



Solutions for Sustainable & Resilient Cities

2016 EU Research and Innovation Day

World Leader in Environmental Services



2015 Revenue: € 24.96 billion*

173,959 employees



Water Services

€11.34 billion
(+1.0% vs.2014)



Waste Management & Resource Recovery

€8.69 billion
(+3.0% vs.2014)



Energy Services & Optimization

€4.92 billion
(+4.0% vs.2014)

Summary



- **Resilience challenges**
 - Challenges
 - Understand the concept of Urban Resilience
 - City's expressed needs
- **VEOLIA, partner of « 100 resilient cities »**
- **Value proposition and solutions**
 - Robust infrastructures
 - Resources conservation
 - Flood management
 - Critical energy supply
 - Heat waves mitigation
 - Critical event management

Resilience Challenges

Global trends impacting cities



A rapid growth of the population

- 9 billion people expected by 2050
- A growing urbanisation (75% of the population in urban areas by 2050)
- Heterogeneous demographic changes (population size and growth rate, age pyramid)

The climate change (cities more involved in prevention, and in charge of necessary adaptations)

Citizen consum'actor

- More and more initiated, sophisticated and skilled
- New expectations of governance and involvement
- Healthy concerns and environmental expectations

Economic moves

- Economic crisis or instability (less visibility for future revenues)
- Middle class growth from 1.8bn to 5bn by 2030
- New economic models (circular economy, economy of functionality, decentralized energy production...)
- New regulations and policies, more stringent and environmental
- Rapid development of new technologies, particularly digital

Competition amongst territories (for talents, investment..)

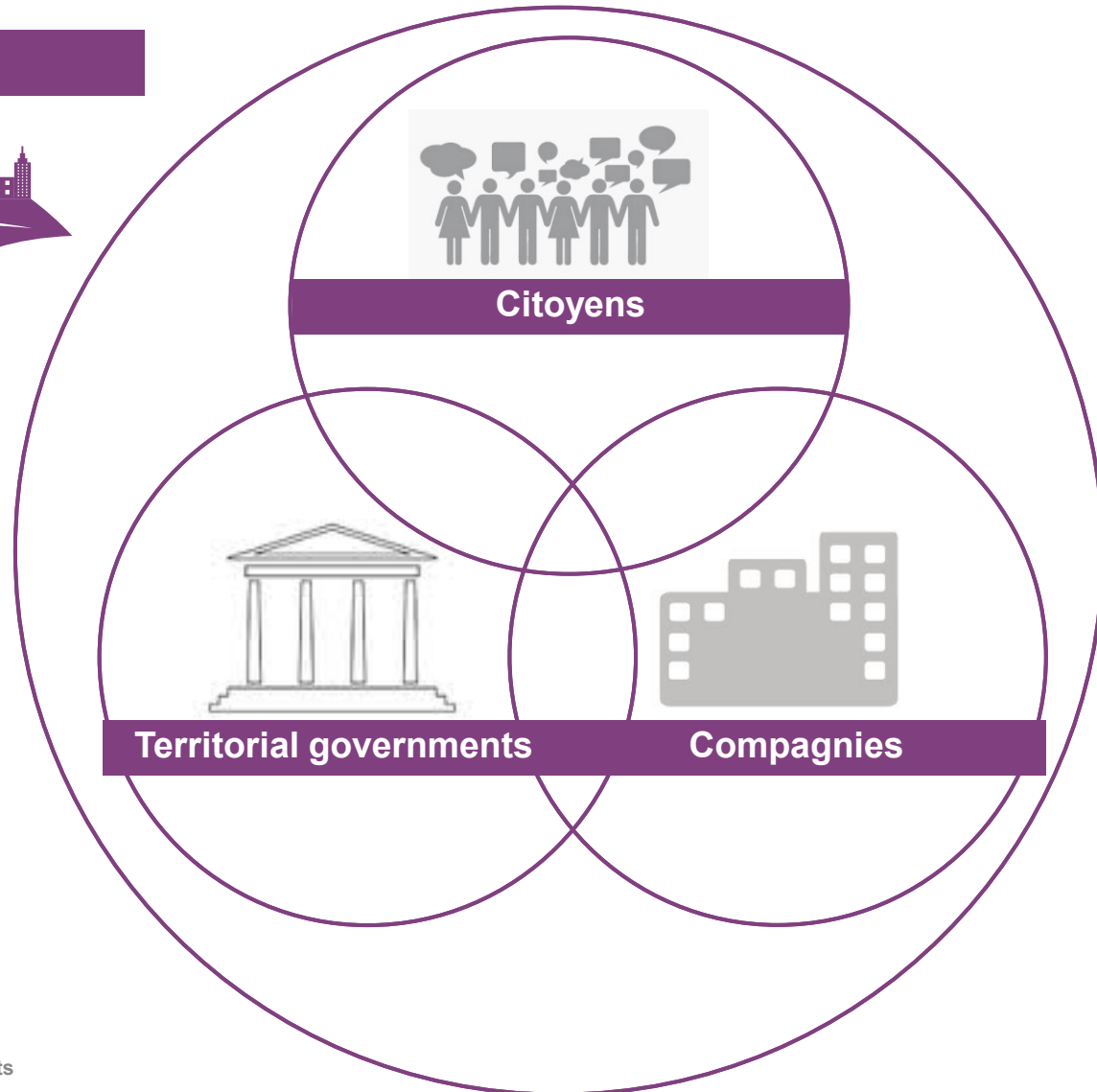
Concept of Urban resilience

Resilience describes the ability of a system to withstand or accommodate stresses and shocks such as climate impacts, while still maintaining its function.

