tool to shore up the development plan for its grid for the purposes of cost rationalisation (layout and sizing), plan extension work as effectively as possible (pooling of roadworks, simulation of support solutions) and thus provide an ever higher standard of service. This tool is also a fully-fledged governance tool for SEDIF, encouraging as it does so consultation and communication and providing evidence of high-quality asset management.

Developed during an initial project phase over two test zones located in the North and South of SEDIF's jurisdiction, the decision support tool is ultimately intended to be used across the whole of public utility delegation.

This approach can also be used to tackle the management of a range of highly complex problems, especially to enable, for example, an integrated and exhaustive approach to all anthropic activities within the water cycle to ensure the very best management of the resource.

Figure 1: 3D visualisation of data characterising the territory and its trends (via a timeline)

Figure 2: Creation of scenarios using a Gantt chart

Figure 3: Prospective comparison and analysis of scenarios

# BIBLIOGRAPHY

**Grosse F. (2010), *Is recycling "part of the solution"? The role of recycling in an expanding society and a world of finite resources*. SAPI EN. S. Surveys and Perspectives Integrating Environment and Society, n° 3.1.**

**Grosse F. (2010), *Le découplage croissance/matières premières. De l'économie circulaire à l'économie de la fonctionnalité : vertus et limites du recyclage*. Futuribles, n° 365, p. 99-124.**

**Grosse F. (2011), *Quasi-Circular Growth: a Pragmatic Approach to Sustainability for Non-Renewable Material Resources*. SAPI EN. S. Surveys and Perspectives Integrating Environment and Society, n° 4.2.**

# Chapter 3

## The need for an inclusive and decompartmentalised approach: progressing together

# INTRODUCTION

The potential of the digital transition comes from the amenities provided for promoting projects understood in a global and interdisciplinary manner, and by playing on inclusion, in terms of territorial and company management alike.

The methods and challenges of inclusion and interdisciplinarity must still have favourable cultural conditions. This is what the different initiatives introduced in this chapter are targeting.

First of all it is about promoting international standardisation in the creation of professions in digitisation, like that for water (AFNOR – French standardisation association).

It is also about an administration of public utilities actively open to discussions with territorial partners, with concrete examples developed by Belaïde Bedreddine (interview with the President of the SIAAP - Paris region waste water authority).

Questions regarding training are at the heart of cultural integration policies and very lively initiatives like the ones from AITF - Association of Territorial Engineers of France (interview with Patrick Berger), from ATTF - Association of Territorial Technicians of France (interview with Fabien Le Port) and from the Ecole des Ingénieurs de la Ville de Paris (text by Youssef Diab), show how fruitful this path can be.

Territorial or company policies can be resolutely directed towards listening, partnership and sharing ideas. It is this kind of digital transition territorial policy which Hervé Marseille, President of Syctom, is calling for, in his interview. It is also what the proposal from Arnaud Tréguer, regarding the partnership policy of the Saint-Gobain PAM company in the areas of digital and smart cities, is illustrating. Lastly, it is what is being practised by the Paris&Co open innovation, the economic and innovation development agency of Paris (text by Marie-Xavière Wauquiez).

In advance of the reconstruction of value chains, the question of the updating of current chains and their foundations, possibly affected by “cognitive bias”, is raised too. The stakeholders of the water sector, brought together by the French ministries of the environment and the economy in the Water working group from the eco-industries industry strategic committee (CSF), draw inspiration from a method promoted by behavioural economics, “nudges”, helping hands to get rid of these biases which hamper and counter the ecological and digital transitions.

We know that, generally, it is the territorial approach in the wider sense which is the basis for the best responses to local public utility challenges, however “urban” they are. This is especially true for the role of digital intelligence which allows for new efficiencies on the issues of resources and resilience, as soon as we can offer holistic territorial assessments… but also specific ones, like those which the two texts from the INRA (French National Institute of Agricultural Research) and the IRSTEA (French National Research Institute of Science and Technology for the Environment and Agriculture) mention.

# Hydrometry in the Meuse/Moselle rising water prevention department (SPC)



By Philippe Battaglia, DREAL Est

## THE HYDROMETEOROLOGICAL NETWORK

Over a given territory, a single State department, most often the DREAL, produces all the hydrometeorological data responding to various needs. The French hydrometeorological network has several different roles and the same station can have several uses. **The general knowledge network** lets you know the hydrological features whatever the circumstances, carry out monitoring reports and display hydrological indicators, especially useful to the Prefect's departments, so they can manage crisis situations linked to drought. **The flood forecasting network** is more directed towards providing information in real time on the water level in periods when it is high. Everyone knows about Vigicrues(www.vigicrues.gouv.fr), which is freely available via the internet (Figure 1). We distinguish the warning stations, upstream of the high-stakes sectors, from the forecasting stations based in the towns where floods are frequent, or ones where the consequences are significant. **The international networks**, which particularly have five stations on the Moselle River and one on the Meuse River, are used by countries located downstream of these international major rivers, in order to manage high and low water levels.

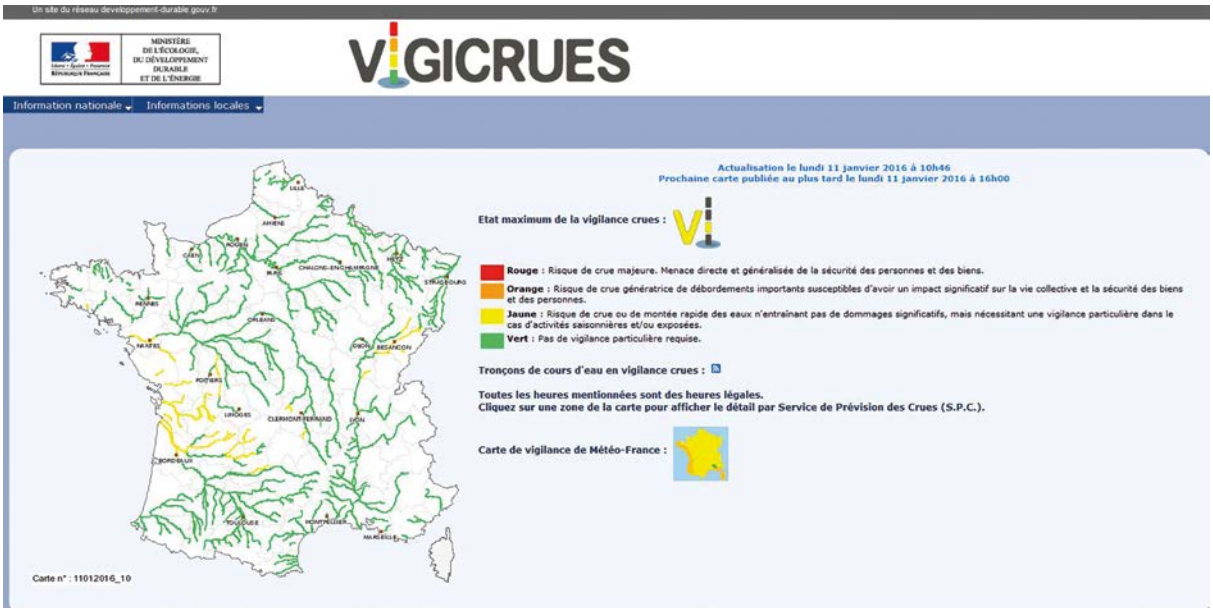



Figure 1: Vigicrues website

The water level (discharge calculation from a height measurement) and flowmeter (calculation of the discharge from runoff speed measurements and a height measure) stations serve to produce continuous logs of the water heights and discharges. The precipitation stations in the upstream watersheds, in addition to the Météo France network, provide rainfall data.

This network is constantly developing with the creation of new gauging stations and the improvement of measures in the existing gauging stations. Figure 2 gives the example of two types of station. The high-stakes stations have two sensors for a redundant measurement. When the sensors are near to bridges and in eddies, they are gradually complemented by sensors upstream, where the water level is more stable and better controlled. The hydrometeorological network over the watersheds of the Moselle River and the Meuse River is made up of a hundred and fourteen gauging stations and thirty one rain gauges. By way of an example, over the last three years, a station was built in Corny (Moselle River), with a flow measurement via ultrasound and transit time. This station, in the canalised Moselle River, slightly upstream of Metz, commissioned in 2014, is based near to a sector that has to cope with great human and economic challenges during rises in water levels. Another gauging station was created in 2014 in Châtel-sur-Moselle (Vosges), between Epinal and Tonnoy, to better anticipate the arrival of rises in water levels coming from Vosges. Three new flowmeters, designed to better manage the rising water levels, were installed in June 2015 in Charleville-Mézières, to manage the relief during floods.

The data from the network is sent at a set frequency (four times per day under normal circumstances, as many times as necessary during a crisis) to the flood forecasting PC whatever the circumstances. The network is secured with a twin power supply. The raw data is stored in a hub where it is pre-validated before being used by the hydrological forecasting models for flows and to provide "real time" data made available to industrial or institutional users and the general public. After validation, this data is fed into the "Hydro" heritage databank which makes data on the water levels and flows freely available to the public (www.hydro.eaufrance.fr) (Figure 3).

*Water level station with solar panel upstream of a weir*

*Hydrometric station of Hagondange on the Moselle River: water height measurement with two radar sensors under a road bridge*

Figure 2: Two types of station


Figure 3: HYDRO website

By way of an example Figure 4 shows the variations of water height and discharges of the Moselle River (in Epinal) and of the Doubs River (in Besançon) at the start of January 2016.

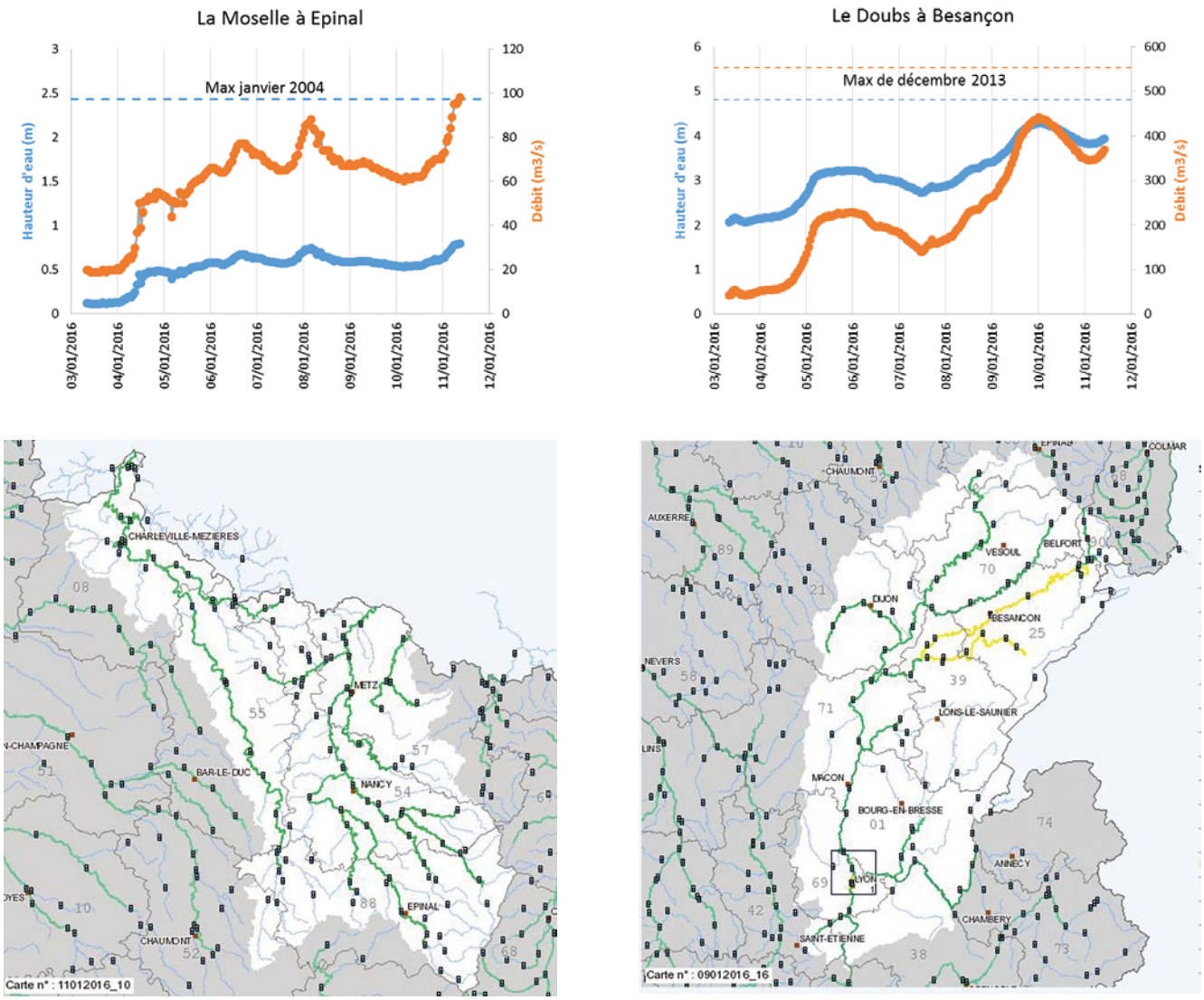



Figure 4: Variations of water height and flow of the Moselle River (in Epinal) and of the Doubs River (in Besançon) with the corresponding warning maps (the start of January 2016)

# THE PROFESSIONS

Hydrometry is managed by the regional DREAL branches under administrative supervision of the SCHAPI (Central Hydrometeorology and Flood Forecasting Support Service). In the watersheds of the Moselle River and the Meuse River, the team which manages this network is, overall, made up of ten people split into two units with different missions. The **maintenance** staff ensures the proper functioning of the hydrometeorological stations, while the **hydrometry team** provides the data on the heights and flows (l').

The **maintenance team** is made up of five people. On a daily basis, it is in charge of monitoring the proper working of the stations and reducing the length of breakdowns to a strict minimum. To do this, the main tasks consist of doing preventative maintenance (periodically replacing consumables and sensors,

as well as maintaining the stations) and, of course, curative maintenance (intervening and solving the problem quickly in the event of a breakdown). In addition, the maintenance centre carries out the developments required by various users, with, in particular, the design and creation or the project management of new measuring devices. The main aim is to ensure a constant transmission of data measured and to reduce the non-operational periods. Maintenance also occasionally takes part in the gauges.

The other profession is **hydrometry**, which is geared more towards measuring. Five people are specifically involved in these tasks. The field activity consists of carrying out gauging (instant measuring of the flow by exploring the velocity field) with equipment adapted to the runoffs. Then, there is the important work creating the rating curves (height/flow relationship) and pre-validating the height/time data. This allows for the rapid provision of water height and flow data to the users of "real time" measuring, for forecasting floods, managing water abstraction and waste, as well as for the general public. To complete their work the hydrometry technicians assess, confirm and bank the data afterwards, for storage in a "heritage" database, the "hydro" public and free database.

This data then makes up the reference in terms of flows and water height to calculate the typical flows of rivers (module, low and high water level flows).

The hydrometry technicians each manage a watershed of several tens of stations. Their main tasks consist of planning, carrying out and confirming the gauging of their stations and also working on the data coming from the continuous measuring (assessing, validating, banking, managing rating curves and "grass" corrections, etc.).

## OVER A YEAR...

For 2014, 621 discharge measurements were taken over the watersheds of the Moselle River and the Meuse River, including several tens during periods of high water. Such measurements were also carried out at regular intervals through the summer to characterise the low water levels and measure the influence of the grass on the water level, in order to calculate low water level flows as accurately as possible in real time.

In addition, gauging campaigns for specific low water levels were carried out on the iron producing basin to better understand the hydraulic profiles, following the flooding of the mines, and on returning to a "natural" hydrologic situation.

The maintenance technicians carried out 303 preventative and 260 curative interventions on the stations of the hydrometeorological network in 2014.

On a daily basis, the hydrometers correct then pre-validate height/time and flow/time data in the data hub for use in real time. They ensure the publication of the "bulquo", the daily report of the specific hydrologic situation at the Lorraine DREAL. This data is then used to make the flood forecasting models work. The results of forecasts are assessed and validated before being fed into the "Vigicrues" site twice a day during the "normal" period and up to four times per day in serious flooding periods, 365 days per year. Moreover, hydrologic monitoring reports are published on national and regional levels, to give information on the run-off conditions of rivers. The monitoring of the run-off conditions is strengthened during low water level periods.

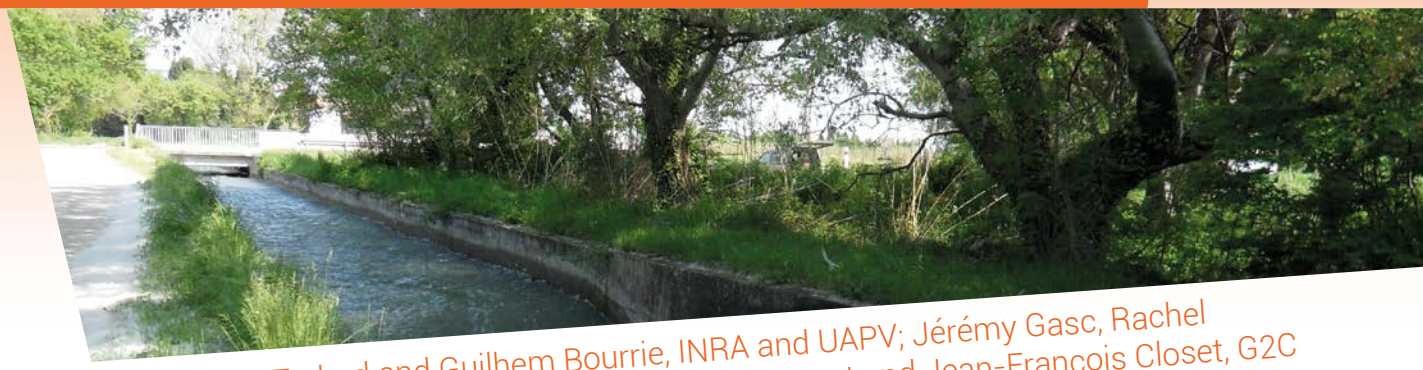
Experienced members of the team are involved in several working groups of the SCHAPI to design network and hydrometry equipment monitoring software (SAMHY), to redesign the hydrometry quality charter, for the inter-comparison of gauging equipment and to help the local authorities to develop their warning networks.


astee.org/site/wp-content/uploads/2016/04/Prévision-des-crues-def-HD-720p.mp4

Drag gauge

Crane gauge

# Territorial resilience: the input of integrative modelling for land and water resources



By Fabienne Trolard and Guilhem Bourrie, INRA and UAPV; Jérémy Gasc, Rachel Jouan and Jean Lecroart, Artelia Eau & Environnement and Jean-François Closet, G2C Ingénierie

## INTRODUCTION

Urban sprawl, which is carefully overseen by planning documents in developed countries, or more unchecked in emerging countries, leads to the disappearance of agricultural spaces and/or makes soils unsuitable for agriculture, modifies the local water cycle and fragments natural habitats. In some territories under pressure, in particular vis-à-vis the water resource, urbanisation is already putting in danger the availability of local resources (land & water), the associated eco-systemic services, the agricultural potential and, in so doing, territorial food security. The effects of climate change can amplify the consequences of this process. The climate determines the intensity of the processes in the terrestrial critical zone, *i.e.* the area going from the groundwater table to the summit of the canopy, defines the eco- and agro-systems and, via feedback, determines the eco-systemic services. The current warming dynamic is leading to an increase in rare meteorological events (greater variability in space and time) and a modification in regional trends: both of precipitation (quantity & seasonal distribution) and temperatures (averages & ranges).

Therefore, "the way in which the territory positions itself as regards these pressures and the scarcity of resources, such as soils and waters, that cannot be obtained elsewhere (land and water), will become determining in the assessments that investors will make of its appeal and the security for operations which will be committed to there"[17] (Astuce & Tic, 2011).

Faced with these global changes, the local authorities and stakeholders who make decisions in terms of territorial planning need an integrated approach based on scientific measures to: (i) consolidate the knowledge on the state of the territory's resources (ii) quantitatively assess, over the medium term (*e.g.* 20-30 years), the impacts of urban development and climate change on the local resources and eco-systemic services of their territory; (iii) manage the dialogue between stakeholders with factual representations of the territory and scenarios to be shared.

The needs thus expressed by these end-users are (i) to secure and justify the development choices and (ii) to have a framework that can be shared (a robust, factual and quantitative diagnostic) for decision-making.

Securing development choices involves:

- The capacity to compare the different options and their implications,
- Support for the revision of options over time,
- Support in controlling urban sprawl,
- Anticipating consequences and identifying measures to take, faced with climate change,
- Support in their agricultural development choices.

The provision of a shareable framework involves:

- The creation of materials and representations of the accessible information,

17. Key figure: cost of the degradation of environments and the reduction in services provided by ecosystems for European economic growth = at least 7% of global GDP in 2050 excluding climate change.

- The capacity to state the legal obligations and regulations locally,
- Analysis and modelling tools developed enough to deal with questions in their complexity.

Today, the existing tools are essentially sectorial and do not take into account the interrelationships between the different systems and sub-systems of the landscape mosaic representing the territory (Trolard et al., 2010). Figure 1 summarises the main areas to consider and their principal interactions.

With the progress in computing and digital processing methods for data, modelling of processes and of ecosystems, as well as their algorithmic translation, are experiencing clear progress, thanks to the convergence of studies undertaken by specialists, each within their disciplinary field. Yet despite significant summarising efforts, notably faced with climate challenges (e.g. IPCC, 2013) and environmental challenges around biodiversity (e.g. European Commission, 2008), these collective productions do not allow for the specific visualisation of the impacts on the resources of planning choices of a given territory; as such the managers and decision-makers lack the operational analysis that they need to make decisions.

A response to this need for an integrated approach has been considered, created and then tested in a demonstration territory, the Crau plain in the south-east of France. It is currently undergoing development thanks to the work of the Astuce & Tic (2008-2011)[18] and PRECOS (2013-2015)[19] consortiums.

It is the PRECOS approach, which summarises below, one the one hand, the implications in the use of digital, and, on the other, its deployment and handling by the local stakeholders.




Figure 1: conceptual diagram of the interactions between areas of competence to be considered to create the integrative approach and the associated software architecture of PRECOS

18. Astuce & TIC Consortium: FUI programme (2008-2011) "territorial vulnerability and risk management" certified by the competitiveness hub, the partner companies of which were G2C Ingénierie, MEED SA, Orange Lab and the academic institutes: the INRA and Aix-Marseille University (UMR Cerege).
19. PRECOS Consortium: pathfinder 1 (2013-2014) and pathfinder 2 (2015) financed by Climate-KIC (European Institute of Innovation and Technology) the partner companies of which are: Veolia and Artelia and the academic institutions: the INRA, the IBIMET (Italy) and Imperial College London (UK).

# PRECOS (PREDICTION OF THE IMPACTS OF CLIMATE CHANGE AND URBAN SPRAWL ON ECO-SYSTEM SERVICES): A RESPONSE TO THIS NEED FOR AN INTEGRATED APPROACH

PRECOS was designed to respond to two major territorial planning challenges:

- The scarcity of resources, above all water and land,
- The decompartmentalisation of sectorial policies affecting these resources (notably town planning rules, managing water, agricultural and forestry policies, etc.)

## THE PRINCIPLES

PRECOS proposes an information processing chain based on the DPSIR[20] principle from the OECD (Figure 2). PRECOS is therefore able to simulate and visualise, in space and according to the time:

- A situational analysis of the environmental assets (natural resources, agricultural yields and access to water) of the territory considered;
- The previsional consequences on environmental assets of projects of future territorial planning, of land use changes and of the climate change

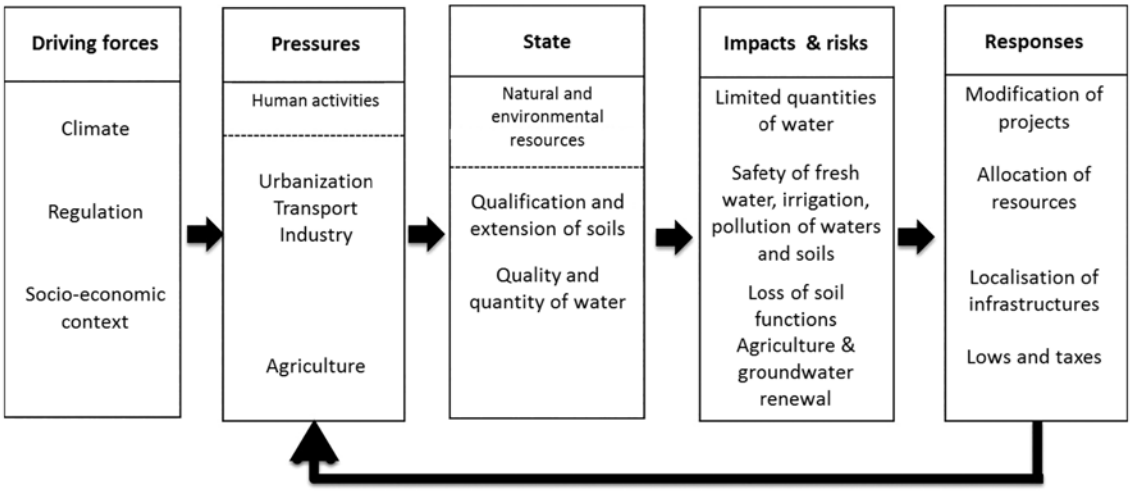



Figure 2: Definition of the DPSIR concept from the OECD for the management of resources: soils and water over a territory

Specifically, thanks to PRECOS it is possible to:

- Establish a situational analysis of a territory for numerous parameters (e.g. land occupation, agricultural qualification of the soils, industrial risks, chemical quality of water, water resources, agricultural yields, the fragmentation of habitats, etc.);
- Recreate the trajectory of these parameters over past periods;
- Simulate possible futures depending on socio-economic scenarios by evaluating the impacts on environmental assets of climatic, agricultural, territorial, socio-economic and regulatory constraints;
- Provide representations of these impacts, accessible to decision-makers to communicate and manage dialogue, via spatial and temporal representation tools (e.g. maps, graphs, tables, etc.).

PRECOS is therefore contributing to better managing shared assets, such as a territory having a hold over a groundwater table serving a multitude of stakeholders, a watershed managed by a water board or a landscape mosaic, in partnership with agricultural actors which maintain and use these common assets.

## THE TECHNICAL ASPECTS OF PRECOS

From a scientific and technical point of view, PRECOS is made up of seven modules which are able to establish and assess environmental indicators in three thematic areas: the degradation of soils, water and soil resources and agricultural production (figure 3).

20. DPSIR = Driving force – Pressure– State– Impact– Response

The calculation software programs were selected according to their robustness, their international audience and the existence of communities participating in their maintenance and their development. These modules are integrated into the software architecture and the interfaces have been established. The entirety of the code of each module was respected, which allows them to be used independently and more in-depth if required. The modular nature of the architecture also allows for the substitution of one module with another or the addition of a new one for new features which, depending on the demand of the end-user, could be better adapted to the local context dealt with (Astuce & Tic, 2011).

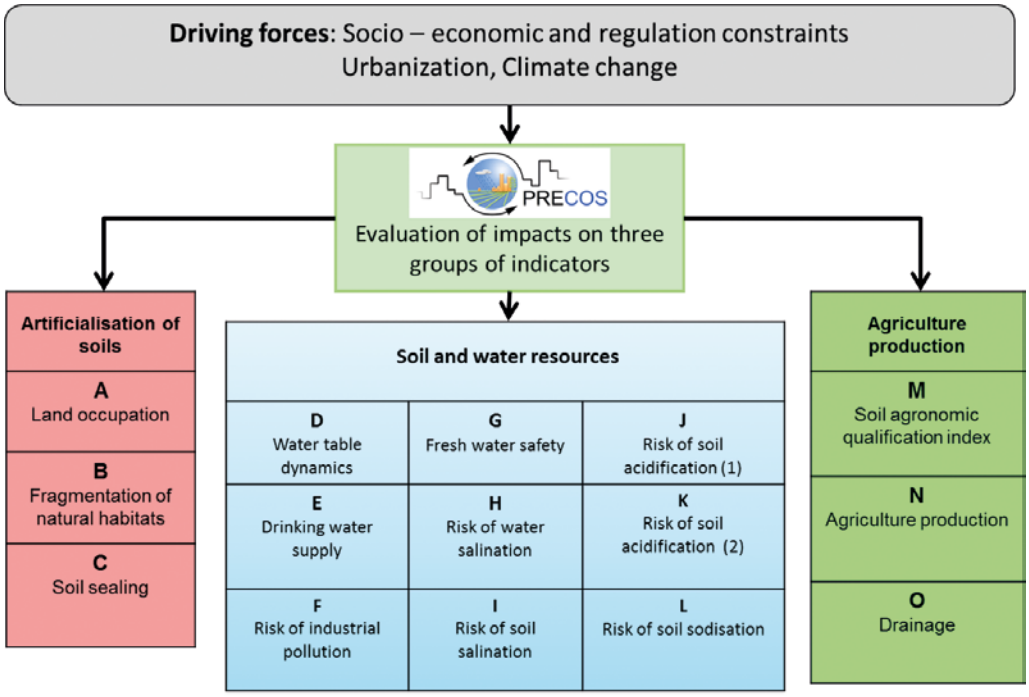



Figure 3: Dashboard of indicators currently proposed within the PRECOS approach

## TERRITORIAL APPLICATIONS

The feasibility of the approach with the Astuce & Tic's prototype was tested and validated in France in a pilot territory: the Crau. It was thus possible to test the data linkage conditions of data that must be mobilised for the modelling chain. The module defining the occupation of the land therefore appears as the key module if the time dynamics of the land usage trajectories and tests of scenarios and researched (e.g. urban simulations can play this role). The scenarios can include hypotheses on future infrastructures, planning regulation, modifications of agricultural practices, climate disturbance, etc.

We therefore show that in the Crau the local socio-economic development is essentially founded on the low cost of water and the abundance of the water resource contained in the aquifer. The cornerstone of the system relies on gravity-fed agricultural irrigation and maintaining the hay irrigated grasslands of Crau's hay (Trolard et al., 2013a). The continued disappearance of these grasslands due to urban sprawl, combined with the effects of climate change and the modification of water allocation for uses that are more urban than agricultural, can significantly compromise the groundwater recharge by 2030[21] (Trolard et al., 2013b, Olioso et al., 2013, Baillieux et al., 2015).

Replication of the approach was then explored in Italy, in the Emilia-Romagna region and, in Spain, in the Valencia region in the context of the PRECOS (2013-2014) project. The work shows that this transposition is technically possible and that the skills can be brought together locally to implement it. For each territory concerned, this replication therefore involves a hierarchized inventory of its critical resources and their uses and sectorial models corresponding to the data available.

21. In Crau, the combination, by 2030, of the A1B scenario for climate change, a 14% reduction in the irrigated grassland areas, a 30% reduction in the amount of water for agricultural irrigation and a 30% increase in drinking water due to the expected demographic growth, is leading to a reduction of the order of 30% in the water supply to the groundwater.

## THE NEEDS AND IMPLICATIONS TO BE IMPLEMENTED FOR THE DEPLOYMENT AND USE OF THE PRECOS APPROACH BY THE END-STAKEHOLDERS.

PRECOS deliberately strives to deal the territory in terms of its different dimensions and calls on the diversity of information and communication technology to make the results obtained accessible to the end-users. Essentially, integrated vision and prospective capacity also means a dynamic and multi-disciplinary approach.

This requires:

- Increased data accessibility over the territories and its digitisation within a shared framework (*e.g.* INSPIRE directive, 2007 and the implementation of regional geo-portals),
- The decompartmentalisation of different sectors (*e.g.* town planning, agriculture, industry, environment, etc.) via the standardising of information and the co-creation of projects with a shared vision of the territory in a limited space and with scarce resources,
- The creation of and access to platforms territorialised and run by communities of users and developers, which allow both the assembling and sharing of software, interfaces and ad hoc tutorials, application websites for users, as well as feedback of experiments.

## OUTLOOK AND CONCLUSIONS

The progress of digital now allows for strengthened combinations of information and progress in understanding the environments in which we live, which, up until very recently, were unobtainable for decision makers and local authorities. The PRECOS approach was built with this in mind and must eventually offer, in partnership with the pilot territories, an informative platform, which includes:

- a catalogue of the models used in analogue conditions, to facilitate this inventory,
- a pre-configured meta-model ("virtual machine"), which allows for the rapid integration of sectorial models and the adaptation of supported databases.

The development of this platform has been undertaken, openly, between the pilot territories and planning engineers, like those represented in the stakeholders. This development illustrates how the abundance of data, characteristic of big data, can be used to help to solve long-term inter-sectoral issues that are becoming more and more significant. Its deployment coming in a voluntary local authority should help to strengthen the attractiveness and collectively allow us making progress in this direction.

# BIBLIOGRAPHY


Astuce & Tic (2011), ***Anticipation de l'aménagement sécurisé des territoires urbains, campagnes et de leur environnement par les technologies de l'information et de la communication***. Rapport final du programme FUI (2008-2011), De Mordant de Massiac J.C., Trolard F. & Bourrié G. coord., 1480 pp.

Baillieux A., Olioso A., Trolard F., Chanzy A., Lecerf R., Lecharpentier P., Banton O., Ruget F. (2015) ***Changements globaux : quels impacts sur l'aquifère de la Crau ?***, Géologues (in print).

European Commission (2008), ***Progress towards halting the loss of biodiversity : a first assessment of implementing the EC biodiversity action plan.***

INSPIRE (2007), European directive.
http://www.developpement-durable.gouv.fr/La-directive-europeenne-Inspire-de.html

IPCC (2013), ***Climate change 2013 – The physical science basis. – Summary for policy- markers.*** 5th report of the GIEC, Working Group 1, Stocker T.F. and Qin D. coord., 33 pp.

Olioso A., Lecerf R., Baillieux A., Chanzy A., Ruget F., Banton O., Lecharpentier P., Trolard F., Cognard-Planck A.L. (2013), ***Modelling of drainage and hay production over the Crau aquifer for analysing impact of global change on aquifer recharge.*** Procedia Environmental Sciences, 19, 691-700.

Trolard F. and the Astuce & Tic consortium (2010), ***Etalement urbain et changements globaux : l'urgence de considérer les sols et l'eau dans un modèle intégratif. Liaison Energie Francophonie***, 86, 135-140.

Trolard F., Reynders S., Dangeard M.L., Bourrié G., Descamps B., Keller C., De Mordant de Massiac J.C. (2013a), ***Territoires, villes et campagnes face à l'étalement urbain et aux changements climatiques. Une démarche intégrative pour préserver les sols, l'eau et la production agricole***, Ed. Johanet, Paris, 156 pp.

Trolard F., Dangeard M.L., de Mordant de Massiac J.C., Bourrié G., Lecerf R., Le Pors B., Chanzy A., Dangeard A., Keller C., Charron F. et le consortium Astuce & Tic (2013b), ***Chapitre 15 : La disparition des habitats naturels et agricoles vue par le programme Astuce & Tic. In : Ecologie et conservation d'une steppe méditerranéenne, la plaine de Crau***, coord. L. Tatin, A. Wolff, J. Bourrin, E. Colliot & T. Dutoit, QUAE ed., Paris, 229-245.

# “Smart water” services, an engaging issue of standardisation





By Agnès Meur-Richaume and Jean-Michel Remy, AFNOR

**AFNOR ensures its mission, recognised as being in the general interest, by bringing together all the professionals who need to agree on common criteria, written by them in voluntary application standards. The first work identified in the area of “smart water” concerns utilities. Explanations follow.**

## “SMART” SERVICES AT THE HEART OF CONCERNS OF WATER SECTOR STAKEHOLDERS

New services to warn of a leak, detect over-consumption, warn of a backflow, monitor water networks, etc. now appear at the heart of the water sector and all have a point in common, in that they call on new information and communication technologies (NICT). This is why we talk about “smart water”, and “smart water management”, in the same way that we talk about “smart cities” for sustainable cities or “smart grids” for electricity grids.

The development of these new services involves multiple stakeholders from the water sector: private companies ensuring the management of water utilities and waste water treatment, local authorities, public authorities, manufacturers of products and equipment, building and construction companies, smart metering stakeholders, engineering professionals, etc. not forgetting the end beneficiary of these services: the user.

Yet it also involves other more generalist stakeholders, intervening in multiple sectors, not just the water sector. They are the major stakeholders working in the field of NICT and connected objects, but also the developers of global industrial solutions classed under the terminology of “smart cities”.

This very rapid development of NICT applied to water raises numerous questions for the stakeholders of the industry. What will the interoperability of the solutions proposed be? What interoperability will there be between the different utilities to the local authorities (water, energy, etc.)? What system will there be for the ownership, confidentiality and freshness of the data? What control and mastery will there be of smart measures? What place will smart water services have in the overall industrial offers of “smart cities”?

# STANDARDISATION, A COMMON LANGUAGE WHICH BENEFITS THE USER

In this field of smart water, which is still evolving and not completely stabilised, it is not unreasonable to believe that standardisation can constitute a precious aid. The voluntary AFNOR standards allow for the definition of a common base and a frame of reference for emerging practices and services. Now, in the area of smart water, numerous initiatives are being, or will be, launched, on a national and global level. The more this plethora of initiatives is a real sign of economic development and innovation, reflecting a certain growth, the more supervision and standardisation of these practices are, over time, necessary.

Standardisation can be the place where the different stakeholders involved discuss together and compare their interests in a neutral environment, completely transparently, with the aim of finding a consensus on common elements to share.

It is in this sense that the recently created AFNOR working group began its initial reflections, on the basis of conclusions from the white paper published by AFNOR "Grand Cycle de l'Eau" (Large Water Cycle) Strategic Committee. The approach favoured relies on seeking the right balance between the technological solutions and needs of the user (the user of services): technology not as an end in itself, but at the service of user and customer needs.

The first work planned is focusing on services and customer needs, by engaging first of all with four known and sufficiently documented services to write a normative document: services to warn of a leak or backflow, services to detect over-consumption and services to monitor the water networks. "Generic" criteria qualifying a "smart water" service will then be sought out from the cross analysis of these operational cases. The interoperability of smart water solutions, a sensitive issue with big challenges, will be subject to a specific consideration, before planning, if required, for dedicated standardisation work.

The AFNOR working group will also be responsible for ensuring proactive monitoring on the wider topic of smart cities and on the place of water in these considerations, which are essentially carried out on an international level.

## LEAK WARNING SERVICE

- **How do you define the service offered to the user? What exactly are the specifications of the service offered? What user needs does it respond to and how does it respond?**
- **How do you evaluate a leak warning service?**
- **How do you establish performance indicators for a leak warning service, in order to do benchmarking?**

# GIVING FRANCE A HEAD START

ISO 24510, 24511 and 24512 international standards published in 2007, which target quality and the running of water and waste water treatment utilities, are perfectly consistent with the French water management model, combining public and private with a certain consistency in the quality of the utility over the whole territory.

This good overlapping between the national and international level has been made possible by the high level of involvement of French water stakeholders for over ten years in international standardisation within the working bodies of the ISO, and, in particular the steering of the ISO/TC 224 technical committee in charge of the quality of water and waste water treatment utilities. The export challenges that these standards assume for French stakeholders, and in particular for industrialists and companies, are evident. To be able to rely on an ISO normative framework compatible with their practices is an undeniable "bonus" for French companies.

This role that standardisation plays, as a vehicle for economic intelligence and assistance with exporting, was highlighted in a report[22] submitted to Nicole Bricq, the then French Minister of Foreign Trade, in January 2013. "The influence on international standards and rules, in other words on the economic game rules, is an essential, though not

22. "Développer une influence normative internationale stratégique pour la France", Claude Revel, January 2013: http://proxy-pubminefi.diffusion.finances.gouv.fr/pub/document/18/14133.pdf

very visible, part of the competitiveness of companies and states. International regulations are never innocent, they determine markets, set governance methods, allow their stakeholders to get ahead of the competition, to stop it, or to export their constraints."

French water stakeholders are well positioned on the international standardisation scene and are developing real normative strategies to support the national challenges on sensitive topics, like, for example:

- Water and waste water utilities, with the presidency of the dedicated ISO technical committee,
- Drinking water, with the presidency of the European technical committee on the subject,
- The characterisation, management and recovery of sludge coming from water and wastewater treatment, with the presidency of the dedicated European and international technical committees,
- The reuse of processed waste water, with an active and influential French delegation within the technical committee created recently on this subject and jointly coordinated by Israel, Japan and China.

The French stakeholders are also well positioned on an international level in the standardisation bodies which are sprouting up around the theme of smart cities, whether it is within the general body, the ISO, or specialised bodies in electro-technologies (the IEC) and telecommunications (the ITU-T).

Water and smart management of water are, of course, part of the "technical" sectors concerned by the theme of smart cities, which also brings together more cross-disciplinary reflections on governance, societal aspects and the point of view of consumers/users/citizens.

The water sector is well considered in the generic standardisation work on sustainable cities developed at the ISO (ISO/TC 268 technical committee), and even in the considerations undertaken at the ITU-T; telecoms and information technology world organisation, in the context, for example, of a white paper published on intelligent management of water. The professionals on the issue are also well represented at the governance level of the ISO, within the strategic group in charge of coordinating activities on the topic of smart cities. In addition, smart water is on the programme of the issues addressed during bilateral exchanges between AFNOR and its Chinese counterpart, the SAC, as well as questions relating to smart meters and frequency bands dedicated to remote reading.

Added to these generic considerations are sectoral standardisation activities, which participate in the development of a normative corpus encompassing the different aspects of smart cities. It is clear that the creation of international standards in terms of services for water, ones for crisis management of activities from the sector, ones for reusing processed waste water, reusing sewage sludge and for measuring the quality of water, contribute to this.

Communities of experts in all countries are rallying round these emerging issues, which are developing at a tremendous rate.

In France, the new AFNOR working group intends to have a say. With the ambition of bringing proposals to the ISO table aiming to formalise, on a voluntary basis, these services and practices on an international level.

As such, standardisation will be able to provide additional weapons and tools to stakeholders of the large water cycle, to promote their interests internationally and include them as much as possible in international services.

Furthermore, national stakeholders will have a head start if, together, we adopt a proactive attitude and contribute to these developments, which should be greatly facilitated by France's leadership on some of the international standardisation technical committees, which count in the water sector.

In this sense, AFNOR's role will be to orchestrate sophisticated normative monitoring, in order to anticipate the trends and grasp the right opportunity to propose a frame of reference. Or, even better, bring it about.

# The new performances of a public sanitation utility borne along by digital technology



By Belaïde Bedreddine, President of SIAAP (Paris Region Waste Water Autorithy)

## HOW IS DIGITAL ENCOURAGING THE PUBLIC UTILITY TO DEVELOP? HOW IS THE SIAAP GETTING TO GRIPS WITH THE ARRIVAL OF DIGITAL IN THE PUBLIC SPHERE?

The digital transition currently at work in local authorities, as well as in society, our personal lives and our leisure time, marks an important change in the way these challenges are viewed and represented.

New practices and their systematic organisations encourage us to anticipate, as far as we are concerned, the consequences of digital on the public sector and its organisation.

Within a context of digital acceleration, we must now be able to capture and analyse an ever more significant amount of information from multiple sources and adapt its procedures for processing and disseminating this new everyday reality. This leads to considerable changes, and French public utilities, such as the SIAAP, are not shying away from these developments.

We should note, first of all, that the digital world affects more and more people in our country. According to several sources (the OECD and the UN), France is placed among the leading nations in the ranking of the best e-administrations. Nearly 80% of French people use digital public utilities.

Moreover, the capacity for digital processing and its uses for the general public are increasing day by day. An ever growing amount of data allows for the creation of responses in real time and the improvement of day-to-day services (assistance with traffic, weather forecasting, organising relief, protecting populations, etc.).

