C.I.R.E.D.

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Solutions for livable and resilient cities

# Urban Water Technologies / Institutional Context : a Dynamic but slow Interaction

## Focus on Paris Area

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# Are Water & Sanitation Services sustainable?

- European WSS are now a mature industry: issue of long term management and renewal of infrastructure, without initial subsidies

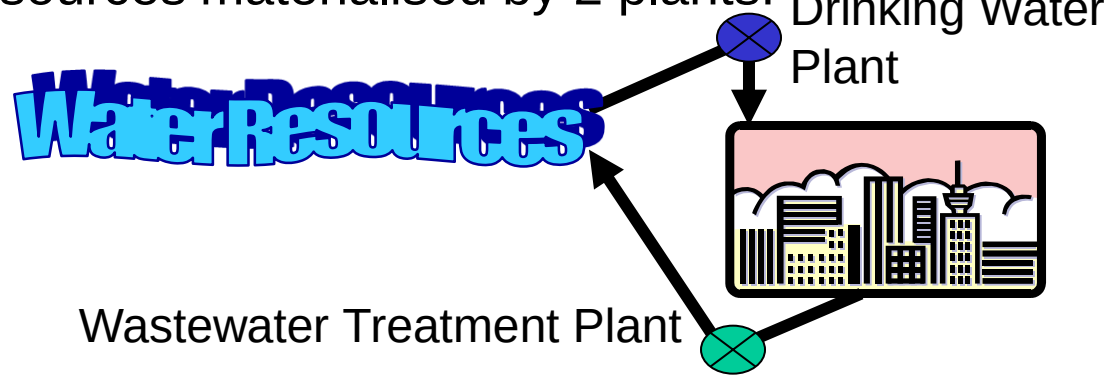
- EU Water policy : improve environmental and health performance, and support full-cost pricing; Water Directives entail high additional costs and meet reluctance and delays in member-States

- While utilities invest in more technology to meet the Directives, a new historical trend of water consumption decline threatens financial balances

- In addition, some water users want to drill their wells and harvest the rain: a new neighbourhood level of governance?

# Europe (NW) has the best public services …

- High connection rates, but moderate water consumption (2-3 less per capita than in the USA)
- Local management (*municipalism*), but with financial support from upper levels: multi-level governance
- Volumetric tariffs widely used: utilities become a ‘club good’ with universal membership (except septic tanks). Utilities’ turnover make them a powerful actor
- Separation utilities/resources materialised by 2 plants:



# Yet, water services and ressources do interact

- Issue of water quality for drinking water
- In large cities, sewer services have increasing implications, e.g. reflections on: Urban rainfall, nuisance or resource?
- Rise of wastewater reuse (non conventional water under Mediterranean climates), and issue of sewage sludge reuse
- Controlling diffuse pollution from agriculture helps reduce drinking water treatment need and costs
- In developing countries, interaction of urban drainage and solid waste collection and treatment (e.g. Niteroi – Rio de J. 2009) …

# Demographic context of greater Paris

- Ile-de-France region : 11 million population, 20% of France
- The central part, « greater Paris », has a very high population density (about 24000 inhab/km2 in Paris, 7000 in close suburbs)
- pollution discharge from wastewater and storm water collection and treatment in Ile-de-France largely exceeds the natural self cleaning capacity of River Seine
  - Summer flow of Seine river : 60 m3/s
  - Treated wastewater discharges downstream from Paris at Achères (largest WTW in Europe) : 23 m3/s
- Contrast with low density in France : 5 million septic tanks!

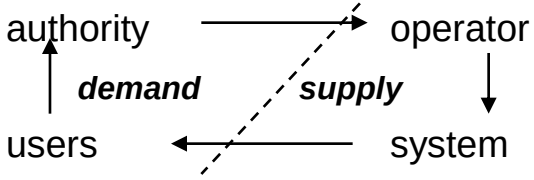
# Why ‘look back to the future’

- Water services are highly « capital-intensive »: today’s technical and institutional set up determined by long term past financing practices
- The well-known public-private debate often related with 2 other less known debates: centralisation-decentralisation, and ‘unbundlded’ or multiservice/integrated. *Path dependency*
- In Europe, public services’ development linked with the initial local nature of the Welfare State: *municipalism*. While water resources allocation made by States or regional institutions
- City control historically linked with centralized systems & treatment
- It makes sense to cross institutional and legal history analyses with the widening of available technologies,
    - To understand how we got where we are

# 3 successive engineerings in water industry

- **Paradigm of quantity & civil engineering**
  ***more water from further, cheap money***

***crisis (volumes )***




- **Paradigm of quality & chemical/sanitary engineering**
  ***cleaner and closer, operation costs and volumes billing***

***crisis (drinking water criteria multiplied)***

- **Now (WFD): common pool resource & environmental engineering**
  ***demand side management; territorial policies vs technology***
  ***From farmer better than from further!***

