European Federation
of National Associations of
Water Services

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Waste water treatment challenges in the future

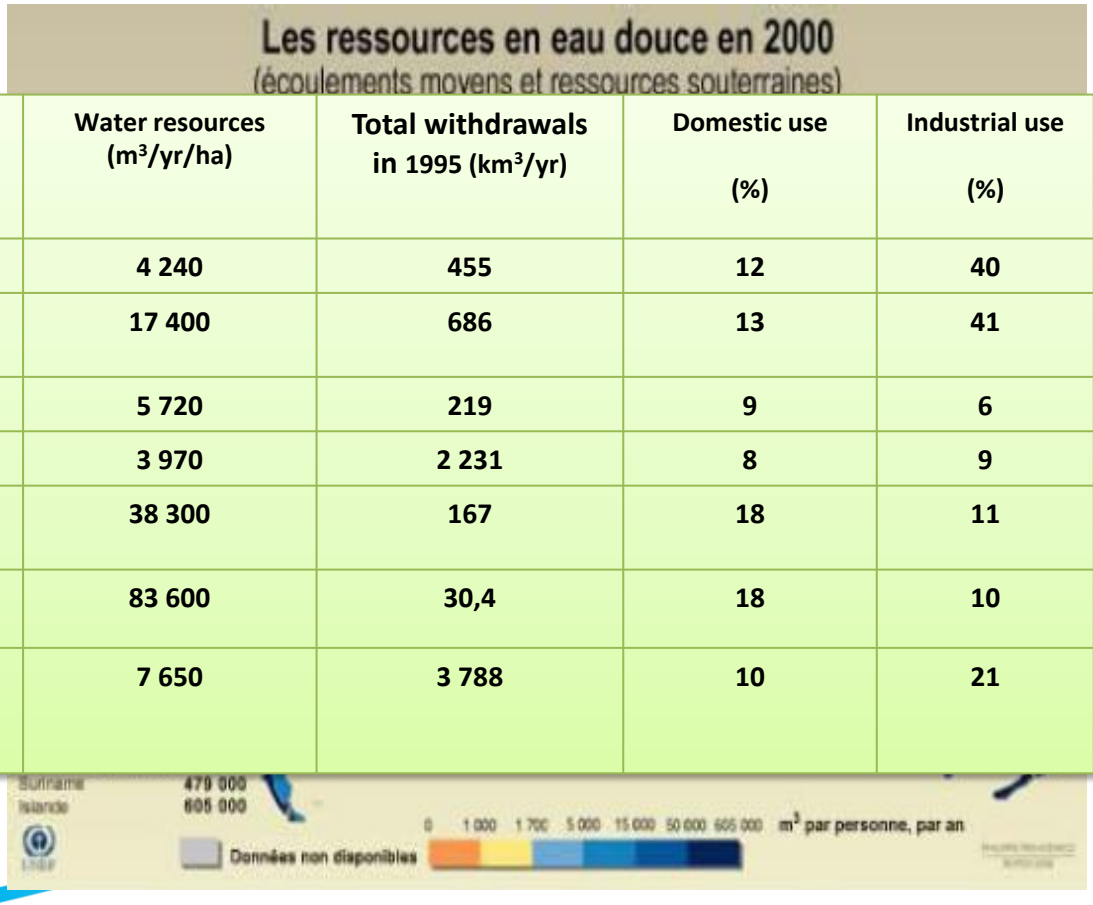
Bruno Tisserand- Chair of EUREAU Commission II

TURIN- SMAT Gruppo

November 8, 2013

Water in the World

- Water needs: one of the biggest challenge in the coming decade



Continent	Water resources (m^3/yr/ha)	Total withdrawals in 1995 (km^3/yr)	Domestic use (%)	Industrial use (%)	Agricultural use (%)
Europe	4 240	455	12	40	48
NorthAmerica	17 400	686	13	41	46
Africa	5 720	219	9	6	85
Asia	3 970	2 231	8	9	83
South America	38 300	167	18	11	71
Oceania	83 600	30,4	18	10	72
World	7 650	3 788	10	21	69