- Resilience is aimed at **sustaining and enhancing the capacity to adapt to uncertainty and surprise.**
- **Resilience goes further than risk management**, it is more than coping or short-term survival, **it is enhancing city's attractiveness**
- **Comprehensive and holistic framework** that combines the physical aspects of cities with the less tangible aspects associated with human behaviour.
- **Not only an infrastructures matter**
 - Physical systems in the urban environment influence human behaviour
 - Promotion of **multi-sectoral approach, interdependencies between different systems**

Resilient City : for whom ?

Territories



VEOLIA

**Partner of the initiative by the
Rockefeller foundation**

« 100 Resilient Cities »

video



VEOLIA

**Value propositions
&
Solutions**

Resilient City : a response to Cities' needs

Market trends

- Demography
- Climate
- Economy
- Politics

Challenge: Economic development within cities that has to face growing impact of climate changes

Cities' challenges

Attractiveness

Sustainability

Competitiveness



Cities' expectations about « resilient » solutions

Efficiency

Safety

Quality of life

Recovery

Veolia's value propositions

Robust infrastructure

Resources conservation

Flood management

Critical Energy Supply

Heat waves mitigation

Critical event management

Cost-efficient adaptation and mitigation measures

The Strategic Resilient plan helps us to answer customer needs

Efficiency

Safety

Quality of life

Recovery

What are our value propositions?

Robust infrastructure

Supporting cities by the development and the management of adapted infrastructure able to withstand to the demographic growth and to the climate change impact

Resources conservation

In water stress conditions (hydraulic stress and growth in water withdrawal), reducing water footprint within the cities

Flood management

Helping cities to protect themselves against flood risks, to reduce their vulnerability in the long-term, to better handle crises and to accelerate the return to normalcy post-event

Critical energy supply

Supplying energetic solutions off grid to ensure the continuity of critical services

Heat waves mitigation

Reducing UHI effect by refreshing cities, minimizing the UHI and identifying vulnerable areas to improve public health

Critical event management

Critical events detection, anticipation, simulation, management
Accelerating the return to normalcy and the recovery of the city after a shock

How could we support you?

Consulting

Installations

Operations

Supervision

Shared value

ROBUST INFRASTRUCTURE

URBAN CONSULTING

Planning more resilient urban development

- Sustainable urban consultancy
- Labelling system : HQE, eco-neighbourhood
- Defining environmental strategies

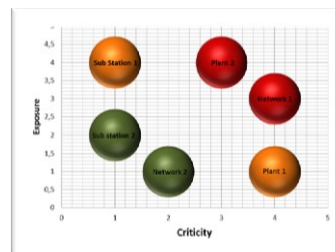


Simulation du développement de l'écoquartier en 3D

RISK ASSESSMENT

Identifying the risks, modeling and measuring their impacts

- Identify process and infrastructure weaknesses to improve them
- Establish action and investment plans to reduce, manage or transfer risks and prioritize actions



ASSET MANAGEMENT

Reducing total Cost of Ownership (TCO)

- Effective risk mitigation
- Efficient investment
- Extended life span of the assets

More resistant infrastructure are more attractive for investors.



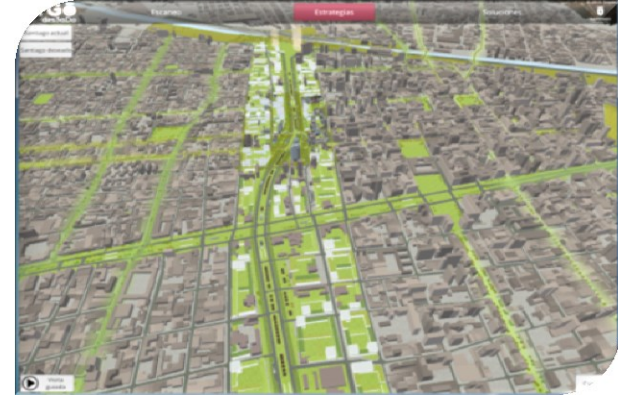
Urban consulting – Example of Santiago of Chili

City modeling & planning, 3D Urban simulator

Veolia has developed a methodology to assess City's Urban and Environmental strategy :
KEY2©Sustainable City

