Water Reuse in France - Status and Perspectives

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ASERSA Webinar Series

Water Reuse in France
PRESENTATION OVERVIEW

01
Current status of water reuse

02
An evolving regulatory context

03
Perspectives

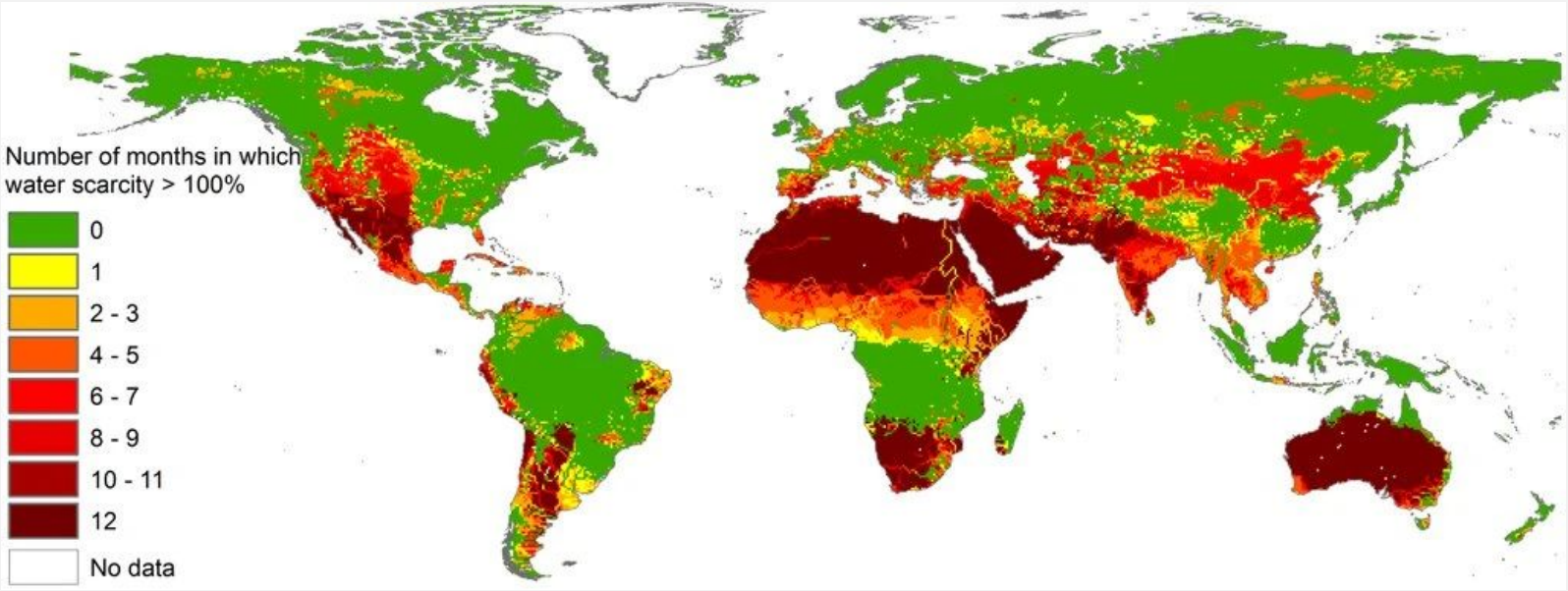
04
Exemple of developments





The challenge
TODAY

Water scarcity is already impacting many parts of the world



Source:Mesfin M. Mekonnen and Arjen Y. Hoekstra, 2016

The challenge TOMORROW

Situation today:

- 36% of the population already leaving in water scarce regions
- more than 60% of the world's population live in areas that experience waterscarcity at least one month in a year

- *Increase in population (water, food, energy)*
- *Concentration in urban centres*
- *Increase in industrial production*
- *Impacts of climate change*

The perspective - by 2050:

- the global population will reach 9 billion people
- 55% of which will be living in cities
- water demand will raise by 55% worldwide
- 4.8 to 5.7 billion people may be affected by water scarcity at least one month a year