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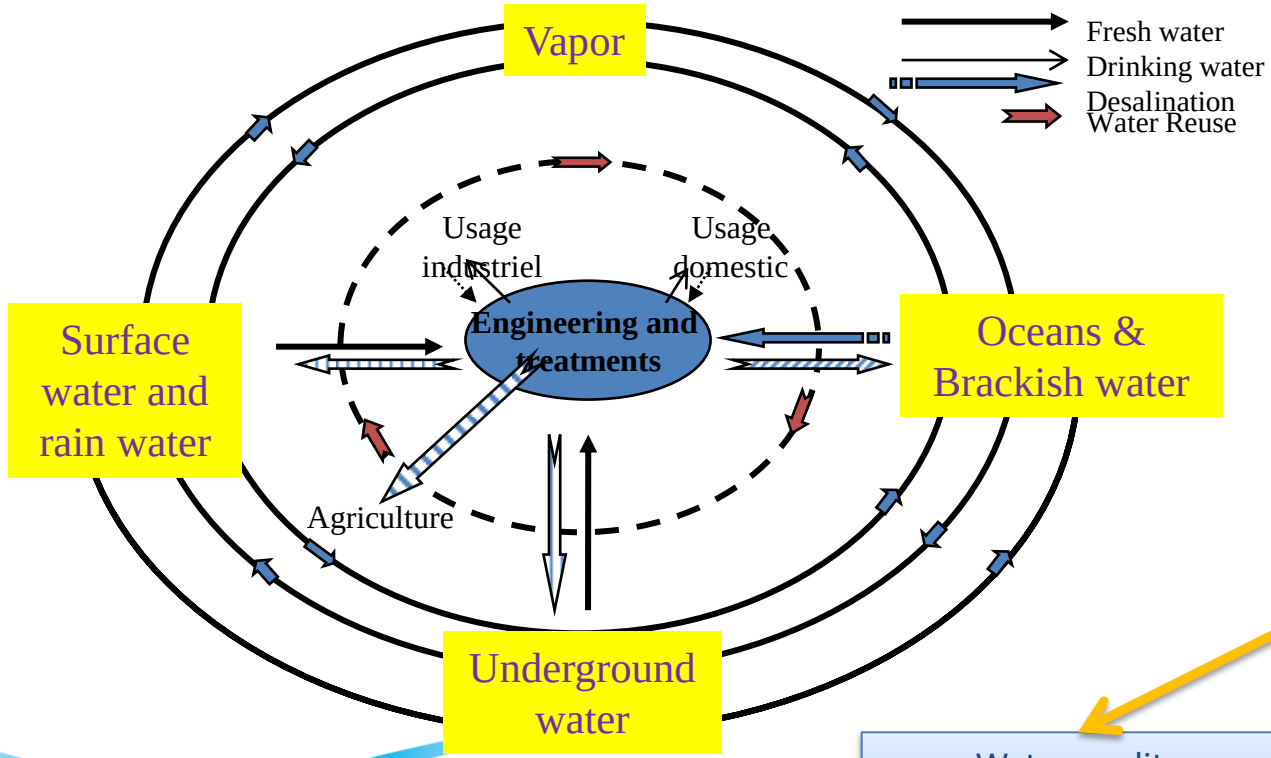
Ref: Nicolas Roche- Nov 2013

Water Cycle

- Water cycle and energy consumption are closely linked .
- Energy consumption as well as energy production can be optimized at each step of the water cycle
- One of our major stake will be to deal with (emerging) pollutant: Chemicals, Pharmaceuticals…)



Water needs
Water resources
Water supply
Water treatment
Water reuse

Water quality
Emerging Pollutants

Energy consumption
Energy production

Ref: Nicolas Roche- Nov 2013

Water cycle : Energy needs

- **Drinking water : 0,05 to 0,5 kWh/m3**
- **Wastewater : 0,3 to 1 kWh/m3 (could be reduced)**
- **Sewage Sludge treatment : 0 to 1kWh/m3 (could be negative)**
- **Desalination :**
  - Multi-effect distillation : 10 to 15 kWh/m3
  - Reverse Osmosis : 3,5 to 7 kWh/m3
  - Low pressure distillation : 2 to 3 kWh/m3

