

“Urban planning and
urban services:
the essential
alliance”



**Introduction publication
to the 92nd ASTEE Congress**
> 4-7 June 2013, Nantes (France)





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Coordination: Marcel Belliot,
Bernard Chocat and Solène Le Fur

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PREFACE

by Pierre-Alain Roche, President of the ASTEE



Our purpose is here to foster a dialogue between urban planners, developers, and professionals of the local environmental public service (LEPS: drinking water, sanitation, solid waste disposal and energy) on "sustainable and responsible cities" (the theme of ASTEE 2013 Congress in Nantes). We follow with a transversal and multidisciplinary approach: "SPLE: réussir la mutation de nos métiers" (ASTEE, 2011) and "Improving performance of water and sanitation public services" (ASTEE, 2012). Once again, we will endeavour to practice what Edgar Morin called "naive inter-disciplinarity" (MORIN, 1990), or in other words "contrasting perspectives", as this seems most propitious to innovation. Already, upon the founding of the Association Générale des **Ingénieurs, Architectes et Hygiénistes Municipaux** in 1905, the very name of our learned society expressed the desire to unite these 3 professions, and it established in its bylaws the notion of "urban engineering", which the late Claude Martinand would newly redevelop (MARTINAND, 1986). Hence, our action today harks back to the principles that prevailed when our society was created over a century ago.

However, the context is very different. We no longer live in a time when segregations and inequalities were visibly discernible in the urban geography of neighbourhoods with services and those without. Today, urban services in Western Europe no longer focus on developing physical access to services, with increasing number of customers financial snowball driving the system. The scene is now dominated by issues of rates, mechanisms of financial solidarity between consumers, contradictions between asset management needs, and pricing policies in economical difficult times and sagging consumption due to improved technological performance among users. It is demonstrative proof that, while the aim to establish "universal service" has been largely realised (EDWARDS,

2003), the problem of service access and sustainability has yet to be resolved and it is more an economic and social problem than a technical one. In the shrinking cities of the US, the very survival of the infrastructures is doubt (DUPUY, 2011), not due to a decline in population, but rather to evolving practices and the impoverishment of both the population and the public sector, much like "a feeble old man in his oversized suit". In France, the same kind of problem has been posed for the replacement of obsolescent national railroad infrastructures.

The social project to ensure an equitable access-to-service remains unchanged but the progress necessary to accomplish this is of a different nature and the solutions are likely no longer the same.

A first issue, that is only partially and poorly resolved, relates to the vulnerability and the bad resilience of these complex municipal systems. Today, of all the natural or technological risks cities face, flooding, either due to urban rainwaters or river overflows poses by far the greatest likelihood of drastic or long-term social or economic damage, to the extent that it could even threaten the survival or minimal comfort of large populations.

A second issue is the aim for proximity and smaller spatial scales for urban projects. Ambitious 20th century planning phases saw the development of transportation and road infrastructures, energy networks or cold energy, drinking

water, sanitation, waste collection and treatment at the conurbation scale. Today, such large scale network models are challenged: disconnection of users from networks, storm water control at plot scale, rainwater collection for private uses, smart grids and energy self-sufficiency at an individual or small-scale, search for small-scale composting solutions, and the shortening of circuits. The neighbourhood once again takes centre stage with the concepts of the eco-neighbourhood. The rise of these new spatial paradigms came at the same time as the public financing crisis at the beginning of the 21st century. Are we really inventing a new urban model that is more sustainable while avoiding solutions that are burdensome and difficult to maintain? By turning our backs on the use of large existing collective infrastructures are we not making costly choices that inevitably fall short of priorities by further exacerbating future problems? Do we not run a risk of undermining the social pact where universal service, buttressed by cross-subsidies, plays a fundamental role in our shared well-being? In such scenarios, once the urban network is broken up and relocated, is it possible to recover the best means of ensuring solidarity at well-adapted scales? Are we building a model that is really more energy efficient and less wasteful of natural resources? With the densification of our metropolitan centres, are we not rendering them even more fragile by increasing their systemic interdependence and by augmenting their exposure to natural risks? Have we really boosted the resilience of our systems?

In the title of the congress this book prepares, we have intentionally referred to the notion of a city being both sustainable and **responsible**. Technical issues take centre stage in the debate as soon as sustainable objectives are discussed, not merely from the local or individual perspective, but from a perspective in which wider global issues are taken into account. Such considerations call

for work on life cycles, and for a realignment of service objectives in a broader perspective: for us this implies not only finding solutions for the operation and asset management of municipal services in an economically constrained world, but also the need to minimise the overall impact of these activities, which in essence are industrial in nature, even though they are carried out by public authorities. Greenhouse gas emissions, or more generally the environmental footprint of human activities cannot easily be interpreted as a key to the sustainability of the urban system itself, but they play a role in the responsibility of the urban system in respect to surroundings territories as well as contribution to global issues. This is well understood in the integrated water resources management at the basin scale, where the "panarchic" organisation of ecosystems leaves us no alternative (ROCHE & al., 2005). The same may be said of the meshing of all urban-peri-urban-rural community circuits, and more generally of the acknowledgement of a certain responsibility to the entire planet. Today, our local authorities are concerned by their social and environmental responsibilities like private corporations. This approach, which turns its back on an individualistic logic, reminds us that we belong to a broad, larger collective entity. It echoes with buddhist values, or more specifically with by the Japanese "āida-gara" (togetherness, connection).

I wish to particularly thank Marcel Belliot and Bernard Chocat, whose collaboration illustrates the interdisciplinary of this undertaking, for introducing this book that they have coedited and for clarifying the key issues raised during our preparatory discussions.

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*Translator's note: Here, "territory" designates a somewhat vague geographical area without a geopolitical boundary or authority, akin to what a "region" is in English. It was decided to use "territory" in this article and elsewhere in this book to avoid any confusion between the French "region" which is a geopolitical entity with distinct borders. French regions, while they have no legislative authority, can levy their own taxes and are governed by a regional council.

EDITORIAL

by Gilles Retière, President of Nantes Métropole

I thank the ASTEE for choosing to hold its 92nd annual congress in Nantes, the Green Capital of Europe in 2013, with the theme "Promoting Sustainable and Responsible Cities".

Indeed, the "Green Capital of Europe" prize, awarded by the European Commission in conjunction with a friendly but very rigorous competition between European cities, came as a welcome acknowledgment of our city's commitment to environmental concerns. However, this award underscores, more than anything, a responsibility to pursue the efforts already undertaken and the need to promote and consolidate the exchange of good environmental and sustainable development practices between European cities. This ASTEE's publication is an additional opportunity for Nantes Métropole to assume this responsibility.

I would add that today, four out of five Europeans live in urban centres and their standard of living depends largely on their urban environment. The promotion of the sustainable development of cities is thus one of Europe's pivotal lines of work, most notably in light of the threat posed by climate change.



With this in mind, support was rallied from all stakeholders with a role in promoting the emergence of modern European cities in preparation for the conference in 2013. This joint undertaking mobilized stakeholders at all levels: the European Commission, European cities, local institutions, socio-economic players and major companies, non-profit organizations and the public services of all the municipalities that make up the greater metropolitan area of Nantes.

The 92nd ASTEE congress fits in with this joint dynamic and dovetails with efforts for sustainable and responsible development among the various local, national and international events that are designed to allow institutional and corporate directors, researchers, citizens and even young people to meet and engage in discussions throughout the year 2013.

I wish each of you a great congress.



Thinking and acting together for efficient actions

by Philippe Marest¹, the Assistant General Manager and General Director of Environmental and Urban Services Department of Nantes Métropole, and Vice-President of the ASTEE;
and Olivia L'Honoré, Director of the Support, Coordination, and Piloting Mission at the Headquarters of Nantes's Metropolitan Environmental and Urban Services

The issue of decompartmentalisation, central to the problems posed by sustainable development, is equally central to the Nantes Métropole project, which takes into account the various environmental, economic, and social dimensions in the implementation of public policy and their action plans, as well as the installation of a wider governance of the stakeholders. Furthermore, this question is illustrated through a number of very concrete examples provided by Nantes Métropole. The nature of this urban community, the most integrated form of inter-municipal cooperation, and the powers they wield, both mandatory and voluntary, constitute a potent tool that benefits both the inhabitants and the territories both in terms of public service and the sustainable development of the territory. The various instruments at its disposal to implement public policy require actions that are coordinated, internally and externally coherent, and inevitably decompartmentalised.

Internally, the measure that best ensures a coherent action is a transversal approach designed to specify the range of Nantes Métropole public policies via its actions plans, clarify the objectives, project management, deadlines and financial stakes².

This managerial approach relies on decompartmentalised political steering implemented through steering committees composed of elected officials with a wide range of official responsibilities.

In matters of sustainable development, the decompartmentalisation of services is quite simply an operational imperative, as it would be illusory to undertake sustainable development with a technical "isolationist" outlook. Cross-over expertise is an essential factor of any valid assessment in the stakes of sustainable development. At Nantes Métropole, a concrete translation of this approach is exem-

plified by the transversal climate and biodiversity action plans.

Externally, networking between the 24 municipalities (which was particularly close with the City of Nantes, given that a certain number of departments were shared most notably the department of sustainable development) ensured greater compatibility of the territory's various public policies. The implementation of a specific mode of governance via the implementation of seven local centres and opportunities for dialogue with locals facilitated by an inter-municipal approach to specific duties completes this measure.

Decompartmentalisation is also manifested through assessments with multidisciplinary approaches, and based on shared indicators and public opinion surveys.

Status reports on sustainable development of Nantes Métropole and the City of Nantes illustrate this type of approach.

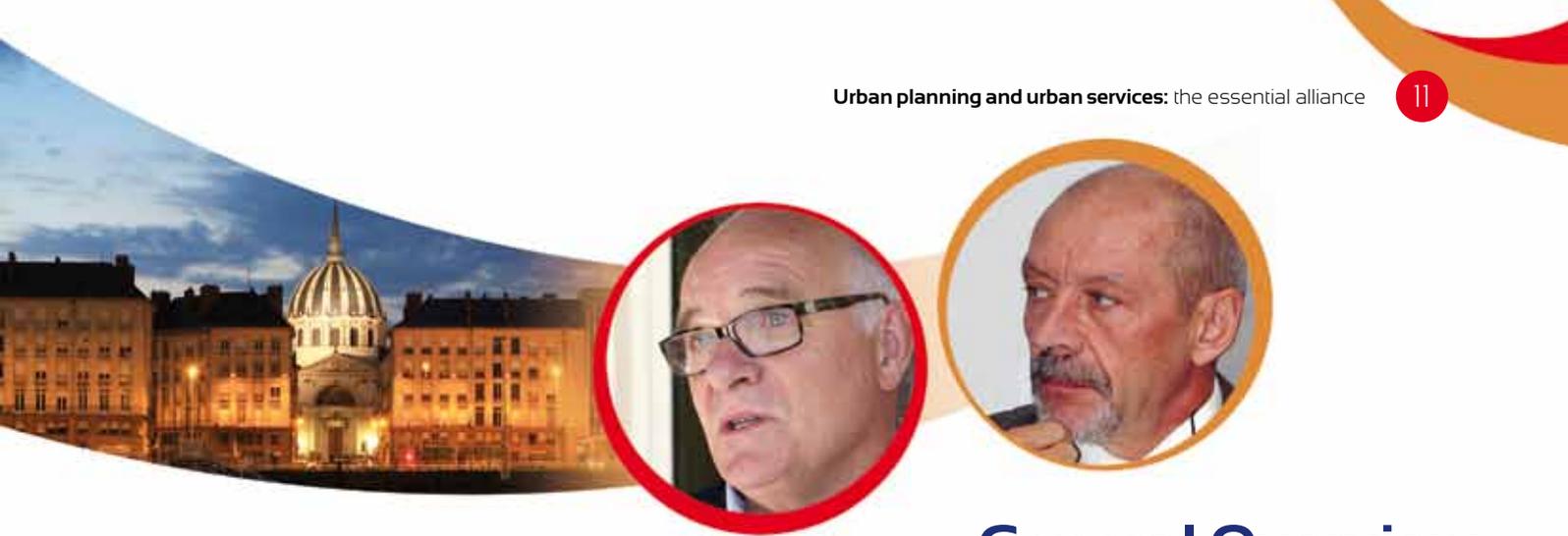
Finally, the implementation of action-research programmes to establish a forward-looking vision in the territory, and then to propose operational solutions designed to anticipate these changes has given researchers and practitioners a cross perspective to pave the way for innovation.

This critical issue is illustrated by four articles written by Nantes Métropole colleagues on the carbon footprint of public services (a new prism for the analysis of practices), on the implementation of a multi-dimensional climate plan, on the social role played by public waste removal services, and on the interaction with the local population in a climate workshop to co-develop public policy.



(1) Directeur du projet Nantes Capitale verte 2013

(2) 4 politiques publiques générales et transversales : Attractivité, Cohérence territoriale, Démocratie locale, Développement durable - Agenda 21
11 politiques publiques thématiques : déplacements, enseignement supérieur, recherche et innovation, développement économique du territoire, attractivité internationale et Europe, emploi, énergie, environnement, eau, développement urbain des territoires, habitat.



General Overview

by Marcel Belliot and Bernard Chocat, edition coordinators

By deciding to entitle its 2013 congress “sustainable and responsible cities” and by choosing to hold it in Nantes, the Green Capital of Europe for 2013, the ASTEE has placed “sustainable urban development” high on its list of priorities. The concept of a “sustainable city” is relatively recent; it first emerged a mere twenty years ago. But the practices underpinning sustainability are much less recent. The engineers who have built, equipped, embellished and maintained French cities over the last two centuries know this all too well. Their action has always been tempered by a certain realism and by the conviction, first articulated four centuries earlier by Francis Bacon, that “nature, to be commanded, must be obeyed.” Yet, the times have changed considerably since the Renaissance. The days are long gone when man thought quite legitimately that his impact on nature, which he was only beginning to understand, was akin to a pinprick on the hide of an elephant! Today, everything is integrated, as three major changes have significantly altered man’s rapport with nature. The first is a dramatic shift in numbers. The second change is technology, and the third is cities.

A brief history of humanity

In just a few centuries, we have changed the world, and it’s not certain that those who have built it and those who live in it are really fully aware of these sweeping changes. A short review of the milestones in human history might be useful in foreshadowing the challenges of the future.

Homo sapiens appeared on earth just 300,000 years ago, which is very recent in terms of the age of our planet (about 5 billion years). Man’s impact on nature began very gradually. The domestication and control of fire several hundred thousand years ago was a significant milestone, but the first real revolution came 10,000 years ago with the development of agriculture. At the time, some 10 million people were dispersed all over the face of the earth. From hunter-gatherers, men turned to farming and became sedentary. Soon, the first towns and cities were born, then States were formed and empires were created. 2,000 years ago, the world’s population was almost 200 million. Seventeen centuries later, by 1700, the number had tripled, as the world’s population stood at almost 600 million.

The industrial revolution transformed the human condition. Initiated in Europe three centuries ago, the revolution spread to all continents. It delivered mankind from thousands

of years of servitude and significantly increased man’s ability to alter his environment and put it at risk. Another revolution, urbanisation, followed on its heels. In 1990, with a world population estimated at 1.8 billion, 13% (or about 220 million) were city dwellers. A half a century later, in 1950, the world’s population had jumped to 2.5 billion, of which 29% (or 730 million) lived in the city. By 2007, the world’s population exceeded 7 billion, and for the first time half of them (3.5 billion) resided in urban areas. The urbanisation of the world’s population was one of the major shifts of the last century.

Future analysts predict a world population between 9 and 10 billion by 2050, and 60% will live in cities. The world will be largely urban where humanity, fifty times more numerous than 2,000 years ago, will exert enormous pressure on the planet’s resources and where the impacts of such strains, magnified by technology, will jeopardize all former equilibriums. Man, once a small predator with limited means in the face of harsh unforgiveable elements, had become the master of the world.

Global stakes with local implications

Cities are one of the focal points where tensions between man and nature are played out. But cities are also the proving grounds where ideas to tame nature without destroying it are invented and tried. It is in the cities where the battle of sustainable development will be won or lost, a battle that will determine the future of humanity and its posterity. Over the last fifty years, a number of significant events have marked the development of this concept and increased awareness of the role cities play: the Stockholm Conference in 1972, the first Earth Summit in Rio de Janeiro in 1992, the European Conference on Sustainable Cities and Towns in Aalborg in 1994, the Habitat II Conference in Istanbul in 1996, the Kyoto UN Framework Convention on Climate Change in 1997, the World Summit on Sustainable Development in Johannesburg in 2002, the Copenhagen Climate Change Conference in 2009, the second Earth Summit (Rio+20) in 2012, and soon, in 2016, the Habitat III Conference. The international community is unanimous in affirming that the struggle for sustainability is the only battle worth fighting, and that it will be fought first in the cities and will involve all the players who, regardless of their title, will have a role in this transformation.

“Politicians” are on the front line of this battle by virtue of the international commitments they signed, the laws they passed, and the local policies that they adopted. “Residents” will also play a major role as their behaviour and attitudes will influence social dynamics and their compliance and respect for “sustainable practices” will determine the success or failure of public policies. And finally, a third category of players will have a role in the sustainable city battle. These include scientists, engineers, and developers who work daily to improve and transform our cities.



drinking water or sanitation services nor were there waste collection or treatment networks, or public lighting and energy networks. The industrial revolution and its spinoffs in areas of energy, technology, and sanitation, brought about major changes. Cities that were formerly “stagnant” had become more fluid, and they established networks, emblematic characteristics of modern cities. However, new questions were raised that undermined the notion of technical specialisation: the characteristic strength of a network. In this era of sustainable cities and transversal approaches, do reticular models still have a future?

ASTEÉ and the sustainable city; a roadmap for the 2013 congress

Originally called the AGIAHM, the ASTEÉ brings together urban services technicians and researchers who work for cities throughout France. These men and women have been on the front line of the urban revolution that modernized the territories. Through its publications, discussions, and meetings, the ASTEÉ has advanced expertise in matters of urban development and has been instrumental in disseminating good practices relative to urban facilities and equipment. It has adopted and endorsed the principles of sustainable development and it intends to make its own contribution. In this introductory document to the Nantes congress you will find insight, feedback on recent undertakings, reports of on-going research, and most important, what remains to be done to transform our urban centres into sustainable cities.

This document is divided into seven sequences that form a bridge between the past and the future, ranging from research to experimentation, punctuated by expert reports and first-hand testimonials. It aims to reflect the vast diversity of approaches that contribute to the design and construction of sustainable cities.

The common thread of transversality

A common thread runs through this introductory document: that of transversality and of a cross-over perspective that must be employed by those in charge of developing and serving our cities. While many urban technology systems exist, each city is in fact unique and its area is not inextensible. It must be able to accommodate harmoniously all the departments and services necessary to the quality of life and well-being of its inhabitants. A close link between urban planning and urban services is the primary prerequisite to sustainable development. It is also a prerequisite to an economically efficient city as it helps optimise investments and promotes the efficiency of services rendered to its inhabitants.

This is the backdrop that was used in preparing this introductory document for the Nantes congress, and it was with this in mind that the contributions were selected.

French cities have undergone significant changes since the French Revolution. As quantitative as these changes were, they were even more qualitative in nature. At the end of the 18th century, most of the modern urban services that seem integral to city life didn't exist. Cities had no public

drinking water or sanitation services nor were there waste collection or treatment networks, or public lighting and energy networks. The industrial revolution and its spinoffs in areas of energy, technology, and sanitation, brought about major changes. Cities that were formerly “stagnant” had become more fluid, and they established networks, emblematic characteristics of modern cities. However, new questions were raised that undermined the notion of technical specialisation: the characteristic strength of a network. In this era of sustainable cities and transversal approaches, do reticular models still have a future?

The concept of sustainable development is barely 50 years old. It began as a simple finding issued by the “Club of Rome” in 1968 and published in its 1972 report “The Limits to Growth”: the planet's resources are dwindling and they must be preserved if we want to leave an inhabitable planet to our children. A new word was established, that of environmental imprint.

In this context, an article on the Parisian conurbation launched some very interesting perspectives. Economic prosperity over the previous two centuries in the Parisian area had gone hand in hand with a gradual lessening of its “dependence” on the food or energy supply compared to the surrounding countryside. Only water resources remained highly dependent on the hydrographic network of the greater Paris area. Is the dissociation of the territory/resources rapport irreversible? In the future, will not a number of advantages be found in a greater reliance on nearby resources and local (even organic) farming, or renewable energy resources produced locally?

In the struggle to reduce the greenhouse effect and climate change local municipalities are on the front lines, and they intend to set an example. This prompted Nantes to get an accurate reading of the carbon footprint of the public services provided by its communities. Public services represent about 6% of all greenhouse gas emissions (GHG) of the greater Nantes area, which leaves a certain margin for improvement in terms of reducing its carbon footprint and could lead to new means of compensating for residual and incompressible carbon emissions.

In 2008, in the wake of France's Grenelle Environment Forum, the Minister of Sustainable Development issued a call for projects from local communities to develop “Eco-neighbourhoods” and promote “Eco-cities”. Winners were chosen from the more than 600 projects that were submitted. The most exemplary projects, in terms of sustainable mobility, energy savings, reduction of GHG emissions, biodiversity, and social diversity, were published. The Eco-neighbourhood label will be defined in order to better support and promote the projects in terms of sustainable development.

A movement has been launched and now that it has been embraced by local municipalities, it can't be stopped.

The resilience of a city is a measure of its ability to recover sustained equilibrium after a disturbance or disruption.

In this anthropocene era, will the future world be one in which man is no longer innocent of the catastrophes he must endure? Will technical solutions lessen the pressure on natural resources, like the dematerialisation of flows or a better management of urban waste? They will not obviate a fresh look at urban technologies, no longer viewed as a means of distancing and mastering the forces of nature, but as a tool for urban metabolism.

In a changing world where turbulent environmental disasters are bound to increase, how will the rather complex systems put into place over the last two centuries respond to the need of maintaining basic city services? How will they withstand or weather the predicted catastrophes or those that have yet to be predicted? RESILIS, a project financed by the French national research agency (ANR), explored a number of innovative solutions in this regard. It concluded that risk management should not focus on managing the crisis to the detriment of plans for prevention and recovery. It also concluded that technical networks and public transit are primary factors of disruption. This underscores the importance of "integrated approaches" and the necessity to involve local stakeholders.

Cities are complex entities where the management of risks (whether of a natural, technological or malicious source), cannot be merely technical. The management must also be social and regulatory. Cities are not just on the receiving end; by virtue of their development and their activities, they alter the environment, and even risk jeopardizing the very resources they depend on. The consequence of climate change, another major constraint, are even less specific, but they must be anticipated and urban systems must be adapted accordingly. The demands of residents in terms of urban services constitute another variable that must be taken into account.

Drinking water supply networks developed by cities undoubtedly rank among the most brilliant technical success stories of the urban service sector. However, these systems are also unquestionably vulnerable to malicious attacks, flooding, network leaks and breakage, natural disasters, or accidental pollution. Such a list of vulnerabilities calls for considerable upstream forethought and preventive action another argument for forward-looking approaches, the diversification of measures, and the development of adaptable engineering in the training of technicians and decision-makers.

The coordination of the scales of governance is another imperative of urban sustainability.