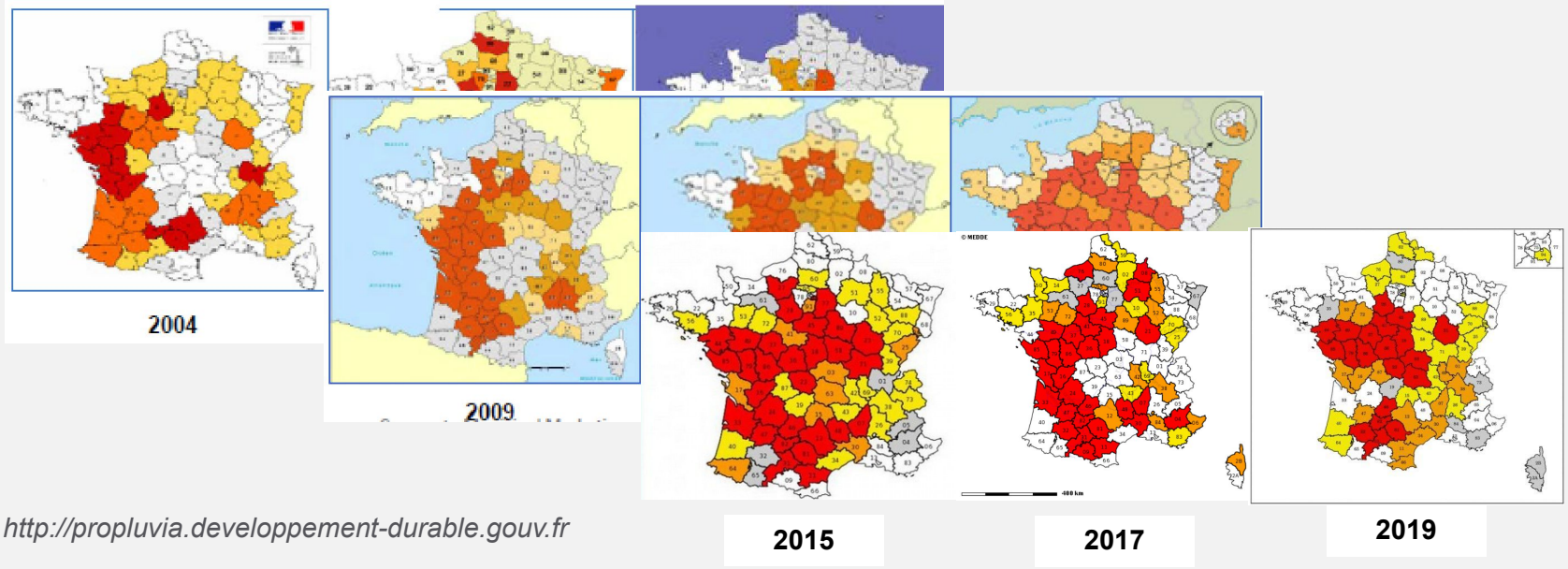
- **water scarcity is already a reality**
- **the situation is going to become even more challenging in coming years**

Sources:

The United Nations World Water Development Report, 2017 - Wastewater: The Untapped Resource
The UNESCO, 2020 - Water Reuse Within a Circular Economy Context
The United Nations Water - Water Scarcity Fact Sheet - https://www.unwater.org/water-facts/scarcity/

Water availability in France
INCREASING PRESSURE

Summer water restrictions



http://propluvia.developpement-durable.gouv.fr

Water availability in France
INCREASING PRESSURE

Severe potential impacts

- **Environmental**
  - health of water streams and ecosystems
  - biodiversity

Drying Doubs River - July 2019

Water availability in France
INCREASING PRESSURE

Severe potential impacts

- **Environmental**
  - health of water streams and ecosystems
  - biodiversity
- **Economical**
  - agricultural production
  - tourism attractivity
  - industrial production

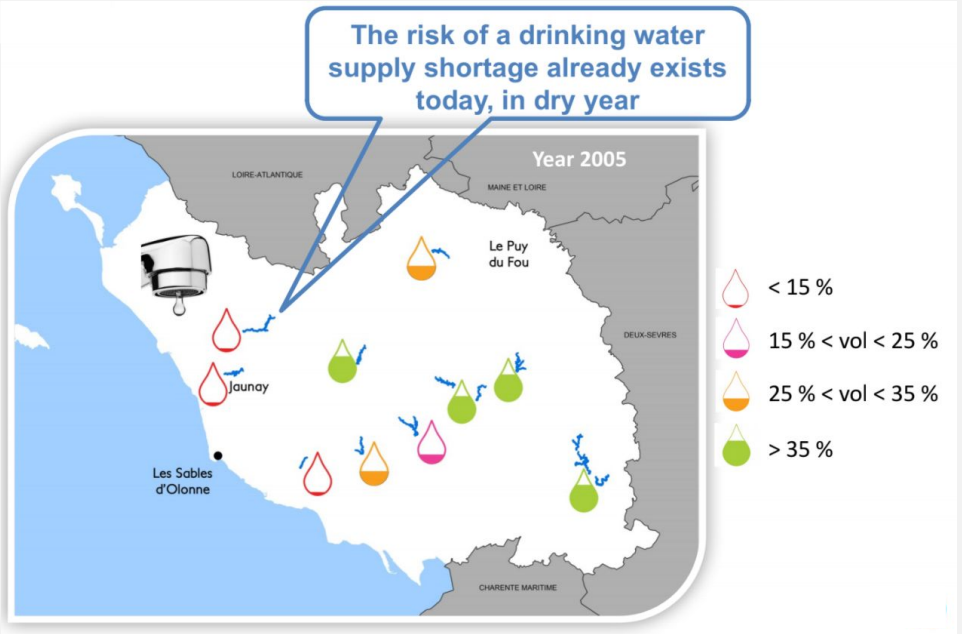
Disneyland Paris receiving 10M visitors and reusing 1.5Mm3 of water per year

30 March 2021: ~1,200 farmers protesting against water withdrawal restrictions

Water availability in France
INCREASING PRESSURE

Severe potential impacts

- **Environmental**
  - health of water streams and ecosystems
  - biodiversity
- **Economical**
  - agricultural production
  - tourism attractivity
  - industrial production
- **Societal**
  - urban wellbeing
  - competitive access to ressources