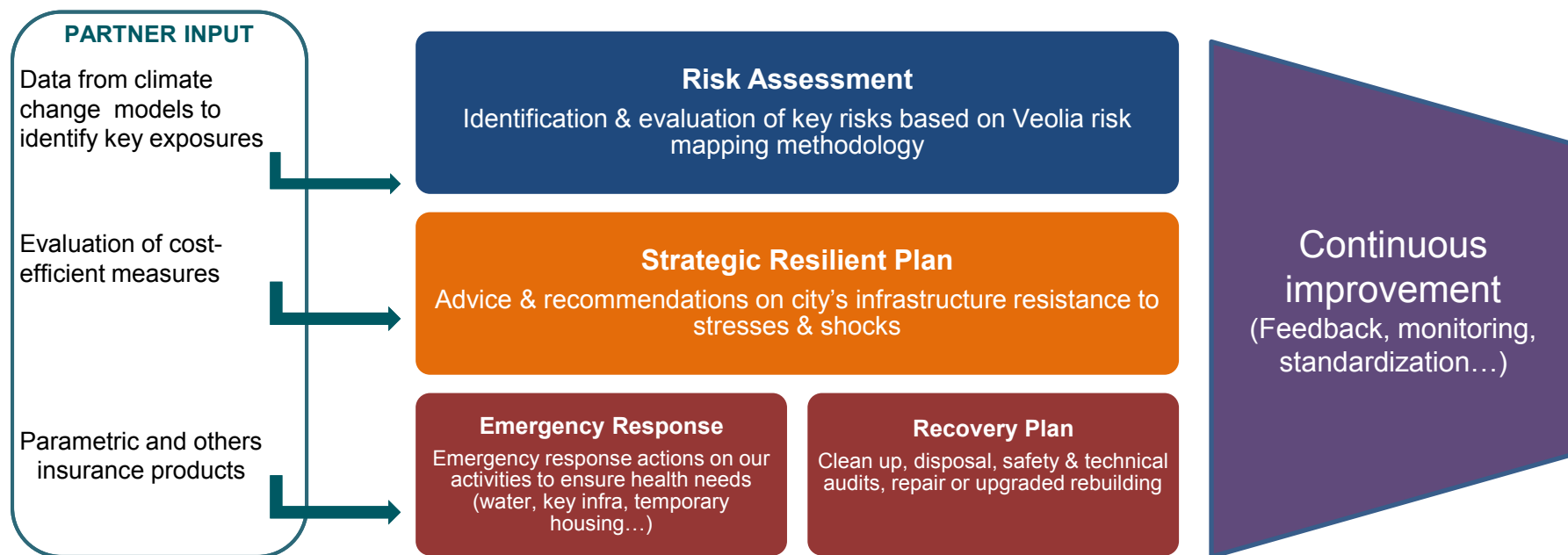


We propose to apply our methodology to the City Resilience characteristics



- 1 WELL-BEING IN THE CITY
- 2 NATURAL RISKS
- 3 URBAN DENSITY
- 4 CONNECTIVITY & NEW TECHNOLOGIES
- 5 NATURE IN THE CITY
- 6 USE OF RESOURCES
- 7 SUSTAINABLE MOBILITY
- 8 SOCIAL EQUITY
- 9 ECONOMY & EMPLOYMENT
- 10 CULTURAL IDENTITY
- 11 URBAN SECURITY

Proactive Resiliency – joint value proposition with insurance companies



A changing approach of risk management

- A **long term** urban strategy
- More **attractiveness and sustainability** for territories
- A favorable environment for economic development and improved **competitiveness of territories**

PARTNERSHIP

SwissRe & Veolia to conduct jointly risks assessment for New Orleans .



RESOURCES CONSERVATION

WIIX

Water Impact Index Water Footprint

The logo for Water Impact Index (WIIX) features the words "Water", "Impact", and "Index" in a light blue, sans-serif font, with vertical lines separating the words.

A tool developed to measure the impact of activities on a local water resource.

It is unique and it integrates volume, quality and local stress factors into a single indicator.

SMART NETWORK

Smart solutions for smart water management

Smart solutions are used to optimize the network management.

- Sensors, smart metering, hypervision to facilitate the real time detection of the leakage, the real time monitoring of the system and the water quality.



ALTERNATIVE TECHNICS

Reduce water withdrawals

Alternative technics exist to preserve water resources such as reuse water and desalination and aquifer recharge.