Lastly, through their easy-to-use nature, digital tools make citizens more aware, further unifying and mobilising them by encouraging new expectations and information requests, which are increasingly demanding, associated with environmental issues (air, water and soil quality, etc.), public health issues (food security, drug testing, etc.), and the efficiency of organisation methods (cost of utilities, industrial safety, etc.).

These changes not only represent a formidable development opportunity, they lead to the reconsideration of our practices and our organisation within public utilities.

Today, the SIAAP is committed to its own digital transition, as we are assessing all the opportunities that it can provide us in improving utilities provided everyday to nine million residents living in the Paris region.

## HOW DOES THE DIGITAL TRANSITION TRANSLATE INTO THE SIAAP'S PROJECTS?

At our level, the digital transition consists mainly of developing our operating systems by integrating new parameters (environmental, societal, technical, etc.) on the one hand and, on the other, our operating methods within our organisation (digitisation of the examination of files, provision of documentation, etc.), always with the aim of modernising and improving the utility provided to Paris region residents.

Some projects reflecting the digital transition underway:

**1. The integration project of two software packages (MAGES + PROSE):**

The SIAAP now has a high performing tool (MAGES) which is able to collect, in real time, all of the quantitative information coming from the Paris region network (flow, state of the network and the functioning of the plants), as well as integrating forecasts provided by Météo France into it.

MAGES is therefore able to deliver an instant snapshot of the network situation. The system analyses this information in real time, coming up with the most suitable scenario depending on the actual situation: violent storms, maintenance work on the networks, etc.

The short-term aim is to couple this quantitative data management tool (MAGES) with another, qualitative, data management tool (PROSE). PROSE is a software package capable of simulating the environmental impacts of waste water effluents treated in the natural environment.

Thus, the aim of this integration project (MAGES + PROSE) would allow for an innovative quality control tool for the natural environment. This tool would eventually be able to help with the planning and scheduling of production in our treatment plants, but also to ensure the traceability of our facilities' management actions.

### 2. The creation of the IT Blueprint

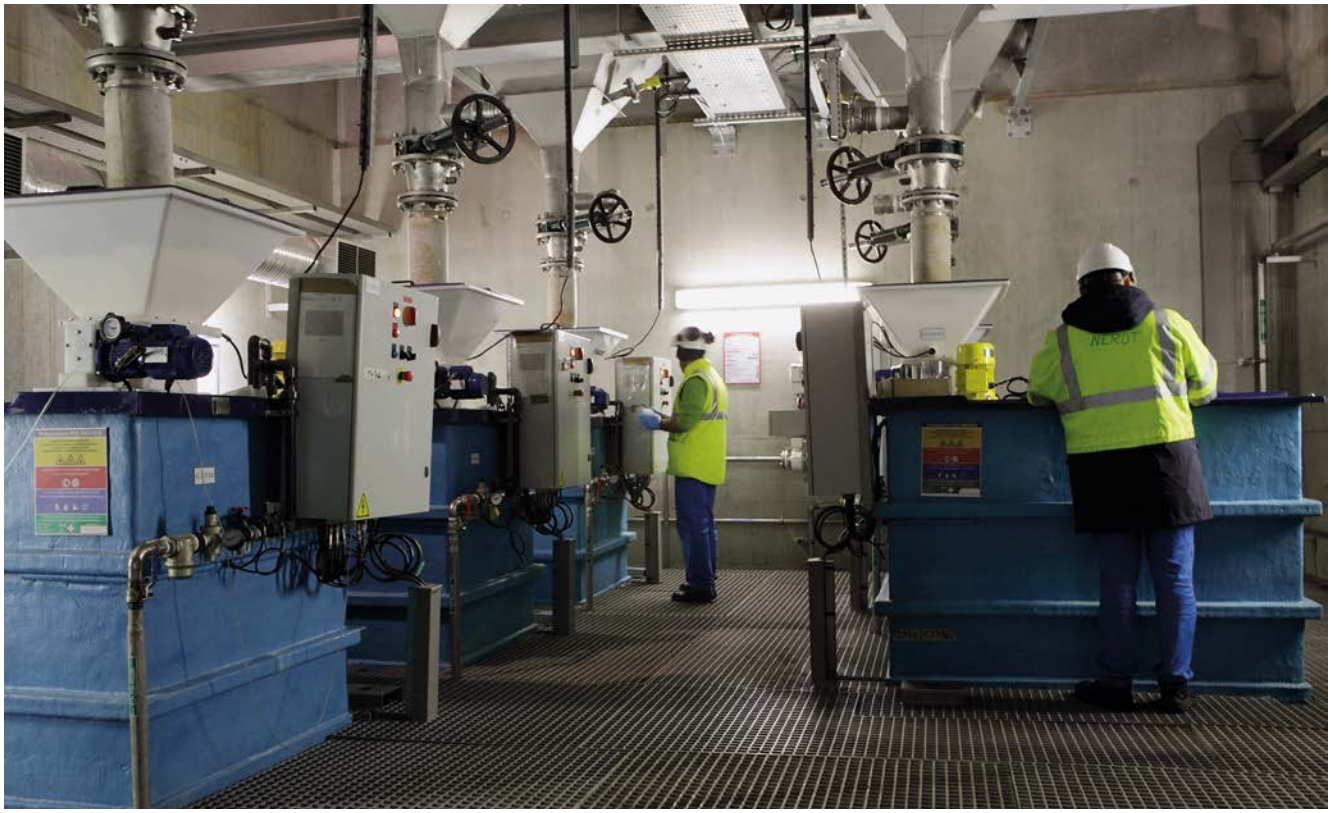
Lastly, the SIAAP is creating its IT Blueprint and the question of the digital transition is at the heart of its consideration, as this blueprint includes all the essential computing information for the SIAAP's activities (from support functions to more operational ones). One of the main challenges of this blueprint will therefore be to control the amount of data stored, its exchange flow and processing. By way of an example, and this only concerns the data from our head office, the data storage volume increase projections are going from 70 terabytes currently to over 300 terabytes by the end of 2020.

## WHAT IS THE SIAAP'S POSITION ON THE QUESTION OF DATA, FOR EXAMPLE WHERE ARE YOU HEADING AND/OR WHERE DO YOU WANT TO GO IN TERMS OF THE PROVISION OF DATA?

Currently, via dedicated websites, the SIAAP provides users with predictive odour dispersion tools, progress reports on major operations, operational reviews, online complaint forms, etc.

In the future, with the planned development of databases, flows and processing, we can envisage that the tools provided to the user could be ever more sensitive and responsive to events and open up other areas for dialogue and shared knowledge (the price of water, the choices and placement of structuring equipment, etc.). As President, it seems to me that it is essential for the major public utilities like ours to create this relationship with the user in all its forms. When institutions seem more distant from them, we owe them transparency, information, and need to encourage interactivity, which meets their expectations.

The provision of data must be able to give even more value to our activity for users and for our organisation. This is why we intend to succeed in these new challenges by adjusting our practices in a world which currently has digital at its core.



## HOW DOES DIGITAL CAUSE THE RELATIONSHIP WITH THE USER TO EVOLVE?

The emergence of digital in our society has profoundly changed the behaviour of users. Far from being a constraint, it is an asset to reconsider our relationships with every user and to be even better performing. It is also a duty of the public utility to respond to the level of demand in terms of transparency, performance and quality of information.

To respond to these challenges, the SIAAP has identified three priority areas: providing simple, transparent and consistent online services, offering personalised and geo-located information and giving a voice to the general public.

Users now have online complaint submission forms and consult odour dispersal predictive tools depending on their location. In the future, they will be able to interact with us on discussion platforms, forums and social networks.

The SIAAP is also working with all of the stakeholders to define the conditions for data uploading and transparency and to offer a standardised dialogue. It is about considering methods for territorial organisation, for cross-referencing authorisations for sources of open data, for the quality and cost of services in real time, yet also qualified people, associations and staff representatives.

Open data offers new areas of expression to the SIAAP and its partners to commit to a simplified and constant dialogue with users. The digital ambition of the SIAAP is therefore, above all, to consolidate its trusted relationship with the nine million residents of the Paris region.

## HOW DOES IT CAUSE COLLABORATION AND PARTNERSHIP METHODS TO DEVELOP?

Thanks to digital, our ambition is to make our communication more direct and accessible, to work on sharing the common strategic vision, adopting an agile architecture, open to all our ecosystem, and to implement a governance method founded on dialogue and the involvement of everyone, directed, as a priority, towards those to whom we owe our public utility mission.

Internally, we are therefore in the process of developing our working methods. To do this, we benefit from experience and expertise mastered by competent and invested staff. Fully aware of their public utility role, the SIAAP staff are now adjusting their data usage practices and it is within this rationale that the SIAAP is working, for example, on the digitisation of bills.

Moreover, partnerships with other major Paris region stakeholders such as Seine Grands Lacs, Eau de Paris or the SEDIF (Paris Region Water Authority) are currently being studied, in order to contribute to the development of forecasting and anticipation methods, which will make the SIAAP better performing, notably in the management of aquatic environments and preventing floods.

It is in this sense that the SIAAP is seeking to share, with other major urban boards, the experience acquired in, for example, the budgetary planning of water treatment membrane replacement operations.

Finally, the SIAAP is now fully committed within international organisations like the French Scientific and Technical Association for Water and the Environment (ASTEE), the International Water Association (IWA), the French Partnership for Water (PFE) and the International Alliance of Water Utilities for Water Security, Safety and Sustainability (WSMART). The respective teams are increasingly able to discuss their experiences, to share projects and deploy sustainable collaborations with international partners. The SIAAP thus contributed significantly to the success of the last ARCEAU (Local Authority Research Association in the Area of Water) conference which took place at UNESCO, during COP 21. They participate in numerous international initiatives in the context of decentralised cooperation, with a view to sharing their expertise and skills in the area of international solidarity.

## ABOUT THE SIAAP

SIAAP
Service public de l'assainissement francilien

The SIAAP (Paris Region Waste Water Authority) is the public utility which decontaminates the waste water (including rain and industrial waste water) of nearly nine million Paris region residents every day, to return, to the Seine and the Marne, water which is favorable to the development of the natural environment. The SIAAP, with its 1,700-strong staff, decontaminates twenty-four seven, nearly 2.5 million m³ of water, transported by 440km of drainage channels and processed by its six purification plants.

# How are territorial engineers preparing for, and supporting, the digital transition?



By Patrick Berger, President of the AITF (Association of Territorial Engineer of France)

## PATRICK BERGER, YOU ARE THE PRESIDENT OF THE AITF. CAN YOU PRESENT THE AITF TO US IN A FEW WORDS?

The AITF, created in 1937, is the largest territorial employee practice and expertise community with approximately 5,000 members. It is based at all levels of the local authorities. Its main mission is to organise inter-member solidarity and to fight against geographic and professional isolation by relying on 14 regional branches and 19 national working groups, covering all the fields of territorial engineering (transport, networking, GIS, energy, town planning, green spaces, waste, cleanliness, architecture, logistics, etc.)

## TRANSITIONS ARE ON THE AGENDA AT THE MOMENT: THE ECOLOGICAL TRANSITION AND THE DIGITAL TRANSITION. HAVE THESE TRANSITIONS BEGUN? ARE THEY ALREADY BEING REALISED IN THE TERRITORIES? HOW AND THROUGH WHAT ARE THEY MANIFESTING THEMSELVES ?

The territories are currently undergoing a profound change and not only at the level of their governance with the creation of greater regions, metropolises, etc. This change is translated into the area of the energy transition via the development of alternative energy, the possibility of producing their own energy on a local level, the development of neighbourhoods with positive energy and in the context of urban regeneration, etc. Uses in cities are evolving with the development of green modes of transport, public transport but also, and above all, with the appearance of car sharing, which no longer necessarily requires your own vehicle, in Paris, Lyon, Nantes, etc. The ecological transition is also manifested through more nature in cities, the preservation of biodiversity, pesticide-free initiatives, the development of the urban agriculture concept in Rennes, Montpellier, Strasbourg, etc. The provision of digital data (Open Data), smart cities, BIM and smart roads, are beginning to emerge and lead to new experiences, in Bordeaux, Lille, Marseille, etc. The 3rd industrial revolution is underway in the North. The AITF is carefully monitoring all this change and has taken the theme of "Innovations and Territories" for its next National Pubic Engineering Meetings (RNIP), in Saint-Etienne, on the 19th and 20th May 2016, after we worked, in 2015, on the theme of "Climate and Territory".

## WHAT DO THESE TRANSITIONS MEAN FOR PUBLIC UTILITIES AND FOR THEIR TERRITORIAL ENGINEERS?

These "transitions" lead to the need to review the organisations of local authorities with governance systems that are a lot more cross-disciplinary. The rationale of professions working in isolation is questioned. The "refuse collection" manager must talk with the manager of IT systems. The citizen or user increasingly becomes a stakeholder via the provision of data from the local authority, and the territorial engineer turns into a public procurement manager for the elected representatives. This leads the engineer to constantly question the tools and processes that he implements, with the need to seek solutions in professional networks, in order to benefit from the experience of others and collective intelligence, as well as to seek public-private partnerships, all the while remaining a defender of the general interest, benefiting from quality training throughout his career, etc.

## HOW ARE PUBLIC UTILITY ENGINEERS PREPARING TO SUPPORT THEM?

The main preparation for this change is the integration into professional networks or knowledge communities like the AITF. The AITF either creates or supports research and development structures and digital platforms like the IDRRIM (French Institute of Roads, Streets and Infrastructure for Mobility) and Plantes et Cité. Professional development must be able to support them throughout their career. Access to training must be made as easy as possible from their home or workplace thanks to the development of e-training and the democratisation of MOOCs. The CNFPT (French National Centre for Local Public Utilities) has just started to implement these new tools and the AITF is supporting these initiatives. It will offer a new website so that the access to knowledge accumulated by its members is easier for the members themselves.

## WHAT ARE THE PROFESSIONAL OR CAREER DEVELOPMENTS CURRENTLY BEING OBSERVED OR FORESEEN? HOW WILL TODAY'S ROLES BE AFFECTED BY THE MASS ARRIVAL OF DIGITAL IN PUBLIC UTILITIES?

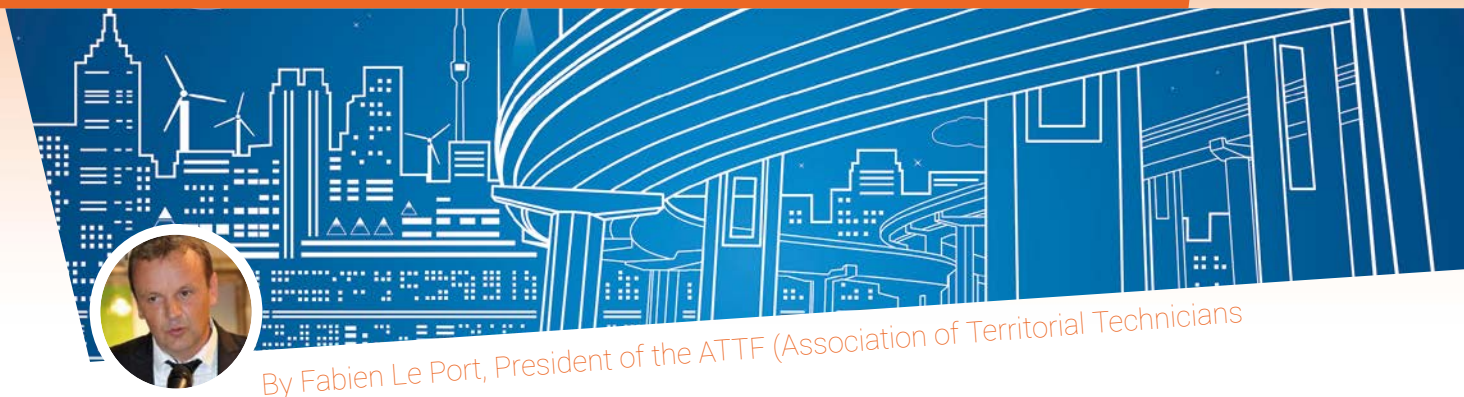
Cross-disciplinarity is becoming the byword, yet it must rely on solid professional knowledge. Nowadays, engineers must also be constantly connected. A new generation of engineer is being created: the engineer 2.0.

He must also develop an ability to discuss with users, which he must integrate into his production and territory management process. However, the challenges are great in terms of protecting data and circulation over the entire territory.

## HOW IS THE AITF SUPPORTING ITS MEMBERS IN THIS CHANGE?

The AITF is offering its members a monthly journal, the Magazine de l'Ingénierie territoriale (Territorial Engineering Magazine), which accords a significant place to the experiments undertaken in the territories. This year it has also been offering a new website, which is a lot friendlier. We have opened a LinkedIn page and a Facebook one. The RNIP meetings are created nowadays around a Scientific Committee, in partnership with the CNFPT, the CEREMA (French Research and Expertise Centre on Risks, the Environment, Mobility and Planning), the EIVP (École des ingénieurs de la ville de Paris) and AMF, etc. They are mainly open to the "world outside" of territorial engineers with the presence of elected representatives, researchers, administrative specialists, social science specialists, private entrepreneurs, etc. It will begin, modestly of course, to produce and promote MOOCs

# What is the day-to-day digital transition for territorial technicians?





By Fabien Le Port, President of the ATTF (Association of Territorial Technicians of France)

## FABIEN LE PORT, YOU ARE THE PRESIDENT OF THE ATTF. CAN YOU PRESENT THE ATTF TO US IN A FEW WORDS?

The ATTF has been unifying the territorial technicians of France since its creation in 1968. It now has nearly 3,000 members, coming from local authorities (municipalities, inter-municipalities, départements, regions and their public bodies). Its aim is to establish professional and friendly relationships between its members, providing them with support for everything regarding exercising their profession and offering solutions on general interest questions linked to spatial planning.

Working in favour of developing the technical knowledge of its members, the ATTF ensures the circulation of professional information and encourages the professional development of its members, by relying on its regional networks to allow for a pooling of knowledge and best practice.

## IN 2015, THE ADOPTION OF THE LAW FOR THE ECOLOGICAL TRANSITION AND GREEN GROWTH MODIFIED THE REGULATORY LANDSCAPE. IS THIS TRANSITION ALREADY UNDERWAY? WHAT CONCRETE EXAMPLES ARE THERE OF IT IN THE TERRITORIES?

Whether it is the digital transition or the ecological transition, our local authorities are, of course, at the heart of these challenges. The environmental preservation required, often coupled with a search for savings, mean that the ecological transition has been concretely illustrated in our planning operations and our operating methods for many years, whatever the size of the local authority.

To mention but a few examples, the pesticide free green spaces policies, the purchase of vehicles known as clean, the replacement of public lighting with LEDs, building insulation, the management of flows, the reuse of waste and the development of heat networks are all examples of initiatives that can be noted in numerous local authorities.

## WHAT ARE THE DEVELOPMENTS THAT IT HAS BROUGHT ABOUT?

The ecological transition has led us to "reconsider" our studies, our planning programmes and our purchasing choices by placing our reflection, in advance, through the lens of environmental preservation. And we must admit that, although in certain business areas, the choices and methods easily become clear from proven experiments, which are simple to implement, other issues still need to be discussed, notably due to the relevance of choices to be made.

For example, an issue like the suitable choice of power for administrative vehicles still leads to lots of discussions, debates and exchanges between our technicians involved, in as much as the parameters to consider (carbon reports, dimension of the car fleet, use of vehicles, etc.) mean that, to date, there is not necessarily a choice reproducible everywhere.

## DOES THE CURRENT AGENDA ALSO LEAD TO THE UNDERTAKING OF REFLECTIONS ON ANOTHER TRANSITION: THE DIGITAL TRANSITION? IS THIS TRANSITION UNDERWAY IN THE TERRITORIES?

Concerning the digital transition, putting to one side the internet revolution and communication via electronic messenger, the appearance of digital in our working tools is more recent and not necessarily at the same level of development, depending on the dimension and the means (as much human as financial) of the local authority.

Although, in our local authorities, the digitisation of administrative documents (purchasing orders, invoices, public contracts, PLU (local master plans) and GIS) is widely established, other developments offered by digital, such as public open data and the relationship with the user, are still in a development, or even creation stage.

## HOW DOES IT AFFECT THE JOBS OF TERRITORIAL TECHNICIANS? WHAT CHANGES HAVE ALREADY BEEN OBSERVED AND WHAT ARE THOSE STILL TO COME?

The ecological transition leads us to consider our strategies and selection criteria differently. As for the digital transition, it directly affects our day-to-day activities, it enters into our working methods, in that it often implies an almost immediate responsiveness, either to respond to requests (users, elected representatives and directors), or to maintain the efficiency level of tools available (updating heritage data for example).

More generally, both of these transitions have imposed new working methods on public utilities: they must be accompanied by the implementation of an internal system to encourage interdisciplinarity between utilities as much as possible and allow for the validation and sharing of information.

## THE INSTITUTIONAL AND REGULATORY LANDSCAPE HAS DEVELOPED A LOT OVER THE LAST TWO YEARS. BEYOND THE ECOLOGICAL AND DIGITAL TRANSITIONS THAT WE HAVE JUST MENTIONED, WITH THE MAPTAM AND NOTRE LAWS, A NEW DIVISION OF SKILLS IS TAKING SHAPE. WHAT PROFESSIONAL CHANGES ARE APPEARING AND WHAT ROLE DOES THE ARRIVAL OF DIGITAL PLAY IN PUBLIC UTILITIES?

The arrival of new skills in local government has translated into the appearance of new technician jobs, with even more specialised profiles in their area of intervention. Compared to the transitions mentioned, we can, for example, cite the development of posts such as the geomatician, the energy efficiency engineer and the flow manager.

However, although in the large local authorities, we have been able to observe the recruitment of these specialised jobs, it is not necessarily the same in the small and average sized local authorities, and it is there, with the mass arrival of digital in our public utilities, that the difficulties risk being the most blatant and the inequality between territories most apparent.

We have accounts from technicians via our associative network who are already deploring the increase in working time spent in front of the computing tool (sometimes a lot more than 50% of the time) to the detriment of time, which is nevertheless essential, being spent on the ground, in order to ensure the supervision or monitoring of construction sites in their territories.

Faced with this digital challenge, the response cannot simply be found in the purchasing of software or IT programs that are better performing than one another, if, at the same time, the suitability of available internal skills is not anticipated within our local authorities.

## HOW ARE PUBLIC UTILITY TECHNICIANS PREPARING TO SUPPORT THESE TRANSFORMATIONS?

Our technical professions have always needed to regularly reconsider our skills. For example, we no longer think, if only we could do road planning operations like ten years ago!

The transition, whether it is ecological or digital, also imposes on us this necessary updating of our knowledge and our skills.

Being able to adapt to technical and/or regulatory developments to best respond to the demands of our elected representatives and user expectations, is the very essence of our professions. Training, conventions, exhibitions and discussion networks are essential elements to allow for this adaptation.

Unfortunately, faced with financial constraints, local authorities seem more and more reticent to allow their staff to participate in these actions. Yet, in our opinion, it is an essential foundation if you want to preserve qualified and competent territorial engineering.

## AND HOW IS THE ATTF SUPPORTING ITS MEMBERS IN THIS CHANGE?

Our association can intervene on two levels:

- At the level of its member technicians, it encourages the development of skills and qualifications, discussing experiences and pooling knowledge. Whether it is via our communication tools (newsletter, magazine and website) or via regional and national events (training, conventions, technical visits, etc.), we strive as much as possible to support the technicians in adapting to the developments associated with our professions. To do this, our network also "feeds off" the skills of partners, in partnership with our professions, like the ASTEE for example. The issues linked to the ecological and/or digital transition naturally fully find their place in these activities.
- At the level of public authorities, the association can be the spokesperson for technicians as regards the difficulties encountered on the ground, faced with such and such a mission or competence. For example, symposiums organised jointly with the AMF (The Association of French Mayors and Presidents of Inter-municipalities) allow us to share observations, discuss our issues and consider avenues for inquiry, and solutions even.

These issues around the digital transition are already at the heart of our missions, they will be even more so in the future. If we want to preserve the appeal of our professions and the purpose of our missions, the ATTF must support these changes, in order that the developments they bring about are realised via practical and non-restrictive tools.

# Digital at the service of restructured urban engineering: linking research and training



By Youssef Diab, University of Paris Est, EIVP (École des Ingénieurs de la Ville de Paris)

**At the start of 2014, there were 2.7 billion internet users compared to 360 million in 2000, and 6 billion people with a mobile phone contract (or 86 people with contracts per 100 residents) compared to 719 million in 2000. In this context of the rapid expansion of digital, the majority of public bodies have launched actions aiming to encourage and spread the use of Information and Communication Technologies (ICT). Although the effect of digital is still not really being felt in the make-up and organisation of cities, a great deal of progress can be seen in urban services and major improvements are expected over the next decade, with the will required to develop the concept of smart cities. The challenges for the urban territories are great and the cities will, on one hand, be a growth driver, but, above all, a quality living area for a new population, more and more attracted by the urban world (Wechter, 2013).**

**The smart city is in vogue and very few municipalities and other public bodies have not now launched actions aiming to encourage and spread the use of ICT in their actions. These initiatives are a testament to the momentum of digital networks in the daily lives of citizens. They are also an indicator of the great change brought about as regards access to the city's services and resources (Picon, 2013).**

## CONTEXT AND CHALLENGES

Over the last decades, information technology and innovations serving the sustainable city have experienced a considerable development. Cities are constantly developing and the population is coming together more and more in urban areas. The polarisation of geographical flows goes hand in hand with that of digital flows, and digital virtual spaces are developing between metropolises and continents. In this context, cities are seeking to capitalise on these flows by placing the development of their territory within a sustainable development strategy and by relying on new technologies via a new form of engineering directed towards digital, for a significant and essential development of the city's professions. This is how the city of the future takes shape, a current topic for the training of engineers and technicians who work in the urban area (Ascher, 2005).

Researchers are contributing to it via new topics dedicated to the cities of the future. Within the courses at the Ecole des Ingénieurs de la Ville de Paris (Paris engineering school - EIVP), we focus on the use and development of digital at the service of a restructured urban engineering. Among the leading topics of this research, we focus on the themes of urban resilience and the questions of energy in cities, which call on new approaches combining questions on urban engineering and digital. These research, innovation actions and different courses offered are at the service of stakeholders from territorial authorities with which they are called to work.

The challenge is significant, as monitoring the development of cities and their professions must be an essential part of contracts with training and research bodies with all those who are with the stakeholders of urban sustainable development.

This concerns all of the city and metropolis stakeholders and their future: entrepreneurs, engineering and project management offices, administrations and elected representatives from local authorities. This is particularly true for the schools close to local authorities. This commitment, alongside the city of Paris, allows the EIVP to be "on the ground", but also to diversify and complement its teaching, as much as required, and, above all, to respond to the new strategic and operational expectations of cities. This observation, or reflection, concerns the training in the engineer curriculum, but also the long and short professional development courses created. The link with research is there for a lot of them!

The research side is essential. It is vital that students and teacher-researchers from all the schools dealing with the questions of the sustainable city, are up to date with the latest state of knowledge on issues that they will be responsible for throughout their professional life.

The EIVP, for example, is fully participating as a member in the actions of the competitiveness hub Advancity. It is also an associated member of the Paris- Est University. Not forgetting the Institute of Energy Transition, Efficacity, where the school stands alongside the best private and public stakeholders on questions of territorial energy. The active involvement in research projects from the French National Research Agency (ANR), as well as in European projects covering all the fields of the "sustainable and resilient city" topic must also be noted. We cite the two leading programmes: H2020 dedicated to partnership research and INTEREG which is clearly directed towards local authorities. The involvement of researchers is greatly appreciated.

This research prepares for the schools' future by positioning them at the cutting edge of several subjects and areas. For example, the EIVP has clearly identified the themes relating to restructured urban engineering by focusing on the questions of resilience and energy in the city. This will also encourage schools to develop their own potential by welcoming a growing number of doctoral students, specialised in the key topics. For the EIVP, the doctoral students work on issues relating to questions of energy and climate within cities, major structuring urban projects like high rise buildings and risk management, or even urban resilience.

A final significant point for greater visibility of actions from higher engineering and research institutions, it consists of increasing the discussions and cooperation with schools and universities, both in France and internationally. For example, the EIVP has agreed partnerships with the Ecole des Ponts Paris Tech, the École Nationale du Génie de l'Eau et de l'Environnement de Strasbourg (Strasbourg National School for Water and Environmental Engineering - ENGEES), the Curtin University of Perth, in Australia, the Polytechnic Schools of Barcelona and Madrid, the Ecole Hassania des travaux publics of Casablanca and even the Illinois Institute of Technology of Chicago. Other partnerships are also being prepared.

# RESEARCH CHALLENGES AT THE CROSSROADS OF URBAN ENGINEERING AND DIGITAL: RESTRUCTURED URBAN ENGINEERING

Digital networks, in the future, will have, "the ability to modify the physical form of the city by assuming the same role that was exercised before by transport infrastructure". Such a hypothesis seems risky and its significance is shown to be limited due to the high inertia that the urban form exhibits. The changes at work in the material nature of the city seem inversely proportional to those which affect lifestyles and the new digital condition of social stakeholders. The physical form of the city does not change very quickly and the information society has not yet left its mark on the landscape of the city nor its urban morphology.

Such a material resistance or low resiliency to change is due to the weight of urban grids shaped by the road networks. The immutability of street layouts is one of the reasons for the slowness of changes in the configuration and physical look of cities. The city is, above all, a relational entity, even if it may be considered, according to certain points of view, as a collection of objects or buildings. The city is not a "factory", as the fashionable expression has it, rather it is a "coexistence", an inter-play of relationships between flows and places, which are not articulated formally or visually. This statement appears in a significant way in the contributions coming from the Summer School of the EIVP dedicated to urban engineering and digital (Vaquin & Diab, 2013).

These considerations have led me to reform Urban Engineering. This restructured urban engineering comes from a research consideration to prepare a scientific project for a research team, analyse the links between techniques and urban innovations, as well as the challenges of the cities of the future and the interplays of stakeholders. These skills have been used to understand the complexity of a multi-layer urban project the timespan of which does not correspond to political agendas, or the pace of the researchers' reflection. Through this approach, restructured urban engineering cannot come from a discipline, or a disciplinary field. Research in urban engineering, located at the crossroads of urban sciences and environmental sciences in the wider meaning of the two areas, is interested in decision making assistance tools, which should be offered to local authorities and other stakeholders involved (Diab, 2014).

Restructured urban engineering is different from that prescribed the previous century, which was defined as the art of designing, building and managing networks. There now exists a global approach to the city which seeks to improve the efficiency and productivity of planning and urban utilities, whether they are networked or not. The notions of creativity and innovation take on their full meaning in this new approach, which must be able to help the cities to incorporate the challenges of sustainable development. The two founding items of the scientific doctrine of restructured urban engineering are de-compartmentalisation and complexity (Diab, 2014).

# THE TRAINING COURSES AROUND DIGITAL AND THEIR PLACE IN URBAN INNOVATIONS

The emergence, in the 90s, of Geographical Information Systems (GIS) created a disciplinary field known as "geomatics". This neologism, created from the merger of the terms "geography" and "information", clearly indicates that it is about using computing means and technologies to serve geography, the purpose of this use being to better visualise, model and analyse, objects which surround us. GIS has many areas of application. In this way, in the local authorities, it serves both as a decision making assistance tool – affecting the planning and monitoring of urban projects – and a territory management assistance tool. The development of the capacity and performance of computing means has allowed for spectacular progress to be made in the area of digital mapping and the GIS. Therefore, from geographical data from the GIS, we are now able to represent a territory in three dimensions with a growing level of realism. This obviously allows for the development of new uses in urban engineering.

The EIVP has appropriated these new challenges by mobilising a post-engineer training tool which has been highly successful since 2012; the Urbantic specialised Master's collaboratively organised with the Ecole des Ponts-ParisTech. It welcomes fifteen students per year, who work in close collaboration with partner companies and in particular urban project managers.

This course distinctly clarifies the fact that the system, in itself, will never provide solutions. What is important is the human who processes this data and who will use this system as a medium for their inquiry and analysis.

This interdisciplinarity to organise the local authority is also a formidable modernisation tool. We are moving from a rationale of holding on to data to one of sharing information. The GIS has come to respond to a challenge of democratising geographical data within the organisation. In this sense, we can consider that the geographical information system is participating in the de-compartmentalisation of utilities within the organisation. This point is essential because when you analyse the difficulties which can be encountered in complex territorial or urban planning projects, you realise that part of the possible errors and delays are down to coordination and communication problems between the different bodies working on the project, each with their view of things. It therefore becomes very difficult to arrive at a common and shared representation of the project.

Lastly, 3D representation in the GIS has also proved to be useful during the design and public consultation phase. 3D representation is also a detection and error correction tool, one capable of refining the project. For example, the creation of three-dimensional models on questions of sunshine or for view problems, for which 3D simulation has become essential.

## CONCLUSION

In a world where urbanisation is only getting stronger and where competitiveness between the urban metropolises will only get fiercer, the engineering schools, while maintaining the excellence of their teaching, must continue their development by diversifying and complementing their teaching and their research centre, to respond to the very great demand, from local authorities and companies, for training in the professions of the city.

Moreover, engineers, more so than technicians, must be able to communicate with the population and organise consultation meetings. It is also what we are learning in our educational and research project. For example, we must train our engineers in the questions of organisational resilience and social resilience in the same way as the resilience relating to technical systems. Finally, the question that we may pose as a researcher is what place will digital accord to the technicians of urban networks and, more globally, to all of the urban organisations? This is the right question that the cities must answer in the future.

## BIBLIOGRAPHY


**Ascher F. (2005), *Le Mangeur hypermoderne*, Paris, Odile Jacob, 183 pages.**

**Diab Y. (2014), *Le Génie Urbain Refondé. Note de synthèse pour la constitution du laboratoire de recherche Lab'Urba*. Presented at the scientific council of the UPEM. 5 pages.**

**Picon A. (2013), *La ville numérique entre utopie et réalité. Dans « Numérique et Génie Urbain »*, Summer School of the EIVP. Volume 6 of the Carrefours du Génie Urbain collection. Pp 45-57.**

**Vaquin J.B. et Diab Y. (2013), *"Numérique et Génie Urbain"* 2012 Summer School of the EIVP. Volume 6 of the Carrefours du Génie Urbain collection. 278 pages.**

**Wechter S. (2013), *La ville numérique : quels enjeux pour demain.* Dans « Numérique et Génie Urbain » 2012 Summer School of the EIVP. Volume 6 of the Carrefours du Génie Urbain collection. Pp 13- 27.**

# TRANSITIONS AND SYNERGIES

Hervé Marseille details the challenges of the digital and energy transitions for Syctom, the leading European waste processing agency. He mentions the importance of digital technologies in the individualisation of practices, especially for a better division of costs, with the aim of greater solidarity.

He presents the possible synergies between the major urban utilities, with the example of projects currently developed with the SIAAP, while giving a reminder on the need for sharing. He explains to us the new opportunities offered by the energy transition law via actions that Syctom has chosen to undertake.


youtu.be/hOdwL-LGjzk

> “The energy transition law brings new constraints, but, at the same time, new opportunities.”

**By Hervé Marseille,**
Senator-Mayor of Meudon,
Vice-President of the Senate
and President of Syctom

Photo © Bertrand Guigou/City of Meudon

> “We need to share.
> Together we can go further
> and do better.”

**SYCTOM AND REUSING WASTE**
**syctom-paris.fr**

**THE PROJECT TO CAPTURE $CO_2$ FROM FUMES IN SAINT-OUEN**
**direct.syctom-paris.fr/fr/projet/captation-du-co2-saint-ouen**

syctom
l'agence métropolitaine des déchets ménagers

# Supporting the transition, a partnership strategy



By Arnaud Treguer, Saint-Gobain PAM

**ARNAUD TREGUER, YOU ARE THE MARKETING DIRECTOR OF SAINT-GOBAIN PAM, CAN YOU TELL US WHAT IS THE GROUP'S STRATEGY TO SUPPORT THE TRANSITIONS AT WORK IN ENVIRONMENTAL PUBLIC UTILITIES?**

For several years, Saint-Gobain PAM has been developing a partnership strategy which allows it to widen its offer, but also to adapt to the constantly updated legislative developments and contexts of our customers.

As a leader in pipe solutions, we wanted, for example, to contribute to the improvement of the heritage management of networks with a new service for analysing the old cast-iron pipes, in order to anticipate and plan for defective networks to be updated. Our expertise in cast-iron pipes, the ePulse Diagnostic network analysis technology, linked with the experience of our research centre, allows us to efficiently analyse the state of the drinking water networks.

Aware of the challenges in terms of sustainable development, we have also innovated with a system of micro turbines, allowing for the generation of renewable energy from water networks under pressure. The principle consists of producing electrical energy, both for private use and for sale, by using the surplus energy of hydraulic irrigation or water supply networks. Saint-Gobain PAM offers an innovative and clean solution to recover the energy from hydraulic systems.

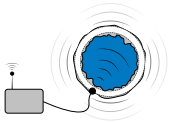
These new initiatives are based on a partnership approach with our customers to allow them to save and reconcile sustainable development with reducing their investments.

The partnerships are either on extending the range or a service offer.

Another partnership example shows Saint-Gobain PAM's desire to provide a service offer and adapt to the changing legislation.

The French decree no. 2012-97 of 27/01/12 commits managers and operators of water networks to detailing the precise state of their network heritage, to setting leak level reduction targets and to establishing the required updating plans.

**YOU MENTIONED PREVIOUSLY THE EPULSE DIAGNOSTIC NETWORK ANALYSIS TECHNOLOGY. WHAT DOES IT CONSISTS OF?**



50% of French pipes date back further than 1972! It is estimated that between 20 and 30% of the drinking water transported is lost to nature. The age of the network, the nature of the ground, water hammer, excessive pressure and even vibrations from road traffic are all factors capable of severely damaging the pipes and leading to leaks in the facilities. In addition to these losses, both in terms of the precious natural resource and money invested in processing, these issues can also cause a real danger to public health.

Yet, currently, the network diagnostic is based on indicators such as the rates of wear, the frequency of leaks, but also the age, type and diameter of the pipes, causing a considerable margin of error, which leads to taking unjustified decisions.

Saint-Gobain PAM has agreed a European partnership with the Canadian company Echologics®, (Mueller Technologies Company), which now allows them to offer this new optimisation service for updating the network. This exclusive, non-invasive, system is based on acoustic measurements to assess, without a service interruption, the health of the pipes, by calculating the residual thickness of the pipes.

It allows for the targeting and prioritising of maintenance or updating actions, without investigative work. This allows for a better anticipation and division of the updating budgets.

**http://echologics.com/epulse**

## ENVIRONMENTAL PUBLIC UTILITIES ARE ENTERING A NEW TRANSITION, THE DIGITAL ONE. HOW IS SAINT-GOBAIN PAM, A STAKEHOLDER OF THIS PUBLIC UTILITY, CONTRIBUTING TO THIS DEVELOPMENT AND PROGRESS?

To innovate in the world of water and anticipate future needs, Saint-Gobain PAM is developing digital services for local authorities, design offices and cable laying companies.

The first professional tool is the new www.pamline.fr website, designed for all mobile media and offering over 15,000 product references and 300 pages of technical content, accompanied with videos and downloadable documentation.

In addition:

- A dedicated YouTube channel brings together over 100 construction site videos, installation tutorials and 3D animations (see: PamlineTV),
- A browsable catalogue site publishes all the catalogues printed by Saint-Gobain PAM (dedicated website: www.ecatalog.pamline.fr).

## CAN YOU REVEAL SOME OF THE NEW IDEAS WHICH ARE BEING PREPARED IN SAINT-GOBAIN PAM TO US?

More specific applications will be launched soon to help design offices and companies with the design and creation of networks (choice of calculation and assistance tools). We can already cite two examples:

- A calculation application for the placement of ductile cast-iron pipes via the directional drilling technique.
- A comparative calculation tool of the total cost of ownership (TCO) of drinking water pipes and their environmental footprints (life cycle analysis)

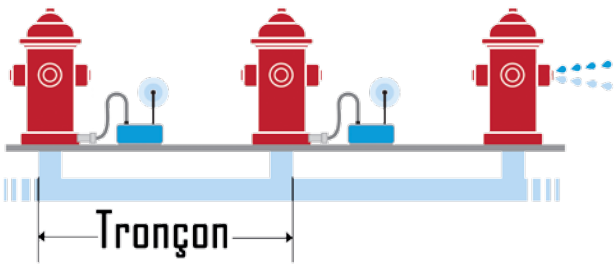
Finally, Saint-Gobain PAM is preparing for the future by working on highly innovative projects in the area of GIS (Geographical Information System), BIM (Building Information Modelling) for drinking water networks, and even connected objects (pipes, seals, etc.).

The software for total cost of ownership during the life cycle of pipes lets you measure the impact during the investment of pumping costs, leak and sustainable costs. It measures the estimated cost, but also gives an analysis of the life cycle of the product.

It lets you choose the best overall price and measure its environmental impact. This software was created by an outside partner and validated by an audit firm, just like the methodology which was certified by the University of Berkeley.

This approach is consistent with article 83 of the 2014/25/EU Directive of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal sectors and repealing Directive 2004/17/EC.

This article 83 refers to the cost of the life cycle: the costs linked to acquisition; the usage costs (such as energy and other resource consumption and maintenance costs); costs linked to the end of life such as collection and recycling costs; and costs assigned to environmental externalities linked to the product, the utility or the structure during its life cycle, as long as their monetary value can be determined and verified. These costs can include the cost of greenhouse gas emissions and other polluting emissions, as well as other climate change reduction costs.



# Open Innovation and the sustainable city

By Marie-Xavière Wauquiez, Paris&Co

**Paris&Co is the economic development and innovation agency of Paris. It is specialised in the topics of attractiveness and innovation with a view to creating jobs and economic value in Paris: it prospects and welcomes international investors, contributes to promoting the economy of the metropolis internationally and encourages the influence of the Paris region ecosystem of innovation via the incubation of young innovative companies, experimenting with innovative solutions, organising start-up events and networking via its network of over 800 start-ups with some one hundred major accounts. Paris&Co therefore allows its parties involved to make the Open Innovation concept a reality for all of its stakeholders.**

At the start of the 21st century, a growing proportion of the population lives in an urban environment. Although more than one out of every two people has been living there already for several years, the latest studies state that, in 2030, 2/3 of the population will live there. Several factors explain this development: the mechanisation of agriculture, the development of a services economy concentrating the jobs in cities and the social transformations of families.

In developing countries, these phenomena also occur, combined, among other things, with sharp increases in the population due to the reduction in poverty and the increase in life expectancy. It therefore becomes essential to offer quality living conditions to these billions of human beings.

In all these territories, two major challenges must be met:

- Offering quality real-estate structures whether it is for homes or for facilities in terms of offices, businesses and industrial buildings.
- Ensuring the mobility of goods and people to allow for the diverse functions of the city to be operational and effective: feeding individuals, allowing them to equip themselves, go to work, take care of themselves, educate themselves and simply meet up, etc.

Now, it appears that the solutions implemented since the emergence of the first two industrial revolutions are no longer adapted to densely populated cities for two main reasons:

- The use of fossil fuels to produce energy and electricity generates more or less significant airborne emissions locally, harmful to the health of residents and ecosystems in their totality, directly or indirectly.
- Networks, whether they are road ones in terms of mobility and logistics, or "others" even, in terms of the "utilities" (water, electricity, energy, etc.) are reaching saturation and the functions of the city are therefore affected, whether it is occasional or recurrent.

Moreover, it appears that western lifestyles are associated with a great waste of natural and energy resources, and also space resources given the phenomena of urban sprawl.

While COP21 took place in December 2015 and the governments of 186 States committed to keeping the temperature increase below 2°C compared to the preindustrial averages, it is, however, necessary to change our usual models to move towards "sustainable cities".

