ForCity

Veolia approach to sustainable and smart city

Today, natural resources are becoming increasingly scarce while our needs are growing in an ever more densely populated and urbanized world facing climate change issues.

The world has to rethink its relationship with resources and come up with new social and economic growth models that are more efficient, better balanced and more sustainable.

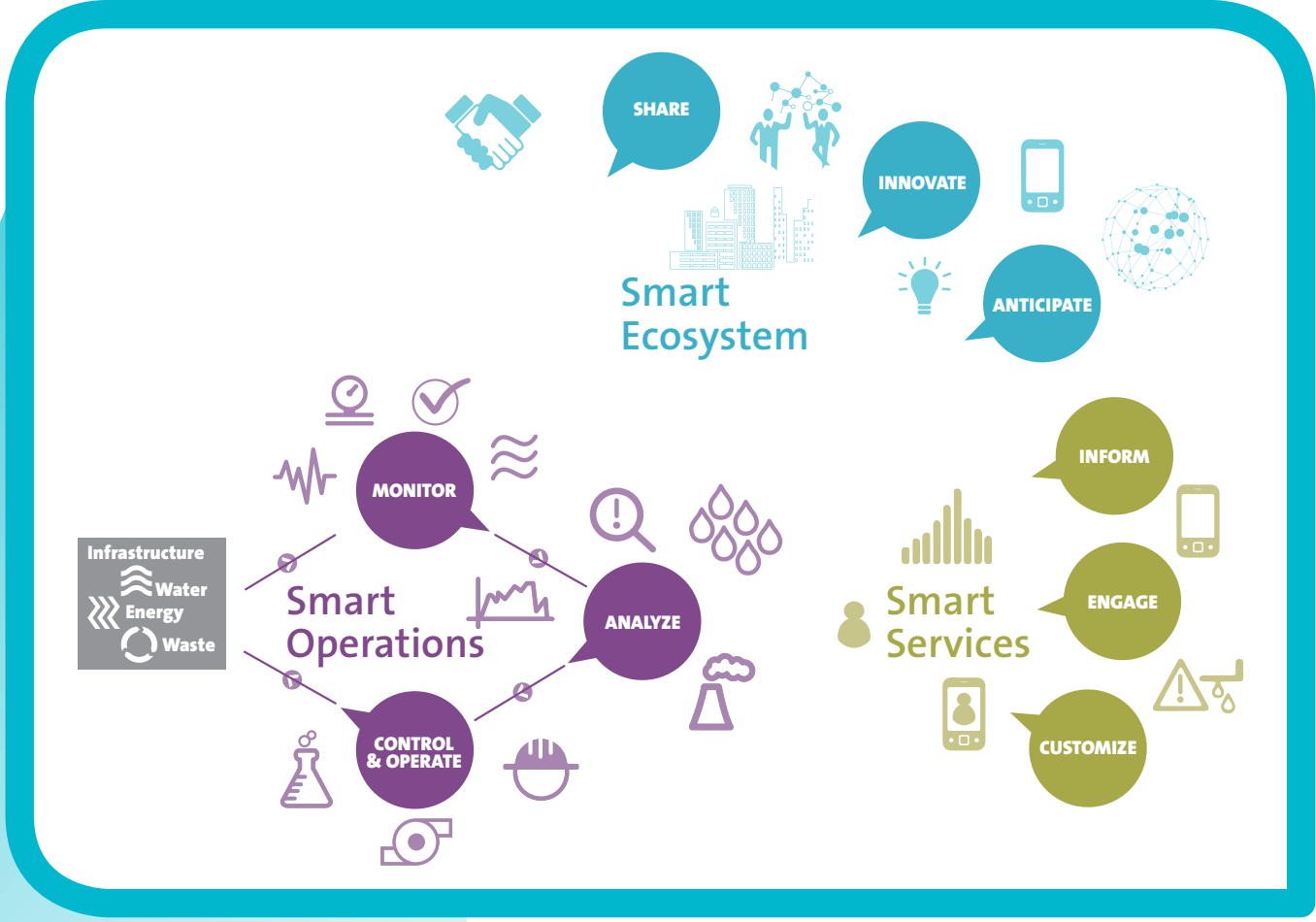
With 160 years of expertise in the areas of water, energy and waste, Veolia applies its capacity for innovation to pursuing human progress and wellbeing, and improving the performance of businesses and regions.

