Veolia's water solutions for more resilient Cities

The way forward /
Disaster Resiliency Measures & Capacity Building

WATER ECO-SECURITY 2015
Experience Sharing Workshop

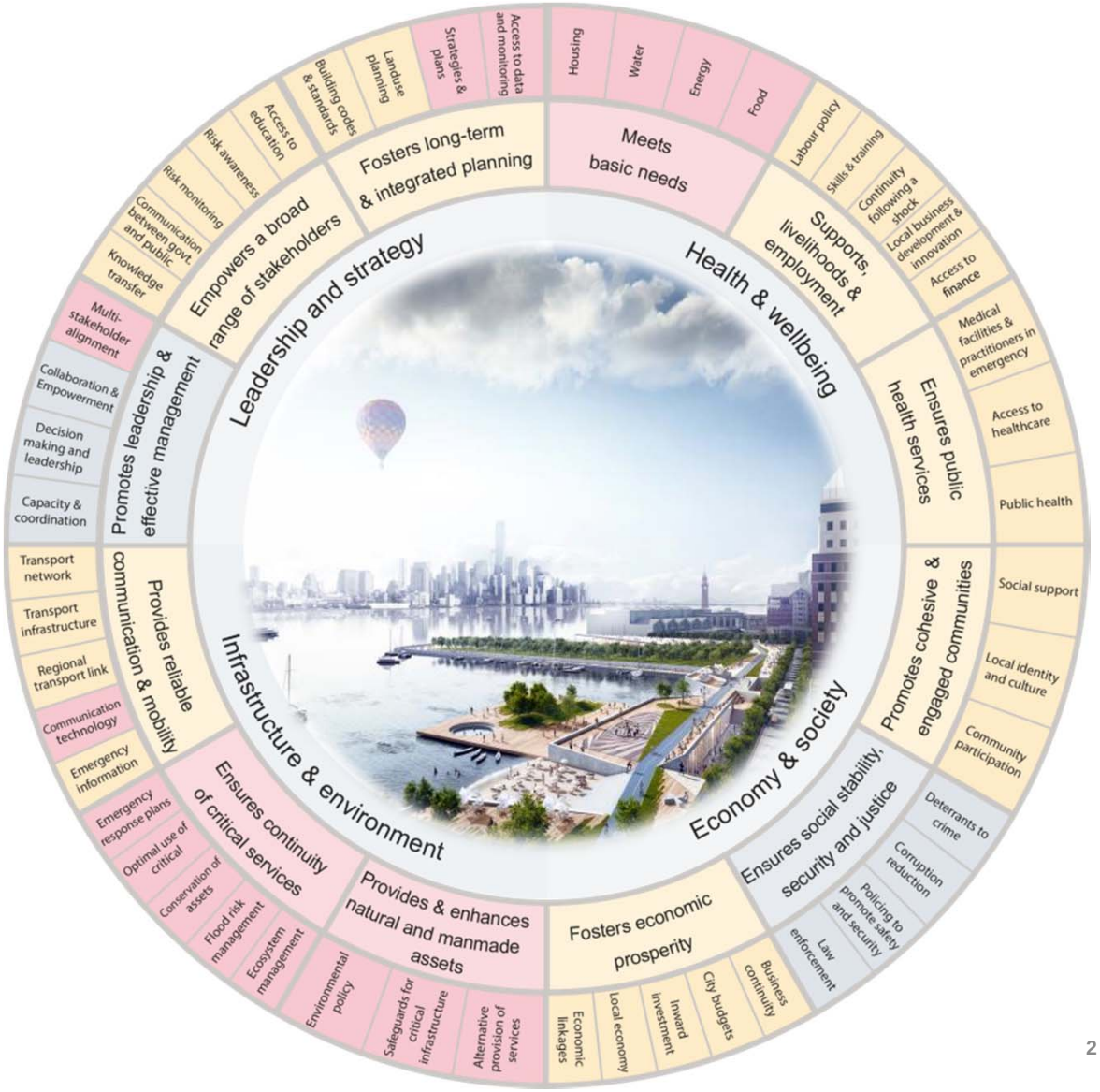
5 December, 2015

Veolia’s approach on Resilience

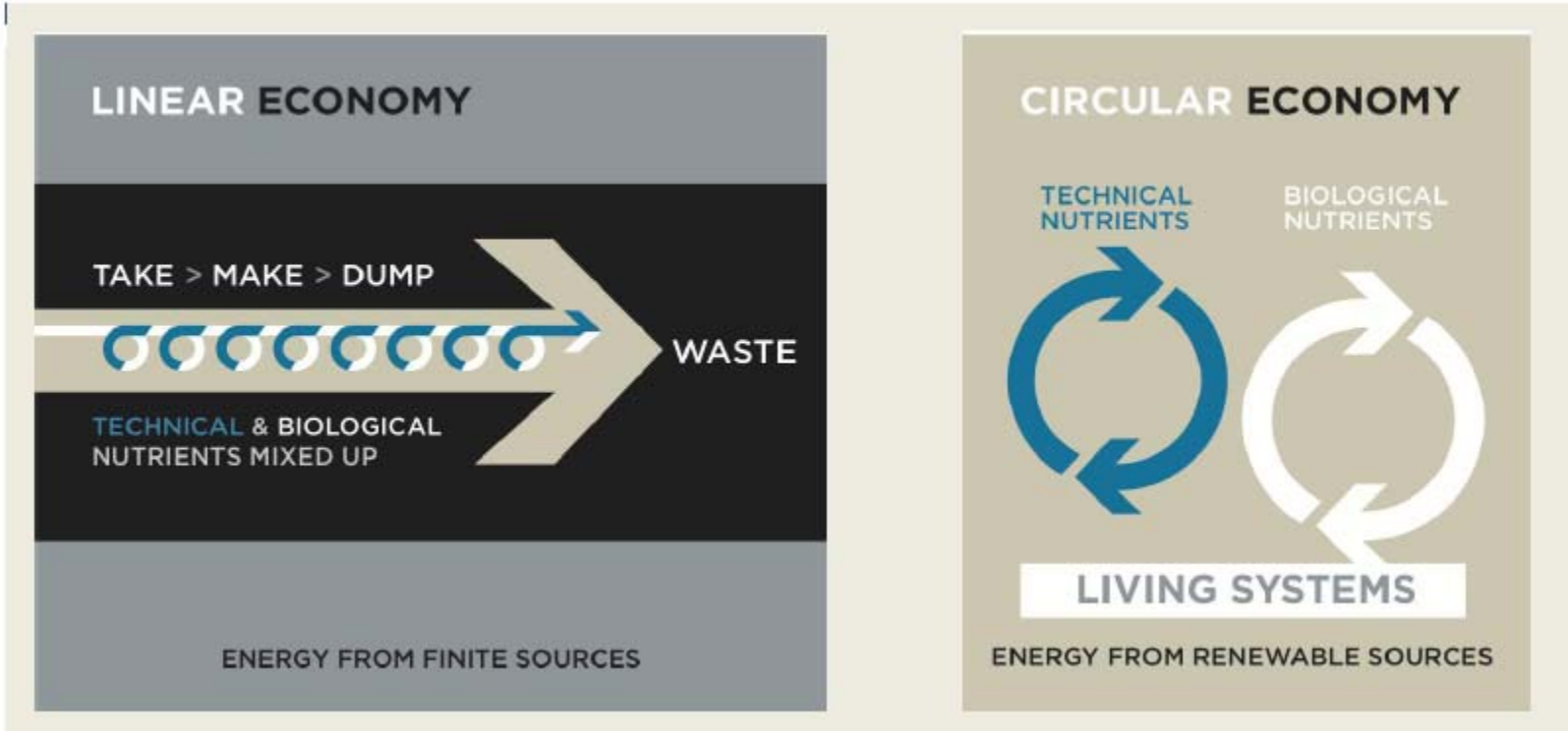
VEOLIA’s core competences

VEOLIA’s contributions

The Veolia’s resilient approach ensures that cities can perform effectively in the future.
Cities are equipped, organized and skilled to adapt and anticipate/overcome major risks.



Circular Economy is a shift in our way to think the way we do business



"A circular model based on reusing resources, regenerating natural capital, and designing for reuse".
Rethink and redesign, reduce, reuse, recycle, dispose

Source: EMF

1. Circular economy and water: Reuse

Recycling wastewater in Windhoek, Namibia

Context

- Average rainfall 250 mm/year
- 83% of this water evaporates because of the heat
- 1% filters down into the groundwater
- Groundwater = 40% of the country's requirements
- City suffers from chronic water shortage

Water consumption must be regulated

Veolia's solution

- Veolia and its partners have managed a potable water treatment plant in Goreangab since 2002
- The facility purifies large volumes of treated wastewater coming from the nearby wastewater plan
- It produces drinking water for nearly 300.000 inhabitants

Windhoek is one of the only cities in the world to recycle its water for domestic use, and the only one to do so on this scale

Case study Windhoek, Namibie

VEOLIA

RESILIENCE, Municipal, Windhoek, Namibie
Wastewater recycling for potable purposes

KEY INFORMATION AND FIGURES

CONTRACT SCOPE
Site: Windhoek, Namibia
Scope: Wastewater treatment plant

CONTRACT DATA
Duration: 20y
Contract type: concession,
Annual turnover: 4m€

INFRASTRUCTURES
1 recycling plant: Goreangab – 21,000m3/d

The challenge

The context

- Rapidly growing conurbations such as Windhoek or coastal cities (Swakopmund, Walvis Bay) undergo severe water scarcity issues, which call for considerable infrastructure expenses in order to reinforce water supply.
- In agreement with municipalities, the plant's operating contract needs to follow strict requirements, notably in terms of water supply quality – as the water will be drunk in the end – and in terms of procedures to follow.

The needs

- Catering for growing water demands from the population (+5%) as the country suffers from severe water scarcity issues
- Exploiting a pioneer plant for pre-purified wastewater recycling for drinking purposes
- Transferring competences in drinking water production and recycling to local authorities

350,000 inhabitants catered for	7.6 million m3 of potable water	35% of daily water demand

WATER SOLUTIONS

Veolia's solution

- The hydraulic stress that Windhoek undergoes has led the city to recycle domestic waters three decades ago onward, thus catering for more than 30% of daily water demand.
- The Goerengab plant allows the Namibian capital to consequently increase its drinking water supply (multiplied by 3).
- The plant produces up to 35% of daily water demand.
- In addition to important environmental aspects, he plant also produces cost-effective water for industrial purposes.

PLANET

Recycled water for drinking and industrial purposes.

WOMEN & MEN

100% Namibian people are employed (technical and management)

The benefits for our client

- From 5.8m to 7.6m m3 of drinking water annually available for city populations
- Efficient competences transfer for water production and recycling: personnel is composed at 100% of Namibian people, for both technical and management jobs.