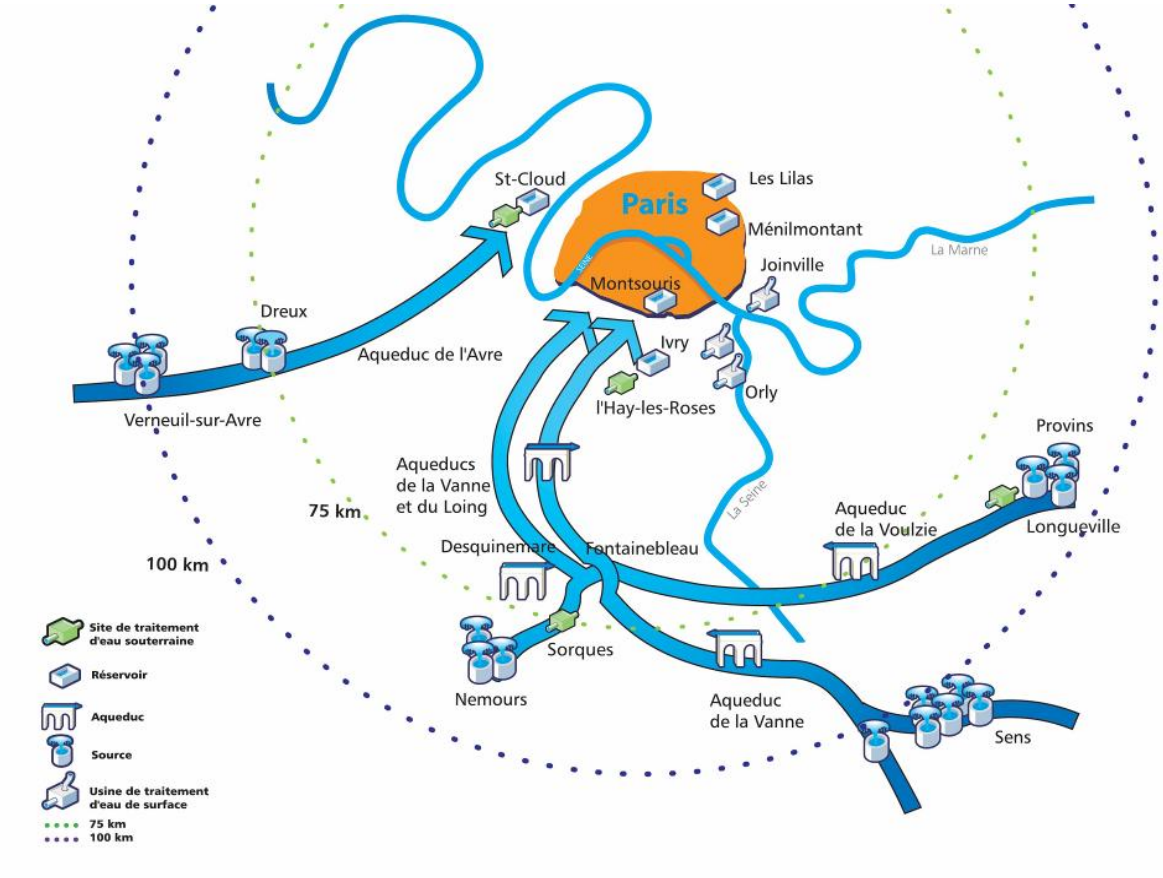
# Initial water access issue in Paris

- 19th c.: the first problem is to ‘wash the city celan’ (solid waste elimination), fire control and parks watering
- A ‘public service’ develops and also feeds free public fountains; water comes mostly from the Seine - untreated
- There are also ‘private’ services delivering water in houses to subscribers (Frères Périer 1781); most water from Seine too
- In 1860 with Paris extension, Haussmann creates a monopoly for water production, but keeps both systems separate, to avoid a public-private debate. ‘private’ service fed with distant sources
- He keeps the private operator, Générale des Eaux, born in 1853 to connect properties and recover bills

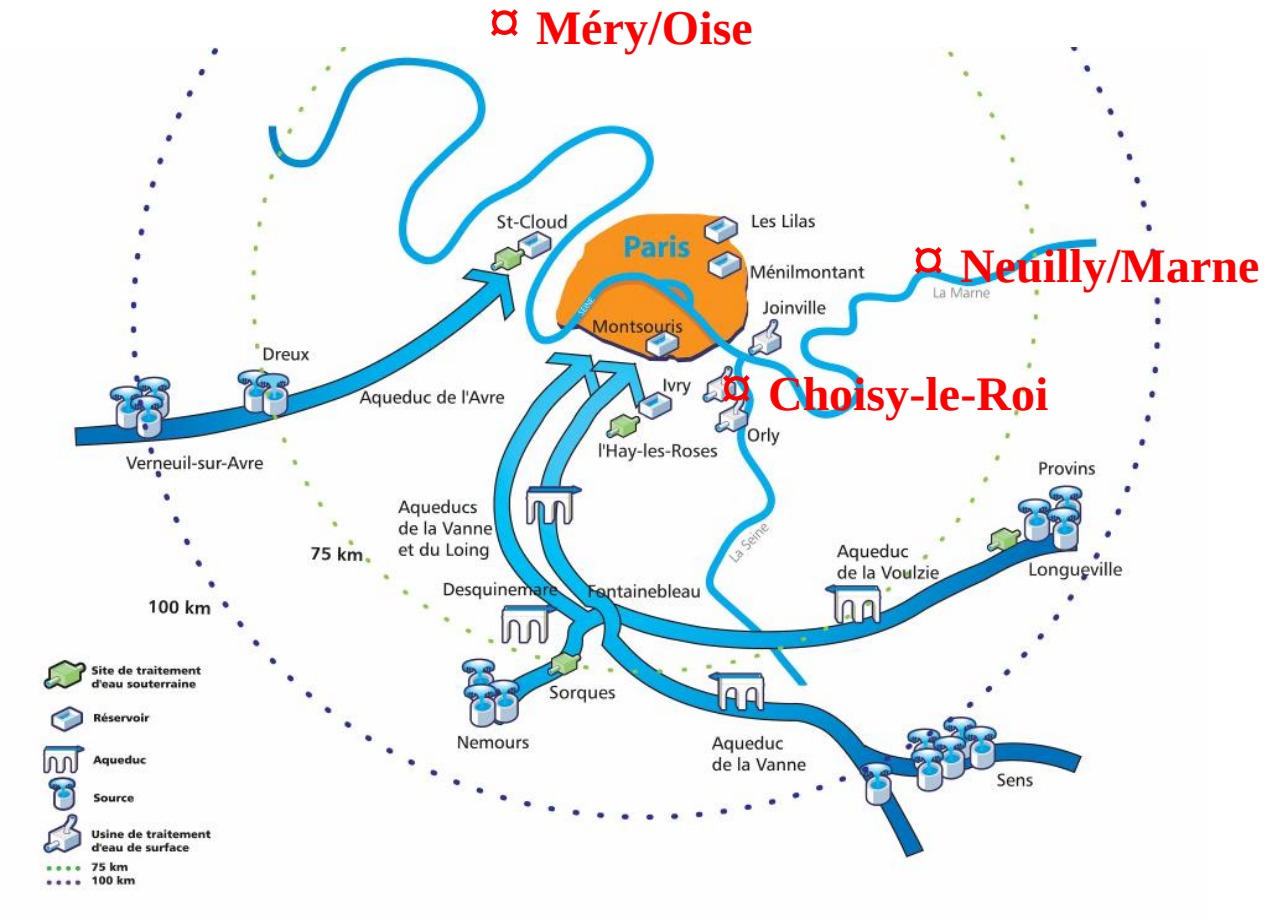
# Adoption of water treatment

- In Britain, lack of distant and abundant freshwater; cholera (London 1849) is pragmatically fought with slow filtration; made mandatory (London 1853)
- But Haussmann and Belgrand distrust this technology which does not eliminate all bacteria. They opt for long distance aqueducts: Vanne, Voulzie, Loing, Avre (around 100 km)
- Filtration finally wins (Ivry, 1902), when associated to chemical treatment invention ($O_3$, Activ. carbon, Cl, UV …)
- A projected aqueduct from Geneva lake shelved in 1919
- Both potable and non potable water systems located in ‘visiting’ sewers: today, very low leakage possible