To make the switch from a resource consumption rationale to a use-and-recover approach in today's circular economy, Veolia designs and implements solutions aimed at improving access to resources while at the same time protecting and renewing those same resources.

Veolia accompany cities in their smart development through a network of companies and experts at three levels of integration:

- **Smart operations**
- **Smart services**
- **Smart ecosystem**

Veolia key figures 2013



Our proposal for Smart Cities

Using its extensive return of experience in being a partner to cities for 160 years, Veolia can develop and deliver innovative services tailor made to Cities, using technologies as enablers, to support the achievement of the goals of city leaders for Smart Cities. These services include design and implementation of innovative solutions and assistance to leverage value from data and take action.

THREE AREAS OF FOCUS
have been identified where we consider Veolia would deliver the highest value to Cities:

1 WATER — Making the most of water resources by leveraging data for action

2 ENERGY — The city is connected to an energy efficiency platform

3 URBAN PLANNING & MODELLING — A new way to plan the sustainable city

URBAN PLANNING & MODELLING

SMART=

a new way to plan the sustainable city.

Why make your mistakes in real life at great expense and time? Instead, do your experiments on the computer, where mistakes are "free." Of course, this only works if you have the skills and computing power to model complex systems with great accuracy.

With **ForCity**, we have the capability to help you build a decision-support tool for urban planning based on the city's challenges and systemic models. This decision support tool could enable your city to optimize its strategic choices by allowing the comparison of different strategies through maps, 3D scenes, graphics and tables. It will deliver short-term tools for decision support for urban development of strategic districts of the city with a first focus on energy, water and waste management.

ForCity: a break through approach for smart governance

1 The "experienced start-up"

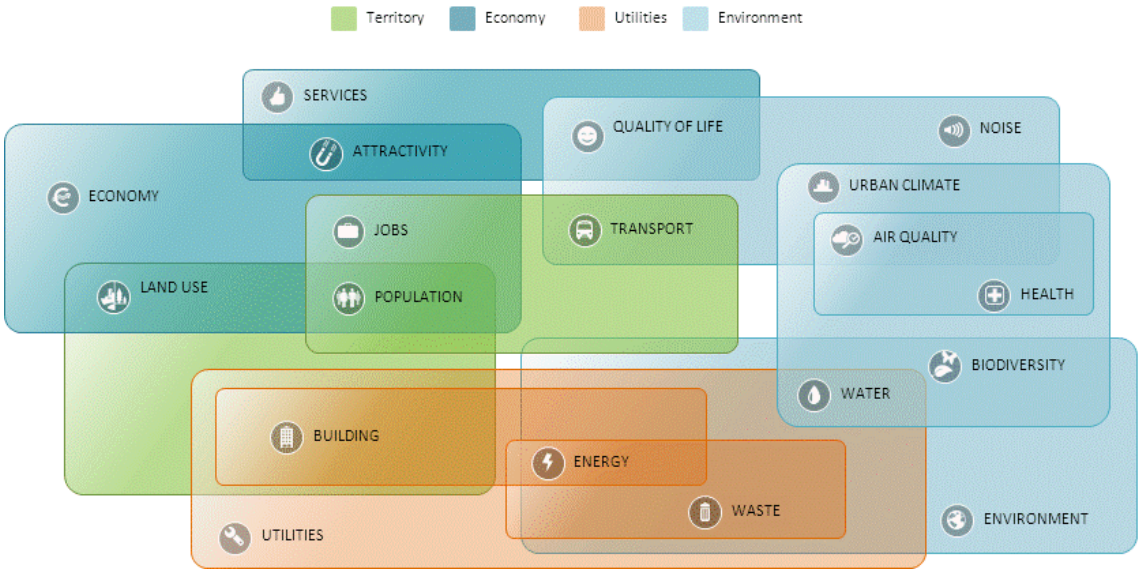
ForCity is an **independent company based in Lyon, France**, recently founded by two individuals **after a long managing experience in urban services and environment and after a four year R&D program dedicated to urban modeling.** ForCity benefits from pilot projects 2009-2013 in **Mexico City, Singapore, and Lyon (France).** In order to aggregate knowledge, **ForCity partners with world-class academics** (e.g. LET: Laboratoire de l'Economie des Transports, France) and **leading companies: running partnership with Veolia**, on-going MOU with a public transportation leader.