Update: 2015
Contact: Africa

Coordinated by: Pauline Dumons
Innovation & Markets

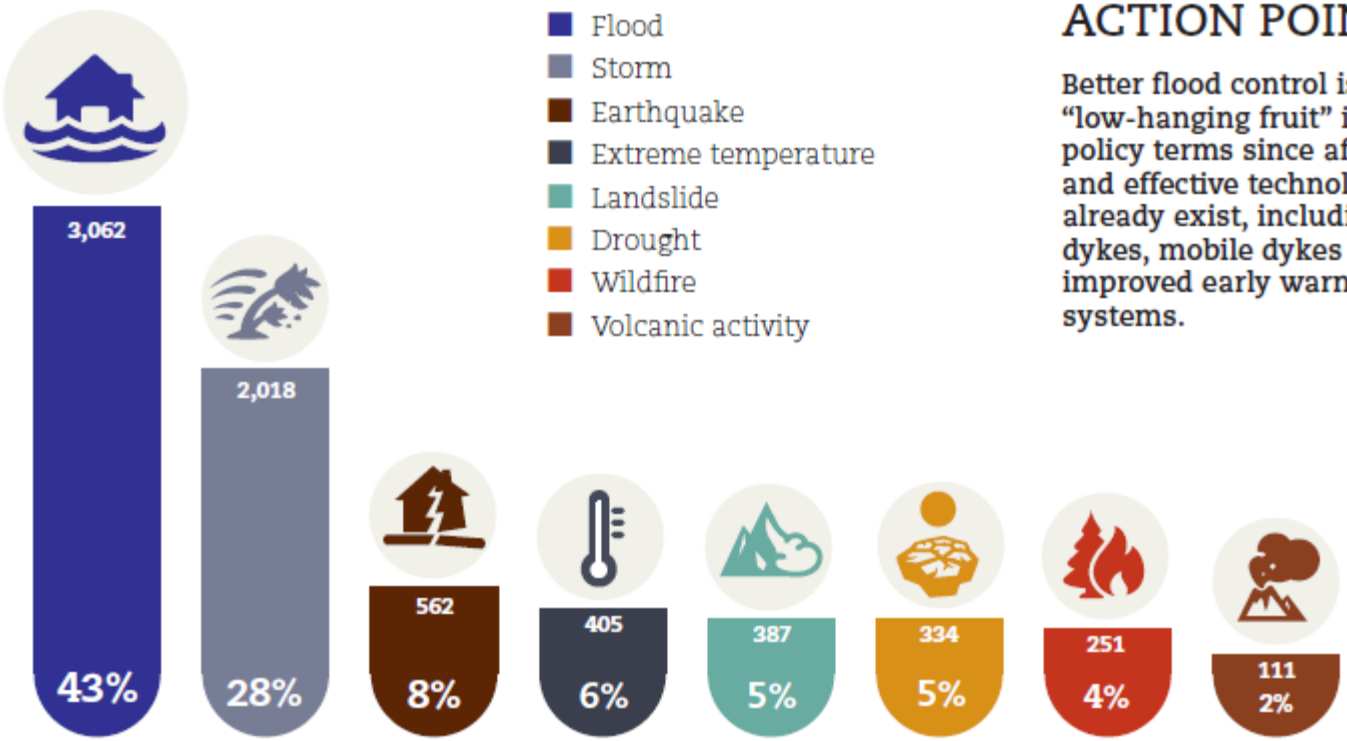
MUNICIPAL OFFER

RESILIENT

2. City resilience
to withstand water shocks and stresses

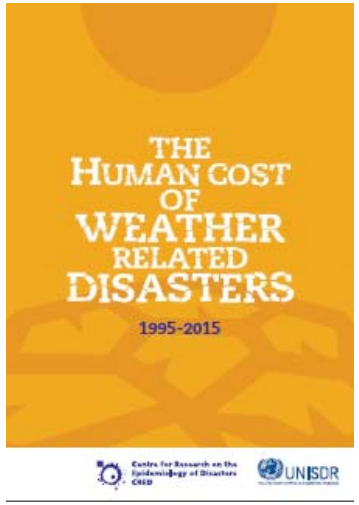
UNISDR : United Nations International Strategy for Disaster Reduction
The Human Cost of Weather related Disasters
1995-2015 (report issued on 20/11/2015)

Percentage of occurrences of natural disasters by disaster type (1995-2015)



ACTION POINT

Better flood control is one "low-hanging fruit" in DRR policy terms since affordable and effective technologies already exist, including dams, dykes, mobile dykes and improved early warning systems.



UNISDR : United Nations International Strategy for Disaster Reduction
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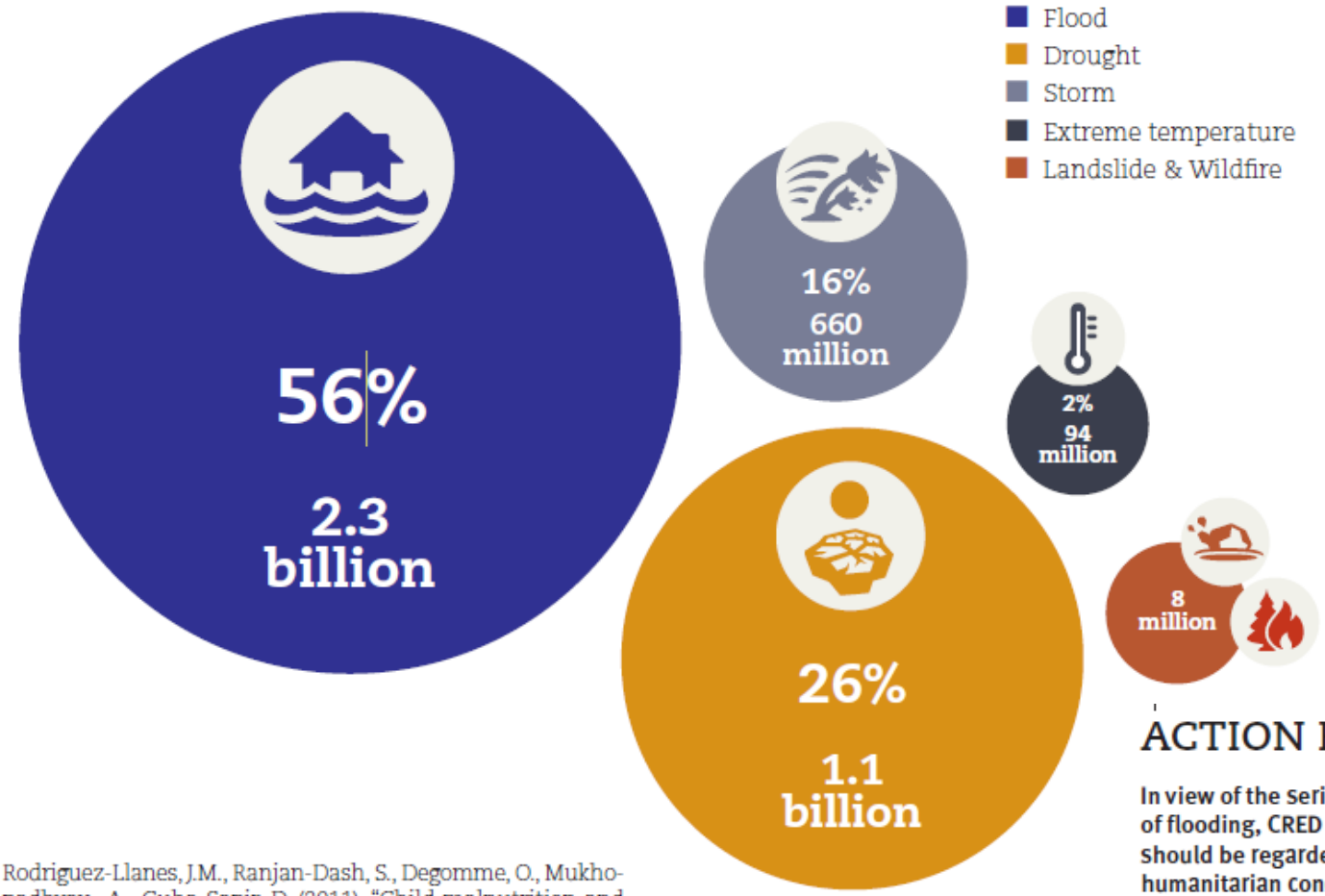
Numbers of people affected by weather-related disasters (1995-2015)
(NB: deaths are excluded from the total affected.)



[3] Rodriguez-Llanes, J.M., Ranjan-Dash, S., Degomme, O., Mukhopadhyay, A., Guha-Sapir, D. (2011). "Child malnutrition and recurrent flooding in rural eastern India: a community-based survey". BMJ Open 2001;1: e000109.

ACTION POINT

In view of the serious health and socio-economic impacts of flooding, CRED and UNISDR believe that flood control should be regarded as a development issue as well as a humanitarian concern. Priority should be given to cost-effective mitigation measures in poor regions at high risk of recurrent flooding, together with malnutrition prevention programmes.

UNISDR : United Nations International Strategy for Disaster Reduction
The Human Cost of Weather related Disasters
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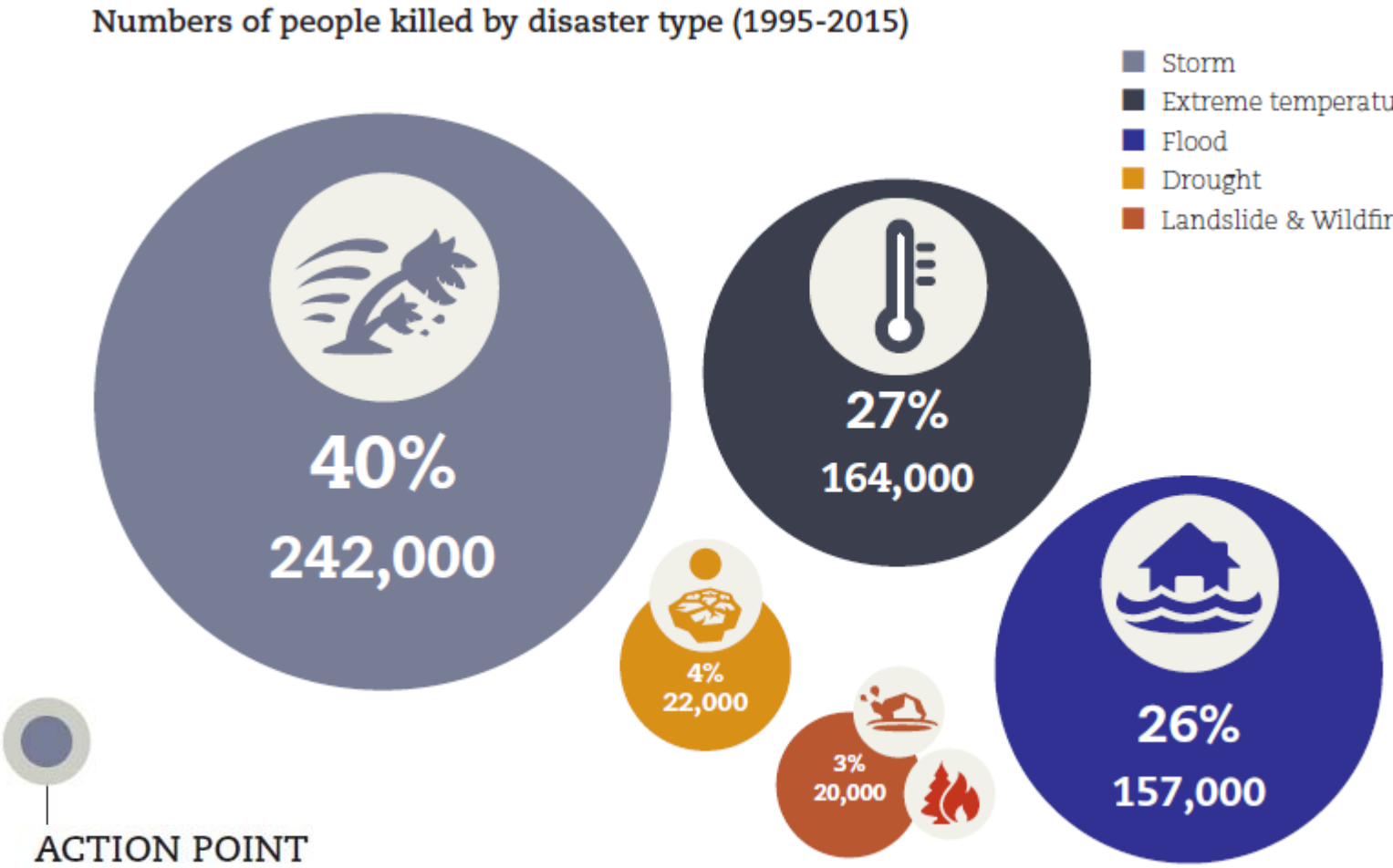


ACTION POINT

More effective deployment of storm early warning systems could save many more lives in future, particularly in poor rural communities at higher risk. Proven life-saving measures, such as cyclone shelters and wind-resistant buildings, are also options which (according to resources available) could help protect vulnerable populations.

