Water, sanitation, energy, waste: the dawn of the network-free city?

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Negative externalities, changes in society and technological innovation all call into question the industrial model used to organise urban services and utilities. For Sylvain Petitet, it is high time to consider new models and new complementarities for the provision of these urban services.

For almost two centuries, an industrial model characterised by the creation and operation of major urban networks has fashioned the development of cities and has established itself as the only service model for a certain number of essential urban services (water, energy, waste disposal, etc.); however, this model is now being seriously reconsidered the world over with regard to its intrinsic limits, and is being challenged by the emergence of more decentralised solutions that are now credible alternatives. But instead of seeing these options as competing solutions, would it not be better to envisage a complementarity between centralised "fully networked" approaches and more decentralised emerging solutions?

A brief history of urban utilities

In the 19th century, the rapid urban expansion resulting from the industrial revolution made it necessary for public authorities to take over the distribution of water and energy, as well as the evacuation and treatment of wastewater and refuse. It was at this time that an industrial model was born to ensure the production and management of these major urban services. According to this model, production (production and treatment of water, production of electricity and gas, waste incineration, etc.) takes place in large factories and covers the widest possible territory, in order to benefit from economies of scale and reduce plant equipment costs. The result has been the emergence in France of SPICs (*services publics industriels ou commerciaux* – "industrial or commercial public services"), the management of which, in most cases, is private, with the creation of large companies to provide these services. These large companies, working on behalf of local authorities, have in turn set up networks, devised according to technical requirements and composed of plants at municipal and later intermunicipal level, or even at departmental (county) or national level. Streamlined operations and the expected economies of scale justified the development of these technical networks on an ever greater territorial scale. This industrial model, originally restricted to urban areas, has today spread to the whole of France, according to time frames appropriate to each area, to the point that it is now the dominant – indeed, almost the only – model for these utilities. With regard to water distribution, for example (Goubert 1986), even the most remote rural farms in France are now linked to the "municipal water" network and have abandoned their springs and/or ancestral wells.

This type of technical organisation is not merely an essential infrastructural element for the operation of the contemporary Western city; it is also an integral physical part of the city – it is what defines the Western city of today. This industrial model for urban utilities, of course, initially led to a clear improvement in public hygiene, enabling the eradication of cholera and diphtheria, which

had devastating effects on the cities of the 19th century. It brought with it safe water supplies and a comfort that were hitherto unknown, eliminating, for example, the need to fetch water by hand, as well as supply irregularities, risks associated with poor resources (recurrent pollution of urban wells by cesspools), and the individual or collective maintenance requirements for local wells and catchments. These urban utilities also led to the emergence and democratisation of electrical domestic appliances (inherently linked to the development of electricity) – today essential items – which in turn led to a drastic reduction in household chores. The washing machine, for example, is the result of a successful, if unlikely, marriage between water and electricity.

This organisational model for the production of urban services – a model for cities and "urban" life – has been adopted across the globe and is seen as the obvious solution. The city, which is now home to over half the world's population, is not only a form of high-density habitat that groups together a range of political, administrative and economic functions, but also a means of addressing the issues of drinking water provision, wastewater removal, energy supply and refuse disposal.

The limits of the industrial urban utilities model

We are now so connected to networks, to the point of being unable to do without them – indeed to the point of being unable, legally, to live outside their grid – that we are often unaware of their technical and territorial organisation. We take the daily miracle of their continued operation so much for granted that we are now struggling to adopt more responsible behaviours imposed by the need to reduce their negative environmental externalities: recycling, vigilance with regard to domestic discharges to sewers, water usage restrictions in periods of drought, etc.

In addition to the lack of responsibility induced by a model that originally consisted in the collective management of utilities in return for a personal financial investment (i.e. "pay your bill and we take care of everything"), the difficulties experienced in adopting these new behaviours show the limits of the system and its rationality.

First of all, these urban utilities – designed for growth and developed according to an industrial approach – are based on a principle of constant increases, which is now generating negative externalities that are increasingly unacceptable and unsustainable: depletion of natural resources (water, energy resources), increasing pollution of natural environments (effluent and refuse that is more and more difficult and costly to treat), and a spatial concentration of various kinds of damage. A new concern for sustainable development and a growing sensitivity to environmental issues illustrate the limits of the rationality of this model (Coutard 2010). Moreover, although this organisational model shields the majority of users from such environmental nuisances and provides them with an invisible, silent and odourless service, the unlucky neighbours of the most harmful facilities are obliged to put up with the inconveniences imposed in the name of the public interest, or else risk passing for selfish Nimbys.[1] For example, the construction of ever larger incinerators (in order to obtain the typical economies of scale sought by industrial models) has an extremely negative environmental impact: they generate high levels of heavy goods traffic, as well as visual pollution, noise pollution, odours and chemical pollution.