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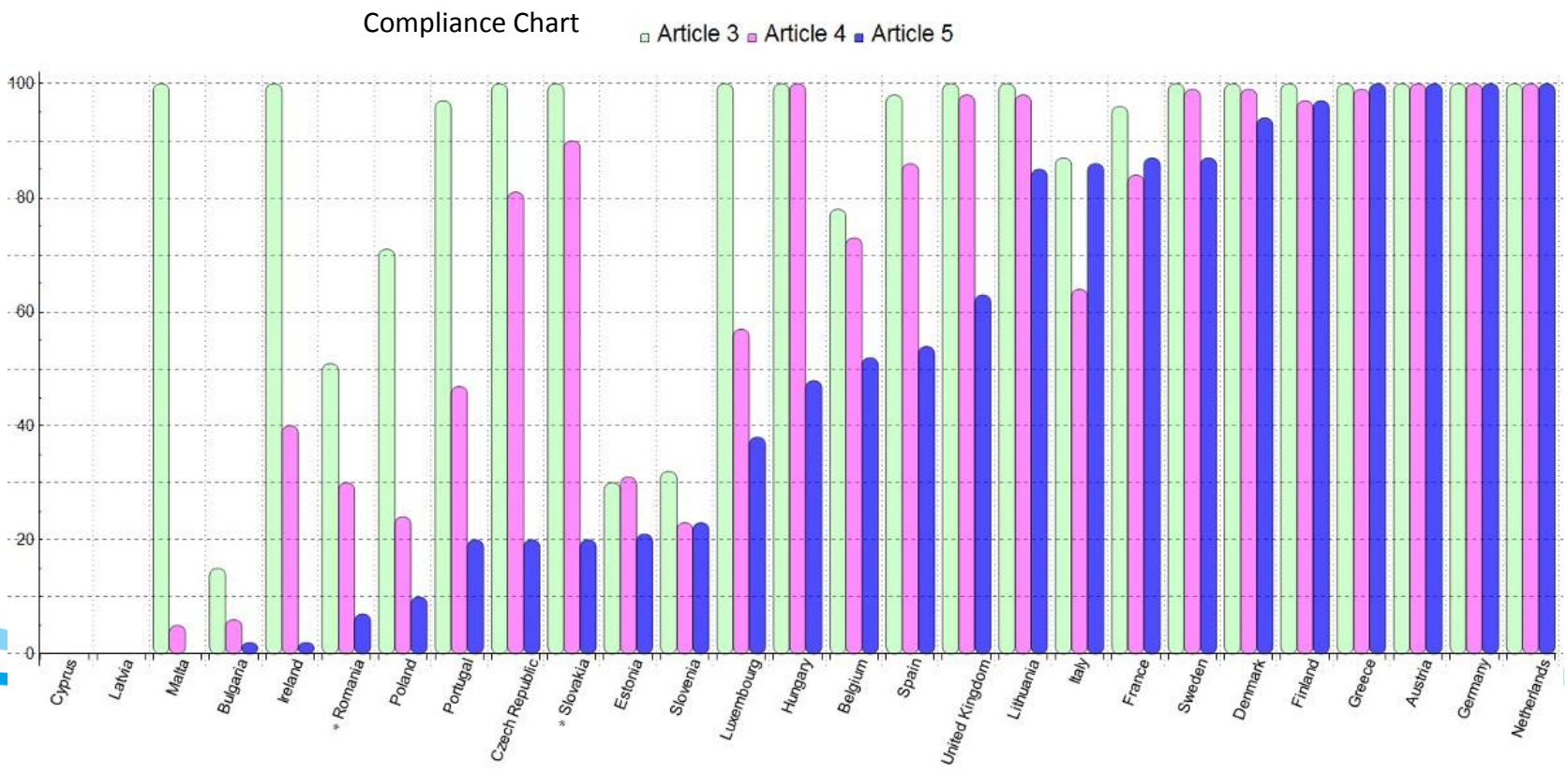
Ref: Nicolas Roche- Nov 2013

Wastewater collection and treatment improvements in Europe, says EU report

BRUSSELS, Belgium- 13 August 2013

This report measures the percentage of compliance that each country has achieved in wastewater collection (article 3), wastewater secondary treatment (article 4) and more stringent wastewater treatment (article 5)



What are the challenges in Urban Sanitation

- **Urban environment requires a nuisance-free sanitation**
  - Visual
  - Olfactory
  - Auditory
    - What does not bother visually and not smell is heard less !

- **Urban environement requires solutions respectful of sustainable development criteria**
  - Low energy consumptions
  - Reduction of waste generation
  - Optimisation recycling solutions : Water, Energy, Materials
    - Rethink treatement solutions to make them even more efficient regarding local stakes

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Urban environment requires a nuisance-free sanitation

- **A centralized, traditional waste water treatement, far from the urban centre**
  - Solves temporarily the visual constraint
  - Requires the installation of collection networks
  - Enables increased investments and use of more complex and efficient technologies
  - … Constraints of closeness of neighborhood are limited

- **The decentralized waste water treatment has to be integrated immediatly into the urban environment**
  - Underground WWTP solutions or fully covered and non-visibles of the residents
  - Not covered and landscaping.
  - Intermediate solution because covered but being an environnemental asset : Organica™ , the WWTP covered by a greenhouse !

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Which innovations, which prospects ?

- The Organica™ concept
- Compact technologies
- Energido, recover the calories available from the waste water
- Real-time and predictive management of wastewater systems
- Patrimonial management - Comprehensive and on-going approach
- Wastewater treatment, towards a new paradigm
- Towards a strategy for energy neutral

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Applying principles of Ecological Engineering : the Organica™ concept

Issue → Renewing the image of the wastewater treatment plants while maintaining their effectiveness

Services rendered by plants → A roots system fixing bacteria

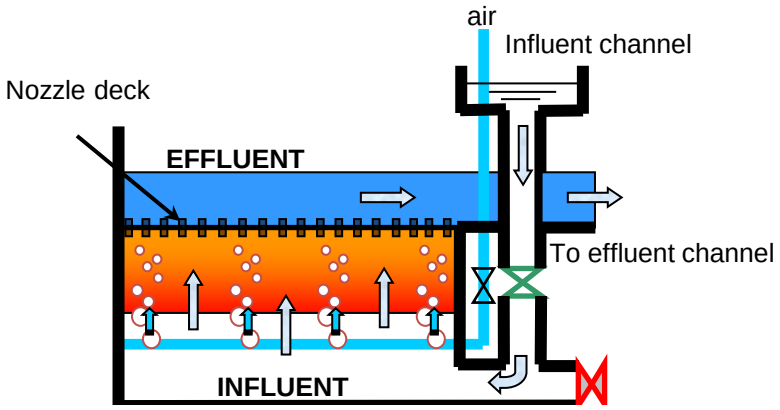
The Organica™ , concept :