ForCity is currently working in **Lyon and Lille (France)** and in **Hong Kong**; ForCity plans **new projects** in **Paris, Singapore**, and in **big cities in Japan, United States and China.** ForCity employs currently 12 people – from IT developers to modelers to consultants – and anticipates 20 to 30 employees by 2015, developing at least **six city platforms in leading cities of Europe and the World.**

2 Looking into the complexity of urban change

When public decision makers plan big projects for their City, there is one thing they know for sure: **things will not happen the way it was designed.** After two or three years, they just know that they don't know. Why is that so? Because a city is not a simple, deterministic body.

On the contrary, **a city is a complex system, meaning an addition of heterogeneous sub-systems that interact together permanently at every scale of space and time.** On one hand, every project is influenced by the myriad of individual and business decisions that will occur independently in the next couple of years; on the other hand, the project itself will affect these decisions, and even every new projects of the City itself will interfere directly and indirectly with the former ones, or with the ones being decided at the same moment in other silos of the public administration.

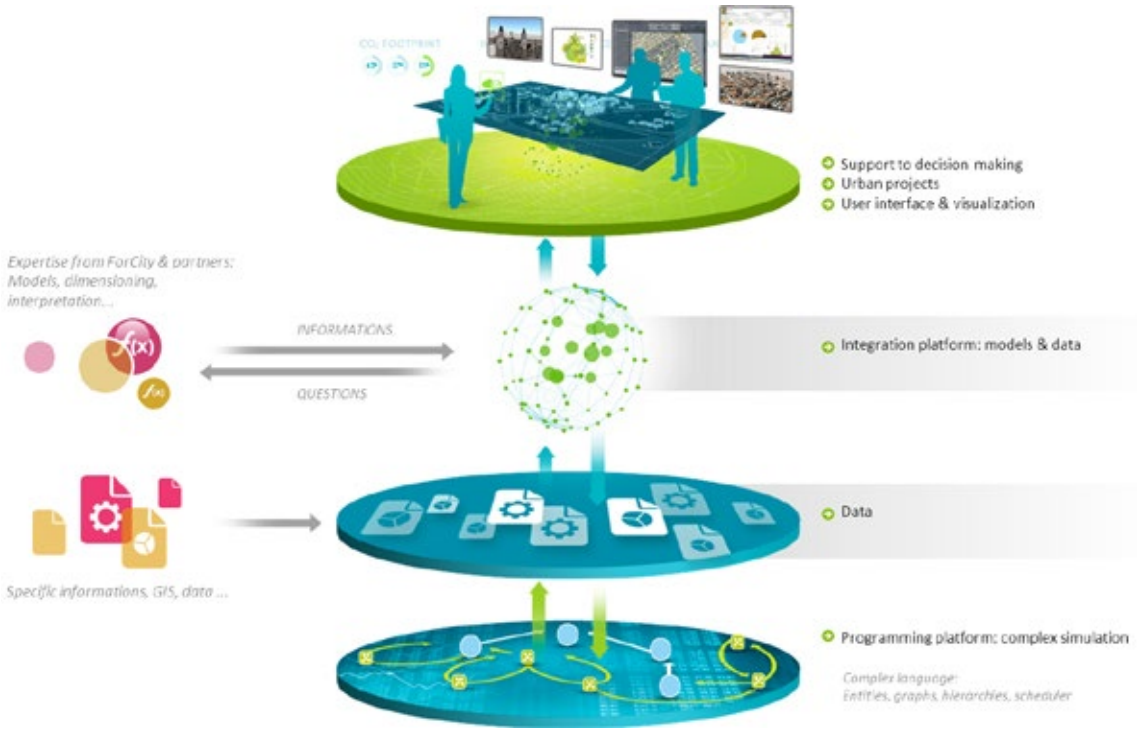


So **the first rule with ambitious Cities is to keep adaptable in decision making.** But what if they could also anticipate the way that myriad of interferences happen? What if the decision makers could play their projects within **a digital city lab that simulates the interactions and the systemic behavior of the City**? And what if different departments or partners of the City could play their projects within the same digital city lab, thus cooperating to anticipate together the consistency of their approaches and their global benefit to quality of life, and to any upper goal of the City?