How should urban services be organised and expanded given the growing complexity of cities and the constant expansion of their territory? At what level or scale should the problems be handled, solutions found, key actors identified and financing mobilised?

Neighbourhoods undergoing urban redevelopment, usually modest in size, provide a good illustration of the interdependence of the scales of intervention. Often self-centred, these neighbourhoods are generally poorly integrated to the rest of the city. The accent must obviously be placed on the enhancement of their urban potential and

social services. These projects should nevertheless be put into perspective in terms of the city's future spatial and temporal development plans. Much remains to be done in this field.

Beyond the perimeter of the urban area, the territorial coherency scheme (SCoT), established by the solidarity and urban renewal law (SRU), describes a project at a territorial scale comprising the entire life zone. The SCoT covers all aspects of urban life, from the environment to forms of travel, from natural habitats to housing or urban services. By raising the issue of the future expansion of networks, it helps ensure expansions are more compatible with urban development. It is an essential instrument in coordinating the scales of governance. With approval of 142 SCoTs, and the pending approval of 244 more, the success of this new territorial planning instrument is undeniable.

An original exercise in territorial programming and planning was recently conducted in the Paris region and not without a share of debate and discord. The project had very ambitious objectives in terms of public transit and development. Two of the issues deserve particular attention. The first was the articulation of scales between the regional level, where master plan is put into action, and the local level, where the territorial development contracts (CDT) are to be implemented in the zone around train stations in the public transit network. The second is the cooperation between the competent authorities: the State, Region, Departments, municipalities, inter-municipal associations, public and private operators of transit and other miscellaneous services. The success of the exercise will largely depend on the way these are treated.

Water management systems, whether wastewater, storm water, drinking water, or decorative water, have an impact on the entire urban cycle, both in terms of challenges and usage. Technical and sectorial approaches must allow for an integrated urban water management system. This means a careful analysis of the requisite functions, an accurate physical assessment of the territories concerned, the identification and the mobilisation of all the stakeholders: organising authorities, operators, users, non-profit organisations, residents, businesses, etc. While this step may seem complex, it is indispensable.

Water access questions often pit cities against countryside, and the use of surface water versus ground water often provokes conflicts in rapidly expanding metropolises. This is just one more reason to salute the action of the Gironde water board (SMEGREG), which succeeded in establishing a plan for the sustainable management of the deep water tables of the Gironde, a water resource that provides about half of the area's water. By associating the urban community of Bordeaux with the Department of the Gironde, the water board put into place alternative solutions and put the burden of the costs of network repairs on those who were bore responsibility for the needed repairs a form of polluters pay.

Water is becoming a rare commodity whose protection is a growing concern in light of the continual expansion of urban zones. The solution lies in the rationalisation of territorial waters. This implies a spatial and functional redistribution, a certain specialisation of the water supply, and the development of network interconnections.

It also implies a shuffling of assignments and responsibilities (creating a potential source of friction and need for delicate negotiations in matters of resource protection versus pollution abatement efforts) most notably agricultural pollutants.

Sustainable cities will be multi-disciplinary or not at all. Transversality is the common thread throughout this work, but a city's core responsibilities are too often widely dispersed. The conflict between urban planners who plot the city's future and the engineers who make the city work is very real, even though many urban planners are also trained engineers. This illustrates the difficulty that is often encountered today in getting people to work together, and underscores the importance of forming a new partnership between the various players.

Transversality is the key word that must be used to move toward planned urbanism. It is high time to put an end to the regulatory and "sectorised" vision of the city that prevailed until the end of the 20th century.

This implies profound changes in the way rules and laws are drawn up and enforced. Far more than a catalogue of prohibitions and regulations, an urban project must formulate a collective ambition involving social, economic, and spatial transformations. Stringent regulations must allow room for project advice and supervision. This also means changes in the way such work is conducted: a compartmentalised logic (urbanism, waste disposal, water, road maintenance) must give way to a territorial logic that deals with these issues in a transversal manner. This implies a global, holistic vision of territorial development.

These changes can only work if several conditions are met:

- The political objective must be clear, coherent, and concerted; a genuine "urban project" must rely on a multi-disciplinary and shared vision that ensures "urban objects" serve common values.
- Services must be decompartmentalised and multi-disciplinary thinking encouraged. Management constraints must be integrated within the initial design phases. This will necessitate a reworking of the service organizational structures.
- The abandonment of isolated sectorial divisions will not be sufficient. It is imperative that all the partners and all official stakeholders manage to work together. This will require a new culture that relies on open minds and a capacity to share.

Training can help develop this new attitude. Many schools have implemented joint study programmes (i.e. engineer-architect), or even offered double diplomas that promote a pedagogical approach based on "projects" or "inter-training workshops". It will be some time before today's students become the majority among the cities' operational players and stakeholders. While necessary changes in the training of future directors of urban services is evident, changes in the practices and habits of those already in place are just as important.

The touchstone of the cities' new approach will be the training of future urban planners. A number of university curriculums already stress the importance of a multi-

disciplinary approach and encourage the involvement of professionals in the teaching process as well as teamwork in practical on-site training programs. Many also stress the value of international work/training experience.

The final point addressed in this chapter deals with what the authors call "external decompartmentalisation". Managers of urban services and urban planners are not far from it the only players in a city's decision-making process. The construction of a common project requires the mobilization of all local actors, particularly the city's residents.

In times of economic crisis, urban services assume an obvious social role. One's rights as a city resident are not limited to a "right to housing", a right that is often difficult to ensure.

Faced with the risk of social exclusion, one's rights must be expanded to include all urban amenities. Rich or poor, everyone has a right to running water, clean streets, and waste collection. But urban services are not merely a technical provision that is set up and made operational. It is also a service with rates that are charged to ensure that it is (or is not) available to all. Though sometimes neglected, social cohesion is the third pillar of sustainable development. In a "sustainable city", the quality of urban services must not depend on the neighbourhood or the revenue of its inhabitants. Urban services are powerful tools for social integration and solidarity. Ensuring the universal character and unfettered access in hard economic times during which social and territorial disparities are further accentuated poses a real challenge. A number of French cities have attempted this in recent years, and not without difficulty. A precise identification of the poorest of the poor is the first obstacle as it requires access to administrative and social records whose origin or use may be somewhat problematic. The technical decision to implement reduced rates and collective "compensation" arrangements are another option. Should the lowest rate level be free, or should the rates be progressively more expensive? Or should the rates be linked to revenue with a water allocation for the poorest? A law has yet to be passed that would make social water rates fully operational.

The most basic urban service, the street, does not merely facilitate transport and travel, it provides access to homes, and it is a focal point for neighbourly chats, even a place for children to play. Changes to public streets are not a simple matter! An article was written on this seemingly banal "urban object" that revealed many frank, candid and unspoken thoughts. It proposed a method tried in Poitiers that disarmed opposition by patiently engaging all parties through consultation which, in the end, won unanimous support for the project.

A city will not reach sustainable status without the participation of its inhabitants. This is particularly true in environmental matters. How, for example, would it be possible to launch an ambitious recycling programme without resident support? Nantes tried this by encouraging individual composting in a suburban neighbourhood composed largely of single dwellings, and by promoting collective composting in social housing districts with the help of a specialized non-profit association. The success of the experiment led to the creation of recycling

centres where residents could drop off used or discarded belongings. Nantes' gamble paid off.

How are the services provided by the technicians received and perceived by local residents?

The first thing we learn from sociologists who monitor social practices, is that the actual usage of urban services rarely corresponds to the intended usage. Worse yet, the discrepancy between the intended usage and the actual usage can go either way. Usually, the user is totally disinterested in the technical aspects the service provides. The wastewater treatment system, hidden from sight and largely underground, is totally ignored by most inhabitants. Without the slightest idea how the system works, they unscrupulously throw their outdated medicines and chemical products down the drain, jeopardizing the operation of the wastewater treatment plant and the environment.

On the other hand, new measures or services sometimes trigger unexpected changes in thinking or behaviour; they can be diverted from their initially intended usage, and even generate new services or new needs. A storm water retention basin, originally intended to reduce flows upstream, may easily be transformed into a recreational lake where fishing becomes the primary activity.

The question of perception and potential diversion is crucial as soon as the development of the concept of eco-neighbourhoods and eco-cities leads to rapid evolutions in procedures and techniques. How do users evaluate the advantages and disadvantages of new services that have an impact on urban lifestyles (sometimes in a manner totally different from what was intended by the technicians)? Residents may take little interest in the over-arching principles and be more prone to judge them sector by sector (GHG emissions, energy or resource consumption, etc.). What does interest them are the real values that their neighbourhoods provide and facilitate: solidarity, assistance, hospitality, etc.

It is rather evident therefore that the goal of achieving a sustainable city would not be possible without the participation of the citizen/resident/inhabitant/user/client/taxpayer. But how is this to be accomplished in a way that the phase of public consultation does not appear to be just "smoke and mirrors" designed to assuage the conscience of public officials?

The first solution proposed involves acting as early as possible to get users involved in the very initial phases of preparatory deliberation. The two "citizen workshop" experiments presented in this document are enlightening. The first was conducted really very early in the process. Its aim was to collectively ascertain what could be done to contribute to greater involvement of the inhabitants in the management of water services. It is quite easy to understand that in such conditions users are more inclined to get involved than when they are merely asked to participate in a committee whose role, objectives, and scope of action were determined without first being consulted.



These experiments also show that it is possible to mobilise users over the long term, even if this requires some sacrifice on their part (one case required seven weekends of work over the period of one year). Evidently, some citizens are prepared to make a contribution suggesting that users are not nearly as passive as conventionally assumed.

Another line of thinking, though just touched on here, was given a much higher profile in Agenda 21. It has to do with the implementation of practices and the satisfaction of the players. For greater efficiency and to effectively replace the initial planning outlook, these vantage points must be associated with retroactive measures that will enhance the actions, thus ensuring a positive impact, and correct those that fail to point the system in the right direction.

In conclusion, even though it is not a simple matter to mobilise all relevant players (most notably users) in building the city of tomorrow, there is hope that it is indeed possible.

What is the future of today's city?

Urban society is subject to a variety of tensions and it must deal with a range of significant changes. While it is difficult to predict the future of today's cities, there are however a number of possible directions that could be taken to ensure more coherent, orderly change. Two major factors of change have been identified:

- The first has to do with necessity: energy reserves are dwindling, cities continue to grow outward, and greenhouse gases must be controlled. These issues have an impact on housing, heating, urban transit, and the workplace all aspects of urban life. Cities must evolve to better adapt and do so sooner than many might think. However, at least in the medium term, these factors for change are relatively predictable.
- The second factor has to do with options provided by technical innovations: these include the digital revolution of today and the scientific revolution of tomorrow. Such factors of change are totally unforeseeable. Who could have predicted the widespread use of cell phones, GPS, or the social networks some 20 years ago?

How are we to prepare, and more importantly prepare the city, for changes that we cannot anticipate? How does one go about designing a city that functions today in a given context, but that will have to function tomorrow in a completely different context? To these complicated questions, researchers endeavour to provide consensual answers. The complexity must be fully grasped, and cities must be thought of as systems, behaviours must be taken into account, and simulation tools developed that assist in judicious decision-making.

The ANR sustainable city research programme has resulted in other advances that were based on ideas very similar to those proposed for managing today's cities. The programme invites researchers to abandon their conventional academic divisions and adopt a multidisciplinary approach, where engineering and life

sciences collaborate. It also required them to leave their laboratories and do fieldwork with local officials and industrial representatives. With such a wide variety of subjects and approaches considered, the gamble on a multidisciplinary approach paid off. Much work is yet to be done as the establishment of a real systemic approach for a city is a long arduous task. One can only hope that industrial and local authorities are prepared to lend their support to this effort.

To sum up this quick review of the articles offered in this introductory document to the ASTEE Conference 2013, **several points deserve particular attention.**

Transversality is a prerequisite to "sustainability". How is one to reconcile the unique and irreplaceable character of a city given its wide variety of uses and functions, not to mention the large number of actors who have a role in city services? Multidisciplinary dialogue and the transversality of approaches are the keys that will make it possible to overcome the conflicts and strike an accord between sectorial policies. This dialogue is particularly necessary between urban planners and urban service specialists. They must not remain in their technical "ivory tower". To the contrary, they must communicate, compare analyses, combine their methods. There are two areas where the application of transversality seems most appropriate:

- The first is in the initial phase of the "project". A project, whether for a city, neighbourhood, or territory, is a synthesis of technical approaches, financial constraints, and social objectives. It is the formulation of a shared vision that leads to physical investments usually through operational interventions or regulatory measures, among others. A "territorial project" brings together all stakeholders, specialisations, and programmes. Its "transversal" construction fosters the optimisation of public action, and promotes the participation of residents. It is an irreplaceable instrument of a "sustainable city".
- The second has to do with the training of urban professionals. The city will always need engineers and their technical expertise, designers and their creative talent, sociologists and their knowledge of social issues, economists and their financial expertise, ecologists and their understanding of environmental issues. The city will particularly feel a need for "honest men and women" who demonstrate a capacity for understanding and the ability to communicate with others, and who are able to look beyond their own area of expertise in order to understand the expectations of others. Changes in training are essential to fostering greater multidisciplinary.

Another key to a sustainable city is adaptability. Faced with an uncertain future and the risk of increasing natural or man-made disasters, a policy of prudence is not enough. Changes must be anticipated and projects with a certain built-in reversibility should be favoured. Technical solutions that facilitate a return to equilibrium and allow for the reversal of steps taken should be given priority over those that represent a leap of faith, or that favour "divergence".

At the end of the day, this is no doubt what will determine success in an urban setting, where the city is a system to which everything is linked. It is of little use to hope to solve a problem without taking into account all the potential consequences of a "solution". Tomorrow's "sustainable city" will embrace a combination of natural, economic, and social approaches. Its development and management will demand professionals whose responsibilities include a broad urban culture, irreproachable technical expertise, and a real capacity to work together.

Created in 1905, the general association of engineers, architects, and municipal hygienists (AGIAHM), became the Association Scientifique et Technique pour l'Eau and l'Environnement (ASTEE) in 2004, and played an active role in the modernisation of French cities. Its activity is in line with the ideas embraced by the Musée Social and "municipal socialism", and it groups a very wide range of professionals. Urban services engineers have played a very important role in this regard, as they have felt very involved in the effort to make French cities healthier, better organised, safer, and more functional. They were at the very heart of post-war boom activities and played an important role in the re-emergence of urban engineering at the end of the 80s. The adventure continues, though it is now animated by the new challenges posed by sustainable development, the dynamics of metropolisation, the widening gap of territorial inequalities, and the search for more resilient urban systems. The ASTEE will know how to respond.



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Chapter 1

**From yesterday city to today's:
how have the challenges and
approaches changed?**

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From yesterday city to today's: how have the challenges and approaches changed?

Generally speaking, 21st century citizens take for granted their city's urban services. Yet, they are barely two centuries old. European cities were not equipped with drinking water and sanitation systems for a very long time, and there was no system for collecting or treating waste, no energy systems or public lighting.

At the end of the 18th century, most of the modern urban services that seem such an integral part of city life today did not exist or were in a very different form: network services lacked support like the water deliveryman or the raw materials collector whose job it was to make "poudrette" (fertilizer made of urban/human waste). We owe the modernization of our cities to the industrial revolution and its advances in new techniques, energy, and sanitation. Sabine BARLES reminds us what cities were like at the time, and describes their subsequent transformation. We learn how "stagnant cities" became circulating cities and how, little by little, the constraints that fettered their development and hindered their works were eliminated. She goes on to explain how a fundamental aspect of modern cities, the network, was gradually put into place. New questions are emerging today. Are the technical specialisation and sectorisation of services that formed the backbone of network solutions still as viable and reliable? In light of today's sustainable cities and the growing interest in transversal approaches, are the conventional reticular models bound to become obsolete? Isn't it time to invent new "trajectories"?

The concept of sustainable development is barely 50 years old. First issued as a simple finding by the "Club of Rome" in 1968 and published in its 1972 report "The Limits to Growth": the planet's resources are dwindling and they must be preserved if we want to leave an inhabitable planet to our children. A new term was created, that of "environmental imprint". Several contributions fall in line with this perspective.

The contribution by Gilles BILLEN, Luis LASSALETTA, Eunhye KIM, and Josette GARNIER deals with the hinterland of the Parisian urban conglomeration and focuses particular attention on the supply of food, energy, water, and materials. The dependence of Paris on its surrounding countryside is not new and closely linked with the systems of communication as well as the lifestyles and aspirations of consumers. The water supply has always been very dependent on the local hydrographic system. The Parisian food supply chain, long disconnected from the surrounding countryside due to globalisation and the development of efficient transport networks, may once again forge ties with local producers thanks to organic farming and a push to buy local. Could this demand to "buy local" coupled with

recycling efforts trigger a shift to other local sources of production like energy and raw materials, thereby setting a durable trend? That is the question.

Local communities, in the battle against greenhouse gases and climate change, are on the front lines and they intend to set an example. This motivated Nantes to get an accurate assessment of the carbon footprint of the public services produced by the communities belonging to the Nantes conglomeration. This is revealed in the article written by Yves GOURITEN and Tatiana LÉCOSSAIS, urban community experts, in which the communities are directly responsible for 6% of all greenhouse gases produced in the metropolitan area. This initial diagnostic, which requires confirmation, will help identify the sectors where improvement is still possible, bolster steps already undertaken, and construct a clear battle plan. This should eventually lead to the implementation of plan for offsetting residual and irreducible carbon emissions.

An initial assessment was made in the final article, written by Bruno BESSIS and Franck FAUCHEUX, who were in charge of inviting proposals for the "eco-neighbourhood" and "eco-cities" projects launched in 2009 and 2011, by the French minister in charge of sustainable development. They offer a retrospective of the origin of the "sustainable city", starting with the National Sustainable City Action Plan of the Grenelle Environment Forum, and the objective to promote an overall vision of a sustainable city. More than 600 projects were submitted to the Ministry, reflecting the enthusiasm of French communities for the initiative. The top submissions were published after the competition phase was completed in order to award the most worthy projects in terms of sustainable development: mobility and public transit, energy savings, greenhouse gas emissions, social and functional diversity, and biodiversity. Thanks to this undertaking, an eco-neighbourhood label will soon be issued. It will provide leverage to encourage, accompany, and enhance community projects in areas of urban sustainable development.

a. What can we learn from the history of cities?

Cities over the last two centuries: from one environmental crisis to another

by Sabine Barles, Université Paris 1 Panthéon-Sorbonne

In France, the end of the Ancien Régime was marked by what could be called a profound environmental crisis a multi-faceted crisis that first hit the cities and put municipal officials, learned men, and scholars on a search for solutions that sadly wouldn't be implemented until the 19th century or even the 20th century. Cities were eventually transformed from within, but the changes also altered their relationship with the environment and the entire biosphere.

The environmental crisis at the end of the Ancien Régime

The plight of cities on the eve of the French Revolution was serious: they were facing a double crisis, both from within and without, which was essentially environmental in nature, though it wasn't qualified as such at that time.

A number of authors condemned cities for their unhealthy environment and high mortality, which doctors analysed in detail. Urban mortality rates were indeed much higher than rural mortality rates, and the natural demographic balance in cities was negative: more people died than were born. Urban growth depended on an influx of people from outside the city. The practice of medicine was steeped in the theories first expounded in Hippocrates's "On Air, Water, and Places" (so much so that it was later qualified as neo-hippocratic), in which are found the keys to the deplorable state of sanitation found in cities. Basically, he maintained that if so many die in cities, if one is so often ill, it is because the air, the water, and soil is contaminated, or corrupt. The fevers, dysenteries, eye diseases, and cachexia were all attributed to urban mephitic (noxious exhalations from the earth), including morbid or mortal vapours given off by a soil corrupted by the inescapable putrefaction found in cities. The urban soil was indeed saturated with organic matter (human and animal excrement, the residue of butchers and other trades, cadavers, etc.), and the soil was always humid, drenched by rain that stagnated on unpaved narrow streets that rarely got enough sunlight to fully dry. The discovery of the mechanics of respiration gave these notions a boost and it was conjectured that a dense concentration of humans and animals inevitably fouled the air, and the confined nature of urban environments (tightly packed buildings and high city walls) prevented the influx of fresh air.

Subsistence crises and fuel shortages complete the picture. Cities were largely dependent on the outlying farms and forests for sustenance. Food production was dependent on propitious weather conditions and a bad year had harsh repercussions on city dwellers. Floods, freezing conditions, and droughts often meant a rupture in the food chain, as

waterways were a major means of transporting goods and supplies. Forests were being depleted: while floating logs down waterways widened the range of available lumber in the 16th century, by 1760, the demand for luxury furniture and wood and charcoal to fuel industrial growth outstripped the supply, leading to dwindling forests in many regions. Despite the state's highly elaborate checks and controls (or perhaps due to such controls, depending on your perspective) the food and energy supply chain was very fragile, and in the 1780s, this led to a crisis resulting in a structural increase in demand that was further frustrated by prolonged inclement weather that hampered both the production and the supply.

Urban adjustments in the 19th century and the easing of energy constraints

A transformation of the city from within was proposed and partially begun in the 1780s: urban cemeteries were moved, fortifications were dismantled, and unhealthy sectors isolated. It wasn't until under Napoleon that urban transformations were given any real impetus; urban transformation efforts were systematised under Napoleon III. The role of the engineer was predominant, and he rethought the city in terms of hydraulics. To combat stagnation, he favoured a circulating city: air, water, people must be able to flow more freely not only for reasons of health, and for greater economic vitality. Networks were key to the project: water, sewers, gas, pavements, walkways, tramways, compressed air, electricity, and then the telephone were all signs of urban reticulation. The separation of these circuits allowed for a better flow, and similarly the same applied to health improvements: floor coverings and road surfacing insulated the soil from the air and water, reducing the fouling of the latter; by channelling sewage below ground (if possible in water-tight pipes), the air breathed by residents was protected. All these factors contributed to the disappearance of high urban death rates at the beginning of the 20th century, even though the deployment of the model was limited to a small number of cities.

Energy constraints were gradually eased. The virtues of coal were advanced by scientists, and industrialists were soon persuaded. Other facets of reticulation, the construction of new canals and the development of the railways brought the city closer to the coal mines. Gas lighting was but another manifestation of this energy transformation: coal gradually replaced wood as the universal fuel source. Significant energy savings (probably never equalled) were to be had at the beginning of the 19th century, not only in the industrial sector, but also in homes, where the efficiency of hearths, furnaces, and chimneys were optimised in both size and materials.

Food production and supply, however, remained a critical issue and significant research was conducted in the emerging field of agricultural chemistry with the aim of boosting crop yields. The lack of farm manure led to desperate search for any kind of fertilizer and cities were considered a strategic source: urbanite eat end consume more than others, so they produce a range of by-products that are useful fertilizers. Human manure (mixture of urine and excrements) and other urban waste (street sludge, manure from slaughterhouses, dung, bones, and various animal and vegetable residues) were highly coveted and a source of much speculation. The need for the recovery of these resources prompted new excreta management techniques: waste was emptied and turned into dry fertilizer (poudrette), urine was distilled to produce ammonium sulphate, fields for spreading manure were established at the outlets of new sewers, street sludge was transported to city entrances where they helped contribute to a boom in gardening, or transported much further by water or rail.