Floods

Two different flood situations…
… with the same kind of solution :
Risk control by a good regulation of flows

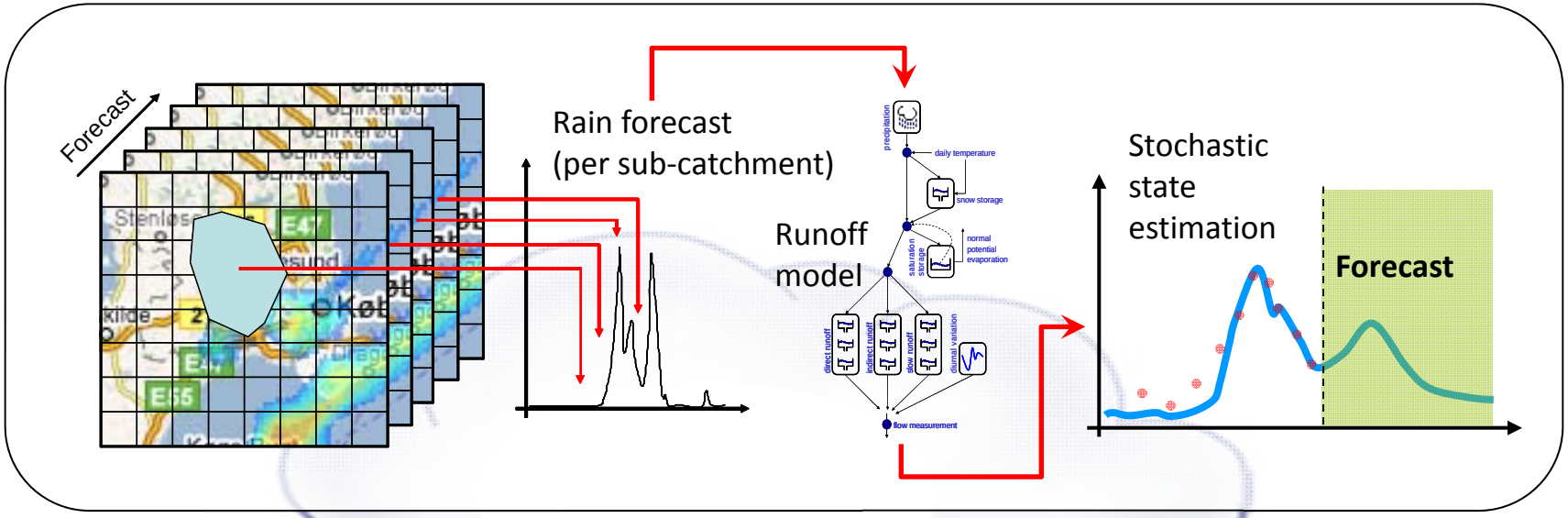
- Floods from rivers and other water courses from the hydrological system

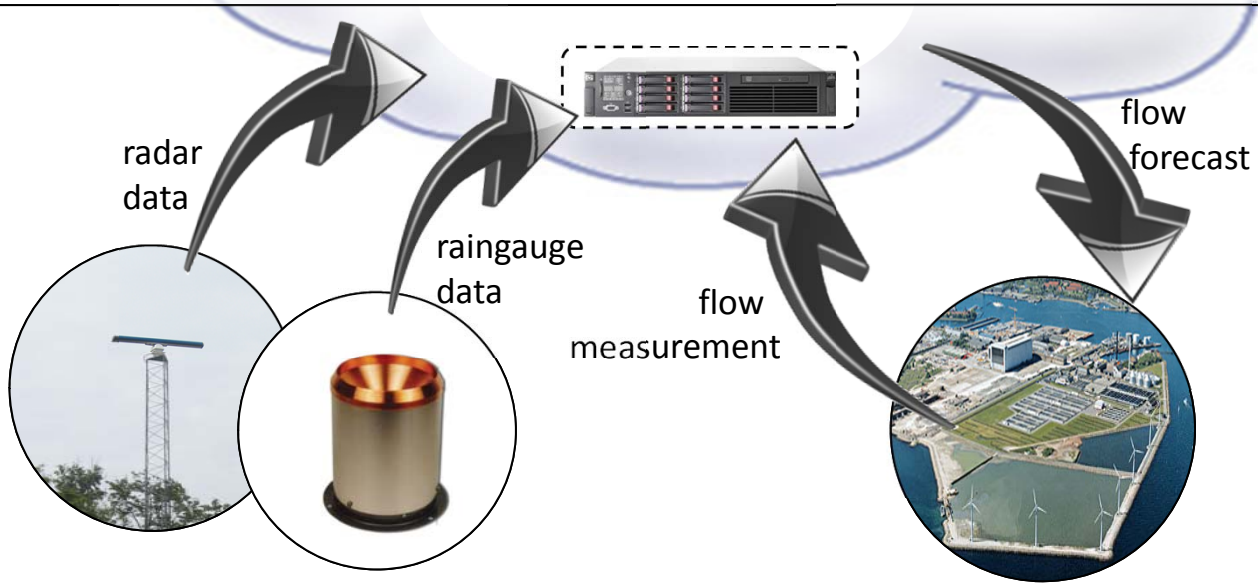
- Flood from overflow from urban sewerage system, also called “urban pluvial flooding”

How to help
extend the return period
of rain "limit" (tipping point)
with a good flow management ?

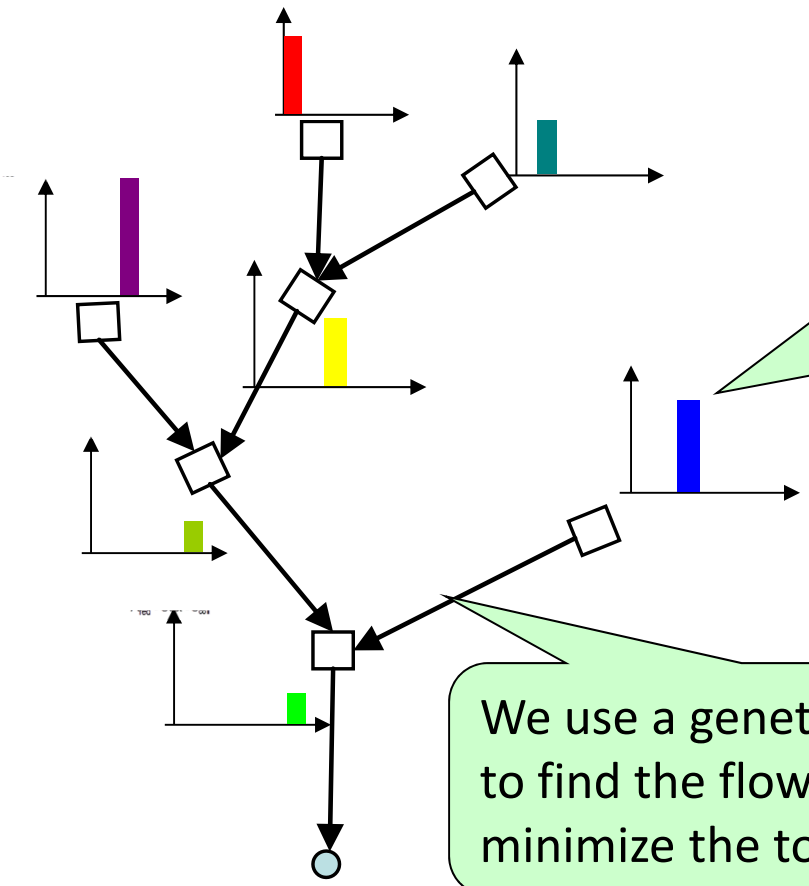
Copenhaguen

Copenhaguen: STAR Utility Solutions PREACT





Copenhaguen: STAR Utility Solutions
Sewerflex



Calculate risk at each section:
- forecasted flow
- storage filling
- connected area
- anticipated impact (prioritisation)
- transport capacities
- treatment capacity

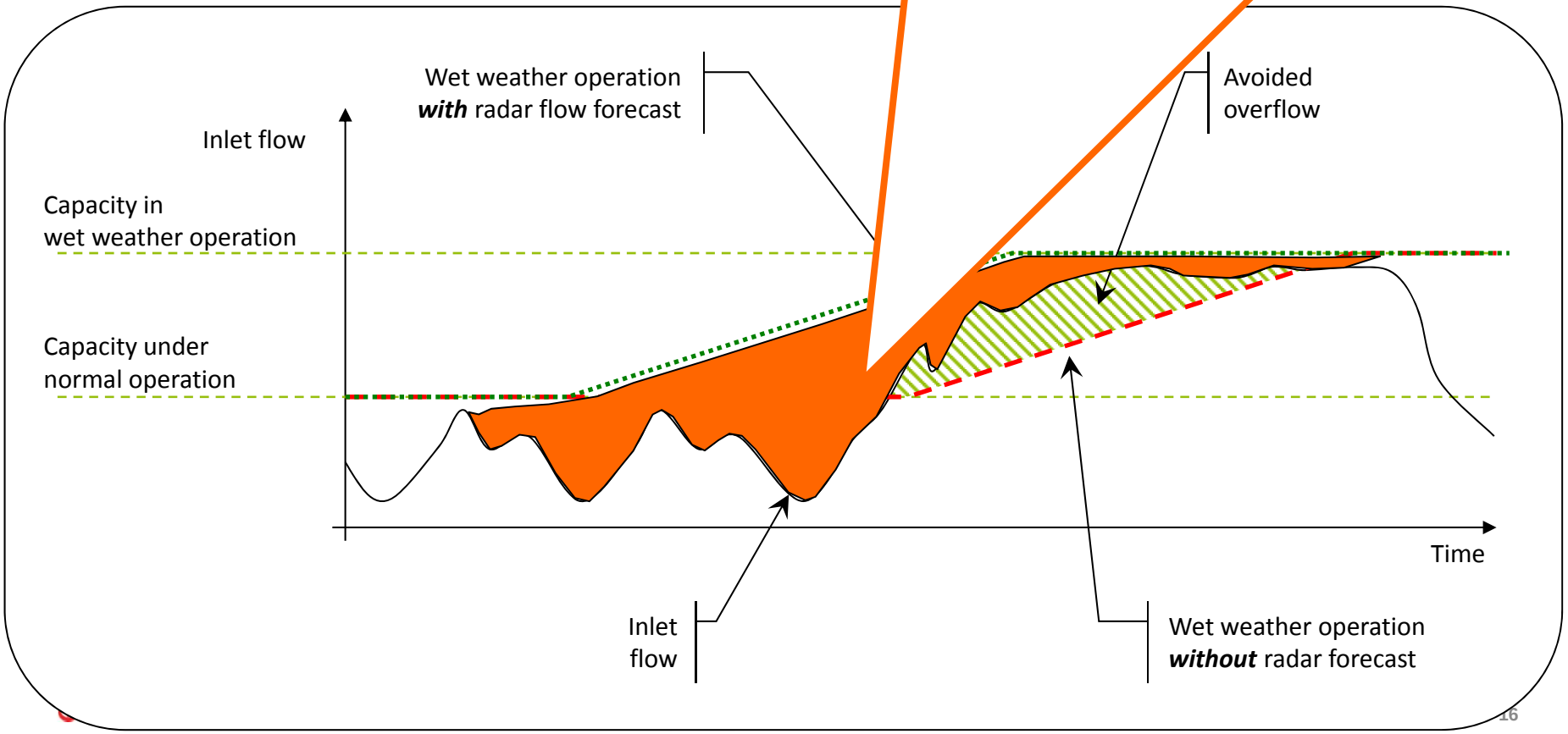
We use a genetic algorithm to find the flows that minimize the total risk.