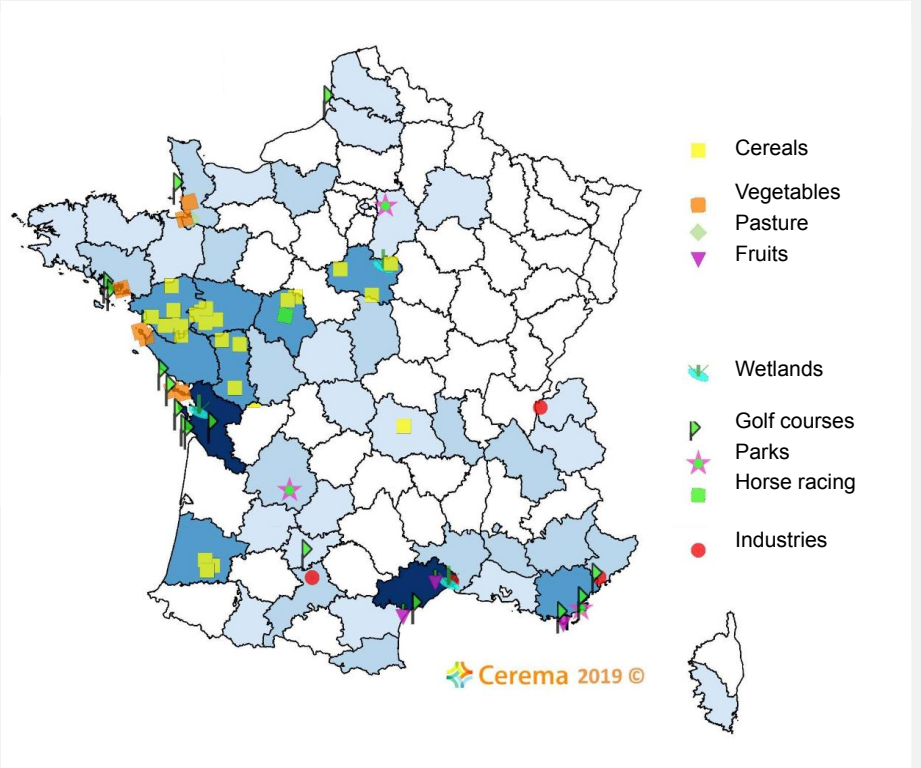


Fresh water ressources in Venée - summer 2005 - threatening the supply of potable water
Courtesy of Venée Eau

Water availability in France
CURRENT SITUATION

CEREMA STUDY - 2017

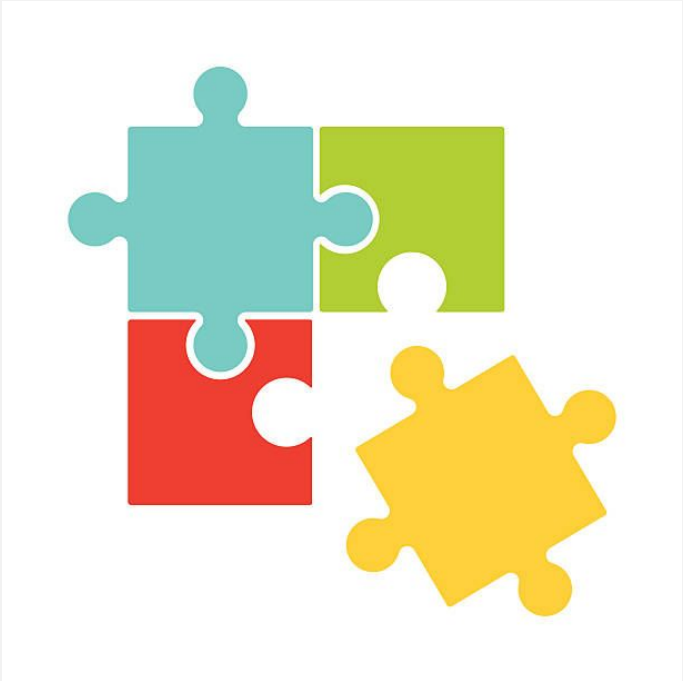
- Overview of water reuse in France
  - 63 water reuse projects in operations
  - Very heterogeneous geographical repartition
  - 60% for culture irrigations
  - 32% for urban uses - mainly glof course irrigation. But 78% since 2010
  - Part of industrial reuse underestimated as private WWTPs not part of the study scope
- < 1% of treated wastewater reused
  - 8 - 11 Mm3/year reused annually



Water availability in France
CURRENT SITUATION

WHAT ARE THE BARRIERS?

Technical / Fit for purpose

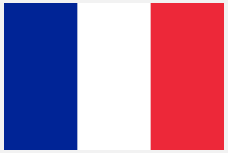


Administrative / Regulation

Financial / Costs vs benefits

Societal / Public acceptance

Regulatory context
IN TRANSITION



ARRÊTÉ DU 2 AOÛT 2010, MODIFIÉ PAR L'ARRÊTÉ DU 25 JUIN 2014

- Regulation on water reuse for irrigation of cultures and public spaces
- Sets minimum requirements for water quality (4 grades) depending on use and type of irrigation
- Additional barriers at point of use (minimum distances, maximum wind speed)

Type d'usage (classé du plus restrictif au moins restrictif)	Niveau de qualité sanitaire des eaux usées traitées			
	A	B	C (5)	D (5)
-Espaces verts et forêts ouverts au public (notamment golfs)(1) -Cultures maraîchères, fruitières et légumières non transformées par un traitement thermique industriel adapté (2)	+	-	-	-
- Culture maraîchères, fruitières et légumières transformées par un traitement thermique industriel adapté	+	+	-	-
- Fleurs vendues coupées	+	+ (5)	-	-
- Pâturage (3) - Fourrage frais	+	+ (4)	-	-
- Autres cultures céréalières et fourragères - Arboriculture fruitière (6) - Autres cultures florales que fleurs vendues coupées - Pépinières et arbustes	+	+	+	-
Taillis à courte ou très courte rotation avec accès contrôlé du public	+	+	+	+