At the dawn of the 3rd industrial revolution, can this provide the cities and those who live there with solutions to the different challenges to be met? As humanity has always found solutions to development issues, as evidenced by the accelerated demographic increase over the last decades, we can be confident. However, the values on which the development of

western societies was based coming out of the 2nd World War must be profoundly questioned. For each of the major functions of the modern city, a few major groups, pure plays or not, are created gradually, from mergers and diverse concentrations: energy, property developers, public transport, public transport companies, waste removal, sanitation and supply of water, etc. Yet, these major organisations sometimes encounter difficulties adapting to the demand of their users and direct and indirect customers. This is evidenced by the gap between citizens' practices and the offers which are provided to them. The most blatant example in France is the success achieved by Blablacar, a new "almost-public" mobility service run by consumers, passengers and drivers, without any grants.

At a time of innovation acceleration, whether it is via smartphones or connected objects, the traditional stakeholders do not seem to be automatically able to quickly develop the solutions expected by the residents of cities.

Hopefully, Open Innovation will be a catalyst able to turn inventions into innovations, adopted by as many people as possible and with an unrivalled speed in terms of spread. There are certainly several definitions of Open Innovation, but we will use the following one within Paris&Co: the collaboration between small and large companies, undertaken in a community of interests. Operationally, it is about making start-ups and major groups work together, quickly and effectively, in win-win approaches.

After the unrivalled reign of fossil fuels, from now on it has been acknowledged that data, information collected at any moment and time by the different range of new information and communication technology (to use a term which now seems old-fashioned), represents the "oil" of the future. We therefore still need to know how to use it for maximum efficiency.

Several solutions come to mind:

- Using this data for a rational use of natural and financial resources. For example, in the Parisian metropolis, public transport is used at 120% of its capacity during peak hours, but the average daily occupancy rate is only 40%. Succeeding in "levelling the peak" thanks to digital tools would therefore be – without major investment – a very efficient way of improving the quality of life of travellers on a daily basis. Given the multiplicity of flow generators, the use of "big data" will allow for transport needs to be refined as much as possible. In certain cities, travellers are also compensated when they delay their journey times.
- Using this data to pool production and transport capacities, whether they are private or public. This is what the new "collaborative" activities are all about, the success of which relies on the ability to share, most often, goods and services between strangers. Companies also share production tools (in fab labs for example) and/or transport capacity, by providing space available in lorry trailers, which are rarely 100% full.
- Using this data to move towards the circular economy by allowing for the reuse of natural resources, which would otherwise be considered waste (as they no longer fulfil the function for which they were designed initially). This is the case for a start-up which converts combustion vehicles into local captive fleets of electric vehicles with the aid of batteries in the second part of their life.

The majority of the time, these new services are offered by start-ups, innovative companies experiencing great growth. Created by individuals driven by an immeasurable energy and enthusiasm, these small structures are "shaking up" the major groups, often incapable of radically innovating yet very much wishing to remain leaders in their markets. It is even more the case with institutional stakeholders, which, due to cumbersome governance organisations, are, the majority of the time, disconnected from innovations on the ground.

It is here that open innovation takes on its full meaning. By allowing mutually beneficial discussions between companies of different sizes, Open Innovation is an approach with three advantages. The start-up gains in credibility, by showing the relevance of concepts developed at major groups and the groups gain in flexibility and agility by drawing inspiration from the development process and these small organisations' ability to "pivot". The last advantage is that the city-dweller has a multitude of solutions offered to them, corresponding to these different expectations, variable depending on the day, the season and their age.

Embodied in organisations such as Paris&Co via incubation, experimentation and networking sessions, Open Innovation manifests itself in different actions, implemented and enabled by the coming together of start-ups in areas suitable to discussion on best practice and collaboration between these start-

ups, running but still fragile due to their young age. The major groups will also find the option of discussing their innovation policies there, more or less rooted in their corporate strategy.

Within the urban space, energy engineers, public transport operators, car manufacturers and developers need to have significant "coverage" to be able to respond to the significant needs of populations and to the contracts delegated by public authorities.

As such, digital technologies are calling into question numerous ways of proceeding. By allowing daily monitoring of their energy consumption, on their phone, for example, consumers can leave behind a passive and often imposed attitude to become "consumer-stakeholders". By knowing transport times and road network congestion in real time, travellers can choose the most suitable method of transport for their needs and their personal constraints. This raises questions about the choice of organisation and town planning undertaken by the authorities on the basis of necessarily limited analyses, when the now famous "big data" was not there to provide quantitative and qualitative data on the costs, unrivalled compared to pre-existing methodologies.

The ability to get major groups and start-ups working together is therefore a necessary condition, but it is not enough for the major metropolises to remain viable and attractive. Paris&Co is proud to work on this objective over the Parisian territory!

# Chapter 4

## What do residents expect from digital?

# INTRODUCTION

What kind of smart city might residents want? One in which services are convenient and useful information is shared? Certainly, as shown by the welcome given by the residents to the initiatives of Issy-les-Moulineaux (interview with André Santini, MP-Mayor) and the Lyon Metropole (text by Emilie Gerbaud).

These same accounts also indicate what anticipation and coordination were necessary to arrive at an intelligently collaborative city, and to discern what information and "informed services" are worth being developed to this end.

Without such anticipation also, the opening to the public of the Water Information Service (Sylvain Rotillon, Joint-association for the Bièvre watershed) would only be of moderate interest. The analysis of Laurent Vigneau (Artelia) shows, as regards Greater Paris, that the information expected does not only mean convenience, but also dreams, meaning and poetry.

The consideration of citizens' opinions with regard to territory transformation projects, or simply their community life, corresponds to a real potential for democracy, but implies handling the practical conditions with care. The analysis of Clément Mabi (UTC - The University of Technology of Compiègne) offers a list of these conditions, which do not rule out the fact that political messages or intentions remain pre-existing.

A practical example of such methods for collecting public expectations is proposed by Mireille Falque (Egis Environnement) and based on mapping surveys from environmental psychology, integrable upstream of projects.

The role of the stakeholder resident, user or citizen is one of the starting points of the LATTS research programme - Ecole des Ponts ParisTech (Stève Bernardin and Gilles Jeannot) to define the construction and usage conditions of information and data management systems which can stimulate a smart city. An expression of these conditions concerns the coordination of these systems, from data production to their administration. This point is picked up on by numerous stakeholders, in chapter 6 and the non-conclusion for example.

# ISSY-LES-MOULINEAUX, DIGITAL CITY

**By André Santini,**
MP of Hauts-de-Seine and Mayor of Issy-les-Moulineaux

André Santini presents the purposeful digital policy that he has been undertaking in Issy-les-Moulineaux for some twenty years. The eco-neighbourhoods of Fort d'Issy and Bords de Seine have experienced great success which he comes back to, with supporting figures and examples. He also presents the solutions deployed in the city in terms of managing the relationship with the citizen and parking. According to him, public utilities must be "naturally digital" and he invites elected representatives to develop the use of this new technology.


youtu.be/vNgGWuroEJo

> "Public utilities must be naturally digital, and I think that, now, we will not be able to go without digital."

**MORE INFORMATION ON:**

The digital eco-neighbourhood of Fort d'Issy:
**issy.com/fortdissy**

The eco-neighbourhood of Bords de Seine:
**issy.com/bords-de-seine**

**PAYING FOR YOUR PARKING WITH PAY BY PHONE**

Since 2009 the Issy residents have been able to pay for their parking with their mobile phone. Simple and practical!

**Available on Android and iOS**

**TELLMYCITY**

Thanks to a smartphone or a computer, TellMyCity allows Issy residents to indicate a problem or suggest an idea to the city, even congratulating it on an initiative!

**Available on Android, iOS and Windows Phone**

# Lyon Smart Métropole


TUBA, urban experimentation tube
(Photo credits: La Folle Entreprise)



By Emilie Gerbaud, Lyon Métropole

**Greater Lyon became the Lyon Métropole on January 1st 2015, facilitating the integration and management of social services which had been provided by the département (integration, health, home care services, education, culture, etc.) to the ex-urban community. This allowed for the seamless integration of a common strategy for social services with urban and economic planning a responsibility of Lyon Métropole.. This also implied the strengthening of the partnership with citizens, representatives and direct beneficiaries of Lyon Métropole. This institutional change was particularly rich and significant for the Lyon Smart Metropolis approach and has served to strengthen our capacity for action in this area: designing an easy, efficient, fluid and pleasant city with and for citizens, integrating new needs and lifestyles, thanks to increased and close interactions with users.**

**The Lyon Métropole has collectively created its own vision and interpretation of the smart city, a smart city which is reflected in the image of the territory, its population, its companies, its history and its way of doing things. Therefore, the Lyon Smart Metropolis approach relies on the territory's DNA: innovation and entrepreneurship, a high quality of life, partnership and collaborative experimentation projects regarding major urban projects.**

## WHAT DOES BUILDING A SMART METROPOLIS MEAN?

If we were looking for a definition of the smart city, we could say that it is about collectively designing new services and solutions, to respond to growing urban challenges, as well as to new expectations from users, taking the best part of digital technologies and new innovation methods.

The citizen is at the heart of the Lyon Smart Metropole approach and its projects, the main aim of which is to improve the quality of life and well-being of all of the user-residents.

New uses, new urban landscapes (Photo credits: Collectif Item)

## TECHNOLOGY AS AN ENABLING FACTOR FOR THE TERRITORY

Technological innovations are certainly important: defining data standards to allow for their interoperability; managing the rapid charging of electric vehicles over the grid; accurately modelling urban flows to optimise their management and anticipate the development of infrastructure; developing interface platforms between users, companies and the local authority; transmitting mass data, in real time; identifying the most economical information transmission solutions in terms of usage; etc.

Technology is an enabling and activation factor of the territory and its stakeholders (an "enabler"). It increases our cognitive capacity and our ability to act, adapt and respond. This optimisation of existing urban utilities already represents progress and very significant potential, in particular for local authorities which see the opportunity to develop a more fluid, efficient and pleasant city, while reducing the operating costs and the environmental impact.

This is the challenge taken up by Eau du Grand Lyon since the start of 2015. To fulfil its ambitious commitments in terms of water quality, service and pricing, the new delegation has implemented HUBLO, the general monitoring centre for drinking water utilities, which deploys no less than 400,000 smart meters within homes, and is increasing the density of leak and water quality sensors. The added value for the user is concrete: a reduction in the water price, better control over water quality, remote meter reading, information in real time for the users and a better responsiveness in the event of incidents.

## THE SMART CITY IS DEVELOPING THE SCOPE AND NATURE OF PUBLIC UTILITIES

Beyond technology and optimising flows, this new digital technology implies new practices for the city and new interactions between stakeholders. Uses are changing, whether it is about getting around, keeping yourself warm, buying a product, accessing a service, talking with friends and family, working or booking a show. Hyper-mobility, -connectivity, -information, and -personalisation of practices creates new demands and needs for users as regards the flexibility, accessibility, free nature and interactivity of services. These emerging services create value for the territory in several ways: innovative practices, user services, new economic activities (and jobs). The challenge therefore resides in creating a sustainable economic model, between the difficulty of monetising externalities (air quality and traffic reduction) and that of monetising services that are, however, real to users (parking assistance, monitoring energy consumption). The smart city is opening up new service areas to audiences, in the general interest, but which do not come directly from public utilities. What role will the local authority therefore have: ensuring the service, supervising and encouraging the development of these services or letting things take their course?

These items are carefully developed in the "Ville Servicielle : quelles transformations pour l'action publique" (which transformations for public action) publication by the Métropole's Forecasting Department.

## THE SMART CITY CALLS FOR THE REINVENTION OF THE LOCAL AUTHORITY'S ROLE

Beyond uses and practices of the city, these developments re-question the respective role of the stakeholders, in particular that of the local authority vis-a-vis citizens and private stakeholders. Let's take the example of the citizen: digital technologies and associated new uses give the user a central place, offering the opportunity to express their commitment and individual responsibility via daily actions ("empowerment"): I manage my consumption, I get information on a malfunction, and I suggest a service to my family circle.

The beneficiary-user becomes a stakeholder/contributor/service provider. A diversification of solutions and services is observed for a given issue: by way of an example, mobility in the city can no longer be summed up by the public transport vs. private

vehicle alternative. Instead, it is summed up via a multiplication in methods and operators: bicycle sharing systems, car sharing, car-pooling, pedestrianized routes, remote working, etc. This diversity provides wealth, agility and attractiveness for the territory. Instead of taking full responsibility for services from start to finish, the local authority has a role to create the conditions necessary for their development and to link the public, private and citizen's offers, in order to make them clear and coordinated, all the while guaranteeing respect for the general interest and individuals.

The Lyon Métropole has fully adopted this approach for activating and stimulating the territory over numerous fields. The strategy adopted on data shows this stance: structuring a governance framework, building and operating the necessary infrastructure (the data.grandlyon.com platform), developing a service layer to facilitate the exploitation of data and turning it into services, initiating a facilitation tool (TUBA, tuba-lyon.com), working with public and private partners on open data for targeted fields, piloting research projects on exploratory topics (like that of Optimod'Lyon and Opticities on mobility) and allowing for the development of user services (quality of life and attractiveness).

## IN THIS WAY LYON SMART METROPOLE IS ASSERTING ITSELF AS A PARTNERSHIP-BASED INNOVATION AND COLLECTIVE INTELLIGENCE APPROACH

Innovation over the different fields mentioned previously occurs as much in the uses of the city, the ways of doing things and the new economic models, as in the digital and technological developments. The large scale experiments, at the heart of urban projects (like those which take place in the Confluence neighbourhood) and the different open innovation spaces (Tubà, Erasme, Youfactory, La Paillasse Soane, etc.) embody this innovation dynamic.

It is a partnership as our vision of the Smart Metropolis is one of a metropolis which is built with all of the territory stakeholders, whether these be citizens, private stakeholders (start-ups, companies and associations) or public and para-public partners (developer-contractors, agencies, universities, landlords, etc.). It is the strength of a collective ambition and a territory project.

This partnership-based innovation approach is integrated in all of the fields of expertise and action areas of the Metropolis: the urban (mobility, water, energy, public spaces, etc.), economic (innovation, entrepreneurship, integration, etc.), social (health, home care, etc.) and societal (education, culture, sports, etc.) services.

Confluence neighbourhood (Photo credits: Collectif Item)

# Making the user a stakeholder of the water and sanitation public utility?

By Sylvain Rotillon, Joint-association of the Bièvre watershed

**Management of water and sanitation utilities since the 90s has been subject to numerous criticisms, in particular over a certain lack of clarity in this sector. In response, under pressure from associations, press and the Court of Audit, the public authorities have introduced numerous measures designed to improve its transparency to explain the make-up of the price of the utility. The operators, both public and private, have realised, for their part, the importance of informing consumers, so that the quality maintenance challenges of the water and sanitation utilities are better understood. With the obligation to report, via an annual report and the existence of a national observatory which publishes data allowing for the monitoring of the inter-annual development of utilities, and for a comparison between them, France has tools designed to respond to these needs. Moreover, initiatives from institutional or associative stakeholders strengthen the information offer. Globally, over 20 years, the progress has been significant. The challenge now, with the development of digital, consists of going further, and making the user a stakeholder of the utility. From the will to the application, the path is, however, no doubt more complicated than a simple click.**

## USER, ACCOUNT HOLDER OR CITIZEN?

Placing the user at the heart of the utility, so that he leaves behind the position of a simple consumer and becomes a stakeholder of the utility, is a laudable intention. The diagram of the virtuous triangle for management of a public utility, showing the three major categories of stakeholders and their relationships, highlights that the user has a role to play. Yet, although this diagram is intellectually satisfying, practically it is far from reality. For the user subscribing to the utility, the relationship consists, above all, of paying their bills to the operator. The information received in return is limited. As for weighing in on the decisions of the organising authority via election, this remains very theoretical. This situation is

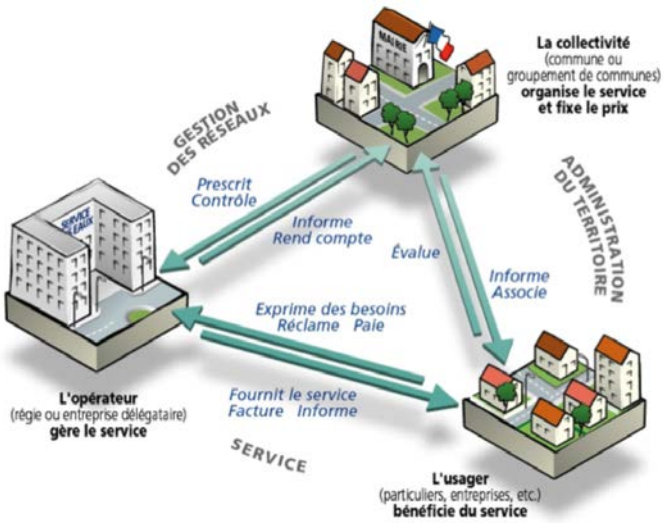



Photo credits: ONEMA

not necessarily associated with a desire from the utilities to be uncommunicative, rather it is, in part, the consequence of the first underlying problem, that of the definition of the service user itself.

We must distinguish between several notions, and in particular those of the account holder and the user. The account holder is the one who pays his bill, who has a contract with the utility, the user is the one who benefits from this utility. They are confused sometimes, but not always, rarely in the city. The user is a lot more difficult to reach as he is not necessarily a citizen of the municipality in which he benefits from the utility.

Therefore, taking the Parisian case, there are less than 100,000 account holders for over 2 million residents and over 3 million consumers. A third of the users are excluded from the triangular diagram, the immense majority of Parisians consist of consumers without a link to the utility. This situation is extreme, yet as soon as the collective housing share predominates, the consumer loses this link in the same way. The question therefore quickly arises of who one wants to make a stakeholder.

To allow the user to participate, it appears necessary to reduce this distinction between account holder and consumer.

The organisation of utilities on a scale which does not correspond to the catchment area is the first obstacle. As a user, we are as concerned by the quality of the utility in our place of residence as we are in our workplace, where we spend a good part of our time. A second obstacle comes from the fact that information is essentially circulated by the operator via the bill. The local authority often remains removed, whereas all citizens are users. The municipal bulletins, for example, could publish the results of the health check which does not affect the account holder.

## THE STAKEHOLDER USER

Participation then requires accessible data. In this respect, progress has been certain since the creation of the national observatory of water and sanitation utilities. Standardised indicators exist and are produced annually. The data is accessible online and a national report is carried out each year. On their part, the local authorities publish an annual report detailing the previous year's performance. Not all the utilities participate in the observatory and not all the local authorities publish a report, yet the situation is progressing. It is, however, about top-down information, necessary, but not enough to make the user a stakeholder.

Digital tools constitute a real opportunity to accomplish this development, placing the user as a contributor. Some mobile apps have been created in order to encourage the user to participate. For the moment, above all, they serve to estimate your consumption, to be able to settle your bill and indicate problems (which more generic applications from local authorities allow too). Another category of tools is directed towards practical assistance to locate water points and toilets. Only the application from the national observatory offers data and is able to address the demands of the local authorities which would not have filled in the national database.

Although we foresee the potential of these new tools, the offer is not there for the user.

A major pitfall for getting users participating comes from the technical nature of the subject. Behind the apparent simplicity (you turn on a tap and water comes out), the utility is a complex system. The more its size increases, the more the complexity increases and the more difficult the summary indicators are to interpret. This is one of the points which, for a long time, has been causing a barrier to the setting up of a national observatory, that of providing difficult to interpret data. The indicators are therefore accompanied with a summary description and detailed records. Yet the collection is either too simple, or too technical, which does not make appropriation by the everyday user easy, or by the majority of the press, which publishes endless articles covering the rates of return or renewal, without hardly ever putting these figures in perspective.

Can the user participate? Access to data now poses fewer problems than the ability to use this data to go further than the agreed and paradoxical discourses around too significant losses, too little renewal and too high prices. The discussions with users during debates struggle to rely on a rigorous analysis of the data available. Seeking to get away from a simplified vision by contextualising data leads to suspicion from the user, who often, justifiably, distrusts the discourse of the expert. We can therefore ask ourselves if it is reasonable to imagine that providing technical data is enough to make the user a stakeholder.

# WHY BE A STAKEHOLDER?

Yet incidentally, does the user really want to participate? The reality generally is not questioned: when users are asked, they do not participate, except a militant minority who present themselves as a manifestation of civil society. Whereas we are all users, we should worry about an essential utility, (the management of which is regularly dealt with in the press) and the question of water is, if you believe the opinion polls, an issue of concern, mobilisation is always very low. The public meetings mobilise a few dozen people, sometimes more when it is a question of the management method. Digital tools are not catching on. Apps remain restricted, between 1000 and 5000 downloads on Android for the most "popular", less than 500 for some, with mediocre satisfaction scores. However, apps letting you locate water points and toilets are finding great success, especially the latter, the most popular being downloaded between 100,000 and 500,000 times.

This reality applies even in the event of very extensive media mobilisation. The launch, in 2011, of the participative platform of the INC (French National Consumption Institute) and the France Libertés foundation; "la grande enquête" (the big survey), despite a media plan culminating in the participation of Danièle Mitterrand on the 8pm news of TF1 (one of France's main TV channels), only got together 10,000 participants over the whole of France. The initial site allowing for participation, prixdeleau.fr, has since been redirected towards advisory activity.

The situation may seem paradoxical: a sector denounced for its lack of clarity implements a national tool relying on a framework created by a school of ecumenical experts, data exists, reports are published, associations are mobilised, politicians make a career around the theme of water, citizens state that this question is essential and, in the end, all this energy and data only serve a small group of experts. Fundamentally, this means that the situation is not perceived as sufficiently worrying for the user to want to participate. The utility works too well and is not expensive enough to become an issue of mass concern. Mobilisations occur when the quality of the utility deteriorates or the price becomes too high. What is the point in participating in a preventative way in something that works? We need to talk with one another about so many issues that it is fanciful to think that the tool will create the need.

Is it impossible to make the user a stakeholder of the utility? Of course not, but you must specify in advance what is expected of them. It is necessary to find a balance between participation which allows for expression while being taken into account, and involvement which does not extend to shared decision making, the legitimacy of which comes from simply choosing. The limits of what is accepted by a local authority or utility are often unclear, creating frustration or disinterest. To become a stakeholder, you must determine the level of skill expected compared to what is asked. The more power you give to the user, the more important it is to train them to get away from the armchair philosophy type discussions. You do not become an expert overnight and to discuss with these people you must have a something in common. If you seek to mobilise user experience, you must clearly define its scope of application and its expectations. If, instead, you just want simple feedback, via digital tools, they must be designed so that they are unambiguous to use and in return you must show how the data is used. In any event, making the user a stakeholder only responds to a quite marginal, essentially militant, demand nowadays. Beforehand, you must be well informed, with education, by explaining the challenges of the utility, putting the institutional communication which explains that everything is going well to one side. What is the point of being a stakeholder if everything is going well? So as not to be a simple gadget, observatory type measures and applications must lead to concrete actions. They must be defined in advance by the local authority or the utility and they must have follow-up. The user can become a stakeholder if the scene is well written, if the director knows where he is going and if it is not about improvisation. The user will remain an extra stakeholder, a walk-on part, but what film would work without extras?

# Yet what do city-dwellers and users want from the city? An elegant and desirable city

By Laurent Vigneau and Patrick Viceriat, Artelia Ville & Transport

**The authors of this article work in the creation of contemporary territories by integrating environmental, human and economic challenges like tourism, leisure and culture, which characterise French urban production. More specifically they are dedicated to the case of Greater Paris and are working on several eco-cities, in France and internationally.**

## THE TWO PUBLIC SPACES

It is understood that the smart city will make everything more effective. It will get rid of unproductive consumption, replacing it with behavioural advice, palliative solutions and optimised alternative scenarios. Citizens will be constantly informed of the best way to use their immediate environment, optimise their journey and do several things at once, while they will be invited to use their bodies differently: less fat, more movements, real time calorie management, etc., as well as always having various options to save time.

**What if the hyper-connected man did not always want to be hyper-efficient?**
**For do we really know what citizens and users of the city want? Several signs lead us to consider that increasingly they want to experience two times at once: an effective, optimised time, and, conversely an improvised, uncertain, unpredictable time.**
**We do not yet now if the two time periods are correlated, if an excess of one leads to a growth of the other, yet we can now state that the second, in terms of technology, is catching up very quickly with the first: a little trip into competitiveness via inefficiency!**

Let's take the case of mobility. The optimisation of journey times and mobility systems is now a reality, while the knowledge of mobility is being refined thanks to technology and big data, with several big surprises like the invariance in average transport times for 40 years and the minority of so called economic reasons: work, deliveries, etc.

As such, a large part of the trips is not linked to journey time. Leisure trips, urban wondering – walks – casual shopping – variable opening hours, etc. are changing city dwellers' relationship to mobility and public spaces. Instead of gaining time, these city dwellers will prefer other values like guaranteed opening hours, comfort, the pleasantness of the route, moods and atmospheres, safety and cleanliness.

The average ageing of citizens will only accentuate this search for "inefficient" journeys as long as they are more "pleasant".

More generally, technologies must now integrate the existence of two public spaces: the physical public space and the digital one.

The digital public space, via social networking and internet links, has stolen a good number of the traditional functions from the physical public spaces: doing your shopping, playing and talking with your friends are the most obvious. Therefore there is a now a competition between the two public spaces.

Under these conditions, what can the physical space offer that the digital space cannot? City-dwellers' demand in terms of uses of the city is changing rapidly towards the sensitive, the pleasant, feeling and experience: the elegant and desirable city cannot be experienced on the net!

## INEFFECTIVENESS TECHNOLOGIES

The signs of new expectations in physical public spaces are numerous: we will cite this Barcelona start-up that is developing GPS navigation which, instead of giving the shortest route, provides the most beautiful one; or even the experiences of the artist Christian Boltanski in Montsouris Park with the sound installation entitled Murmures, hidden boxes of a sort under benches which broadcast recordings of amorous confessions of foreign students (the international university site is next door).

In another vein, the modern urban experience strengthens the feeling of belonging to a "real" group, like the option to change the colour of a building's lighting after a certain number of clicks from several laptops.

Urban knowledge of places visited is also encouraged with urban flash codes: here we are entering the cultural sphere with an instant access to the meaning of street names, their history and even architectural features of buildings: the city is read like an open book.

Technology has also allowed for the increase of Greeters. The Greeters are volunteers in love with and passionate about their city or region who are happy to welcome visitors like they would friends. They offer their time so you can discover places that they like, telling you about their story, neighbourhood or village and sharing their day to day way of life. It is a new form of participative tourism. In 20 years, it has become a global "brand". In France, associations of Greeters have been created in several cities and territories: Paris, Nantes, Strasbourg, Aisne, Normandy, etc. The "Parisien d'un jour, Parisien toujours" (Parisian for a day, Parisian for ever) association was launched in 2007. Since, 5,800 visitors from over 80 different nationalities have been able to discover Paris via trips with volunteers.

## FOR THE FRENCH TECH OF URBAN INEFFICIENCY

No other country but France has and will be able to claim an "ineffective" use of urban space as a major national treasure: number one global destination, strengthened by its global city (Paris), its metropolises and its 250 regular cities, France cultivates a way of life which, for all the issues which are facing us, is expressed in a unique "city lifestyle", symbolised by luxury, fashion, beauty, love, life and health. It is also a major economic issue: in the Paris region for example, tourism represents 7 to 8% of the GDP and 500,000 direct jobs.

No other country has such a diversity of cities organised over a several thousand year old territory network: cities from the plains, river, coastal, mountain and forest cities, old and modern: do you want an exhaustive list of pleasant cities? Come to France. Add overseas territories to this and you also have tropical cities – and what do they have in common? A city life style and French way of life that is globally renowned.

This exceptional fertile ground, sporting a high level of urban creativity both historical and current – like the French style tramway or the lighting of monuments – is curiously not very exploited, notably when it comes to export. It should encourage lots of energy in the search for new technologies capable of increasing the "elegant and desirable" technologies of the city following some avenues suggested here.

- Supporting tourists is already a French speciality with sites like "Ze Visit" or "Cityzeum" (see boxed article) possibly transmitted via urban flash codes. This progress should find logical follow ups in heritage or urban ambiance amplifying tools. These are still to be developed with a less "encyclopaedic" use than what can be found today;
- Few public space technologies currently work on our five senses which continue to be used little in the digital space: soon will there be technologies for smells, audio atmospheres and taste as indicators of living spaces in the city?

- Fun journeys are fully a part of the choice of transport and the promotion of multimodal systems: getting around this way, as though it was a game, will become, in the medium term, a significant item in the choice of methods and routes: French cities are perfectly suited to this little game.
- The historical, heritage and architectural knowledge of spaces that we practice, for children and adults, is also a part of the significant developments to come.

## A MAJOR TARGET FOR GREATER PARIS

Greater Paris will consolidate the framework of the number one destination in the world. It will radically shake up the links between airports, tourist hot spots and the hotel offer. It will also reveal new tourist crossroads which will take over from heritage to invent the touristic appeal of the future.

At the same time, Paris region residents' leisure activities will also be completely reconfigured by the new accessibility of facilities, parks and natural areas.

Tourism and leisure are often combined. They can be very complementary like in Greater Paris where the tourist industry serves to satisfy a part of the Paris region residents' leisure activities and the reverse.

The citizens of Greater Paris, who enjoy tourist facilities, are also more rooted in the "leisure civilisation": they skilfully combine the two periods of optimisation and "slow city" via spaces and down time, distractions, art and culture, which will be enhanced by their growing maturity.

The new technologies of the elegant and desirable city are thus able to kill two birds with one stone by taking both visitors and residents towards a new understanding and new uses of public spaces. This is the major challenge of the sustainable and smart city: being able to offer solutions which benefit everyone – and perhaps even with the French style sustainable city: being able to experience it straight away.

For several months we have been carrying out significant research into Greater Paris' capacity to support the region as a number one global destination, all the while improving the economic return of this activity.

The initial results regard the new territorial organisation to be encouraged, but the detailed analysis of global competition between metropolises concludes on the importance of coupling the French image of a very "glamorous" public space, driven by heritage, with a technological revolution which amplifies this image, all the while simplifying it.

Therefore, fun journeys, poetic spaces and places for living differently, are being worked on in the areas mentioned previously, but in a way in which we can deploy on a large scale with Greater Paris.

# AS PRÉVERT SAID

In conclusion, there would certainly be an interest in promoting, in France, a few incubators or demonstrators which fully exploit our historical and cultural assets, already recognised on a global level. We set about imagining a city where there would be specialised parks with benches which recite poems or quotations, streets which talk to us about the impressionists or surrealists, "custom" routes based on a random journey time, a smell restorer, a sound atmosphere to places according to the choice of historical period, a snapshot, the décor of which changes depending on the date of your choice... the possibilities are endless.

In this way, technologies which optimise time will perhaps join those which make it a timeless moment by allowing us, for example, to hear, in the Montsouris Park, a few words from Prévert, which clearly show that in Paris, time really can stop for a tiny second of eternity.

**"Thousands and thousands of years**
**Would not suffice**
**To recount the tiny second of eternity**
**When you kissed me**
**When I kissed you**
**One morning in the winter sunlight**
**In the Montsouris Park in Paris**
**In Paris On Earth**
**The Earth that is a star."**

Jacques Prévert

## ZE VISIT ET CITYZEUM: 0 OF THE MANY FRENCH PORTALS DEDICATED TO TOURISM

**"Ze Visit": discover a city or a neighbourhood from your smartphone with the ZeVisit audio app.**
**Vox inzebox is a digital tourist destination promotion agency and publisher of content and packager of mobile solutions. For 13 years, Vox inzebox has been producing multimedia content (4,500 destinations covered), designing mobile applications over all platforms (150 applications developed) and ensuring the marketing of destinations to give them greater visibility (over 4 million users each year). Since 2013, Vox inzebox has complemented its offer with the publication of books by buying the Dakota publisher (67 titles and 50,000 books sold each year) and has signed a partnership agreement with Prisma Presse to develop the GEO audio-guide application.**


**Cityzeum is a website offering free downloads of tourist guides for a few popular tourist destinations: Paris, Rome, Barcelona, Amsterdam, etc. The unique nature of the services offered by Cityzeum is that you can install maps and different Digital guides on a smartphone, in order to be able to view them anywhere, at any time. Cityzeum Paris offers over 2000 visits to discover on the site, including museums, shopping, restaurants, leisure areas, squares and streets, etc, all for free.**

# Taking electronic democracy seriously – Challenges and limits of the digital participation of citizens



By Clément Mabi, Compiègne University of Technology

User experiences of information and communication technology (ICT) in a political context are increasing. We now talk of "electronic democracy" to describe the use of digital tools to update the forms of dialogue between citizens and public authorities. This popularity finds it origin in a context marked by a series of factors that it is advisable to recall in order to be able to adopt a sufficiently analytical position, so as not to succumb to the lure of a "techno-optimist" discourse,

without, for all that, opting for disenchantment à priori. The Internet and digital tools certainly aren't the solution to the different problems that democracy is experiencing currently, but we cannot say that their mobilisation "does not change anything". An intermediary position, which it would be worth introducing, is possible.

First of all, we note that citizens are more and more demanding of responsiveness on decisions concerning them and of participation in public action[23]. To respond to this, the public authorities have increased participative measures, constituting a real "participation offer", representing the different "participative solutions" offer to improve the working of democracy. At the same time, the internet and digital tools are now omnipresent in social practices, to the extent that they are upturning the operating methods of numerous fields by digitising a certain number of activities, whether it is in culture, the economy or relationships with the administration, etc.

Online activity is characterised by a great interactivity and the option of networking an infinite number of documents. These features of the "network of networks" seem ideal for an enrichment of democratic practices and have therefore been widely called upon by organisers of measures. What specifically are they? Does ICT offer such promising means of participation? Answering these questions means "taking electronic democracy seriously" and analysing the actual practices of stakeholders, notably in the area of consultation and spatial planning.

23. You can refer to this point in the works of Loïc Blondiaux (2007).

## SOME GENERAL CHALLENGES REGARDING ELECTRONIC DEMOCRACY

If you follow a certain amount of research in the area[24], electronic democracy is likely to provide a favourable framework to dialogue between a significant number of citizens and therefore to **respond to issues of inclusion** that the traditional participation bodies are experiencing. Due to constraints (social, spatial and temporal), certain audiences will not be able to be integrated into participation spaces. The internet would therefore be likely to lift these barriers and facilitate the inclusion of young people, from social minorities. What is more, some are betting that audiences already online could more easily come to participate by using their skills, different from those required for traditional participation (public speaking for example).

The make-up of these participating communities is changing and **participation finds itself "de-localised"**, in other words, it is not specifically linked to a physical presence in a territory. From now on, there is no longer a need to travel to a specific place to give your opinion, it is becoming possible to participate remotely. Therefore, it is no longer just the local residents who are encouraged to express themselves, but instead, all those who feel potentially affected by a project. This opening up changes the outlook and offers perspectives to go beyond the opposition between defenders of individual "NYMBY"[25] interests and spokespeople of the general interest, in that it widens the possibility to consider the variety of groups concerned.

These audiences brought together will also be offered new means of **participating in the collective exploration of challenges raised by issues being debated**. The web is an enormous source of information and would allow participants to give an opinion on the problem raised by relying on multiple and contradictory sources, beyond paper documents provided to the public. Putting their opinions online and making them public, therefore allows for the arguments to be "put to the test" by the community and the variety of information sources, in order to develop their definitions. This new way of producing them would provide them with a greater legitimacy, close to those offered by the decision making theories.

## FEEDBACK FROM THE CNDP PUBLIC DEBATE

Certain institutions in charge of organising consultation with the public now offer digital tools in the "toolbox" of designers of plans. This is the case with the French National Commission of Public Debate (CNDP). The CNDP is an independent authority in charge of organising public debates with citizens around territory planning projects[26], traditionally via public meetings. Referred to for any project over three hundred million euros, it can rule on the holding of a debate and therefore appoint an individual commission (CPDP) to organise the debate on the ground. Its mission is strictly supervised by the law, which imposes a certain number of constraints on public participation.

The institution has been gradually considering the best way to be consistent with the actual practices of citizens and encourage their involvement in public debates. Digital is part of the solutions envisaged. Therefore, the CPDPs are now all equipped with a website. The number one mission of this site is to facilitate the circulation of information, to allow everyone to access documents on the project in a digital form, therefore encouraging a principle of transparency (everyone has access to the same information).

These sites are equipped with a question/answer system (SQR), in other words **an option for the public to directly question the project sponsor**, who is obligated to provide a response. This system, is the extension of the paper version in which, during meetings, the participants can ask a question and demand specifics on the project. In the SQR, it is possible to view all the questions, including those of others and therefore benefit from the responses which have been given to them. It is therefore now possible to ask a question without going to the meetings for those who are not local residents, or to extend debates in other forms by asking a question which was not able to be formulated during the meeting.

A certain number of CPDPs are also experimenting with getting the public to participate by mobilising other tools, like forums, which allow for discussions to be started on predefined issues[27]. The aim is to give the public the greatest variety of means possible to express

24. On the subject see the work of Laurence Monnoyer-Smith (2010) and Stéphanie Wojcik (2011).
25. The NYMBY acronym for "not in my backyard" describes objectors in consultations who focus on an individual interest without following the advice to promote the general interest: I accept the principle of a new facility, but not in my territory.
26. For more information see the website of the CNDP: http://www.debatpublic.fr/
27. See, for example, the debate on the Ivry incinerator, the one on the Deux Côtes off-shore wind farm project or the one known as LNPN.

their points of view and give information on arguments to the CPDP for its report. These forums are therefore a collection tool for opinions, complementary to the public meetings. Other CPDPs have been launched more recently on social networks like Facebook and Twitter, in order to seek out their audiences by letting them know about the public debate and by trying to lead them towards official public debate spaces.

For all that, the pitfalls around the use of digital are still numerous. Facilitating the expression of citizens, notably online, raises, for example, the question of information management. **How do you avoid cognitive overload?** Although, thanks to the SQR, several thousands of questions are dealt with and uploaded, access to information is sometimes complicated, so it becomes difficult to identify a specific piece of content in the mass of data. Secondly, **the identification of participants online also poses a problem**, in so far as, always being concerned over transparency, the CNDP wants participants to identify themselves with their real identity, which is almost impossible to verify on the web. **The problem which results from this is that of the "right to be forgotten"**. Once the debate has finished, some participants do not want their contributions to be archived and indexed by search engines.

## ON THE IMPORTANCE OF A MEASURE SUITED TO THE MISSIONS AND AUDIENCES OF THE INSTITUTION

Putting the opportunities offered by ICT to good use to create a relationship with an audience therefore does not seem so simple. **To get there, the most important thing is to not be taken in by the promises of tools** and to have your choice of equipment dictated to you by preconceptions. Wanting to "be on Facebook" is not a strategy in itself. The approach consists instead of identifying needs by defining the objectives which may be reached, thanks to the mobilisation of tools. Equipment is therefore the final link in the process. **The reality principle must come first**, it is advisable to be consistent with the skills of the target audience and with those who are in charge of running the measure. Doing so requires organisation and therefore human means, which must be taken into account in advance: does the institution have the means for its objectives?

"Equipping" your measure is therefore a way of inviting citizens to participate on the consideration of their environment. Yet **this, above all, requires proper knowledge of the features of tools and the opportunities that they offer** in terms of communication with the public. Let us take the example of e-mail. A leading digital tool, it is now used by a wide audience. It allows for multiple forms of communication: both personal, in the form of correspondence, and interpersonal, thanks, for example, to circulation lists. This practice allows citizens to get in contact with the representative of the institution and circulate information to the public, on the progress of a consultation for example, to a wide audience. We must also remember that certain missions do not need to be taken on by digital tools. Under no circumstances must you be completely cut off from the physical world, and the link between online and offline tools is wise, in order to combine the different audiences (not all citizens are connected), as well as the variety of targets set.

At all stages of the process, it is advisable to keep in mind that **the choices which are made in order to organise dialogue, send a message and translate political ambitions**. Depending on the openness allowed and the measure's ability to organise a wide and calm dialogue, it is a vision of democracy which is made tangible. Considering this symbolic dimension does not necessarily mean doing away with simple communication where dialogue is staged. To conclude, it is important to insist on the importance of an experimental rationale and to provide democracy with the means to reinvent itself, according to the challenges it is faced with.

## FOR MORE INFORMATION

**Blondiaux L. (2007), *Le nouvel esprit de la démocratie*, Paris, Seuil - La république des Idées.**

**Monnoyer-Smith L. (2010), *Communication et délibération. Enjeux technologiques et mutations citoyennes*, Paris, Hermès Lavoisier.**

**Wojcik S. (2011), *"Prendre au sérieux la démocratie électronique"*, in Forey E. & Geslot C., (dir.), La démocratie électronique, Paris, L'Harmattan.**

# Participative study on the living environment "For the public's active participation in understanding the territory challenges"



By Mireille Falque, Egis Environnement

## WHY DID EGIS ENVIRONNEMENT TAKE AN INTEREST IN THIS SUBJECT?

The European Landscape Convention, ratified in Florence in 2000, defines landscape as "a part of the territory as perceived by populations […]". This definition reminds us of the importance of residents' views on their everyday environment.

Moreover, we have noted that populations' points of view transposed into analyses of development studies, etc. are too often reduced, due to lack of capacity. This is because taking into account collective representations of a territory by residents implies going to find them to question them. Now, this approach leads to significant investigative means on the ground followed by analysis of the data.

What is more, as a stakeholder in spatial planning, Egis has noticed that collective representations can affect the acceptability of projects. Certain elements of the territory are of such importance to local residents that the desire to keep them can lead to strong local resistance in the context of a project, without them necessarily being known to the public contracting authority. It is therefore important to be able to identify these items to which residents accord value, in a consensual way, independent of any expertise.

Egis Environnement has therefore asked the following questions:

- "How can we accurately analyse the ideas and uses that residents have of their territory?".
- "What are the subjective criteria which affect the acceptability of a project?".

To respond to these questions, Egis Environnement has been committed, since 2009, to a research project with the University of Nîmes, specialised in environmental psychology.

## A LITTLE "THEORY"...

Environmental psychology concentrates its attention on the experienced space created from physical realities and associated representations, in other words, on individuals' experiences of places. These relationships that individuals have with their living spaces cover several aspects:

emotional, identity related and practical. They are constituent of our daily lives, influencing aspects as dominant as our technological development or our social relationships. They are complex and dynamic, in other words they change over time, notably depending on the transformations in the environment and the representations that individuals make from these transformations.

In human sciences literature, authors agree in saying that attributing certain values to your living area allows for the development of one or another of the aspects of the relationship with the place.

For example the "wild", "spirituality" and "aesthetic" values would allow for the prediction of attachment to a place.

To preserve the emotional, identity related and practical links essential between territories and residents, it is therefore necessary to identify the areas rich in these values, so that developments have the least repercussion possible. Such a consideration of the subjective reality of the territory will therefore benefit development projects, the social and territorial integration of which will be improved.

## ... AND THEN THE "PRACTICE"

An approach has been developed, taking into account this subjective reality, extending the partnership undertaken since 2009 with the University of Nîmes around the "Psycho-social understanding of major transport infrastructures"[1] thesis, aiming to identify the criteria for the social success or failure of a transport infrastructure project. The desire was to develop an operational methodology compatible with the implementation deadlines and budgets specific to the development projects. The participative living environment study is an innovative approach which combines geo-localised qualitative information with the participation of residents. This combination allows for the emergence of collective representations, which reflect territorial challenges and uses not known on an institutional level.

### WHAT IS THE PRINCIPLE OF THIS APPROACH?

The "participative living environment analysis" combines mapping with a questionnaire coming from environmental psychology, based on the type of values mentioned above. It is targeted at the residents of the territories to be analysed.

This questionnaire, adaptable to each area of study, can be put online on any computing media (a website, dedicated or not, social networks, etc.). These arrangements can also change depending on the expectations and project of the customer. It is in this interaction between a participative approach and a qualitative and georeferenced data aggregation tool (in a geographic information system, GIS), that the originality of the methodology is located.

### WHAT ARE THE RESULTS OBTAINED ON THE GROUND?

To develop the methodology, the opportunity to test, in the territory of Fleurines (a small village of the Oise), was taken. The municipality was not directly affected by a project, but was prepared to test the relevance of the conclusions arrived at from the methodology.