Universal specialisation and the mineral city of the 20th century

This socio-environmental constraint was eased by the development of the Haber-Bosch (1909) process, which made possible the industrial production of explosives and fertilizer directly from atmospheric nitrogen: it provided immense quantities of this nutrient for agricultural use. This was added to fossil phosphates (that had already been in use for some time), and potash a fertilizer industry that developed significantly between the two world wars. The urban consequences were enormous: for one thing, the food supply was no longer plagued by problems, but the demand and the use of urban by-products dried up similarly, the same phenomenon occurred to those who had industrial uses for products like rags (for paper). Recycling and recovery were subsequently rendered pointless. Initially, research was conducted to find new uses for urban by-products, notably through the incineration of household waste to produce electricity, at later heat, but it was to little avail and the vocabulary of technical terms got two new entries: urban waste, and wastewater. The most visible environmental consequences were landfill sites and dumpsites, when the refuse wasn't discharged into rivers or the sea.

The transformations undertaken in the urban environment were expanded and soon spread to all cities. The automation of urban transit and the automobile accelerated the paving of the urban landscape: with fewer animals, road surfaces were needed that were water-tight and better adapted to motorised vehicles. There was less water too (and that's the paradox). Industrial cities consumed huge amounts of water, yet urban water was increasingly hidden. Rainwater was considered detrimental, and the growing need for roads led even to the paving of riverbanks that is, when the river is not completely covered, or turned into a sewer. Animals that were no longer needed disappeared or in the case of cattle, were herded to slaughterhouses located increasingly far from the city; a city's vegetation was turned into urban decoration that is always green, contributing to the image of a healthy, efficient, paved city often shrouded in smoke. The diversification of urban transport and the mobilisation of new energy sources provided for greater spatial freedom: the city spread outward and was no longer limited, it could get its supply wherever it liked.

These shifts were also responsible for spatial, managerial, administrative, and professional compartmentalization. As farming and industry no longer needed the city for raw materials, the policies, trades and administrators associated with these sectors, no longer communicated. Farm and industrial chemists, which formerly depended heavily on urban waste, turned to other solutions and urban engineering retreated to insular activities. In the city, zoning further solidified this compartmentalisation, while administrative responsibilities were divided between state services.

Conclusion

The system that has been in place since the first industrial revolution is very coherent. In essence, it freed up environmental constraints that were quite burdensome for cities, and it created a new socio-ecological trajectory against a background of overall growth (the harvesting of new resources followed by their transformation, consumption and discharge in the form of waste), in which the networks of urban services play an important role. By 1970, the system came under fire when certain limitations were identified: dwindling resources, pollution, low living standards etc. Though initially considered negative externalities (hence rectifiable), these limitations are now considered by most as inherent aspects of the system itself. The question now is how to effect a transition that would set it on a new trajectory.

b. What conclusions can be drawn from our imprint on natural resources?

Paris' supply chain, yesterday and tomorrow

by Gilles Billen, Luis Lassaletta, Eunhye Kim and Josette Garnier, UPMC/CNRS

It is no longer an easy thing to identify the lands or territories that provide the basic resources for a large city. This land area, once designated as a city's hinterland, was often structured and shaped by the urban demand. However, the interaction between cities and the territories*, whether near or far, with which they exchange resources, energy, and information, remains central to many issues of sustainable development and environmental governance.*

In the case of the Parisian conurbation, and in conjunction with the PIRVE project (Programme Interdisciplinaire de Recherche sur la Ville et l'Environnement), we examined the hinterland concept using a historical approach that spanned more than two centuries. The detail of this research has been outlined by a number of publications (Billen et al., 2009, 2012a,b; Kim & Barles, 2012; Lestel, 2012) of which several are grouped with other papers dealing with other metropolises in a recently published special edition of the journal *Regional Environmental Change* (Billen, Garnier et Barles, 2012). The following is a brief summary.

The traditional hinterland of Paris

At the end of the 18th century, basic supplies for the city of Paris, which were brought in by means of rivers and waterways, were largely supplied by the territory that constitutes the Seine River basin. Firewood, floated downriver from the Morvan or the upper basin of the Marne, and animal feed for horses produced in La Bassée, provided the greatest share of energy (25 GJ/inhabitant/year) required by the population of Paris (Kim et Barles, 2012) (Figure 1). It was also the Paris basin (in its geological sense) that provided for most of the food requirements of the city's inhabitants in cereal, fruit and vegetables, as well as animal products (meat and milk) although the transport of live cattle fattened in the Limousin was also significant (Figure 2). At that time, the Seine River basin, which not only provided Paris with water but also energy and food, was Paris's hinterland: the exchanges this territory maintained with the city were key to its metabolism.

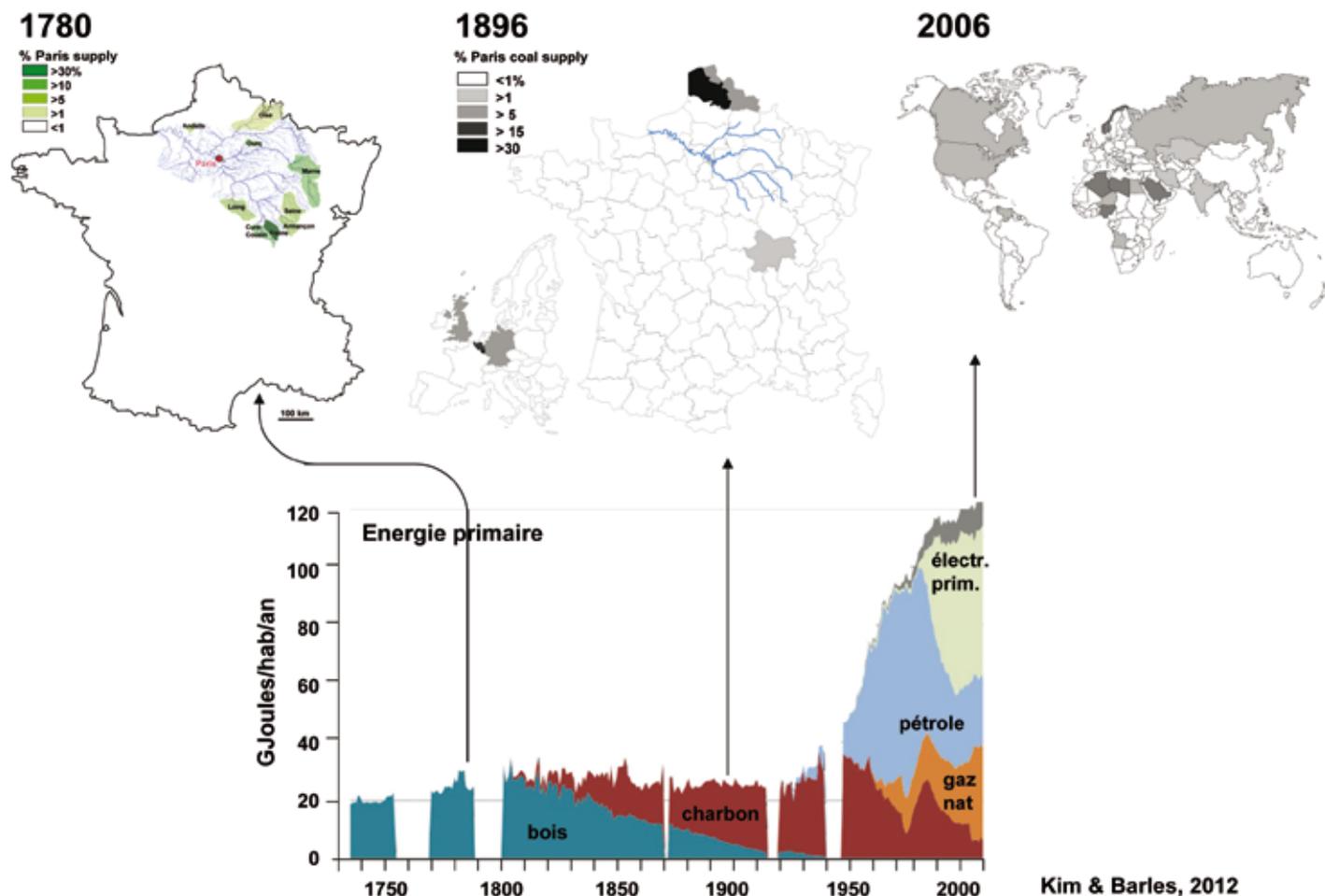
As regards the capital's energy supply in the 19th century, firewood is gradually replaced by coal (though the demand per inhabitant remained unchanged), which shifted the

supply route further south toward the coal basins in the Massif Central, and north, from England, Belgium, and Germany. For a century, transport infrastructures were built to facilitate the flow of supplies from remote areas, on which the Parisian basin no longer depends (Figure 1). Yet 19th century industrialization had deep roots in the Paris region. Barles (2005) demonstrated how the raw materials produced by urban activity (rags, bones, rendering by-products, etc.) constituted very early a primary resource for thriving urban industries (paper mills, tanneries, etc.). Even without metal mining resources, it was both inside and just outside Paris (closer to the actual demand), that the non-ferrous metal industry set up shop at the beginning of the 19th century (Lestel, 2012). And while the specialization of industrial regions increased with the growth of production tools, the concept of a supply basin still held sway in the 19th century.

For Paris, what was no doubt most remarkable was the long abiding food-supply role of the Seine River basin throughout the 19th century until the middle of the 20th century. While the city's demand for food grew by a factor of 10, the rural community of the Parisian basin boosted its farm produce export capacity tenfold owing to improved techniques in growing legume fodder crops and the use of animal manure (Figure 2). Thanks to a closer complementarity between farming and animal husbandry, the hinterland managed to meet the needs of the city without a notable expansion of the production supply area.

Shattering the notion of a hinterland

The collapse of Paris's supply zones dates back to the second half of the 20th century. With the oil and natural gas boom, followed by nuclear power (and a commensurate

Figure 1: Energy Supply areas of Paris agglomeration from the 18th to the 21st century

trebling of per-capita energy consumption), the distances between energy supply and consumption soared, and Paris, like all major modern metropolises, found itself reduced to a node among many others in the global exchange network (Figure 1). At the same time, the deindustrialization of the Ile-de-France resulted in its relegation to a point of final consumption of foreign-manufactured goods.

The food supply chain was not immune to this centrifugal movement. After the second world war, at a time when the population of Paris once again doubled in size, the growing reliance on synthetic fertilizer broke the functional ties between agriculture and animal husbandry, leading to unprecedented specialisation in rural territories and a considerable increase in their export potential; what followed was a complete opening up of the international markets both in terms of the supply of cattle feed and the marketing of grain. However, analysis of recent freight transport statistics shows that 70% of Paris's food supply is still provided by two territories: the Seine River basin, the traditional hinterland, now exclusively specialised in field crops, providing the largest portion of vegetable protein consumed in Paris and the other large cities in its ambit while exporting 80% of its grain production to the international

market ; and the 'Grand Ouest'(Brittany, Normandy, Pays de la Loire), has become dominant in animal products following the disappearance of cattle farming in the central Parisian basin. To provide feed for its oversized herd, the 'Grand Ouest' imports large quantities of soybean and grain meal from Brazil and Argentina, representing an input equivalent to that produced by a territory 30,000 km² in size.

At present, the Paris region's food supply relies essentially on three territories of comparable size, but with radically different functioning (Figure 3):

- The Seine River basin, after having long served as the Paris region's hinterland, is now primarily involved in grain production, of which 80% is sold to external markets.
- The territories of Brittany, Normandy, and Nord Pas de Calais, while importing considerable animal feed, provide a major portion of the demand for animal products in the Paris region.
- Regions in Latin America, specialised in soybean production, provide a majority of soybean imports.

A geographical shift in supply sources?

The paradox of the Parisian market is that of a direct food supply market that is, for all intents and purposes, essentially local, yet integrated in a farm produce system that is open to the world and for which Paris is no longer the preferred customer. Contrary to what one might think, the city has remained attached to its countryside even though the countryside has turned away from the city and is now largely integrated in the global market. Two opposing food supply trends are now apparent in the Paris region:

the first is the centrifugal trend of economic development in the farming, agribusiness, and distribution sectors; the second is the centripetal trend characterised by some urban consumers seeking to restore closer ties with the traditional hinterland by buying local.

However, the capital's water supply, even if it relies on resources and infrastructures that are far upstream from Paris, is and will remain restricted to the reaches of the Seine hydrological catchment area. The territory of the Seine basin is thus expected to provide both the water and food needs of Paris two activities that are increasingly source of conflicts given the excessive use of synthetic fertilizer and pesticides by modern agriculture. Studies have demonstrated that the maintenance of current farming practices in the Seine basin would have serious consequences on the sustainability of drinking water



resources due to nitrate contamination and the declining quality of surface water (Thieu et al., 2010). The spread of good farming practices (the optimization of fertilizer dosing, the introduction of nitrate-fixing intermediate crops, etc.) will lead to a stabilisation of the situation without actually inverting the trend. This points to the need of a much more radical shift in farming practices, notably in groundwater catchment areas (which represent almost a third of the total surface of the Seine basin). Three levers for change can be used to this end: relocation efforts, the promotion of organic farming, changes in eating habits.

The first gets its impetus from a growing desire to relocate urban food supplies and from a groundswell of consumers seeking more direct, healthier, personal ties with farmers and ranchers. A relocation of farming in the Seine River basin would first require a reintroduction of cattle raising in synergy with crop farming; this also implies breaking the dependence on the importation of transgenic soybeans from America and producing local feed. Organic farming, whose ecological efficacy has been demonstrated, is well poised as an alternative agricultural system, as leguminous species like alfalfa play an important role in crop rotation, a main feature of organic farming techniques. Finally, a reduction of animal proteins in the human diet is desirable, both for public health reasons and for equity concerns with regard to populations in the Global South.

Figure 2: Food supply areas of Paris agglomeration from the 18th to the 21st century

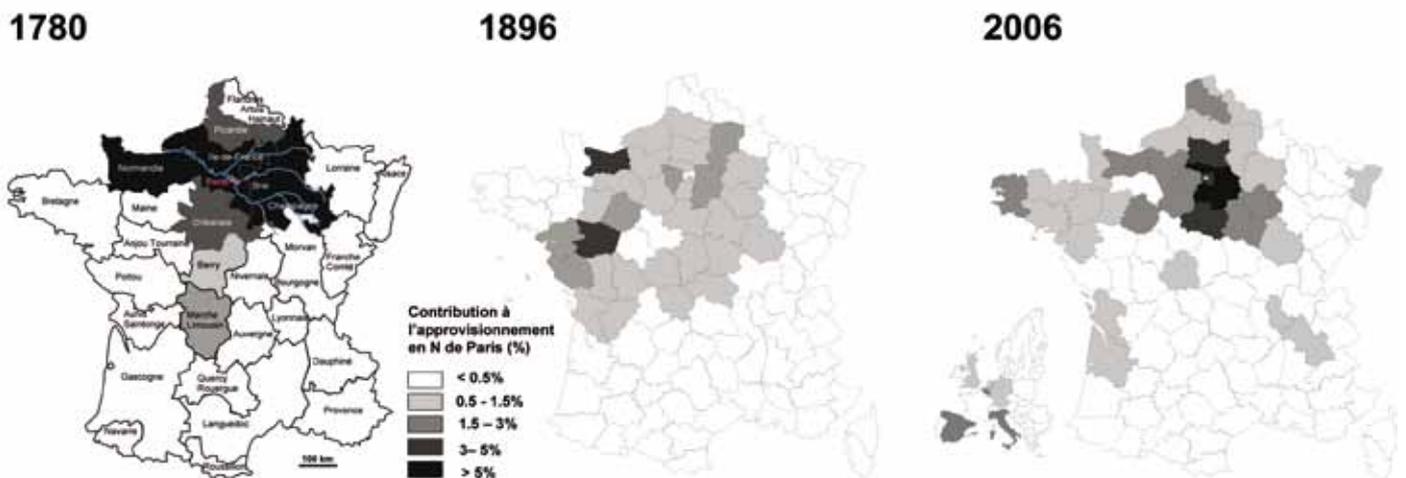
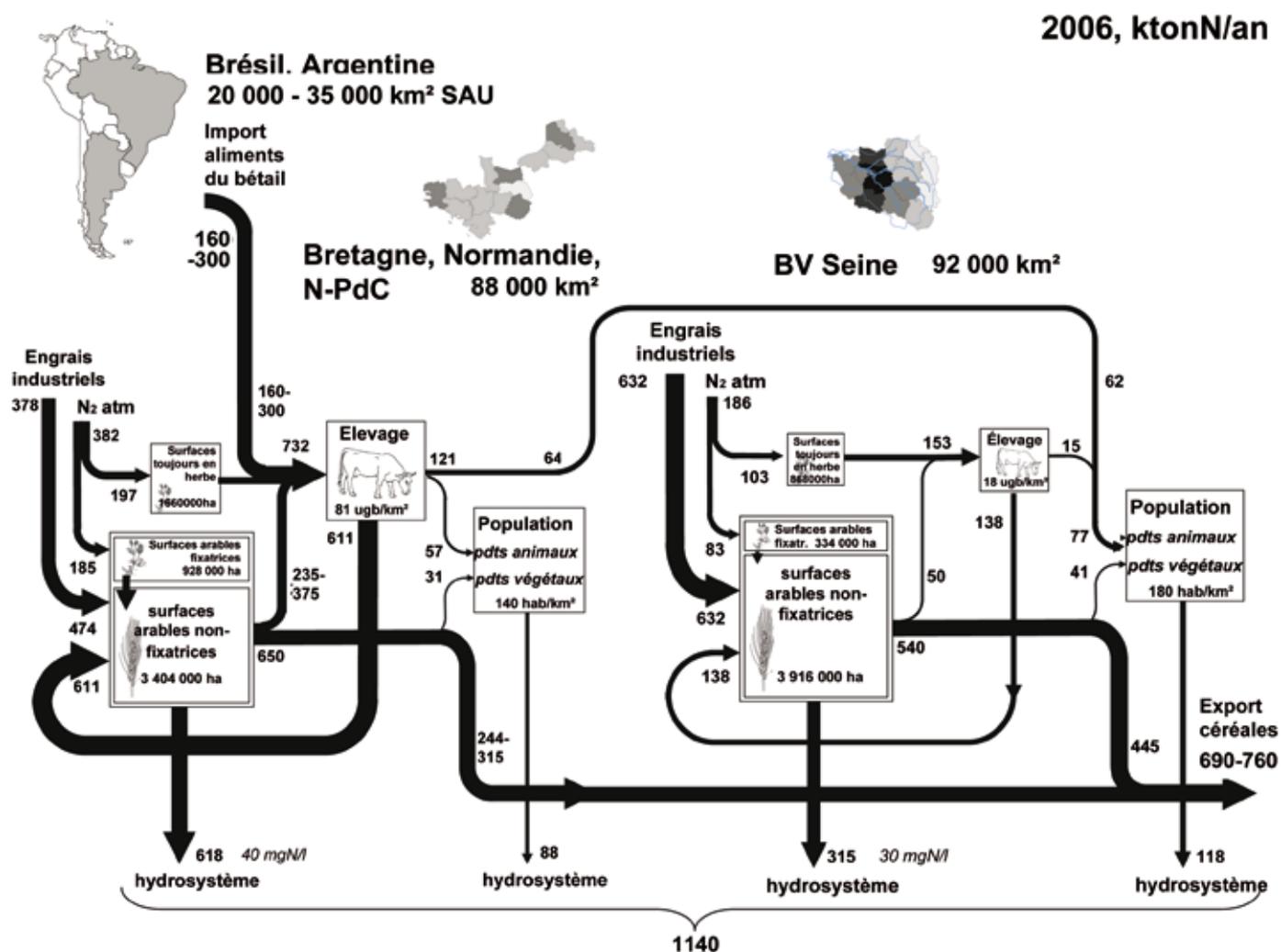


Figure 3: Nitrogen fluxes in the agrosystem of the 3 territories currently contributing to Paris food supply (Fluxes are in 1000tonN/yr. Data from Agreste 2006; SitraM, 2006 and FAOstat 2006)



A rather utopic scenario entitled "organic, local and demitarian" has arisen in the Seine basin (Billen et al., 2012b). It would lead to a considerable reduction of the food imprint of inhabitants in the Parisian area, and facilitate the production of high quality water without a reduction in the quantity of grain currently exported. This scenario would therefore not jeopardize the territory's grain export targets.

If the relocation of the food supply of a large metropolis like Paris to his traditional hinterland is not inconceivable, the same question should be raised with regard to its supply of raw materials and energy by systematically taking inventory of resources derived from the recycling of consumer goods.

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Assessment of urban flows

by Sabine Barles, Université Paris I Panthéon-Sorbonne

The exemple of the ANR Confluent project on the flow balance in city

Dematerialisation and cities: urban metabolism and the management of energy and materials flows

- **Urban metabolism: an issue of knowledge and interdisciplinary action**

Cities consume significant amounts of energy and material, whether directly on their territory or indirectly through the materials, goods, and services they import or export and the emissions they discharge. Urban metabolism thus has both upstream and downstream consequences, with a variety of impacts on the biosphere and human society itself. However the methods that would enable a more detailed characterisation and identification of the conditions for the better management of energy and material flows are still largely inexistent. The Confluent project lies at convergence of these problematic issues. The first objective is to contribute to a better understanding of the energy and material flows put into play by the cities both directly (energy and materials flow analysis) and indirectly (environmental imprints); the second objective is to initiate a process of reflection on flow management and on the elaboration of territorial projects co-constructed between the different actors with a perspective for dematerialisation. It also aims to help in the establishment of a territorial ecology as a field of research and interdisciplinary action.

- **Territorial ecology: from energy and material compatibility to dematerialisation strategies**

The project is based on several complementary approaches under the banner of territorial ecology: energy and material flow analyses, like those developed in the fields of industrial ecology and social ecology; spatial flow analyses of substances (especially nitrogen) based on biogeochemistry and geography; analysis of the interaction of actors, proximity theory, economies of convention, economy of functionality such as those found in socio-spatial sciences; history was also used to better analyse urban

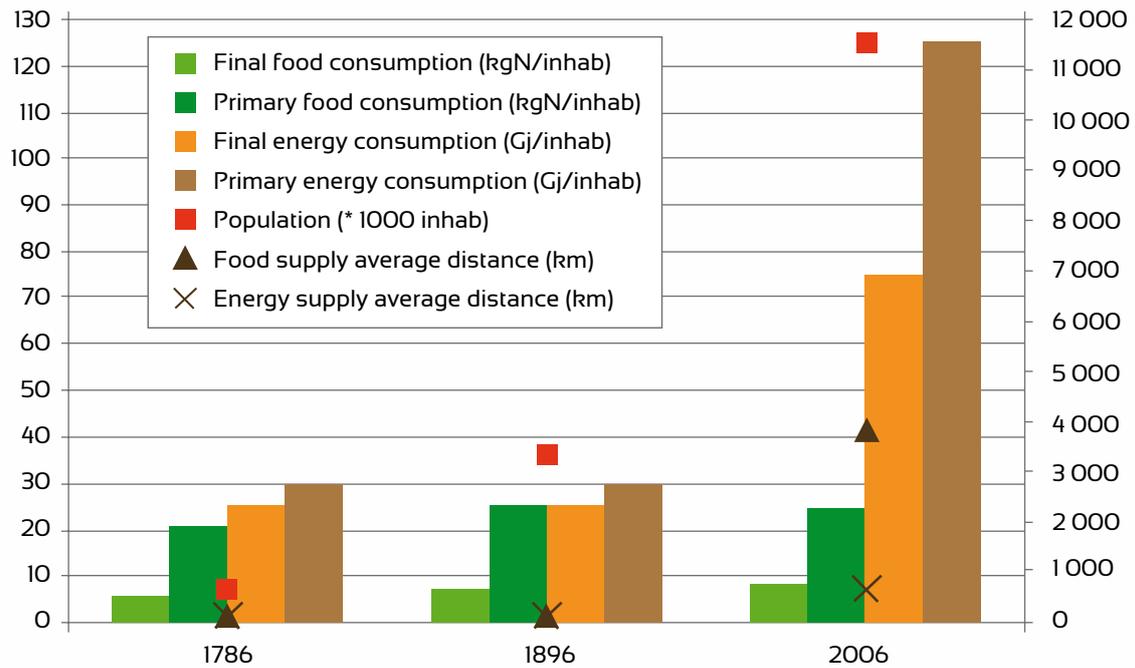
socio-ecological trajectories. A significant methodological study was done and supported by fieldwork conducted in the conurbations of Paris, Toulouse, and Troyes and their associated regions. The objective was not only to test the methods, but to compare the territories and work with local actors to identify the institutional mechanisms that would contribute to a definition of collective objectives and strategies at a local level, particularly on the basis of a partnership between public and private actors.