4 water classes (A = best to D = worst) depedning on intended use and type of irrigation

+ : allowed
- : forbiden

Regulatory context
IN TRANSITION

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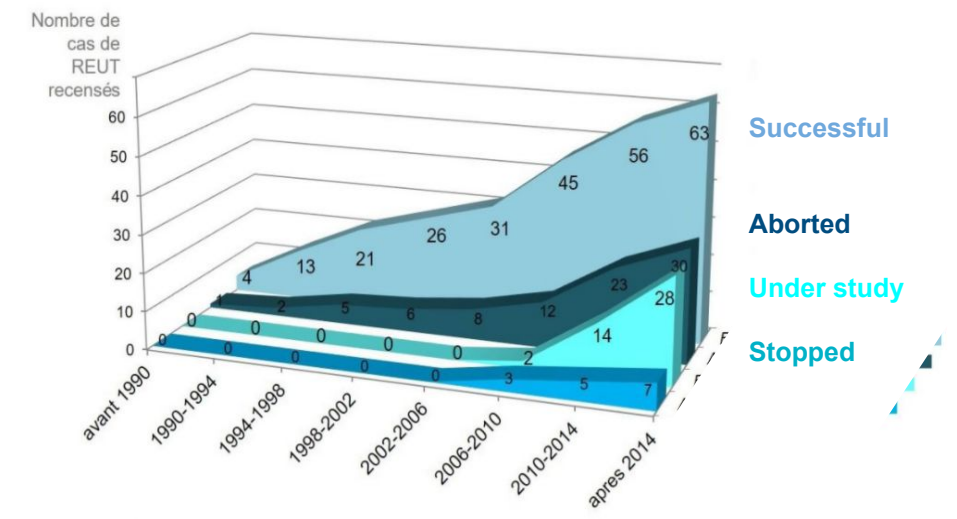
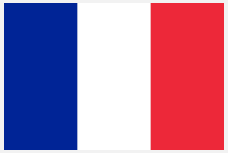


Increase of water reuse projects since regulation was implemented

- Increase in succeful projects
- Increase in failed projects
- Some projects were stopped

Cerema
CLIMAT & TERRITOIRES DE DEMAIN

Regulatory context
IN TRANSITION



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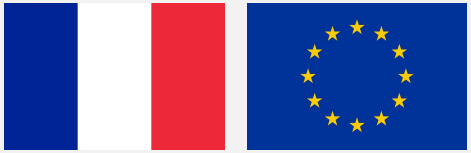
EUROPEAN REUGULATION ON MINIMUM REQUIREMENTS FOR WATER REUSE, June 2020

- Limited to **agricultural irrigation**
- Sets minimum requirements for water quality (4 grades) depending on use and type of irrigation
- To be applied by June 2023 in all state members

Regulatory context
IN TRANSITION

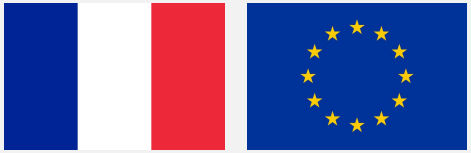


COMPARISON FOR CLASS A WATER QUALITY REQUIREMENTS

	French Regulation	European Regulation
TSS (mg/L)	< 15	< 10
TURBIDITY (NTU)	/	< 5
COD (mg/L)	< 60	/
BOD_5 (mg/L)	/	< 10
E.Coli (UFC/100mL)	< 250	< 10
Removal SRB Spores	> 4-log	> 5-log
Removal coliphages	> 4-log	> 6-log

- **More stringent water quality standards**
- Requires at minima a robust tertiary filtration system followed by disinfection
- May need membrane (UF) filtration followed by UV/chlorine disinfection

Regulatory context
IN TRANSITION



IS THIS REGULATION GOING TO BRING A POSITIVE IMPACT ON WATER REUSE PROJECTS IN FRANCE?

LIMITATIONS

- Need for comprehensive risk management
- How is this going to be applied?
- Impact on existing reuse schemes
- Impact on treatment costs
- Limited to agricultural irrigation

OPPORTUNITIES

- No need for additional barriers at point of use
- More consistent accross all EU countries
- General agreement that the scope is too narrow
- **Opens the door to wider considerations**

Perspectives
WORKING GROUPS

RE-USE OF NON-CONVENTIONAL WATERS

- Working group under government piloting (Health and Environment)
- Coordinated by the ASTEE (Technical & Scientific Association for Water and the Environment)
- Objective of the government: X3 the use of non-conventional waters by 2025
- Non-conventional waters:
  - Treated wastewaters (municipal and industrial)
  - Rain water
  - Grey water

MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE
Liberté Égalité Fraternité

MINISTÈRE DES SOLIDARITÉS ET DE LA SANTÉ
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association scientifique et technique pour l'eau et l'environnement

Perspectives
WORKING GROUPS

RE-USE OF NON-CONVENTIONAL WATERS

Working Group on non-conventional waters

Sub-Group 1	Sub-Group 2	Sub-Group 3	Sub-Group 4
Uses inside / around buildings	Municipal uses	Industrial uses	Agricultural uses