The questionnaire was opened online for a fairly restrictive time period (one month), and an advertisement in the municipal paper described the approach. 7% of the population of Fleurines filled in the questionnaire on the dedicated website, providing a very interesting volume of information on the representations of the territory through different values.

Quickly, certain places steeped in an emotional and symbolic dimension were identified, which would have been difficult to identify in a traditional analysis. These areas can be highlighted by a mapping of the values of the territory.

### WHAT TYPES OF PROJECT IS THE APPROACH DESIGNED FOR?

The initial aim was to offer project sponsors a better understanding of the territory in all its dimensions, to ensure the feasibility of their projects. Even though the consultation phases are increasingly taking into account what local residents say, you must understand that, at this stage, any modification of the project incurs considerable additional engineering costs. On this point, the


Residents are invited to respond to an interactive questionnaire via a dedicated website. Each citizen therefore creates their sensitive map of their living environment. (© momius - Fotolia.com)

methodology increases upstream involvement in technical studies of information, which is additional and useful when designing a project.

What's more, this methodology then allows the product to be jointly created with the residents, as the data is all geo-localised, preserved over time and very easily accessible at any time during the project. These items mean the methodology receives an excellent welcome from sponsors. The methodological principles mean its use can be envisaged for any kind of project (urban, industrial, transport infrastructure, etc.), at different study stages and also for territorial planning studies (PLU - local town planning, SCOT - territorial coherence schemes etc.).

***Example:***

***Application of the approach in the municipality of Fleurines (Oise)***

*The approach, via collective representations of the territory, was tested on the rural community of Fleurines (1,800 residents) in the natural regional park of "Oise-Pays de France", 50km to the north of Paris. In this village clearing, in the heart of the Halatte forest, responses to the study were collected at the end of 2013 via a dedicated website created by Egis. Questioned on the values of countryside and the environmental quality that they attribute to different places in their village, the residents, via their answers, created the mapping of their territory.*

### *Mapping of landscape values by the residents of Fleurines*

*Initially and for each value, mapping was carried out (Figure 1). It was able to locate these values within the territory, as well as how often they were expressed. To give greater "readability" to the results, this map can be accompanied by photos representing the landscape values identified.*

*In the example given (Figure 1), the map lists the sites and places with a "spiritual and therapeutic" value. The results reveal that, for Fleurines residents, the state forest of Halatte takes on this value and is mentioned the most.*

*Other places also take on this value, but to a lesser extent: they are the mound of Saint-Christophe, the swimming pool and its surrounding areas (known locally as "La Montagne" – the Mountain) and Mont Pagnotte (Halatte forest).*

*Secondly, a summary mapping of territory values was created (Figure 2). It brings together all the data collected and reveals, on a territorial scale, the collective values. This "sensitive" mapping highlights the diversity of representations, while ranking the places with the most value in the eyes of the residents.*

*In the example given (Figure 2), the participants said they were particularly attached to two sites: the mound of Saint-Christophe, the highest point of the village with 360° views and the state forest of Halatte.*

*However, the values represented by these two sites are very different: the mound of Saint-Christophe is mainly mentioned for its aesthetic value, whereas the forest of Halatte represents all the values studied, within which there is a great uniformity.*

*In addition, the participation of the residents allows for the specific delimitation of places in the village perceived as degraded (located notably around the equestrian farm in our example) and the provision of new information on places up until then not identified and described by the participants as holders of numerous values (aesthetic, recreational, heritage, educational, etc.).*

*The recurrence of answers describes a hierarchy of challenges designed to create recommendations on future developments:*

- *comparing the different recreational spaces of Fleurines,*
- *safeguarding the individual sites of the forest of Halatte*
- *preserving the view from the mound of Saint-Christophe,*
- *decreasing the degraded area on the outskirts of the equestrian farm,*
- *etc.*


Figure 1: sensitive map listing the sites/places with a "spiritual or therapeutic" value for the residents of Fleurines

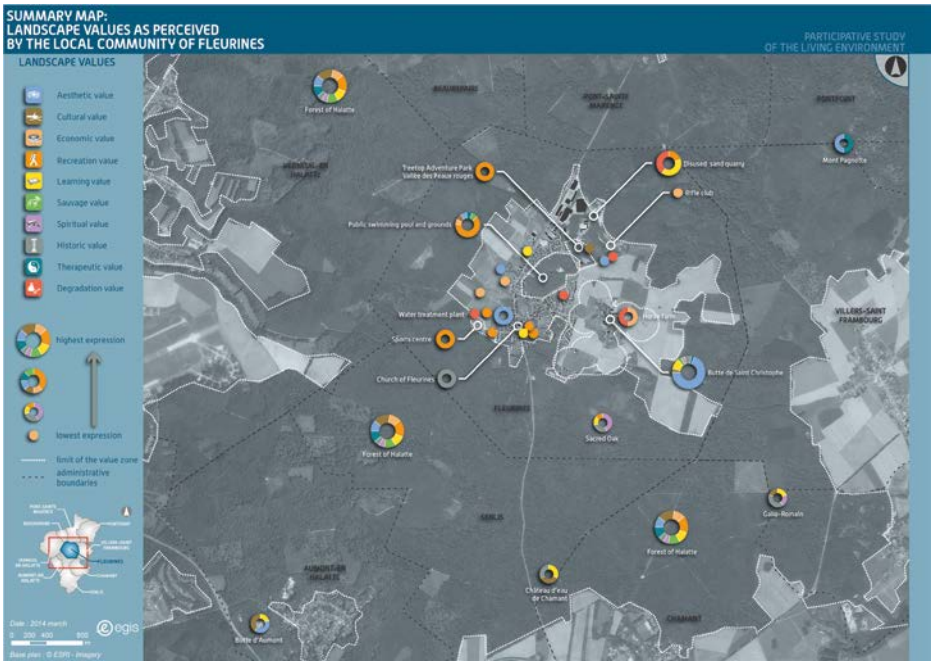



Figure 2: sensitive summary map of values of the territory of the Fleurines residents

# BIBLIOGRAPHY

**Lopez A. (2013) "Enjeux psychosociaux des grandes infrastructures de transport", doctoral thesis, Psychology and educational science research department of Aix-Marseille – University of Provence / University of Nîmes**

# From “smart” to “integrated” city: a research agenda for social sciences

By Stève Bernardin and Gilles Jeannot, LATTS, Ecole des Ponts ParisTech

**In his most recent book, Antoine Picon explores the political and social imagination related to the “smart” city. He describes the promises and limits of a self-fulfilling prophecy, when he refers to the advent of a new kind of intelligence in cities. More specifically, he exposes the way in which the call for a digital upgrading regenerates some old metaphors of the city, in which the roads become some “arteries” and green spaces become “lungs”, with cities “entering modernity”. His analysis paves the way for a new research agenda within the Laborary on Technics, Territories and Societies (LATTS). It leads to question the very principle of coordinating and integrating the different aspects of public and private interventions in cities being Who will take charge of it, when, and why precisely? The question still waits for an answer.**

## THREE TOP PRIORITIES: SUSTAINABLE DEVELOPMENT, CIVIC INCLUSION AND SECURITY

The research project of the LATTS refers to a critical assessment of the top priorities pushed forward by the promoterss of the so-called “smart city”. It calls for a critical reappraisal of the usual claim for integration of the various field of public utilities in the city. Does it respond to a political or a social need? Who is push it, and in what terms? The analysis still must be developed, through the analysis of a renewed invitation to digitize urban spaces. It goes back to a three part objective of (1) optimal management of natural resources, (2) increased participation of citizens in local political life, and (3) an improvement in the security and safety of everyone in the city.

(1) In terms of sustainable development, the smart city is ordinarily considered as an essential medium through which it becomes possible to rationalize the ordinary practices of citizens. It must, in particular, help to optimize the energy consumption of residents, for their daily journeys and heating, most notably, at their work place and at home. The advent of the smart city must, moreover, help to control the production of waste, by controlling the waste emitted by households, to facilitate their later processing. To borrow from a well-know formula, it must change lifestyles of citizens to make them “eco-responsible”.

(2) For its promoters, the smart city must also participate in making public decisions more democratic, by bringing decision makers and users of urban utilities together. Each citizen could become a stakeholder of local planning or transport policies, as well as energy consumption and waste processing, by relaying in real time the reasons they are satisfied or unsatisfied with the proposals which have been made to them. The development of information and communication technology could therefore go along with a facilitated transmission of individual data for collective uses. Then, the “connected” citizen could enable the very content of urban policies to be deeply changed.

(3) More often, the smart city appears as an ideal for the safety and security of people. Covered with sensors, it would identify and record some potential warning signs, perhaps invisible otherwise to law enforcement agencies. Its promoters do not see the ghost of “Big Brother” in such a vision. Quite the

opposite, they value the deployment of technical measures in the respect of common law to preserve the liberties of everyone, instead of restricting them a priori. Normally their argument relies on the case of cities like London or Singapore, where the streets are already equipped with cameras in the name of maintaining public order. That is why the call for the advent of a "safer" city.

Each of these three points is worth being scrutinized through the lens of social sciences. It would then be possible to better understand the political and the social challenges of the emerging "smart city", by getting away from the pitfalls of a naïve optimism or cynicism a priori. Which are the populations targeted by the projects managers? Are they made part of a larger development program? These questions need to be asked. But they do not mean that the role of international or commercial stakeholders in the process to digitization of the cities should not also be questioned. Does the advent of the "smart city" win an unanimous support, or does it reveil some old political differences? Which companies are its main promoters? And who, in the end, is in charge of integrating the different databases, when and how precisely?

## CHIPS, SENSORS AND CONNECTED TERMINALS: WHEN SOCIAL SCIENCES TAKE NEW TECHNOLOGIES SERIOUSLY

At the LATTS, the analysis starts with the choice of a method: that of taking seriously the study of technical devices that contribute to the creation of the "smart city". Historians, geographers, sociologists and political scientists, then, investigate the political and the social challenges of the changes underway through the lens of sciences and technics. It leads them to further develop a body of work carried out for over thirty years at the LATTS, on the research theme of "urban networks". More precisely, the researchers want to show how technical innovations find their place in a specific set-up, from a social and political point of view, in a given territory. They highlight how some apparently innovative measures participate in the reframing of some old research questions related to life in society.

The approach questions the novelty of the many experiments classed under the banner of the "smart city". Optimization practices relying on information systems opened to users are not new. As regards to this, one could mention the practices developed a long time ago in the area of urban transport for the modelling of transportation. The researchers at the LATTS, nevertheless, choose to enter into the analysis without any preconceived ideas, through a very specific study of sensors and remote transmission systems, which measure and broadcast, in real time, geo-localized information. In some cities, the technologies are integrated within the urban property itself, like in a growing number of transport services.

By studying these original forms of data production, the researchers want to take seriously the new objectives displayed by smart city developers, like the upstream collection of information and the downstreaming of personalised services, the optimisation of resources available to mayors for environmental, social and economic aims, or the integration and standardization of some actions previously segmented at the level of the city, between distinct sectors of municipal intervention. The approach questions the way in which information is gathered, standardized, analyzed, stored and visualized. Who will take charge of it, and with which digital tools?

## BETWEEN INSTITUTIONS, ECONOMICS AND CIVIL SOCIETY: STUDYING NEW FORMS OF COORDINATION

The question of coordinating different sources of data production is at heart of the research project of the LATTS. It refers to a debattes between the producers of data (citizens, companies or administrations), and some organization at various governmental levels, between the public and the private spheres of action. The interconnection of data, indeed, is an essential theme for the coordination of actors, to go beyond the simple juxtaposition of innovations in various sectors of public action.

The question can be dealt with from the point of view of the technical possibilities of networking different geo-localized databases. This raises interest in the relation between the different public utilities of the city. Who transmits the data, when, to whom, and in what format? The work already carried out on integrated management software packages suggests that such a question reveals not only technical challenges, but also some political, economic and social interests. It seems important, therefore, to invite social sciences to consider

the transformations of coordination models and practices associated with the development of the digital city nowadays.

Moreover, the question of coordinating data production activities is an essentiel entry point into the analysis of the restructuration of urban government, which could lead to the advent of the smart city. Which residents can take possession of the projects presented to them, when, and how? Do the elected representatives make it a priority of their current mandate or for the upcoming one in each city, independently of any political disagreement? Who chooses to validate the very principles of data sharing, in which social, economic and political configurations?

The coordination challenge comes into play between the public and private, institutional and commercial sectors. The means chosen to promote the smart city correspond to some economic service provisions. Three categories of service providers seem to be able to work in this area: they are major information companies seeking to penetrate the market of urban management; or construction industry and urban service groups already present on the market, wishing to propose new service offers integrating data management; and, lastly, a myriad of small companies who tend to offer some more specialized products and services.

Will the arrival of these last economic stakeholders lead to the development of a stabilized relationship for cities with major service and construction industry companies? One could also question the evolution of the legal and technical form of the contracts passed between public officials and private companies. It would connect with the mutation of major companies offering database hosting solutions on their server (through "cloud" solutions) or software as a service ("SaaS"). Several cities are experimenting new partnership in these domains. Could we envisage some other pathways of development for the contracts between public officials and private companies, borrowing from some UBER-type of urban services for instance? The researchers at the LATTS are committed to study those questions through a detailed analysis of the experiments initiated in this area.

# BIBLIOGRAPHY


Cardon D. (2015), *A quoi rêvent les algorithmes*, Seuil, république des idées.

Chourabi H. et al. (2012), *"Understanding smart cities: an integrative framework"*, 45th Hawaï international conference on system sciences.

Danielou J. (2012), *La ville intelligente, état des lieux et perspectives en France*, Studies and documents, Commissariat for sustainable development, no. 73 November.

Danielou J., Menard F. (2013), *L'art d'augmenter les villes.* (Pour) une enquête sur la ville intelligente, Report from the PUCA (Planning Construction and Architecture Programme).

Goldsmith S., Crawford S. (2014), *The Responsive City: Engaging Communities Through Data-Smart Governance*, Jossey Bass.

Graham S., Marvin S. (2001), *Splintering Urbanism*, Routledge, London.

Greenfield A. (2013), *Against the Smart City. A Pamphlet*. Do Projects NYC.

Luque-Ayala A., Marvin S. (2015), *"Developping a critical understanding of smart urbanism ?"*, Urban Studies.

Picon A. (1998), *La ville territoire des cyborgs*, Paris, Les Editions de l'Imprimeur.

Picon A. (2013), *Smart Cities, Théories et critiques d'un idéal auto-réalisateur*, Editions B2.

Picon A. (2015), *Smart cities, a spatialized intelligence*, Willey.

Rabari C., Storper M. (2013), *"The Digital Skin of the City"*, Working Papers of the Cities and Territories Programme, 2013-01, Paris, Sciences Po.

Saujot M., Erard T. (2015), *"Les innovations de la ville intelligente au secours de la ville durable ? Décryptage à partir des enjeux de données"*. Working Paper from the IDDRI (Institute for sustainable development and international relations), 02/2015 May 2015, Sciences Po.

Townsend A. M. (2013), *Smart Cities. Big Data, Civic Hackers and the Quest for a New Utopia*, W.W. Norton & Company.

Tropeta D. (2010), *The smart city Vision: how innovation and ICT can build smart 'livable', sustainable cities*. The Innovation Knwledge foundation.

# Chapter 5

## Which stakeholder transitions for this digital transition?

# INTRODUCTION

The digital transition is part of a context which affects the administration of territories as much as the public utility institutions and companies which work in this area.

It is the context of the collaborative economy, which includes the overall utility vision (interview with Célia Blauel, Eau de Paris, and text by Christophe Perrod, SEDIF), the end of the exclusive domination of the producer and the integration of users in the production of data, but in the practice of the utility (interview with Norbert Friant, Rennes and Rennes metropolis), it is the advent of the circular economy (text by Jean-Marc Boursier, FNADE – French National Federation of Decontamination and Environment Activities).

In this context, it becomes interesting to offer actions aiming to "complement" the urban functions, by offering, for example, data flow management services, enhanced over different urban uses (text by Catherine Dumas, SIPPEREC - Intermunicipal Association of Outer Paris for Energy and Communication Networks).

The creation of new values within professions manifests itself in the exchange of data with consumers/users, like with the per-weight pricing of waste collection and the circulation of information collected from the meter.

Utility operators, such as SUEZ and Veolia (interviews with Jean-Louis Chaussade and Alain Franchi), are projected in the best services provided to consumers, when digital allows for increased and targeted responsiveness; they can rely on their service integrator experience, to play a role in the integration of data specific to their professions and beyond.

The SIAAP offers a more specific example with its role as a major sanitation utility, in which a vast and complex system can now benefit from automated management, managing, in real time, vast flows of data, as well as being the only one capable of controlling overflows and excesses.

Equipment manufacturers, an example of Sainte-Lizaigne on another scale, create value very much in advance, by integrating, into water network management devices, means of measuring, self-diagnosis, etc.

For all these stakeholders, data standardisation is a pre-requisite, as well as the promotion of rules appropriate to their controlled and secure sharing. Cost savings and efficiency gains are the specific and shared results, in part acquired and in part to come.

# DIGITAL AT THE SERVICE OF WATER

Célia Blauel details the contribution of digital to the Parisian water utility and its challenges in the services provided to account holders, thanks to remote meter reading, as well as in the management of the security of facilities and infrastructure of Eau de Paris. She presents the information system implemented by the public company, which allows for the combination of operational management data, protecting the resource for a better performance in the policies implemented. In a landscape with a multitude of interactions, digital is also, according to her, a facilitating tool in dialogue with other operators.


youtu.be/Iqdy5wmv0gM

> “Digital is a real asset, as it allows for the development of high performing and innovative services for users.”

**By Célia Blauel,**
Deputy Mayor of Paris in charge of the environment, sustainable development, water, canal policy and the Territorial Climate Energy Plan, as well as the President o f Eau de Paris

Photo © Patrick Sordoillet

### THE MONTSOURIS RESERVOIR

**eaudeparis.fr/uploads/tx_edpevents/brochure-montsourisBD.pdf**

### ONLINE AGENCY

This service allows account holders to manage their Eau de Paris contracts easily and carry out all their procedures online 24-7.

**agence.eaudeparis.fr**

Account holder service of Eau de Paris

Photo © Eau de Paris

MAIRIE DE PARIS

eau de Paris

# How is the digital transition implemented in Rennes Metropolis?



By Norbert Friant, City of Rennes and Rennes Metropolis

## NORBERT FRIANT, YOU ARE RESPONSIBLE FOR THE DIGITAL SERVICE IN THE CITY OF RENNES AND RENNES METROPOLIS, WHAT IS THE RENNES TERRITORIAL CONTEXT?

The Metropolis of Rennes includes 43 municipalities encompassing 420,000 residents, half of which are from Rennes.

The common governance of this territory has been growing ever stronger since the 70s, going successively from the status of district to that of Urban Community, then Metropolis, since 1st January 2014.

Digital has great legitimacy of an industrial origin here, in that Rennes developed as a major centre of the telecoms industries, with the design of Minitel by the CCETT (Joint Centre of Television and Telecommunication Research) (ex–research of France Télécom), for example.

Rennes is updating its scientific roots by welcoming over 70,000 students in to its higher education institutions.

The development of Rennes Metropolis is very intensive and is part of the general migratory movement towards West France. It is signalled by a few emblematic projects like the ongoing construction of the 2nd metro line and that of the new station, to welcome the TGV trains which will place it 1 hour 27 minutes away from Paris.

A local housing plan is organising and encouraging the welcoming of populations.

## WHAT LINKS DO YOU SEE BETWEEN THE NOTIONS OF THE DIGITAL CITY, THE SUSTAINABLE CITY AND THE SMART CITY? WHAT ARE THEIR POSSIBILITIES?

Digital is just a tool, an ingredient.

Yet it provides a powerful means to respond to the challenges of the sustainable city, namely, social cohesion, notably in a context of ageing populations, controlling resources and the different forms of urban resilience.

As for the smart city, it is one which results from the overlapping of intelligences, in other words the multiplicity and intensity of discussions. The smart city does not mean a technological city, even though technology plays an important role, in the background. The intensification of discussions also helps to provide answers on the sustainability of the city.

## WHAT DOES THE DIGITAL TRANSITION MEAN FOR A TERRITORY?

The digital transition is a phenomenon that is expanding greatly, more quickly than planned. Fifteen years ago, when the proportion of French homes with internet access was 25%, it was estimated that the limit would be 50%. Today we are at 85% to 90%.

The Internet is not only one person's access to millions of others, it is instead, and above all, the interlinking access of millions of people, to each other.

This results in the obsolescence of the producer model which unilaterally offers goods or services to passive consumers, by replacing it with collaborative and shared construction models between producers and consumers. Sharing data between one another is the basis of these new models.

## HOW CAN URBAN UTILITIES SUCCEED IN THIS TRANSITION?

For urban utilities, like with all major social functions, the first challenge is that of cultural adaptation. We exchange data when we are convinced of the benefits of the interdisciplinarity and the interest in collaborating.

This involves promoting listening to the expectations of one another.

In Rennes, it was via an open dialogue for example, between the policy officers in the area of waste management and the digital technicians, that the connected container solutions were able to be imagined. One provided the professional skill and the other the technical knowledge.

On the management level, the project management methodology is a key methodology for this condition of interdisciplinarity.

## CAN YOU TELL US MORE ABOUT THIS TRANSITION IN THE RENNES TERRITORY?

Open access to public data is the cornerstone of promoting digital and the value created. Rennes will have been and remains a pioneer on this subject.

The creation of a GIS, over 20 years ago, was an important stage. The territory was, for example, modelled in realistic 3D.

The public utility companies must facilitate access to their operational data in real time.

In the area of transport, for example, Keolis provides information in real time, via an application, on the progress of buses, and the availability of spaces in bike rental sheds. Internet applications take this to provide it to users at the same time and in various ways.

## WHAT DO THE DIGITAL OPTIONS PROVIDE TO SUSTAINABLE CITY AND TERRITORIAL PROJECTS?

The future will be directed by the development of the internet of things and increased data capture, on public utility networks for example.

At the other end of the chain the question of the place of major data processing professionals is raised, like Google and others, who seek to promote standards on data, to make them compatible with their algorithms, which would allow them to take hold of behaviour prediction issues.

There would, however, be an ethical problem that such subjects escape the control of citizens directly concerned.

To illustrate a practical aspect of this current debate, a data manager such as Google is reluctant to accept a traditional clause for data usage licences which it is granted, that of giving formal information on the reason for the data format adaptations that it requires to integrate them into its search engines.

Moreover, the Google model is in competition with open search engines.

## IS IT NOT THEREFORE ABOUT FORMALISING THE OUTLINES OF AN “URBAN DATA MANAGEMENT” SKILL AMONG THE SKILLS WHICH DETERMINE LOCAL PUBLIC GOVERNANCE?

Yes, it is about regulations to be defined by establishing public data rules, for example, anonymisation rules, the notion of trusted third parties, etc.

The subject is vast and, globally, of a political nature; it requires expanding the rules already initiated in the INSPIRE directive and in the NOTRe law.

There would be a subject to debate in the General Assembly and citizens debates to organise on the issue, before sending certain conclusions from them to the legislator.

## HAVEN’T PEOPLE BEEN FORGOTTEN IN THE DIGITAL TRANSITION?

Obviously, not all territories progress at the same speed. Yet a public dynamic like the one we have just mentioned would inspire confidence to correct things and act for equal opportunities.

## WHAT NEW SERVICES ARE TO BE INCLUDED IN OR LINKED WITH PUBLIC UTILITIES? NEW ROLE PLAYS AND NEW VALUE CHAINS?

The managers of "traditional" public utilities are keeping the usual subjects to promote, but they can be complemented by all the connected services, which can be provided thanks to digital.

For them, the debate is whether to keep strict control or not over the data they are producing, and the capacity they offer to independent services to develop by implementing API[28].

For example, the Linky solution, developed by ERDF for electronic meters, will provide new services certainly, but remains very restricted. We can see new, even more productive value chains being promoted, in that they will be guaranteed by the rules of the game on sharing and securing public data.

28. API: software interfacing standards

# The digital transition and circular economy: innovative routes of the FNADE



By Jean-Marc Boursier, President of the FNADE (French National Federation of Decontamination and Environmental Activities)

**JEAN-MARC BOURSIER, YOU ARE THE PRESIDENT OF THE FNADE, CAN YOU PRESENT THE FNADE IN A FEW WORDS?**

The FNADE, French National Federation of Decontamination and Environmental Activities, is the representative organisation of environmental industries. It brings together 234 private companies, 53,000 employees in France, over 11 billion euros in turnover and 932 operating facilities. It unifies eight associations which represent all of the waste reclamation and recycling sector. The FNADE is a member of the European Federation of Waste Management and Environmental Services (FEAD).

The FNADE's mission is to make the voice of environmental professionals heard, with actions carried out on a regional, national and European level. To do this, it represents its members with the public authorities and different stakeholders and collaborates with stakeholders and experts in recycling and reusing waste in various works, which will shape the way management works in the future. It represents professionals in order to be associated with a new economy which is underway, and within which the waste resource has an essential role to play.

**THE LAW OF ENERGY TRANSITION AND GREEN GROWTH AND THE DIGITAL TRANSITION, MUST ONE HELP THE OTHER? OR ARE THESE SEPARATE TRANSITIONS?**

The Law of Energy Transition For Green Growth (LTECV) and the digital transition are closely linked for several reasons.

The first is the new drive given to the loop of the circular economy. To implement the circular economy, we must network different stakeholders and digital is an essential tool to facilitate these relationships between the upstream: producers, local authorities, industrial customers and citizens, and the downstream: purchasers of raw materials coming from recycling and local and green energy purchasers. This interface role is essential to connect the different stakeholders. Our role, for the recycling and reclamation industries, is to create the link between the upstream and the downstream, from logistics to turning waste into raw materials or energy.

The material and energy resource that waste consists of is at the heart of the LTECV's objectives. To reach these objectives —more material and more energy—, I believe that digital is an important lever for:

- Capturing these resources, notably via new digital offers;
- Ensuring traceability, the mark of the quality of the resource;
- Measuring and connecting the flows, with a real-time information rationale.

Moreover, I am convinced that the law for energy transition for green growth will require greater involvement from citizens, with more sorting at the source. In return, it will be essential to deliver information in real-time to citizens in order to share with them the successes and barriers: digital allows this more easily. We must also support them in their efforts, providing them with tools which facilitate sorting, for example, to order services or warn of issues encountered. Interactions with citizens can therefore be enriched and strengthened thanks to digital.

The digital transition must therefore help us to produce more materials and more energy, with higher performing, interactive and connected tools. It also allows us to better discuss with citizens, our end customers.

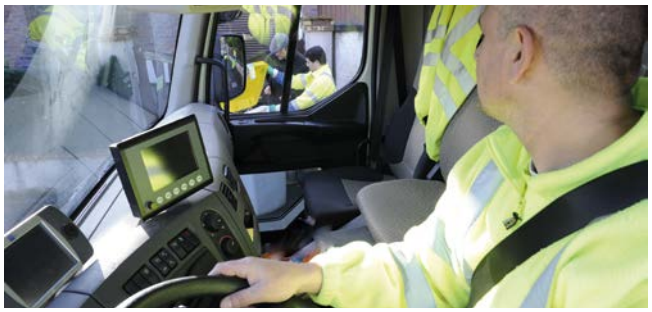
I often remind people that our profession is at the heart of the major challenges of our societies, as environmental challenges – associated with resources and climate – go way beyond the waste sector. Our vision is that it is the whole economy which needs to be reconsidered, and the shift in our industry is already underway to activity contribute to this profound change.

### LIKE THOSE OF THE ASTEE, ARE THE MEMBERS OF THE FNADE SENSITIVE TO THESE NEW TECHNOLOGIES?

Of course! The question of digital affects the waste sector just as profoundly as that of water or energy. Moreover, it will be the theme of our next annual FNADE convention, which will bring together the professions and the stakeholders on 21st June 2016 in Paris. There, we will debate with the public authorities, local authorities and the stakeholders involved, the different challenges linked to our professions.

### WHAT CAN THIS DIGITAL TRANSITION BRING MORE SPECIFICALLY TO THE AREA OF WASTE AND DECONTAMINATION?

There are numerous areas for action. For collection, for example, the on-board weighing systems are able to measure the sorting efforts and therefore implement encouraging systems, like incentive-based pricing. It is therefore a lever to develop waste management and forge a more balanced relationship with the citizen, which rewards his efforts. The digital transition also makes a new form of invoicing possible. Overall, it is customer reporting which is improved with the accuracy of data provided. Customers, moreover, want to have access to this information and, very often, in real-time.



In the processing facilities (sorting or energy recovery plants), the data is used to optimise performance, and better anticipate necessary maintenance efforts.

Measures and controls are, of course, also at the heart of digital challenges. They are the quality guarantee for services delivered and the proper working of the processes. To this end, they are the essential marker of the environmental performance that we deliver to our customers.

The common feature of these different areas for action is the real-time transmission of information. What seems essential to me is understanding that these tools make our professions, and therefore our customers, smarter. This is the term that you have chosen for this symposium, incidentally. Our professions have been able to develop, adapt and become ever smarter. The know-how and expertise is constantly expanding and improving. Relationships with customers and stakeholders have been changed. The professionals, in their day to day activity, benefit from these developments and their professions become more rewarding. Furthermore, the citizen has an ever more crucial role: he will become, I am sure, a real stakeholder of the circular economy.

### HOW ARE WASTE COMPANIES APPROPRIATING THIS TRANSITION AND HOW ARE THEY DEALING WITH IT?

The profession has taken hold of digital tools straight away. The recycling and reconversion industries have understood the benefits provided by digital in terms of quality, efficiency and improved working conditions. Yet we still have things to learn. Other sectors of activity are more advanced than us. I am convinced that our next convention will open up new ways of progressing for us.

### ACCORDING TO YOU, WHAT ARE THE OPPORTUNITIES THAT DIGITAL OFFERS FOR THE STAKEHOLDERS OF URBAN UTILITIES (ESPECIALLY THOSE FROM THE WASTE SECTOR)?

There are many. The most emblematic for recycling and waste reconversion are probably those which tangibly modify the relationship with the customer, like incentive-based pricing or performance measurement. I also see better recognition for our utilities. Digital is based on objective, tangible and measureable data. It is therefore the best way of measuring the performance of our utilities. This is why I think that it is an asset to better recognise the quality of our utilities. The transition also works to this end; it places quality at the heart of the service provided. It is towards performance contracts and not towards resource contracts that we must progress. To conclude, the digital transition of our professions will allow the cities to become even smarter.

### WHAT ARE THE RISKS THAT THIS TRANSITION CREATES?

It is now up to us, beyond the utility that we provide to our customer, to be able to enrich it with the analysis of data that we collect on their behalf. The analysis of the information gives it meaning and strengthens the intelligence of our professions. Our professions are developing, our companies too.

### WHAT MESSAGE DO YOU WANT TO SEND TO THE PARTICIPANTS OF THE ASTEE CONVENTION?

The resource and climate challenges make us aware of the importance of our professions. As environmental professionals, we have an essential role to play to respond to these challenges. We are committed to making a full contribution towards achieving the objectives set by France and Europe and also by COP21. I hope that this work by the ASTEE will be rich and productive, as these moments for reflection and sharing are essential to allow us to make progress together. I hope you all have an excellent ASTEE convention.

# Smart water networks — the customer at the heart of innovation – the example of the Paris Region Water Authority



By Christophe Perrod, SEDIF (Paris Region Water Authority)

## THE SMART CITY

The overall growth in global population is being accompanied by a growing concentration in urban communities. The major existing metropolises are, moreover, facing ever more demanding challenges due to the scarcity of resources and the obligation to reduce the environmental footprint.

In this context and thanks to the progress of information technology, the "smart city" is emerging.

For public network utilities such as energy, water and sanitation, this revolution began thanks to two major changes which are still emerging:

- The possibility of measuring and transmitting numerous parameters in real time via a network of sensors, and intelligently processing this large amount of information,

for better management and a better service to users,

- the potential decentralisation of at least one part of the production within the same city. This means, for energy: solar collectors, wind turbines and geothermal energy, etc. For water it means, more long-term, the options of using rain water and recycling waste water, at least for certain uses.

## THE NETWORK AND SMART METERS: A MAJOR IMPROVEMENT IN THE SERVICE QUALITY

The "smart" water network uses information technology in order to optimise resource management, production, distribution and consumption, for example, by allowing for better networking of the offer and demand between production and water consumers, by relying on prospective medium and long-term data.

For many years, the main production plants of SEDIF have benefited from a very extensive level of automation, with the implementation of sensors and high performing industrial computing tools which allow, for example, for a completely automatic operation of the Méry-sur-Oise plant, the management of facilities being ensured during the night via an expert system.

In the spirit of what has been undertaken in the main plants, one of the targets of the 2011-2022 public utility delegation contract is to implement a "smart" (i.e. communicating) drinking water supply network via sensors and New Information and Communication Technologies (NICT).

In a way, the idea amounts to managing the supply network like the "4th SEDIF plant".

At the same time, this decentralised approach constitutes major progress for the service quality, with the traditional customer "at the end of the pipe" now being at the "heart" of the system.

One of the essential innovations to progress in this approach is the remote meter: this is the TELEO project.

Its implementation over a short period has constituted a real industrial challenge. Between 2011 and 2015, 570,000 radio-equipped meters were installed in 149 municipalities, complemented by a radio network made up of 51,000 repeaters (in public lighting) and 278 concentrators (on the roofs of public buildings).

This process was divided into:

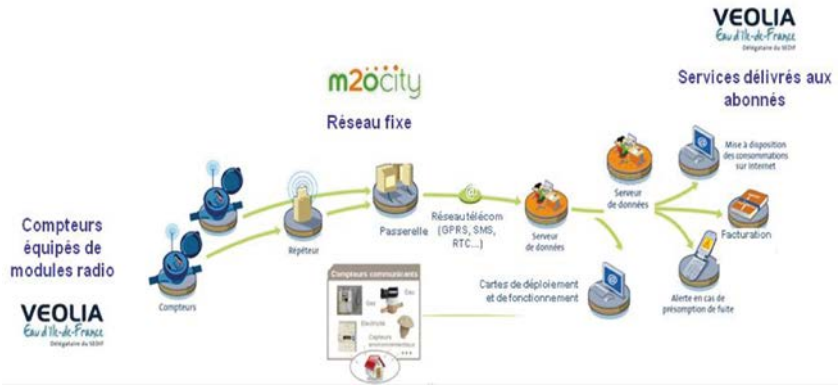
- Researching, Negotiating and Deploying
- Identifying and confirming the installation sites
- Presenting the project to elected representatives and technical services
- Negotiating the occupancy conditions of the public or private area
- Installing the network and connecting the meters
- Delivering the service
- Planning
- 48 monthly batches, three phases per batch
- 100,000 sensors/year
- 100 FTE
- Radio-equipping the meters
- A mailshot, then calls
- 50 interventions/weeks/staff
- Informing to involve
- Explaining and dealing with objections
- Account holders and local authorities

The deployment now accomplished translates into a data availability rate greater than 97%. The technology deployed is almost exclusively Homerider, at 868MHz, with a low intensity and a very short emission period.

To prevent concerns relating to electromagnetic waves, two measuring campaigns on the level of exposure to electromagnetic waves, before and after deployment of the fixed network, demonstrated that they were completely safe.

In 2010, the SEDIF chose to entrust this essential project to its delegatee, Veolia Eau d'Ile-de-France, via an operator model.





M2O City, a subsidiary owned 80% by Veolia and 20% by Orange, is financing, designing, creating, operating, maintaining and developing the radio network. It remains the owner of the infrastructure. This approach encourages sharing with other stakeholders, like, for example, for fill level monitoring for waste drop-off points (over 1,400 service points – six public authorities), for the energy management of buildings and the monitoring of environmental quality (meters and sensors - gas, electricity, heat, temperature, air, noise). The M2O City offer has allowed the SEDIF to benefit, from the start, from a pricing anticipating a certain level of sharing.

For example, it allows for the detection in real time of rapid changes in consumption, and therefore, most often, leaks after the meter, but also for the sophisticated mapping of usages. It is also better able to anticipate needs, on more local scales.

This translates into, first, a collection of services, included in the price of the water:

- for domestic customers: real time invoicing four times a year, monitoring consumption online and warnings in the event of overconsumption;
- for the major consumers: unique access to view indices and alarms from all the meters, consolidated consumption and warning threshold settings;

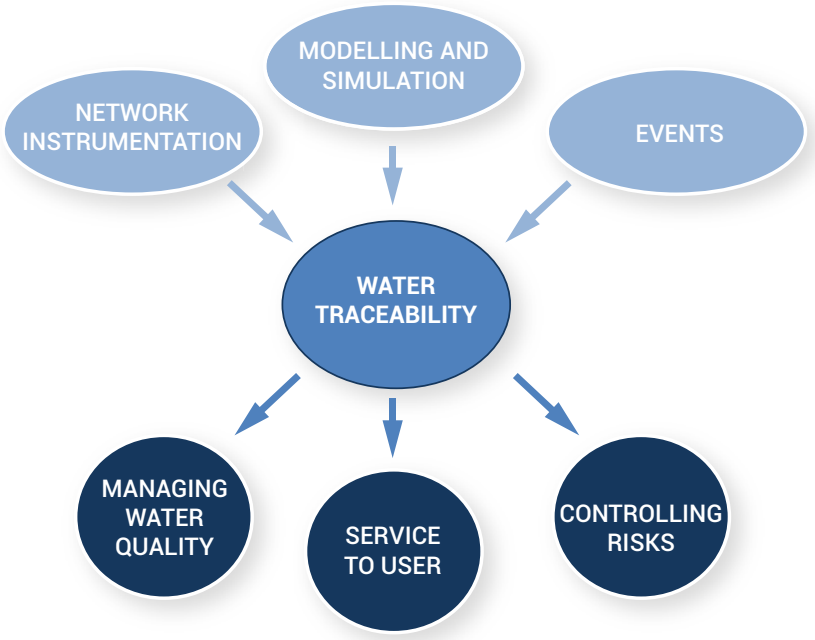
and, second, into additional tools for the operator: detection of metering anomalies, fraud and water backflow, better detection of leaks, assistance with renovation decision making with meters, better prediction of consumption and revenue.

This decentralised technology allows SEDIF account holders to be placed at the heart of innovation, and allows for a major improvement in the service quality.

The exploitation of volumes of data collected, allowed for by the development of "big data", will certainly be richer in terms of learning and developments than what we can imagine today.

During the implementation of the new delegation contract, several other innovations contributing to the implementation of a "smart network" were deployed:

- RES'ECHO: deployment of acoustic loggers, standing arrangement and remote transmission of leak detection:
- over 1000 sensors deployed, affecting approximately 500km of piping;
- in sensitive piping in areas subject to risk prevention plans (P.P.R.): quarry or gypsum dissolution areas, areas with shrinking and swelling of clay soil, etc.
- for more advanced detection of leaks, in order to contribute to the reduction of water losses, while reducing their consequences.
- QUALIO: controlling the water quality from its source to the distribution point in order to guarantee SEDIF consumers water of an irreproachable hygienic quality, constantly and at all points. Water traceability relies on the deployment of multi-parameter probes, the continuous measurements from which will be integrated into the network monitoring system:
- Installation of over 200 sensors, installed thanks to advanced optimisation algorithms ;
- transmission of temperature, chlorine, conductivity and pressure measurements;
- aggregation and processing of data, defining and configuring warnings.



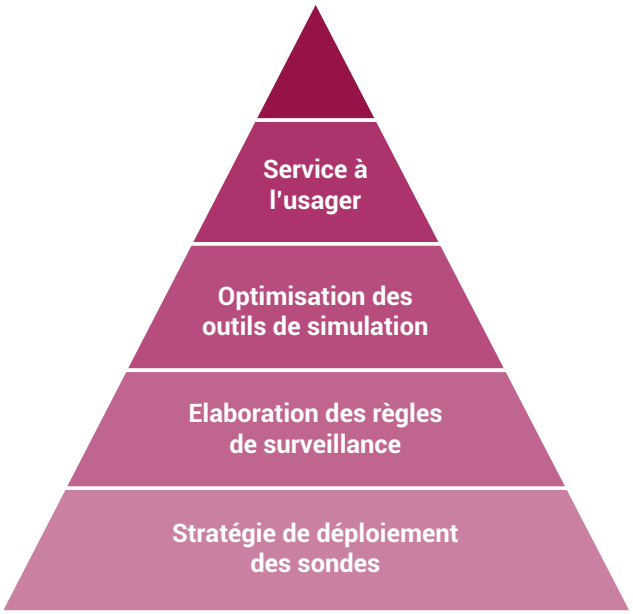

## MORE INFORMATION ON TELEO:

**sedif.com/teleo.aspx**
**sedif.com/iso_album/lettre_special_teleo_bd.pdf**

The integration of these tools at the heart of the centralised monitoring and management system of the network, the SERVO, will allow for an overall vision of all the parameters influencing the management of water losses, and will allow this system, via cross-analysis of the data, to optimise the efficiency of actions.

SERVO allows for the optimisation of the processes: production, supply, water quality, customer relations, reporting and controlling risks, via the real-time processing of all the data from the utility:

- resource quality (mapping of potential polluters, results from continual analysis, weather forecasting);
- availability of facilities, data on their operation (levels of reserves, flows from pumps, networked chlorination stations, residence time);
- geo-referenced visualisation of the network heritage, its instrumentation and maintenance teams in real time;
- technical management dashboard of electrical consumption;
- measurements from leak and quality sensors, coupled with the logging of operation events (water stoppages, rinsing, complaints, etc.) and customer contacts;
- the integration of hydraulic and quality monitoring tools;
- upstream and downstream traceability of water quality, by identifying the water source and its route;
- decision making assistance tool in the event of an incident with automatic mapping of impact zones, automatic warning of the users affected only.




These innovations make SEDIF a pioneer among water utilities, in terms of the "smart network". However, they are only the first steps of this development, the options offered by the technology in this area are likely to develop profoundly, notably thanks to research programmes, committed to, not just by the operators of urban utilities, but also by the companies from the IT sector.

They are specific examples of SEDIF's desire to make improving service quality a priority.

## TO FIND OUT MORE:

The SEDIF website : **sedif.com**

The key figures from SEDIF:
**sedif.com/flipbook/2015/master_livret_chiffres/master/sources/index.htm**

The industrial heritage of SEDIF:
**sedif.com/imageProvider.aspx?private_resource=19249&fn=SEDIF_plaquette%20patrimoine%20web%20FR.pdf**

# En route towards the connected city: yes but how?

By Catherine Dumas, SIPPEREC

**The SIPPEREC, Intermunicipal Association of Outer Paris for Energy and Communication Networks, created in 1924 to ensure the supply of electricity, has gradually expanded its sphere of action to renewable energy and electronic communications to help the Paris region authorities meet the challenges of the energy and digital transition. Two worlds which now converge with the connected city, which the association is highly committed to. With its three order groups "electricity and controlling energy", "electronic communications" and "data and the geographical information system", the association acts on behalf of over 550 local authorities and public institutions.**

Urban policy is now in digital mode, within a rationale of collecting and sharing data. Faced with a high citizen demand and the growing appetite of industrialists, local authorities need to define their strategy and equip themselves with a suitable organisation.

It is about a deep-rooted trend: all over the world initiatives are blossoming to imagine and develop the city of the future. A survey from the French Public Policy Observatory undertaken in September 2015 indicates that nearly eight out of ten French people consider the digital development of cities important and a priority. Reducing public expenditure and improving safety are top of the list of concerns relating to "smart cities", just behind the ecological dimension.

There will be between 50 and 80 billion connected objects by 2020, with new professions on the horizon, like that of the programmer in the Internet of things: 1.7 million jobs in 2014, 3 million in 2019. These things will be more and more miniaturised. This is the third wave of the internet, that of collaborative intelligence.