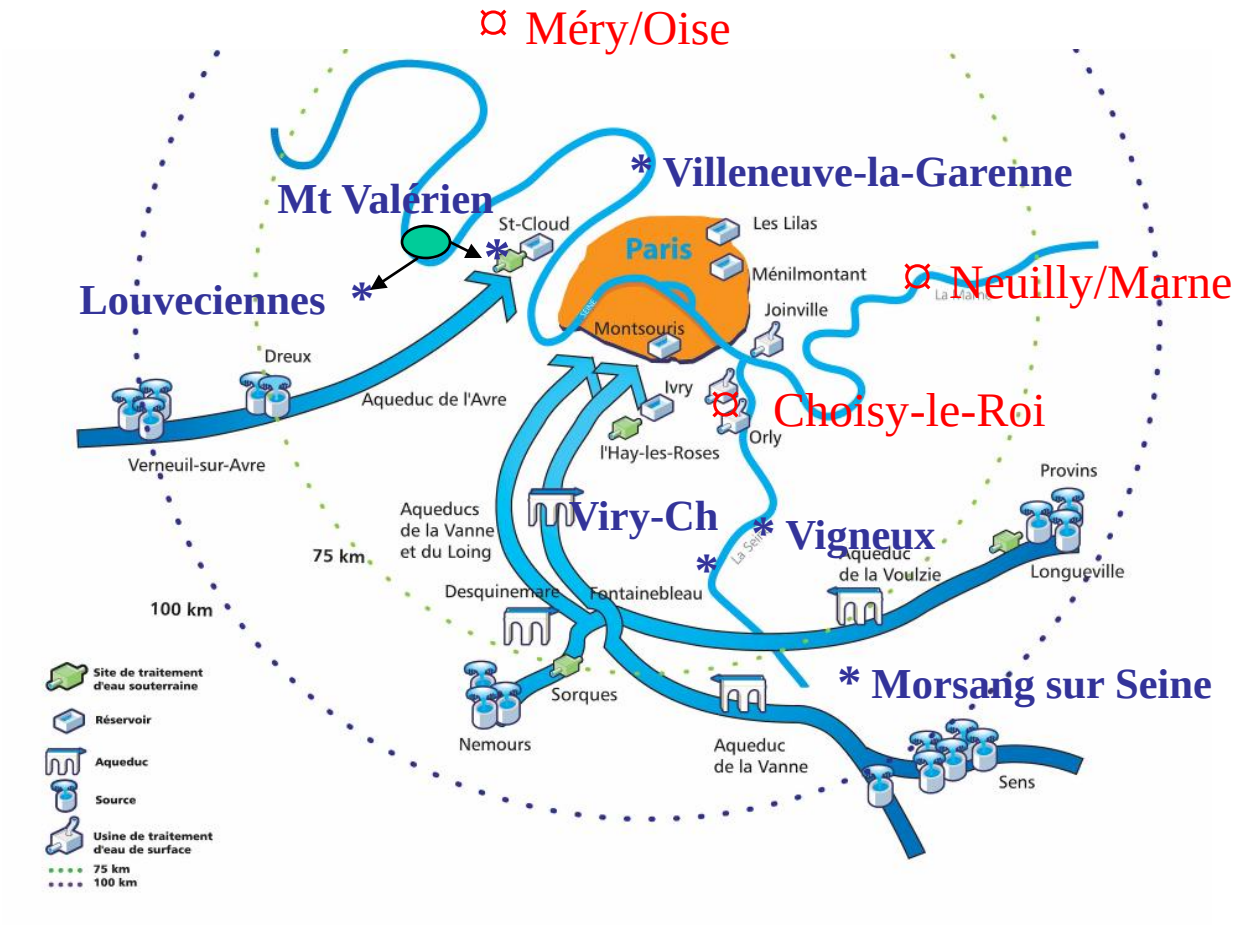
# Paris water supply: river or distant springs?