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Perspectives
WORKING GROUPS

RE-USE OF NON-CONVENTIONAL WATERS

- For each sub-group:
  - identify matching water origin / use - initially extensive
  - gather REX on existing case studies
  - identify burdens and levers (technical, financial, acceptations)
- Restitution in June 2021 for actions planning
  - Regulation
  - Financing
  - External communication and engagement

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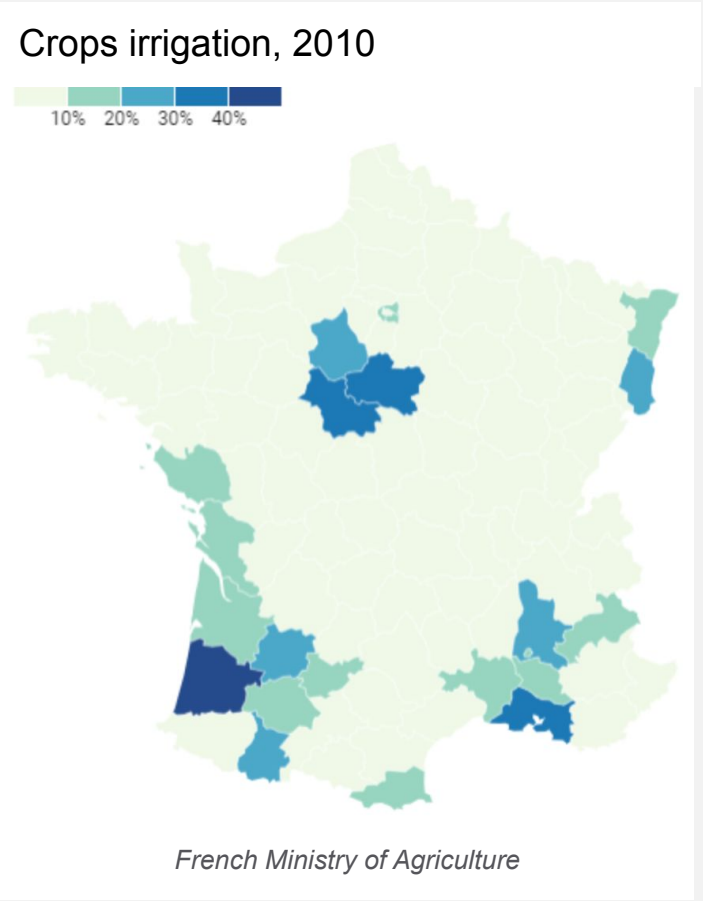
Water Reuse in France
CURRENT DEVELOPMENTS

AGRICULTURAL IRRIGATION

- Very high demand
- Sensitive issue

- Adaptation to EU regulation
- Demonstration of benefits vs costs
  - security on yields
  - benefit of nutrients
  - smart irrigation

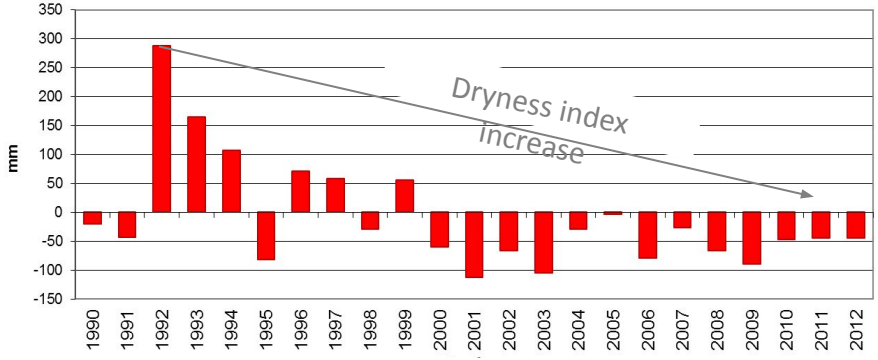
- Need for demonstration projects



Water Reuse in France
CURRENT DEVELOPMENTS

EXEMPLE OF VINE IRRIGATION

- Wine industry is sensitive to water scarcity
- Languedoc region particularly exposed:
  - 1/3 of the wine produced in France is produced in this region
  - Arid area with ~ 200 mm of annual precipitation
  - Loss of production estimated at 9% between 2000 and 2006
- Vine irrigation allowed since 2006 in France due to recurent periods of draught
- Periods of irrigation depend on the type of wine produced



Dryness index evolution from April to September, Years 1990-2012
INRA, Experimental vineyard of Pech Rouge, France

Water Reuse in France
CURRENT DEVELOPMENTS

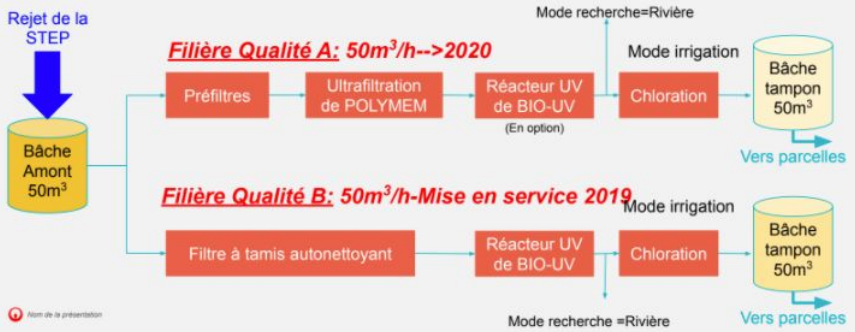
SW | RW_C | RW_B | PW

EXEMPLE OF VINE IRRIGATION

- Collaborative research project 2013-2016 near Narbonne
  - comparison of 4 waters (reuse B, C, surface, potable)
  - water, soil, plant, grapes and wine monitoring
  - 2 different grapes on 1.5 ha
  - drip irrigation