3 A window to the future

The **gigantic number of data** now available in a smart city, as well as the **acceleration of computing** and the progress of mathematics now allow for simulating systems that were out of reach just a couple of years ago. But data and technology are useless if taken alone. A complex system remains complex once in the computer, and in order to describe the issue, to choose and design the models, to calibrate their parameters and links in a realistic way, you need to know how the real world reacts in every silo that you take into account.

ForCity allies **unique field experience** and **academic knowledge, alone and together with its partners.** ForCity creates a **digital platform in the city**, which allows the users to simulate their own projects within their systemic, moving environment, to **simulate the interactions between different projects and between the projects and external players**, to simulate scenarios of decisions considering different sets of assumptions, and to compare these scenarios with regard to common KPIs.

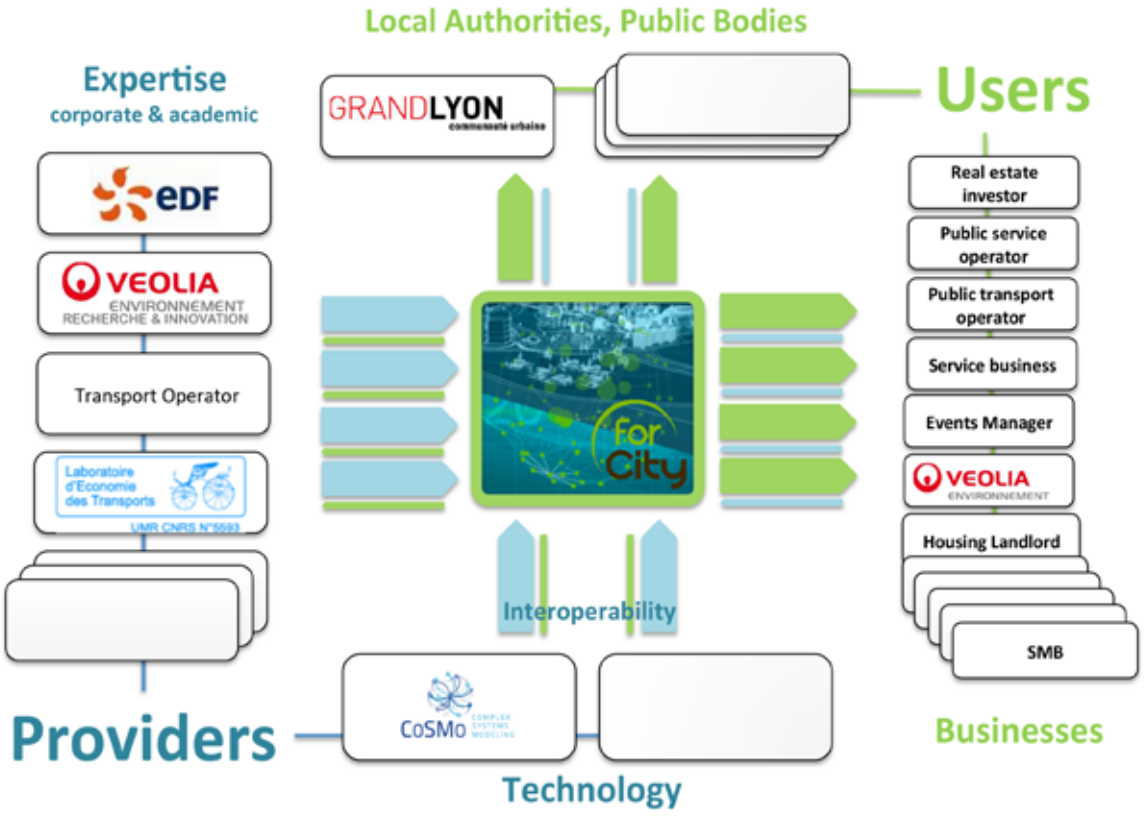


The digital platform is linked to data sources and kept updated. Every user thus benefits from a **simulating tool** which accompany him along the time to **update his strategic planning**, taking into account the **external evolutions or new projects or new political targets that are to be considered later.** Along the time, ForCity allows for looking constantly a couple of years ahead, the way do the car headlights into the night road.