Moreover, these networks, the technical design and funding of which are based on anticipated growth in consumption (growth in individual consumption, population growth, even the expansion of the territories to be served), are struggling to adapt to a possible reduction in consumption, linked, for example, to changing lifestyles, technical developments enabling more water- and energy-efficient appliances, consumers' sensitivity to price rises (elasticity of individual consumption with regard to price) and decreases in urban population and their potential effects at

[1] The term "Nimby" ("not in my back yard") refers to people who oppose projects – especially public ones – and who are aware of the common interest of these projects but do not wish to see them take place "in their back yard". For more about Nimbyism (in French), see: André Torre, "Du bon usage des conflits ! L'expression des désaccords au cœur des dynamiques territoriales", *Métropolitiques*, 20 June 2011. URL: http://www.metropolitiques.eu/Du-bon-usage-des-conflits-L.html.

regional level. The way these utilities are financed, whereby revenue is linked to volumes distributed, is having trouble adapting to the drop in consumption observed in Europe for over 10 years now (Barraqué 1999), which has led to a reduction in revenue for utilities companies at a time when significant investments are necessary, in particular for the renewal of infrastructures. If companies react to such drops in consumption by raising their prices, however, this may lead users to further reduce their consumption, creating a vicious circle for the utilities firms and threatening their economic viability. "Shrinking cities" in areas experiencing rapid deindustrialisation and significant population losses are struggling to reduce the size of their networks and resolve problems resulting from a collapse in consumption in certain neighbourhoods, while their financial resources are falling significantly (Féré and Scherrer 2010). We are observing first-hand the low level of reversibility of these infrastructures and the difficulties involved in adapting to changes in consumption.

Finally, it can be noted that in the so-called emerging countries, the "fully networked" model – promoted by major international organisations to bring these cities, currently experiencing population explosion, into urban modernity and encourage their economic development – is having difficulty meeting the needs of the population. The deployment of these models, requiring very costly investments, does not really correspond to the population growth time frames of these cities (Petitet 2007), meaning the poorest cannot enjoy the benefits of urban living, at a time when hygiene conditions are all the more more dramatic as a result of the intense urban concentration (Petitet and Schneier-Madanes 2005).

Can technical innovation work against networks?

Independent or semi-collective solutions, on the point of being eliminated by the inexorable and triumphal march of urban utilities networks, were until very recently considered marginal options restricted to the most inaccessible and/or expensive-to-serve areas, or to the handful of "eccentrics" resistant to dependence on utilities firms or public authorities. And yet, at the margins of the city, the limits regarding the deployment of these major technical measures and certain recent technological innovations have brought these autonomous or semi-collective solutions back into the picture.

For instance, although the network – at the cost of considerable investment – has all but eradicated the individual production of drinking water, restricting well water to garden use only, a credible alternative now exists in the form of booster pumps coupled with ultrafiltration devices. Similarly, while individual or semi-collective sanitation in France owes its survival exclusively to the exorbitant cost of providing a collective sanitation network across the whole country, it has recently been reintegrated into public service provision, in view of environmental concerns. Local production of wind or solar power is also a reality, even if illogical and costly financial arrangements (subsidised installation and buy-back of energy produced at above retail price in the case of solar electricity) have enabled EDF to remain the dominant player with regard to the French electricity network. Finally, the increasing cost of waste disposal has revived interest in making one's own compost, and even the semi-collective production of biogas.

Furthermore, in developing countries, the inability of large networks to meet the needs of populations may lead to the development of collective or individual solutions more locally with regard to water provision – e.g. wells and pumps managed and operated by small groups – or electricity supply – e.g. rechargeable battery services (Jaglin 2011).

Reconsidering the industrial model

Is it possible to see in these solutions – which are still marginal and more or less controlled by the major utilities operators – the beginnings of a somewhat radical reconsideration of the primacy of

urban utilities and their industrial and network-based organisation? In developed countries, the growth of local, individual or small-scale collective production (for a housing estate, an apartment block, a neighbourhood, etc.), leading to an accelerated decline in consumption, would be all it would take for the system to be severely weakened. In common with other "short circuits" created to foster sustainable development, the development of local production and consumption could then lead to major urban utilities (energy in particular) being used as complementary services, seriously calling into question their industrial and economic models.

In developing countries where, for economic reasons, it is difficult to develop major urban utilities at a reasonable price (for the poorest populations) and at an appropriate territorial scale, it may be well worth considering alternative solutions that are less expensive, more flexible and less centralised, either on a temporary basis or in addition to the standard model. There is also the question of whether competing or complementary solutions are preferable. On this matter, only time will tell – however, the "fully networked" model is almost certainly a thing of the past.

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