- Going full-scale in 2021
  - Class C according to EU standards, but actually targetting class A French standards
  - 80 ha irrigated
  - 50 m^3/h
  - Tertiary treatment: pressurized filtration/UV/Cl_2
  - Partnering with AQUADOC and ECOCLIMASOL for smart management of irrigation
  - 0,65€/m^3 for the growers

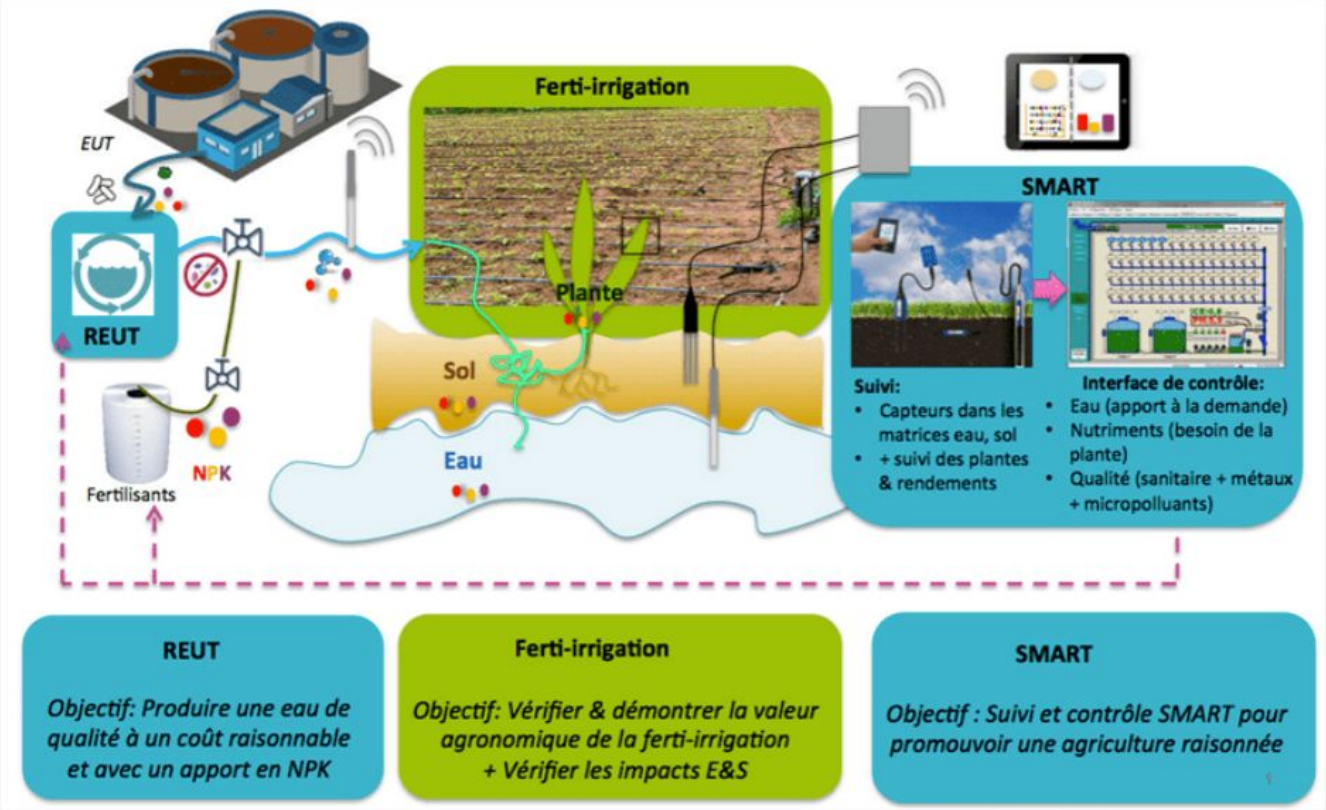
Water Reuse in France
CURRENT DEVELOPMENTS



IRRIGATION OF LARGE CULTURES

- Collaborative research project Smart Ferti Reuse in the South of France
- Objectives:
  - REUSE: test 2 tertiary treatment process trains at pilot scale (filtration 40 µm / 0.03 µm; UV; Cl_2)
  - FERTIRRIGATION: value N, P, K nutrients present in water
  - SMART: develop sensors and an application for optimal irrigation
- Extensive moniroting for risk management:
  - water, soil, aquifer, plant, air
- 5 testing fields, including 2 for comparison (irrigated with well water)