General Algorithm

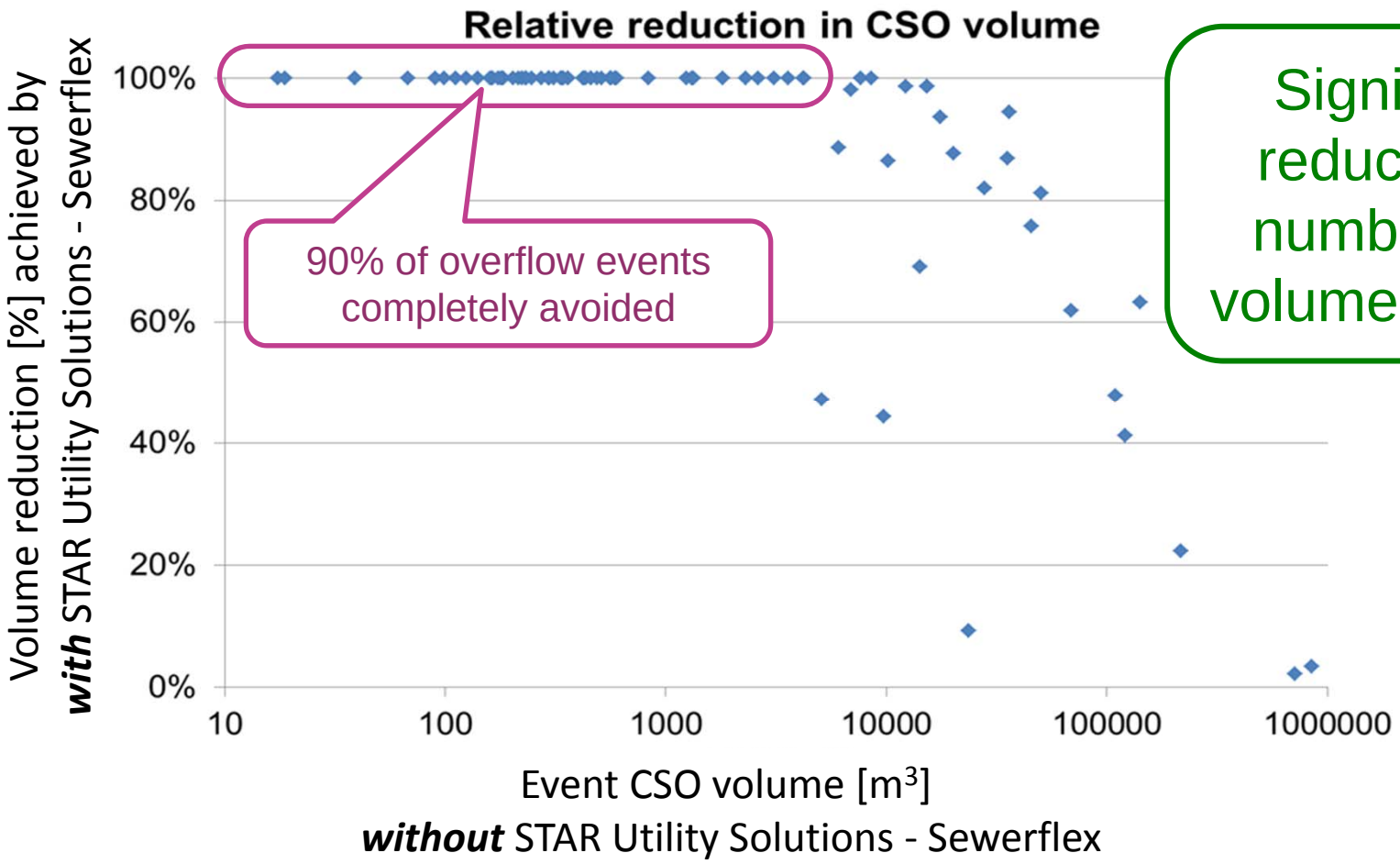
The genetic algorithm is a mathematical search engine use to find the optimal flows within the network that minimise the total risk of overflow.

Copenhaguen: STAR Utility Solutions

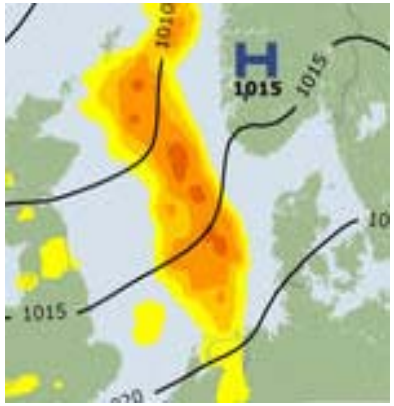
Avoid combined sewer overflow
(flow forecast + wet weather operation) + integrated real time control



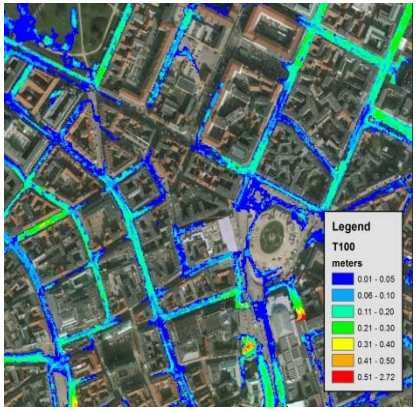
Copenhaguen: STAR Utility Solutions

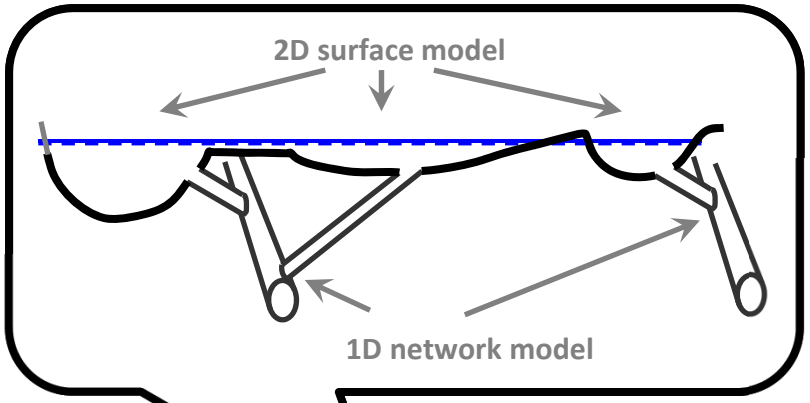


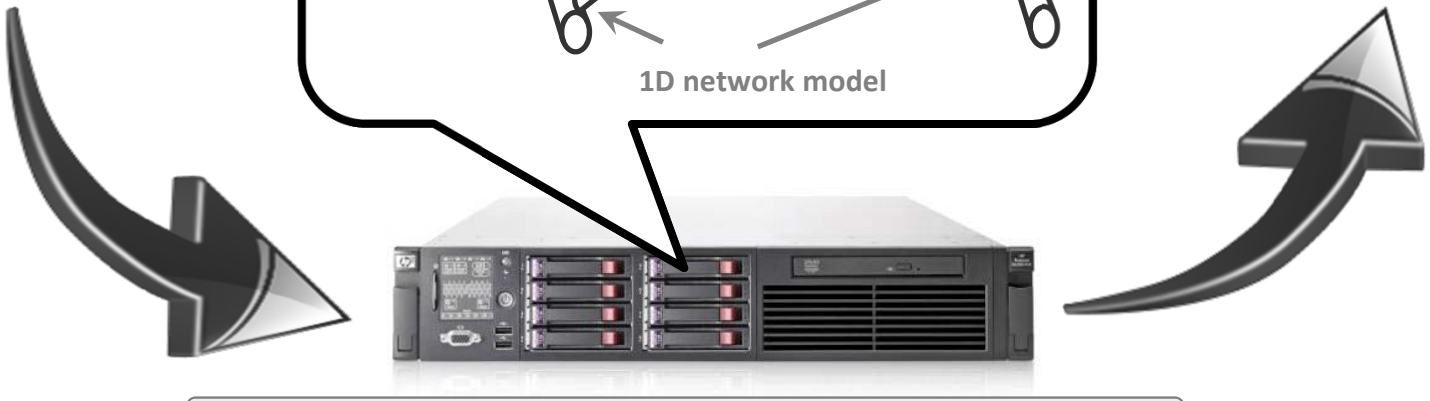
Copenhaguen: STAR Utility Solutions SURFF



Numerical Weather Model Forecasts





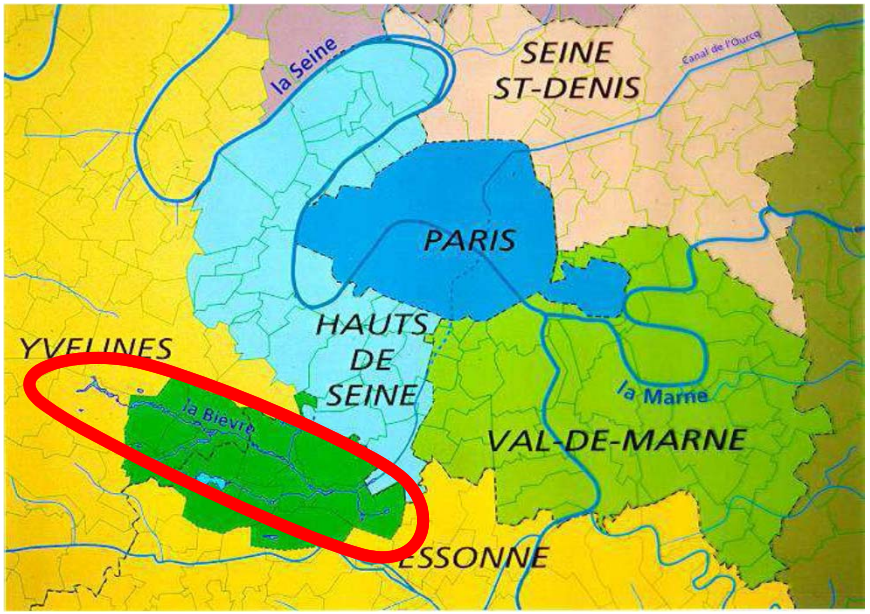


Re-calculation of flood forecast once every hour

Copenhaguen: STAR Utility Solutions SURFF

- Flood forecast during extreme wet weather events
- Know where floods will occur before they happen
- Contingency action (road closures, barriers, sms etc.)