Major results

Beyond important methodological contributions, the analyses of raw materials shed light on the materiality of urban operations (and their three major flows: construction materials, farm and food products, fossil fuels), and provided a typological outline of the territories according to their metabolism. The elaboration of the food imprint of Paris illustrates urban dependence on global agricultural systems, while a reconstitution of its energy consumption over the last two centuries reveals characteristic transitions. During multi-actor meetings, the presentation of quantitative results and that of innovative coordination mechanisms raised possible measures for improving the energy supply and consumption in the building sector (this aspect of the project is still on-going).

Scientific production

The project's team oversaw and contributed to a special edition of *Regional Environmental Change* (12 (2), 2012) devoted to the environmental imprint history of cities (Billen, Garnier, Barles, dir.). Also, a dozen articles were contributed to international peer-review journals, about twenty reports delivered at international peer-review conferences and thirteen more at national conferences, not to mention three chapters in books, and a dozen valorisation conferences. The wide range of media is an indication of the interdisciplinary nature of the approach taken.



Paris: Consumption of nitrogen in foodstuffs and unit energy consumption (scale at left), population and average distance of supply source (scale at right), 1786, 1896, 2006.

Basic information

The basic research project "CONFLUENT : CONnaissances des FLux Urbains, Empreintes environnementales et gouvernance durable", was coordinated by the laboratory Géographie-Cités (UMR 8504, CNRS, Universités Paris 1 & 7), with the participation of the Sisyphé laboratories (Structure et Fonctionnement des Systèmes Hydrauliques Continentaux, UMR 7619, CNRS & Université Pierre et Marie Curie), CREIDD (Centre de Recherche et d'Études Interdisciplinaires sur le Développement Durable, UMR 6279, CNRS & Université de Technologie de Troyes), and PACTE (Politiques publiques, Actions politiques, Territoires UMR 5194, CNRS & Université de Grenoble). The project began in January 2009 and lasted four years, with a total budget of 1,240,000 euros, of which 490,000 euros were contributed by ANR.



Carbon assessment of Nantes Métropole services

by Yves Gouriten, Director of the Mission Intégration des Services Publics (MISP) at the Direction Générale Environnement et Services Urbains and Tatiana Lecossais, technical project manager at the Public Services Integration Mission of Nantes Métropole

Starting in 2003, the urban community of Nantes Métropole decided to measure and analyse the greenhouse gas emissions (GHG) of its territory. With the aim of elaborating a Climate Policy, the analysis focused on the gas emissions generated by local energy consumption (all energy sectors). It emerged that GHG emissions amounted to approximately 2.5 million tons/year. The emissions attributed to the communities of Nantes Métropole represented about 6% of this total a significant share that prompted a study of ways to reduce these emissions. To clarify the issue, a "carbon analysis" of the urban water, wastewater, transport, and waste disposal services, conducted by transversal analyses (staff travel, logistics, etc.) was recently undertaken by Nantes Métropole.

Due to the skills provided by the municipalities, there are two main components to Nantes Métropole's actions:

- The implementation of services to the population (urban transport, water, waste discharge, heating networks, public roads, etc.)
- Development of its territory, notably through urban planning, the organisation of transport, and the development of residential and activity zones.

Starting in 2003, the urban community of Nantes Métropole decided to measure and analyse the greenhouse gas emissions (GHG) of its territory with the aim of elaborating a Climate Policy. The analysis focused on the gas emissions generated by local energy consumption, and provided insight into the order of magnitude of the emissions (2.5 million tons/year) and their distribution by activity sector.

Distribution of GHG emissions linked to local energy consumption

Travel	29%
Residential	30%
Tertiary	21%
Industry	19%
Agriculture	1%

It was also possible to evaluate the proportion of these emissions attributed to the activities specific to the municipalities of Nantes Métropole: 6%. The impact of these emissions is considerable, not to mention the impact on public policies regarding greenhouse gas emissions.

Also, in conjunction with the implementation of its Territory and Energy Climate Policy for 2010, Nantes Métropole sought to provide an accurate evaluation of its operations in terms of GHG to see if there was a margin for improvement, and if so, the conditions required to bring about such improvement.

A carbon analysis of urban public services (water, wastewater, household waste disposal, etc.) was subsequently launched and complemented by transversal analyses (personnel travel, logistics, etc.).

The work was undertaken with the following in mind:

- **Accept a certain margin of uncertainty**
The factors of uncertainty are considerable. The aim is not to seek absolute precision (which is illusory), but to establish orders of magnitude that would allow for an assessment of the impact (measured in terms of T eq CO₂) of corrective actions, and to progressively establish a prioritized list of all types of actions with respect to costs (€)/TCO₂ avoided.
 - **Take into account the complete emissions cycle**
An analysis of emissions from energy consumption should be completed by an analysis of so-called "grey" energy (or scope 3 for insiders). This factor is essential in certain activity sectors. It is, incidentally, the approach adopted by the ADEME in launching its Bilans Carbone® (carbon assessments).
 - **Work at the scale of services/processes**
The aim is to identify tangible avenues for the reduction of GHGs, which implies associating agents involved in the process and evaluating GHGs in their ambit of responsibility and not from a global perspective. Despite the potential margin of error in calculation, it appeared necessary to go into a certain level of detail (particularly because where there was a potential for a reduction in emissions was not necessarily where the emissions were greatest).
 - **Assimilate the Nantes Métropole managerial approach**
The research and the implementation of concrete actions are often hampered by potential obstacles:
 - Comprehension: while the calculations may be easily understood, certain concepts of the carbon analysis are not easy to grasp
 - Lack of direct benefits: the challenging of established practices may lead to the re-examination of practices difficult to manage
 - Scepticism, given certain approximations inherent to the analyses
- This approach is thus not conceivable without the full support and commitment of general management.

What lessons can be learned from the initial analyses?

- Because it is quantifiable, carbon analysis allows for completely diverse actions to be compared and put into perspective. This is a vital decision-making tool
- The quantification (taking into account the limits and uncertainties inherent to carbon analysis) allows for one to go beyond the qualitative criteria of an action and propose quantitative targets and solid assessments
- A carbon approach requires an understanding and analysis of an entire process from every perspective: for example, a carbon analysis of a road construction site should lead to an examination of the impact of GHG generated by the ensuing traffic snarls.

What are the advantages and disadvantages of an internal approach?

The difficulty of a comprehensive approach for territorial authorities, notably for the municipalities and their inter-municipal cooperatives, has to do with the diversity of métiers. The calculation of CO₂ emissions is, at the end of the day, a complex technical and scientific tool. Hence, a calculation of the incineration of household waste cannot be done with the simple use of a ratio like kg eq. CO₂/t incinerated. It requires a precise analysis of the process (the level of energy recovery, the type of energy produced, etc.) if one hopes to modify practices or possibly fuel the debate on the industries best adapted to the territory. Thus, beyond a good understanding of the emission factors, a good understanding of the processes specific to each service must be developed.

This approach will provide an overall perspective of the potential levers. The advantage of an internal approach in close cooperation with public services lies in its capacity to go beyond "conventional" eco-friendly actions, allowing for an in-depth examination of problems associated with

the processes. Indeed, beyond the Carbon analysis, an in-depth analysis is useful in implementing a realistic and measurable action plan, thus providing an essential tool for implementing Territorial Climate Policies.

Nantes Métropole's experience in coupling a transversal approach with a "métier-by-métier public service" approach has enabled it to take into account the entire range of activities and to identify a number of ways of proceeding one homogenous sector at a time (not just per public service, but also per support services : IT services, automobile fleets, etc.).

The implementation of an action plan: several phases and a long-term undertaking

Highlighting measures undertaken

What is the reference date for the Carbon assessment? Regardless of the year in question, to measure actual progress, it is important to quantify the share of emissions already curbed by the efforts made in the previous years, as well as the potential emissions. Indeed, this exercise serves to highlight the measures undertaken to mobilise the services, and in certain cases, to foresee future actions when compared to something that already exists, a known entity. Because the last kg eq CO₂ are often the most difficult to attain, this helps in assessing potential difficulties, and provides a perspective for potential action in the future. Nantes Métropole thus decided to provide an evaluation of reduced CO₂ emissions in the category of emissions avoided thanks to measures already taken, and not just reductions linked to future measures.

Implementing concrete actions

Once the avenues for further reflection have been identified, a feasibility and cost study will be necessary. At times, lurking behind certain actions, however honourable, hides



erroneous ideas or unpleasant surprises. For example, the streamlining of logistics at the Nantes Métropole level (limiting the frequency of office supply deliveries) may prove counterproductive with respect to the delivery schedule set up by the transporter (which optimizes its own delivery circuits). This calls for a transversal view of the supplier/client relationship, thus forcing the abandonment of a purely inward looking perspective.

Similarly, the choice of a specific material inevitably involves a series of constraints that may seem contradictory (no doubt the use of a given material may produce less GHG, but the constraints associated with its use can completely offset this initial advantage). The ability to quantify these different items is an essential tool in the decision-making process.

It is only after the completion of these feasibility studies that a plan of action can be implemented, and only then can the real value of carbon analysis be appreciated.

Financial outlook based on carbon dependence: a new decision-making tool

Scenarios regarding the future trend of fossil fuel-based energy costs (cf. ADEME) show to what extent it is important for municipalities to reduce their dependence on fossil fuels if they want to maintain future financial margins: an increase of almost 50% in the price of heating oil is predicted over the next 20 years, while natural gas and electricity costs are expected to climb by 30 to 40 per cent. It would be wrong to assume these higher costs will be limited to energy expenditures, as all municipal expenses will feel the impact of higher fuel prices, including supplies, services, and public service delegations. To evaluate these risks, carbon analysis is a valuable tool as it provides an objective means of measuring our dependence on these energies for supplies, services, etc.

A forward-looking analysis will shed a different light on the financing of proposed projects if the criteria related to changing energy costs are taken into account. It will also help in deciding what projects should be pursued by integrating a more comprehensive cost estimate.

Carbon compensation: the final step

The compensation of emissions is the final step in the process. It is only after the completion of the emissions assessment and the implementation of the action plan that the compensation of residual and irreducible emissions can be dealt with.

This step, which must take into account the local context and political policy, is not easy:

- Nantes Métropole has little land to develop large-scale forestry, are the municipal parks sufficient to have an impact?
- What role can a policy of international solidarity play given that it could provide potent leverage and constitute a potential source for even larger projects?
- What form of certification could be put into place to ensure good results?

We are just beginning our deliberations on the subject, and the future is promising.





c. What conclusions can be drawn from “sustainable city” efforts?

Eco-Neighbourhoods and Eco-cities, an initial assessment

by Franck Faucheux and Bruno Bessis, MEDDE (French ministry in charge of ecology, sustainable development and energy)

Four years ago, the Grenelle Environment Forum significantly altered our view of development, and set ambitious goals in terms of urban sustainability. The Eco-neighbourhood and Eco-city approaches, launched at the end of 2008 in conjunction with the national sustainable city action plan, were designed to help municipalities devise and implement a comprehensive vision of urban sustainability that is shared by residents, elected officials, developers, builders, urban planners, architects, landscape architects, as well as construction firms, public works operators, energy suppliers, public transport managers, and shopkeepers.

1. Eco-neighbourhoods

Of course, many municipalities had already taken measures for sustainable development (sometimes for several years), and had even developed their own benchmarks, monitoring tools, and indicators.

Similar to several pilot operations undertaken in Northern Europe, efforts initially focused on the emblematic development operation called “Eco-neighbourhoods”. However, without consensus on the meaning of an Eco-neighbourhood, its eventual aims ambitions or goals, no shared vision has yet emerged at the national level an essential condition to enriching collective thinking.

1.1. The initial call for Eco-neighbourhood projects in 2009

No fewer than 160 projects were submitted by the end of March 2009. They were as diverse in city size and context as they were in geography.

The selection committee whittled down the number of submissions to 32, of which nine competed for the National Grand Prize. In the end, panel members awarded the prize to Grenoble’s **ZAC de Bonne**. Following on the heels of this initial success, two lessons soon emerged.

The first was that the Eco-neighbourhood 2009 guidelines were too “technical”, focusing excessively on environmental aspects, to the detriment of the other two aspects (social and economic). Consequently, partners in the undertaking pointed out that the project’s governance, operational relevance, and economic feasibility should be given more weight.

The second lesson was that even though not all submissions managed to meet all the targets, the competition nevertheless mobilised municipalities and incited them to initiate and engage in project improvements. To encourage this early momentum, **the National Eco-neighbourhood Club** was created to provide access to a database of information and training, as well as facilitate encounters and exchanges between the 160 candidate municipalities.

1.2. A second call for projects in 2011

Following the discussions and debates held by the National Eco-Neighbourhood Club and the support of the municipalities and partners in this undertaking, a new set of Eco-Neighbourhood guidelines (more responsive to the territories and to municipal expectations) was drawn up for the second call for projects on January 19, 2011.

This new set of guidelines strikes a better balance between the technical themes, project steering, and political commitment, while raising the issue of “living together”. This was divided into four topics: “Approach and process”, “Lifestyle and practices”, “Territorial development”, and “Resource preservation and climate change adaptation”. The four topics were further divided into twenty goals.

Grille ÉcoQuartier 2010-2011

Approach and process	Quality of life and customs	Territorial development	Resources conservation and climate change adaptation
1. Managing and consulting with a view to cross	6. Promoting coexistence	11. Ensuring the functional diversity	16. Reducing greenhouse gas emissions, adapting to climate change
2. Locating and defining the project	7. Promoting lifestyles caring and responsible	12. Better organising travels and reducing car dependency	17. Optimizing energy needs and diversifying sources
3. Ensuring the financial, technical and legal feasibility	8. Giving a pleasant living and healthy environment	13. Promoting alternative and sustainable transport mode	18. Ensuring quality and efficient management of water resources
4. Being able to manage and evaluate the project and its neighbourhood	9. Enhancing the local heritage, history and identity of the area	14. Entering the project in the dynamics of local development	19. Using non-renewable resources by reasoned way and reduce waste
5. Sustaining the process	10. Intensity, compactness and density draw an area appropriate to the context	15. Enhancing relations with agriculture and forestry	20. Preserving biodiversity, restoring and enhancing nature in cities



Loi Grenelle 1

Loi Grenelle 2



Nature en ville

Plan d'action en faveur des territoires ruraux



To take the second call for projects to a new level, the aim was to identify and enhance the value of the operations through a competition to showcase French excellence with a Grand Prize and highlight progress in sustainable development through thematic prizes and strategic territory prizes.

On the heels of the 2009 success, an even larger number of municipalities got actively involved (**393 in all**), despite its experimental nature.

After an initial assessment, almost 80 submissions were preselected, of which the panel of judges awarded two National Grand Prizes: the **Operation du plateau de Haye** (municipalities of Nancy, Maxéville, and Laxou), and **Operation de l'Union** (municipalities of Roubaix, Tourcoing, and Wattrelos).

The National Eco-Neighbourhood Club, whose membership has expanded to a network of more than 500 municipalities, was created to help disseminate good practices, identify problem areas, and search for solutions. It provides a forum for exchange, discussion, training and debate on an entire range of emerging topics.

1.3. Initial assessments

While the objectives to be reached in the Eco-Neighbourhood projects are better understood now, they need to be dealt with in greater depth and contextualized. Today, urban residents are more aware of the pending threats to the environment and have expressed these concerns to elected officials. Some pioneers have gone ahead and united experts, developers, financiers, promoters, and residents in collaborative urban projects by fostering dialogue between experts and residents.

The Eco-Neighborhoods, by virtue of their values, their ambitions and their objectives, address several basic issues facing today's society:

- **The ecological transition of the urban environment:** the Eco-Neighbourhoods approach is based on notions of density, integration of nature in the city, anticipation and adaptation to climate change, with the aim of implementing them harmoniously;
- **Territorial equality:** one of the objectives of Eco-Neighbourhoods is to reduce the difficulties residents face in living, finding lodging, working, entertaining, and staying healthy in an urban environment by promoting

projects that encourage social and functional diversity while capitalising on territorial advantages and local expertise;

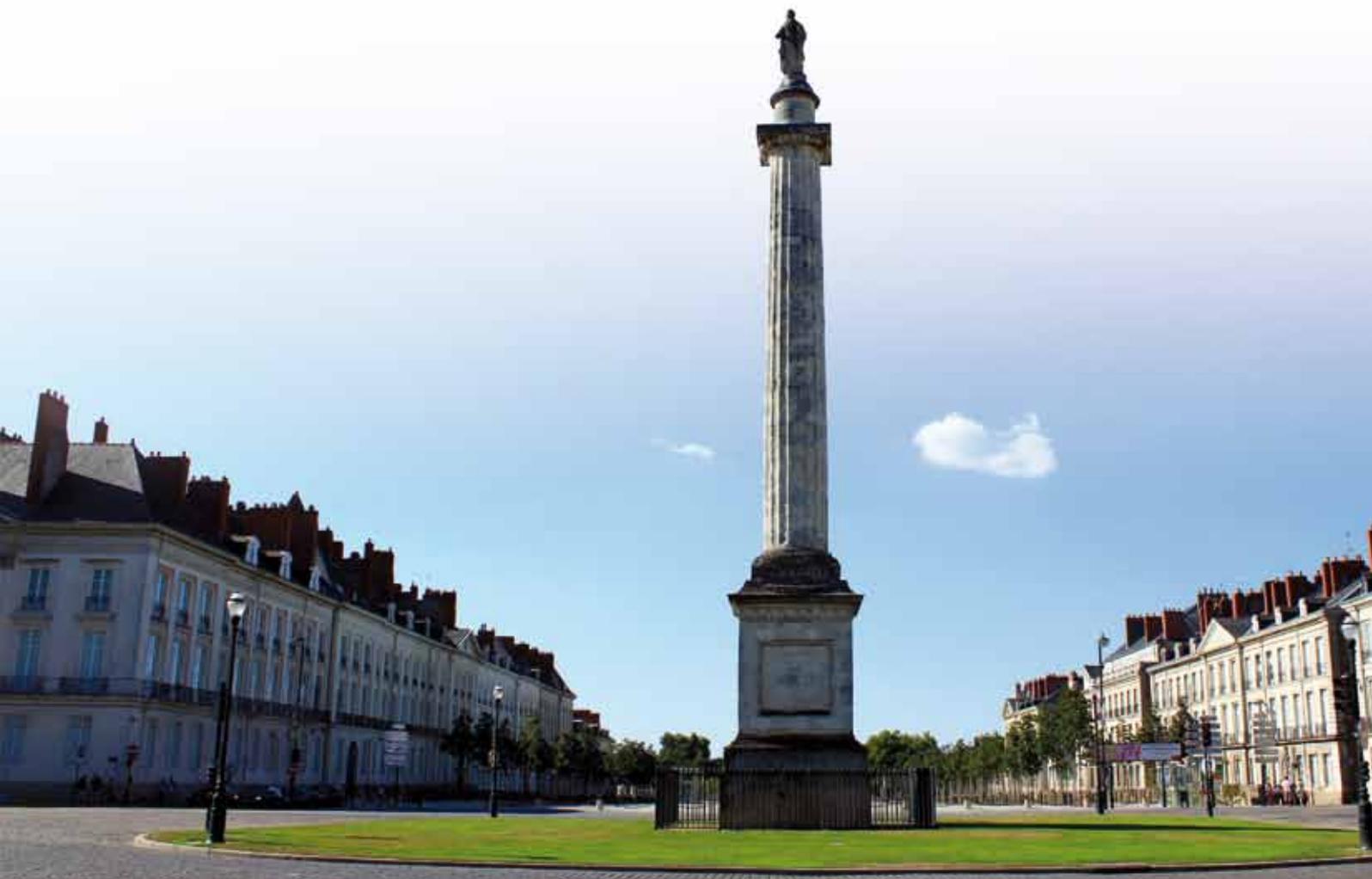
- **Goal of 500,000 housing units per year:** the Eco-Neighbourhoods provide territories leverage by enabling them to fully take advantage of their potential and generate economic momentum.

The Eco-Neighbourhoods also provide a local response to national and international objectives for the year 2020:

- **The European "3 x 20"** encourages France to boost its share of renewable energy production to 23%, reduce greenhouse gas emissions by 20%, and reach 20% in energy savings by 2020;
- **The Nagoya protocol** commits France to a 2010-2020 Biodiversity Plan with a progress report due in 2015. Promoting biodiversity implies work in a city that is denser, greener and more desirable thanks to protected natural areas.

A few figures

- Over 500 municipalities belong to the National Eco-Neighbourhood Club, a forum for local municipalities to meet actors in urban development
- The 394 project submissions in the 2011 call for projects (pre-operational phase) represent over 200,000 planned housing units, of which 66,000 (or 31%) are affordable housing units
- Of the most advanced 186 projects, there are 133,000 planned housing units, of which almost 45,000 (or 35%) are affordable housing units
- In all, the Eco-Neighbourhoods represent a non-negligible share of housing constructions in France (309 800 housing units built in France in 2010).



2. The Eco-cities

Today, the stakes in this development have been raised to an inter-municipal level that examines management modes, both from a decisional and an operational point of view. The Eco-cities approach addresses the need for a new scale of urban action, and it is thus complementary to the Eco-Neighbourhood calls for projects.

2.1. The applicants

Adapted to large conurbations, the Eco-city approach currently involves 19 territories whose municipalities have committed with the State to oversee urban development. The major urban development projects of Eco-cities involve 22 inter-municipalities and a total of 600 municipalities, representing a total of almost 10 million inhabitants. Eco-cities actors intervene at several levels to better address most of the sustainability issues of the cities. The operations



provide a strategic and integrated framework for all types of actions some of which have an impact on sectors of cities that are often involved in one or more Eco-neighbourhood-type urban projects.