For the elected representatives, it is important to properly understand the different facets of the connected city. It concerns several sectors (transport, energy, electronic communications, etc.), but also diverse roles, from mapping to collecting and managing data, etc. It is advisable to act based on the needs of the cities themselves. The development of digital can be a real driver for reducing costs and a tool to provide a better service.

There are a lot of experiments and announcements which come from marketing without necessarily corresponding to a tangible reality. Nevertheless, some operations are gradually establishing themselves in France and abroad.

At the same time, we are seeing the emergence of projects undertaken by citizens themselves. Like citizen sensors tested in partnership with several social landlords, which are able to monitor electrical consumption. This is another dimension of the connected city: its participatory dimension.

Reaching these objectives implies a real e-administration becoming widespread, digitised and accessible to everyone. One which is more efficient and better able to listen, which opens its data because it knows that this will enrich them, and assist in the emergence of new tools, which make life in the city easier.

The various competencies of the SIPPEREC, its electrical grids (the most significant concession for distribution of electricity in France in terms of customers and consumption), electronic communication and the services developed in its three order groups make it an important stakeholder in preparing the Paris region municipalities for this development, in a coordinated, progressive and economically sustainable way.

Against a financial background which is more restrictive every day, it is advisable to consider pooling the purchasing and management of such equipment, to get the best technical and financial solutions, while ensuring to preserve the security of data and respect private life. The expenses of the smart city can only be accepted by residents if they provide management savings, a better service or new incomes to the local authority.

Before launching a project, it is important to properly define its strategic objectives and priorities. This must be part of the long-term. It would be best to adopt a pragmatic and progressive approach.

It is a real challenge for the local authorities, which must equip themselves with an organisation suited to this area, with a cross-disciplinary approach designed to make all the services work together, services which may not necessarily be used to doing so.

## THE CONNECTED CITY: THE USES AND EXPECTATIONS OF PARIS REGION LOCAL AUTHORITIES

The survey* undertaken by the SIPPEREC at the start of 2015 to understand the practices and expectations of members in the area of the connected city has encouraged numerous responses.

It shows a growing interest for local authorities in this subject, but also reveals questions on the tools and organisation to implement, the cost associated, etc.

**Survey conducted among 1,100 people, with 189 answers representative of different skill areas.*

## PRIORITY IS GIVEN TO ORGANISATIONAL, ECONOMIC/ FINANCIAL AND TECHNICAL CHALLENGES

The smart city starts with better organisation of internal services of the local authority and a better operation of urban management, with two main goals: improving the service to citizens and facilitating the city's relationship itself, with its citizens.

Optimising investments and operating costs of the local authority at the same time as rationalising public expenses.

For the people approached, the challenges around the connected city should lead their local authority to:

- A better consideration of the needs of citizens (information in real time, accessibility and transparency of data, increased responsiveness of public utilities);
- a rationalisation of general resources within the local authority;
- a better understanding of the operation of public utilities managed directly, or delegated to a third party, in technical and financial terms;
- a reduction in the costs and expenses for the local authority due to an optimised management of services.

Nearly 60% of local authorities already have networks of sensors in service (energy efficiency, technical management of public buildings, public lighting and heat networks).

At the same time, several barriers have been identified, like the dispersion of means, the difficulty to implement a cross-disciplinary approach and the low exploitation level of data collected.

## THE NETWORKS DEVELOPED BY THE SIPPEREC: A NEED TO GUARANTEE THE FLOW OF DATA

The connected city relies on information transport and collection networks, called "back-bone networks".

The order group for electronic communication services coordinated by the SIPPEREC targets these new markets dedicated to the connected city.

In particular, it offers a "Voice- Data-Images back-bone network" contract at a very high speed capable of interconnecting all types of sensors

and ensuring the passage of data flows between buildings and public equipment.

This order group also offers a "data transmission services" package and, for mobile phones, the "machine to machine connectivity" linked to the municipal equipment: dynamic display panels, managing traffic lights, alarm centres, public lighting and mobile payment terminals, etc.

All these applications and data necessary for the connected city imply very high speeds, in a secure context. They therefore rely on the public initiative networks of the SIPPEREC: IRISÉ, SÉQUANTIC, EUROP'ESSONNE, OPALYS and the modernised cable networks (with 4,200km of networks made up entirely or in part by fibre optic, including 520,000 points served by cabled networks).

## THE "SENSORS" ALREADY OPERATIONAL WITH ACTIONS FROM THE SIPPEREC

- Building management system
- Improvement of the performance of public lighting
- Remote electricity meter reading
- Electrical consumption management tool
- Geothermics: remote reading of information relating to the management and consumption of sub-stations planned for the primary network
- Photovoltaic: remote reading and monitoring of production and consumption data
- Video-protection for use of public roads, spaces open to the public and private places
- Data transmission services - WAN: M2M connectivity on fixed connections
- M2M connectivity on mobile connections
- Geographical information systems: collecting, processing and integration of geo-referenced data, mapping of existing networks
- Back-bone networks: interconnection of buildings and collection of data flows coming from networks of sensors.

# COLLECTING AND PROCESSING DATA

The order group for data and geographical information systems (GIS) has immediately usable tools:

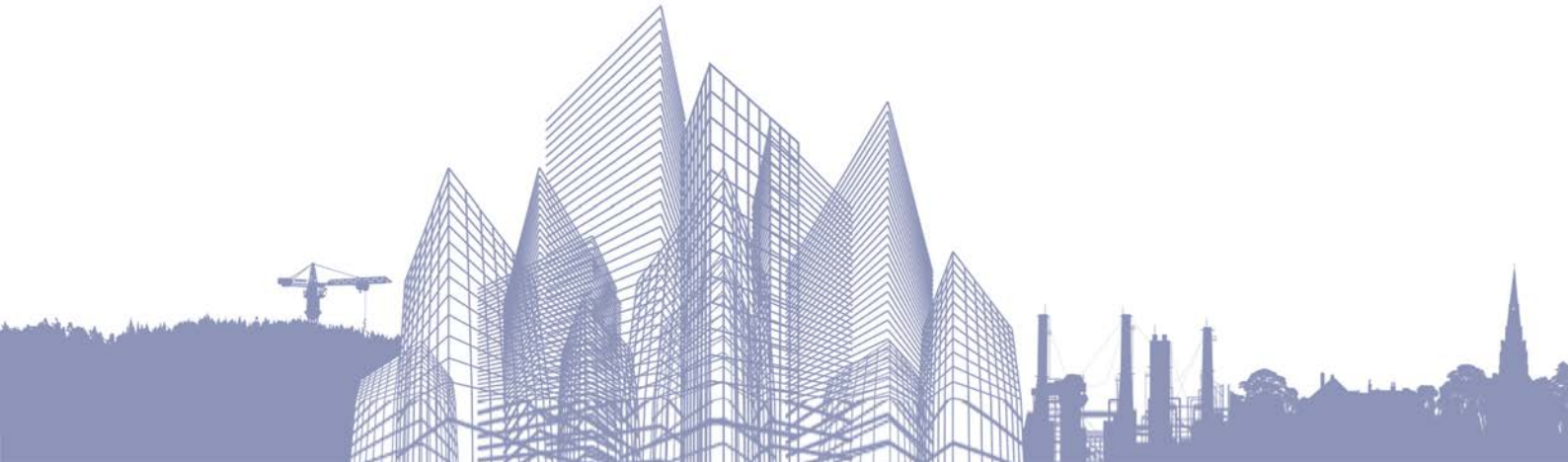
- Collecting, processing and integrating geo-referenced data;
- Managing work declarations and declarations of the intention to begin work (DT-DICT) ;
- Additional investigations to locate the networks.

The "Data and GIS" order group will soon integrate a shared data circulation and storage platform for cities and other bodies who want it. The aim of this tool is to respond to several challenges:

- Circulation of data: several levels of data circulation are affected. Firstly, for utilities (via intranet) to share common data held by the local authority. It is about gaining efficiency, avoiding data duplication (a source of lost time and money) and implementing a centralised database containing the digital heritage of the body. A second level of circulation concerns the partners of the local authority (extranet): other local authorities, services of the state, service providers, etc. The advantage of such a tool is to make exchanges more fluid while making them more secure. Finally, the last level of circulation is towards the general public via the internet. The challenge is significant: making data held by the public body easily accessible, gaining in transparency, continuing with the technological change of administrations and possibly creating a new communication channel between the local authority and its citizens.
- Regulation: the legislator tends towards automatic open data produced and held by the public bodies (generalisation of open data). We are going from a model where the citizen had to initiate a process if he wanted to have data (CADA law of 1978) to a model where the data must be provided without an additional process on the part of our fellow citizens. The data circulation platform offered by the SIPPEREC is placed within this context and will be able to respond to this need, with which the local authorities will be confronted.

Each local authority will be confronted with needs in terms of safeguarding and storing data, but also questions of interoperability and content management. The implementation of a GIS platform and open data will allow the local authorities to decide themselves the aspects and technical developments and not leave a supplier to impose their vision and tools.

The SIPPEREC has a monitoring, support and tool provision role, in the context of order groups. These already include lots of "connected" tools ready to be used. Others will quickly complement them to respond to the growing needs of members in terms of pooling and controlling costs by relying on the public initiative networks of the SIPPEREC: deployment of fibre optic networks for collection from networks of sensors, especially in the context of the interconnection of public buildings and video-protection.



**By Jean-Louis Chaussade,**
Managing Director of SUEZ



# THE DIGITAL TRANSITION FOR A STAKEHOLDER OF THE RESOURCEFUL-CITY

> “Digital will not only affect each of the public utilities, it will create an interdependency between the public utilities, inter-information, which itself will change the behaviour of the public utilities, territories and their residents.”

The city of the future will be a resourceful-city, obtaining from itself all the assets to develop and strengthen its appeal. SUEZ is providing its expertise and innovations, in particular digital, to all of the stakeholders of the city. Jean-Louis Chaussade presents his vision of the digital transition. He describes a major transformation in the relationship between companies, territories and residents, as well as mentioning an effect within each of the public utilities, but also an interconnection and interdependency between their information flows. Digital is, according to him, a key tool, as allowing for real time management and controlling a certain number of events in advance, also means creating value for all of the stakeholders.


youtu.be/BioeWHCgvSg

**INFLUX™**

For an optimal management of the sanitation system, INFLUX™ offers an overall vision, from weather forecasting to the quality of the receiving environment.

**ondeosystems.com/wp-content/uploads/2013/05/Fiche-produit-Influx-VF-2015_BD1.pdf**

suez

# Digital, development, transition or paradigm shift



By Alain Franchi, Managing Director Water France, Veolia

Photo Credit: Getty Images/amana images RF

## FOR VEOLIA, WHAT DOES THE DIGITAL TRANSITION OF TERRITORIES MEAN?

The digital world is transforming the notion of the territory. In the past it was a place for circulating the values of our national community. Now it has become the reference point and the point for attaching decentralised functions allowing for local values specific to a particular past to be added to these national values, therefore opening up new future paths. The digital transition allows for this diversification, via the digitalisation of information, the production and provision costs of which were prohibitive not long ago. In this new rationale, economy of scale will probably be in competition with an economy of interdisciplinarity.

## IS DIGITAL TRANSFORMING THE RELATIONSHIP OF THE COMPANY WITH THE USER?

Digital is transforming the relationship with the user/consumer in that they can impose on the company, in a certain way, their vision and expectations in relation to the service provided. Digital allows for a certain "standardisation" of diverse offers and services. It gives the option to better adapt the quantity and quality of the services provided to the needs of the citizen, even creating others from it, without interfering in personal life, with the user remaining in control of their uses. These therefore make the user a singular being who escapes the traditional prescriptive classifications, such as the traditional socio-professional categories. Therefore a sharp or continued drop in water consumption or its reverse can be warning tools for the home concerned.

Digital is also the opportunity for a better measurement of customer satisfaction; this, for a complex utility like water, cannot be simple feedback on satisfaction levels. The consumer only sees the tip of the iceberg and a fraction of the utility which affects him, but he interacts with his vision and his experience of the utility. In this constant interaction, reciprocal learning from parties must be able to result in shared, just and balanced ethics.

## IS THE RELATIONSHIP WITH OTHER STAKEHOLDERS OF PUBLIC UTILITIES CHANGED BY DIGITAL?

All the public and private sectors will be affected by the digital economy. Data becomes an essential element to create service offers. Whatever its origin (production sector), data allows for multiple analyses that the digital economy wants to develop to better adjust the product offers to potential demands. By way of an example, a photo site fed into by tourists over a given location may allow for a better understanding of their expectations and therefore to "better" invest. The richness of the digital economy is determined by all these analyses that are currently very little exploited or not at all. Energy consumption is not only useful information for energy producers; it can be useful in choosing the types of construction material to use in a specific geographic area; it can be useful to confirm the presence of residents at different periods of the year, etc.

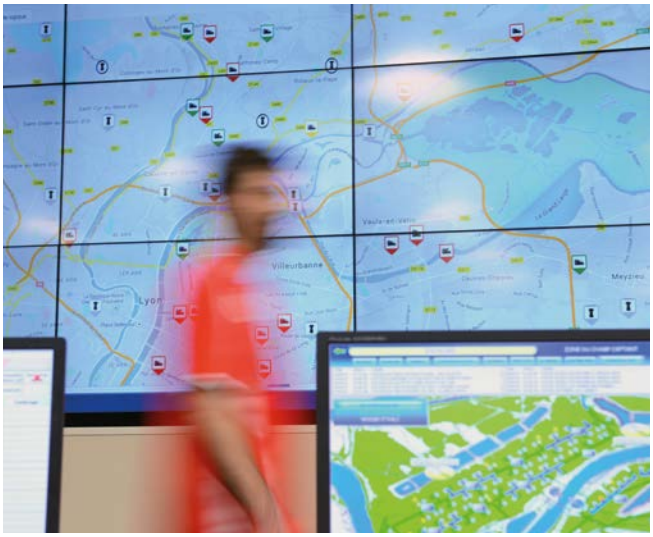


Photo Library- VEOLIA_Olivier Guerrin

# INTERACTIONS BETWEEN STAKEHOLDERS

### HOW DOES THE EXPLOSION IN DATA DEVELOP THE ROLE OF THE OPERATORS? WHAT PLACE IS THERE FOR TRADITIONAL OPERATORS IN THE DIGITAL CITY?

The development of what we call "smart networks" - or IoT, Internet of Things – responds to resource protection challenges with the pre-locating to the nearest meter of leaks. The digital transition improves the performance in managing our utilities thanks to data collection tools on the sections of the network and optimisation of the water quality, via the monitoring of quality parameters in real time.

Therefore, in the Lyon urban area, our teams are deploying 6000 sensors over 2000 kilometres of the drinking water network and 290,000 remotely read water meters in account holders' homes. The aim is to save 33,000$m^3$ of water per day, to reduce the electricity consumption for pumping water in layers, and to inform the 290,000 customers affected by telephone or email of consumption anomalies and possible risks of cut-offs. This new information provided to users has consequences on their consumption habits.

### DIGITAL: WHAT OPPORTUNITIES ARE THEIR FOR AN OPERATOR OF URBAN UTILITIES LIKE VEOLIA? ALSO WHAT ARE THE RISKS?

Veolia's customers benefit from new services coming from digital technologies like smart water meters, which communicate to prevent leaks and service interruptions. In certain sanitation utilities in which we are present, customers have access to mapping and to the monitoring of odour sensors.

Thanks to over 1.7 million sensors deployed, we process more and more data available and the computing tools are more and more powerful to analyse them, with the cost of information collection decreased by a factor of ten in a few years.

We have the ability to collect data in large sets, and integrate and analyse these sets. We are becoming specialists in the assembly and algorithmic transformation of data for an operational use, providing added value to these data.

Our territorial network allows us to offer services and bespoke offers.

Beyond certain digital inequalities over the French territory, local authorities of all sizes now benefit from the digital transition. Veolia wants to contribute to the solidarity between the rural and the urban world, to the cooperation between developing territories and between major metropolises (for example discussions between local authorities – city clubs).

Veolia is also responding to the concerns of industrialists and territory activities like public infrastructure, hospitals, retirement homes, training and leisure centres, etc. Moreover, Veolia is also supporting collaborative initiatives, like the forum dedicated to water professionals: Fluksaqua.

The risk of making data available is a risk in terms of reputation: how can we ensure the sincerity of the information transmitted by the producer while their usage is not always known to them? Therefore what data needs to be defined, a bit like m3 of water, which is a set of standards more than a "completely finished" product. This is one of the most significant challenges of the digital economy as it gives meaning to the idea of transparency, while protecting expertise.

# WHAT IS VEOLIA'S POSITION IN TERMS OF THE USE OF DATA?

### IS THE VALUE NOW WITHIN THE DATA OR IN THE ASSETS?

The value is not within the data or the assets. It is in the ability to provide analysis and decision making assistance tools to better manage and allow the end consumer to be a key part of the utility. It is women and men who create value via this possibility that they realise.

### WHAT ETHICS SHOULD BE CREATED AROUND THIS DATA? HOW DOES THE VEOLIA GROUP RAISE THE QUESTION OF THE OWNERSHIP OF THE DATA?

Veolia is a French company, working within a culture and strong ethics as regards protecting the data of its customers, whether they are individuals, professionals, or local authorities. It does this while respecting the regulations in force. We must also specify that the data is never our product, whether it is captured at the source or produced by our algorithms.

In this context, Veolia completely shares the aim of creating value driven by the bill on digital and, notably, on the development of innovative services from public data. However, it appears necessary to distinguish data essential to the public utility from data which can be a vehicle for the growth of companies. Maintaining respect for industrial and commercial confidentiality is an essential element of the knowledge protection system of French companies.

# Smart networks: how do you develop products and services within a context of technological breakthroughs? SME vision…

By David Gotte and Vincent Beccavin, Sainte-Lizaigne

**Water is not a concept, it is a natural resource provided to us. The production and supply of drinking water implement techniques over a thousand years old to give life to populations. Nowadays, what, for our developed countries, seems as completely normal as opening a tap, still remains an action unknown to a large part of the global population.**

## SAINTE-LIZAIGNE CONTEXT

### MARKETS/HISTORY

Our business (Sainte-Lizaigne) was driven by the development of drinking water networks, especially over French territory since the 50s. Originally, and still to this day, our industrial tool (bronze casting) and our machining and assembly parts have been producing valves, connections and hydraulic equipments systems for water conveyance for over a hundred years. So many "simplistic" objects are able to create, open or close a water supply from a main pipeline. Our products are designed for builders and operators of networks, municipalities and direct management authorities, private operators and public works companies, who are the main users. Up until only a few years ago, our research was directed towards developments either linked to technological (ease of installation, guarantees of performance or stability, etc.), ecological, ergonomic or economic constraints (managing stocks, optimisation of materials, weights and shapes, etc.). The main aim was to fulfil construction, extension and network operation needs, as well as needs for the development of the assets. The operators are, for their part, driven to develop the networks, ensuring the operation by monitoring resources, developing main pipelines and supply. As for network monitoring, it is mainly linked to monitoring production and the pipeline, in order to ensure the water utility, with the electro-mechanical and the hydraulic as the main tools.

### CUSTOMER APPROACHES, OPERATOR/ACCOUNT HOLDER DIFFERENTIATION, ETC. (INTELLIGENCE FOR WHOM?)

The network monitoring systems are techniques controlled by users and the monitoring of the performance of networks is already of a sufficient level, as long as we implement the appropriate maintenance means. Sustainability and reliability are the main criteria chosen for selecting products. Nowadays, the development of electronics and communication methods gives new possibilities and perspectives in the area of "the intelligence" of networks, equally in the area of feedback from information, traceability and the analysis of data and signals. Faced with these developments, Sainte-Lizaigne has, over the last five years, been starting to integrate additional functions into standard solutions (valves) allowing it to listen more closely to the network, to program or order remotely and to collect and feedback information linked to the network. At this stage, it is, however, important to know more precisely where the need is located: improving the performance of networks, improving the options for monitoring the consumption of account holders, providing more services to account holders in the management of their consumption, preserving our resources, etc. Such are the challenges which face us, without necessarily having all the keys to the problem due to the size of our company and the multitude of possible needs and technological avenues available.

### OUTLOOKS AND DEVELOPMENTS COMMITTED MEAN DIFFICULTIES IN MAKING CHOICES

From this statement, options were taken for the development of different solutions integrating electronic and communication functions.

Later on we will describe applications currently being marketed or developed which we have invested time and development in, in order to respond to needs linked to concerns regarding operation (searching for leaks), flow management (antenna purging) and remote closure (account holder management). The difficulties often reside in the choice of communication protocols over which there is still a lot of "vagueness"/uncertainties on future directions or lifespans of solutions to be developed. Our initial and standard productions were designed to last over 50 years… It is also a breakthrough in the development methods. Faced with these choices, we have, however, real development opportunities, which can be outlined as long as we take the right directions and we can find partners (industrialists or users) in order to implement collaborative projects.

## THE PROJECTS CURRENTLY BEING DEVELOPED AND THE SOLUTIONS…

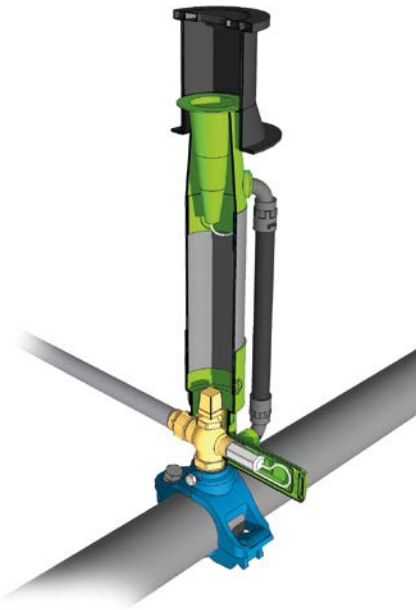
### NEW TOOLS FOR MORE EFFICIENT ASSET MANAGEMENT

Sainte-Lizaigne has developed the "EAR" active connection – Network Active Listening system - in partnership with the SEBA KMT company.

EAR is a patented system which is able to detect leaks over all types of pipes thanks to a listening system placed at the heart of the pipework, in direct contact with the water. This solution is even more relevant on PE and PVC tubes for which the "standard" solutions in contact with the operating square of the taps quickly show their limits, due to the reduced listening distances (significant reduction of the signal through the tube's material).

The data captured by the hydrophone which equips it are analysed and stored by a transmitter and can be recuperated by different methods such as the passing of a patrol vehicle, or access via the radio network then GSM communication, allowing for access to data via the internet.

We can imagine moving towards a comprehensive asset management of product traceability during the creation of new networks (or intervention on existing networks) up to "scheduled or preventative" maintenance, in order to anticipate the possible obsolescence



of parts of the network. This means giving our databases information now to preserve and ensure the monitoring of information for future generations…

The Géodata system allows for the monitoring of equipment and interventions during operations on the ground via reliable and simple means. The operational acquisition of data from the water network is ensured thanks to RFID technologies or barcodes (reading traceability data from installed products) and a PDA terminal (geo-location, timestamping, linking to existing works, consistency checking, etc.). The data is then synchronised and consolidated in a database.

The capitalisation of this information and the creation of a database of the asset network and its traceability are able to ensure a prospective and operational management of the network, an assessment of its development, as well as anticipate needs.

To encourage the integration of such data, the valves can be, for example, equipped with RFID chips.

This process has not been marketed yet, as the data coming from Geodata must be integrated into the existing GISs and the development can only be envisaged with a computing partnership with the operator. Tracking products from the time they leave the factory to their installation, and throughout their presumed lifespan, is a strength of this concept.

### APPLICATIONS FOR A FACILITATED AND RESPONSIVE OPERATION

The first version of the eValve studied and marketed has integrated functions on the programme which manages it, allowing for opening and closure commands remotely, but also maintenance cycles throughout its lifespan. The instructions are sent by the operator who can receive different warnings, for better management of information exchanged with the account holders. This version is remotely controllable via the M2OCity network through the use of the HomeRider communication protocol.

Sainte-Lizaigne is also developing applications for smart motorised valves via Bluetooth Low Energy for control via smartphone. This valve can manage scheduled purges, record a log, feedback statistics from a sensor, etc.

## THE BARRIERS AND/OR BLOCKAGES

### WHAT PROTOCOLS AND STANDARDS DO YOU CHOOSE?

Among the technologies required for the instrumentation and management of the network, the one which seems the most structuring is communication. All the acquisition or order technologies are specific and different depending on the applications. The only common point among all the solutions is the transmission of information.

There are numerous communication technologies currently available. The diversity of solutions is explained in numerous cases by requirements or technological choices, like the quantity and nature of the data to be transmitted, the flow, the frequency of transmission, the accessibility of devices, etc. This large number of elements means that it is difficult to choose from among the existing technologies and protocols.

Each communication protocol requires the implementation of a dedicated infrastructure which can be costly.

Choosing a solution is therefore difficult for local authorities, which do not want to increase the number of networks to install and maintain.

The diversity of stakeholders, solutions and choices to make lead to a multitude of economic models (financing, investment/amortisation, maintenance, life span, etc.).

### THE GAP BETWEEN ACTUAL NEEDS AND THE CAPACITY TO MANAGE INFORMATION

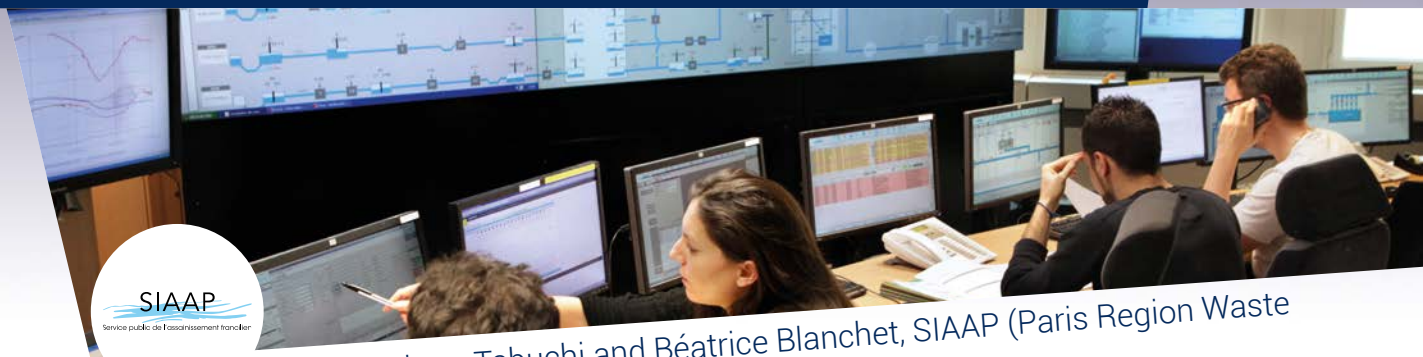
The definition of data collected, processed and sent from the water network is a complex subject. The whole process consists of gathering the maximum amount of information to create added value without drowning the users (operators, local authorities or account holders) in a flood of information that they are not familiar with, and which would hinder the understanding and use of a system. To create a smart network, it is necessary to collect and store data of different types and coming from different sources. This must then be processed and analysed by a centralised system to provide the user with relevant and usable information. Faced with this assessment, it is complex for us to define or impose an architecture on behalf of our customers...

### WHAT ABOUT NETWORK AND INFORMATION SECURITY?

Information and network security is an aspect that is not economically recoverable and yet it is very sensitive in the management of a connected network, as collecting data, or an incorrect interpretation, can have significant repercussions.

The responsibility for the security of information is shouldered by the product manufacturer. Yet how do you specify the security criteria of a product and ensure that they are sufficient once it is implemented?

# The contributions of automated management to the management of a sanitation system of the Paris urban area



By Jean-Pierre Tabuchi and Béatrice Blanchet, SIAAP (Paris Region Waste Water Authority)

**In order to conform to the developments in environmental challenges, especially in partnership with French and European regulation concerning urban sanitation and the recovery of the Seine and the Marne, the Paris Region Waste Water Authority (SIAAP) has been undertaking important construction and modernisation work for the transport, storage and treatment of waste and rain water for several years. To coordinate and optimise the operation of its work, the SIAAP has developed an assistance tool for the dynamic management of the sanitation system, called MAGES (Effluent Management Assistance Model of the SIAAP).**
**This system, operational since 2007, is the legacy of years of development undertaken within the urban area on the question of automated management. Eight years after its commissioning, it is now about drawing out the initial insights and learning from it.**
**Developments of this system are planned to adapt it to an expected increase in the constraints which will be imposed on the SIAAP in the years to come by 2020-2025, with the development of Greater Paris, but also with climate change.**

## INTRODUCTION

Waste water treatment for the Paris urban area has particular features on both an institutional and technical level, linked to its history, which led to the creation, in 1970, of the Paris Region Waste Water Authority (SIAAP). Its administrative scope, made up of the four central départements of Paris Region, does not correspond to the technical scope, which goes greatly beyond this. A large number of stakeholders and a specific governance are the results of this.

The size of the urban area, its development and the technical, then environmental, challenges confronted the sanitation stakeholders, from the start of 1960s, with numerous problems, particularly managing rain water, but also the pollution of rivers. Faced with this situation, innovations became apparent as a means of response.

Over time, the demands in terms of performance have been increased by the regulatory developments introduced by the European directives, the Directive on Urban Waste Water in 1991 and the Framework Directive on Water in 2000. This has gradually led the stakeholders towards the need for a more global vision of the operation of the sanitation system. The SIAAP, which is downstream of the entirety of the collection and transport system and responsible for the impact of the sanitation system on the natural environment, felt the need to implement a more integrated teleprocessing tool.

# CONTEXT AND OBJECTIVES OF MAGES

## AN IMPORTANT LEGACY

The teleprocessing tools that the Paris region has are the result of a long history that began in Seine-Saint-Denis in 1974. The Département-level Equipment Directorate then in charge of sanitation, found itself confronted with serious flooding problems due to urban development, its topography and its distance from the drains in Seine an in Marne. The utilities, at the cutting edge of innovation, therefore, first of all, proposed the creation of containment basins for rain water which did not solve all the problems. This led the utilities to invest in research capabilities, in particular with the development of the mathematical modelling of networks on a département scale. At the same time, it appeared that managing these basins could prove complex and require significant and responsive intervention teams. Teleprocessing was viewed as a response to these problems. Therefore, in 1974, the first computing and remote work ordering tools were installed, paving the way for automated management developed thanks to a strong partnership between researchers, managers and design offices. This would lead to the HADES and then the NIAGARA systems. Understanding rain in real time, but also its forecasting, rapidly became essential. This led to the introduction of weather radar images in urban hydrology, supported by the development of the CALAMAR[29] application, which was able to transform radar images into runoff sheets of water used as input data in the modelling tools of networks, like the tool developed by the SIAAP MAGES.

Over the 80s, the départements of the inner suburban area of Paris were equipped with a teleprocessing system: Val-de-Marne with VALERIE[30], Hauts-de-Seine with GAIA[31], then the SIAAP with SCORE[32] and Paris with GAASPAR[33].

From this period, the SIAAP planned the development of a supervisor. CŒUR[34] to ensure synchronisation and coordination on an inter-département scale. It would be the 1997 sanitation plan of the central area of the Paris region which would kick-start this global system. Studies had shown that automated management would be able to envisage an overflow reduction capable of reaching 30%.

## THE OBJECTIVES OF MAGES

In this context, in 2001, the SIAAP committed, with the active collaboration of its partners (départements, operators of plants and water authorities) to the creation of a dynamic management assistance tool for its sanitation system, called MAGES: Effluent Management Assistance Model of the SIAAP. Designed for operators of networks and plants, this real-time tool equipped with a Non Real-time version was targeting three priority objectives:

1) The overall and shared knowledge of the sanitation system was the first objective. To satisfy it, the operators standardised the data that they used for managing their works, thanks to a data exchange system: the EDEN system (Environmental Data Exchange). It allowed for the exchanging and centralising of the measures and the current state of works.
2) The second objective was the prediction of the sanitation system's operation in a stable configuration. It was about providing each operator with the filling predictions of transport, storage and flow works arriving at each plant, over a 24 hour period during dry weather and a 6 hour period during rainy weather.
3) The third objective was assistance with the sanitation system's management to optimise the use of works during rainy periods.

In 2007 the tool was deployed on the central site of the SIAAP with the "PC SAPHYRS", supervision console for all of the sanitation system of the SIAAP and over each of the control rooms of the six plants and four constituent départements of the SIAAP. All the operators therefore had real time access to the same information.

MAGES was an ambitious and innovative project due to the size of the area concerned, the number of inter-dependant modelled works, the model's ability to integrate in real time the configuration changes of the network and the operation constraints of the works, as well as the number of operators and projects stakeholders.

## THE TECHNICAL CONTEXT

MAGES works on a vast and complex sanitation system.

The catchment area is the combined type at the centre of the urban area and the separate type around the periphery. Spread over approximately 1,800km2, the population connected to the processing plants is near to nine million residents and

The average daily volume processed is 2.5Mm$^3$/day.

29. Developed by the RHEA company
30. (Val-de-Marne Use and Computerised Regulation of Effluents)
31. (Management assisted by sanitation IT)
32. (Central system for optimising the filling of drainage channels)
33. (Automated Management of Paris Sanitation)
34. (Coordination and Optimisation of Urban Wastewater Effluents)

Six water treatment plants ensure the treatment of wastewater, with very variable treatment capacities between them during dry periods: Seine-Aval – 1.45 Mm³/day, Seine-Amont - 600,000 m³/day, Seine-Centre - 240,000 m³/day, Seine-Grésillons - 300,000 m³/day, Marne-Aval – 75,000 m³/day and Seine-Morée – 50,000 m³/day. The overall baseline capacity for biological treatment is 3.8M m³/day. After activation of all of the treatment sectors, the total treatment capacity reaches 4.6M m³/day.

This sanitation system also stands out due to three points:

- The significant water transfer capacities between plants via a network meshing, a result of the urban area's history, which the flow management system greatly benefits from;
- The great anthropic pressure exercised by the Paris urban area on the Seine makes the environment very sensitive to overflows during rainy periods.

This is already a major challenge. The current storage capacity created by the SIAAP is 900,000 m³. It will be developed in the coming years.

- The treatment processes deployed at the SIAAP call and will continue to call greatly on biofiltration which, with less than 2 hour residence times, is very responsive and therefore sensitive to load variations, the management of which will be a challenge.

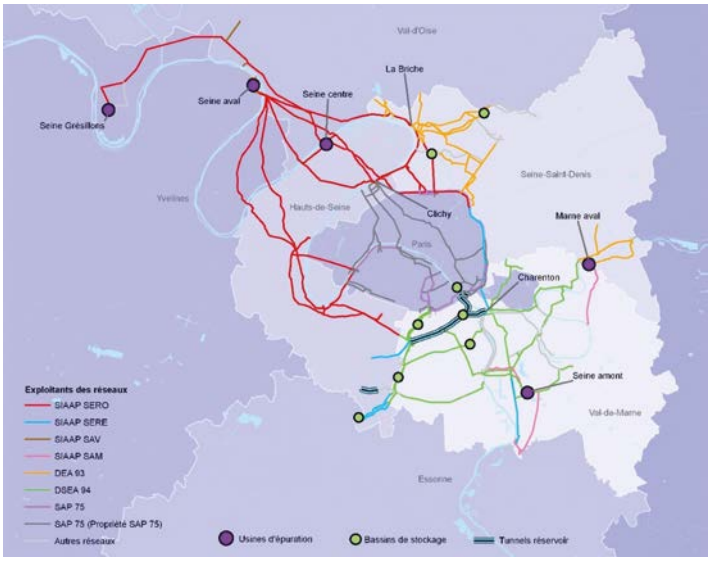



Figure 1: Sanitation system under SIAAP project management

## MAGES AND ITS GENERAL PRINCIPLES

MAGES relies on real-time deterministic modelling of transport and storage works with 23,000 calculation points coupled with an optimisation process to seek out the management scenario.

This modelling takes into account the contributions in dry periods, the measured and predicted rain contributions, meteorology with a set of over 2000 variables, the physical changes on the sanitation system linked to down-time and incidents inherent in the operation of any sanitation system.

A MAGES treatment cycle takes place over five minutes and includes:

- **Identifying the current state of the system** with the collection and validation in real time of measures used to update models (position of regulation bodies, filling of basins, etc.) and the simulation of the state of the network created with a detailed hydraulic model. This simulation provides a coherent system status provided to each operator;
- **Forecasting of the trend situation**. The MAGES system provides the predicted status of the system by also integrating the rain forecasts. The hydraulic state is therefore displayed for approximately 400 key points of the network, over a 24 hour timeframe in dry periods and a 6 hour timeframe in rainy periods;
- **Determining the optimised management scenario**. A model based on hydraulic and simplified hydrological equations is able to calculate a large number of simulations in a few minutes, the results of which participate in the creation of an optimisation problem. It is about minimising the cost of an objective function based on priorities such as limiting overflows to different spillways, the priority for using different storage volumes available and the treatment plant operating time period in rainy period configuration. There are three management strategies configured in MAGES: the "long-term dry period" strategy, the "overflow rainy period" strategy, which aims to reduce overflows as much as possible without increasing the risk of flooding, and the "flood rainy period" strategy, which targets, as a priority, controlling the risks of network overflows on the road.
- **Forecasting of the optimised trend situation**. The main work instructions obtained during the previous stage are inserted into the detailed hydraulic model to provide the system status, assuming the proposed instructions are applied effectively.

# THE CONTRIBUTIONS OF MAGES AND SMART MANAGEMENT

The development of MAGES accompanied a major period of progress for the sanitation system of the urban area as, at the same time, the facilities of the SIAAP were completing a profound transformation, as a result of the decongestion programme of Seine aval.

At the end of the 90s, the SIAAP had three large plants: Seine aval (downstream), Seine amont (upstream) and Seine centre (central), Marne aval (downstream) presenting challenges of a lesser magnitude. The SIAAP had just come out of decades of a chronic shortage in purification capacity and the management margins were very low, the management still being very static. The following decade led to a complete change in the landscape linked to the political decision to reduce the size of the historical plant: Seine aval, which had to go from 2.1Mm3/day to 1.5Mm3/day, implying the creation of new plants to compensate. This development in the purification station was also accompanied by a significant transformation in the South-East part of its transport system, designed to feed into the Seine amont plant. New connections and rain storage works with a capacity of 580,000m3 were created.

Therefore the SIAAP went from a situation of a shortfall in treatment capacity to a completely new situation with real room for manoeuvre. It is in this context that the dynamic flow management programme came about. The commissioning of MAGES provided a radically new vision as this teleprocessing, assisted by powerful calculation methods, was able to modify, thanks to its gridiron network, the division of flows between plants with a lot more flexibility and an overall vision. The commissioning of MAGES largely facilitated the assimilation of changes which were just appearing. The management had gone from static and local to dynamic and global.

Gradually, the Flow Management Service of the Network Directorate, manager of MAGES and of PC SAPHYRS, thanks to the knowledge learnt on a daily basis, was transformed into a "control tower", with a global vision of the collection of "network-plants".

MAGES gradually led to the implementation of procedures and the modification of organisations. The dialogue between plants was developed, just like that between the flow manager and the plant operators. The vision of the sanitation system had been radically changed.

## OUTLOOKS OF VARIED PREDICTIONS

One of the specifics of MAGES and its developments is that it allows for a vision and usage over different time periods:

- 6 to 24 hours: is the current real time operation with the pooling of data and instructions to optimise the requesting of transport, storage and treatment works, with a consideration over the recent past, whether it was dry weather or not, of the state of the environment;
- 1 to 10 days: is the current operational outlook with a detailed and optimised programme of the operations giving rise to a provisional report on the operation management ;
- 1 to a few months: this outlook is one of feedback, relying on the "Non-Real Time" function of MAGES. It allows for feedback on past situations, but also particular studies like the scheduling of maintenance operations or tabletop exercises;
- 1 to 3 years: this is the period of scheduling, over several years, of down-time operations and specific studies for particular operations;
- Lastly, it is advisable to highlight that the hydraulic model associated with MAGES is a sufficiently sophisticated and robust base to have served as a basis for the hydraulic model used in the context of the revision of the plan of the SIAAP which, coupled with a quality model from the Seine ProSe, has given rise to significant methodological innovations.

The following paragraphs detail some of these uses.

## A GLOBAL AND SHARED VISION

The main aim to provide a global and shared vision was achieved from the commissioning of MAGES, with the standardisation of all of the data which provides the overall vision of the operations of the sanitation system. It places the operators in an overall management context by providing them information which goes beyond their strict management scope.

The shared vision has allowed for the implementation of a real cooperation between different stakeholders, which is part of the continuous improvement process for the operation.

This shared vision may have been specifically realised, but the effects of quality water transfers, sometimes very different, accelerated the process of sharing information. Now bi-monthly meetings bringing together the plant operators and networks have been implemented, capable of ensuring the analysis of past situations, the optimisation of operations and the sharing of experiences, therefore placing it in a process of continuous improvement of the operation, by relying on data provided by the MAGES tool. These exchanges have become essential to the proper functioning of the sanitation system.

## OPTIMISING OPERATION IN REAL TIME

From the prediction of the contributions of dry and rainy weather, MAGES provides, at all locations in the network, in real time, the flows and water levels upon entering the plants and characteristic points of the transport network.

Understanding hydrographs in real time with an optimised prediction over the 6 hours to come provides relevant and essential information to the operators, to take the decisions which are required on the management of their facilities. This predictive management is able to better anticipate the start-up of procedures in rainy weather, the regulation of the flow over treatment facilities (to avoid

saturating them via a peak in pollution likely to go beyond the construction characteristics of treatment facilities) and the coordination of storage and draining stages of different basins and reservoir tunnels, positioned in series or in parallel.

## PROVISIONAL REPORTS FOR THE BEHAVIOUR OF NETWORKS AND PLANTS

Faced with the observations of strong interactions between plants and networks for a high performing management, a provisional report for the behaviour of networks and plants of the SIAAP is created each week. It is established in partnership with the operators of the plants and networks and is circulated among all the operational services and functional services, ensuring the operation reports and monitoring of the natural environment.

This report gives summary information on the availability situation of each of the plants and networks, according to maintenance work and incidents. This situation is given for the current day, with a prediction of the contributions and division of flows for the next ten days, and takes into account the annual scheduled downtime programme for the next three months. This prediction is created from the Non-Real Time version of MAGES. This information is correlated with the data on the natural environment (flow and temperature of the Seine), as well as the trends for rain over ten days and can, if necessary, be adapted to reduce the impact on the environment. A summary map indicates the network downtime and the reduced capacity periods of plants. The situation relating to the risks of $H_2S$ and $CH_4$ in the networks is also described.

## A MANAGEMENT ADAPTED TO FLOWS FOR THE SEINE AVAL PLANT

Among the six plants, Seine aval plays a major role due to its capacity and its situation within the network. It is frequently required to provide assistance to other plants. The reverse is less often the case, as only two plants can contribute to reducing, in limited proportions, the loads entering Seine aval.

Weak flows are critical for this plant, designed to treat daily volumes equal or greater than 2.1Mm³/day. In summer, the flows drop under 0.8Mm³/day and flows lower than 10m³/s therefore pose problems. An operational regulation procedure in real time of the flows capable of avoiding going under this threshold has therefore been implemented. It relies on a water transfer from the Seine centre and Seine Grésillons plants complemented by storage in the drainage channels to support the night-time flow.

The drainage channels which feed into it were originally designed to carry 2.7 Mm3/day. With the reduction in capacity, the flow speeds became lower, making them sensitive to deposits. The picking up of these deposits during heavy rain poses operational problems that can create excesses in prohibitive values. To reduce these risks, the operator requires a specific regulation with an increase in the flow by a level of 5 m3/s per 15-minute period, allowing them to change the configuration: physico-chemical treatment of water during rainy weather instead of phosphorus.

## MANAGING DOWNTIME

The provisional management of downtime is a major challenge for operators. The significant construction work and maintenance operations on plants, as well as the flushing, inspections or renovations of the transport network are scheduled each year, sometimes over periods of several months. A schedule over several years is created by relying on the Non-Real Time version of MAGES. A procedure is able to create the downtime period schedule for the following year subject to the water policy service for approval, after an evaluation of the impact on water volumes. This coordination is essential to ensure that the schedule does not present major incompatibilities in terms of operation and impacts not acceptable for the receiving environment.