4 Integration, cooperation, communication

The key words of ForCity are consubstantial to the concept:

- **Integration:** because ForCity core business is integrating problematic and models.
- **Cooperation:** because ForCity offers a collaborative platform, where different users, from businesses or public administration, may simulate their own projects and decide to keep information for themselves or to share with some others or to open it to everyone.
- **Communication:** because the 3D representation of data and results allows for breakthrough ways of communicating a vision and impact of every project.



Lyon, France – Early stage of ForCity collaborative eco-system of users and partners.

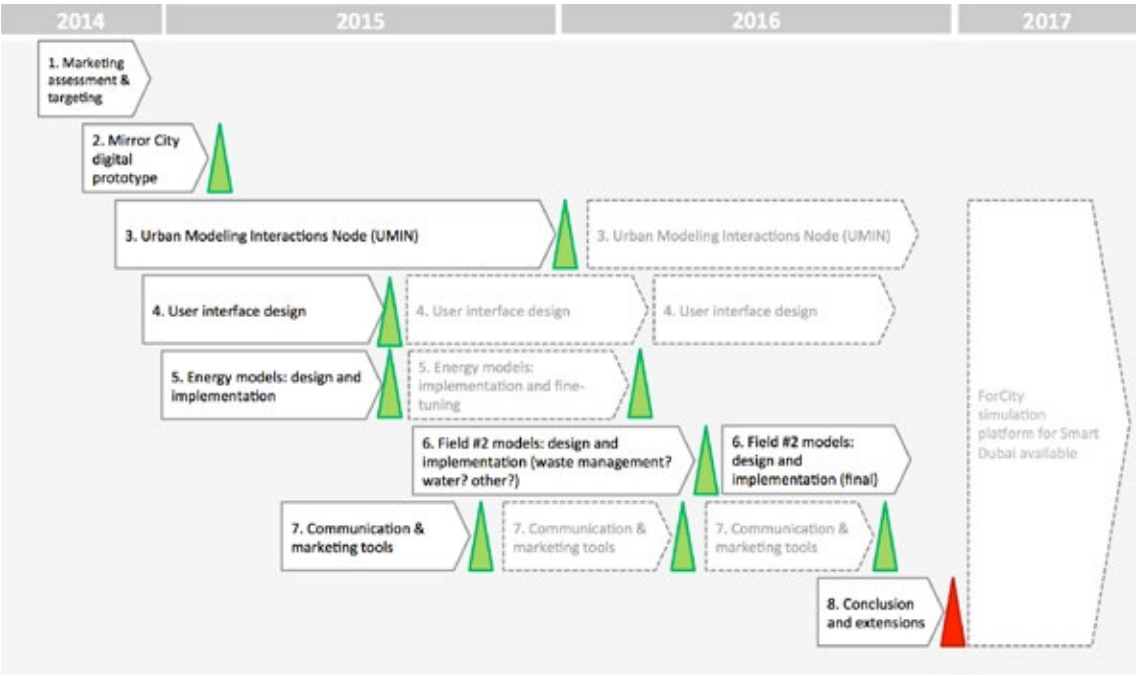
Contract with the City of Lyon ("Grand Lyon") includes beside ForCity three other partner companies (EDF, Veolia, CoSMo), working with- and contributing to the implementation of ForCity platform in Lyon. Goal of the contract, based on modeling urban development, is to support public decision related to the current transformation of an area, called Gerland.

Beside that early contract, ForCity is currently developing additional eco-system of users of the ForCity platform, especially in the fields of water management (Veolia), energy management, transportation, construction & housing (...)

ForCity usually leverages a first project on-site to develop its modeling & simulation platform, investing in the powerful simulation tool of urban development, based on local data, specificities and projects. Then ForCity opens the platform to other customers, both public and private. This collaborative approach allows for mitigating the cost for every user, as well as for opening new ways of collaboration and communication.