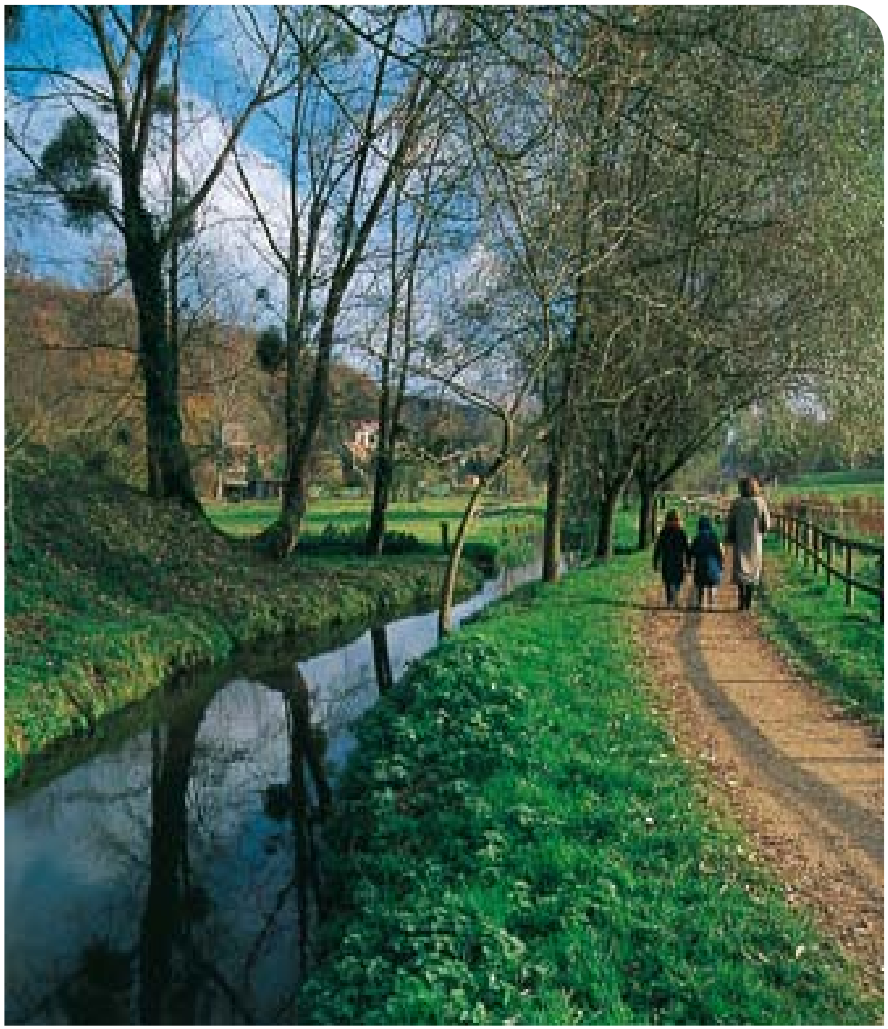
Catastrophic flooding in The Bièvre Valley (France)



1973


1982

The Bièvre : Guard against risks of flooding



- Two additional reservoirs with a capacity of 64.000 m3
- Creating a remote management system and dynamic and automated hydraulic control
- + Soil sealing control strategy in order not to increase runoff in the valley

The Bièvre : Automated management system
No more major flood since its implementation

No major overflow :

- 6 rainy events since 1995
- including the two extreme rainfalls of 2001

On July 6, 2001, it fell 55 mm in two hours in the valley

Bièvre Valley, Municipal, RESILIENCE

SIAVB Syndicat intercommunal pour l'assainissement de la vallée de la Bièvre

FLOOD RISK MANAGEMENT

Bievre Valley

FRANCE

CONTRACT SCOPE

Site: Bievre Valley

Scope: hydraulic management

CONTRACT DATA / Bievre

Duration: 5 year contract renewed since 1992

ACTIVITY SECTOR

Resilient City, well being

EXPERTISE

Monitoring, modelling, decision support

The challenge

Floods prevention in the Bièvre valley

The company VEOLIA, in charge of the hydraulic regulation in the Bièvre Valley uses hydraulic management for its remote control management system.

The numerous floods that occurred in the Somme, the Marne or the Seine river in the early 1980s and during the first quarter of 2001 made flood prevention the forefront of the news.

Veolia's solution

The hydraulic management system implemented by Veolia for the control of the swelling of the Bièvre, tributary of the Seine, South of Paris, enables to prevent flood risks and to protect the inhabitants of the valley from the swelling of the Bièvre. Statistically, the protection has improved from a 10-year-period to a 20-year-period with the same infrastructure.

The management of the outflows is carried out thanks to the maintaining of a maximum limit of water in canals, limit of overflowing, so as to optimize the hydraulic transfer capacity.

The hydraulic management system | **Since 1992** | **ALERT**

The benefits for our client

This system interests the professionals working in this field and the local authorities who really know the consequences of important floods.

We can thus think that, in the coming years, hydraulic management systems such as the one implemented in the Bièvre Valley will be developed.

Process description

First of all, ALERT informs the selected operators of the actions undertaken by the automatic hydraulic management system of the Bièvre Valley.

The important information regarding the level measures, rate of flow, rate of flow variations are transmitted so that a specialist could judge if the actions undertaken by the automatons are appropriate and efficient.

Each reservoir possesses its own technical warehouse which enables the measurement of the level, the flow, the flow variation and the automatic command of the opening and closing of the floodgates. As they are conceived as chalets, they are in perfect harmony with the natural environment.

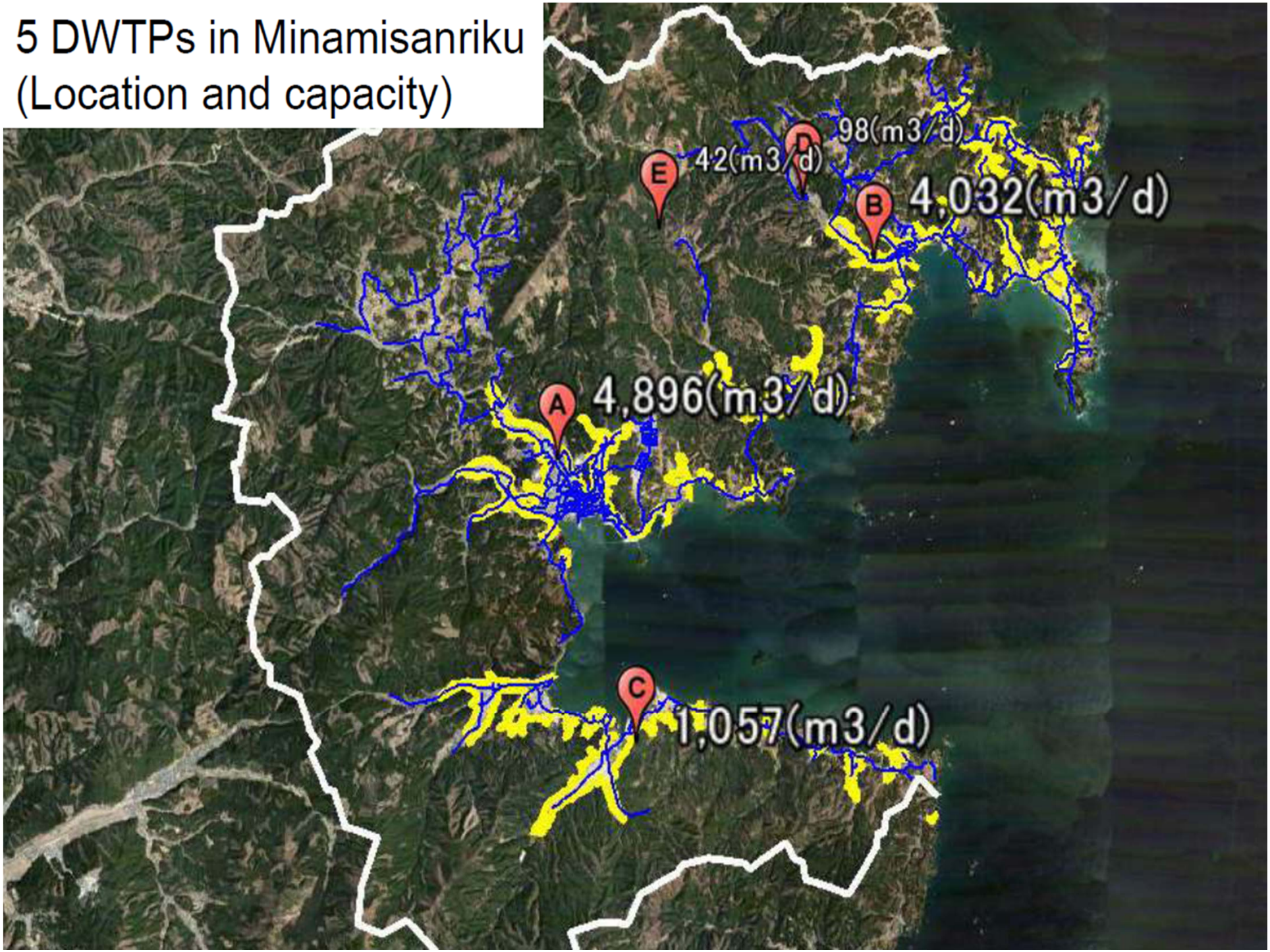
Then, ALERT transmits the whole alarms to the operators selected in the on-call schedule of the software. Thus, every functioning defects (motorized gates, automatons, measures, power cuts, UPS, …), intrusion in the technical building or defect (stuck cut branches, etc…) is immediately signaled by ALERT.