MAGES is one of the major tools for assessing the impact of routing from watersheds with characteristics from domestic and industrial contributions which are variable.

### MANAGING INCIDENTS

The management of all the equipment malfunctions is facilitated by this tool. The updating in real time of features of transport, storage and treatment works of MAGES is a major asset to reduce the impacts of these incidents on the environment.

## THE FUTURE DEVELOPMENTS OF MAGES

Now MAGES has reached its maturity and it is advisable to prepare for the future.

While the directive on urban waste water imposed a performance target for the sanitation system, the framework directive on water requires a result on the environment. This significant change is the challenge of the years to come. The impact of the Parisian urban area on the quality of the Seine is such that simply respecting the urban waste water directive does not allow for a good state to be reached: the purification performances of the SIAAP must go well beyond the framework directive on water. This starts on a day-to-day basis with the reliable and well performing operation of facilities.

Beyond these targets, the commissioning of the new biological water treatment facility at Seine aval, based mainly on biofiltration, the population increase in the Parisian urban area, managing pollution during rainy weather and the expected effects of climate change, are all factors which have led the SIAAP to launch the developments of MAGES. These mainly aim to integrate into the system the quality of effluents and the impact on the aquatic environments. This concerns the development of a flow prediction of the pollutants entering the plants and, especially in Seine aval, the quality of the discharges from plants, with the modelling of processes and a prediction of the quality of the Seine, in order to operate the sanitation system in accordance with the daily respect of targets within the framework directive on water. The introduction of the operation cost among the management rules is also being studied.

## CONCLUSION

The development of flow management in real time, relying largely on digital technologies, has allowed for significant progress in terms of operation performance and understanding of the sanitation system. The improvements have also affected the areas of organisation and understanding. The appropriation of MAGES by the operators of the networks and plants for the management of their facilities and its use for revising the plan of the SIAAP, have demonstrated operators' confidence in this tool and the optimisation of the operation which results from it. Furthermore, it is undeniable that the level of complexity reached by the sanitation system of the Parisian urban area implies having tools from the area of artificial intelligence, essential to the daily operation of the facilities of the SIAAP. This has proved possible because, over 30 years ago, visionary engineers began this adventure in automated management, placing the Parisian urban area among the most advanced in this area.

The challenges of the future linked to respecting the good state of the Seine require taking an ambitious step forward, integrating the quality of water throughout the sanitation process up to the natural environment. It is a challenge that the SIAAP intends to meet in the years to come.

## BIBLIOGRAPHY

**Bachoc A. (1984), *Pour commencer à automatiser la gestion du réseau d'assainissement en Seine-Saint-Denis… Disons douze ans*. Département of Seine-Saint-Denis, Département-level Equipment Directorate. Operational arrondissement no.3.**

**Blanchet B., Fradin A., Tarif P.** (2008), *Outil d'aide à la gestion dynamique et coordonnée du système d'assainissement de la région parisienne : MAGES (Modèle d'Aide à la Gestion des Effluents du SIAAP)*, ASTEE 2008 Conference.**

**SIAAP (2016), *Schéma directeur d'assainissement 2016-2027* (currently being created).**

# The French water sector: assets, innovation and behavioural economics

By David Colon, Veolia, Representative at the GT Eau of the CSF éco-industries;
Wladimir Gauthier, representative of the UIE at the GT Eau; Christian Laplaud,
Altereo, engineering companies representative and President at the GT Eau and
Annie Larribet, Directorate General for Enterprise, Secretary of the GT Eau

## ORGANISATION OF THE BODIES

**The Water Working Group (GT Eau), attached to the Industry Strategic Committee (CSF) of the Eco-Industries of the National Council of Industry, brings together professional, representation bodies from the water sector (UIE, FP2E, Syntec Ingénierie, CINOV, Canalisateurs de France, Profluid, competitiveness clusters, etc.), the public stakeholders of water (FNCCR, Onema, Water Supply Agencies, etc.), the standardisation bodies (AFNOR), and the representatives of the ministries (Digital, Economy and Industry, Environment, Energy and Sea and Health).**
**The GT Eau represents one of the four industries of the Strategic Committee of Eco-Industries (CSF) co-chaired by the two ministers in charge, on the one hand, of sustainable development and, on the other, of industry.**

**The industry agreement of the GT Eau has allowed for the launch of the "Water quality and scarcity management" plan of the New Industrial France (NFI), now reorganised into nine solutions including the sustainable city solution. The work committed to by the industry has therefore led to the launch of a call for projects, sponsored by Ademe in the context of the PIA2 (Plan for Investment of the Future), around four themes: the purification plant of the sustainable city, smart water (networks and resource management) and the desalination plant.**

### OW DO YOU WORK WITHIN THE STRATEGIC COMMITTEE ON BEHALF OF THE WATER SECTOR?

Originally, the GT Eau's aim was to promote the French excellence of this industrial sector which contains over 900 companies, approximately 125,000 jobs, and which exports its expertise internationally.

Our common aim is to bring together all of the stakeholders which affect the developments of this sector and which can play an active role in its overall dynamism. Concerning the work that we undertake, the CSF Eau becomes a place for co-creation driven by an acute sense of the general interest, outside of the rationales of industry competitiveness.

To start, we recently adapted the governance of the water group in order to serve this objective. The presidency is ensured on a rotating basis every year between the representatives of the three groups of companies: from engineering (Syntec Ingénierie), "water suppliers" (FP2E), and companies with a water specialism (UIE – which itself brings together ten authorities and two associations including the ASTEE). During each presidency, the two other representatives are vice presidents.

### IS IT DIFFICULT TO GET ALL THE STAKEHOLDERS OF A SECTOR WORKING TOGETHER?

To focus on issues in the overall interest of the sector, we have created new working methods within the water sector.

Recently, we have written an Operational charter validated by all of the participants, in the name of the public or private organisations that they represent. It is a founding act for these working methods within the sector that we want to separate from industry interests.

We note that our discussions are becoming more and more fluid and efficient over the course of our meetings.

In addition, we have drawn out cross-disciplinary themes containing major issues for all the stakeholders of the CSF Eau, and in which everyone can contribute by providing insight in their specialist field.

To do this, we have put in place five workshops which work in advance of each plenary meeting of the CSF-Eau and which can welcome other experts not represented in the plenary group.

Therefore, in these working groups we welcome financial stakeholders from the industry (water authorities, Caisse des Dépôts et Consignations, etc.). The mediator of companies and public contracts supports us as a stakeholder of our industry ecosystem. To this end, it has been able to share its observations with us in terms of the challenges of other industries within the working groups.

## YOU MENTION THE WORKING GROUPS OF THE CSF EAU. ON WHAT THEMES ARE YOU WORKING?

Without going into the detail of our work, we have identified two major and essential challenges for the future of the French water industry: the water asset challenges on the one hand, and the place of innovation on the other.

The asset question is raised at several levels. All the stakeholders note that continuing the renovation of water infrastructure at a level that is, overall, too low in France is now leading to very critical situations per area. Sacrifices were made to maintain the low price of water in territories where the total contribution from water bills is no longer able to maintain the network in a good condition.

Nowadays, it is the rural world which is the most affected and finds itself, in places, confronted with technical and sanitary crises to which French companies are capable of responding, once a new economic equation has been proposed.

The theme of innovation is very unique for this French water industry. This is due to the fact that the essentials of the industry's economy are driven by local public procurement.

Obviously, competitive tendering, as it is implemented, in a way that is meant to ensure the optimal use of public funds, leads, in practice, to a mechanism greatly impeding the penetration of innovation and encouraging conservatism. Yet, innovating means accepting to take a technological and industrial risk with a new solution that has yet to be experienced. This risk is sadly not very compatible with public procurement which wants to obtain guaranteed efficiency of its purchase and is therefore run to "curb" the expression of its needs.

At the same time, the industry is noting that engineering (public or private) would like to play a greater part in the catalytic role of innovation. To do this, the contracting authorities must be more inclined to request solutions which, as well as being of quality, are also likely to bring about innovation.

Innovation does not happen on its own. It only occurs if it finds a market to carry it in a viable way. Therefore you must be sure to invent mechanisms which will guarantee the risk of innovation over the French territory and which will nevertheless allow companies to demonstrate the solutions that they will then export.

This is what the water sector of the sustainable city (New Industrial France phase 2) is trying to implement via funding encouraging the purchasing of innovative solutions and which will be able to result in technology demonstrators. The sale of French water technologies is undertaken internationally thanks to "large group – SME" ecosystems. They will be stimulated if the internal French market is high-growth.

Whatever happens, we note that the decision making mechanisms calling on innovation are far from easy to promote and implement.

## IN YOUR OPINION, IS THERE A COMMON POINT BETWEEN THESE TWO THEMES: ASSETS AND INNOVATION?

Yes, we have noticed that the water sector was a prisoner of numerous "cognitive biases".

These are ways of thinking accepted by everyone yet which do not correspond to any logic.

On the issue of renovating water assets for example, there is a very widespread idea: the financial incapacity of contracting authorities to fund renovation works for their infrastructure. Yet, in studying the question, you realise that not only are the local authorities overall not very much in debt37, but the funding offer (grants and loans) for water utilities is five times more significant in volume than the demand.

We could also talk about the cognitive bias making the price of water a prisoner of the collective logic dragging it downwards, with, from the point of view of the decision makers, an almost impossible social acceptability for increasing the price, even in areas requiring the biggest reinvestments. Currently, the price of water is only really appreciated in terms of the financial result of the investment to be provided in the infrastructure, its upkeep and operation. The price is analysed in comparison with other prices, or on the basis of national averages; the financial position for innovation in such a price has become almost impossible.

37. La dette des collectivités représente moins de 10 % des 2100 milliards d'euros de dette publique. L'annuité de la dette dans leurs coûts de fonctionnement est de 10,6% pour les communes (7,1% pour les intercommunalités), 5,9% pour les départements, et 11,8% pour les régions.

## SO WHAT DO YOU PLAN TO DO TO SOLVE THESE "COGNITIVE BIASES"?

It was an idea that Christian Laplaud, President of the CSF, had in order to enlighten our reflections in working groups with the contributions of a new discipline in France: behavioural economics, coming from human and social sciences. This discipline takes into account the cognitive limitations of individuals, the role of emotions in the construction of rational decisions and the influence of social interactions on individual choices. The cognitive biases, notably in the water sector, can be grouped into major categories: anchoring bias, conjunction fallacy and optimism bias… There are solutions suitable to each bias: they are small scale informative actions, but ones which can have major effects on behaviour, without creating interdictions and without changing economic incentives. It is what we call a "NUDGE": a simple and non-costly helping hand which changes behaviour.

## AND WHAT ARE THE RESULTS FOR THE FRENCH WATER SECTOR?

It is too soon to say as we have just launched this approach. Yet we are planning to quickly propose the first "nudges" for the water sector. The first will perhaps consist of an encouragement action so that the future municipality groupings planned for by the NOTRe law do not find themselves in a transition situation which would inhibit decisions, and so that they are encouraged to formally commit to considering investment plans over several years in water infrastructure and, ideally, if possible, calling on the innovative expertise of stakeholders from the sector.

# Chapter 6

## The exploitation of data, a new frontier

# INTRODUCTION

The abundant development of urban data strings is one of the most impressive aspects of the digital transition. We have seen how the role play of major stakeholders of urban engineering in the past, present and future must consider these strings. Yet these strategies can only be appreciated in regard to the exploitation of the data that is therefore produced, organised, preserved and circulated.

Open data is the backdrop to this question and a report from the Hauts-de-Seine Sustainable Development Council (François Leblond) shows both the interest and elements of prudence to provide in this instance, as much in terms of security as the ease of future uses.

We therefore understand that it is finalised initiatives that allow for the provision of concrete answers, some of which are presented and commented on in this chapter.

The idea of collaborative organisation between stakeholders of water utilities and users of the data from the Water Information Service (SIE) is dealt with by Laurent Coudercy and the ONEMA (National Office of Water and Aquatic Environments), by working on ideas via a hackathon, the first step towards a co-creation.

The value chain of the water utility can itself be subject to a systematic investigation (SunRise Smart Water project presented by the Civil Engineering and Geo-Environment Laboratory, University of Lille 1). Entering structured data at the source brings about the digital transition in other areas like digital agriculture (report from the IRSTEA – Research Institute of Science and Technology for the Environment and Agriculture).

A focus on remote water meter reading (Thomas Perianu for SUEZ) is at the centre of an overall development of the utility in Malta. It is the same question of metering data on consumption which, for electrical grids, creates a new efficiency, as announced for the deployment of the Linky meter (interview with Christian Vivès, ERDF).

# Open data: making data accessible to everyone



By François Leblond, Honorary Prefect, President of the Hauts-de-Seine sustainable Developpment Council

**The Hauts-de-Seine Sustainable Development Council is a consultative body composed of 48 members from organised civil society: elected representatives, associations, socio-professional stakeholders, experts/qualified individuals. This council's aim is to give recommendations on major projects concerning the territory of the département. These recommendations are the result of audits, then debates, between members of the Council, whose very diverse points of view are provided to enrich then merge within a shared report, which is handed to the President of the Département upon completion of the work.**

Via a referral letter dated 23rd October 2014, the President of the Hauts-de-Seine Département-level Council asked the Sustainable Development Council to give a recommendation on open public data and to provide clarification on the following questions: How do we ensure that open data stimulates discussion between public stakeholders and civil society? Is public data in raw formats understandable to citizens? How do we encourage the reuse of data, notably in the form of concrete and relevant applications for users?

This new referral succeeded the recommendation given on "Digital, Very High Speed: territorial challenges, societal challenges" in which the Sustainable Development Council was interested in the contributions of digital in the areas of teaching, work, the city, leisure, tourism, culture, health and administration/citizen relationships.

These two successive referrals show to what extent the digital revolution and open data now call out to the local authorities both in terms of what they will change in their relationships with citizens and what they can offer in terms of efficiency for the management of the city and economic dynamism.

Just like the State, the Hauts-de-Seine Département launched open data in 2012. In May 2015, the platform totalled 112 sets of data, including 107 sets coming from the Département and 5 from the partner University of Nanterre. The data is free, under Open Licence and the Département wants to encourage quality.

# WHAT DOES THE RECOMMENDATION OF THE HAUTS-DE-SEINE SUSTAINABLE DEVELOPMENT COUNCIL TEACH US ABOUT THE PERCEPTION OF STAKEHOLDERS AND USERS, THE CHANGES UNDERWAY AND THE TANGIBLE REALITY IN TERMS OF MODERNISING PUBLIC ACTION AND ECONOMIC GAINS?

The debates and proposals of the Sustainable Development Council are an indicator of the level of maturity of open data and its consequences: the connected and smart city, the modernisation of administration and participative democracy. This outside and sometimes uninitiated view on département-level policies is often a source of common sense and creativity.

On the issue of open data, this approach is all the more interesting as it appears that experts and lay people discuss very little together; the first group thinking that popularisation is not appropriate for an eminently complex subject from a technical and legal point of view, while the second group feel excluded from the debate due to the use of jargon that is not very understandable. The way the issue is understood in itself is a source of learning: the "data" purpose needs to be explained and its use is not self-evident.

On the operational level, open data requires a legal, economic and technical opening up, and its structuring is required to facilitate the reuse and processing of data. The 45 recommendations, although they are a reminder of these methodological prerequisites, are, above all, on the means to develop the uses of open data and widen the spectrum of producers and users of data.

The digital city is betting that capturing, aggregating, centralising then analysing a massive influx of data on energy, water, waste and transport will be able to improve the efficiency of the city's management. Open data must allow, via the combination and sharing of data, for better anticipation of the risks, via the implementation of indicators and complex control panels, which help real-time decision making, managing situations more rationally and efficiently, and therefore better protecting citizens. From the recommendation of the members of the Sustainable Development Council, it is the forecasting, or even the prediction sector, which seems to be the winning sector of activity in the changes underway, both from the point of view of value creation and the quality of the information exploited and produced. Cultural data is also identified as an extraordinary potential source of new uses, stimulating the creation of applications.

Open data encourages multi-disciplinary and multi-stakeholder expertise. In this sense, it is a vehicle for innovation; sectors of activity previously limited to experts are now open to users and other stakeholders.

Informing and interacting with citizens pose a major challenge. Ideally, open data would encourage the covering of citizens needs by themselves and would complement the actions of the public authorities. However, on the one hand, civil society is not always aware of the existence and location of data, nor aware of what is at stake; on the other, the user's interest is not necessarily where you would expect it to be. The citizen's desire to access raw data seems, in the end, quite limited. Conversely, making data relevant to audiences (dataviz) appealed to the members of the C2D92, who see it as a real popularisation and information tool.

Although the interface with the user, consumer and producer of data is underway, so that this interfaces becomes widespread, numerous support measures are required. Currently the data mainly benefits journalists, developers and associations. So that open data stimulates the debate between public stakeholders and civil society, it needs to be supported in the use and understanding of the data. Louise Merzeau reminds us that the culture of digital and open data does not stop with the addition of technical skills, understanding the context of the sources and the issues is also as necessary. The C2D, for its part, picks up on one of the conclusions from the National Digital Council report for a new inclusion policy:

"the challenge is not knowing how many people use digital or not, rather it is about knowing who digital helps to play a role in society and who it puts in difficulty".

In the future, associations, then gradually consumer-stakeholders, should be able, by comparing services provided

to the user, to develop practices and prices: producing a good level of service explained to the consumer, including all the parts of the price, could become the rule. Moreover, "crowdsourcing" will participate in a growing way to the overall understanding of the environment.

By being better able to identify the expectations of citizens and the features of their living environment, open data is a decision-making tool to define public policies.

The contribution of open data to the modernisation of the administration and its relationship with the user is not being debated. However, it presupposes a change of culture faced with the data and digital tools in a system where, up until that point, sharing data was not an aim. Open data creates a real breakthrough, this is why it must, above all, be used internally. The tool can facilitate interdisciplinarity, the evaluation of public policies, continuous improvement, empowerment and transparency, as long as it is supported by a real managerial and organisational project and collective implementation, allowing for a real appropriation of the producers and users of data.

The obsolescence of data, its updating, maintenance and the distribution of applications which do not come from the data producer are real issues. The creation of a quality certification for the data by the public authority is proposed, but is it not contrary to the principle of openness?

Surprisingly, the privacy risk seems, in the stakeholders' minds, to be taken care of by the legal sphere and anonymisation. The risk of re-identification is not mentioned much. This point is in accordance with the analysis of Philippe Yolka, professor of public law, who notes in a recent article that "for the digital natives, information is firstly an opportunity and source of wealth, whereas their elders saw, in its collection, a real danger: the effects of big data are (wrongly?) feared less nowadays, than the threats of big brother were in the past"; however, people's minds are very affected by the terrorist attacks and the question of reducing and circulating data for security reasons is raised.

Although it is taken for granted that the commitment of local authorities to open data responds to economic development and administration modernisation aims, notably in its relationship with the user, the economic and financial gains do not seem visible enough on the local scale to convince all of the stakeholders. Some consider that there will not be a return on the investment which includes collection and production, and express reservations on the free access of private stakeholders to a data history, which represents a real market value. This vision is confronted with a more altruistic one of reciprocal enrichment, which eventually should lead to a win/win balance. An intermediary vision consists of distinguishing the start-ups from consolidated companies, to use the classification of Lucie Cluzel-Metayer, from multi-nationals in a dominant position. The creation of applications is often driven by the administrations themselves.

Effectively open data, due to its uniformity on a national level, often makes the profitability of the application difficult for the project sponsor, applications are still often the work of students.

Avenues are also mentioned to optimise public procurement.

The report concludes with two points of vigilance:

Data is a powerful tool, but one which requires taking a step back and reflecting. Data can appear to correlate, without necessarily being linked, and a poorly supported open data approach could harm its initial objectives.

The environmental impact of the data and information technologies must not be ignored.

Sharing and smart management of data should allow for productivity gains and innovation. The exploitation of data has not yet found all these procedures. The smart city, in order to become a driver at the service of sustainable development, must pool data to allow for resources to be shared and must leave space for the unexpected, while not restricting circulation once the data is available.

# BIBLIOGRAPHY

**AJDA, Actualité Juridique Droit Administratif (2016), *Les enjeux de l'Open Data*, journal of 25th January 2016.**

**Conseil de Développement Durable des Hauts-de-Seine (2014), *Numérique, très haut débit : Enjeux de territoire, Enjeux de société*, recommendation no.13 of 23rd June 2014.**

**Conseil de Développement Durable des Hauts-de-Seine (2015), *Open Data : Rendre les données accessibles à tous*, recommendation no.14 of 23rd June 2015.**

# Testing the effectiveness of access to data and its usability: a collective exercise worth promoting



By Laurent Coudercy, Onema

## THE OPEN DATA APPROACH IN THE WATER INFORMATION SYSTEM (SIE)

Since its origins, the water information system has made open data on water a general principle. This principle was translated via the creation of numerous themed sites offering access to data via consultation and download, and from the Eaufrance portal (2005). Thanks to these websites, numerous pieces of data on water are available, including for copyright free reuse. This data has been available, since 2013, under open licence, (Etalab), via an open data portal: data.eaufrance.fr, in addition to other access methods.

## OPEN DATA, BUT IS IT EASILY REUSABLE?

However, overall there is room for improvement and ONEMA (National Office of Water and Aquatic Environments) and the ministry in charge of the environment have gradually become aware of the complexity of a data search in this very rich collection! Our sites are too complex, their access logic and circulation formats are defined mainly considering the needs of the producers of said data, everything being organised firstly to preserve the integrity of the data, the need to facilitate its reuse remaining secondary.

Therefore, on the groundwater website (ades.eaufrance.fr) the data selection tool is able to select the desired points by their type and the location, with, for this aspect a luxury of choice. Then five new selection criteria are proposed to us! To simply view the data, you must find your way through all the query screens: go through the descriptive record of the plant, then find the link to the visualisation and respond to a series of questions, before finally being able to ask for the graph to be displayed! To sum up, too complex an access pathway, which often leads to not having the data! As for the data on the quality of rivers, you must know the administrative basin concerned, go to the site of the authority in question and learn to use the different interfaces depending on the sites!

Essentially the observation was made, including in numerous ministerial reports! Clearly "the data is not lacking, but it is scattered, fragmentary and difficult to access".

We must still confirm this feeling, by turning towards the re-users!

## THE HACKATHON, AN OPPORTUNITY TO COME FACE TO FACE WITH RE-USERS, IN A CO-OPERATIVE CONTEXT

This is why the ONEMA organised the first hackathon on 16th June 2014 relating to data on water. The aims: to become aware of the current limits of the SIE in terms of access to data on water with the aim of reuse, and to be able to consider new technical methods of data access, better responding to needs. This hackathon was organised with the support of Etalab, the Prime Minister's department in charge of public open data and the development of the French open data platform, data.gouv.fr.

*"Hackathon, what's that? This word is a fusion between hack and marathon. It corresponds to an event where people, mainly IT developers, getting together to do collaborative computer programming over several days. Their aim: solve a common project as quickly as possible."*

35 voluntary participants worked for nearly nine hours on the subject. Among them were journalists, engineers from design offices, web-entrepreneurs, researchers, network managers, but also representatives from the ONEMA, the French ministries of ecology and health, the International Water Office and the BRGM (Geological and Mining Research Office). The day was organised around three working areas: the overlapping of data on water, including information not coming from the SIE; the circulation methods of this data to facilitate its reuse; and its graphical representation, still known as data visualisation.

## THE LESSONS FROM THE FIRST HACKATHON ON WATER

In addition to examples of data processing, different observations shared by the participants came out of this intensive day:

- Much of the data managed by the SIE are freely accessible online, under open licence. Only the data on flows of rivers, accessible subject to a login and password, and sales data on pesticides (limited access due to tax secrecy), is excluded.
- Its recovery in a reusable form however, remains long and difficult. The data access interfaces on the professional sites offer numerous selection criteria, certainly suited to professionals of the sector, but make the recovery of data very laborious, even unfeasible often, for a stakeholder outside of the sector.
- Lastly, the data formats proposed by the SIE are not designed for re-users. Instead they are for exchanges between professional information systems. Therefore, to exploit data, you must know the reference sources and classifications used by the SIE, and be able to orientate yourself in the dictionaries and scenarios. In short, you must plan for significant prior intellectual investment before any concrete reuse.
- As for the other data sources on water (those not depending directly on the SIE), they are, in general, less freely accessible. Another minus point for data outside of the SIE, some is not reusable as it does not have key data allowing it to be networked with other data (INSEE code of the municipalities, contact details).

In short the SIE can largely still be improved. To do this it must take into account the needs and ideas of stakeholders wanting to reuse the data on water, but who do not have the time or desire to understand all the structural rationale which makes up the richness and reliability of the SIE.

The first hackathon on water

## FOLLOWING THE FIRST HACKATHON, GOING FURTHER: THE LEADS

This hackathon, despite its limits, has been able to make the problems encountered by the stakeholders outside of the SIE known internally within the SIE, to reuse these data! A message is a lot more credible if it is coming from those who are the most affected, following an actual practical experience. The SIE has benefited from the friendly and constructive perspective of outside stakeholders during and immediately after the hackathon.

An effort was therefore undertaken to offer citizens and users consultation interfaces and download methods that are easy to use.

The new themed sites, open since 2015, have taken into account the need for simple and friendly interfaces to make viewing data easier for all the stakeholders, while also facilitating their downloading. This effort is particularly visible on the site on the water withdrawals in the environment (bnpe.eaufrance.fr, opened in January 2015), on the one on the quality of rivers (naiades.eaufrance.fr, opened in September 2015), or on the one relating to monitoring floods (onde.eaufrance.fr, opened in November 2015). These sites present a lot more simple search methods than our older sites: you just need to answer "where, when and what", with an easy to use interface, in order to see the different representations of the data appear, which are easily understandable and with a direct download available!

At the same time, the research and development centre INSIDE (interoperability of distributed information systems on water) bringing together the BRGM and the ONEMA offered, in 2015, under the aegis of the French Ministry of the Environment in the context of a bid for the future investment programme on open data, to undertake the hub'eau project. It is about developing the prototype of a general interface for the SIE, offering re-users of data the data structures suitable to their needs, easier to use than those currently offered by the SIE. These are also in formats that are easier to manipulate. This prototype should complement the current access method offer with data structures that are understandable in themselves (no longer needing to search for what the parameter code 2422 means, for example), in a mono-tabular form if possible, via a documented and structured API, in formats such as CSV, JSON or GéoJSON. The prototype should be available on hubeau.fr by the end of 2016.

## GOING FROM A SIMPLE HACKATHON TO A JOINT-CREATION WITH THE RE-USERS

Strengthened by its previous experience, it seemed essential to us to test this prototype by calling on the intelligence of stakeholders outside of the SIE. It will therefore be subject to a hackathon on 1st June 2016, in the context of the ASTEE conference, in order to confirm the limits of what will be able to be developed on this data, and to be able to envisage, before the end of the year, a series of developments relying on the needs expressed by the users' ecosystem.

Providing the right technical answers to the challenges of users, whatever they are, is a challenge that we must meet in the future: we can no longer design our circulation or data provision sites without taking into account actual needs, technical uses and the best practice of our professional environment in every sense!

We must therefore learn to jointly create our interfaces calling on the intelligence of all of our digital ecosystem and in particular on the re-users outside of the SIE! The hackathons are special moments to observe problems encountered and start to consider leads for a solution; but we must also forge more sustainable collaborative links with the most motivated stakeholders, by providing collaborative methods suitable to this kind of approach: calls for projects, supporting stakeholders, creating user and re-user groups around projects, etc.


The reusable data of the SIE

# SunRise Smart Water: large scale demonstrator of smart water networks

By Isam Shahrour, Oras Abbas, Amani Abdallah, Yves Abourjeily and Elias Farah,
Civil Engineering and Geo-Environment Laboratory, University of Lille 1

## INTRODUCTION

The SunRise Smart Water project is part of a wider project (SunRise Smart City), which began in 2010 with the aim of creating a large scale demonstrator of smart urban networks. This project was supported by a wide public-private partnership, including local authorities, water and energy operators, start-ups and research laboratories. Considering the access and instrumentation difficulties of urban networks in cities, the choice was directed towards creating the demonstrator on the campus of the Cité Scientifique in Villeneuve d'Ascq, near Lille, in the north of France.

The work was initially on collection, verification and digitalization of water and energy networks in a geographical information system (GIS) (Afaneh, 2015). Then, it consisted of collecting operational data with the help of the instrumentation of these networks. This data was subject to initial analyses in order to understand the operation of the campus networks and carry out improvements, making the instrumentation denser. Analysis tools were developed with the project partners for a more in-depth analysis of the data collected and the creation of action strategies for better management of these networks.

The demonstrator benefited from significant support from the International Association on Water Security (W-Smart). It is one of the four demonstrators of the SmartWater4Europe European project. A presentation of the SunRise Smart City project is available via video (SunRise: four years feedback).

This communication presents the water networks of the campus, the instrumentation of these networks, the data collected and the first analyses of these data.

## DRINKING WATER NETWORK: PRESENTATION OF THE NETWORK – DETECTING LEAKS (FARAH, 2015)

The drinking water network was built in the 1960s. The network includes 15km of pipes (Figure 1). It is supplied by the public network at several points, located in the north, west and south of the campus (general meters on Figure 1). This network serves the 140 buildings of the campus. It includes 49 fire hydrants and 250 valves.

The network is equipped by nearly 100 remotely read meters, which include the nine general meters and the different building meters. The consumption data is recorded every hour. The network is also equipped with five pressure cells which measure the pressure every 15 minutes. These cells serve to monitor the pressure in the different sectors of the campus and to calibrate the hydraulic models of the network.

The consumption data has allowed for the creation of consumption profiles for buildings, taking into account the hourly bands, the working days and the season. These profiles serve as a comparison basis with the consumption measured, in order to detect leaks in the buildings of the campus and over the entire network.

Figure 2 shows an example of consumption in a teaching building during four weeks of the month of May 2014. It shows a leak during the weekend of the second week, which continued into the Monday morning of the 3rd week. Outside of this incident and its disturbance on consumption from the 3rd week, we note a repetitive character to water consumption in this building.

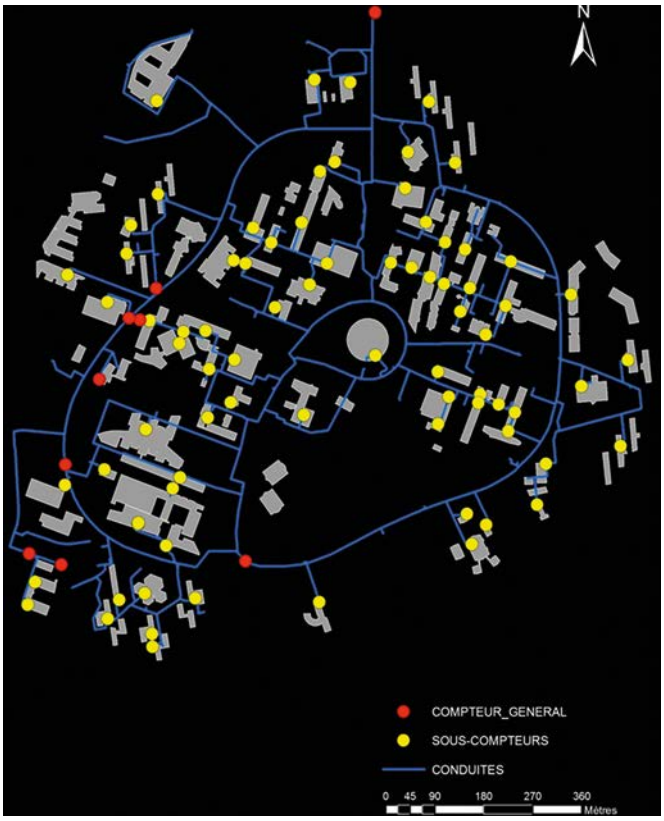



Figure 1: Drinking water network of the campus of the Cité Scientifique (15 km networks, nearly 100 remotely read meters)

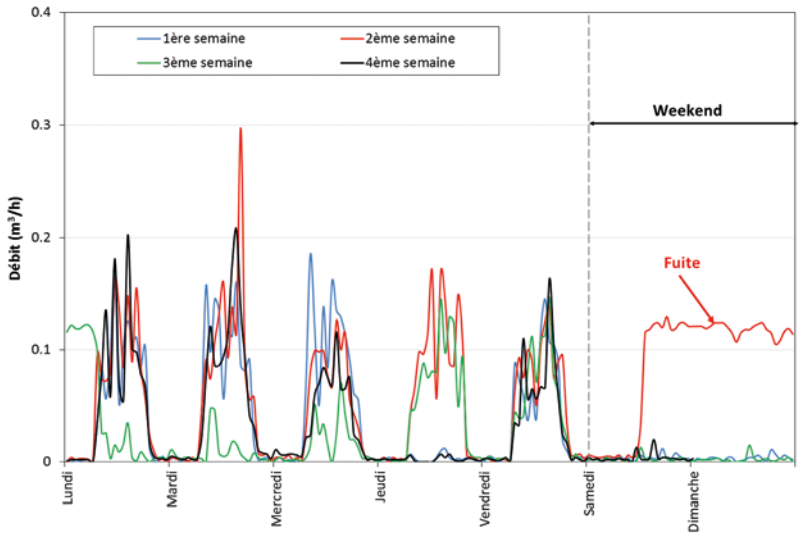
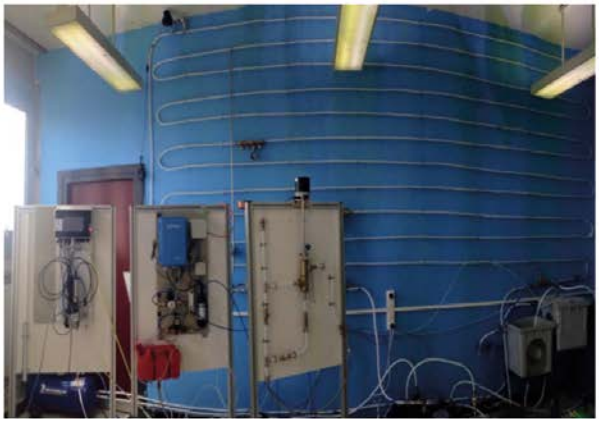



Figure 2: Example of water consumption in a teaching building (May 2014)

# CONTROLLING THE QUALITY OF THE WATER IN REAL TIME (ABDALLAH, 2015)



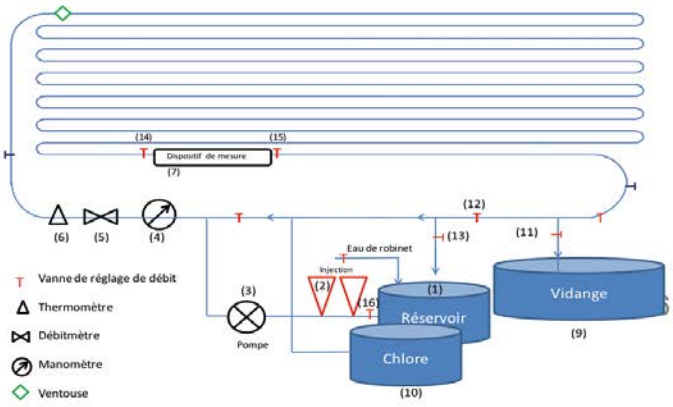



Figure 3: Pilot plant for the qualification of water quality control measures

Controlling the quality of water in real time is occupying a more and more significant place in the management of water networks, notably to ensure the operational security of these networks against any accidental or deliberate contamination. This control is very complex due to the large variety of contaminants, whether they are of chemical or biological origin, and the inherent character of the analysis of the water quality in real time. Measures were developed to indirectly detect the presence of contaminants in the water, via the monitoring of various parameters, such as the absorption, turbidity, light refraction and chlorine concentration.

Within the SmartWater4Euroipe European project, three water quality devices were selected for the demonstration project (S::can, EventLab and Intellisonde). In the absence, for our site, of feedback on these three pieces of equipment, initially we created a pilot station (Figure 3) which is able to reproduce the operational conditions of the campus network in terms of pressure and flow speed. This station allows injection of chemical or biological substances, according to well determined scenarios and monitor the response of the equipment to these injections.

Figure 4 shows the response of EventLab to successive injections of mercury dichloride with increasing concentrations (5.10, 20, 30, 40, 50 and 60mg/L). We note that the response of this equipment corresponded well with the concentrations injected.

Figure 5 shows the response of S::can (absorption and turbidity) to successive injections of E. faecalis with increasing concentrations (105, 106, 107, 108 CFU/ml). We note that the response of this equipment is in accordance with the concentrations injected.

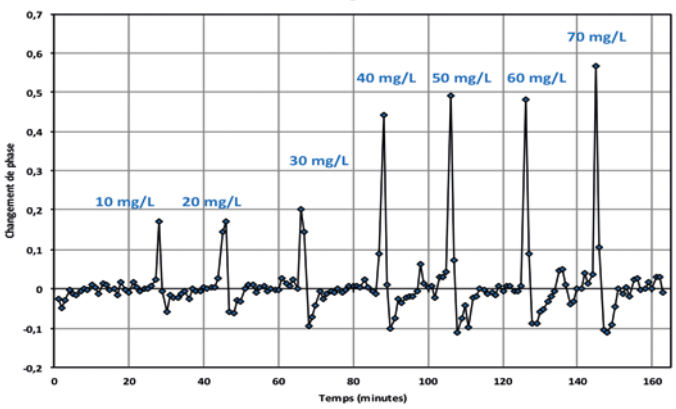



Figure 4: response of EventLab to injection of mercury dichloride with increasing concentrations

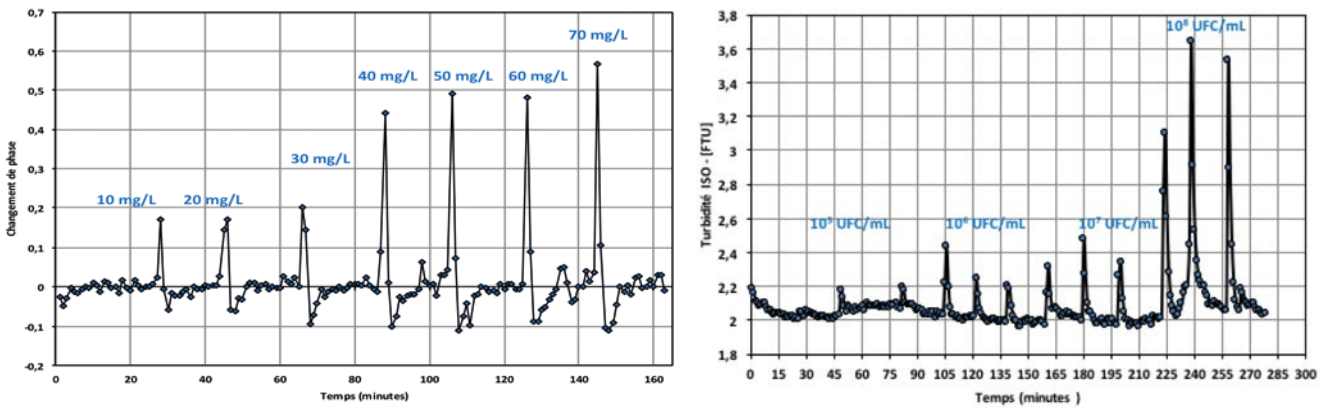



Figure 5: response of S::can (absorption and turbidity) to injections of E. faecalis with increasing concentrations

# WASTE WATER NETWORK (ABBAS, 2015)

The waste water network is illustrated in Figure 6. It is composed of a secondary network of 12 km of pipes serving in main network of Lille Métropole of 4km in length. 25% of the pipes have a diameter less than 200mm, 65% have a diameter equal to 200mm and 4% have a diameter greater than 200mm. The network is organised into two parts. The first collects the waste water in the south of the campus towards a collector located to the east. The second part collects waste water in the north of the campus towards a collector located in the north. The network is equipped with six sewage pumps.

The instrumentation was installed on the sector located in the south of the campus (Figure 7). The section of instrumentation is located in the collector of the main network which receives the waste water discharged by the building located to the south of the campus. The instrumentation included a water level – speed sensor equipped with a recorder and a GMS/GPRS communication system. We have also equipped the network with a turbidity sensor.

Figure 6: Waste water network of the Cité Scientifique campus

Figure 7: Sector equipped with instruments

Figure 8 shows the flow speeds recorded during two weeks of September 2015. We note a very high speed value during the second week (13 September).

This event coincided with intense rainfall recorded on the campus. This result reveals a problem of connection between the waste water network and the rain water network.

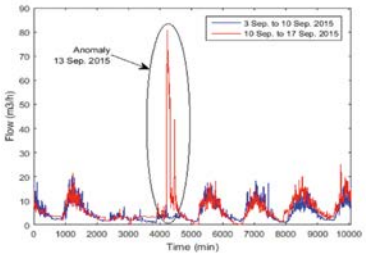



Figure 8a: Flow recorded during two weeks of September

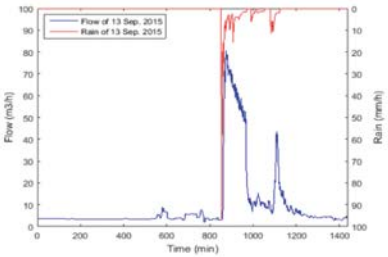



Figure 8b: Rainfall recorded during the flow anomaly

# RAIN WATER NETWORK (ABOURJEILY, 2015)

The rain water network consists of 31km of pipes with a diameter between 150mm and 1,200mm (Figure 9). It is made up of a secondary network and the main network of Lille Métropole. The campus includes two watersheds. The first is located in the north. It covers an area of 50 ha with a water proofing coefficient of 0.4. The second is located in the south. It covers an area of 80 ha with a water proofing coefficient of 0.3. The network is equipped with check valves and flow regulators, lift pumps and retention basins.

The instrumentation was installed in the sector located in the south of the campus (Figure 10). It included a water level sensor and a flowmeter equipped with a recorder and a GMS/GPRS communication system. A weather station was also installed on the campus.

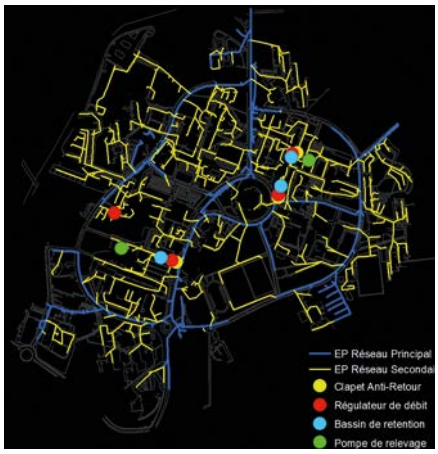



Figure 9: Sanitary water network of the Cité Scientifique campus

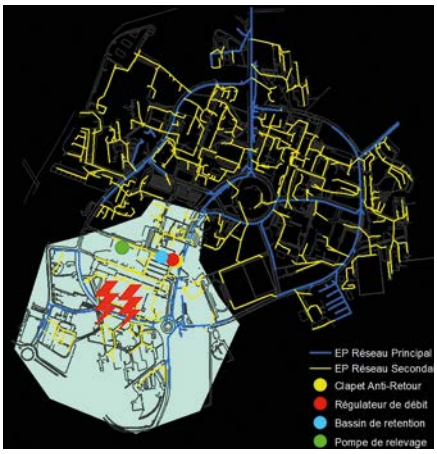



Figure 10: Sector equipped with instruments

Figure 11 shows an example of recorded data including the flow speed (11 a) and the rainfall rate. (11b). This data is used to calibrate the SWMM model (Figure 11 c). This model is currently used to explain the causes of overflows observed in this sector.