A project for your city

The proposal for Smart City follows first a five step process, in order to deliver early outcome while allowing later for fast extension to many fields of decision making. Our suggestion here is to start with an energy issue; of course this is only a first proposal, and the energy topic may be substituted by another issue, relevant to ForCity simulation tool: water, waste management, transportation, urban development, events & tourism, for example.



1 Marketing assessment & targeting

Stakeholders are identified and involved in the kick-off. Scope of work is precisely defined. Timetable and deliverables are set-up. On technical level, expert people define:

- **Relevant geographic scales** (region, city, town...)
- **KPIs** (future output from ForCity simulations)
- **External parameters influencing the issues,** e.g.: temperature & climate, energy price, micro-local repartition of population – global, age, origin, social profile, expatriates, visitors etc.; geography of purposes of mobility – jobs, leisure, exhibitions, conferences etc.; structural trends and evolutions of the City and its global environment
- **Scenarios to be modeled:** time scenarios, critical assumptions....

2 Mirror City digital prototype

Quite early in the process, ForCity sets up a digital Mirror City: a **3D representation of the City** where **every road and building is not only a shape but a mathematical object**, subject later to dynamic modeling and simulation. It allows for everybody in the project to gain an early representation of the future outcome of the project. It allows also for early communication if needed. It will be enhanced step by step along the project with **growing functionalities** from the user interface and additional data and models represented in the 3D visualization.

Lyon, France – Mirror City including a technical network

3 Urban Modeling Interactions Node (UMIN)

ForCity adapts its UMIN model to the specificities of your City. UMIN is an extended modeling of urban evolution, interacting in a systemic way with transport availability as well as with quality of life and other input to land use individual decisions. The models are robust but their instantiation in a new City is a big challenge, because of the cultural, local and regional specificities that influence deeply the multiple decision makings. This model is a cornerstone of urban simulation, so it is implemented very soon in the project. It is also a huge work package, which will deliver its results in several steps, with step by step fine-tuning along the project.

Lyon, France – UMIN simulation of population drifts and traffic density along the years, including three strategic projects in transportation

4 User interface design

ForCity designs the user interface that gives the users an access to the shared ForCity platform for the city. It is adapted to the needs of Smart Cities and its stakeholders. The user interface is delivered **in two to three versions along the project,** in order to **adapt to user feed-back** on one hand, and to the parallel **setting-up of the digital platform for your city** on the other hand.

5 Energy models – design and implementation

ForCity **describes the first strategic issue to be modeled** (here, an energy issue), and **designs the models together with experts from each field related to the issue.** ForCity integrates the models in the simulation platform and links the energy models with the UMIN simulation of the City evolution.

Energy needs are dictated by housing and business buildings, by who lives in there, by what decisions they make considering what alternative they have, and by the evolution of these issues and many others year after year along the time. A key decision in the field of transportation may affect dramatically the composition of the population of an area after a couple of years, the way people behave at home or in the office, and energy needs may be transformed in a way that could not be anticipated by traditional planning methods. Were the technical solutions over-dimensioned? Or the opposite? Was public or private money wasted, or should one have spent more or differently in order to avoid later problems? Is a tax or pricing policy efficient for its purpose, considering who are its user targets, how they distribute in the territory, how they probably will or could in a couple of years, and how unexpected rebound effects could happen considering the systemic of behavior and interactions?

Last steps of the project

The modeling may be **extended to one or several other topics,** in order to **leverage the powerful multi-thematic approach of ForCity collaborative modeling.** The step-by-step approach proposed here allows for checking first (with the energy issue, e.g.) the relevance of the collaborative simulation platform for your city. Then, extension to other fields may be considered and implemented immediately. Communication tools (touch screen, moving screen captures etc.) may be issued at every step of the project, once the mirror city is delivered.