- A wastewater treatment plant combining traditional efficiency and benefits from microorganisms and plants
- A compact treatment with low energy consumption and odourless
- Enabling an educational approach

Compact technologies

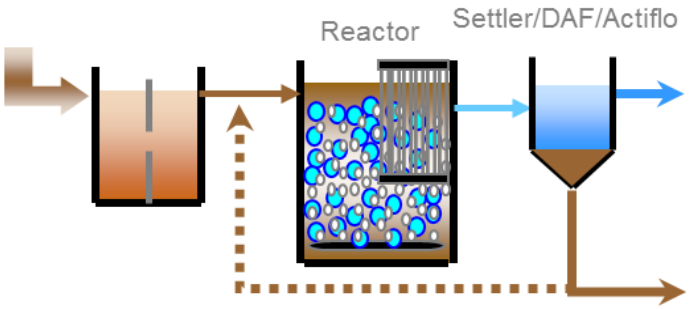
- Identified needs : more compactness, more efficiency

Biostyr®



- Unparalleled biological solution
- Well suited to great capacities
- **A major reference for large cities**

AnoxKaldnes™ MBBR



- Leading-edge biological treatment
- An AnoxKaldnes invention…
- …being copied

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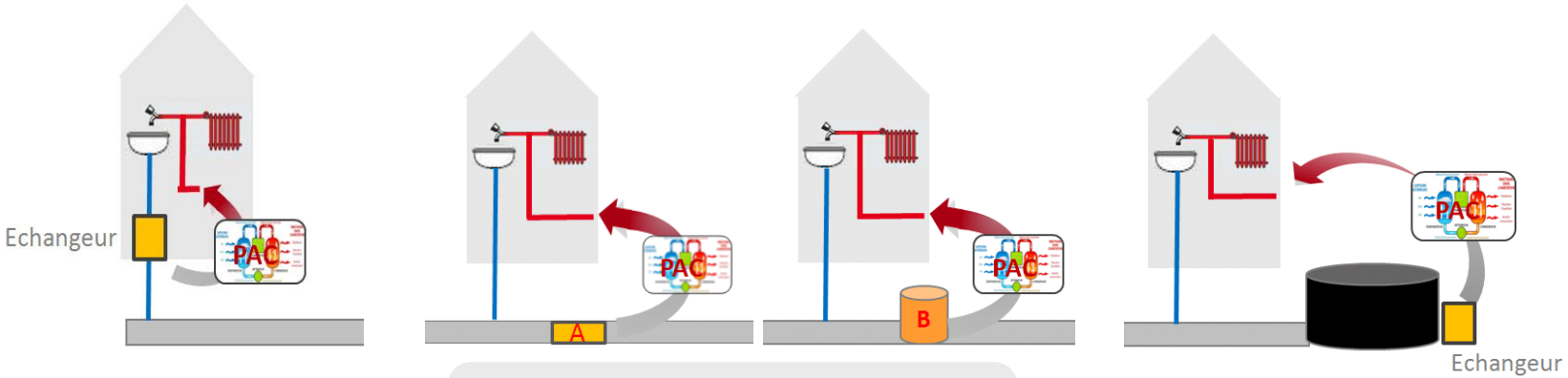
Energido: Energy recovery from waste water ?

Heat can be recovered from waste water according three concepts

1. At the foot of buildings in order to reuse their energy for their own use.

2. On the collection or transport network of thees effluents. In this case, located in the vincinity of the heat utilisation system.

3. At the end on the installation of a treatment system (WWTP) for internal needs of the station or a heat utilisation system located in the vincinity.



In this configuration, heat can be recovered according two principles

A. Achievement of a heat exchanger integrated into the sanitation network (in-situ). It can be designed with the construction work or added afterwards.

B. Implementation of a total or partial derivation of raw sewage flows to a deported heat exchanger (ex-situ).

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Heat recovery from wastewater

- **Wastewater (EU) offer a clear potential of energy recovery**
  - A relatively high and stable temperature : 10 – 20 C
  - Involved volumes are increasingly important
- **Principle : to value this waste heat by means of a heat exchanger coupled to a heat pump**
  - Purpose : production of hot water at a temperature of between 40 and 60 C
- **The recovered energy is considered then as a sustainable energy**
  - Heat pumps converting the heat from wastewater are part of the provided solutions enabling to meet the objectives of Grenelle de l'Environnement : 3 x 20 %
  - Installation eligible for environmental aid (the fund renewable heat managed by the ADEME in particular)
- **Diversity in energy distribution**
  - Éco-district, aquatic centers, offices …