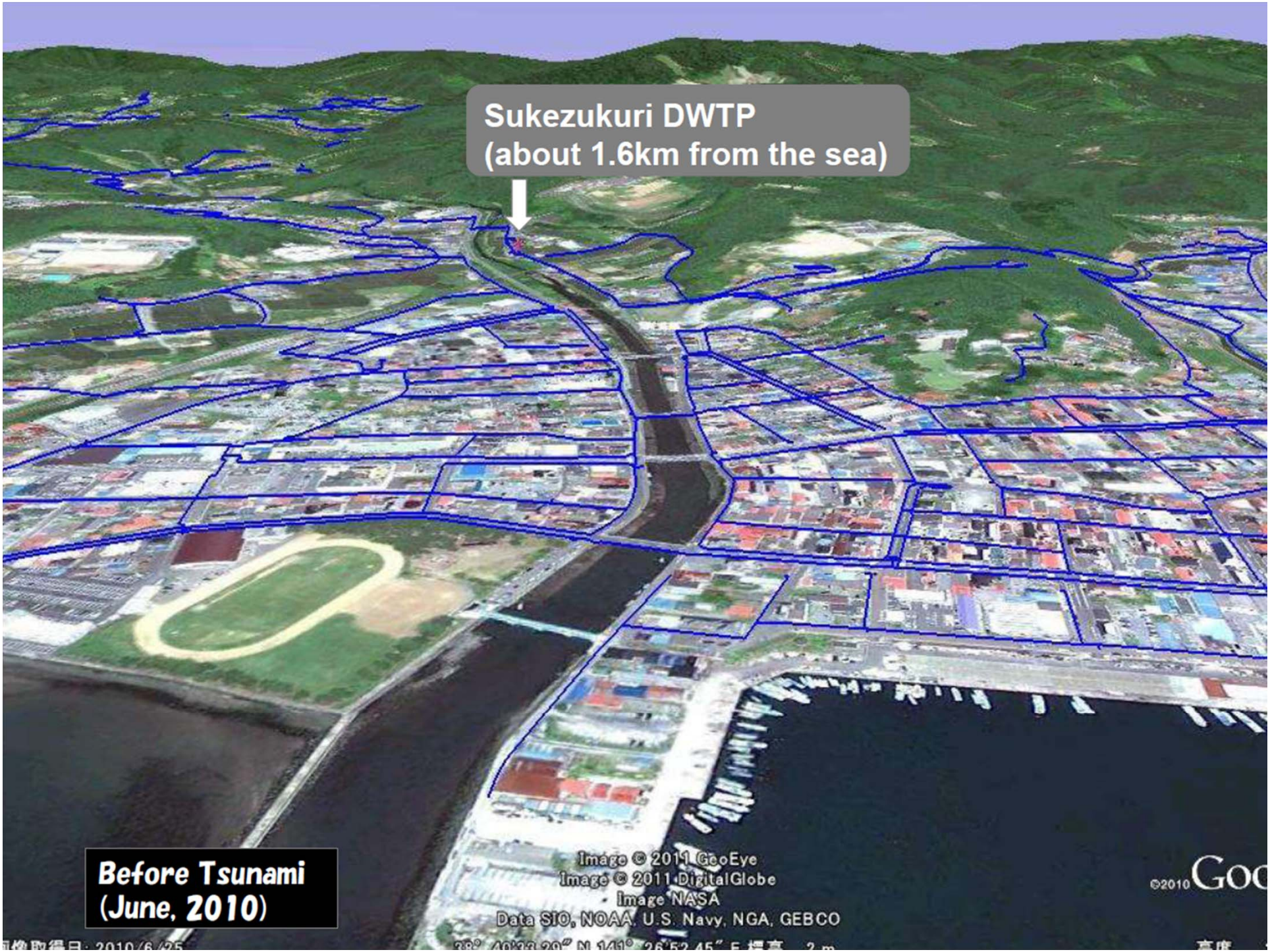
The whole means of monitoring, interpretation, and decision making process have been updated to the most recent scientific and operational knowledge since 1992 by Veolia and its client.

Natural disasters

Location of Minamisanriku City

5 DWTPs in Minamisanriku (Location and capacity)




Sukezukuri DWTP
(about 1.6km from the sea)
Before Tsunami
(June, 2010)
Image © 2011 GeoEye
Image © 2011 DigitalGlobe
Image NASA
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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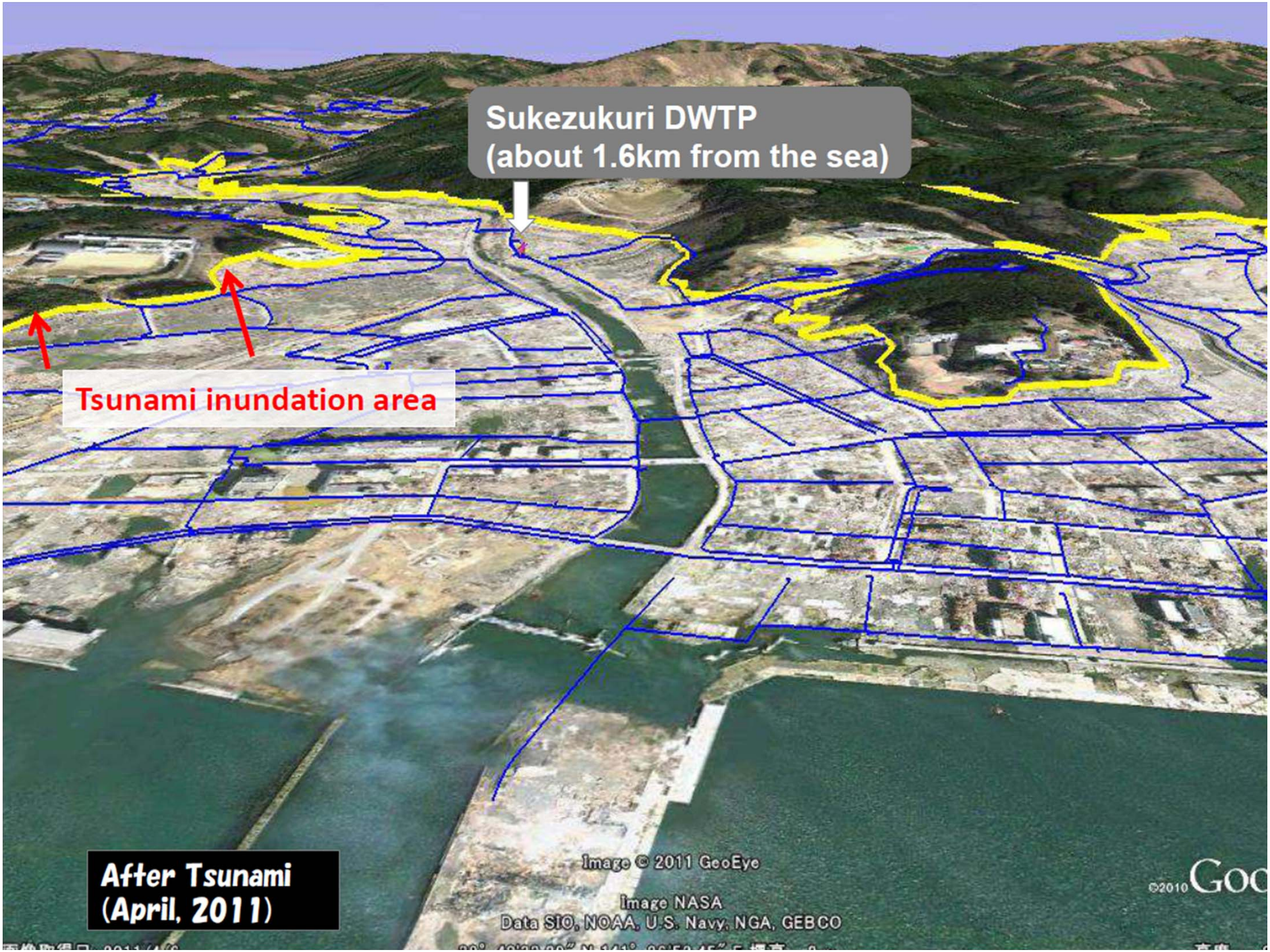
Sukezukuri DWTP
(about 1.6km from the sea)
Tsunami inundation area
After Tsunami
(April, 2011)
Image © 2011 GeoEye
Image NASA
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Destroyed drinking water treatment plants

About 98% of the city's production capacity were destroyed.

		Production capacity (m^3/day)	Raw water	Process	Structural damages
A	Sukedukuri DWTP	4,896	Groundwater	Chlorination	Surface structure destroyed
B	Isatomae DWTP	4,032	Groundwater	Chlorination	Surface structure destroyed
C	Togura DWTP	1,057	Groundwater	Chlorination	Surface structure destroyed
D	Kamisawa DWTP	98	Groundwater	Membrane	Minor
E	Komehiro DWTP	42	River water	Sand filter/ Activated carbon	Minor