2.2. A transversal project approach

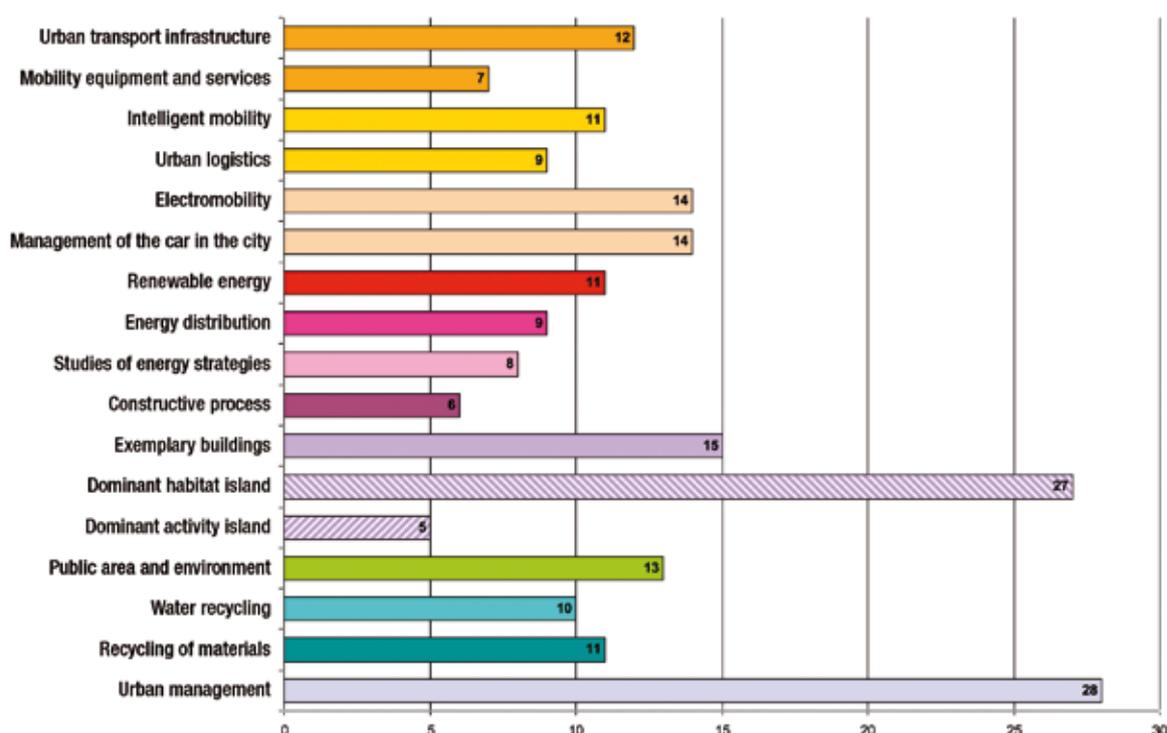
The year 2010 was devoted to the examination of approaches proposed during the submission phase of the first 13 Eco-cities projects (by means of on-site workshops), with three objectives:

- The identification of the priorities of sustainable urban development in each territory, at a citywide level;
- The validation of the Eco-city perimeter representing one or more strategic sectors;
- The establishment of several major goals for all public services (transportation, habitat, environment, energy, culture, etc.) through exemplary and transversal action programmes.

The "City of Tomorrow" offers potent leverage to begin innovative urban development. Eligible actions are both complementary and synergistic with the more conventional actions required by the Eco-city operations as presented by the cities. By nature, they must be replicable. This requirement meets the general objective of the Eco-city approach, which must ensure that each action programme is both exemplary and demonstrative.

Based on the programmes proposed in 2011 for the 13 first Eco-cities and for six others in 2012, a gradual procedure for the selection of innovative actions was put into place. At present, 210 actions have been identified, of which 12 are TCSP infrastructure projects.

EcoCité / Ville de demain : 210 actions identifiées (octobre 2012)



3. A step further

3.1. Towards an Eco-Neighbourhood label

Following four years of extensive cooperative efforts and the growing participation of local authorities and two calls for projects, the drafting of Eco-Neighbourhood guidelines and the experimental phase is now complete. Next comes a phase in which the approach is widely disseminated to ensure territorial and urban development sectors take decisive steps toward sustainable urban development.

To meet this goal, the Ministry of Housing and Territorial Equality decided to establish an Eco-Neighbourhood label to recognize exemplary projects, clarify the conditions of Eco-Neighbourhood success, and raise the profile of the approach.

Thanks to impetus provided by the State, a shared vision of the Eco-neighbourhood approach has gradually emerged since 2008: it is an operation to build a socially diverse city that involves the different actors including residents, and offers a high standard of living while limiting environmental imprints. The realization of an Eco-neighbourhood means finding the right solutions, in terms of programming and urban form that is adapted to both local and national needs and challenges. An Eco-neighbourhood must meet the expectations of the greatest number and avoid "showcasing".

However, too many projects offering "urban models" today have no meaningful political framework and are devoid of local consultation. Other self-proclaimed Eco-neighbourhood projects develop exceptional sectors for the elite in gated neighbourhoods, without any dialogue with their territories.

Consequently, the national Eco-neighbourhood approach provides no ready-made models or solutions; it rather stresses a contextual and shared project approach. All municipalities are invited to join in a voluntary and ambition approach that corresponds to the specific challenges facing their territory.

In as much as the call for Eco-neighbourhood projects has mobilised many municipalities of all sizes, the approach must now raise the bar. The new label will provide leverage to **encourage, accompany, and enhance municipal projects** in terms of sustainable development. This is based on three fundamental goals:

- Proposing measures to **ensure improvements in the quality** of their project and its long-term viability based on an evaluation of indicators;
- **Ensuring greater public accessibility and visibility of the Eco-neighbourhood projects** to boost public urban cultural awareness;
- Raising the profile and promoting the excellence of **French practices** both internationally and throughout Europe.

3.2. Toward an integrated approach to sustainable development

The experimental and exceptional stage of Eco-neighbourhoods and Eco-cities will eventually be superseded. Every territorial project will subsequently give way for a detailed territorial convergence of multiple sectorial public policies (habitat, transportation, energy, resources, amenities, activities, etc.). While urban planning has laid the groundwork over the years, a consolidation of the forms of action of the various stakeholders should take place, and at several levels.

Since 2012, the networking of the Eco-cities stakeholders has facilitated the exchange of observations and points of view on such matters. The plotting of the progress and follow-up of Eco-cities operational strategies over the last three years has forged new directions.

An improved integration of the actions of urban stakeholders is consequently not only desirable, it is a logical extension of the practices of both professionals and users. Support for this change is complementary to the support desired by Eco-neighbourhoods to reinforce the legibility of the urban proposals and undertakings in a bid to ensure greater attractiveness of urban territories.





Chapter 2

How can one best boost city resilience?

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City resilience is a critical issue. We will have to get used to a changing world where sudden environmental disturbances and disasters will increasingly occur and to which complex systems put in place two hundred years ago will have to react to ensure urban continuity. How will cities become more resilient to natural catastrophes both expected and unexpected? It is often said "the more modern it is, the more vulnerable it is". Engineers and politicians must take risks seriously.

In their first article, Michel TOUBIN, Jean-Paul ARNAUD, Youssef DIAB, and Daniel SERRE reviewed the initial results of the RESILIS project (financed by the National Research Agency (ANR)), to identify innovative solutions that would improve city resilience. "Risk management should not be focused on managing the crisis to the detriment of prevention and recovery plans", wrote one of the authors who indicated that the technical and transportation networks are the primary sources of urban disruption and that this should be taken into account when deciding how to respond to crises. They underscore the need for integrated approaches and the issue of governance that must occupy a prominent place among local stakeholders. The resilience of a city is its capacity to recover after having suffered some form of disturbance or catastrophe. Sabine BARLES has analysed this capacity in a resolutely systemic manner. City and countryside are closely linked. While "cities contribute decisively to environmental changes", they are also its first victims. We have entered the anthropocene era and mankind can no longer say it is innocent of the catastrophes to which it is subjected. The author advances several ways to attenuate the effects of the coming environmental changes. A dematerialisation of flows would allow for a reduction in the consumption of non-renewable resources. Significant progress is also possible in the management and recycling of urban waste. However, a fresh look at urban techniques is essential: these should not be seen as a way of "keeping nature at a distance", but it should rather be a tool for urban metabolism.

In an article devoted to urban risks, Bernard CHOCAT identified the challenges city managers must face. Cities are complex entities and the management of natural, technological, or malevolent risks cannot be merely technical. It must also be social and regulatory. The concepts of resilience and retroactivity must be emphasised as

cities don't merely suffer the consequences, they also have an impact on the environment, and the resources they need can be jeopardized by their own development. Climate change also constitutes another major constraint. The actual consequences of climate change are still not fully understood, but such effects must be anticipated and urban systems must be adapted. The demands of residents in terms of urban services constitute another variable that must be taken into account. The capacity to measure changes and know how to adapt is important.

In a second article, Bernard CHOCAT turns to urban water distribution services. While remarkable from a technical standpoint, "these systems have many flaws". The threat of terrorist attack, flooding, network breakage, natural catastrophe, or accidental pollution all present real risks that must be foreseen and prepared for well in advance. The interdependence of networks is in fact an aggravating factor. This explains the author's emphasis on the need for forward-looking approaches, the diversification of measures, and the development of adaptable engineering in the training of technicians and decision-makers.

For Michel REPPÉLIN, an elected official in charge of drinking water and wastewater services in the greater Lyon area, the greatest environmental risks the conurbation faces are those of drinking water distribution and flooding. An Integrated Relocation Pilot Project (IRPP) was put into place in 2005. Some indicators, like rainfall, are carefully monitored and a standing secretariat, the SPIRAL, is in charge of prevention campaigns. Flooding of the Rhône, which has caused considerable damage in the past, is carefully monitored and Lyon is studying drinking water supply diversification strategies.



Municipalities and resilience engineering: the RESILIS project

by Jean-Paul Arnaud, Egis, Lyon; Youssef Diab, Univ Paris Est-EIVP-LEESU; Damien Serre, Univ Paris Est-EIVP; and Marie Toubin, Egis-Univ Paris Est-EIVP-Univ Paris Diderot-Sorbonne Paris Cité

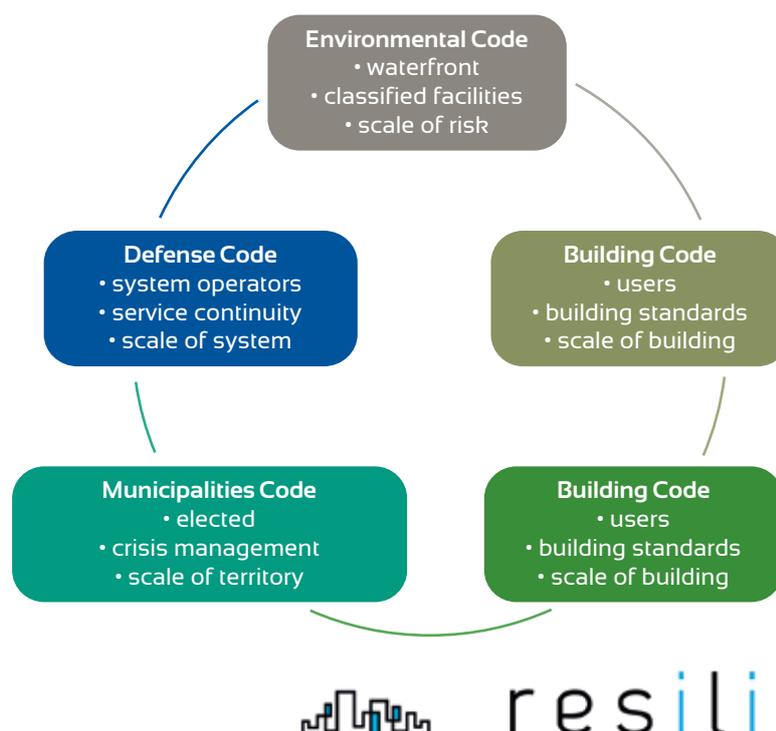
With its social interactions, high degree of connectivity, and its competitiveness, urban society is increasingly complex. While urbanity stems from the accumulation of resources, the concentration of powers, as well as economic and cultural wealth, it is also a vector for risks due to this concentration. Yet, risk management primarily focuses on managing the crisis to the detriment of prevention and recovery plans. Measures and actions are also limited to a single sector or organisation (policy maker, network manager, company, emergency services, etc.), while interdependencies between urban organisations, infrastructures and activities remain strong. Finally, risk management favours short-term measures and has difficulty getting the local population involved. Defined as the capacity of a city to absorb change or disturbances and still maintain its services (Lhomme et al., 2010), urban resilience seems to address these new needs in terms of risk management as it allows for an identification of the above-mentioned threats. The ANR RESILIS project, financed in 2010 for a period of three years, aims to develop innovative solutions to improve city resilience through better multilevel and multi-actor governance, through actions affecting residents, and through an optimized management of technical networks.

Municipal expectations and the weaknesses of current measures

Cracks have begun to appear in the risk management system in France, which puts the onus on the State and its engineers to limit and manage risks (Veyret, 2004), come up with technical solutions and specific regulatory measures, as well as organize crisis response and aid to victims (i.e. flooding in Nimes in 1988, in the Var in 2010, the storm Xynthia in 2010, the explosion of the AZF factory in Toulouse in 2001, etc.). Given the current economic crisis

and the State's loss of financial clout, local actors have had to step in and take responsibility for risk prevention issues like crisis management by focusing most often their attention on the major risks that have been identified, but to which it was assumed they were not exposed. They find themselves facing a profusion of regulations (figure 1) that drastically limits an integrated assessment of the problems for which they are responsible: security of persons and goods (mayoral police force), and territorial development and attractiveness (Arnaud et al., 2012).

Figure 1: Risk management, a summary of sectorial policies



Yet, with the increasing awareness of environmental issues and the emergence of the concept of sustainable development, cities are increasingly apprehensive about the long-term consequences of today's decisions given the context of present and future crises: climate change, rising sea levels, energy, sanitary, economic and social crises.

European regulations are moving in this direction by calling for a level of risk preparedness that exceeds normal reference levels, particularly in cases of flooding. It is not a question of protecting from low-probability events with disastrous consequences, but of anticipating the potential effects in terms of continuity and putting into place mechanisms that would facilitate reaction to such events. While crisis management remains the responsibility of the State (via the prefect), territorial resilience must be prepared long before the crisis and it thus falls to local authorities who must integrate the risks into their territorial projects. Although the concept is appealing, it has drawn much criticism, notably for its poor operability. (Djament-Tran et al., 2011).

Solutions of the RESILIS approach

The purpose of the RESILIS project is to adapt the concept of resilience to an urban environment as a system in order to define tools that would enhance resilience. The ANR project, spearheaded by Egis, brought together a multi-disciplinary consortium with EIVP acting as scientific coordinator. The project owes its innovative character to its multi-risk approach and a systemic analysis of a city's operations when subjected to a wide range of disruptive events. The approach revealed a number of interesting results:

- An analysis of the operations and interactions between subsystems revealed that most of the disruptions and failures originate with or are propagated by the technical or transportation networks
- Poorly controlled inter-links between dissimilar networks increased vulnerability due to the domino effect.
- An approach by network made it possible to ignore the specifics of the initial failure, which allowed for greater focus on the operational impacts (Robert et Morabito, 2009)
- Finally, the distinction between the technical functions and the service functions highlighted the critical role of organising both actors and governance

Figure 2: Three complementary aspects of resilience to be jointly improved



Beyond identifying the characteristics of a resilient urban system (Figure 2.) that result from theoretical tasks (feedback analysis, for example), the best results came from formalising an integrated approach for municipalities wanting to adopt an approach to resilience in their territory. To do so, as part of the RESILIS project, a number of tools have been created or adapted to meet the needs identified by a municipality: a mapped inventory of locations, methods for identification (including GIS tool) and cooperation between urban service interdependencies, climate resilience indicators and microclimate tool, a sensitivity assessment tool and training kit. These tools, though specific and different in character, must be implemented as a comprehensive whole (Figure 3).

For example, a site inventory mapping tool helps identify the strategic locations in the territory (administrative and activity centres, hospitals, etc.) and their risk profile. Then, by cross-referencing these with the network resilience assessment (with managers of urban services) a clearer picture of the potential indirect failure of these strategic sites emerges by identifying their dependence on technical networks. Finally, the occupants of these strategic sites must be trained and made aware of the potential risks and failures so that they can act appropriately to disruptions, remain autonomous, and anticipate the impact to their buildings/infrastructures (resilient design or rehabilitation, adaption, protection).

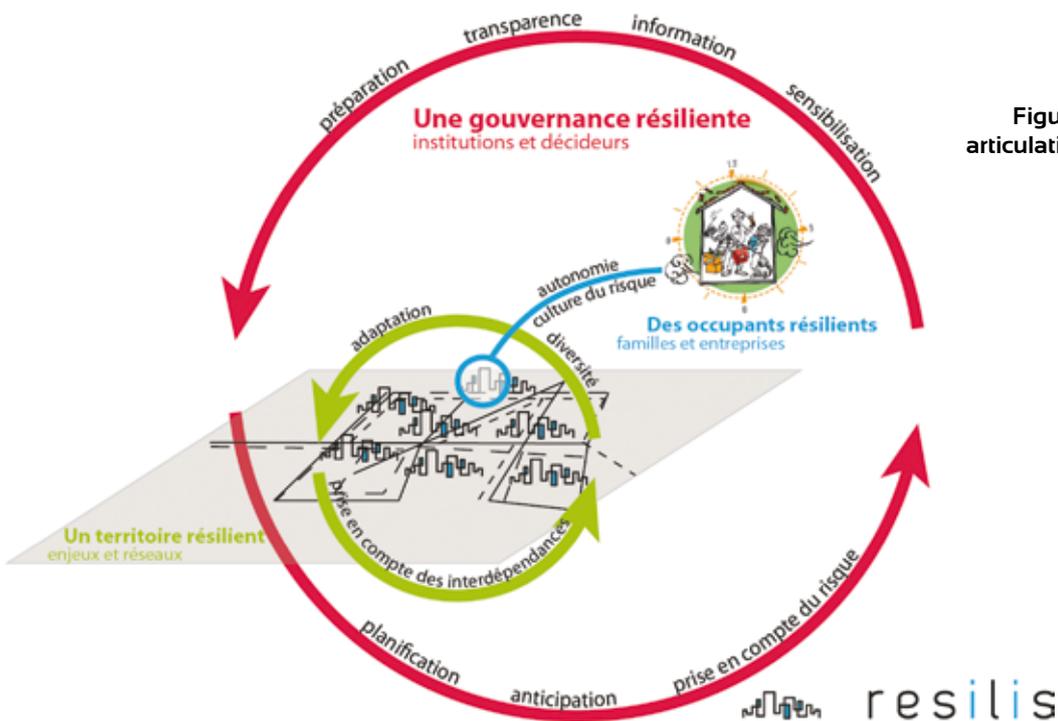


Figure 3: Territorial resilience, the articulation of three interconnected levels

Conclusion

The municipals partners' experimentation with the tools underscored the need for an integrated approach and revealed a great demand for better communication with local residents. A technical resilience assessment is also important and requires a complete assessment of all risks and potential solutions, as a technical response to an isolated risk may prove counterproductive when facing a secondary risk. Finally, the question of resilience management, while not easy, is critical as it will determine the future of the concept, depending on the extent municipalities willingly embrace it, their room for manoeuvre, and the means they allocate to implement and promote sustainable urban development (Toubin et al., 2012).

Acknowledgements

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Urban resilience and socio-ecological transition

by Sabine Barles, Université Paris 1 Panthéon-Sorbonne

Although resilience is a concept that is a little over a hundred years old, it has long been confined to the field of mechanics. It seems to have begun to stray in the 70s when it began to be used in other scientific fields like ecology, then psychology, sociology, etc. It designates the capacity of a system to recover full operability after a disturbance or disruption. It is also often raised in the analysis of socio-ecosystems or anthroposystems cities in particular.

Resilience, a successful concept

The success of this concept in an urban context can be attributed to a number of things.

First, a careful analysis of recent catastrophes, such as floods, earthquakes, hurricanes, has shown that not only the technical infrastructural equipment put into place to combat such risks was largely incapable of alleviating the effects and at times even aggravated the impact. But it also showed that a return to normal after the crisis depended on variables that had rarely been taken into account. One of the more emblematic cases in point is hurricane Katrina, whose effects were dramatically amplified by the use of the land in the Mississippi delta and the network of canals that crisscross the region, provoking catastrophic flooding that ravaged New Orleans in 2005. Once the storm had passed, the city remained in a crisis mode for a very long time due to institutional, political, and social failures that thwarted reconstruction. The presence of these characteristics (specific to an anthroposystem) in New Orleans and its region explains not just the seriousness of the catastrophe (and the anthropisation of a natural hazard), but the city's inability to manage the crisis over the long term. In short, New Orleans possessed little resilience. Similar conclusions can be drawn in a number of cases. In France, there was the heat wave of 2003 (which also hit Italy very hard) or the flooding in La Faute-sur-Mer in 2010. Furthermore, similar observations can be made of any city or society in a context of latent socio-ecological crisis. The environmental changes sweeping the planet (climate change, loss of biodiversity or sixth extinction, depletion of certain resources, etc.) have a systemic impact on societies that are partially responsible for the changes. In such a context, it's not a question of choosing between the environment and society, or between pollution and economic slowdown. Rather, we must acknowledge the

two terms are intricately intertwined that there is a structural solidarity between societies and the biosphere. Cities are the first concerned by this analysis as they have a decisive impact on changes to the earth's environment (either directly or indirectly), even though they suffer dearly from their consequences. The question of the safety of the food supply is also relevant: in certain regions food production is affected by climate change, which compromises urban supply. This aggravates intra-urban inequalities. There are also coastal cities that are threatened by rising sea levels. Some cities face energy shortages. The examples of urban instability (or even more critical situations) are numerous, which compounds the growing concern that extreme climatic conditions could, in some cases, be aggravated by climate change.

What can be done to make cities more resilient?

Finally, the question regarding the functional operation of cities (essentially an ecosociosystem) in a continuous mode itself characterised as a quasi-latent crisis situation also raises the question of their dysfunctional operation in a major crisis and their return to satisfactory operation. Making cities more resilient means not only preparing them to recover from major crises, but given the systemic nature of such crises, it also means transforming normal operations. It also means adapting to nature not adapting nature. In this context, the problem posed by resilience is comparable to that posed by a socio-ecological transition or to that of a post-carbon city, or to that of the attenuation of or adaptation to climate change (the most publicized of the planet's environmental changes, which unfortunately tends to overshadow all others).

Dematerialisation is probably one of the major factors of the socio-ecological transition with the potential of improving urban resilience. Indeed, most of the environmental

changes that affect us can be attributed to the metabolism of society (i.e. flows of energy and materials that societies take from the biosphere, and transform, consume, and finally discharge in a degraded form). The metabolism of today's society is characterised by a linear circulation of materials associated with the creation of biogeochemical cycles in which cities act as a type of hearth: the material (and energy) flows in circulation have increased since the industrial revolution. A portion of these flows is derived from fossil fuels or non-renewable sources, some of which are gradually being depleted: combustibles, phosphates, various metals, etc. At the other end of the chain, the discharge into the biosphere of all types of emissions and effluents has resulted in the accumulation of materials in certain ecosystems or compartments of the environment, the limits of the food web having been reached: carbon accumulations in the air, nitrogen in the soil and water, lead residues everywhere, etc. The consequences are social, sanitary, economic, and environmental.