Example of Milwaukee: Managing wastewater and stormwater for resources conservation



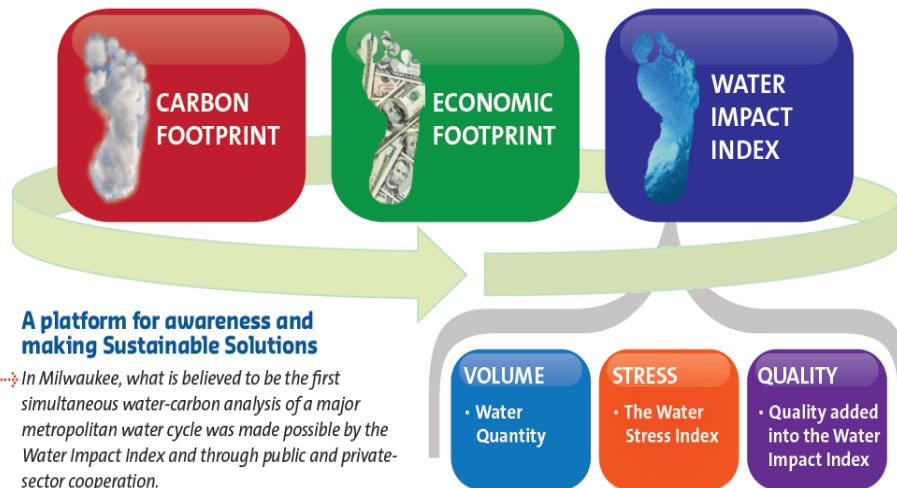
Since 2008, Veolia and the Milwaukee Metropolitan Sewerage District (MMSD) work around the clock to protect Lake Michigan - the community's most valuable resources - by providing high-quality wastewater treatment services.

The 10-year partnership agreement focuses on operation, maintenance and management of two large **wastewater treatment plants**, **19 pump stations**, **collection system**, **stormwater system** and **deep tunnel system**.