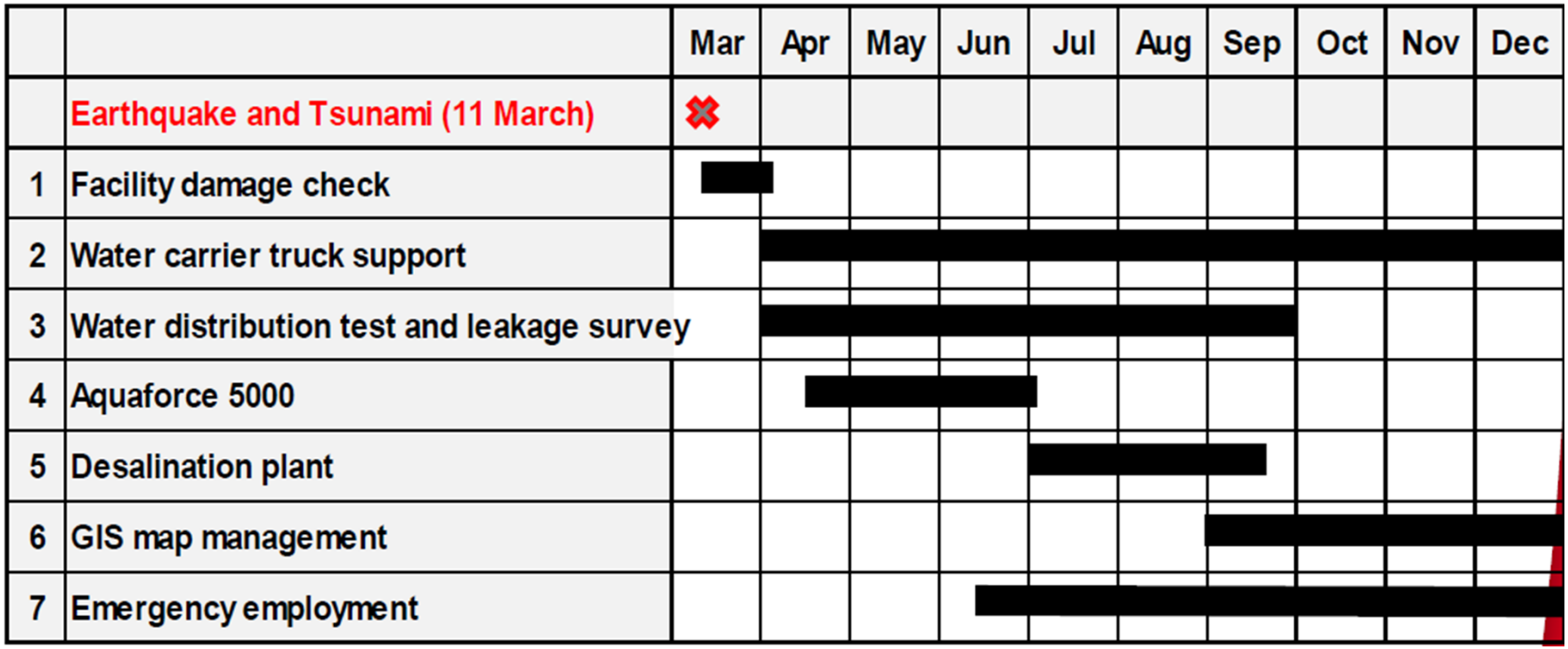
Damage to the distribution pipelines

About 65km out of 230km were destroyed

Veolia group’s support for the recovery effort

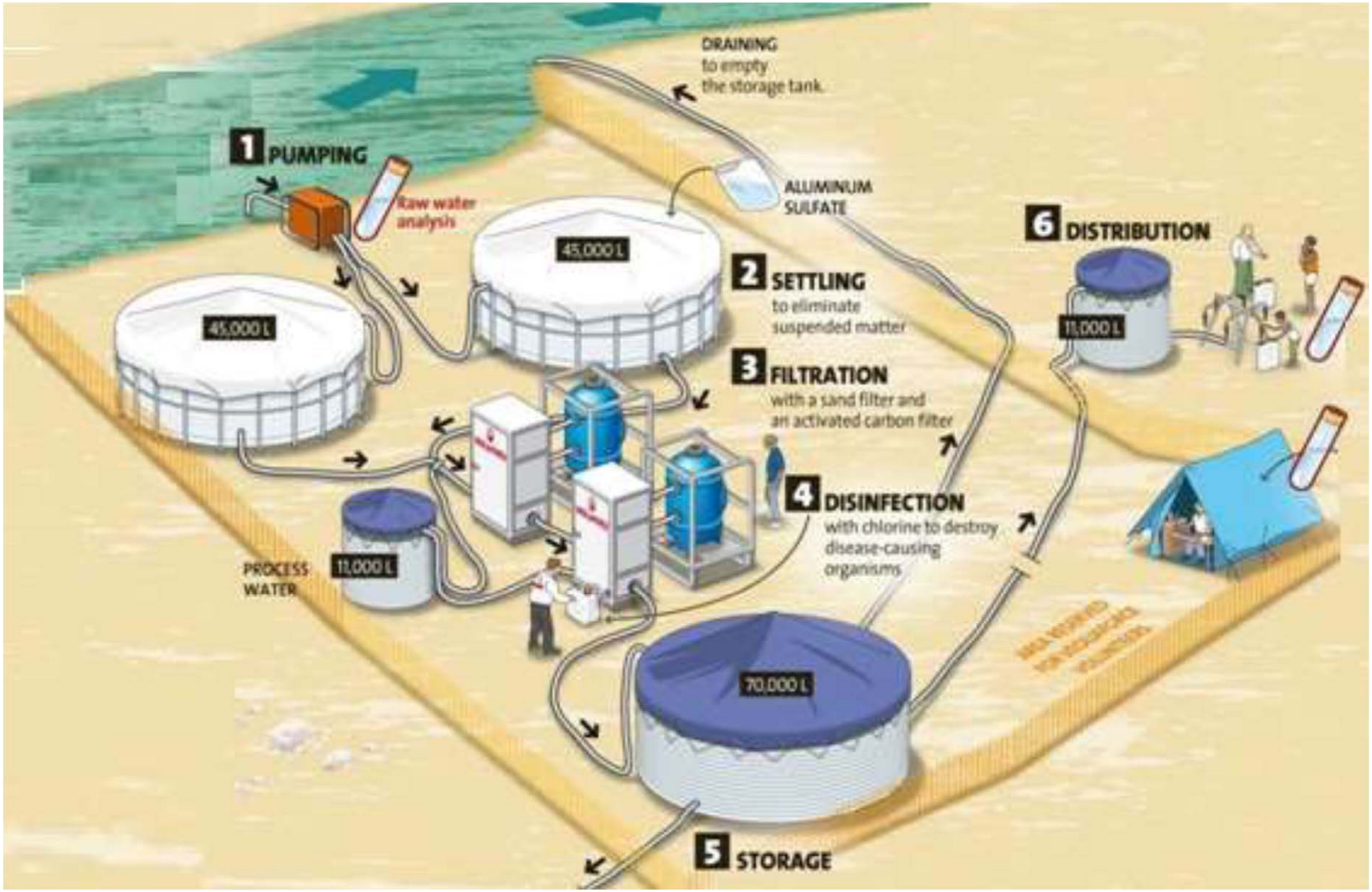
Veolia water’s subsidiaries
- contracted since 2009
- drinking water facilities operation, customer services and network management

Veolia group’s activities in the water supply recovery effort



Aquaforce 5000 units

Mobile water treatment system for emergency rescue



Desalination units

2 RO units (1,300 m3/d) were installed to remove the high salt concentration from the groundwater

Installed RO units in Minamisanriku

Acts of terrorism

The RAID and Veolia secured Nice drinking water network during major sport event

Context

For the Francophonie's Games 2013 in Nice, an outstanding feature of monitoring and securing the water quality has been deployed:

- Integration of the operational device (RAID and DCI-IT), specialized against different threats: Nuclear, Radiological, Biological, Chemicals
- Security of events and citizens
- Tested at the Shanghai World Expo and validated to London Olympics

Veolia's solution

- ENDETEC- Kapta ™ unique technologycomposed by intelligent and autonomous sensors for energy
- Sensors were spread over the network in the hotspots identified by the RAID and DCI-IT
- The Kapta ™ probes allow continuous measurement of the critical water quality parameters as recommended by the World Health Organization : pressure, chlorine , temperature and conductivity
- A 24h/24 real time monitoring is provided by experts from Veolia

Conclusion:
Towards new business models built on solutions to address resilience issues

Resilient City : a response to Cities' needs

Market trends

- Demography
- Economy
- Climate
- Politics

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

Cities' challenges

Cities' expectations about « resilient » solutions

- Efficiency
- Safety
- Quality of life
- Recovery

Veolia's value proposition

- Robust infrastructure
- Resources conservation
- Flood management
- Critical energy supply
- Heat waves mitigation
- Critical event management

Veolia’s approach on Resilience

VEOLIA’s core competences

VEOLIA’s contributions

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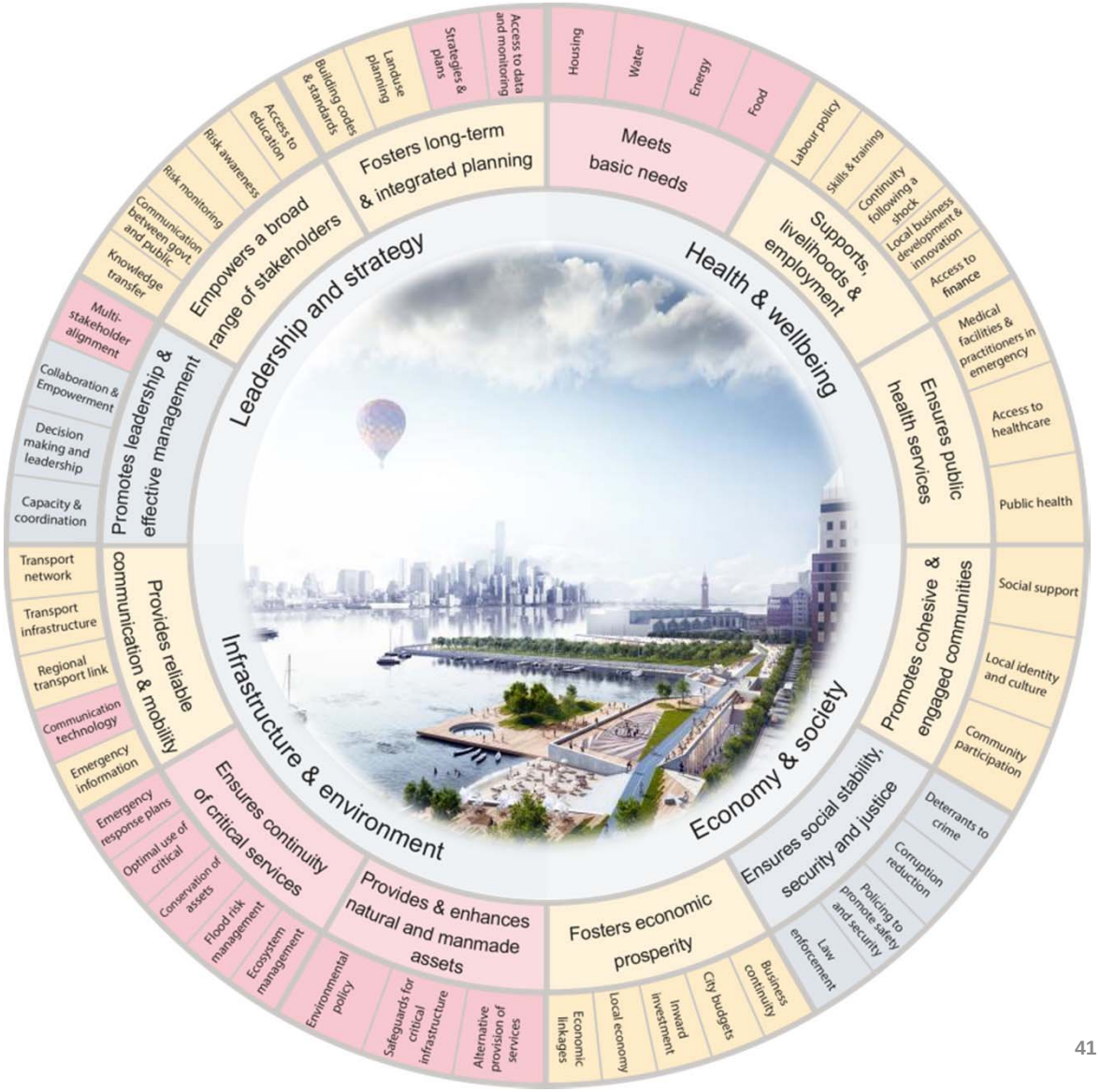
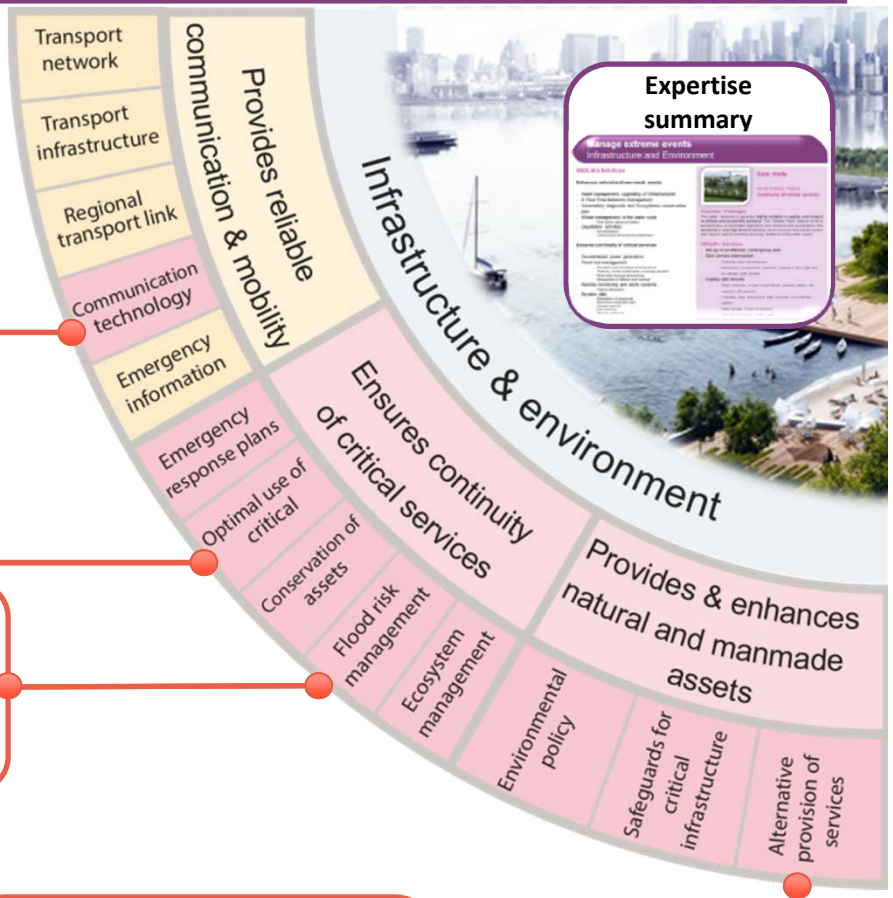