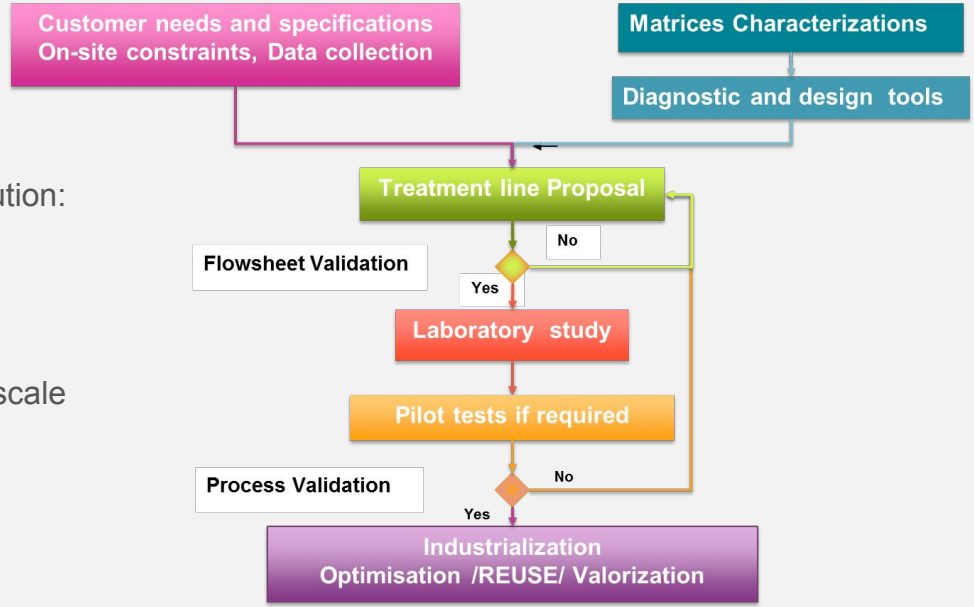
Water Reuse in France
CURRENT DEVELOPMENTS



Water Reuse in France
CURRENT DEVELOPMENTS

INDUSTRIAL USES

- No standard water quality
- Need structured approach to define the best solution:
  - effluent quality
  - target use and water quality
  - process definition & proving (lab- or pilot-scale invetigations)
-



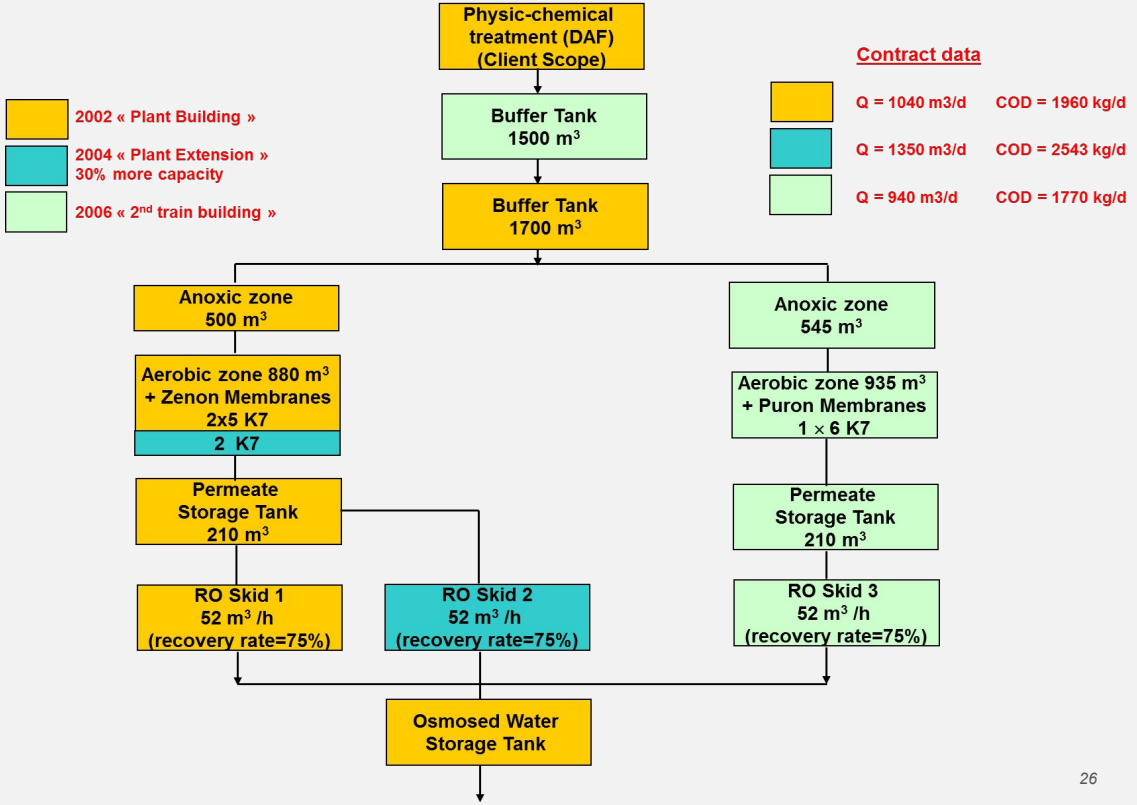
Water Reuse in France
CURRENT DEVELOPMENTS

INDUSTRIAL USES

- Exemple of successful implementation - COOPERL:
- Client challenge:
  - Large pig slaughterhouse in France
  - Until 2002 discharge of 14,000 m3/week of pretreated water to municipal WWTP & the environment
  - Not possible to expand capacity due to discharge limits, necessity to treat further waste water