Water Impact Index

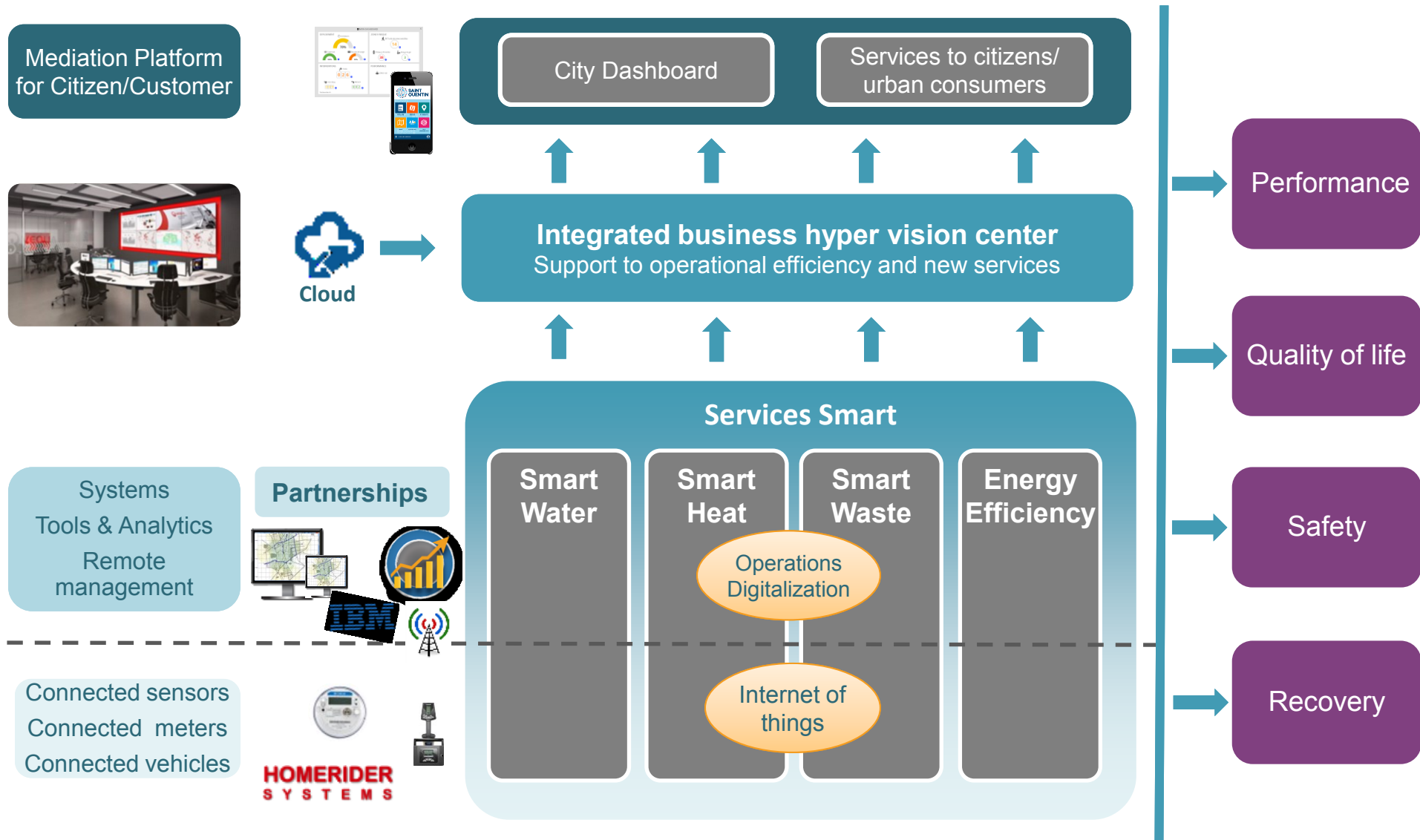
Clean Water act

Strict limitation of overflows



Veolia has achieved compliance with all environmental permit conditions. In fact, operations at Jones Island and South Shore have exceeded **water quality standards** on Veolia's watch, releasing treated effluent into **Lake Michigan** that is **far cleaner than what is required by EPA regulations** and **Wisconsin's Pollutant Discharge Elimination System (WPDES) permit**.

Successful resilient cities will be smart cities



Example of the Grand Lyon, an optimized water distribution system

Veolia, in partnership with IBM, sets up a smart solution of the water networks control

- Put in place automated responses to alerts
- Provide a systems-level view of operations
- Apply analytics to spot trends and make predictions

33,000 m3
of water saved daily after solution deployment

< 2-hour
response time to incidents expected through better work-crew deployment and use

Smart Water Benefits

EFFICIENCY

- Predictive maintenance
- Optimised assets renewal
- Leakage reduction
- Energy efficiency
- Demand management

QUALITY OF LIFE

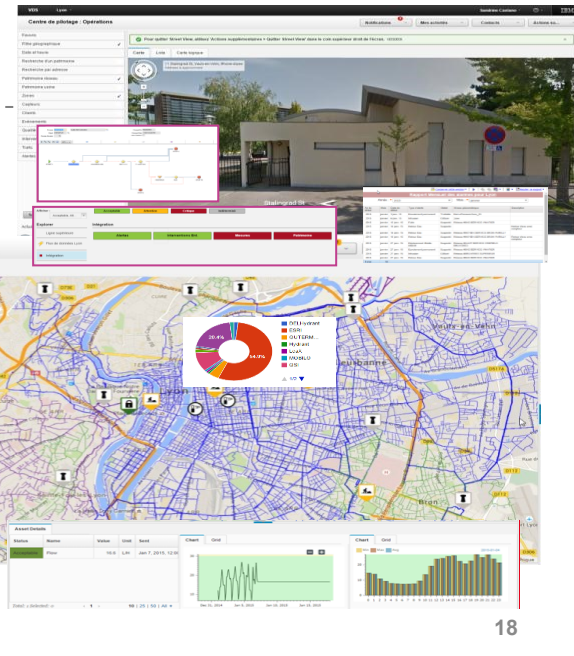
- Real time water quality monitoring
- Customer information and alerts

SECURITY

- Crisis management
- Flood management
- Detection of pollution

RETURN TO NORMAL

- Faster reaction to incidents
- Efficient dispatching of field crews



FLOOD MANAGEMENT

SEWERS NETWORK DYNAMIC MANAGEMENT

Insuring critical energy supply and territory autonomy

Managing in real time the sewer systems and the retention strategies to reduce flood in the city



RIVER BASIN MANAGEMENT

Identifying the risks, modeling and measuring their impacts

Piloting water basin fluxes, example of the Bièvre :

- Creation of a remote hydraulic regulation system
- Optimization of the retention means