The dematerialisation (through factor 4, factor 10, etc.) of urban societies (i.e. a reduced consumption of materials) would mitigate these effects. But this is only possible if accompanied by a lower reliance on non-renewable resources. For cities, this implies substantial work with the supplying territories, since, by definition a city is a place of specialisation that has partially externalised production activities (and almost all its food production). The question is not one of transforming cities into food-producing zones, but of working to have an impact on production sites. This means inventing flow management methods by increasing organisational and physical proximity between production and consumption the theory of proximity. Furthermore, when referring to renewable resources are in most of the cases surface resources. The ground must be thought of as a primary resource, and its appropriation for a specific use (or a variety of uses) should be treated accordingly.

Metabolism is also a factor in the city, not merely because energy and material flows converge there (in any case the small portion not lost in the transformation processes in a broad sense) but because their management modes particularly those upstream are decisive from a metabolic point of view. It must be noted that the management of urban excreta is largely dominated by end-of-pipe techniques that not only perform poorly but are very costly. Conventional wastewater treatment provides ample evidence: after conveying wastewater by pipe, the river water is polluted, which is partially corrected with a water treatment plant, which in turn produces sludge which is spread before verifying if it is inoffensive or not. The sludge must then be treated, much as the atmospheric emissions from the treatment plant must be treated, which requires new products, etc. Often the investment in such measures provides diminishing returns. Yet, the excreta constitute a potentially valuable raw material: the closing of biogeochemical cycles demands their use. At the crossroads of metabolism, urban planning and urban engineering, the materiality (composition and form) and natural aspects of the city are also called into question, as witnessed in the variations in the urban water cycle (see Bernard Chocat's article p.44), the interactions between

energy consumption and urban form, the formation of the urban heat island, to name but a few.

But the socio-ecological transition toward a more resilient city requires further reflection, which has yet to sufficiently attract the attention of urban researchers and practitioners. If we consider that what is at stake are the interactions between urban society and the biosphere; if we admit that the techniques employed by urban society constitute the anthropic share of these interactions (the physical, chemical, and biological processes make up the natural part), then it is the techniques that we must question, in all their dimensions (not just from an engineering point of view). Urban techniques have helped reduce the natural constraints imposed on residents, while pushing back nature which has at times caused us to forget its caprices: floods, heat waves, droughts, etc. Isn't that where action should be taken? In other words, the high-tech solutions that are generally preferred over dematerialisation and decarbonisation (notably a smart grid), wouldn't they tend to push us even further into the technology trap to the detriment of simple techniques like putting on a (wool) jumper when it gets cold? This points to the central question of man's place in the management of urban metabolism: is he actor or agent?

This technical approach chosen here to underscore the issues facing urban engineering demonstrates the multifaceted nature of resilience, whether it is a framework for analysis or a project, it is only after this first step is taken, that the social, political and institutional dimensions (to name but a few) can be measured.

Global change and urban risks

by Bernard Chocat, Professor Emeritus of INSA (Institut National des Sciences Appliquées, Lyon)

This article is heavily inspired by a text written during the preparation of the "sustainable city" ANR call for projects.

Everyone agrees in thinking that we now live in a time of accelerated change, most obviously climate change, but also lifestyle changes, with unprecedented city development, and technological changes. These changes challenge the organisation of urban services by exacerbating risks and putting us in a situation of increasing uncertainty. In light of this, what are the main challenges and issues city managers must face?

How can acute risks be prevented and better managed?

Cities are threatened not only by natural risks (earthquakes, floods, heat waves, droughts, etc.) but also by technological risks (industrial accidents, technical system failures, etc.) and even risks associated with malevolent acts (including terrorism).

The prevention of acute risk in urban areas is dealt with in the Hazard Prevention Programme (HPP). This concept requires studies and analyses that are highly multidisciplinary in nature; however, current practices are still very spotty depending on the urban fabric or the type of risks covered, and much remains to be done in this area to generate well-established and scientifically sound methodologies. Furthermore, aside from these plans, new métiers should appear that will assume responsibility for studies as they relate to the prevention procedures established by the HPP. One of the peculiarities of cities is that a sudden break from the norm is every bit as threatening as that generated by extreme phenomena, which, by jeopardizing the daily practices of the city's management, abruptly exposes its citizens to danger.

The city is a complex entity. The continuity of its operations (and therefore the safety of its citizens) depends on a durable supply of water, food, energy and raw materials, and the evacuation of waste to ensure the free movement of people and goods, etc., even when problems arise. An assessment and improved risk management must therefore rely equally on an identification of urban vulnerabilities associated with the organisation and operation of the city in times of crisis, as well as a better understanding of risk areas.

The management of these risks cannot therefore be solely technical; many social or regulatory dimensions must be integrated. For example, the behaviour of the population before, during and after the crisis, its effective capacity (cultural, economic, etc.) to initiate preventative actions, the influence of non-institutional organisations (companies, associations, etc.), are all difficult elements that must be taken into account. Some of these elements increase the capacity of a city to adapt positively to an unusual and potentially dangerous situation; others hamper that capacity.

It is therefore urgent to develop alternative methods of risk management that do not require undue forward planning (the notion of crisis must incorporate the notion of contingency) but emphasise the concepts of resilience and retroaction.

How can chronic risks in the city be better contained?

The city is also subject to more insidious chronic risks. There is, of course, the risk of a disruption of services associated with the ageing of city assets (in particular network infrastructures), and difficulties in managing resources (e.g. water) or, on a more basic level, funding problems.

There are also health risks associated with the urban environment (air, water and soil pollution, pollution from building materials, noise, waste, etc.). For this reason the city managers must change their way of thinking. Pollutants found in the city come from modern activities and technical solutions as well as former technical solutions. Urban areas should therefore be considered not only as places of production and circulation but also as (unstable) reservoirs of various substances that have an impact on health.

How can the city be developed in a way that controls environmental impact?

Another aspect is that of the control of the impacts of urban life on its outskirts. A city is in fact part of a larger system from which it draws resources (energy, water, raw materials) and discharges its waste (liquid, solid, and gas), but with which it is in competition for use of space.

Urbanisation, being basically a means of establishing order, inevitably creates chaos outside the walls of the city (the 2nd law of thermodynamics!). In developing countries, some megalopolises face increasing disorder outside the city, which poses a major risk to the city itself (i.e. the city's increasing difficulty in obtaining water of an acceptable quality due to the pollution of its own water resources from urban discharge). All cities in developed countries must develop technical systems and processes that minimise the consumption of resources and the amount of waste generated.

The main question is therefore the following: what public and territorial policies should be implemented and which technologies should be used to meet the demand of urban services without impinging excessively on the environment outside the city - on all spatial scales (from just outside the walls of the city to the rest of the planet - notably greenhouse gas emissions, for example). The solutions of course not only involve the improvement of technical systems, but also the modification of the organisation of the city itself and exchanges between the city and its close or distant surroundings.

How can the city be adapted to climate change?

Climate change is of course a major constraint that can have a significant impact on the points already discussed. Climate change is indeed more controversial and its consequences are likely to affect both extreme weather conditions (rain, wind, heat waves) and health conditions (including pests and disease), while at the same time creating new demands (energy savings, reduced greenhouse gas emissions, water conservation, etc.).

At the local level, however, the real consequences of global climate change are both uncertain and vague. This is especially true in cities that have nonlinear interactions with their own micro-climate (for example the increasing reliance on air conditioning to combat heat waves accentuates both energy dependence, and the impact of heat island effects, which air conditioning is supposed to combat). Now, existing urban structures, such as those built today, are made to last well beyond the periods over which we can make a credible forecast.

How can existing urban systems be adapted to this change without damaging them and how can new structures that integrate these uncertainties be designed? The challenge is to develop an approach to urban engineering that is based on adaptability instead of an approach to urban engineering that is based on optimisation. This approach will of course have to take into account all dimensions of sustainability (environmental, social, and economic). Approaches based on the development of scenarios would probably be an interesting direction worth investigating.

Technological advancements are of course necessary, but they must be accompanied by the establishment of new urban organisations and/or new modes of "urban life" (living, getting around, supplies) adapted and/or adaptable to a changing climate.

How can the city be adapted to residents' new service demands?

Urban services must adapt to the changes for which it is partially responsible (climate change, for example), but they are also directly responsible for profound changes that pose risks that city managers must take into account. For example, today's technical solutions (public networks) ensure equal treatment to all users, even if there remains significant disparities from one city to another (and from neighbourhood to neighbourhood) depending on their economic means.

In many areas, current trends favour local or individualised solutions (for the supply of energy or water, or for recycling waste, etc.). How can these two approaches be reconciled while continuing to ensure equal treatment for all?

One way to proceed would probably be to support a more objective means of measuring the actual level of service provided to users. The implementation of monitors combined with quality controls that could constantly check for discrepancies between demand and service provided would be an effective tool. The point would be to keep track of both changes in service rendered and the changing demands of clients/users/residents. The changing character of the environment would thus be integrated into the approach.



Water and sanitation services and urban resilience

by Bernard Chocat, Professor Emeritus of the INSA, Lyon

There are many urban water systems. They include the supply and distribution of drinking water, the evacuation and treatment of wastewater, the management of storm water drainage systems and natural aquatic and wetland environments, and the management of artificial and recreational bodies of water (from fountains to lakes and reservoirs). New solutions are on the horizon: individual sanitation systems are again gaining popularity; new, more natural treatment techniques are being developed for medium-scale applications (block of buildings or neighbourhood). For example: filters planted with reeds, tax incentives to homeowners for the recovery of rainwater, and storm water management has undergone a major revolution. Future urban water management will likely be very different from today's. But will it be more sustainable, and if so, under what conditions?

Water supply services are essential to a city's operations. It is obviously difficult to survive for long without water, so regardless of the circumstance, a minimal supply of drinking water to each resident is absolutely indispensable. But there's much more to be said than simply admitting that cities are vulnerable when it comes to their water supply. Many basic services depend on a reliable, constant supply of water. This is true of hospitals. Take for example dialysis services, fire-fighting services, or even any service whose operations depend on properly cooled computers. A number of years ago, for example, a breakdown in Lyon's water supply system caused a shutdown of all south-east TGV train traffic due to the inability to cool the computers that control TGV traffic.

The same can be said of sanitation services whose constant operation is necessary to ensure public health and to protect the biosphere.

In European cities, the technical systems that provide drinking water and sanitation services are almost always designed to the scale of the city and based on an intensive use of the networks. Water is taken upstream and treated to improve its quality; it is then distributed through a huge network that ensures the supply to the top of the tallest buildings. The wastewater then is recovered in a collection network that is every bit as large as the distribution network, redirecting the effluent toward a treatment plant where it is treated before being discharged into the environment. This urban water cycle, inappropriately dubbed the "small water cycle" on account of its open cycle, is reproduced city after city from the upper catchment basin until the water regains the sea.

These systems are remarkable. For a relatively modest price (on average three or four euros per ton), all residents are ensured a high quality, generally reliable water service. After just a few weeks in an African city without such services one realises the convenience and health benefits they provide.

However, these systems are vulnerable and are not exempt from risk or failure.

What are the factors most likely to provoke such failures and what can be done to minimise them? What level of resilience does a city have to such risks and what can be done to raise its resilience? These two critical questions must be answered if we hope to make cities more sustainable.

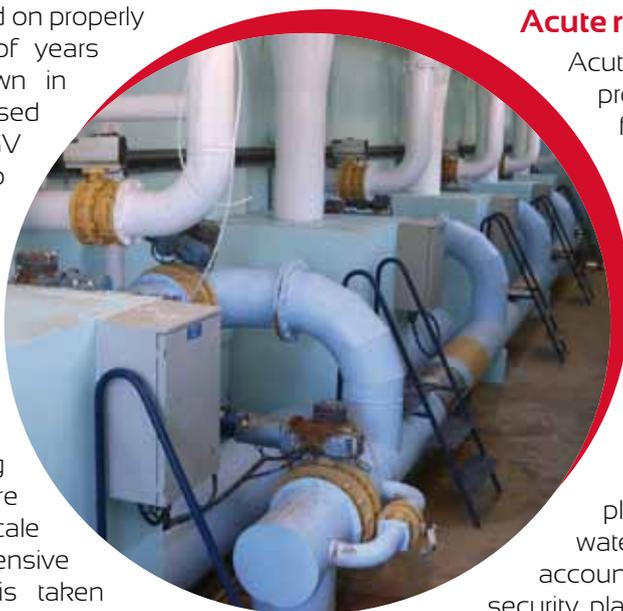
Acute risks

Acute risks are those that are likely to provoke a sudden and unexpected failure of drinking water and sanitation services.

In this context, a malicious or terrorist attack is often evoked. It would be relatively simple to poison the water supply due to its centralized nature, and it would require little logistic preparation. It would also be easy to disrupt the water supply by taking out a critical component (treatment plant, critical pumping station, major water main, etc.). This risk is taken into account in France's national "Vigipirate" security plan. However, no terrorist has ever tried this perhaps because it is far less spectacular than a bomb.

A disruption of water and sanitation services due to natural catastrophe is far more likely. A flood, for example, can pollute catchment areas (which occurred in the Seine-et-Marne in December 2012) and interrupt water distribution. Flooding can also cause major damage to wastewater networks. Postcard pictures of the 1910 flood in Paris show sewage systems that were literally ripped apart by the water pressure. This type of damage occurs regularly every time the wastewater network is overloaded by runoff surface water.

Technological disruptions are also possible (spectacular rupture of a large-diameter water main, mechanical breakdown of pumping station, or failure of electronic control device, etc.).



Chronic risks or risk trends

This implies assessing a system's ability to adapt to change.

The primary risk is the ageing of technical systems. It is difficult to predict how fast various components of a system are going to deteriorate. Hence, it is difficult to set up a renewal strategy that would ensure a system's integrity. It is even more difficult to mobilise the necessary funding for such a strategy in the midst of an economic crisis.

The second risk is climate change. We have already discussed the vulnerability of water systems to extreme weather events like floods, which are likely to occur with greater frequency and severity in the future. Changes in rainfall averages must also be taken into account as well as the risks associated with a reduction of this resource.

The third risk is economic deregulation. The cost of service primarily covers the payback of public debt and the maintenance of infrastructures (representing 80% of total expenditures). If, however, water consumption should drop, due for example to increased rainfall recovery and storage, the burden of fixed charges will rise, forcing a hike in the rate per cubic meter to balance the books. Water rate hikes will incite users to recover rainwater or draw water from their well, which will lead to a further drop in consumption, further complicating the financial situation. An unrestricted policy promoting rainwater recovery could set off a vicious cycle.

The last risk has to do with a loss of equity. Current technical solutions (public networks) provide a certain level of equality in terms of user access, even though there are significant differences from one city to another (and from one neighbourhood to another) depending on their financial means. Certain foreseeable changes argue for more local or individual solutions. One of the main questions facing city managers is how to reconcile these two approaches while ensuring equal treatment, which will be far from easy, as illustrated by the operation of the SPANCs (Public On-site Sanitation Services). Both the actual needs of residents and their perception of service rendered will have to be taken into account (in terms of security, for example, where their perception of risk may be very different from objective risks).

Aggravating factors

The risks touched on in the preceding paragraphs may also be exacerbated by several factors that must be taken into account.

Users themselves have very little resilience to system failure. Used to seeing the various urban services operate without a problem, they are extremely inconvenienced when service is disrupted or breaks down, and their behaviour may further compound the risk.

The interdependence of the networks is also an aggravating factor. We have seen that the disruption of the water supply may compromise other urban services. Similarly, a loss of power could also interrupt water distribution services, for example.

Finally, another aggravating factor is the desire to operate the systems as close as possible to maximum capacity. The implementation of a centralised sanitation network is often cheaper than installing a second collector, but when the system fails, the lack of added capacity reduces the number of adaptation options.

How to boost resilience?

Boosting resilience must begin by a reduction in the risk factors. The development of comprehensive forward-looking approaches capable of accurately assessing risks, their potential consequences, and the means of countering them (through differentiated scenarios, if possible) is an effective way of making cities less vulnerable. This is particularly true of chronic risks or risk trends for which there is ample time to react.

Another potential action involves a diversification of options and an augmentation of the city's ability to adapt to a wide range of situations that are largely unforeseeable. A diversification of water resources and the means to treat or distribute the water allows for protection from a localised problem. An important rule should be to develop "adaptable" engineering that can take the place of "optimal" engineering, which has been the standard for over 100 years. For example, if a storm water collector is built and climate change leads to an increase of severe rainstorms, the only solution would be to dig up the road, demolish the collector and replace it with a larger one. If, however, the option of letting the rainwater infiltrate wells is preferred, then the solution would be to increase the number of wells.

The third option is to anticipate the consequences of a disruption to better deal with the problem. This implies preparing technicians and policy makers by providing training and by giving them the means to manage the crisis, even after the crisis.

This would also imply educating and preparing users. The remobilization of residents to transform them into actors in their environment, particularly during crises, would no doubt contribute greatly to making tomorrow's cities more sustainable.



The risks of a major metropolis from a policy maker's point of view

Interview with Michel Reppelin, Mayor of Collonges-au-Mont-d'Or and the 3rd Vice-President of sustainable development for the Greater Lyon Area

by Solène Le Fur, ASTEE

In an interview, Michel REPELIN speaks of the major environmental risks that the conurbation of Lyon is likely to face in the future. In his opinion, the biggest challenge is ensuring the drinking water supply to residents of the Greater Lyon area.

Dear Mr Reppelin, in your opinion, what are the major environmental risks that the conurbation of Lyon is likely to face in the future?

Over the next few years, the biggest challenge for the Greater Lyon area will be that of ensuring a supply of drinking water to its residents. The challenge is both quantitative and qualitative.

With climate change, another risk is flooding, particularly on the outskirts of Lyon. Rainfall is increasingly torrential in nature, and exceptional storms are increasingly frequent.

Could you tell us what the greater Lyon area is planning to do to anticipate the major changes we are subjected?

I can respond on several levels.

To begin with, every municipality in the Greater Lyon area has the obligation to prepare for potentially devastating events that would wreak havoc and put residents at danger. That is one of their duties. Hence, they have all submitted a Municipal Information Document on Major Risks (MIDMR) that provides a list of all risks the municipality might face in the future. The MIDMRs are forwarded to residents to inform them of the potential risks. In Lyon, there is also a Permanent Secretariat for the Prevention of Industrial Pollution (SPPPI), known as SPRIAL (permanent secretariat for the prevention of industrial pollution and risks in the Greater Lyon area), its role is to oversee public awareness campaigns aimed at preventing technological risks to the quality of air or water.

For major devastating natural, sanitary, or technological events, the municipalities also have a local response plan. If these major events occur and are catastrophic, the Prefect and the fire brigade may be called on for help.

Furthermore, we have an obligation to maintain high quality and continuous service to residents despite the potential disruption factors. Our services must prepare to manage risks posing a threat to service through documents that integrate most of the potential risks and the procedures to be followed should they occur.

For example, for flood risks, the Greater Lyon area implemented a flood risk prevention plan (PPRI) in 2005. Also, a number of recommendations/obligations (ban on all constructions under the 100-year peak flood line, for example) were integrated into the local urban planning scheme that is currently being revised.

In the field, risk anticipation also involves the implementation of preventive installations like overflow retention basins in urban environments (Saint-Priest) or porous floors in low-level flood-prone car parks. The Greater Lyon area also works closely with the Saône-Doubs EPTB and farmers to recreate floodplains upstream the urban area.

An especially important aspect of risk anticipation is the monitoring of certain indicators like rainfall to anticipate flooding, or the monitoring of the quality and quantity of drinking water. In a case of accidental pollution, for example, qualitative monitoring would allow for a swift response: pumping could be stopped and a backup treatment facility with a capacity of almost 300,000m³/day could be deployed. At the same time, the municipalities would be mobilised to provide residents with bottled drinking water.

Prevention, cooperation, and awareness are key factors in learning from past crises and preparing for future crises.

Has the Greater Lyon area faced difficult situations in the recent past? If so, how were these crises handled? Specifically, what adaptations were required to maintain the various urban services?

Let me give you a few examples.

First, the Rhône spilled its banks causing severe flooding in 1840, then the Saône in May 1856. Unfortunately, the flooding was so violent that the city suffered considerable damage. Lyon took this into consideration when it began reconstruction and raised the riverbanks above the peak level of the two floods. Each new installation, like the construction of the underground, was designed with these incidents in mind. Thus, the urban centre became less vulnerable; but this was not true throughout the entire basin. In 1955, for example, a new flood (almost as high as the 100-year high flood level) almost paralysed the metropolis.

Urban services adapt to but can never be totally protected from a major crisis. That is why it is important to improve public awareness. To drive this home, the city has posted peak flood levels of historic floods on buildings and riverbanks. This is a good visual way of reminding people that events in the past could happen again. Similarly, flood prevention also requires a heightened awareness of landowners near small streams so that they help limit flooding by keeping drains clear to avoid jams.

As regards waste collection, the city has only experience minor crises, mostly in the form of worker strikes. We feel we are fairly well prepared, as waste collection services are operated by city workers in the municipalities outside Lyon's city limits, while collection services are delegated to private operators within city limits, so there is little risk that all workers will go on strike at the same time. In case of a prolonged strike (lasting several weeks during which standing waste in the streets begins to pose a health risk to residents), the Prefect and the army would be called in.

Snow removal is a common problem in Lyon. Street cleaning services have put together a well-oiled strategy that classifies all roads according to priority. The roads deemed to be high priority (expressways and major roads essential for public transport) are ploughed first. This work is conducted in close cooperation with the mayors of each municipality. Also, roads and highway services must take into account the environmental risks of spreading salt on icy roads (which jeopardizes the quality of land and waterways). Even such careful preparations are at times foiled when an untimely snowstorm prevents the trucks from doing their job. For example, if the snow falls between 6.00 and 8.00 AM during the morning rush, the trucks cannot salt the roads. To avoid such situations, road services rely on their experience to begin salt spreading operations earlier.

In 2002, Lyon also had an unusual odour problem. To address the problem, a special organization entitled Respiralyon was created. It produces an inventory of odoriferous areas (based on complaints that were filed). Respiralyon also set up an online interface where residents could report anomalies. After a certain number of identical alerts, the Air Rhône-Alpes air monitoring network takes samples and analyses the trace elements found in the air. Depending on different parameters such as wind direction and speed, the origin of the odour plume can be identified. This is how the origin of the 2002 odour was traced back to the Feyzin refinery. Our residents were very effective sentinels

We shouldn't forget that unexplained events causing resident discomfort can provoke mass panic. The responsiveness of urban services is thus essential.

In your opinion, is it possible to improve this adaptive capacity?

It is obvious that in certain areas there is room for improvement. This is case with the drinking water supply, which has become a real concern.

From a quantitative standpoint, a growing scarcity of water resources due to global warming is not a surprise. The urban area with the largest catchment basin in the region (capable of providing almost 85% of Greater Lyon's water needs) is working on strategies to find drinking water elsewhere.

Furthermore, climate change will pose a new set of risks. The urban area must be ready to adapt by taking into account both recurring and exceptional events.



Toward a better coordination of scales and territories

Chapter 3

Toward a better coordination of scales and territories

Faced with the growing complexity of cities and their continuous outward sprawl, what is the future of urban services? What is the best scale to deal with problems, find solutions, identify actors, and mobilise financing? Several articles have addressed the issue of the scale of urban services. They all have one thing in common: they all stress the need for a coordination of the scales of intervention.