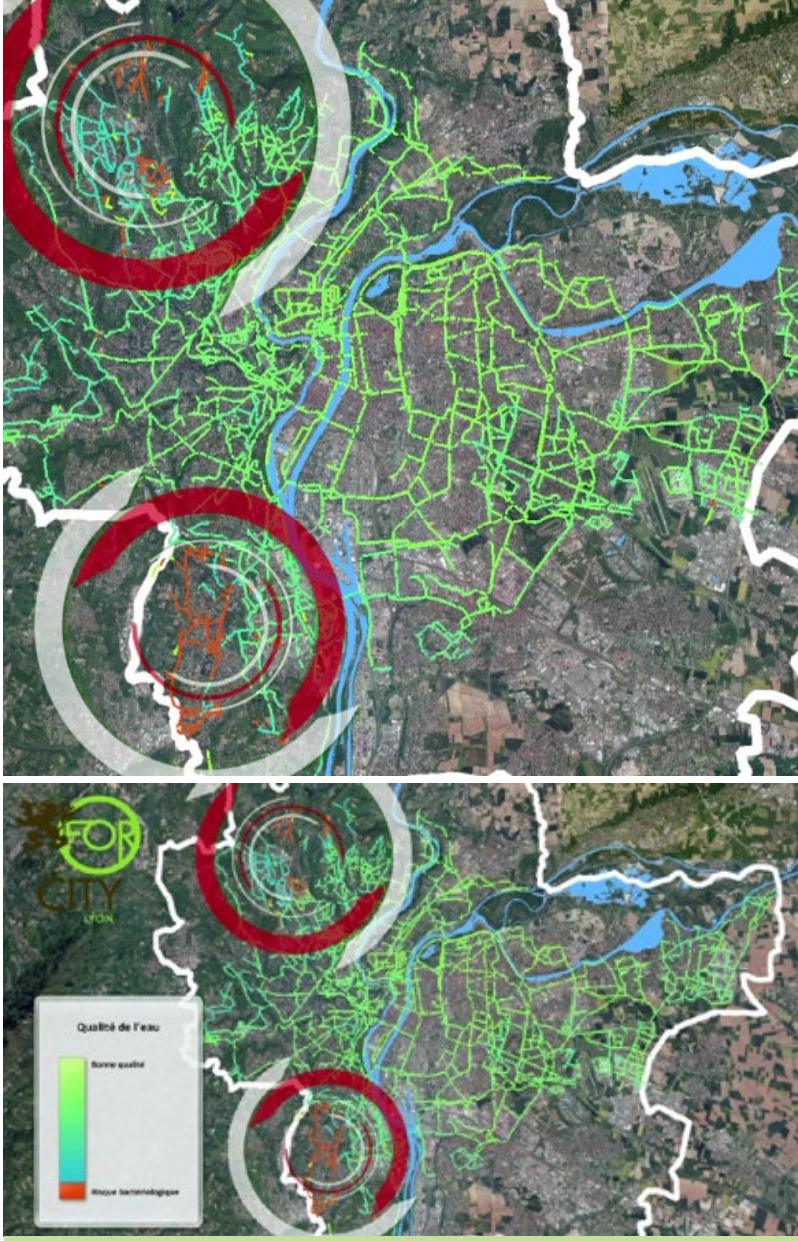
ForCity touch screen on the Veolia booth at an international exhibition (Pollutec, France, 2012)

Benefits for Smart Cities

On the short term, your city benefits for **several deliverables** that gives a **growing perspective of the future potential of the ForCity platform:** digital Mirror City, early simulations of energy issues, early intermediate version of user interface, intermediate implementation of dynamic land use and transport simulations etc.

Then, for example, your city will be able to **answer in a complete new way to strategic questions related to energy issues** (if energy is chosen first), **linked with construction and business development**, and **the number of separate projects that are associated**. How to integrate these projects and **get a comprehensive vision of the energy perspective, the CO2 efficiency, the quality of life, the resilience of the City for the next decade?** How to plan, how to adjust public spending, how to make investors most confident that their money is spent in a place that anticipates?

ForCity allows **identifying emerging problems or opportunities,** that is, ones **that were not anticipated under usual planning methods.**



