



# Interaction between water technologies and the city, under changing sustainability paradigms

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## Abstract

In rich cities of developed countries, water and sanitation services are fully developed, and then they rely upon a very important and costly infrastructure which depreciates only slowly; this in turn entails rigidity and a difficulty to switch paradigms for an improved sustainability. Paris area illustrates this in many ways. For instance, one of the reasons why France was sued by the European Commission for delays in implementing the Urban Waste Water Directive (UWWD) was the Paris metropolis: French government should have placed the area within the 'sensitive' zones, requesting advanced wastewater treatment. But this implied to largely reconsider WSS services; the Region IdF, *département* councils and communes in fact needed more time to really follow the spirit of the Directive: if the project means to stop 'killing the Seine' (which is a small river compared to the urban area), the whole sewage collection and drainage system has to be largely redesigned, and the costs are really heavy.

Trouble was made more serious when drinking water consumption started decreasing steadily at the beginning of the 1990's: beyond potable water, waste water collection and treatment budgets, and the funds which the *Agences de l'Eau* could provide, are all coming from the water bills. In down town Paris, the volumes distributed went down by 25% in 15 years, which is a lot. Paris area is going to meet the same problems as are experiences already in many German cities, in particular in the Eastern 'new' Länder. There the collapse of water demand is such that it won't probably be possible to keep the existing water and wastewater infrastructure. Some urban planners, ecology institutes and water engineers want to take advantage of this crisis to redesign water and waste water systems with a combination of former centralized systems and decentralized new technologies, at least in new development areas in the periphery. But the sustainability of these projects is an issue, because of the associated costs and social impacts that might result.

## Drinking water issues yesterday and today in Paris area

A hundred and fifty years ago, there was a public service of water in Paris, but its main role was not to supply drinking water to the residents. Most of the water was needed to 'wash the city clean' and flush the sewers, for parks watering, fire hydrants. This water taken from unsafe surface storage also fed public fountains. There also was a 'private' water supply by

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companies pumping water in the Seine or from springs and offering an in-house supply. This water was not of better quality. Baron Haussmann turned both services into a public monopoly when he annexed the suburbs to expand the capital. But he decided to keep both services separate, and this is the origin of the dual water supply in Paris. Considering filtration technology untrustworthy, he and engineer Belgrand preferred to improve the 'private service' through long distance aqueducts 'like the Romans'. But at the beginning of 20<sup>th</sup> century, filtration was improved and chlorination was added, allowing river water to become potable: Paris finally chose slow filtration in 1902 at Ivry. Little by little, people connected to the 'private' water supply, which became the 'potable' supply, while the former 'public service' became the non-potable water supply. Today it has lost most of its users, and there is a debate about closing it. But both systems are located in the 'visiting' sewers which can accommodate most urban systems. Despite workers' health risk, maintenance and leaks repair was much easier. Conversely in the suburbs, quasi-all the water is pumped from rivers and where the network is buried under the streets. And while Paris always produced its water directly, and used the Compagnie Générale des Eaux only to connect, meter and bill customers, the suburbs generally signed lease contracts with private companies.

Because water prices seriously increased due to inclusion of sewerage in the bill, and after the disclosure of some corruption affairs, some consumer and ecologists NGOs voiced against these PPPs and proposed to return to direct labour. This occurred in Paris city one year ago, and could have happened this year for the largest contract in France, the suburb's SEDIF. Most member municipalities decided to keep the private company, but some formed a new *communauté d'agglomération* and considered splitting from the joint board, and buying their water instead to Paris, where consumption has decreased and the filtration plant in Ivry is idle. But it turns out to be difficult to 'unplug' from the previous water supply. Nevertheless, this episode opened the Pandora box: in a context of water consumption decrease in the central area, and increase in the outer suburbs, rationalising the production of drinking water at the scale of the region, and reducing the number of drinking water plants, is now an open question, while it was a taboo until last year.

### **Wastewater and stormwater**

At the end of 19<sup>th</sup> century, Paris chose the combined sewer technology, applied in such a way as to discharge all waste water downstream at Clichy. But the resulting impact on the river was so bad that it was decided to extend the interceptor down to the next meander, and spread the sludge on brownfields. Only in 1942 was the large sewage treatment plant inaugurated in Achères. The growing problem was the overloading of this sewage works, yet the largest in Europe. One of the reasons was that visitable sewers had been designed to compensate the insufficient slope with sewer flushing from the second non potable water supply. In the suburbs, engineers of the Corps des Ponts imposed the separate sewer solution, but it was not necessarily well implemented, due to delays for local authorities to install the wastewater sewer, which they were responsible for. In the end, the impossibility to treat all the waste water in one location downstream led to abandon the principle of Belgrand and others earlier: take the water upstream or above the level of Paris, and discharge it downstream. Another large and up-to-date waste water plant was built upstream Paris in Valenton, treating all the waste from south and southeast suburbs; another plant on the Marne was modernised and expanded; all this allowed to reduce the waste arriving in Achères and to complete the treatment to tertiary level. Separate stormwater sewers were also discovered to discharge very polluted water, so a program of surface detention storage was designed in the suburbs of the first ring. The coming issue is to change the land-use

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plans of the communes to incite residents to store some rainfall during storms and to re-infiltrate it. Conversely, some residents are tempted to equip with rainwater harvesting techniques to buy less water from the public supply. There doesn't seem to be many new well drilling in Ile de France, conversely to what happens in other regions, but there is indeed growing uncertainty about the interaction of WSS services with their territories, and with each other.

### **The EAU & 3 E research project**

The unexpected recent decrease of potable water consumption in many cities in developed countries, takes place at the very moment when the European Union urges member States to improve environmental and public health performances, but also to get beneficiaries of the services pay closer to full cost recovery. These combined factors create a new uncertainty and complexity for public services: are our water services sustainable, even in the heart of Europe?

Our EAU& 3 E project, funded by the French Research Agency (ANR), brings together 6 teams with good experience on some of the dimensions of water services sustainability, plus the public company Eau de Paris, which is directly concerned with its water consumption going down, with social impacts of rising water bills etc., and also an institution in charge of water resources / water services interaction in Bordeaux area.

The project includes an investigation phase on existing approaches to answer part of the questions, chiefly in Europe, Australia and North America. We then particularly investigate 4 themes corresponding to the three dimensions of sustainable development (economics, environment, ethics/equity) plus the institutional dimension (multi-level governance needs).

- Economic sustainability: Evolution of water consumptions and interaction with tariff systems in the budgets' balance;
- Social sustainability: support to vulnerable social sectors facing higher water bills: lower the bills or support incomes;
- Environmental sustainability: long term management of the infrastructure and assets with eventual partial replacement with alternative technologies;
- Governance: new institutional set up to achieve a better matching of functional and political territories, and good levels for citizen participation.

The last part of the project will consist in pooling the results of the previous phases into a futures and participative workshop, as well as setting up an international conference to discuss our results with our European, Australian and American partners.

### **References**

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