GREEN INFRASTRUCTURE

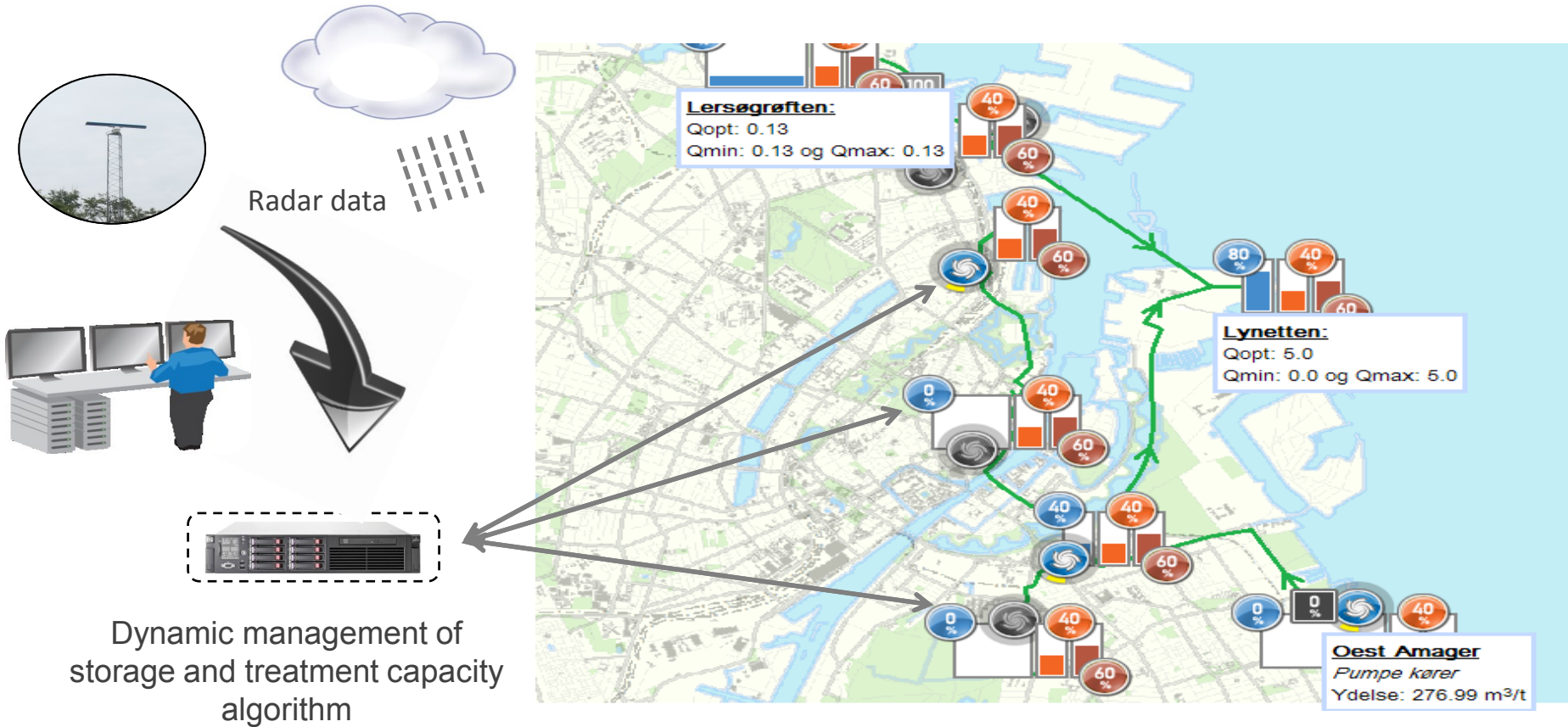
Developing urban green infrastructure

Increasing the well-being thanks to green infrastructure

- Reduction of the rain storms impacts on the sewer networks
- Living place improvement and area estheticism
- Positive effect on quantity and quality of water



Example of Copenhagen : Preventing floods



Anticipating rainy periods for an adapted monitoring of the sewerage system and of wastewater treatment plants



Overflows during rainy periods have been reduced from 100 to 10 occurrences per year

Benefits for Copenhagen : Quality of life



More green spaces and recreation areas
The harbour is now a swimming area

A greater environmental quality
90% less overflows in natural environment



Greater safety for all
Real time alert and information

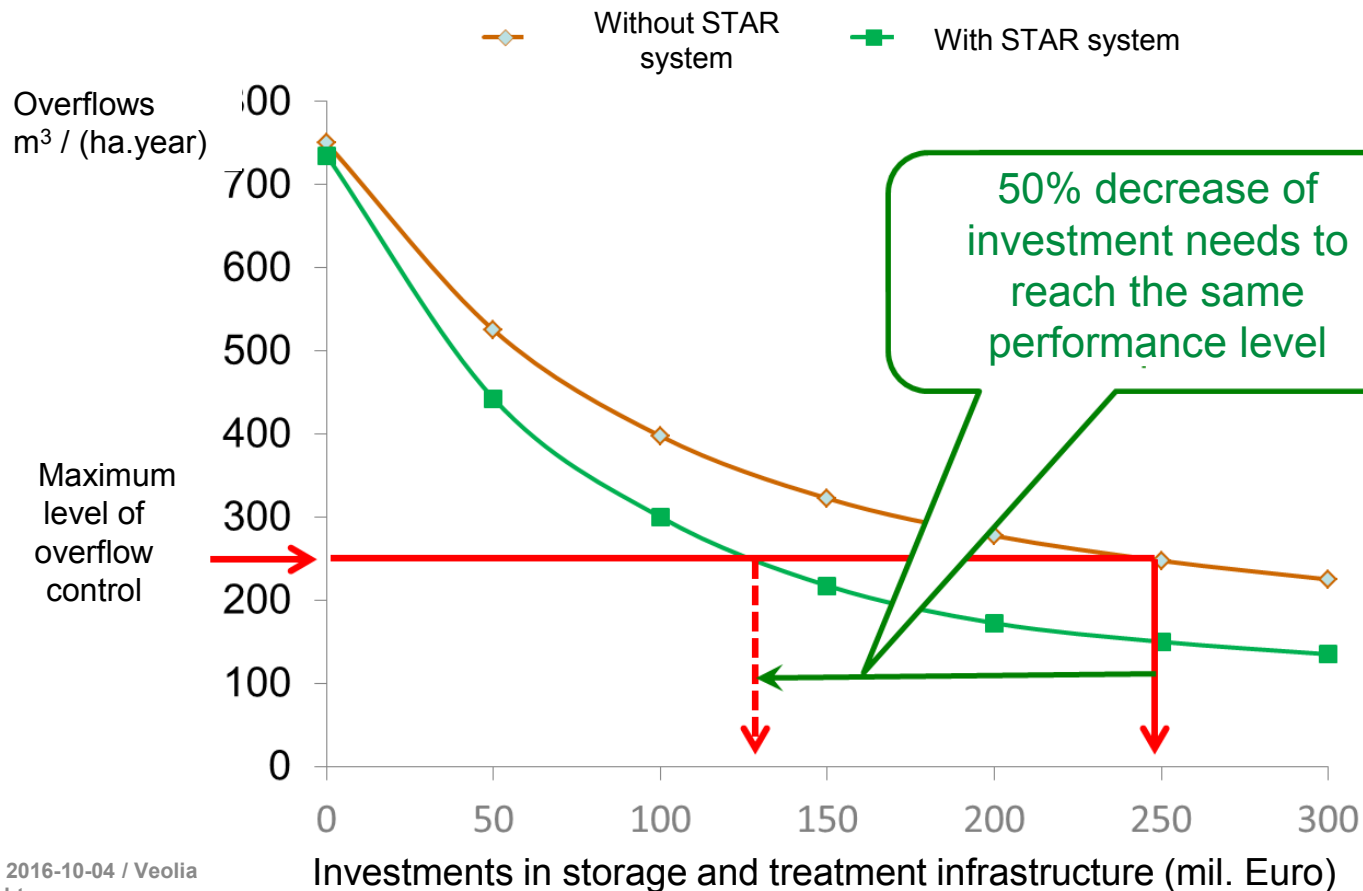
Quality of life and territory attractiveness