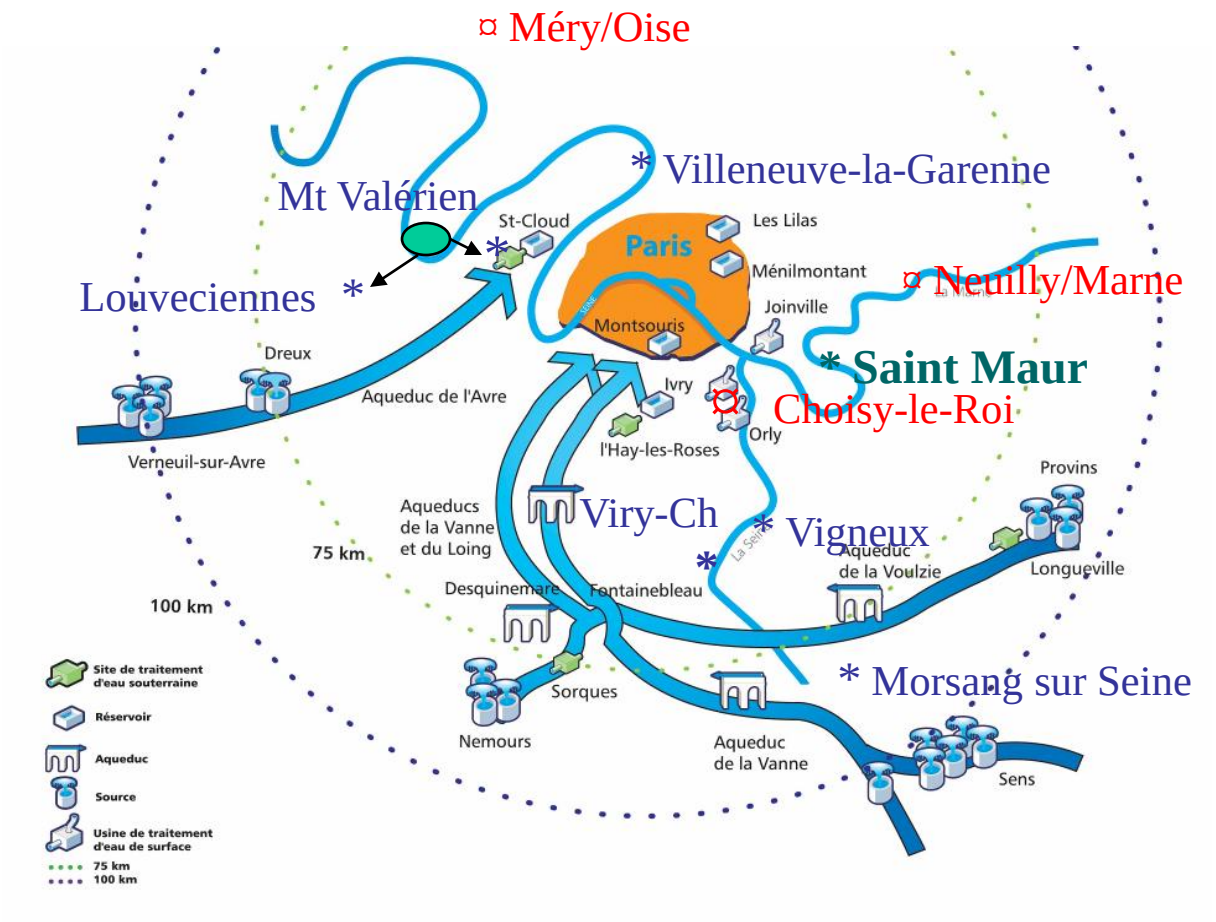
# Suburbs SEDIF: only surface water



# Other joint boards (Lyonnaise): surface, ground and aquifer recharge



# And one *Gaulois village* with direct labour …

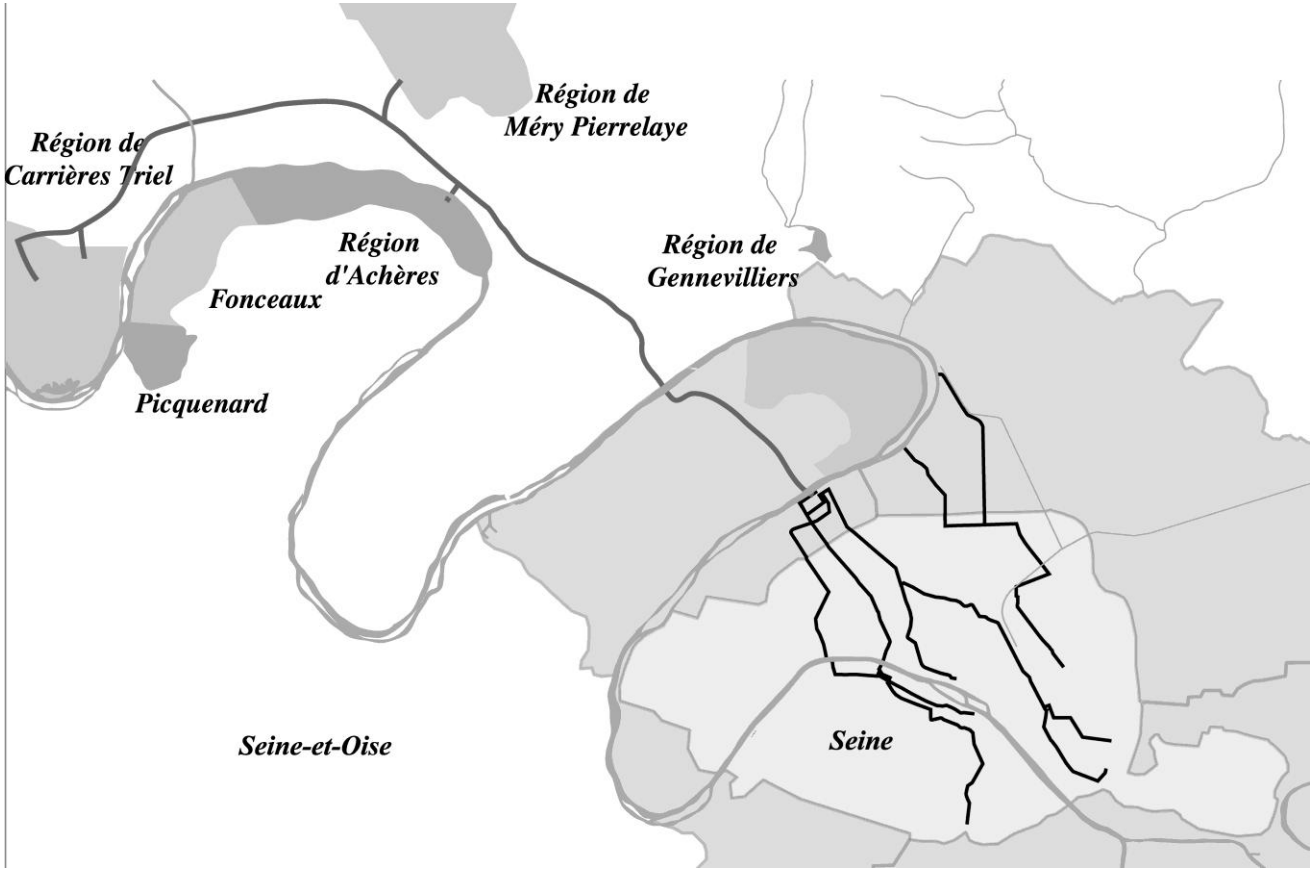


# Sewerage: upstream-downstream linear tradition

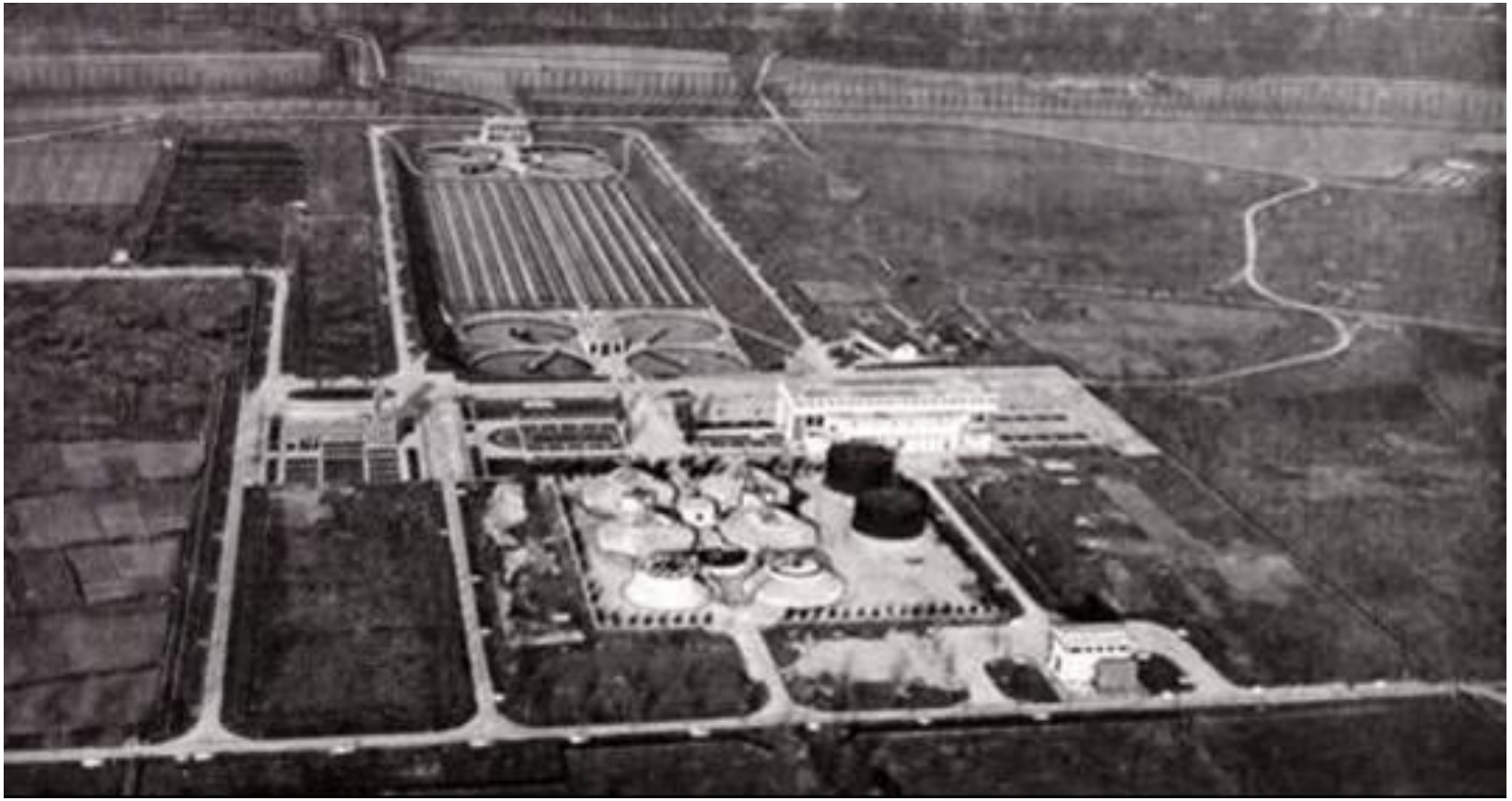
- Solid waste evacuated via sewers *(tout à l'égout*), in rivers downstream cities: combined system incl. non potable water
- Discharges first in Clichy, but pollution leads to extend the interceptor downstream to next Seine's meander, with sewage spread in brownfields
- Wastewater treatment is adopted (Achères, 1941), following the anglo-american model (activated sludge invented 1916)
- After WW2, the steady increase in volumes finally exceeds the site's capacity: Achères 'kills' the Seine despite correct O&M