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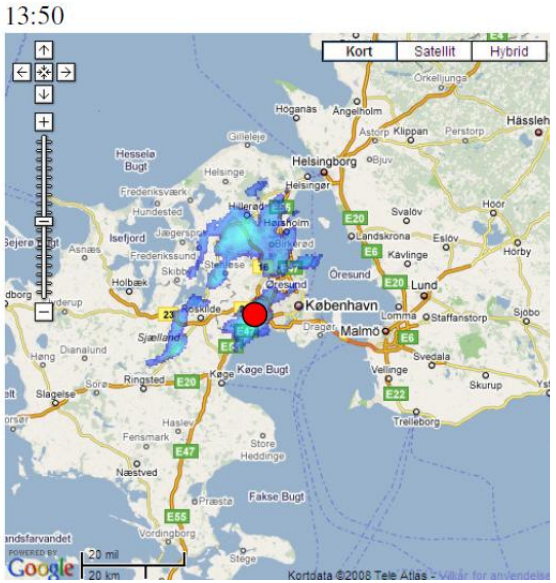
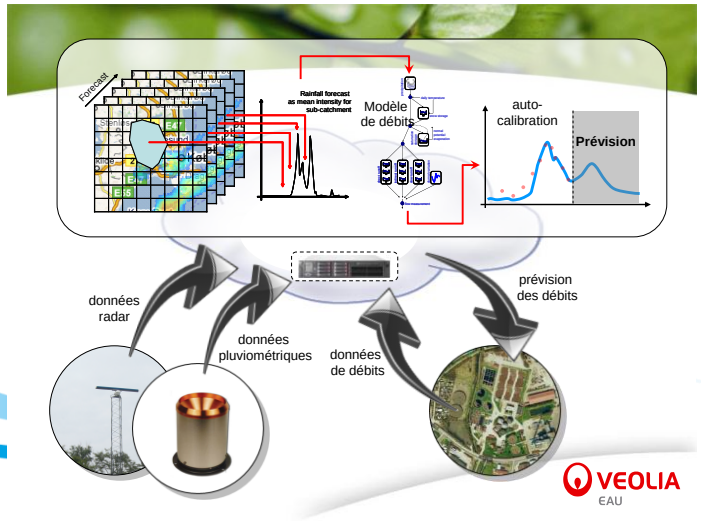
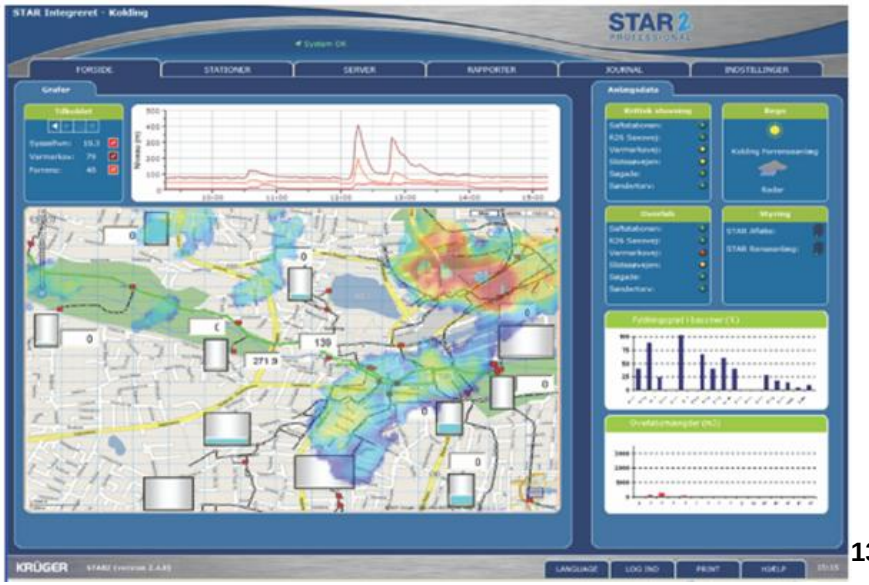
Real-time and predictive management of wastewater systems