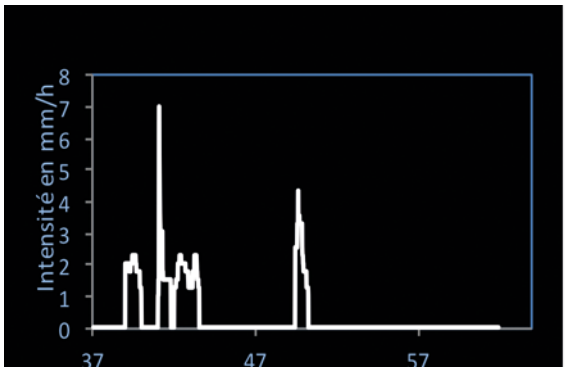



Figure 11a: Measuring example– rainfall rate

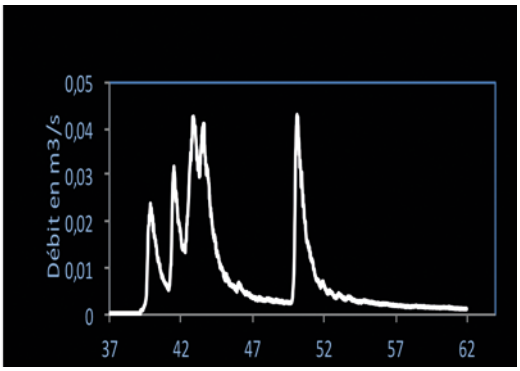



Figure 11b: Measuring example –flow

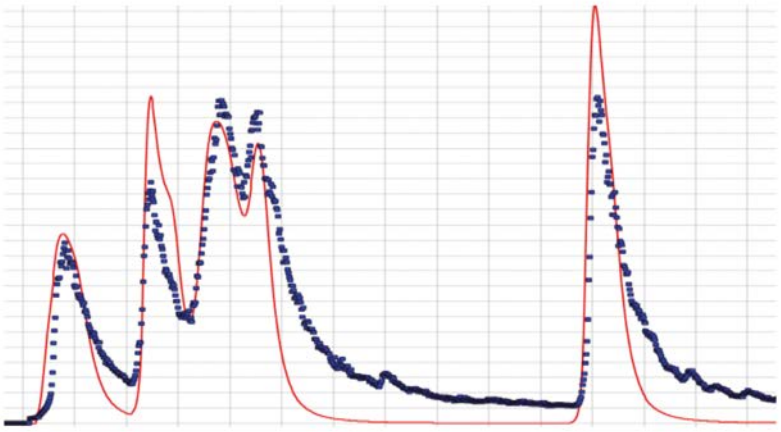


Figure 12: calibration of the SWMM model

## CONCLUSION

This article has presented the state of progress of the smart water network of the SunRise Smart City demonstrator. To date, the data from the drinking water, waste water and rain water networks have been introduced into a geographical information system (GIS).

The drinking water network was equipped with a hundred remotely read sensors and pressure sensors. The water "quality" sensors will be installed very soon, after a stage of qualification.

The waste water and rain networks were equipped with flow, water level/speed and turbidity sensors. The flow measurements were used to calibrate numerical models and to explain certain operating anomalies of the networks.

## BIBLIOGRAPHY


Abbas O. (2015), *Systèmes intelligents pour une gestion durable des réseaux d'assainissement*, doctoral thesis, University of Lille 1 – Science and Technology, presented 15th December 2015.

Abdallah A. (2015), *Réseaux d'eau potable : surveillance de la qualité de l'eau par des capteurs en ligne*, doctoral thesis, University of Lille 1, presented 15th December 2015

Abourjeily Y. (2015), *Systèmes intelligents pour une gestion dynamique des réseaux d'eau potable*, on-going doctoral thesis, University of Lille 1 – Science and Technology.

Afaneh A. (2015), *Système d'information géographique pour la ville intelligente : application au projet SunRise Smart City*, on-going doctoral thesis, University of Lille 1 - Science and Technology.

Farah E. (2015), *Réseaux d'eau intelligents : implémentation et application à la détection des fuites*, on-going doctoral thesis, University of Lille 1 - Science and Technology.

# The information systems in the age of digital agriculture

By the COPAIN team, TSCF (Technologies and information systems for agro-systems) Research Unit., IRSTEA, Clermont-Ferrand Centre

**The new information technology on-board machines or installed in plots (or even in the air with drones) connects the fields directly with farmers. A central objective is the regular and automatic acquisition of data for monitoring and assisting decision making in agriculture. Linked to decision making assistance systems, a mass acquisition of information allows crops to be better monitored and for choices to be made in terms of reasoning on inputs (pesticides, irrigation, etc.), in accordance with the guideline of "the right dose at the right time in the right place". The logged collection of data also allows for a detailed energy analysis by type of activity. The data from certain sensors such as from weather stations can be circulated on the web, in order to share information with different stakeholders. Beyond data from sensors, collaborative websites facilitate the exchange of best practices in agriculture. Numerous pieces of data are also entered to feed into agricultural activity control tools.**

## THE NETWORKS OF SENSORS: AUTOMATED ACQUISITION IS FACILITATED

Within farms, crops are subject to numerous risks: plant water stress, pests, weeds, etc. There are so many risks that it is important to detect and prevent as soon as possible. Farmers use sensors in the field, weather stations or on-board sensors on their machines, to monitor, for example, the vegetation index, the yield and the water status of crops and the soil. The technology of wireless networks of sensors (RCSF) greatly facilitates collecting this data at regular time intervals. The RCSFs are groups of wireless sensors, battery powered in terms of energy, spread throughout the agricultural plots. The sensors communicate between themselves thanks to a wireless computing connection. The information coming from sensors can therefore be sent over quite large distances via near field communication, in order to reach one or more destinations. An essential advantage in the rural and mountainous territories is that this type of data acquisition network can be implemented, even if there is no traditional network coverage available. A key point of these solutions is, of course, energy self-sufficiency. They are usually powered by battery and/or solar panels. Wireless communications must be optimised in order to reduce electrical consumption and the number of maintenance operations.

For example, in the CASDAR CROCUS project sponsored by Arvalis, IRSTEA worked on the development of a RCSF aiming to measure the change in the plant cover state over several years. The sensors used in these networks are small size electronic modules: they contain a microcontroller, sensors (rain gauge, thermometer, etc.), a connection interface such as a USB port and, lastly, a ZigBee or Wi-Fi wireless communication module for example. A set of sensors is positioned within one or more plots. These were placed at strategic geographical positions for acquiring measurements. The data acquired were transmitted from sensor to sensor to a central collection station. Coupled with

decision making assistance software, the data collected can be exploited to give invaluable advice to farmers and technicians.

Another example: in the context of the FUI DISP'eau project sponsored by the ITK company, IRSTEA implemented a RCSF in the vineyards. The RCSF was based on the LiveNode technology designed by the LIMOS (System Optimisation, modelling and computing laboratory) of the Blaise Pascal University. Each node of the network was equipped with a small solar panel and measured the temperature, the light level, the humidity of the soil (at different depths), the battery level, etc. This varied information allowed for the monitoring of the water stress of the vines.

## DATA REPOSITORIES TO LOG THE LARGE AMOUNTS OF INFORMATION

Other interesting aspects include controlling energy consumption. The CASDAR EDEN project has allowed for the centralisation, within a data repository, of the information on the energy consumption of farms (e.g. fuel consumption by tasks undertaken). The aim of the project was to promote a more rational use of energy within farms. EDEN was the logical follow-up to the CASDAR EnergéTIC project, on the detailed evaluation of the energy performance of farming businesses via the use of NICT. This previous project had shown the feasibility and interest in routinely collecting data to automatically control the energy consumption of farms. It was therefore possible to create energy reports at the level of the plot, the production workshop or the different operations. The idea had therefore emerged of developing an information chain from the sensors to data storage, in order to calculate the energy performance indicators according to different dimensions: spatial, temporal, by crop type, by input type, according to materials used, etc.

## FROM THE FARM TO THE WEB

The internet of things (IoT) is regularly seen as the extension of the web of connected objects from the real world. The IoT therefore goes beyond the traditional virtual network of the internet. With the IoT concept, objects which surround us, as well as their data, are visible on the internet. To be more easily interoperable with the standards of the data web, this data must follow certain formats. IRSTEA for example publishes, online, the data from the weather station of the research and experimentation site of IRSTEA in Montoldre in Auvergne (http://ontology.irstea.fr):

- Internal/external temperature,
- Atmospheric pressure,
- Air humidity,
- Wind speed and pressure,
- Precipitation,
- etc.

This data is in the RDF (Resource Description Framework) format. The spread of the publication online of data from objects will greatly benefit the developments of the agricultural decision making assistance systems.

Yet the information is not, of course, always automatically collected. Man contributes to the creation of information and even better, knowledge. The web is also for the exchange and capitalisation of knowledge around agricultural practices. This is, for example, the case in the GECO project, financed by the French Ministry of Agriculture and sponsored by IRSTEA. In this project, a collaborative website will be implemented to capitalise on the ever increasing knowledge and profit from feedback from stakeholders from the agricultural world, as regards innovative crop systems. The aim is to promote agroecology, in other words, crop systems that perform well economically and ecologically.

Still relating to data and knowledge capitalisation web tools, IRSTEA has also developed Sigemo, an agricultural spreading practice monitoring prototype for organic matter. Sigemo was built around a community of shared data between public and private stakeholders of spreading. Exchange formats were also necessary; this data is exchanged thanks to Sandre scenarios in XML and GML formats. Following a test stage in ten *départements*, this tool, now called Sillage, is part of a national water system

in instruction tools for water policy under the contracting authority of the French Ministry of Ecology. Furthermore, IRSTEA is supporting the development of two other national tools; Sillage Télédéclaration, a nitrogen balance input tool at the level of the farm in the context of the nitrate directive, as well as Oasis, a national monitoring tool for water withdrawal.

# How Malta is using remote water meter reading to increase its network performance and customer satisfaction



By Thomas Perianu, SUEZ

## THE CHALLENGE

The beautiful island of Malta is located 95 kilometres to the south of Italy, based in the heart of the Mediterranean, approximately 290km from the North African coast. It has an area of 316km$^2$, with a population of approximately 430,000 residents. Malta welcomes 1.2 million tourists each year, which makes it one of the smallest and most densely populated countries in the world. Regardless of it being surrounded by the blue waters of the Mediterranean, the island itself does not have any rivers or lakes, making Malta one of the ten poorest countries in terms of natural water resources per resident. Currently, Malta's drinking water comes from a mixture of desalinated water from reverse osmosis and groundwater (55:45). Consequently, Malta must confront significant challenges in terms of managing the water resource and managing the demand.

The context of water in Malta can be described by the following features:

- The increase in sea level can put the water quality of the aquifers in danger;
- Over half of the drinking water production depends on the desalination of sea water, which uses a lot of energy;
- Rainfall is regular but there is pressure on volumes during the tourist season.

These factors and the risk of the, as yet, unknown impact of global warming have made the implementation of advanced measures to increase the operational efficiency of water systems on the island necessary. Close management of demand is one of these key strategies adopted.


55% of Malta's drinking water comes from sea water desalinated by reverse osmosis

# THE HISTORY OF THE PROJECT

In 2009, the two largest utility companies of Malta, Enemalta and the Water Service Corporation (WSC), launched a project aiming to deploy an integrated system called Utilities Business System, which would cover both the energy and infrastructure of water supply.

IBM managed the project and identified expert partners with the technologies capable of building a remote meter infrastructure on a national scale. The infrastructure was directed towards a certain number of strategic objectives, notably increased satisfaction and participation of customers, an increase in the effectiveness of the commercial cycle, an improvement in network management, improved management of the demand and a better environmental performance.

Enemalta, WSC and IBM launched a comparative evaluation procedure, integrating both technical and operational criteria. The VHF solution from SUEZ was selected for the water infrastructure.

The technical evaluation compared the VHF solution to the traditional short range solutions called AMR (Automated Meter Reading), including solutions known as "walk- by" and "drive-by". These last ones were rejected due to their inability to create value and would have required the replacement of thousands of already installed meters.

The VHF solution from SUEZ is now the leading market solution for fixed long range remote water meter reading technology, with over two million meters sold in Europe. The solution is based on the 169MHz frequency specifically dedicated by the European Union to long range radio communication for smart meters. As a water operator, developer and pioneer of long range 169MHz remote meter reading, the expertise of SUEZ guarantees a very high level of performance in terms of the reliability of data, generating warnings and the ability to monitor equipment, radio and information systems.

The main features of the VHF 169MHz technology can be summed up as follows:

- Lower operational and maintenance costs than the traditional technologies of short range meter reading;
- Compatibility with different meter manufacturers;
- A minimal impact on the urban landscape;
- A greater readable radio frame rate than competing technologies;
- A capacity for integration and interoperability with other platforms.

# THE SOLUTION

The remote meter reading solution uses a long range radio transmitter connected to each water meter. Receivers collect the data sent by the transmitters over a radius of 500m to 2km. The data is then sent via GSM/GPRS to the information system of the operator.

The availability of hourly or daily readings lets you monitor water consumption at any time and can therefore be used to quickly identify unusual consumption, which could be due to leaks.

This remote meter reading technology offers a better quality of service to customers and leads to a more effective management system.

# MAIN FEATURES OF THE PROJECT

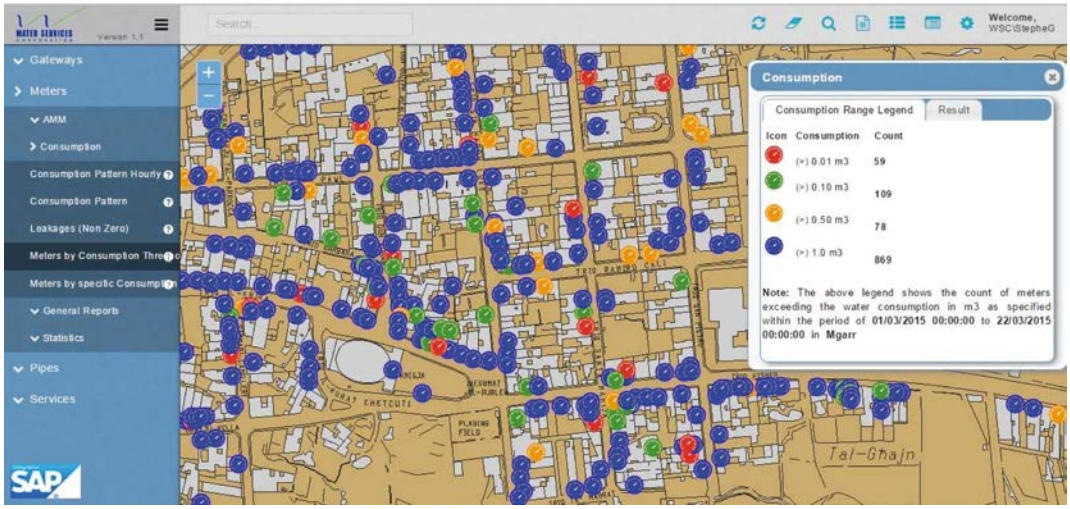
- The project began in April 2010. There are now approximately 265,000 account holders and approximately 225,000 smart meters installed;
- 265,000 smart meters will be installed in total;
- A 318 $km^2$ smart water supply network;
- 260 hubs covering the whole territory;
- Approximately 300 water sectors read and recorded constantly;
- ½ million Euros in savings every year after installation of the remote meter reading;
- Excellence partners: SUEZ and ITRON.

Remote reading with a substantially increased amount of data and the management of remote meters allow for:

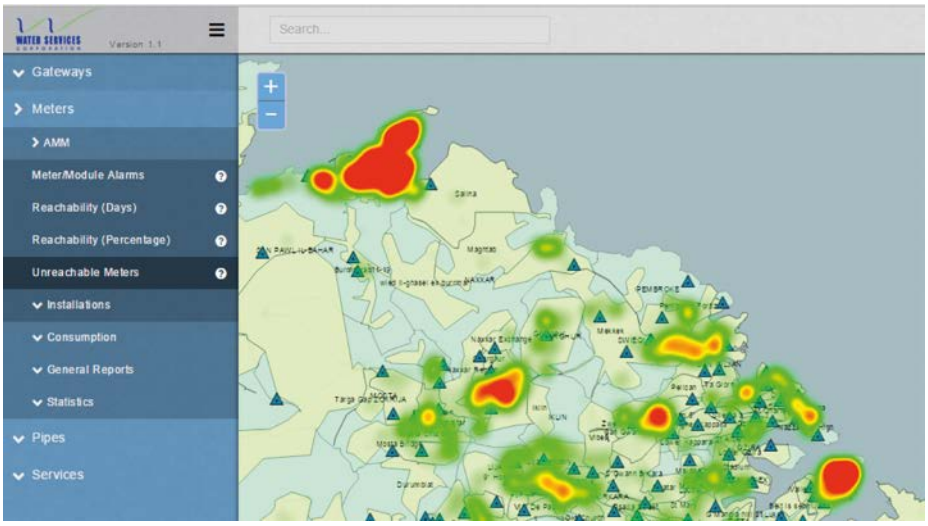
- improved functionality;

- increased savings and profits;
- more relevant operational and strategic decisions taken by Enemalta and WSC, strengthened by the analysis of data produced by the MDM, and notably:
- on the ground interventions and deployment of optimised meters and hubs;
- the option to precisely analyse consumption trends;
- a better balance between supply and demand of electricity and water;
- more relevant validations and estimations;
- an improvement in the quality of the service;
- easier monitoring of the remote reading system and its performance.

To further increase the operational efficiency, WSC has integrated its geographical information system and its remote meter reading system, as presented below:




GIS and remote meter reading integration – This map presents the position of the water meters and their consumption band




GIS and remote meter reading integration – This map presents a "thermal image" of the temporarily offline sensors

# CONCLUSION: THE BENEFITS

WSC identified the following operational and financial benefits, representing approximately ½ million Euros in savings:

| **Operational expenses before implementation of remote meter reading (millions of € per year)** | **Operational expenses after implementation of remote meter reading (millions of € per year)** | **Main benefits of remote meter reading (millions of € per year)** |
|---|---|---|
| Overall ~ ½ million € of savings per year | | |
| Total 0.6 | Total 1.7 | Total 1.6 |
| Manual reading of meters: 0.6 | Manual reading of meters: 0.6 | Frequency of bi-monthly billing, option to improve the receipts (+€1M) |
| | Licences, updates: 0.13 | Improvement of customer service |
| | Amortisations: 1.4 | Billing for actual consumption, negligible estimated consumptions |
| | | Analysis of more precise consumption trends (+€50,000) |
| | | Reading is done without disturbing residents |
| | | Easier detection of leaks (+€500,000) |
| | | Less complaints for billing |
| | | Option of implementing seasonal pricing |
| | | Fraud is more easily detectable (+€50,000) |

Monitoring centre of WSC

# The smart meter, cornerstone of smart grids and the smart city



By Christian Vivès, ERDF (Electricité Réseau Distribution France)

## CHRISTIAN VIVÈS, YOU ARE THE DIRECTOR OF ERDF PARIS. DIGITAL CITY, CONNECTED CITY, SUSTAINABLE CITY AND SMART CITY, WHAT VISION DOES ERDF OFFER OF THESE DIFFERENT CONCEPTS? DO THEY CONVERGE?

ERDF is the national public utility company in charge of electricity supply. Stakeholder of the ecological transition and the development of territories, it strives to develop innovative contributions over all of these four areas, which support the smart and sustainable city.

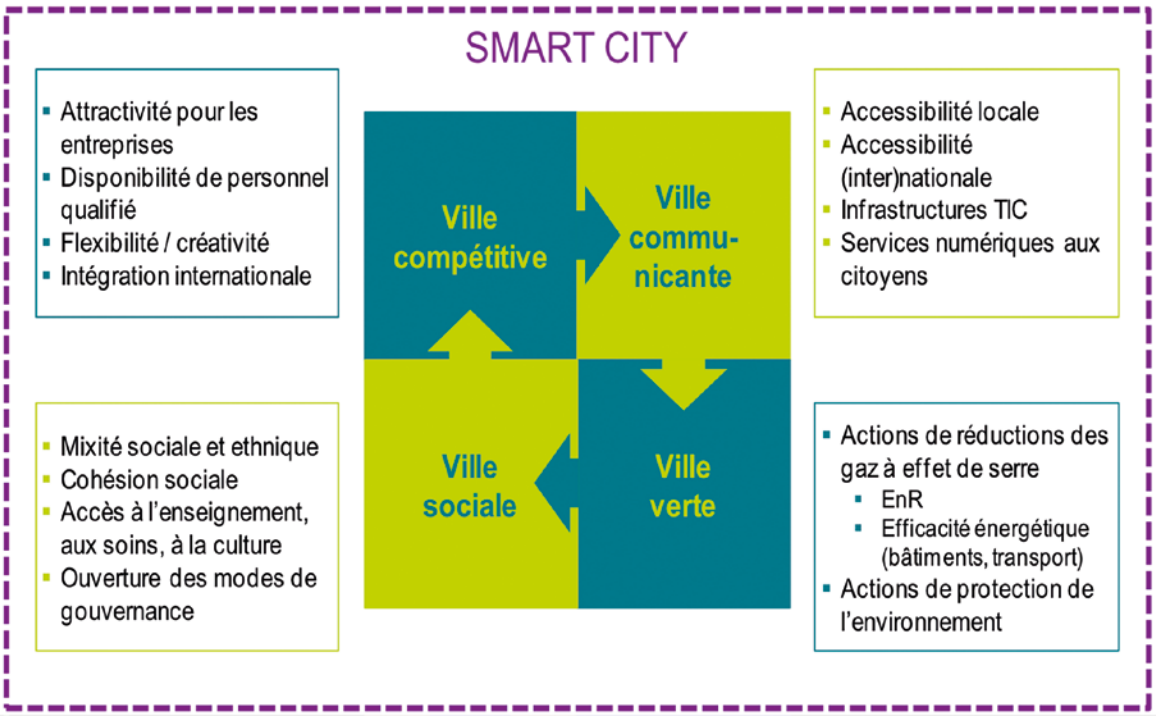
Faced with a diversity of concepts and associated definitions, ERDF gave itself a guiding vision of the "smart city" around four features:

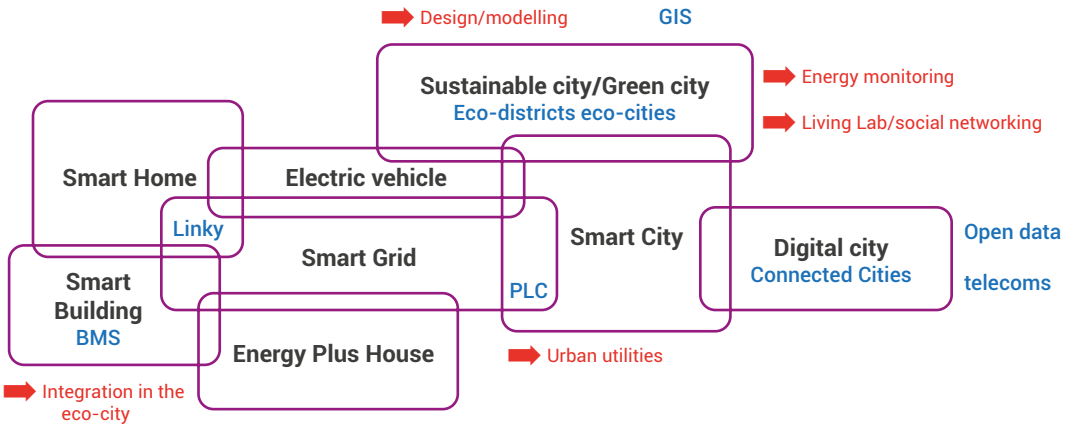
- A competitive city
- A smart city
- A social city
- A green city

## WHAT DOES ERDF PROPOSE IN ORDER TO SUPPORT THE CITY'S TRANSFORMATION?

A recognised stakeholder of the ecological transition and the development of the territories, ERDF is deploying the Linky smart meter.

An essential building block of smart networks, Linky participates in the connected and sustainable city, at the service of its residents.






Source: tecdev cité by ERDF

## WHAT, IN PRECISE TERMS, DOES LINKY CONTRIBUTE TO THE LOCAL AUTHORITIES AND THE USERS OF THE PUBLIC UTILITY?

Linky provides the local authority and consumers with several services:

- Encouraging more energy sobriety with remote reading which allows for the billing of actual consumption as close as possible to usage;
- Simplifying the lives of residents by carrying out the main interventions remotely, such as commissioning, power shifts, etc.;
- Better understanding their energy consumption and acting to control it by having access to new services such as the control of household appliances;
- Limiting the ecological footprint of the electrical system, from production to supply, by allowing consumers to become "consumer-stakeholders" by controlling power use at the electrical point;
- Facilitating the integration of renewable energy by making the real time "extraction – injection" balance more reliable over the grid, in order to ensure the balance of the electrical system;
- Supporting the local authorities in the ecological transition of territories by delivering useful data, made possible by these new meters (load curve, eco-mobility data, etc.);
- Increasing the resilience of electrical grids, notably to climate hazards thanks to the detection, in advance, of risks of electrical incidents and reduced maintenance delays.

The spread of smart meters, within smart electrical grids, are made up of as many sensors spread over the whole territory, producing an exponential volume of "data". These are an opportunity for the development of digital services to citizens, therefore strengthening the societal and economic appeal of the territory.

In accordance with the recommendations of the CNIL (French Data Protection Authority), the consumption data belongs to each user and will not be able to be used without their agreement. This data is, moreover, encrypted.

## WHAT ARE THE CHALLENGES OF DEPLOYING THESE SMART METERS? IN FRANCE, IN EUROPE AND MORE GLOBALLY WORLDWIDE?

In July 2009, the 2009/72/EC European Directive set the aim of deploying smart meters in 80% of European Union households by 2020.

In France, on 9th July 2013, the Prime Minister confirmed the deployment of the Linky smart meter and the replacement of 35 million existing meters in France by 2020.

In Europe, 12 other member states: Austria, Denmark, Spain, Estonia, Greece, Ireland, Luxembourg, Malta, the Netherlands, Poland, Romania and the United Kingdom decided on a large-scale deployment by 2020.

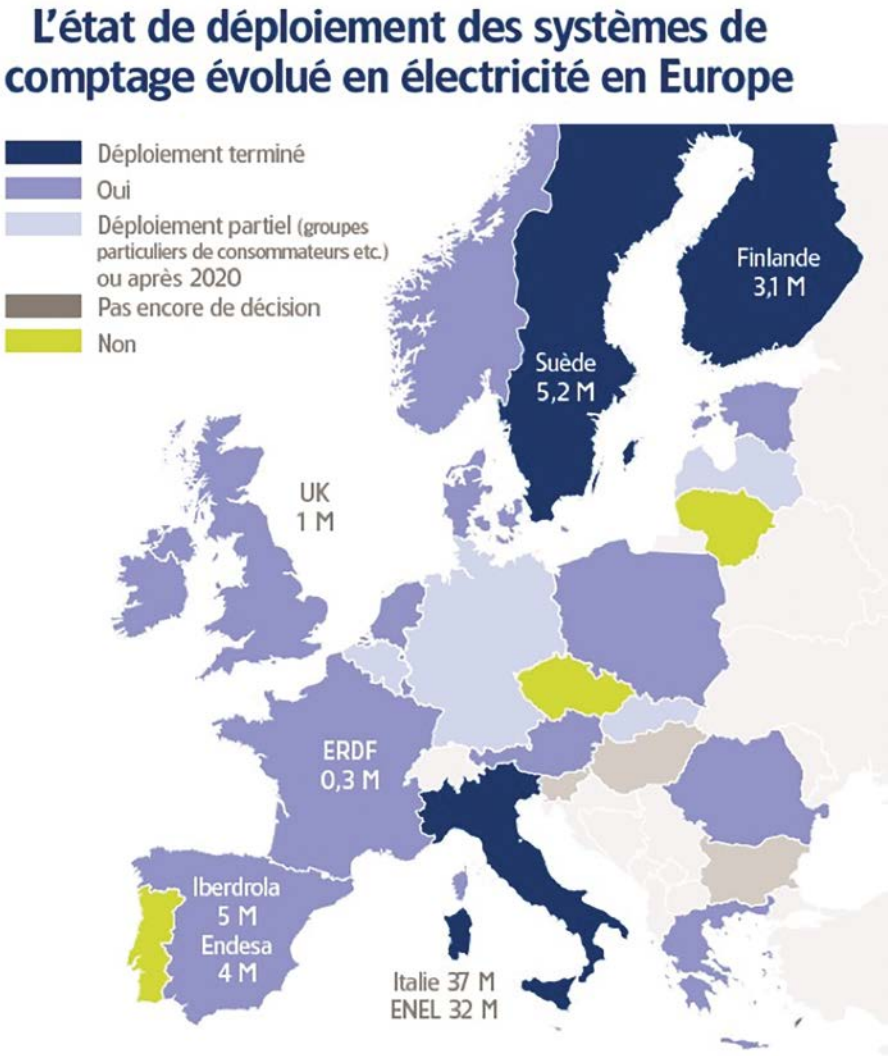
In total, nearly 60 million meters have already been deployed in the European Union out of a target of 195 million by 2020, or 72% of consumers in Europe. The total cost estimated to reach this European target is 45 billion Euros.

## AN EXPONENTIAL DEVELOPMENT OF SMART METERS WORLDWIDE

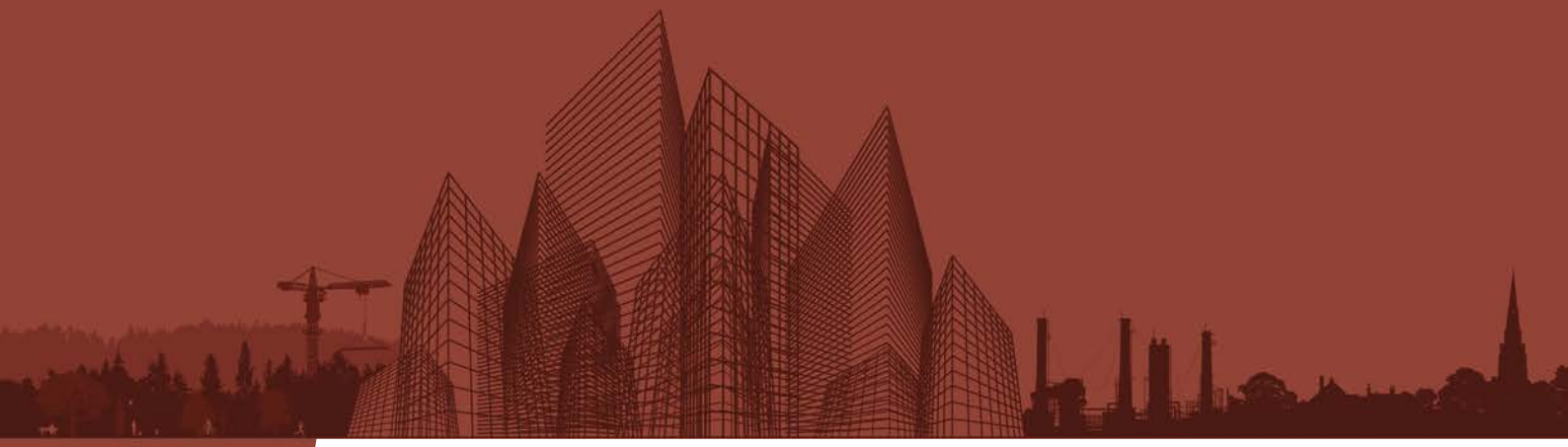
More globally, on a world scale we are noting an exponential development in smart meters. Digital meter projects are increasing all over the planet. Over 313 million smart meters are installed throughout the world, the majority of which are in Italy, Sweden, the United States and Asia. According to a study from the Navigant Research Firm, this number should reach 1.1 billion in 2022.

Two factors explain this rise in smart networks and smart meters:

- A rapid development of renewable energy of an intermittent nature and new uses of electricity such as electric mobility;
- The development of environmental policies targeting greater energy sobriety, such as the law on energy transition in France, adopted in 2015.




L'état de déploiement des systèmes de comptage évolué en électricité en Europe
Sources : Benchmarking smart metering deployment in EU, Klaus-Dieter BORCHARDT Director – Internal Energy Market Directorate-General for Energy European Commission, 26 June 2014



# By way of a non-conclusion

# Digital technology is speeding up the energy transition



By Daniel Kaplan, FING (Fondation pour l'Internet Nouvelle Génération)

## DANIEL KAPLAN, AS CEO OF FING CAN YOU BRIEFLY TELL US WHAT EXACTLY YOUR FOUNDATION DOES?

Set up in 2000, FING is a nonprofit organisation committed to "coming up with new, actionable ideas for anticipating digital changes". In practice, it conducts three types of project: forward-looking action which tends to focus more on alternatives than sweeping trends; thematic "expeditions" aimed at identifying avenues for innovation that encompass technology, economic and social change; and trials in the field to spur action as regards collective and constructive ideas: public open data, fab labs, data culture and so on.

## WHAT DO WE MEAN BY DIGITAL? BECAUSE OF IT ARE WE SIMPLY MAKING SOME MINOR ADJUSTMENTS TO THE WAY WE DO THINGS, OR IS THIS WHOLESALE CHANGE WE'RE GOING THROUGH – A FULL-ON REVOLUTION FROM WHICH THERE'S NO GOING BACK?

The word "digital" describes, on the one hand, a set of techniques, formats and specialist stakeholders (in information technology, networks, etc.) and, on the other, a set of social and economic practices ranging from our personal day-to-day routines (the way we communicate, travel, work remotely or organise our time for example) right up to our community action channels (organisation into networks, large-scale informal collaboration, etc.). Somewhere between the two there is increasingly a means of presenting the way the world is to us through data and models. Informatisation as a concept has been around a while, and it was in no way revolutionary in itself while it did no more than model existing organisations. But when digital technology begins to transform not just knowledge but also the means for accessing and sharing it, contents, the way work is organised and the very rules for creating economic value … in this case, yes, it does indeed completely change the order of things as we know it. Talk of a "third industrial revolution" is quite justified. But an industrial revolution is also political and social: simply put, the first industrial revolution came about with the steam engine and capitalism, the second with the motor car, electricity, Fordism and social security – and we are entering the third on the back of digital technology and an economic and social system which we are still struggling to describe.

## ENVIRONMENTAL PUBLIC UTILITIES ARE TECHNICAL UTILITIES REQUIRING A COMPLEX, FIRMLY ROOTED PHYSICAL INFRASTRUCTURE – ARE THEY HONESTLY CONCERNED BY THIS NEW DIGITAL REVOLUTION?

Look around you: yes. To believe me, you only have to notice the fact that newcomers are already playing their part. IBM is winning water supply markets. In other sectors, Blablacar is giving trains a run for their money, while mapping is increasingly relying on crowd-generated inputs (for example OpenStreetMap and Waze) via private or collaborative platforms. More important still, IBM is also muscling in as a major authorising officer as far as the "smart city" is concerned – and this also goes for Cisco and Siemens. The idea is simple: if information is key to each service being efficient and to the urban system being effective overall, then let's entrust these responsibilities to the people who make this their business, and subcontract to the old water, waste, energy or transport professionals the actual physical handling of the matter – now a subsidiary, very low-margin task. It's not unrealistic to imagine a scenario where these professionals are simply no longer needed as the business has been decentralised as far as possible: Netherlands-based Qurrent offers a "cooperative" production and energy-trading model that relies on input from individuals – but might this be extended to certain forms of water treatment or collection, or local waste treatment (street-corner composters)?

Whilst we can't do without such firmly rooted physical infrastructure, it can become a hindrance – preventing progress in step with new competitors. The price of taxi permits is a case in point, as it is holding the profession back from responding effectively to the Uber app.

## HAVE YOU GOT EXAMPLES TO SHARE WITH US OF BRAIN WAVES TODAY THAT COULD FORM THE NEW SERVICES OF TOMORROW?

I've already mentioned car sharing, Qurrent in the energy sector and, more generally, everything that is being dreamt up around the concept of the "Internet of Energy". Freecycle in the recycling sector is another example, as is Leboncoin, a website where people sell things that they might otherwise have thrown away. In the Nord-Pas-de-Calais region, all sorts of projects are flourishing along these lines under the heading "Third industrial revolution": for example, Jean Bouteille is returning to the concept of selling bulk liquids and of returning empty bottles. More broadly (and there are several examples of this in Nord-Pas-de-Calais), the circular economy is creating considerable scope for economic development that is less destructive. Operators specialising in the environment can have a role to play, but we are also seeing a whole host of businesses emerging which specialise in fabrics, paper and rubber for example, as well as 100% digital platforms like Freecycle. Such circuits need data to be organised on a large-scale – and lots of it.

## INFORMATION AND DATA IS BECOMING EVER MORE IMPORTANT. FROM NOW ON, CAN VALUE ONLY BE FOUND IN ASSOCIATION WITH DATA? AND DOES OPEN DATA TRULY CREATE VALUE?

Data is not synonymous with value – rather, it is a factor of value generation, "a resource, material or otherwise, used in the process of commodity and service (and, I would add, knowledge) production". Value is still found in the use we make of data. But this production factor is gaining in importance and can, in some instances, replace human work (automation of intellectual tasks, PCs mean secretaries are becoming increasingly redundant) or physical capital ('zero stock" buying is now possible thanks to real-time information on the market and the supply chain), or both at the same time (Blablacar, "merely a platform", is rivalling trains and railway workers). There is something specific about data moreover: it is a "non-rival" good which means that, if I were to use it, I would not be depriving you of the possibility of using it too. From the point of view of society then, the multiple uses that can be made of each piece of data create value – without any pre-defined limit. This is the economic argument in favour of open data. In terms of essential services, arguments concerning transparency and democratic scrutiny are just as important.

## PUBLIC UTILITIES CANNOT BE DISSOCIATED FROM USERS. HOW DO YOU THINK RELATIONS WITH PUBLIC UTILITY USERS COULD BE AFFECTED BY THE DIGITAL TRANSITION?

The first change was wrought by the "dematerialisation" of public utilities which, although credited with simplifying and speeding things up, has also done away with many points of contact – thereby stripping the process of its interpersonal aspect. So while there's no denying this dematerialisation was necessary, it has made a mere commodity of public utilities, whose performances are now compared to private utilities. The next stage is to listen out for alternative proposals – either totally private or collaborative.

Digital technology has equipped users, whom we now refer to as customers when they are actually becoming more than that. They now have the means to compare and share views, to discuss a well- or poorly-executed service, and even to organise amongst themselves to generate and share energy or maps (openstreetmaps), travel or replace services that fall wide of the mark (just look at all the blogs or Twitter accounts of railway lines).

## DO THESE UPHEAVALS ONLY CONCERN SMART DEVICES? DO SUCH DEVICES CONSTITUTE BREAKTHROUGHS OR SIMPLE GADGETS?

"Smart devices" are not the causes of these changes – unless of course you include computers and smartphones among them. If we're talking about more specialised devices, some of them, such as connected Sat-Navs, are certainly contributing to a form of user-customer empowerment. But most connected devices don't belong to clients – they are the property of service operators! Networks are equipped with thousands of sensors, service vehicles are like fully-fledged computers, technicians are increasingly making their rounds armed with tablets, and meters are turning "smart"... And yet, the point is that all of this apparatus, which generates reams of data, doesn't generally share much: not with the local authorities, not with other public utilities and certainly not with citizens-users-customers. This not only lays bare a value drain, but also a trust problem: the fact that systems accumulating more and more information – including personal – are making so little of this available outside of the company producing it is mystifying. This situation won't last: the use of smart meters worldwide is ramping up the pressure afresh in favour of data sharing (which goes beyond merely presenting information in an eye-catching way on a website) with customers, with partner local authorities, with research, and beyond.

### LEGISLATION WAS ADOPTED FOR THE ENERGY TRANSITION AND GREEN GROWTH IN FRANCE IN 2015, AND LEGISLATION FOR BIODIVERSITY IS IN THE PIPELINE. HOW ARE THE ENERGY TRANSITION AND DIGITAL TRANSITION CONNECTED? WHAT DO THESE TRANSITIONS HAVE IN COMMON BY WAY OF KEY ISSUES?

The energy transition is an inevitable part of our future, but the ongoing deterioration of our environment is forcing us to admit that its means are not as clear-cut as its end goal. The digital transition is part and parcel of our everyday life – something it shares with most of the changes we are actively involved in – but it does not have any particular collective objective in mind. So the former has an end, the latter the means: they both need each other! And yet it is too often the case that their stakeholders go about their work completely independently of the other, without realising the transformational benefits that could be gained from taking a more closely aligned approach.

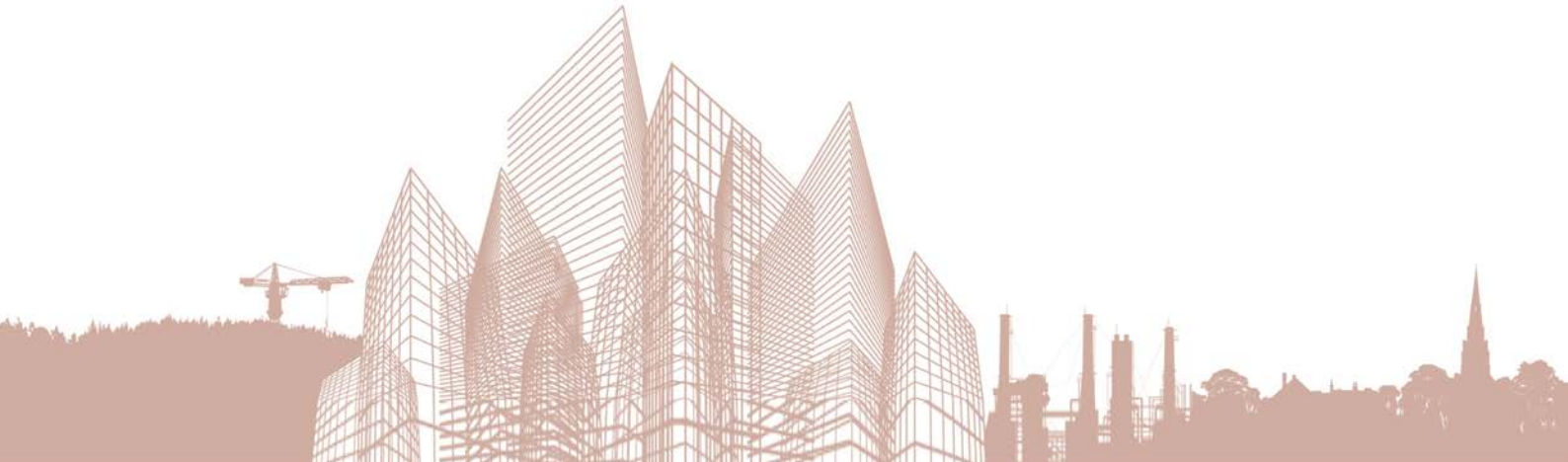
The energy transition of a planet home to nine billion inhabitants is hard to envisage without massive implementation of digital technology. But this shouldn't be done haphazardly. Convergence of the energy and digital transitions cannot encompass solely technical solutions in terms of optimisation, efficiency and even resource substitution. These solutions may well be necessary, but they are also grossly inadequate in view of the ambitious target set ("Factor 4" – i.e. to cut greenhouse gas emissions by a factor of four, or three-quarters, by 2050 in France), and are also particularly vulnerable to "rebound effects". The sheer scale of adjustment required calls for systemic change across-the-board – an energy transition affecting our lifestyle, production and consumer habits with a view to adopting more circular and frugal economies.

What we therefore need to do is combine the knowledge acquired by environmental stakeholders – especially their understanding of the complex interactions making up an ecological system – with the very many gains from digital technology: IT optimisation of course, but also the agility and flexibility made possible by dematerialisation, the new business cultures it fosters and the bottom-up or horizontal forms of action and coordination it enables... All this, while reducing the carbon footprint specific to digital technology itself.