# Downstream discharge:

Paris sewer system 1910

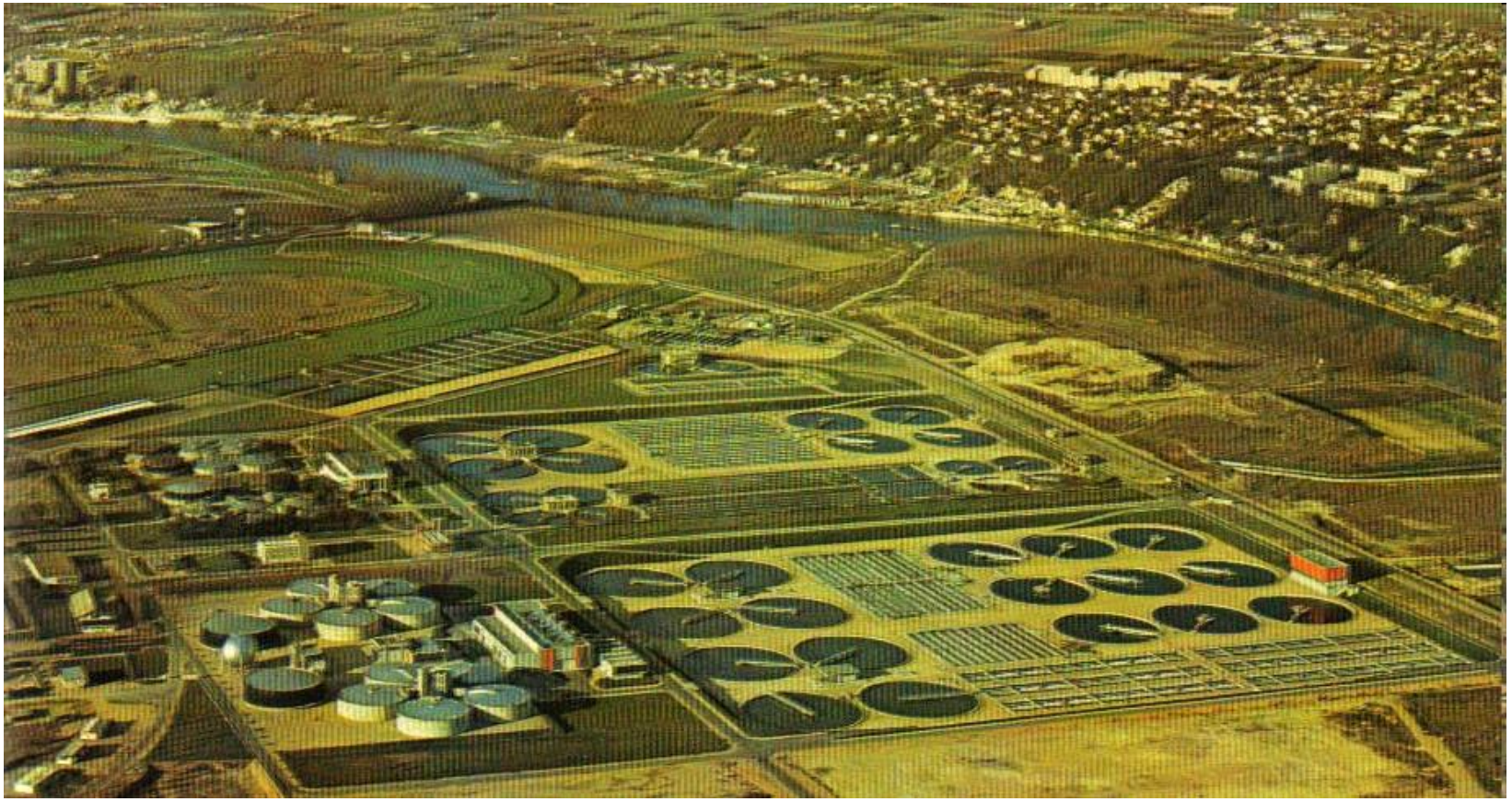


# Sewage works in Achères (1942)



C. SIAAP

# Sewage works in Achères (1991)



Sewer joint boards in Ile de France : SIAAP orange colour (8 mio)

Essonne & Orge: some sewerage boards also manage the river and aquatic environment

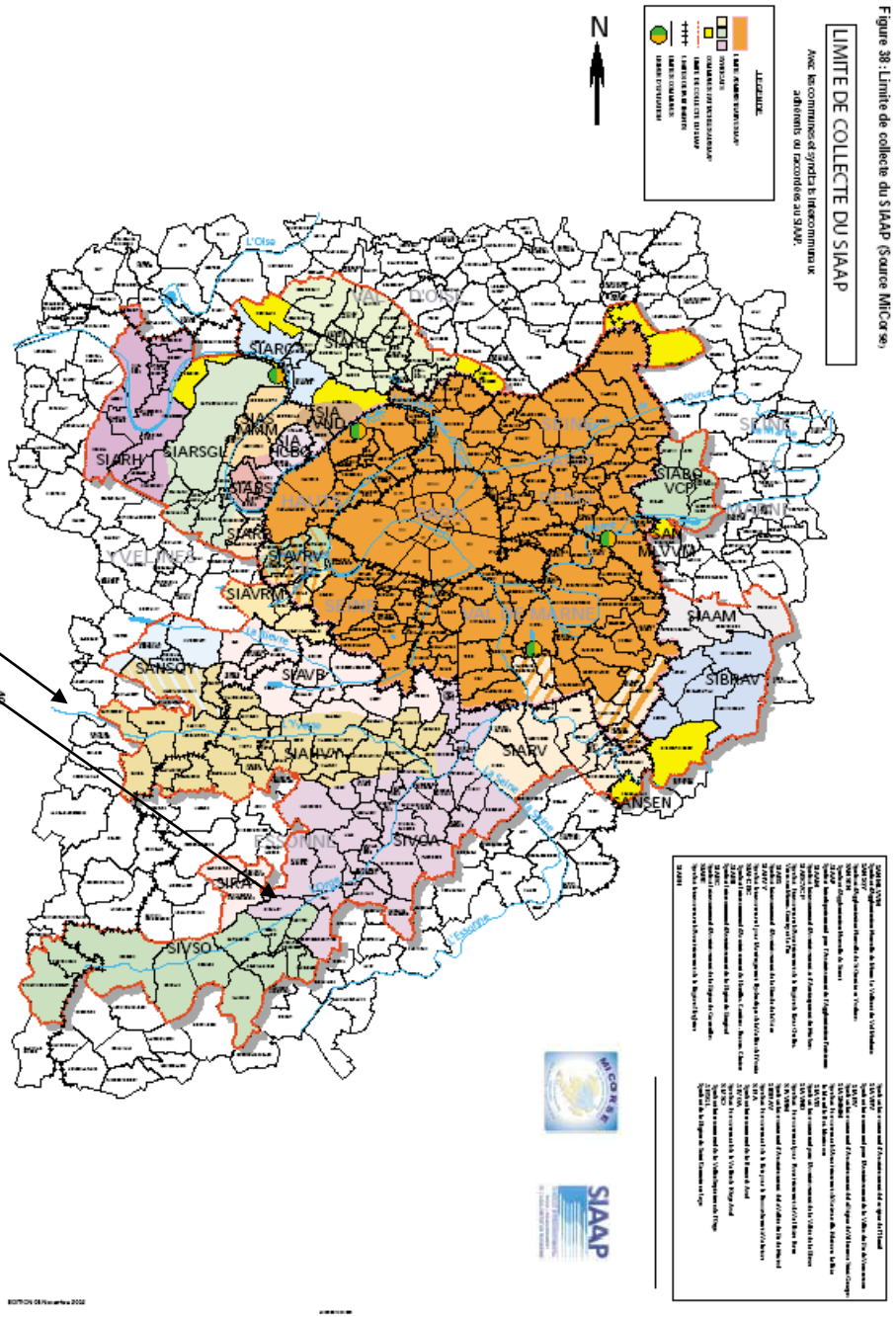
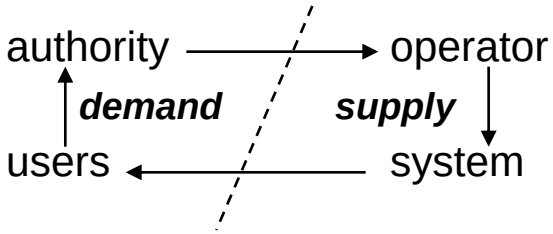



Figure 38 : Limite de collecte du SIAAP (Source MiCorse)

# The second stage crisis

- Growing role of water bills : matching expenses with recipes increases the financial autonomy
- But full cost pricing of a mature utility leads to hig price increases: with infrastructure renewal on top of inclusion of sewer charges this may lead some customers to quit
- At the same time, multiplication of drinking water criteria: over-complexification crisis plus other price increases

The race after quality:
Another supply side loop,
with explosive effects



# The 3rd stage of water industry

- **2 first stages rather on *Supply side***

The recent crisis leads to:

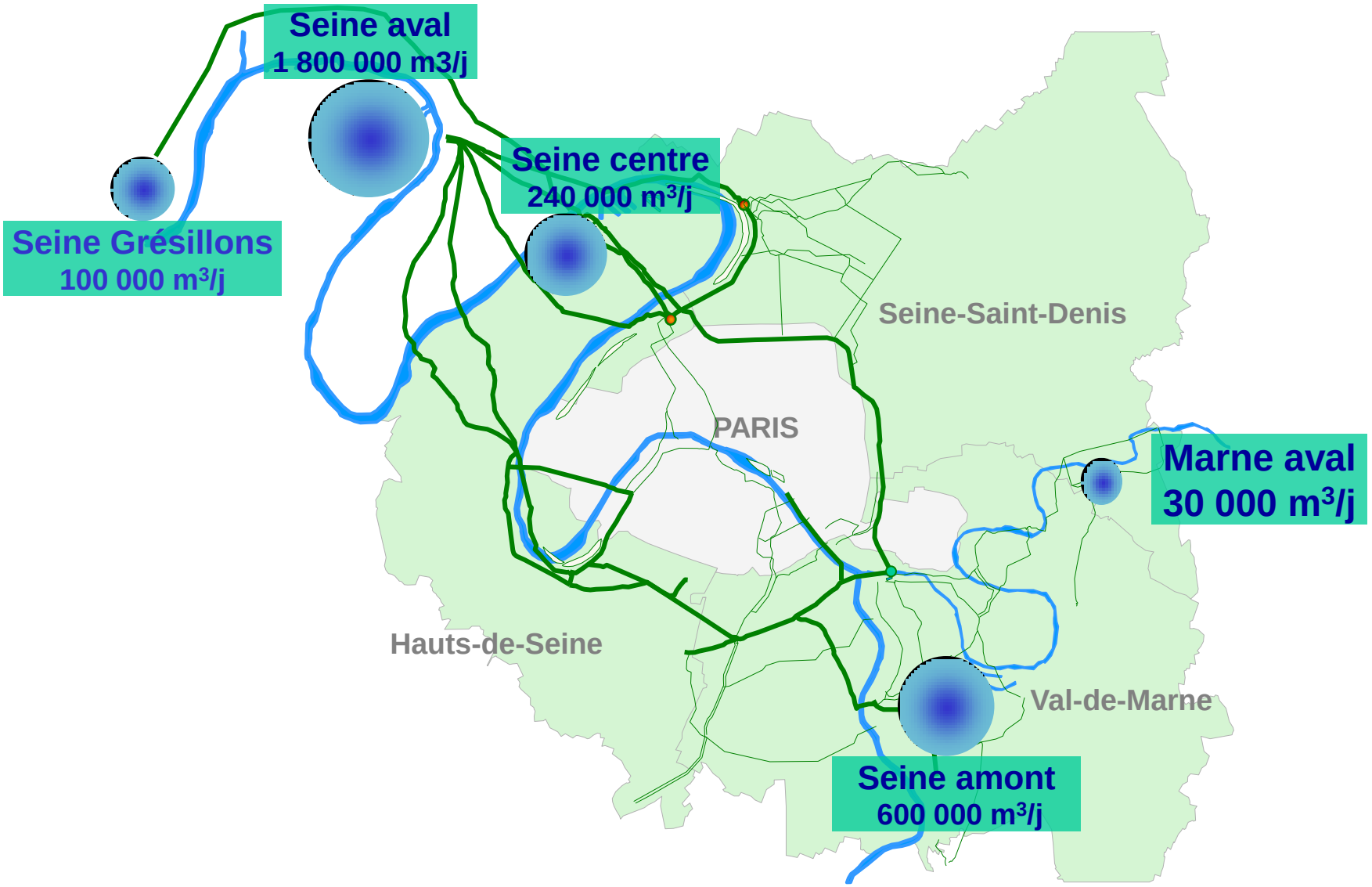
- **Intégrated water management & environmental engineering**
  Demand side management;
  Water conservation;
  flexibilisation of water resource allocation;
  Land use rather than technology policies:
  ***From farmer better than from further!***

- **But technologies of the previous paradigms still available and developing: e.g. sea water desalination**

# New issues and solutions for water and sanitation

- Distributed volumes down by 27% since 1991: one of the water plants is now redundant, or distant springs could be abandoned
- Paris prefers to keep the latter, implying to reach a cooperative agreement with farmers in the area; difficult because karstic
- Then Ivry plant will be closed down (slow filtration technol.) because it is downstream Valenton sewage works
- Indeed for sewage treatment, the linear system of Belgrand has to be changed to gain space in Achères and develop additional treatments
- Valenton: plant operating with its own biogaz, dried sludge converted in fertiliser ….