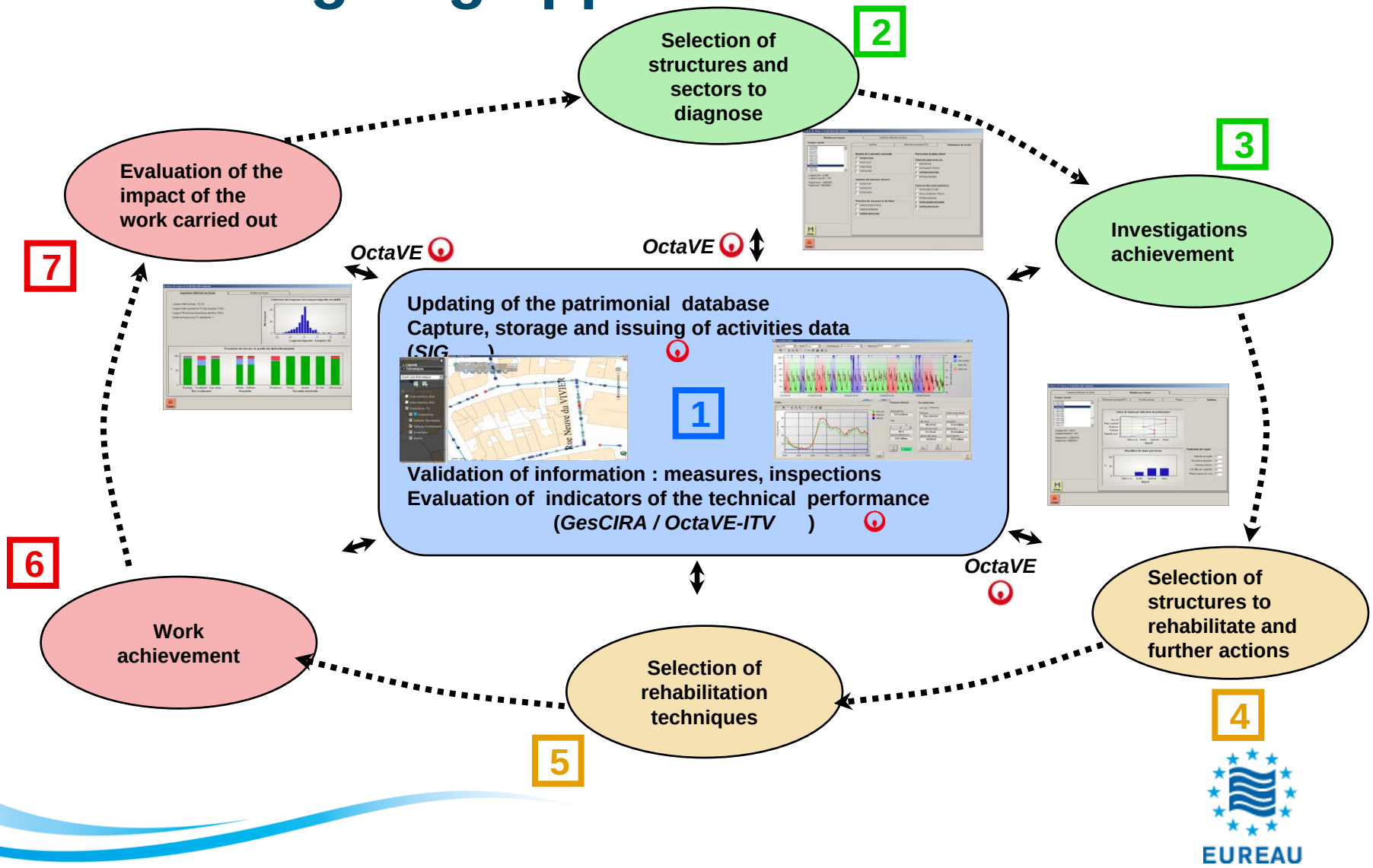
- **The concept**
  - Achieve optimal mobilization for the retention capacity of the waste water treatment plant by using weather forecast datasets to minimize discharges to receiving environment
  - A strong demand in urban areas
- **A collaborative topic**
  - Krüger/DTO/DTF/Ginkéo/VERI







Asset management – Comprehensive and on-going approach



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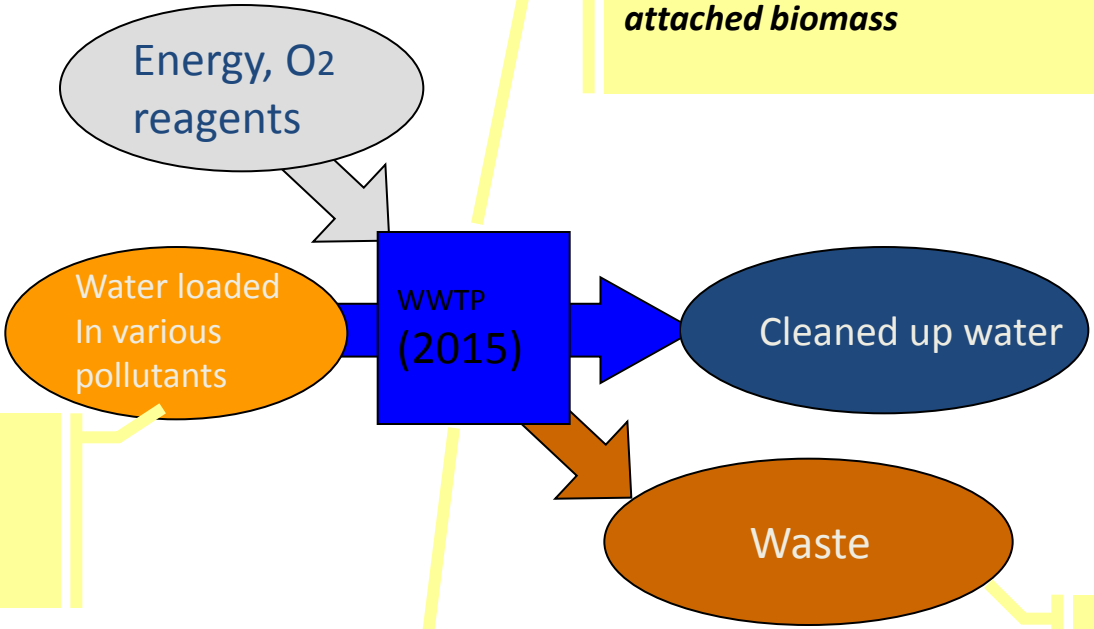
Optimisation of the present wastewater treatment processes and systems