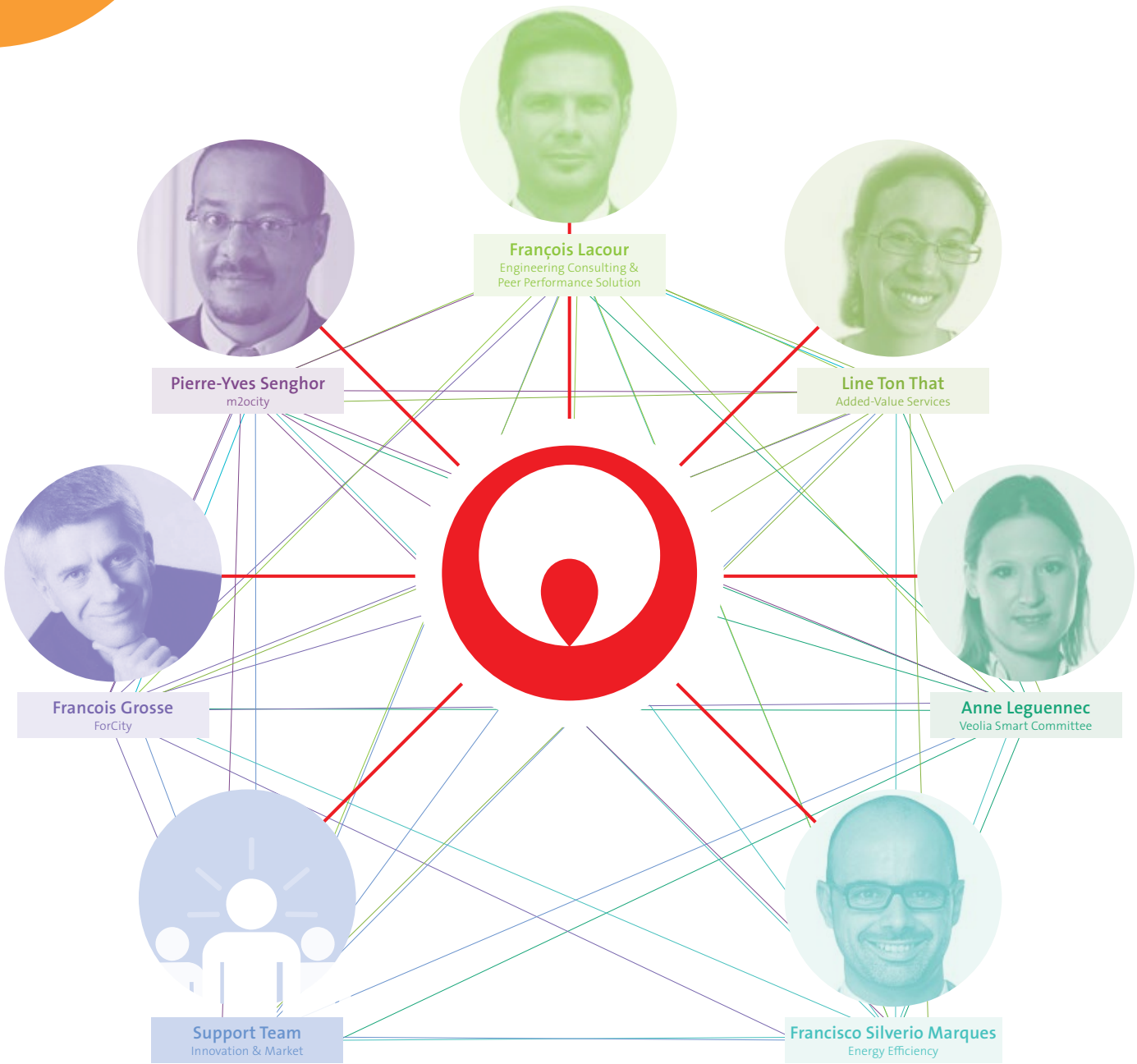
Lyon, France – ForCity dynamic simulation shows problematic areas for the future in the water network, considering contradictory trends of population growth and water consumption decrease, as well as geographic drifts of population density and composition along the years. Solution is anticipated within the maintenance planning along the coming years, which allows reducing short term investment plan and future environmental impact of water purification.

After two years, or even before, your city will be able to expand the scope and include new topics in the digital platform: then ForCity becomes a **dynamic integration tool to share a vision and an on-going dynamic planning,** based on updated information and shared insight from public and private bodies. ForCity becomes **also more and more a communication tool to the people, giving new opportunities to share and explain the vision of your city.**

Team

VEOLIA SMART TEAM

SMART=
global-local dedicated team to support your city.



Resourcing the world

mea.mkg.smarthub@veolia.com | www.veolia.com/gulfcountries