In his first article, Michel BONETTI, sociologist at the CSTB, drew conclusions from several recent urban renewal operations in which he participated. He was critical of the too often self-centred character of the projects financed by the National Agency for Urban Renovation (ANRU) and regretted the relative lack of integration with the rest of the city. He stressed two important points often neglected by policy makers and designers: the urban potential of urban renewal sites is not fully developed; and a lack of attention given to the social role of the neighbourhoods in question. To this might be added and this is not contradictory the frequent lack of perspective of the projects in terms of spatial and temporal development of the urban area. There remains much to be done to modify the priorities and the methods of intervention in these neighbourhoods.

Pierre MIQUEL, the director of SCoTs within the Ministry of Sustainable Development, calls attention to the context in which this new planning document was conceived and proposed. Liberated from municipal boundaries and able to go well beyond the perimeters of the urban area, territorial coherency schemes (SCoT) seek to interpret a territorial project on the only valid scale that of the basin and its inhabitants. 142 SCoTs have been approved and 244 were being studied in January 2012. SCoTs cover all aspects of urban life, from the environment to forms of travel, from natural habitats to housing or urban services. By raising the issue of the future expansion of networks, it helps ensure expansions are more compatible with urban development. It is an essential instrument in coordinating the scales of governance.

In his article, Olivier PASCAL, deputy director of the Mission Métropole du Grand Paris for senior management of Veolia Environnement, hails the very ambitious goals of the approach launched by national authorities in 2008 and officially adopted in 2010 with the passage of a law regarding the urban development of the greater Paris area in which the development of a regional subway system is a key component. He stressed two very important issues. The first issue has to do with the coordination of scales between the regional level, where SDRIF planning is the reference, and the local level where territorial development contracts (CDT) come into play around the stations of the future network.

The second issue has to do with the efficacy of these CDTs, planning spaces provided for the cooperation of all actors of urban development, both public and private most notably those with integrated and modernized urban services. The dashboards of these CDTs would provide an original and practical tool for measuring the results of this cooperation.

Indeed, the "Pari du Grand Paris" (name of the 2008 international consultation) poses a formidable challenge!

In an article on the management of urban water systems, Cathy WEREY and Frédéric CHERQUI pointed out that "wastewater, storm water, drinking water, or decorative water management systems increasingly interact with the city and water users". A purely technical or sectorial approach is not viable, and every scale of the various water uses must be taken into account. She calls for the implementation of an integrated management system of urban water services (the purpose of the OMEGA project that was studied and financed in conjunction with the ANR "sustainable cities" programme). She proposes an integrated function analysis method that identifies all the geographical entities concerned (cities, departments, municipal groupings, catchment areas, etc.) the organisations (urban managers, authorities, organisers, operators, etc.) and new stakeholders (users, volunteer organisations, residents, companies, etc.) that should to be associated with the system.

Bruno DE GRISSAC, director of the Gironde Water Board (SMEGREG), shows how it was possible to implement the sustainable management of Gironde's deep water tables that provide half of the 300 million cubic meters of water to the department's users. The SAGE "deep water tables" law passed in 2003 and amended in 2013, noted a "disparity between the geographical distribution of abstraction points and water resources". The law set specific limits and it combined a policy of water usage optimisation and water resource substitution for dwindling deep water supplies. The creation of the SMEGREG, in which the urban community of Bordeaux and the Gironde Department are partners, has facilitated the implementation of substitute solutions and imposed the costs of environmental restoration on those who made them necessary: in other words, the polluter pays.

The last article in this chapter, written by Rémi BARBIER, professor at the ENGEES, addresses the security of the drinking water distribution system. He introduces the Aquadep project backed by the “Eau et Territoires” programme and the “Eau&3E” programme financed by the ANR. He asks how the drinking water supply system can be kept safe given the constant expansion of urban zones. The solution, he suggests, is a hydro-territorial streamlining, which requires a spatial and functional re-composition, a specialisation of water distribution, and the development of network

interconnections. Rémi BARBIER underscores the major role played by the General Councils and the decentralised services of the State in the streamlining effort. The effort, though far from complete, has thus far focused primarily on the protection of the resource and its production. Its initial promoters (the State and the Departments) are beginning to withdraw and a reallocation of responsibilities is inevitable, leading to organisational squabbles and arbitrations with unfortunate consequences for certain territories, notably the abandonment of non-strategic resources and a free rein given to agricultural polluters.



Changing the scale of intervention in deprived neighbourhoods area, a condition for the success of urban renewal policies

by Michel Bonetti, sociologist, researcher-consultant at the CSTB

Henceforth, the majority of urban projects conform to a framework of sustainable development. They aim to reduce water and energy consumption, develop social and functional diversity, and ensure biodiversity. They also tend to favour the urbanization of sectors with close proximity to public transportation in a bid to combat urban sprawl. However, this is not enough to ensure the success of these projects. Action must be taken on the status of the urban area, the scale of the intervention in terms of conception and temporality. The environment and the urban potential of the sites must be taken into account and great attention must be paid to social impacts.

1. The stakes of Urban Sustainable Development

We have noted in an assessment of a number of urban renewal projects, or neighbourhood renewal projects currently underway, that these projects attempt to mesh with their environment, although they were fundamentally based on an inward, **self-centred concept**. Preparatory studies generally begin with an analysis of changes in the urban context and by highlighting the importance of the integration of these projects in the environment, but as soon as an operational project is elaborated, both operators and developers tend to close the operational perimeter, arguing that their scope of activities is limited to their own urban perimeter. This has also led to the **realisation of disparate incompatible projects**, often juxtaposed, without any real synergy.

We have noticed that the new projects, whether urban renewal projects or new constructions, are often centred in rundown areas, generating a **significant differential in urban quality** when no requalification of the environment is undertaken.

The self-centring of projects is due in part to the fact that the planning tools provide broad orientations on a large-scale typical of large urban areas, while many projects often involve relatively small zones, even though the larger ones can involve up to a hundred hectares. This points to both a **spatial discrepancy**, in terms of the definition of development choices, and a **temporal discrepancy**, given the fact that the urban planning is supposed to be long-term, although the projects are planned for the short-term (even though projects often take a long time to finish).

Each project should capitalize on the **urban potential of its environment** and contribute to its development, whether it is the potential of its structures, of its landscaping, of its economic development, or of its urban or historical identity. This potential can be realized through improvements in the accessibility to certain areas or structures, or through urban re-zoning or reconfiguration that would free up land for development or construction.

A lack of concern for the future has led to the squandering of the potential of land and urban development, and to the

disintegration of cities. Because the land was abundant and relatively inexpensive, projects proliferated. This is particularly striking when the expansion of infrastructures is examined since the 60s when the urban fabric of cities was torn and often intersected by the construction of motorways, as was done in Angers, Tours, or Reims. Ultimately, certain neighbourhoods were severed from their environment. Even worse, some motorways, having been built on the periphery of the city (as if an emblematic completion of urbanisation efforts) actually blocked further development to the point that they had to be partially demolished and rebuilt to allow for subsequent urban development.

The "social pillar" of sustainable development deals with concerns for social cohesion, as well as social and functional diversity. But this goal is often limited to the integration of a certain percentage of social housing and businesses without any real **concern for the social functions** that might be generated for urban revitalisation, or for the social interactions that might develop. Such interactions depend largely on the urban organisation of the sites, on the interactions with their environment, and on their relation with centrality.

2. Project integration in regional urban renewal strategies

We propose **considering urban renewal as a group of closely coordinated projects, whose realisation may extend over time**; by combining the renovation of certain sites with urban development operations or new constructions, the aim is to generate an impetus for development.

The urban potential of the territories varies widely; the potential is obviously limited when they are associated with cities that are in economic or demographic decline, or when the territories are locked inside road or railway infrastructures that not only constitute functional barriers but also potent symbolic barriers. On the other hand, neighbourhoods situated inside the urban area that can be attached to the city centre, like in Grenoble, Nantes, or Brest, have enormous potential. It is striking that urban renovation projects rarely take into account this difference of potential.

We can cite a few examples of territories or areas where we have worked. **At Boulogne sur Mer**, the social housing project "Transition" is fortunate in being situated in a sector called Chemin Vert, a territory with enormous potential as it surrounds a very lively, recently-rezoned street that traverses the entire area from one end to the other. The territory is situated on a plateau, but it is both close to the coast and adjacent to the town centre. Because the bordering hillside that connects it to the centre is developed, this enables one to walk to the old city centre in ten minutes.

At Metz, the large urban settlement of Borny is handicapped by its isolation from the city centre and by its proximity to a highway bypass and express road. However, it does have the advantage of being situated in a much larger territory that bears the same name and is fortunate to have a business zone, a technopole, and a number of public infrastructures. The wide availability of land led to chaotic development, but restructuring is nevertheless possible by realigning development along two urban arteries with dedicated lanes for public transport that will traverse the entire city. These arteries may thus be transformed into veritable urban hubs.

At Reims, the Arc Nord-Est sector is basically unattractive brownfield land for which we were asked to draft plans for an eco-district. This sector borders a large railway network that halted city development. But it is also fortunate to be next to an ageing sector of the city with various types of housing situated near the city centre.

Territorial urban renewal strategies

The urban renewal of a territory, which involves the coordination of different development projects, is based on the **elaboration of comprehensive strategies** that facilitate synergies between the different projects. The strategies involve the inclusion of the neighbourhood renovation plans in a rezoning and development process within the same territory. This implies shifting from a central notion in order to consider each project separately, within its own environment.

Such strategies require a preliminary analysis of probable mutability over the short and medium term of the different components of the urban fabric within the territory (housing, infrastructure, and economic activities). These can evolve into a long-term blueprint (20 to 30 years) for territorial development that needs to be regularly updated to account for changes to the economic context and the momentum generated by completed projects. The strategies are advantageous in that they intertwine the various projects and they provide for an intermediate update of the urban development plans that were formulated with the planning tools.



At Boulogne-sur-mer, upon the completion of the renovation of the Transition neighbourhood, the issue of renovating the Triennial neighbourhood, which is isolated and run-down, was raised. In fact, its proximity to the newly renovated Transition neighbourhood made it appear even more neglected and run-down. Given that the Local Strategic Programme had intended to prolong the Transition urban renewal project, a discussion with local actors led to a decision to expand beyond the scope of the renovation and include the Triennial neighbourhood in the urban renewal plans for the Chemin Vert territory a plan with enormous potential, as we mentioned earlier.

At Metz Borny, the renewal project focused on a peripheral area of the large urban settlement, while the potential of the territory in which it was located led us to rethink the project by integrating other development projects underway in the territory. But this prompted a reassessment of these projects in terms of a comprehensive urban renewal strategy to allow them to contribute to the development of the two urban arteries that are currently being adapted with dedicated public transport lanes (TCSP).

In the planning of the eco-neighbourhood of the Arc Nord-est sector in Reims, instead of designing an autonomous eco-neighbourhood or even endeavouring to better integrate it into its environment, it was decided that the project should be among the first steps in developing an urban renewal strategy for the entire territory. This view

led to the proposal that the installations and facilities programmed for the eco-neighbourhood should be concentrated along the arteries that surround the neighbourhood and which lead to the city centre in such a way as to create two urban centres along these two arteries. In doing so, the residents of the neighbouring districts will also benefit (thus promoting mixed urban development between residents of the districts and the future residents of the eco-neighbourhood), and they will help in upgrading and bolstering these urban corridors.

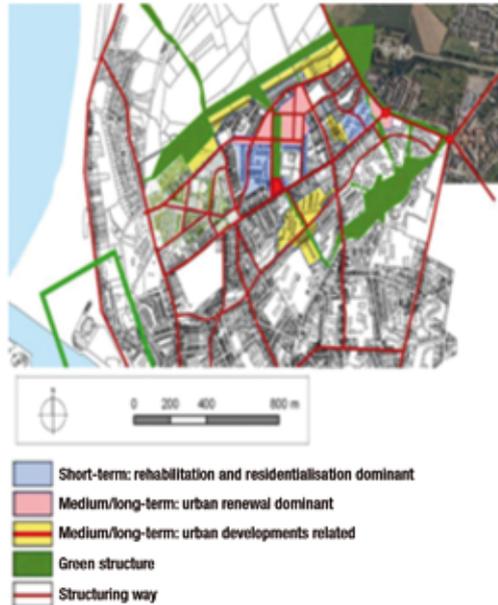
Contrary to that often maintained by certain operators, it is indeed possible to design urban projects with a temporal and spatial perspective that extends well beyond their operational perimeter. But this means public officials must envisage such territorial urban renewal strategies on a broader scale, and they must associate the actors involved in the implementation of the various projects that have been planned in these territories, so that they too can contribute to these urban renewal processes.

URBAN RENEWAL PROJECT OF THE CHEMIN VERT NEIGHBOURHOOD AT BOULOGNE SUR MER

M. Bonetti, JD Laforgue

Major guidance of the renewal urban strategy for the proposed area

1. To improve the shoring of the neighbourhoods on the major urban axis rue du Chemin vert
2. To assist the mouth into the open sea and the joint on the central position through the neighbourhood Triennial
3. To assist the development of secondary tracks, particularly for the east-west axis
4. To assist a habitat diversification through:
 - using abandoned urban areas
 - redialing the north part of the Triennial area
5. To assist access, qualification and development of the marine part according to the renovation on the neighbourhood Transition
6. To create a green corridor through Triennial, linking le vallon de Beaurepaire and then the city center to the sea



L'ARC NORD-EST ECO-NEIGHBOURHOOD PROJECT AT REIMS

M. Bonetti, JD Laforgue

**New urban development according to the specifics of the environment****Strategic specific guidance**

In this territory, 3 different areas/ 3 potentials for urban development according to sustainable and common urban development:

Those 3 areas:

- have their own identity and are attached to their direct environment
- are part of a common ecologic aim

Territorial coherency schemes (SCoT) a tool for regional integration

by Pierre Miquel, architect-urban planning director of the strategic territorial planning department at the National Office for Urban Planning, Housing and Landscaping (French Ministry of Housing and Territorial** Equality)

The territorial coherency schemes (SCoT) replaced the previous master plan since the passage of the Urban Renewal and Solidarity law (SRU) in December 2000. A strategic planning document, the SCoT enables the elaboration of a territorial project on the scale of an entire "living area". How does this tool for territorial integration deal with urban services that are bound by local urban land use plans (PLU) or large land-use development operations?

1. SCoT: a strategic territorial project for anticipating network evolutions

The territorial coherency scheme (SCoT) replaced the previous master plan after the Urban Renewal and Solidarity law (SRU) was passed in December 2000. Similar to the former strategic planning document, the SCoT allows for a public establishment for inter-municipal cooperation or a mixed association to draw up a territorial project on a scale commensurate to a living area: a Sustainable Development and Planning Project (PADD). This project is then transformed into a guidance and objectives document (DOO), that is legally bound by local urban land use plans (PLU) and municipal maps (simple documents adapted to small rural towns), and major land-use development operations. On January 1, 2012, there were 142 binding SCoTs and 244 SCoTs were underway or being planned.

Two laws have emerged from France's national Grenelle Environmental Forum, first held in 2007: a framework law; and another more detailed law called "national commitment for the environment". They have had a measurable impact on urban planning codes. The SCoTs have new obligations and must now take into account: space encroachment restrictions in urban planning with targets specified in the SCoTs, biodiversity preservation and restoration, climate change (greenhouse gas emissions, renewable energy, etc.), and electronic communications. These documents also face an environmental impact assessment that must be integrated to the document (in accordance with an EU directive) requiring the public entity elaborating the SCoT to demonstrate that the land-use plans will have a low environmental impact. The Prefect must deliver a detailed opinion on the subject, an opinion that is made available to the public during the public consultation phase.

The SCoT must also be compatible with the SDAGE and the SAGE, and it must take into account the regional environmental coherency scheme (new document currently being drawn up in most regions under the auspices of the regional council and the prefect of the region).

The inter-municipal perimeter of the SCoT is left up to the discretion of elected officials, although they are encouraged to decide on a territory that is geographically and sociologically compatible, taking into account daily transportation, housing policies, and local planning. But political viewpoints often percolate through, producing strange borders and revealing town-centre/periphery antagonisms.

2. SCoT's diagnostics allow for network identification at a pertinent scale

An initial SCoT study provides a rather complete diagnostic of the area because it takes into account economic and demographic forecasts and identifies needs in terms of economic development, spatial planning, environmental protection, social diversity of housing, and public transportation, facilities and services. A chapter on the initial state of the environment must also be clearly identifiable. Take for example, the SCoT of the Strasbourg region, approved in 2006, that comprises 139 municipalities. It includes a chapter on the initial state of the environment which gives an overview of the territory's natural resources, environmental nuisance, and risks, and lists elements of local living conditions and prominent structures. In a review of environmental issues and their potential impact on public health, it praises the relatively satisfactory state of the quality of air and drinking water, but cautions that it hides a clear deterioration that is worrisome: "more and more residents are exposed to nitrogen oxide and ozone levels that exceed European 2010 standards, underground water surpasses permissible levels of nitrates and agrochemicals, rivers are unfit for bathing," etc. The management of storm water was highlighted as one of the three major issues. As regards the saturation of landfills, there is an urgent need to secure rights-of-way for a new landfill site for "final" waste.

This shows the information provided by the managers of environmental and urban services can be of great value in determining land-use development and protection issues, in view of a relatively determined and ambitious project. A SCoT thus allows for a synthesis and coordination of the various thematic policies advanced by the municipalities, while also coordinating the scales of reflection: municipality, inter-municipality, or living area.

3. SCoTs: a framework for tomorrow's networks and land-use planning

Develop or protect? What geographical sectors will be affected by a long-term project designed to transcribe a sustainable and balanced vision of the territory.

Will urban renewal operations be preferred over urban planning on farmlands, albeit moderate in the form of an eco-neighbourhood? Will the decision be made to preserve a green and blue corridor (sign of ecological continuity to promote biodiversity), to protect wetlands and sources for

drinking water, and to ensure life-style and landscaped amenities?

These are a few of the key questions asked of elected officials in charge of preparing the SCoTs that require political answers. Urban development will inevitably expand a host of urban service networks: road services, power, public lighting, water supply, wastewater and sewage systems, waste collection, public transportation, fiber optics, etc. The densification in sectors already urbanised may strengthen these networks and their performance (i.e. prompting the completion of structural equipment, changes of pipe and duct diameter, and the realisation of equipment that is more or less expensive). Land-use planning and development choices will also affect investments (choice of water cycle management, reliance on one non-renewable energy source over another renewable energy source, etc.).

For example, the SCoT of Métropole Savoie, comprising the agglomerations of Chambéry and Aix-les-Bains, based its land-use project on the densification of urbanised zones that could be reached in less than 20 minutes by public transportation. The project map illustrated this with an isochrone curve within which local policy-makers decided to establish preferential zones for future urbanisation. It also gave peripheral municipalities a strong sign that, through their local land-use plans, they will have to limit new constructions while the urban communities were given the green light to initiate new development plans (ZACs, etc.) for housing projects easily reached by public transit, eliminating new residents' almost exclusive reliance on private cars.

4. Network status: indicators for monitoring SCoT evolution

A SCoT must be monitored and an assessment should be conducted at least every six years to justify the decision to maintain it in force for another six years, or begin review procedures. This deadline is both long and very short for regular monitoring work that relies on indicators to assess territorial changes in the specific fields targeted by the SCoT. The metropolitan hub of Brest, for example, has just published a guide of SCoT monitoring indicators that were approved in September 2011 with the support of the Brest urban planning agency. The guide lists 26 indicators that are grouped into three broad categories: spatial organisation, major equilibria, and economic development. Other indicators include the quality of marine and coastal waters, the locations of green algae accumulations and the quantities removed annually, the impact on bathing and shoreline fishing preservation efforts, and the discharge of man-made pollutants into the sea. The type of subjects observed and figures monitored underscore the importance of the time limits associated with the Water Management and Development Schemes (SAGE) to improve the quality of underground, storm and coastal waters. This raises the question of the efficacy of wastewater treatment systems, most notably for a better integrated management of coastal zones. Urban dispersion, and the spread of residential and business zones, which has gobbled up 175 hectares a year over the last decade in the Brest region,

as well as questionable farming practices usually get the blame for these disturbing trends. The size of the sanitation networks and the impact of pollutants discharged into the environment are major issues that call into question the collection, conveyance, and treatment of wastewater.

The collection and reuse of waste is also among the items observed by the SCoT monitoring process. In fact, the Brest region SCoT project supports the creation of a non-hazardous waste storage facility in the north-central Finistère, as defined by the departmental plan for the management and prevention of household and similar waste (2008-2018). The indicators give figures for the tonnage collected and the share recovered, stored, or recycled. The storage facilities of inert waste can hold an average of 300,000 tons of inert waste. Three new sites have been planned to increase and sustain storage capacities. The data will be provided directly by the General Council of the Finistère.

Conclusion

Drawn up for a period of three to six years, the territorial coherency schemes are the culmination of a collective effort that represents a positive step forward for the region's future. It assembles all the information and vital data for urban service managers and policy-makers. Conversely, it is due to these qualitative and quantitative data that these land-use planning experts can lay the groundwork for the major decisions that will affect the future of the population and its standard of living.





The success of greater Paris's urban services

by Olivier Pascal, Deputy Manager of the *Mission Métropole* du Grand Paris, Veolia Environnement

The Greater Paris Project is not lacking in ambition: it aims to develop a world city for the benefit of the whole country, and also to reduce territorial divisions and urban dysfunctions of the existing metropolitan area. A law passed in 2010 defined the main thrust of the project. The project is based on a new transportation network to structure and promote the redevelopment of the Parisian metropolis, while at the same time tackling urban sprawl. This redevelopment will be organised by multiple centralities and will include the construction of 70,000 housing units per year). The goal of territorial solidarity has given it a political complexion. How will the project integrate urban services?

"Conventional" planning methods are intended to provide overall coherency, such as specialised regional schemes (for ecological coherence, climate, air quality and energy, etc.), and the SDRIF (the strategic plan for the Île-de-France Region, a 2013 project currently being evaluated), with regard to development, planning, and transportation options.

Specific programming means are being deployed on a scale one step below the Region in the Greater Paris area: first and foremost, Territorial Development Contracts (CDTs). In terms of inter-municipal territories, the CDTs are the link between geographic urban planning and territorial development. Twenty of them, representing two-thirds of the overall metropolitan area, had been defined by the beginning of 2013 (some successfully, which will culminate in a public inquiry in February 2013).

TERRITORIAL DEVELOPMENT CONTRACT (CDT):

A CDT is a contract between the State and at least two municipalities within a defined territory, according to the principles established by the law of 3 June 2010 relating to Greater Paris, and further specified by the decree of 24 June 2011, issued by the Minister of Urban Affairs.

CDTs are intended to develop territorial plans that would enable them to take full advantage of the transportation network, but assert their own dynamism in terms of economy, employment, housing, environment, architecture and social and cultural life, by setting long-term planning goals (typically 15 years) and listing the resources allocated by the State and the municipalities. They portray a vision for the development of a territory that is compatible with much broader development plans.