(short-term improvements)



Optimisation of processes with attached biomass

Optimisation of waste water collection & Network Management

Optimizing performances of traditional processes (included PIA)

Management of by-produts from sewage treatment

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Inorganic materials in waste water : A positive extraction for a sustainable development

- **Stakes**
  - Low quantities : quantities contained in wastewater represent less than 1-2% of quantities used in industrialized countries
  - It becomes more and more problematic to propose mixtures containing N, P ou K besides other numerous useless or dangerous substances : sustainable destinations are to be implemented

- **Ongoing progress**
  - For nitrogen :
    - Fuel-efficient solutions for N treatments (anamox, shunt des NO_3)
    - N recovery coupled with anaerobic processes
    - Recovery coupled avec P (struvite)
  - For phosphorus
    - Higher consumption during biological processes
    - Recovery coupled with P (struvite)
    - Physical and chemical extraction in tertiary sector
    - For sulphur and potassium
    - Specific extractions in network or in WWTP

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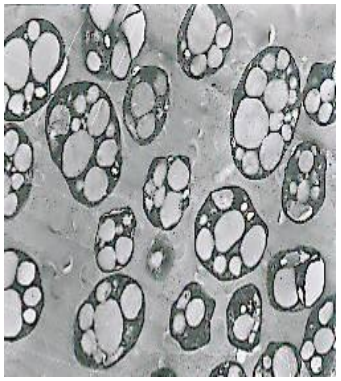
Green carbon in waste water :
A sustainable development towards Bioplastics

Sources of « green carbon »