Water Reuse in France
CURRENT DEVELOPMENTS

- Water reuse started in 2002
- Slaughtering capacity increased
- Plant capacity increased 2 times between 2002 and 2006 from 1,040 m^3/d to 2,290 m^3/d
- 60% of water recycled for
  - Truck washing
  - Floor washing
  - Cooling towers
- No discharge to the environment and reduced discharge to the WWTP
- By-products are recycled as biofuel and fertilizers by the cooperative



Water Reuse in France
CURRENT DEVELOPMENTS

- But no use in contact with food product
- French regulation is not very clear about it:
  - Non-potable use allowed if "*no influence on the health of the user and on the safety of the final foodstuff*"
  - Application Decree was never released
- The "clean water" collective was created in 2020 by professionals of the F&B industry in Britany to demonstrate that water can be reused safely in the F&B production

Water Reuse in France
CURRENT DEVELOPMENTS

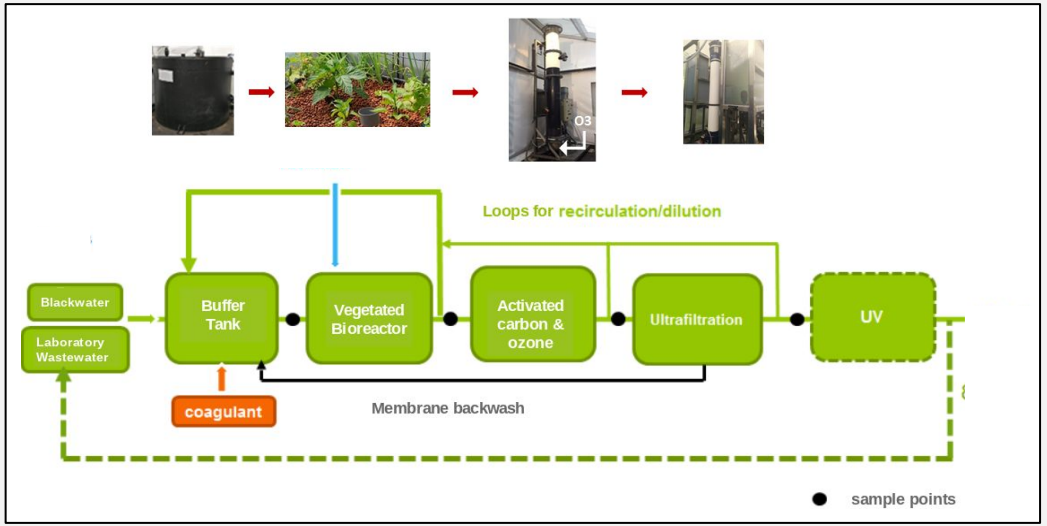
URBAN USES - solutions for decentralized water reuse systems

- Sewer mining: Opaline-Duo process based on direct UF filtration:
  - Very compact → footprint reduction of 2.5
  - No biology / physical treatment only → simpler & faster start-up & less odor
  - Higher potential for recovery→ energy or C/N/P in addition to water
  - Lower sludge production

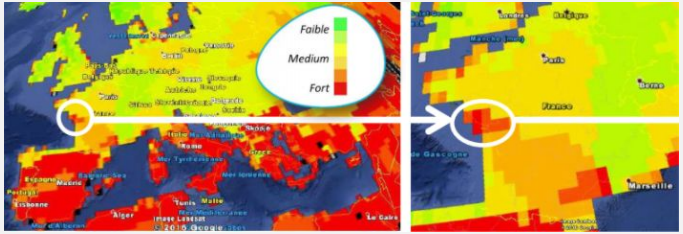
Water Reuse in France
CURRENT DEVELOPMENTS

URBAN USES - solutions for decentralized water reuse systems

- Small communities / eco-neighborhood
  - process based on:
    - vegetated bioreactor
    - O3/activated carbon reactor
    - UF
    - UV
  - Reclaimed water quality suitable for all non-potable uses



Water Reuse in France
CURRENT DEVELOPMENTS



MOVING TOWARDS POTABLE REUSE

- Potable reuse is a solution implemented in several parts of the world
- Planned potable reuse is not regulated (allowed) in France but many cases of de-facto Indirect Potable Reuse (IPR)
- Vendée is a territory facing growing pressure on its water resources in summer time - need to secure water ressources relying mainly on dams:
  - dams interconnectivity
  - reduction of networks losses
  - alternative resources:
    - seawater desalination?
    - IPR?
- Started working on IPR since 2013 as part of DEMOWARE EU project
- Demonstration project (150 m^3/h) from 2022:
  - 1 year to the sea
  - 3 years to the Jaunay dam

Vendée Eau's JOURDAIN IPR demonstration project

Water Reuse in France
KEY MESSAGES

- Like many other parts of the world, France is facing increasing pressure on its natural water resources
- Regulation on water reuse for irrigation exists since 2010, but water reuse has developed slowly due to administrative burden, costs and to a lesser extent acceptance
- The EU regulation on water reuse for agricultural irrigation is too narrow in scope, but it opens the door for further thinking
- Efforts are being made to develop the use of “non-conventinal” waters
- Technology is not the limiting issue
- Funding is available for investment costs
- Focus on:
  - agricultural uses - need demonstration, slow, but a true challenge
  - industrial uses - no one size fits all, particular effort on F&B applications
  - urban uses - demonstrate new applications, develop decentralized solutions
  - IPR - demonstration, support the development of regulation in France & acceptance

This might be just the right time to unlock the true potential of water reuse in France

Thank you for your attention

Questions?

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