Focus on Veolia's competences in Infrastructure & Environment

Urban Pulse: A tool easing citizens' lives

Smart Water Box: A centralized hypervision platform and dedicated modules

A large range of flood mitigation solutions



Case Studies

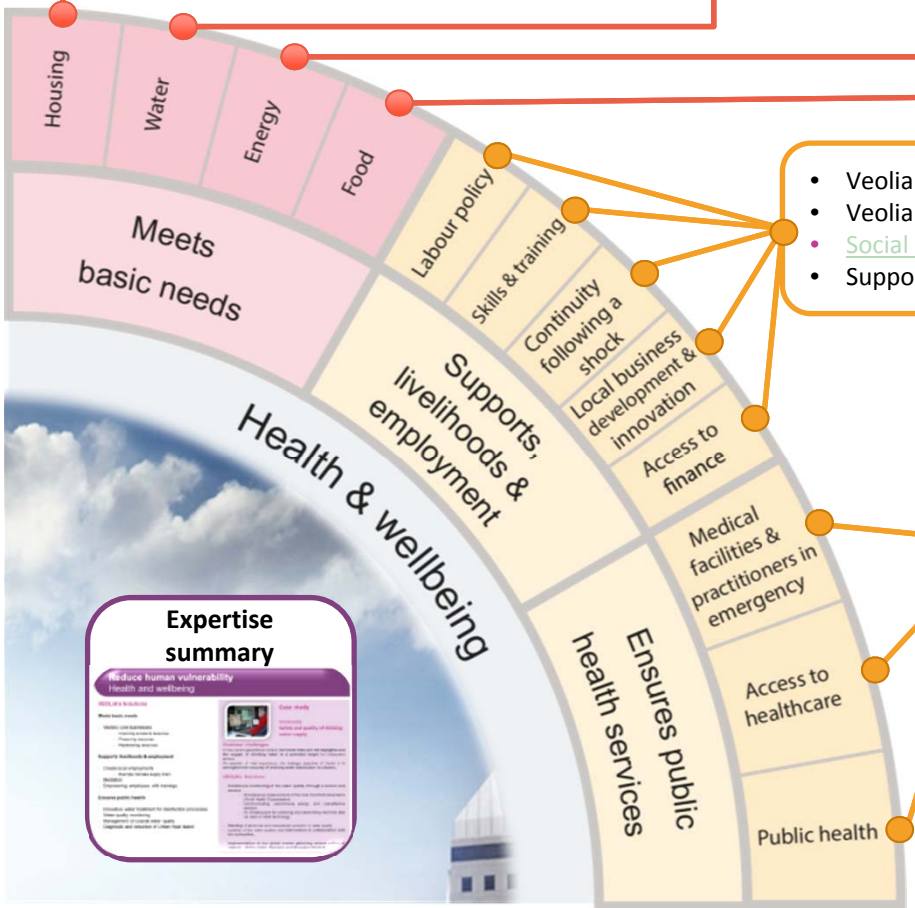
An example of alternative solution: Wastewater recycling for potable purposes

Focus on Veolia's competences in Health & Wellbeing

Housing challenges and urban rehabilitation

Veolia drinking water and waste water value chains

Management of energy risks



REUSE: An alternative to irrigation, the example of Braunschweig

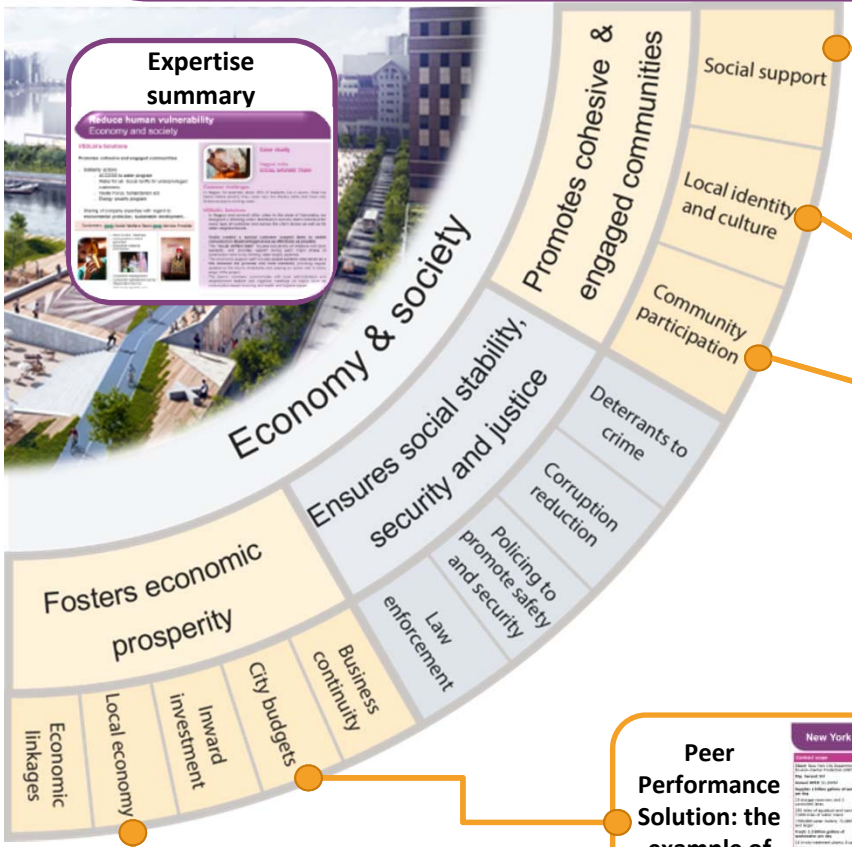
- Veolia campus
- Veolia Foundation
- Social incubators (Mexico, Lyon, Toulouse)
- Support microcredit programs

Healthcare systems challenges answered

Expertise summary

Case Studies

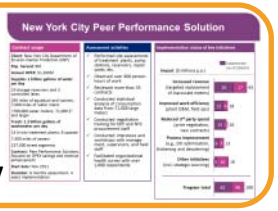
Focus on Veolia's competences in Economy & Society



A concrete example: The PIMMS, essential tool for social mediation

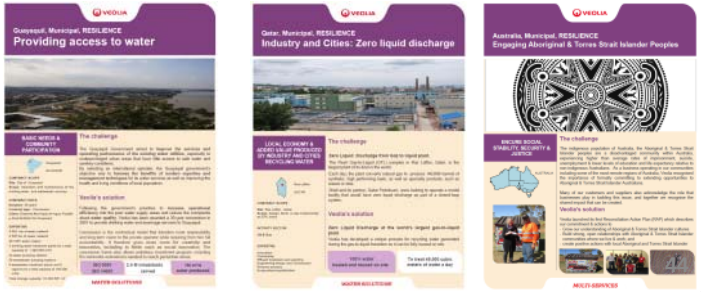
Lulu dans ma rue: a promising initiative leading the way forward

Peer Performance Solution: the example of New York City



Some concrete action leading the circular economy

Case Studies



Focus on Veolia's competences in Leadership & Strategy

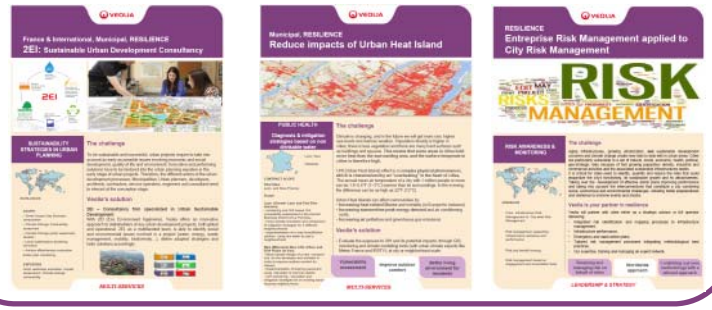
2EI: a global approach for urban strategy

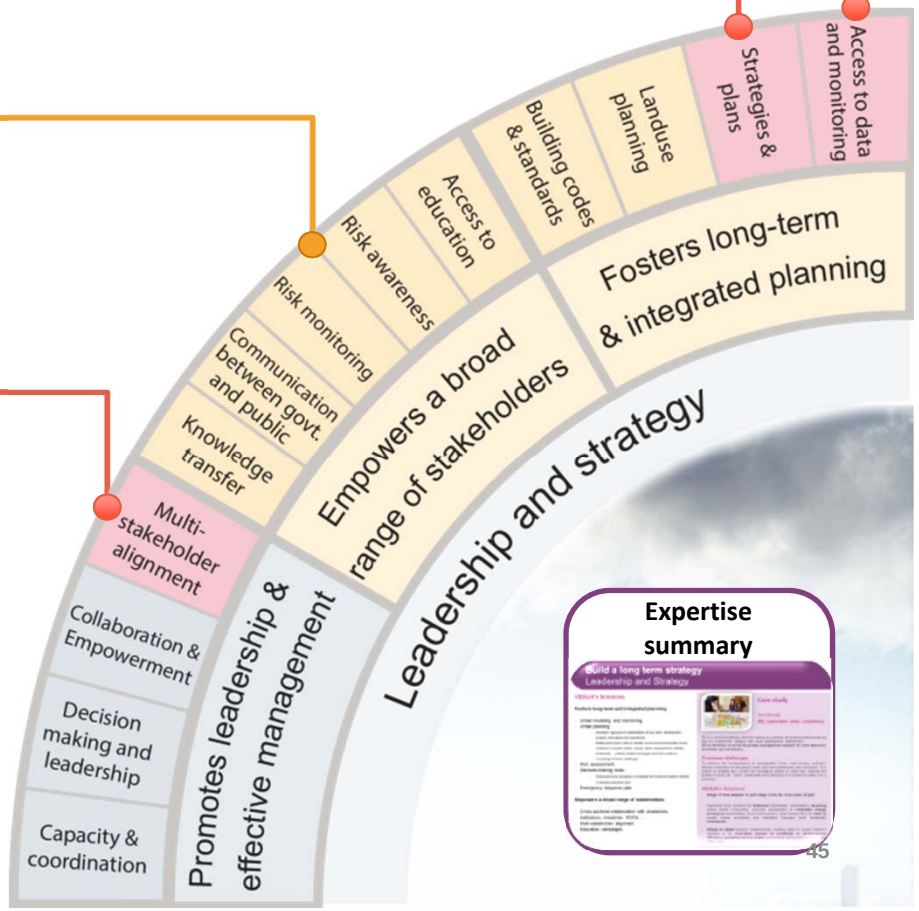
Forcity initiative for urban modeling

Veolia and Insurance Cies partnership for risk management

Veolia engagement toward multi-stakeholders

Case Studies





Expertise summary