Organic Materials from waste water



Intermediates : polymers

PLA, PHAs

Bioplastics

Plastics Techniques, Items, …

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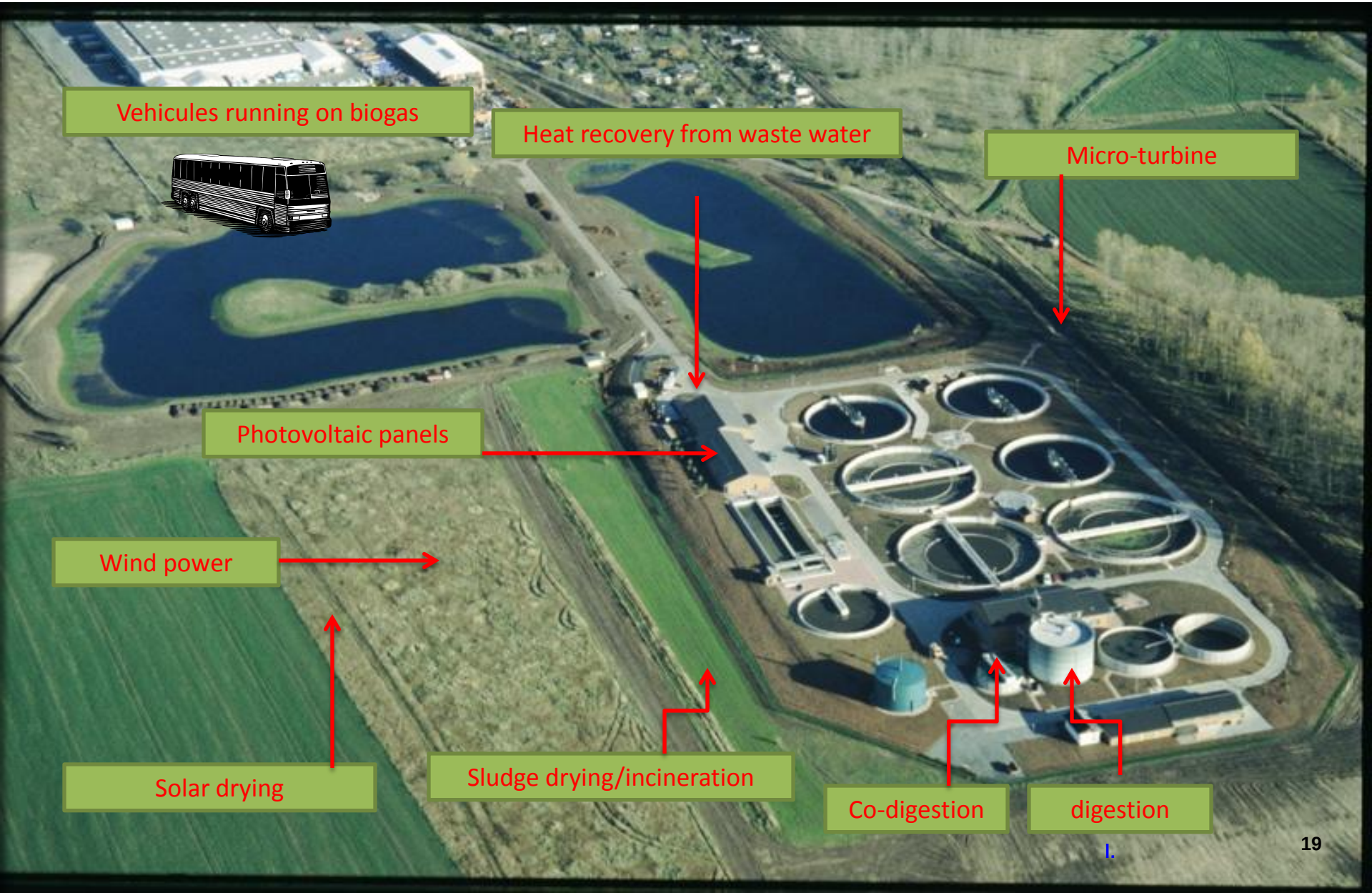
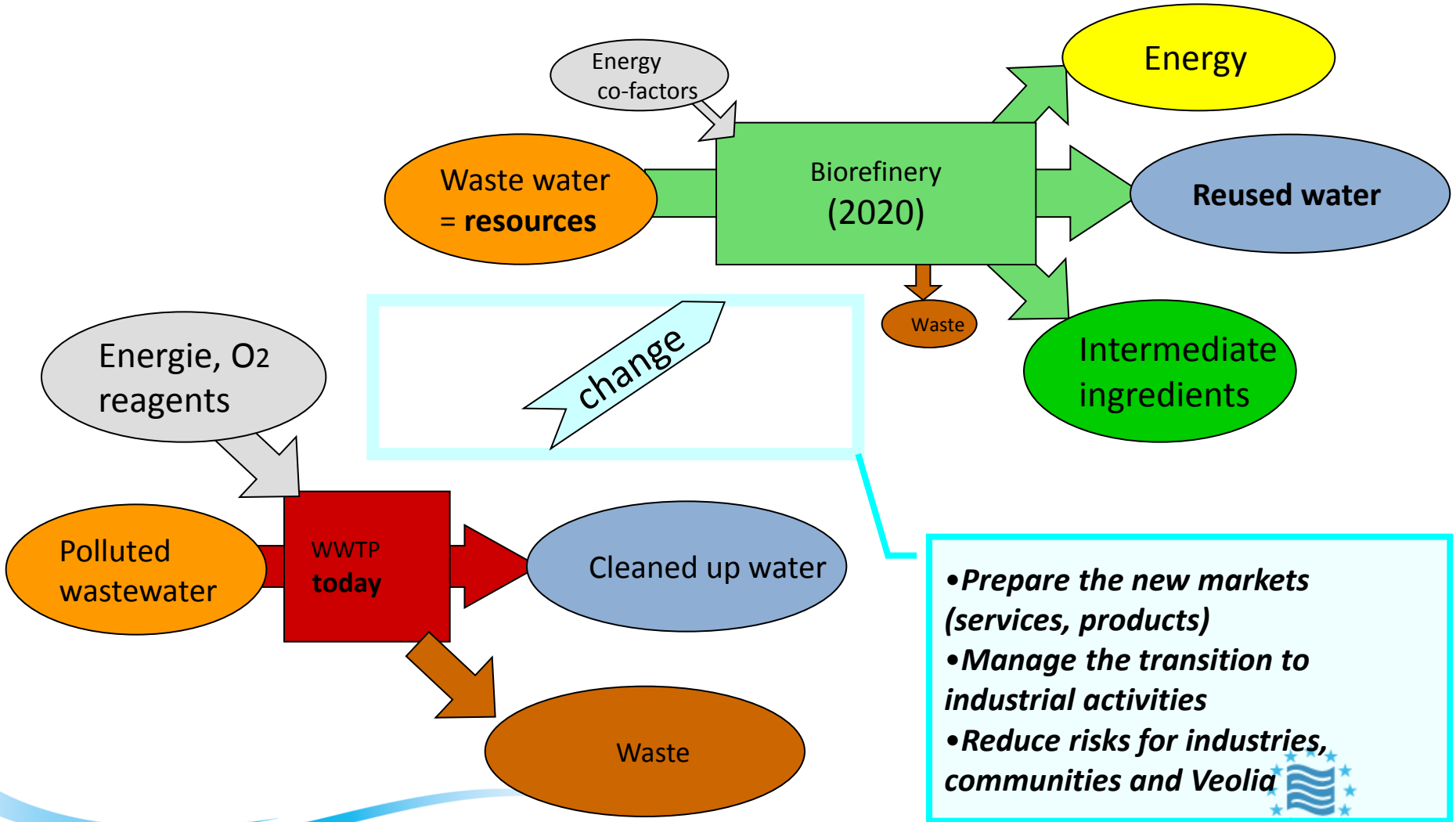
Energy saving optimisation strategy



Conclusion: 2020-2025 target : energy neutral or material recovery - A strategic choice for the wastewater sector



- ***Prepare the new markets (services, products)***
- ***Manage the transition to industrial activities***
- ***Reduce risks for industries, communities and Veolia***

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Thank you for your attention!

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