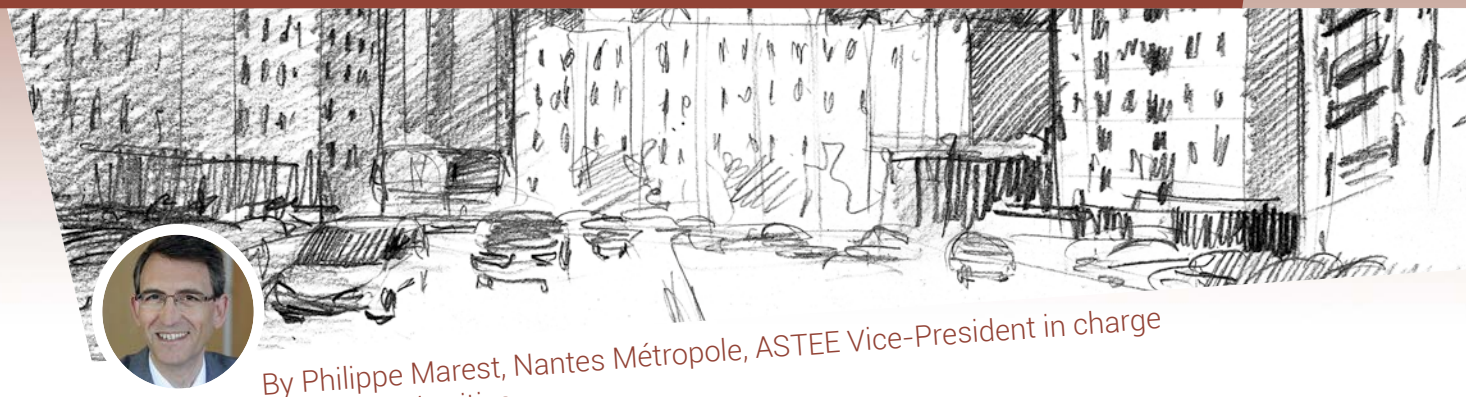
### IN YOUR VIEW, WHAT ASPECTS OF ENVIRONMENTAL URBAN UTILITIES NEED TO BE SUCCESSFUL FOR A SUCCESSFUL DIGITAL TRANSITION?

First of all, we need to rebuild the relationship with territorial stakeholders – whether businesses or citizens – in which they are more than just consumers. If these utilities can maintain high-quality relations with the latter, then they will be able to weather new forms of resistance. They need to play a central role in the energy transition, and they will be able to make such a contribution by getting their customers on board in the production and design of solutions. How can such a relationship be restored? By sharing out information and decision-making, and by giving "customers" new abilities (to find out, to produce, to make savings, to plan ahead, to share and so on).

Then, we need to open up their systems and data. One of the cornerstones of the digital economy is the constant reconfiguration of value chains, with each service being provided through the dynamic combination of several links ensured by different companies – not always the same. The strength of the digital giants – old and new alike – lies in their ability to grow whilst allowing others (sometimes millions of others) to grow along with them. They will export this strength to all the sectors they extend their business to. Urban utilities will have to do likewise, or become subcontractors of digital stakeholders. But by opening up they will also be able to help create new common goods, justifying their connections with the territories in which they work. This will also pave the way for new services – hyperlocal or niche ones – which these giant corporations will never be able to set up themselves: circular economy platforms specialising in a given sector or material, repair cafés where the service life of your devices can be extended, neighbourhood composters, etc. What if, tomorrow, the ability to bring such initiatives to life, and to connect them, formed part of the core business of environmental professionals?



# Augmented urban utilities: a new roadmap for the organising authority and network operators?





By Philippe Marest, Nantes Métropole, ASTEE Vice-President in charge of Local Authorities

## TERRITORIES IN TRANSITION: A BALANCE BETWEEN THE ECOLOGICAL URGENCY AND DIGITAL REVOLUTION

Climate change, dwindling resources, biodiversity in decline… the energy transition needs to be undertaken right now so we can progress to a new model that protects our planet. To lend a hand in this transition, France has drawn up a national strategy on the energy transition and the French Parliament has recently passed the law on "the energy transition for green growth".

At the same time, technical progress is picking up pace as new technologies continue to crop up – and the burgeoning range of digital tools shows no sign of shrinking! Household equipment is growing in popularity: a Western household reportedly has ten smart devices today, a figure which could rise to fifty over the next decade (1).

The digital transition is stirring up aspirations and lifting expectations in terms of changing habits and the use made of public utilities as well as a significant reduction in the carbon footprint. That said, widescale use of digital technology generates greenhouse gas emissions and guzzles energy. In France, information and communication technologies are reportedly responsible for 5% of greenhouse gas emissions (2).

This new digital revolution – sometimes referred to as the third industrial revolution (3) – is shaking up models and organisations. In practice, this is evidenced by the "uberisation" of society, with apps uploaded daily that bypass the traditional circuits of the economy but are not without consequences – including social. It is forcing society to review some of its models and "categories of thought that no longer correspond to the context in which we live" (4) and to come up with new concepts and terms, since "the mental images used are from a different time" (5). Is it having an impact on the French urban utility model then and, if so, how?

## AN INTERACTIVE CITIZEN-USER AND CUSTOMISED UTILITIES

In France, urban utilities are organised between three main stakeholders: the organising authority, the network operator and the citizen-user (Figure 1). The organising authority is the elected public authority fully entitled to organise a public utility in a given territory, and which guarantees that this is well run. The network operator is the body tasked by the organising authority with carrying out the public service mission, i.e. with providing the service to the user, overseeing the network's operation and maintaining the installations made available by the local authority. This role of operator may either be delegated to a company (private operator) or a public institution or be ensured by a government corporation (i.e. a public operator). Lastly, the citizen-user is a citizen and user in its relationship with the organising authority, and a user in its relationship with the network operator. The principal motivations underpinning public action must be the satisfaction of his/her needs and the meeting of his/her aspirations, in the public interest.

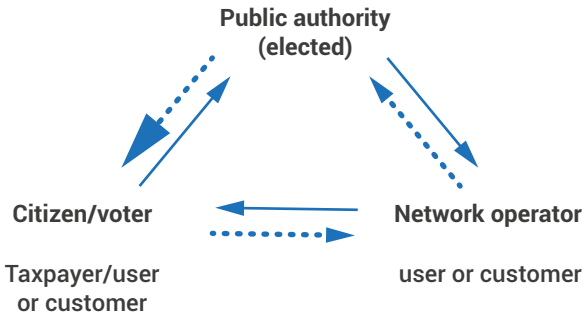



Figure 1: The French (triangular) urban utility model (6)

Digital technology is shifting the boundaries between these three stakeholders:

1- the citizen-user, equipped and connected, is potentially becoming a producer of information, taking on an ever more interactive and mobile role with the possibility of playing an increasingly active part in his/her relationship with the organising authority and network operator. Indeed, s/he can now not only contribute to service performance improvement but also demand this by asking the public authority to provide an easier, more streamlined and more reactive service. This increasingly active role, in this triangular setup, is an initial vector of change.

2- new services have become possible thanks to the ability to customise utilities to users. Because of the instrumentation of infrastructure, the possibility of processing large volumes of data and geolocation, the ability to differentiate usages has become one of digital technology's major contributions. Such data can be made available to users insofar as they meet either a user need or are in the public interest.

The ability to produce new, customised services through the processing of large volumes of data is a second vector of change.

## WHAT ROADMAP FOR THE ORGANISING AUTHORITIES AND OPERATORS?

If we look at the example of drinking water supply – just how much are residents willing to pay for data to be made available? While alerting them about water leakages, billing them for the amount of water they actually use and providing them with information about their water use at regular intervals to bring the reality of water savings home to them all appear to be genuinely good ideas, there seems little point in transmitting data on their water consumption in "real time". Simply put, industrial real time is not the same as real time experienced by households. That said, some professional users may well have other, more specific expectations when it comes to information.

This raises the question of including certain services enabled by digital technology, either within the scope of public utilities, or within the competitive scope, given the nature of some demands that it has now become possible to meet.

To illustrate the solutions brought to these demands, I would suggest introducing an initial idea, of an "augmented urban utility" incorporating the "core" urban utility, whose building blocks are the primary physical services (such as drinking water supply, waste collection or energy provision for instance), and enriched with "additional data" by digital tools serving the public interest and targeting public policy more broadly.

In this new model, the scope and type of services provided by these augmented urban utilities need clarifying to re-examine the missions carried out by the organising authorities. This is because local authorities need a roadmap in order to make enlightened choices as regards the key public utility issues, public policy and, above all, ecological and energy needs.

In the competitive scope, a new scope of specific, customised applications serving a specific interest, for specific customers, is to be developed via a second idea "of digital urban utilities" (Figure 2).

This new space set aside for digital urban utilities is above all the playing field of network operators who are also becoming service operators. As far as public authorities are concerned, it is a matter of facilitating the testing and development of new emerging markets and of fostering the co- production of tools developed on the open database.

But for all that, in terms of the type of data concerning urban utilities, obtained from different sources which are sometimes very sensitive such as water, air or soil quality, a public regulation strikes as paramount. Not only do the reliability and accuracy of data made available need ensuring, but the best form of use also needs to be sought, by specifying the form, level of detail and how often updates take place for example.

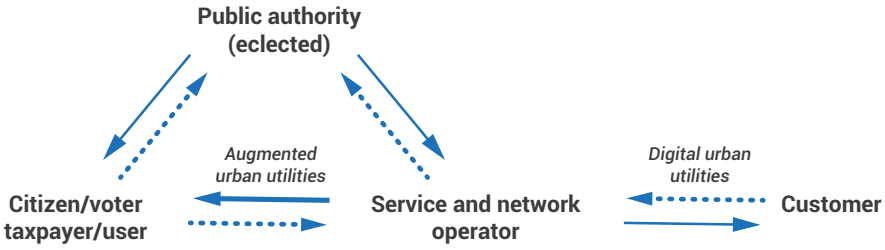



Figure 2: The French model adapted, with augmented urban utilities and stronger relations with the citizen-user

## COOPERATE SMART

Better synergy between the activities of the different services appears to hold promise among the various ideas looked into to improve urban utility performances. Possibilities of pooling activities have already been tested, for instance with the use of remote meter reading. However, these improvements depend on the risks associated with digital technology being managed appropriately. These risks mainly stem from uncertainties over regulations or returns on investment and from questions concerning system interoperability and dependence as regards a supplier and given technology. Lastly, possession of personal data by organisations that do not need to be held accountable can present a threat to personal freedom and such data must be protected from hacking risks.

Concrete answers to all of these questions are vital for the organising authorities, whose ability to respond to them is absolutely necessary if they are to have complete say over their choices, which in turn guarantees their independence. Major cities, which exercise decision-making powers, are natural driving forces behind the development of urban utilities. What's more, instead of dematerialising territories, several experts are in agreement, today, that digital technology is strengthening urban concentration and bolstering urban areas (7). In terms of the complexity and swiftness of change, the major city-level therefore comes across as an "apt scale" (8) for cooperating.

This is the scale at which performance improvement, data protection and technology choices and activity pooling can be addressed, while stepping up digital expertise. The creation, for example, of multi-fluid platforms could supply information about consumption levels at different scales of the territory (block of flats, estate, neighbourhood, municipality, urban area, etc.), thus contributing to the implementation of public policy and territorial projects and playing a key role in taking down barriers between the different scales.

In major living zones, sharing best practices and setting up shared tools between local authorities would make it possible to capitalise on what works and to progress together. To this end, regions and major cities could act as leaders, setting the example for others to follow.

Adapting, cooperating and bringing down barriers: these are three key words for territories in transition.

Urban utilities, in close interaction with the environment and natural resources, based on sophisticated technical systems and taking the digital dimension increasingly on board, are right at the heart of transitions. And yet, such transitions will only be possible if, over and above technology, they also rely on human intelligence and focus, too, on organisations, procedures and, especially, ways of thinking. I therefore have three practical suggestions that will be able to be discussed during the 2016 congress:

1- examine the idea of augmented urban utilities – the extent to which they meet users' expectations in the public general and their consequences on the way the organising authority exercises its decision-making powers, so as to adapt its missions and those of service and network operators;

2- help to increase digital expertise, particularly as regards data management, organising authorities and, more generally, urban utility stakeholders by stepping up involvement in the digital dimension in partnerships that the ASTEE has forged with major professional or local authority associations;

3- build on and further the efforts begun during the ASTEE's previous congresses on decompartmentalisation, particularly in Nantes in 2013 and Orléans in 2014. Indeed, organising authorities and service and network operators are now encouraged to think and act outside of their sector-specific fields of intervention.

The French model of urban utilities must and can adapt to the digital transition, proving itself to be strong and robust in the face of change, according to the principle of public service mutability in France (whereby it must keep up with the times). But such adaptations must not lose sight of the fundamental aims of these public utilities, which underpin social cohesion, or the ability of the organising authority to make its own decisions. In this respect, attempts to achieve automatic oversight, a "contemporary version of the age-old mechanistic dream of the perfect system which would eliminate all forms of human arbitrariness" (9), must be considered with the utmost caution. Global dashboards, presented for managing territories with all manner of diagrams and charts, are no more than simplifying tools – certainly useful for regulating and understanding change, but devoid of all of their complexities.

To end, these thoughts prompt us to consider a deeper, society-wide, transition that is turning our traditional points of familiarity on their head, concerning user services, public interest and personal responsibility.

## BIBLIOGRAPHY


(1) **Institut G9+ (2013), *Les nouveaux eldorados de l'économie connectée*, White paper.**

(2) **Biagini C. (2012), *L'emprise numérique*, P 334, Editions L'échappée.**

(3) **Rifkin J. (2012), *La troisième révolution industrielle, Comment le pouvoir latéral va transformer l'économie et le monde*, BABEL.**

(4) **Bourdin A., Villes 2.0., *La recherche urbaine à l'heure de la ville 2.0*. by Fing, Chronos et Tactis.**

(5) **Lemoine P. (2014), *Rapport au gouvernement – La nouvelle grammaire du succès – La transformation numérique de l'économie française*, November 2014.**

(6) **Economic and Social Council (2001), , *La maîtrise des services urbains organisés en réseaux*, Opinion presented by Claude Martinand.**

(7) **Fing, Chronos & Tactis, *Villes 2.0., La recherche urbaine à l'heure de la ville 2.0.***

(8) **Oural A. (2015), *Gouvernance des politiques numériques dans les territoires*, July 2015.**

(9) **Beauvallet M. (2009), *Les stratégies absurdes, comment faire pire en croyant faire mieux*, Editions du Seuil.**

# Non-conclusion: the rush towards intangible common goods, *big bubble* or *big bang* of *big data* without *big brother*?

By Pierre-Alain Roche, MEEM/CGEDD, ASTEE President

**It's a wonderful thing for us to see the ASTEE continue to build on its cross-cutting collective thought process through these introductory publications on the theme of each of its congresses: these comparative overviews, which increasingly throw human sciences into the mix, are invaluable. As has now become common practice, each document must end with a non-conclusion, as what these successive studies aim to do is inspire us to never stop mulling over their ideas and to take them further.**

## BREATHTAKING INNOVATIONS

That the new means for communicating and processing information are changing the way our traditional professions are practised would be an understatement: we were already making this observation in our first cross-cutting publication[36] and there is no shortage of examples on the subject in this document.

Without ever actually naming it outright, a great many contributions allude, as if to exorcise the danger from it, to "Brave new world"[37] or "Nineteen Eighty-Four"[38]. In Walt Disney's Fantasia, wasn't Mickey fascinated by the possibilities offered up by the new powers (new technologies are our magic wand) yet terrified by this sorcerer's apprentice game which, in the wrong hands, conjures up utter disaster?

Luckily Marie-Noëlle Pons reminds us of the wonderful reference that is Jules Verne's "Paris in the Twentieth Century". I should like to round this off with a few excerpts from "Amiens, a city in the year 2000", a lecture given by Verne himself in 1875:

*"I ran to the end of the bridge... No kindly pauper in sight! The man with the turned-out feet and white beard, who greets everyone he comes across, was no longer there." [...] That day, the boulevards had been watered at a carefully chosen time – not too early, not too late – so as to keep the pavements dust- and puddle-free right when they were bustling with people out walking! [...]. Longueville Square wasn't far! I couldn't wait to reach that mini Sahara! I ran there... It was an oasis. Tall trees cast cool shade over it. Carpets of greenery stretched out under the flower beds there. The air was balmy. A lovely little stream gurgled its way through all of this vegetation. The naiad, thirsty for the old days, was streaming with crystal-clear water. With no skillfully laid-out overflow systems, the lake would certainly have broken its banks and flooded the city. This was no imaginary water, spun glass or painted gauze. No! It really was the chemical combination of hydrogen and oxygen, cool potable water, which teemed with thousands of tiny fish that, only yesterday, could not have survived there even an hour! I dipped my lips in this water, which until then had declined*

36. « Services publics locaux de l'environnement : réussir les mutations de nos métiers », Astee, 2010.

37. « Brave new world », Aldous Huxley, 1932

38. « Nineteen eighty-four », George Orwell, 1949. About the Big Brother from "Nineteen eighty-four" (Big Brother is watching you), we could recall the heated debates about video-surveillance in public places less than ten years ago, examine the extent to which this issue is still in the limelight today and measure the difference.

*analysis of any sort, and, if it had been sweet, Ladies and Gentlemen, in my elated state, I would have found that entirely natural! […] I read the poster!… Indeed, at that very moment, the famous ivory pounder, Pianowski, was performing in Paris, at the Hertz hall; but by means of electrical leads, his instrument was wired up with pianos in London, Vienna, Rome, Saint Petersburg and Beijing. As soon as he played a note, the very same note therefore sounded on the keyboard of these pianos far away – whose every key was changed instantaneously by the voltaic current! […]… So are you making your patients better? – Patients! Do we even have patients since Chinese customs were adopted in France? It's as if you were in China here. – In China! I'm not at all surprised! – That's right! Our clients only pay us fees while they are fit and well! And as they're now never sick, the fund's closed! So isn't it in our interests that they never fall sick!"*

This ebullient optimism, where technological innovations make a contribution to everyone's well-being, makes us smile today, but do we not feel just a tad nostalgic about these times when progress held nothing but hope for us?

Let us return to this optimism from another age for a moment. Who would have thought just a short time ago that drones would carve out such a significant place in everything we do – from thermal analyses of buildings to monitoring the levels and flows of rivers? We are currently envisaging the possibility of communications between mobile phone network base stations being used as information to… fine-tune rainwater measurements. Some of their antennas – not the ones distributed to users – present high-frequency wave ranges that are attenuated by rain. Could this attenuation be used to estimate rainfall intensity? There are all sorts of creative delights and surprises to be had in toying with technology.

Let us nevertheless reassure Alain Bourdin, who seems to detect in our expectations the signs of a "technocratic utopia", and whom this little trip down memory lane back to a world which firmly believed in a glorious future could finally convince that we haven't moved conceptually on from the foundation of our association in 1905: this is obviously just a game and we had already got everything in order in our collective publication on innovation[39]. Bear in mind once again here that innovation is not progress: it does not become so until it satisfies society's need and, as he points out, this need cannot be decreed. Clément Mabi encourages us to promote the "social intelligence" here that Alain Bourdin is so in favour of by "taking democracy seriously".

One way of reassuring is to invent words. This new publication makes a contribution, enriching the already rich vocabulary describing so-called smart cities. We had already poked fun at the sheer number of words springing up to describe sustainable cities in our last collective publication[40]. An institution like the ASTEE, which came up with the expression "urban engineering" in French in 1905, certainly has some hindsight in its possession!

## NEW SOCIAL UTILITIES, THE NEW PUBLIC UTILITY ECONOMY

Once all of these lessons from years past have been reviewed and capitalised on, the main subject of the new debate opened by this publication is that of the new economic models that are likely to emerge along with information. Will it be possible tomorrow to distribute water free of charge since the economic model will be based upon the marketing of data, allowing for new value to be created? Philippe Marest talks about the notions of "augmented urban utilities" and "digital urban utilities".

These ideas could be compared with those of Jean Tirole, who won the Nobel Prize for economics, even though the sectors he tends to focus his attention on are transport, energy and information rather than the urban public utilities we are interested in. In partnership with Jean-Charles Rochet, Tirole has developed these concepts under the term "multisided market". An interview in plain language with him[41] clearly expresses the key concerns associated with these economic valuations added on to "core infrastructure" and the questions regarding how the profit generated is to be shared out between stakeholders. In such situations of "multi-product" monopolies, what tangible financial contribution can these new added values represent? How can these utilities survive in a structured economic model – long after the immediate windfall (and even predatory pricing) effects that the dissemination of new personal data[42] can have on other economic sectors: it is entirely conceivable that a preferential rate could be offered to subscribers who are willing for their personal data to be used, but how stable would the corresponding revenue, and therefore discounts granted in this way, be?

Are such new utilities capable of dramatically changing the operators' playing field? The sector could catch the eye of newcomers, specialists in big data,

39. "Innover dans les services publics locaux de l'environnement", Astee, 2014.

40. "Des territoires et des villes sobres et sûrs : les services publics locaux s'engagent", Astee, 2015.

41. "Comment réguler la gestion des infrastructures de réseaux. Dix questions à Jean Tirole", Conseil économique du développement durable, références économiques n°30, 2015. http://www.developpement-durable.gouv.fr/IMG/pdf/Ref_-_030.pdf

and management of the utility would then end up becoming – somewhat paradoxically – no more than a side to these commercial activities.

Are such changes desirable, inescapable, tameable? Thanks to the stories and ideas presented in this document, we will all be able to get some idea, see how the tools available could be turned to best account and get to grips with these tools for other purposes.

We have a clear sense that veering off towards more or less desirable futures is quite possible, but we can also feel powerless in the face of changes or momentums that seem capable of dragging everything along with them. Let's not forget that it is not just about understanding, describing, explaining, exploring … but also about contributing to choices, guidelines and about opting for ways which facilitate access to desirable futures and distance us from those that do not appeal.

42. On a more light-hearted note, might it not be possible that the message you'll soon receive from your water supplier reporting much higher use than normal in your flat – likely to be caused by a leak – and asking for your consent to automatically close your connection valve, is a ruse concocted by a cunning burglar who's discovered this is a good way to check whether you're away from home? Will you be presented with automatic machines that simulate the amount of water you use by flushing your toilet three times a day, just like we programme lighting variations to make it look like someone's home in an empty flat? When you go to the loo at half-time during a rugby match, will you find it handy or annoying, that, on flushing it, you get a message from the pizzeria downstairs offering to bring you your usual pizza, even though you haven't ordered it? From "Modern Times" (Charlie Chaplin, 1936) to "The Fifth Element" (Luc Besson, 1997) via Villa Arpel in "Mon Oncle" (Jacques Tati, 1958) absurd images are all around us. If, as rightly highlighted by the MP Santini, senior citizens – whom the computer revolution completely passed by – will not miss the smartphone one, we can well imagine that a whole host of everyday services will be accessible to them in this way… as long as they don't leave their phone lying around, don't forget to charge it, don't forget their pin numbers or which buttons to use… These are all difficulties to which, incidentally, the right solutions can be found, as long as we bring them up.

# FROM TANGIBLE COMMON GOODS TO INTANGIBLE COMMON GOODS: EN ROUTE TO A NEW SHARING ECONOMY?

Over and above these considerations on the changes affecting services provided to users in the context of industrial public utilities, the contributions also present us with broader perceptions of community living and collective value creation. Regarding water in particular, we are well versed in the debate on:

- common goods[43] in terms of limited resources[44] where the role of sharing can be addressed by hard law or stem from established users governed in a community context by soft law[45]; common good usage is becoming more widespread as regards public space, for example, where the public institution, like it or not, is abandoning "management" of a space to commoners, within a framework that it defines with more or less precision;
- collective goods (often referred to as public goods) and club goods: local public utilities (water, sanitation, waste, etc.) are a mix of these two categories. The main difference between collective goods and common goods is the fact that their use (usus in Latin law) by some does not hinder their use by others[46]; collective goods are different from club goods in that it is difficult to exclude anyone from benefiting from them (often interpreted as "you can't prevent anyone from breathing"); club goods imply paying our share of their production cost to be able to benefit from them ;
- private goods (or goods purchased for one's own use), with regard to which individuals benefit from the usus, the fructus (the fruit, i.e. any profit), and the abusus (own a good and prohibit others from being able to benefit from it).

Adding fodder to this debate now is the sudden emergence of intangible common goods constituted, on the one hand, by open data[47] and, on the other, by collaborative production[48]: there are plenty of papers out there illustrating these movements. In some respects, multi-product monopolies, open data and collaborative production – by increasing the means for producing and sharing intangible goods – are shifting the traditional boundaries (Figure 1).

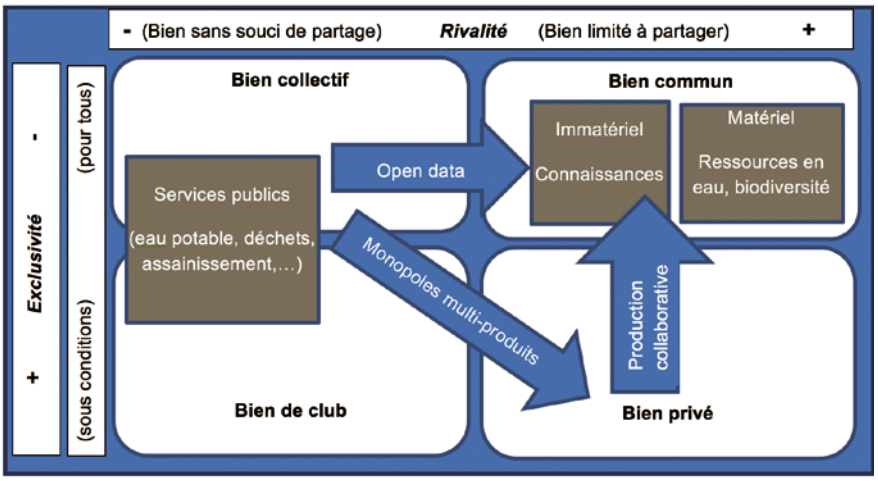



Figure 1

43. See, for example, Bernard Barraqué, in "Peurs et plaisirs de l'eau", P-A. Roche & B. Barraqué supervised, Hermann, 2012, or the report on the price of water mentioned further up.
44. This notion of limitation, introduced by Elinor Ostrom in particular, is by no means insignificant. It is not therefore res nullius (something that does not belong to anyone, but which can be obtained, in which case it becomes res propria) or res communis (something which does not belong to anyone in particular, but which everyone is able to use) from Roman law as illustrated by a sentence from the Digest of Justinian (47, X, 13,7. Ulpian): "Et quidem mare commune omnium est et litora, sicuti aer." ("For the sea is common to all, as well as the shore, and the air").
45. Soft law principles have burst into what many people consider to be the temple of hard law, the European Union and its prescriptive body of regulations and directives, and evidence of the changes taking place comes no clearer than this: with respect to the current "better regulation" package, the aim of obtaining better results for a lower transactional cost paves the way for mechanisms with much more cooperative processes with civil society and, why not in the near future, for recognition of community management procedures as recognised tools.
46. Quote attributed by Philippe Aigrain, collège des Bernardins, February 2016, to Benjamin Franklin (the son of a candlemaker): "he who lights his taper at mine, receives light without darkening me", Philippe Aigrain, collège des Bernardins, seminar "l'humain face aux défis du numérique", February 2016.
47. See in particular the development of this idea in Cécile Arnal and Emmanuelle Durandau: "Open data, l'action publique créatrice d'un bien commun ?" in "Les Entretiens Albert Kahn", cahier n°20 "Biens publics, biens communs : de quoi parle-t-on vraiment ?", Hauts-de-Seine, the département, February 2016.
48. What often comes to mind when we talk about collaborative production is the production of free software. But joining a "nose jury" to inform the Paris Region Wastewater Authority (SIAAP) of odours, detecting holes in roads and reporting them, detecting leaks, taking photos and filming, taking part in an online knowledge-sharing forum on urban biodiversity by identifying and locating species and habitats, within an organised network so as to promote them: all of these actions also contribute to the production of collective knowledge.

## CHANGING DEMOCRATIC PRACTICES IN LOCAL COMMUNITY LIFE?

Shifting the boundaries is another subject we've seen in myriad contributions – for many it means trying to reinvent governance systems: there are many examples that the traditional "democratic institution – individual" dialogue,[49] ever championed as the condition for fulfilment, is opening up to a more complex, less stable multilogue where the means for organising society – at times fleeting but at others steadfast and lasting – are taking their seat at the top table which, in some people's mind, should end up becoming preponderant. The hustle and bustle of urban life is supposed to be the melting pot where these new forms of governance are forming.

A wide array of inspiring questions raised by the most radical of these new forms (where we go further than merely the now classic appetite for strengthening citizens' participation in public decisions so as to "take apart" a sector that is meant to be public and "entrust" it to commoners, thereby ushering in fully-fledged "collective management outside of the local authority framework"):

- are such forms of collective management really open to crowdsourcing, or are they new means of domination, similar to new niches for satisfying the appetite of individual forms of leadership?
- how are these to mature? Are they doomed to forever remain dedicated to the emergence of new ideas, attempts or experiments, a way of "breathing", of nurturing creativity to make way for institutionalised forms of governance once the evidence is there?
  How might they continue long-term without stumbling at the same hurdles as the forms of governance they are supposed to be avoiding?

## VIRTUAL FORMS OF SOLIDARITY AND GEOGRAPHY?

Our previous publications were making this point already,[50] and it's hardly groundbreaking: social forms of solidarity are now treading new paths so that individuals can interact. Physical touch no longer equates contact. Society's fragmentation, and the emergence of multiple communities – sometimes relocated at global level – are calling for a fresh look at the question of territories,[51] where the presence of each of us would be purely circumstantial, and no longer an indicator of belonging.

To the extent that there is now a flurry of debates in France on the Nation-State's death knell[52], with or without a question mark.

## COMING BACK DOWN TO EARTH?

In the midst of this world of uncertain concepts, local public utilities concern the community of concern of those who share the same tangible realities: it's not by licking our computer screen that we can drink, nor is it by clicking online that our rubbish gets thrown away. The territory is real, whether we like it or not, in the flesh and blood of the core functions of our day-to-day lives.

Such utilities are there to provide a simple, daily and palpable solution to these needs: in that respect they make common sense, at the service of fairness and solidarity, and provide a framework that is conducive to activity and well-being. This brings us back to the statement by Renaud Denoix de Saint-Marc: "Fundamentally, the purpose of public utilities is to satisfy their users and ensure social cohesion at the same time"[53]. An obvious fact that is well worth recalling.

49. Dialogue based on the identification of a public interest able to sum up the social contract (requirement associated with respecting others and nature, amenities provided and conditions of this provision) that each citizen has with the rest of society.
50. « Pour des villes durables et responsables, urbanisme et services publics, l'indispensable alliance », Astee, 2013.
51. Back in 1995, Bertrand Badie had already entitled one of his publications "la fin des territoires, essai sur le désordre international et l'utilité sociale du respect" (Fayard, 1995).
52. Among the plethora of publications available on this subject, have a look, for example, at: Luciano Vandelli, « la fin de l'Etat-nation », revue française d'administration publique, 2003/1, n°105-106 and Jean-François Daguzan « la fin de l'Etat-Nation ? », éditions du CNRS, 2015. Surely the most blatant sign is the replacement of the term "international" (between constituted nations) first with "global" and then with "world" in the OECD's texts, which is, itself, an international institution for all that.
53. « Le Service public », Renaud Denoix de Saint Marc, report to the Prime Minister, La documentation Française, 1996.

## TERRITORIES IN TRANSITION

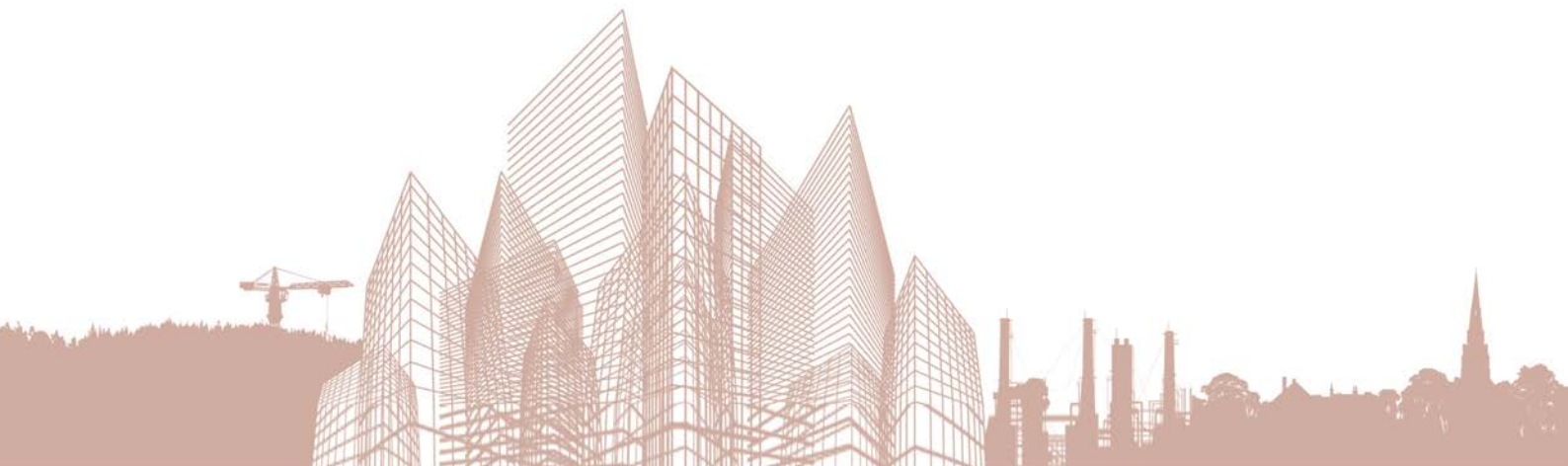
Our local institutions and their responsibilities are mutating as they take on new concepts of territoriality. For drinking water and sanitation for example, the number of organising authorities, which stands at more than 24,000 today, is due to fall to a mere 1,500 by 2020. It will now be most common to come across local authorities that oversee the full range of local public utilities concerning the environment, water, waste and energy distribution in particular and of remits which interact strongly with them (roads, public spaces, urban planning, etc.).

Our territories are therefore going through an institutional transition. This term underscores the ongoing nature of this process which still has many twists and turns to navigate.

These mutations, the loss of certain powers at département-level and a regional scale that will now be more distant, are preying on some people's minds as regards how the link between urban, suburban and rural territories is going to be forged. Many local authorities are having to deal with the issue of the geography of local links between urban areas and their neighbouring territories today (there is not meant to be any particular allusion to the West of Paris here!). Rivers as well as motorways, dual carriageways and public transport lines are all changing the metrics and adding linear forms of solidarity that we are going to have to learn to live with – just like, in infant school, we learn how to handle a rubber and a pencil at the same time so as to avoid ending up with a scrawl overlaying all sorts of ad hoc cut-outs optimising each sectoral approach. The strength and relevance of organising authorities to provide high-performing utilities partly lie in their size and ability to pool means and mobilise the aforementioned new technologies.

## SEE YOU IN LIÈGE IN 2017

We will be continuing our discussions on the scales of territories and their levels of relevance and interpenetration at our 2017 congress, which will take place in Liège. On this occasion we will be addressing the larger scales of territories – particularly the European scale, the subject of much ridicule today – and this is bound to throw up many more key questions and far-reaching changes as regards the concepts of governance.



# Acronyms

**ACV:** Life Cycle Analysis

**ADCP:** Acoustic Doppler Current Profiler

**ADEME:** French Environment and Energy Management Agency

**AESN:** Seine-Normandie Water Agency

**AFNOR:** French Standardisation Association

**AITF:** Association of Territorial Engineers of France

**AJDA:** Actualité Juridique du Droit Administratif (journal)

**AMF:** Association of French Mayors and Presidents of Inter-municipalities

**AMR:** Automated Meter Reading

**ANR:** French National Research Agency

**ANSSI:** National Cybersecurity Agency of France

**API:** Application Programming Interface

**ARCEAU:** Local Authority Research Association in the Area of Water

**AREAS:** Regional Association for Soil Research and Improvement

**ASTEE:** French Scientific and Technical Association for Water and the Environment

**ATTF:** Association of Territorial Technicians of France

**BIM:** Building Information Modeling

**BRGM:** Geological and Mining Research Office

**BTP:** Construction and civil engineering

**C2D92:** Hauts-de- Seine Sustainable Development Council

**CADA:** Administrative Document Access Commission

**CCETT:** Joint Centre of Television and Telecommunication Research

**CEREMA:** French Research and Expertise Centre on Risks, the Environment, Mobility and Planning

**CFU:** Colony Forming Unit

**CGDD:** General Commission for Sustainable Development

**CGEDD:** General Council for the Environment and Sustainable Development

**CNAM:** National School for Arts and Professions

**CNDP:** National Public Debating Commission

**CNFPT:** French National Centre for Local Public Utilities

**CNIL:** French Data Protection Authority

**CNRS:** French National Centre for Scientific Research

**COP:** Conference Of Parties

**CSF:** Industry Strategic Committee CSV: Comma-Separated Values WFD: Water Framework Directive

**DICT:** Declaration of the Intention to Begin Work

**DPSIR:** Driving forces-Pressure-State-Impact-Response

**DREAL:** Regional Directorate for the Environment, Planning and Housing

**DT:** Work Declaration

**EAR:** Ecoute Active du Réseau

**EDF:** Electricité De France

**ENGEES:** Strasbourg National School for Water and Environmental Engineering

**ENSCR:** Rennes Graduate School of Chemical Engineering

**EPL:** Local Public Enterprise

**ERDF:** Electricité Réseau Distribution France

**ESAIP:** Angers Graduate School of Engineering

**ESTP:** Special School for Construction, Industry and Civil Engineering

**FEAD:** European Federation of Waste Management and Environmental Services

**FING :** Fondation pour l'Internet Nouvelle Génération

**FNADE:** French National Federation of Decontamination and Environmental Activities

**FNCCR:** French National Federation of Public Service Local Authorities

**FP2E:** Professional Federation of Water Companies

**FTE:** Full-Time Equivalent

**FUI:** Single Interministerial Fund

**GDF:** Gaz De France

**GDP:** Gross Domestic Product

# Acronyms

**GIE:** Economic Interest Group

**GML:** Geography Markup Language GPRS: General Packet Radio Service GPS: Global Positioning System GPSO: Grand Paris Seine Ouest

**GSM:** Global System for Mobile Communications

**IBM:** International Business Machine

**ICT:** Information and Communication Technology

**IDDRI:** Institute for Sustainable Development and International Relations

**IDRRIM:** French Institute of Roads, Streets and Infrastructure for Mobility

**IEC:** International Electrotechnical Commission IGA: General Inspectorate for the Administration INC: National Consumption Institute

**INPES:** French National Institute for Health Education and Prevention

**INRA:** French National Institute of Agricultural Research

**INSEE:** French National Institute of Statistics and Economic Studies

**INSIDE:** INteroperability of Systems of Information Distributed on watEr

**INSPIRE:** INfrastructure for SPatial InfoRmation in Europe

**IOT:** Internet Of Things

**IPCC:** Intergovernmental Panel on Climate Change

**IPEMED:** Mediterranean World Economic Foresight Institute

**IRSTEA:** French National Research Institute of Science and Technology for the Environment and Agriculture

**ISO:** International Organization for Standardization

**ISSN:** International Standard Serial Number

**ITU-T:** International Telecommunication Union-Telecommunication Standardization Sector

**IWA:** International Water Association

**JSON:** JavaScript Object Notation

**LATTS:** Techniques, Territories and Societies Laboratory

**LED:** Light-Emitting Diode

**LIMOS:** System Optimisation, modelling and computing laboratory

**LNPN:** Paris-Normandy New Line

**LTECV:** Act on the Energy Transition for Green Growth

**M2M:** Machine to Machine

**MAE:** Agro-Environmental Measures

**MAGES:** Effluent Management Assistance Model of the SIAAP

**MAPTAM:** Modernisation of Territorial Public Action and Affirmation of Metropolises

**MDM:** Mobile Device Management

**MEDDE:** French Ministry for Ecology, Sustainable Development and Energy

**MEDEF:** Mouvement des Entreprises de France

**MEEM:** French Ministry for the Environment, Energy and the Sea

**MGP:** Greater Paris Metropolis MOOC: Massive Open Online Course MUG: Gerland Urban Modelling

**MUSE:** Systematic Urban Modelling adapted to the Water Sector

**NFC:** Near Field Communication NFI: Nouvelle France Industrielle NIMBY: Not In My BackYard

**NGO:** Non-Governmental Organisation

**NICT:** New Information and Communication Technology

**NOTRe:** New Territorial Organisation of the French Republic

**OECD:** Organisation for Economic Co-operation and Development

**ONEMA:** French National Office of Water and Aquatic Environments

**OTT:** Over The Top

**PAM:** Pont-à-Mousson

**PDA:** Personal Digital Assistant

**PE:** Polyethylene

**PFE:** French Partnership for Water

**PIA:** Investments for the Future Programme

# Acronyms

**PLU:** Local Urban Planning Document

**PUCA:** Urban Planning Document on Construction Architecture

**PVC:** Polyvinyl chloride

**RCSF:** Wireless Sensor Network

**RE:** Renewable Energy

**RER:** Regional Express Network

**RFID:** Radio Frequency IDentification

**RNIP:** National Pubic Engineering Meetings

**SaaS:** Software as a Service

**SAC:** Standardization Administration of China

**SADAPT:** Sciences for Action and Development - Activities, Products, Territories

**SAGE:** Water Management and Development Plan

**SANDRE:** National Administration Service for Data and Reference Standards on Water

**SAU:** Useful Agricultural Surface Area

**SAUR:** Urban and Rural Planning Company

**SCHAPI:** Central Hydrometeorology and Flood Forecasting Support Service

**SCOT:** Territorial Coherence Scheme SEDIF: Paris Region Water Authority SGP: Greater Paris Company

**SIAAP:** Paris Region Waste Water Authority

**SIE:** Information System on Water

**SIG:** Geographic Information System

**SIPPEREC:** Intermunicipal Association of Outer Paris for Energy and Communication Networks

**SME:** Small and Medium-sized Enterprise

**SPC:** Rising Water Prevention Department

**SQR:** Question/Answer System

**SURGE:** Urban-Rural Solidarity in Water Management SWMM: Storm Water Management Model SYELOM: Hauts-de Seine Joint Association for the Elimination of Household Waste

**UAPV:** University of Avignon and Pays de Vaucluse

**UDF:** Union for French Democracy

**UFR:** Training and Research Unit

**UIE:** National Union of Industries and Companies Working in the Water and Environment Sectors

**UK:** United Kingdom

**UMR:** Joint Research Unit

**UN:** United Nations

**UNESCO:** United Nations Educational, Scientific and Cultural Organization

**UPEM:** University of Paris-Est Marne-la-Vallée

**USB:** Universal Serial Bus

**UTC:** Compiègne University of Technology

**UWTD:** Urban Wastewater Treatment Directive

**VAL:** Automatic Light Vehicle

**VALERIE:** Val-de-Marne Use and Computerised Regulation of Effluents

**VEDIF:** Veolia Eau d'Ile-de-France

**VHF:** Very High Frequency

**WAN:** Wide Area Network

**WSC:** Water Service Corporation

**XML:** Extensible Markup Language

The theme of the ASTEE 2016 congress in Issy-les-Moulineaux is

# DIGITAL INTELLIGENCE AT THE HEART OF OUR PUBLIC UTILITIES

It looks at the wide-ranging question marks hanging over the effect the digital "revolution" is having, the pitfalls to avoid, the new avenues to be explored, social acceptability, protection of privacy and more… Smart cities or territories are not an end goal but perhaps a means that can be leveraged in the approaches we adopt in terms of sustainable development, improving quality of life and respecting citizens. These questions take centre-stage in the contributions gathered within this document. Providing a preview of the congress and insight into the main issues it deals with, these contributions are brimming with ideas, viewpoints and personal experiences concerning the major transitions our territories are going through today. For the first time, this document includes video interviews with prominent figures from the environmental and digital sectors.