Example of Copenhagen : Optimization of investments

Overflows during rainy periods have been reduced from 100 to 10 occurrences per year :

- Millions of Euros of damage have been avoided
- Revaluation of the city's real estate



The promise of green stormwater infrastructure

Rain:Net – Optimisation of green infrastructure management

What is it?

Install Sensors & Telemetry in Green Infrastructure
 Developed by Veolia North America and the start up Opti.

How it works?



Rain Event

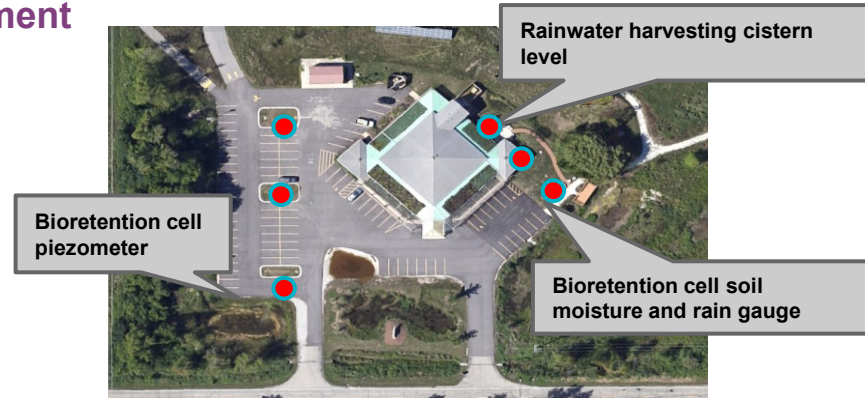
Evaluates Green Infrastructure Performance



Calculates & Reports KPIs
 ++ Prove performance

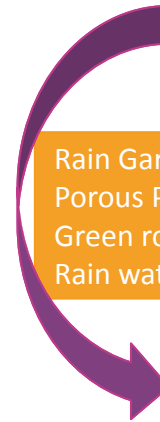


Alerts When Maintenance is Needed
 ++ Reduce OPEX
 ++ Increase efficiency



Key functions of green stormwater infrastructure:

- **Divert it:** Divert stormwater by infiltration it into the ground or by evapo-transpiration
- **Slow it:** holds stormwater flow and slowly releases it to the sewer system
- **Reuse it:** holds stormwater and uses it to meet non-potable water demands



Rain Garden
 Porous Pavement
 Green roofs
 Rain water harvesting



CRITICAL ENERGY SUPPLY

CHP

Remaining independant from the grid during extrem events

Power and thermal energy by recycling the captured heat from the electricity production into useful thermal energy:

- CHP technology converts up to 85% of fuel into useful energy
- CHP reduces fuel requirements (consumes 40% less fossil fuel than traditional technologies) and reduces failure risks.

VPP

Ensuring energy availability in critical situations thanks to industrial energy generation

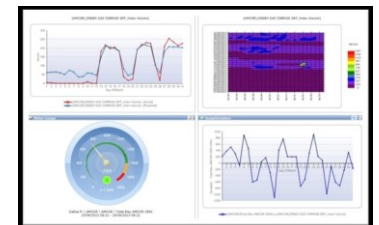
Guiding decentralised energy-generation facilities in critical time and enhance the production capacities of industrial sites to relieve the network.