# Breaking up the linear paradigm



# Valenton sewage works

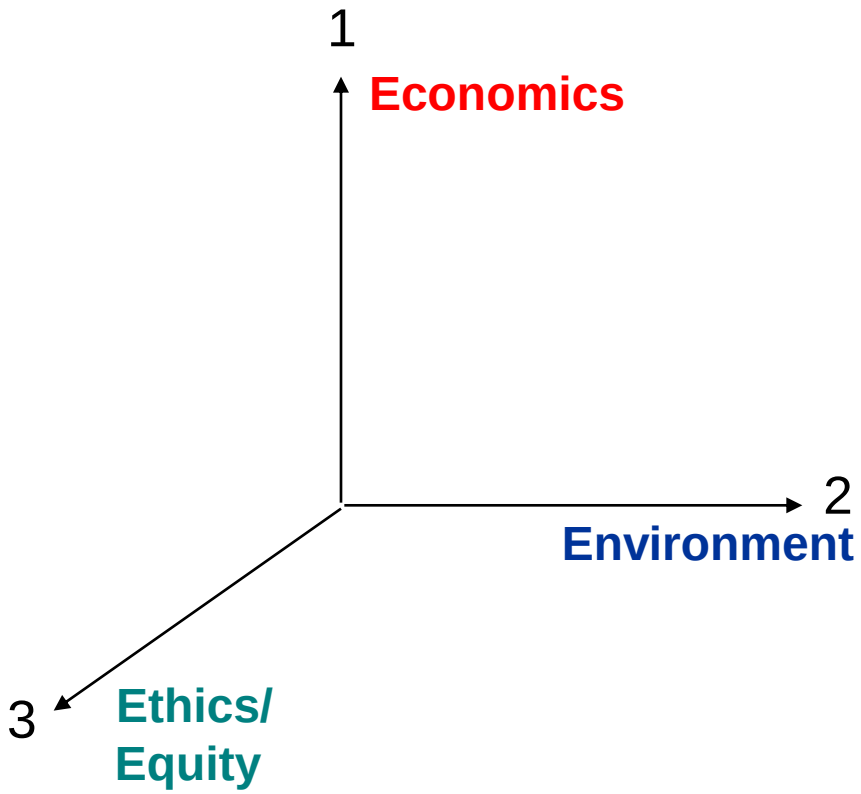
C. SIAAP

# Advanced stormwater realtime management

Bassin de la Molette detention tank, Court. DEA 93

**But needs to be supplemented with land use planning regulations**

# Applying the WFD 3 Es to public services (1)

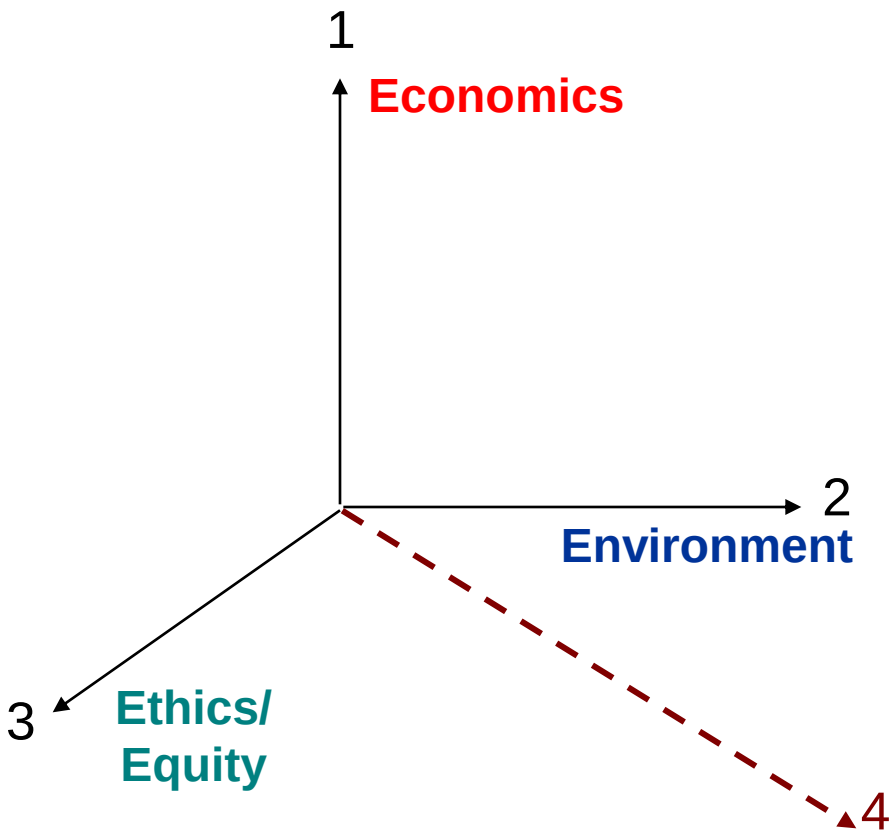



1 – Is there enough invested to keep up the infrastructure?

2 – How much more to meet sanitary and environmental standards? (EU directives, National policy, etc.)

3 - If 1 and 2 are met, is water price still affordable ? What other choice? Looking for citizens and taxes' support?

# Applying the WFD 3 Es to public services (2)




1 – Is there enough invested to keep up the infrastructure?

2 – How much more to meet sanitary and environmental standards? (EU directives, National policy, etc.)

3 - If 1 and 2 are met, is water price still socially acceptable ?

And politically ? Here a 4th axis is needed on governance with multi-level territories

# Origins of the EAU&3E project

- This 3 E methodology was imagined in the EU project *Water 21* in the 1990s (Barraqué, Correia, Zabel, Mostert …)
- Methodology improved through combination with performance indicators (Guérin Schneider, Pezon, Fauquert), and application to Cases in Europe plus Brasilia
- Idea is to use it and improve it again to develop sustainable issues in the above mentioned 4 dimensions
- We wish to develop a foresight approach on the basis of this integrated sustainability methodology

# Setting up EAU&3E

- Île de France offers an interesting case for this integrated approach : water volumes going down inside Paris, but growing in outer suburbs ; issue of price increases ; difficulties with EU urban wastewater Directive's implementation

- ANR tendering suggested to have an operational partner, and we chose Eau de paris, with which we were already working

- Then we associated the various teams working on one or other of the 4 axes, and/or on other French cities with different *problématiques*, like Montpellier and Bordeaux. Other cities are considered (Nantes, Strasbourg …)

# a 4–year project

- We don’t know if there already exists such a global approach, but in the 1st year we are going to investigate what is going on in other countries

- We are then going to develop a 4-dimension knowledge:
  - What makes water consumption go up or down?
  - How can the social dimension be sustainably taken care of?
  - What infrastructure has to be managed on the long run and how?
  - Which new forms of governance could alleviate some of the problems?

- While we work with Paris, we also do in-depth analyses in Bordeaux (with the mixed board SMEGREG) et and some cities in Languedoc Roussillon

# Which consequences?

- WFD focus on aquatic environment recovery compels utilities to ‘return to the territory’ before deciding on technology-based solutions
- The adverse side effect is the blurring, in the minds of citizens, of the frontier between water resources (common pool) and the water services (club goods). People want to save the planet with supposedly cheap ecological solutions
- Indeed in 3rd World, a lot of unconnected people are dependent upon resources: right to water = water rights. But free water in Europe too?
- New trend in Europe in favour of decentralised systems and disconnection: might have very bad social consequences; conversely, decentralised systems allow for renewed cooperation with developing countries where PWS unfinished

# Conclusion

- To conclude: Supply-side and technology revisited by a new territorial approach: looking back at the basin land from the river perspective

- Centralisation & *multipurpose*, or Integrated & participative management? Need for new multi-level governance

- Volumetric bills, or fixed charges or property taxes ? Which combination? Which technology associated with which territorial legitimacy type?

- Thank you for your attention