ENERGY EFFICIENCY

Decreasing energy consumption

Reducing and controlling the energy demand :
Management of the energy consumption through piloting facilities.



Continuity of services: Building resilient cities includes connection to commercial and industrial challenges

The smart way to increase operation continuity in buildings/hospitals

Hubgrade

CUSTOMER

BUILDING

- Wi-Fi Connection
- I Cloud
- ...



HUBGRADE Reporting

- Customer reporting via website



RESOURCE USE



REMOTE CONTROL CENTER

ANALYST

- Data control and analysis
- Alarm signal in case of malfunction
- Corrective action plan



MANAGER

- Creation of operating sheets
- Dispatch of operating sheets
- Emergency action plan

OPERATORS

- Receiving intervention
- Interventions on site



TECHNICAL UNIT

Critical Energy Supply all over the world

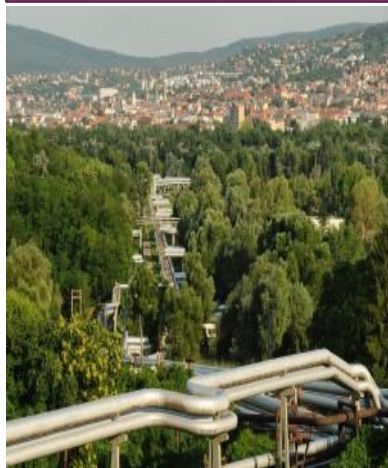
- Veolia has provided solutions to manage risk of both power and thermal energy shortages
- We guarantee secure supply of energy through cogeneration, energy storage, biomass solutions and independence from the grid
- Our solutions can be implemented at district level and also at local level

Energy storage
(Boras, Sweden)



- Become a "green municipality"
- Improve operational flexibility
- Decrease auxiliary fossil energy

Biomass (Pécs, Hungary)



- Reduce dependency from primary fuels and mitigate risks from energy shortages
- The city could switch completely to green heating mode

Hospital complex (Milan, Italy)



- Operations in islanding mode
- Lower its fuel consumption
- Reduce the environmental impact
- Tri-generation and secure energy supply

Combined heat and power (NYU, US)



- Decentralized power generation
- Independence from the grid
- Continuity of critical services
- Secure Energy Supply
- Efficient Energy production

HEAT WAVES MITIGATION

VULNERABILITY STUDY

Evaluating the exposure to UHI and identify the sensible populations

Availability for cities of diagnostic tools in the aim to propose short, middle and long term solutions to reduce the vulnerability of their territory, in particular for the most vulnerable population.



URBAN MONITORING

Real time management of the UHI to inform populations

An urban monitoring service allows a quality of life improvement within the city :

- Tracking UHI and the mitigation measures performance

And other services:

- Air quality and pollution levels, pollen pics
- Noise monitoring in sensitive areas
- Temperature, humidity, and meteorological data

• ...



MITIGATION OF UHI

Humidification of the pavement and revegetation

Reducing Urban Heat Island effect by refreshing cities

Simulating micro-climate on existing or in development neighbourhoods

Setting up mitigation solutions



CRITICAL EVENT MANAGEMENT

PEPARED EMERGENCY RESPONSE PLAN

Ensuring critical aid with emergency response actions on our activities

- Quickly mobilized in case of extreme event to faster the activity recovery
- Response team (in coordination with local city emergency response services if required depending on gravity of event)



DEPOLLUTION

Protecting population health and managing dangerous pollutions

Setting up of depollution solutions

- Wasteland rehabilitation
- Depollution of actives sites
- Sites monitoring
- Safety procedures in case of accidental pollution



. Nuclear Pollution in Fukushima, Japan
. Tianjin disaster, China

RECOVERY SERVICES

Clean up, disposal, safety audits, repair or upgraded rebuilding

- Reducing the recovery time and disruption to daily life in avoiding a cascade effect
- Reducing cost of business interruption
- Optimizing the risk insurance coverage

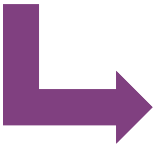


Exemple of New Orleans: Hurricane Katrina Recovery



The East Bank Wastewater Treatment Plant is located on the east bank of the Mississippi River and serves the entire East Bank of Orleans Parish.

In August 2005 Hurricane Katrina devastated the Gulf Coast and left the East Bank wastewater treatment plant under 20 feet of water. Immediate recovery efforts were successful with treatment restored in just three months. Long-term planning and recovery continues until this day :



- After 30 days: Plant was dewatered
- After 45 days: Facility was receiving 30 MGD
- After 95 days: Secondary treatment was restored

Since Katrina, the Federal Emergency Management Agency (FEMA) has obligated \$244 million in wastewater system recovery projects, including the continued rehabilitation of the plant and repair or replacement of pumping stations and other key infrastructure.

Thank you!
감사합니다!

Contact



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