The framework of these CDTs will firstly allow the pre-selection of land-use options (through Designated Development Areas (ZADs), and secondly the pre-selection of the project owners of development plans of various shapes and sizes (whether or not relevant to the notion of Joint Development Zones (ZACs), including train station peripheral development plans. In essence, CDTs are prescriptive planning documents and their original intent with respect to other prescriptive documents such as SDRIFs (the Île-de-France region's strategic plan) or PLUs (Local Urbanism Plans), will probably be adapted in light of evolving decentralisation legislation.

Other constitutive problems confronting the Grand Paris will differ depending on the scale in question (innovation, creation of added economic value, entrepreneurship, training, culture, etc.).

Whether public or private decision-makers, cooperation between actors operating within a given specialty or scale require a number of forums for dialogue. Veolia Environnement, through its Grand Paris Metropole Mission and in association with other groups, felt it could make a contribution by organising a series of dialogues and seminars on these transversal subjects (called "Entretiens du Grand Paris"). Veolia Environnement is also publishing a journal entitled "Revue du Grand Paris" (a detailed look at the initiatives is available at: <http://www.veolia.fr/region/le-grand-paris/>).

A Few major issues

Building a common regional approach and vision is of course the first challenge in ensuring cooperation between territorial development planners and urban services.

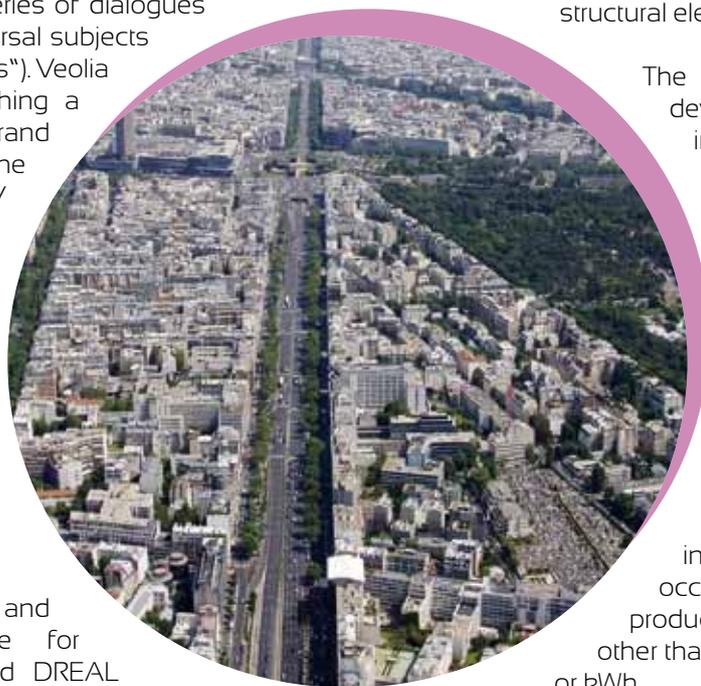
While DRIEA (Regional and Inter-Departmental Directorate for Equipment and Planning) and DREAL (Regional Directorates for Environment, Town Planning and Housing) State services in Île-de-France prepared housing provisions for Greater Parisian territories, sustainability studies were conducted throughout 2012 by the DRIEE (Regional and Interdepartmental Directorate for Environment and Energy) in electrical power, building materials and urban hydrology. This work led to several major conclusions for urban programming:

- The increasing scarcity of resources compared to demand is a common problem, and true of water resources, energy resources, and building materials. In general, the Île-de-France region lacks self-sufficiency in all these resources and the activities of the Greater Paris area will have an impact on the importation of materials (construction of housing, service industry buildings and infrastructures), and electrical power (i.e. data centres). As regards water resources, external dependence is more seasonal, since climate projections suggest increasingly lower water levels in the Seine basin, for which the initial response will be to boost low water levels with dams of the Grands Lacs de Seine

These imports are treated as matters of national solidarity by ad hoc institutions, the State, and the Basin Council. In any case, the development of recycling is essential in the Greater Paris region. This applies to construction activities as well as the establishment and operation of public

urban services, which underscores the need for specific equipment within the CDTs.

- Another diagnostic element the existing linkage of the metropolitan territory's major services networks (water, energy), is in itself a robust infrastructure that has been and will be propitious to social solidarity by assuring equal access to all basic services. This network linkage is also advantageous for its overall resilience, insofar as it allows for an alternative should a portion of its structural elements fail



The issue is therefore the development of these large infrastructures by fending off their deterioration, and by adapting the general grid to meet emerging local needs whether water or energy, both of which are variably expressed in quantity and quality.

Network financing, which may depend on a range of additional features from local solutions such as the use of rainwater for intermediary services, or the occasional use of energy by-products, should consider forms other than rates based on average m^3 or kWh

- Another common factor of regional planning and urban services is the role of global warming, which has an impact on both the water cycle and energy resources, and is responsible for extreme events that urban services must take into account (heat waves, heavy rainfall, etc.)

The development of new urban spaces, whether to create new centres or revive old ones, provides more urban transformation approach opportunities; it notably offers three opportunities:

- Operations that can reach critical volume to bring the depreciation of environmental solutions to a break-even point (heating networks, geothermal networks, or pneumatic collection of waste)
- In-depth transformations of a number of urban components, enabling a convergence of initiatives such as the use of end-energies derived from the water cycle or industry for use in urban heating
- The administrative framework of the CDTs provides for the creation of new goals, either in the form of performance targets for urban operations, or technical standards via average values

In recent years, standards have been set to improve the environmental and energy performance of buildings. The time has come for these standards to be applied on a much broader scale. The standards must be rendered more legible to ensure compliance and enforced through measurement-based reporting.

At this stage in the Greater Paris Project, a number of undertakings have already been accomplished in line with this dynamic.

Efficient urban planning over the years

What are the conditions for successful urban planning with CDTs?

Despite their initial complexity, the process is now well underway.

This having been accomplished, at some point a number of projects will be finalised by contract with very diverse timetables: a train station in one location, a housing project nearby, recreational or cultural installations elsewhere. At what point will they enhance the standard of living? How can it be maintained?

The periodic review of the indicators, as required by the CDTs, is an essential urban development tool for the Greater Paris project. This review will allow for a descriptive trajectory of the territories in question (in terms of their functional or technical objectives) thus enabling early corrective actions, overlying the project's normal course and timetable.

This is why the establishment of indicator dashboards is an essential step in the urban development process of Greater Paris in 2013. These dashboards can be established for each operation, as well as for providing aggregations at a much higher - even regional - level.



Integrating urban water management services

by Frédéric Cherqui, LGCIE INSA Lyon and Caty Werey, IRSTEA-ENGEEES GESTE

The image of urban water has changed, as have its uses. The “single network» system has certainly helped with wastewater disposal and solved sanitation problems associated with wastewater, but it has also helped to hide these infrastructures, known only to the operators in charge of their maintenance and durability. Most wastewater and drinking water will undoubtedly continue to be conveyed through pipes for sanitary reasons, but the time has surely come to consider a real integrated service for urban water management.

Urban water: new challenges

Hidden water has been transformed into a source of beauty and pleasure as illustrated by several articles in the book “Peurs et plaisirs de l’eau” (Fears and Pleasures of Water) (B. Barraqué & P.A. Roche, 2010). Water is once again in urban and peri-urban development plans: reflecting pools, riverbank developments, open-channel streams, etc. In the work cited above, F. Scherrer raises the question of the “urban eco-cycle: a new technical paradigm?” We believe this is more than a technical issue as there are implications for the organisation of urban services as there are implications beyond these services. For O. Coutard and J. Rutherford (2009), “a sustainable urban eco-cycle” provides for a definition of alternative principles of territorial organisation on the fringes of collective networks organisation. They speak of composite systems: alternative, decentralised (rainwater harvesting, heating or cooling production at the foot of buildings, on-site sanitation systems, etc.).

C. Carré et al. (2010) weigh the need for new local urban water management, while noting that although territorialised at-the-source control solutions are progressing, organisational proximity is difficult to implement. Today we speak more easily of “environmental services” which indicates a shift in practices and that the new challenges are being taken on board at a different scale. A purely technical approach, in which water management is considered only from the engineer’s perspective, is not viable (Chocat et al., 2007). It is essential that all stakeholders (technical and non-technical) be involved in the evaluation of the service provided and in the operation of installations and organisations (Toussaint, 2009). Indeed, water management cannot be considered a purely technical system independent of the city and its residents. The water management system (wastewater, storm water, drinking water, decorative water, etc.) increasingly interacts with the city and its water uses: alternative storm water management, water sensitive urban design, best management practices used to design landscape or used as sports fields, rainwater harvesting, on-site sanitation, or the future adaptation of water production/distribution for consumption through the use of smart grids (Shu, 2011). It is no longer only a question of evaluating the management means that were implemented, but there is a growing need to define objectives in terms of the provided service level (Roche et al., 2012): the quality of the aquatic environment, water-related uses, nuisances experienced by users, etc.

It has thus become necessary to be able to communicate through performance indicators. The shift from technical indicators to something more comprehensible will help elected officials better manage their objectives and allow citizens to better understand the decisions made.

Rethinking on the scale of an Urban Waters Management System (UWMS)

These changes inevitably imply territorial changes on three levels:

- **Spatial:** migrating from a sanitation network to an Urban Waters Management System (UWMS) requires a reconsideration of the entire waters management systems (wastewater, storm water, drinking water, alternative storm water management, natural and decorative water) and of the territory’s entire water cycle. These systems interact when it comes to devices, stakeholders and services provided.
- **Organisational:** migrating from the sanitation network utility to a cross-functional process that connects services for street, cleaning green spaces (often managed at the municipal level), urban planning, public transportation, construction projects, etc. Some communities have already implemented a number of inter-service collaborations: use of wastewater for cleaning rubbish bins, maintenance of best management practices deployed by parks’ department, combined cleaning of public roads and networks, etc. Cooperation between public/private developers, institutional developers, etc., should also be encouraged.
- **Actors:** the management becomes multi-player: aside from the various actors involved in the design and maintenance of facilities, the role of the resident/user/consumer expands from that of a mere user of sanitation and water services, water bill payer, and victim (in case of failure), towards a more dynamic role, as an individual or member of association, as a user and potential owner of water management devices, as a co-decision-maker in some operations such as ecodistricts, or as an operational supervisor of on-site installations at the base or atop a building, etc.

The OMEGA project

In OMEGA¹, a project funded by the French National Research Agency’s (ANR), the UWMS is examined through the services provided by the urban water management

system (functions). The challenge is to merge economic, social (urban), environmental, technical (engineering approach), organisational, and operational (on-site realities) visions. The UWMS not only deals with drinking water, wastewater, storm water, streams, groundwater and bodies of water, but also with decorative water or water as an energy source (heat recovery, reduction of the urban heat-island effect). It consists of:

- A group of technical and spatial devices interacting with the city: networks, pipes, inlets, water treatment plants, retention basins, septic tanks, grease traps, roads,

riverbanks, beaches, etc.

- A set of organisations responsible for these facilities: regional and local authorities, engineering firms, construction companies, operators, the State, etc.
- A catchment basin corresponding to the domain of influence of urban water management: underground water, rivers, nature in the city, etc.

This system aims to provide a set of service functions. The OMEGA project has proposed a list of functions (Cherqui et al., 2011); the table below illustrates a few of these functions:

Table 1: Description of (new) functions of the Urban Water Management System

Fonction de service	Description
USA - Respect uses of the aquatic environment	Current or desired uses of the aquatic environment must not be assigned: fishing, swimming, walking, use for drinking water, hydroelectricity, etc. Uses benefit groups or individuals considered as users.
EQU - Ensure social equity	Services must be provided to all in a fair and equal manner. This is to ensure the an equal access to public services, to fight against poverty or marginalisation, to maintain social cohesion within the territory, etc.
RES - Optimise resource management	The system should favour choices of design and management that preserve resources in the broadest sense (water, energy, non-renewable materials).
NUI - Avoid nuisance and other risks	Nuisance and other risks to consider include odours, noise, visual pollution, collapsing, disruptions of urban transport, etc. They may appear during the phases of construction, operation, maintenance or rehabilitation of a system's installations or be associated with its operation.
ECO - Ensure acceptable costs	This function includes costs, and focuses on profits generated for other functions by the system. Economic control concerns managers (organising authority and operator), users, local residents, local businesses, etc.
INT - Promote an integrated management of urban centres	This function allows the UWMS to be linked with other systems and scales. This is to improve coordination with other services or stakeholders, to promote coordination with other territorial levels and to promote links with different sectors of governance.

Conclusion: A necessary change of scale

In conclusion, using examples of the service functions mentioned, the table below shows the requisite redefinition of territories.

Table 2: Territories of analysis of the different functions

Functions	Spatial level	Organisational level	Stakeholder level
USA- Respect uses of the aquatic environment	Sanitation system (network, STEP, etc.) + water bodies (streams, rivers, lakes, groundwater) according to usage	Administrator (organising authority/operator) + service responsible for natural environment + service responsible for major rivers (if present) + service responsible for parks ...	+ local residents + "users" of bodies of water (water abstraction for agriculture, hydroelectricity, etc.) + environmental protection associations + federation in charge of rivers + user associations (fishermen, farmers, etc.) ...
EQU- Ensure social equity	Sanitation system (network, STEP, etc.) + the city or urban community	Administrator (organising authority/operator) + city social services ...	+ residents + service users, water bill payers + Child Benefit Office, housing associations
RES- Optimise resource management	Sanitation system (network, STEP, etc.) + the city or urban community + natural environment (local or global scale)	Administrator (organising authority/operator) + service responsible for drinking water + service responsible for planning + service responsible for infrastructures (and energy issues) ...	+ service users, water bill payers + environmental protection associations ...
NUI- Avoid nuisance and other risks	Sanitation system (network, STEP, etc.) + the city or urban community	Administrator (organising authority/operator) + service responsible for green spaces + service responsible for public highways + service responsible for urban planning ...	+ local residents + citizens + service users, water bill payers + economic stakeholders ...
ECO- Ensure acceptable costs	Sanitation system (network, STEP, etc.) + the city or urban community + natural environment	Administrator (organising authority/operator) + service responsible for green spaces + service responsible for public roads + service responsible for urban planning ...	+ local residents + citizens + service users, water bill payers ...
INT- Promote an integrated management of urban centres	Sanitation system (network, STEP, etc.) + the city or urban community + natural surroundings + larger territorial scale	Administrator (organising authority/operator) + service responsible for green spaces + service responsible for public roads + service responsible for urban planning ...	+ General Council + Department + Representative of the State + citizens ...

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How to sustainably manage a scarce resource in a rapidly growing metropolis: the example of deep water aquifers in the Gironde

by Bruno de Grissac, Executive Director of the SMEGREG

The largest metropolitan department of France (over 10,000 km²/4,000 sq. mi), the Gironde has 1.4 million inhabitants, with a population growth rate of about 1.1% per year. The drinking water supply is provided by 109 water supply services that vary greatly in size. The largest service is the Urban Community of Bordeaux (CUB), which serves nearly 685,000 inhabitants; the smallest service serves only 87 inhabitants. All combined, the water needs of the department (drinking water, industry, agriculture, etc. excluding the cooling needs of the Blayaïs Nuclear Power Plant), amount to about 300 million cubic meters per year, half of which come from surface water and underground aquifers, and the other half from deep underground water resources protected by the Water Management and Development Scheme (SAGE). The high quality, low vulnerability to pollutants, and easy accessibility of deep underground water make it highly advantageous (particularly for sanitary reasons), for the production of drinking water. How can this scarce resource best be managed?

These advantages explain why more than three-quarters of all deep groundwater abstractions are used to supply drinking water. There are 390 drinking water abstraction points in the Gironde, of which over 380 tap deep aquifers, providing nearly 97% of the department's drinking water. All the inhabitants of the Gironde get their tap water, at least partially, from these well protected resources.

While these deep underground aquifers have a more than ample capacity to meet all the water needs of the department, the concentration of abstraction points in densely populated zones has locally made excessive demands on some of these resources.

The Water Management and Development Scheme (SAGE) for Gironde's deep aquifers, first established in 2003 and revised in 2013, aims to ensure "good quantitative status" for these aquifers, which raises two questions:

- How much can be abstracted from each aquifer?
- How (where and at what rate) can these amounts be abstracted?

From an operational standpoint, an aquifer's "good status" rating is based on:

- Large-scale assessment (several thousand km²): an accumulation of the volume abstracted yearly whose impact on reserves does not jeopardize resource sustainability (concept of maximum harvestable volume);
- Local-scale assessment (tens of km²): an operational plan that prevents the draining of reserves, the influx of other water sources, and a decrease in flow (for the benefit of downstream environments).

Quantitative management established by the SAGE is based on various observations, starting with a disparity between the geographical distribution of abstractions and that of resources; this disparity is assessed on very different scales depending on the purpose of the analysis, i.e. a balanced input-output ratio, or the pressure of the aquifer at key points.

While cases of local overexploitation are not likely to elicit much interest beyond a few water supply services, the impact of exploitation disparities affects broad territories and a wide number of water services, each compounding the status of overexploitation. The Eocene aquifer has been classified as low in a territory covering 4,800 km² that overlaps all or portions of 67 water services that rely on this resource.

To maintain the "good status" of deep aquifers, and a fortiori the restoration of a "good status" for others, it is essential that the abstractions respect the sustainable limits of that resource both in terms of the volume abstracted and the spatial distribution of the abstraction points.

With this in mind, the SAGE requires a specific regulatory framework and combines, from a technical point of view, a priority water usage optimisation policy and, as an essential supplement for aquifers in deficit, substitute resources.

First and foremost, the usage optimisation policy concerns all users within the SAGE territory. This is true of all water usage (treatment or distribution losses, collective, individual or household consumption, or that related to economic activity, etc.), but priority is given to improving the performance of water services (in 2004, treatment or distribution losses reached 31Mm³ for every 120Mm³ abstracted for drinking water from deep aquifers).

Support measures are naturally reserved primarily to users and communities supplied by aquifers in deficit, or in high-risk or high-stake areas.

While all users should save water, the objectives of this policy are established pragmatically, on a case-by-case basis, taking into account each user's situation. In the interest of efficacy, and to halt the rising costs of water access due to efforts to reach goals set by the SAGE, these goals are established by systematically comparing the cost-effectiveness of a proposed cutback to that of a substitute resource, whose effect would be comparable.

Moreover, despite its size, the potential savings in water resources that can be technically and economically mobilised are insufficient to meet SAGE goals, and resource substitutions are inevitable.

An estimate of the need for substitute resources was made in 2012 during a SAGE review of the Gironde's deep aquifers. This review was based on a scenario described as "realistic but safe" that, in order to estimate drinking water needs, combined:

- A demographic increase based on projections made by the Bordeaux Urban Community (CUB) that are higher than the projections made by the National Institute of Statistics and Economic Studies (INSEE);
- An ambition for a policy for water savings called "core savings".

The mid-range scenario suggests a need for 20Mm³/year in new production capacities by the year 2021 to supplement savings.

While the water use optimisation policy concerns all users and the entire SAGE district, substitutions cannot be expected of all stakeholders. Indeed, even if solutions existed everywhere (which is not the case), the multiplication of local projects would be an economic aberration and have a significant impact on the costs of water access.

The Joint Association for the Study and Development of Water Resources in Gironde (SMEGREG) was created by the CUB and the General Council of the Gironde to study and propose substitution solutions that can then be implemented in the Gironde.

For the ten or so major projects under consideration in the area where the Eocene aquifer is considered to be low, it seems that the concentration of new resource projects in the urban area of Bordeaux is the best way to meet the SAGE's goals, while limiting the impact on water access costs as much as possible.

Motivated by the search for optimal savings, the concentration of large-scale substitution projects in the urban area raises a cost distribution issue (an investment in excess of €80M is required for a production capacity of 20Mm³/year).

While all supply services that draw water from the Eocene aquifer in the area where levels are deemed to be low have a role in its overexploitation, resource rationalisation has required some water services to shoulder a lion's share of these investments, which had a significant impact on water rates for their customers. Other supply services also culpable of overexploitation will benefit from this effort, as the restoration of the Eocene aquifer enable them to continue to draw from this resource.

The principle described in Article L211-7 of the Environmental French Code allows for the costs of repairs to be borne by those who made the repairs necessary (those who draw water from the Eocene) as well as those who stand to gain from the activity (those who continue to be supplied by Eocene water).

Drawing inspiration from the principle established in this article, the Local Water Commission (CLE) added a mechanism to the SAGE deep aquifer project to offset higher rates charged by supply services that bear the costs of major substitution projects.

This mechanism, developed in conjunction with the Adour-Garonne water board, relies on incremental increases in user fees when the water is drawn from a deep aquifer. The increase that is applied depends on the status of the aquifer (low, normal, etc.). The funds collected from this fee hike will be used to compensate higher water rates for customers who will be supplied in whole or in part by the new production hubs that supply substitute water for areas where the aquifer has been overexploited.

It should be noted that this mechanism was already in place when the industrial water service of the Urban Community of Bordeaux was created in 2003. It provided for a temporary and digressive compensation (over 15 years) for higher costs incurred by industries situated on the Ambès Peninsula since 2003 that were supplied with treated Garonne river water instead of drilling for Eocene aquifer supplies, for which authorizations were revised downward or withdrawn.

Motivated by techno-economic optimization, the high concentration of large capacity water supply substitution projects in the urban area of Bordeaux might lead one to assume, at first glance, that the metropolitan area, and in particular the CUB, is chiefly responsible for the overexploitation of the Eocene aquifer. This (false) assertion has led some to argue that the mechanism for compensating the additional costs mentioned earlier is in fact to finance the development of the urban community, or at least to force rural users to pay for overexploitation of the Eocene aquifer for which the urban area is solely responsible.

To refute this notion, it should be pointed out that even with a total ban on CUB's abstractions from the Eocene would not alone be sufficient to restore the aquifer to its normal levels.



The challenge of securing drinking water

by Rémi Barbier, UMR ENGEES-Irstea GESTE

In twentieth-century France, the challenge facing drinking water suppliers was that of universal service. This was accomplished by an extensive construction programme, whose legacy is a network of modest supply services, comprising on average fewer than a dozen municipalities (Pezon and Canneva, 2009). But the institutional sustainability of this organisation has been under fire for twenty or thirty years for its ability to meet the new water supply challenge: is it really able to permanently ensure customers a sufficient amount of good quality water at an acceptable cost? This has provoked a general reaction of territorial stakeholders, exemplified by the Aquadep project.

Rationalisation supported by a coalition of actors

The “priority of securement” has emerged as a response to recurrent warnings regarding the quantity and quality of water and the state of network infrastructures. “Hydro-territorial rationalisation” appears to be the keystone of a secure water supply. It revolves around the following salient features:

- A spatial and functional regrouping of the supply purview (new co-operations between protection/production/transport/distribution/planning/support) has given birth to new “territorial arrangements”
- A trend for greater specialisation in the supply of so-called “strategic” resources (for one reason or another and requiring added protection against nonpoint source pollution)
- The development of network interconnections

Of course, rationalisation can operate (to a certain extent) on a voluntary basis. But our observations indicate that this injunction, mentioned in many official reports, is also the result of public action at the departmental (country) level. This is because the department historically constitutes the spatial embodiment of the Republic’s territorial administrative authority for sectorial interests (notably farming), rural solidarity, and where the General Council often occupies a central and active role in formulating water policy.

Surveys show more accurately that two actors have thus far played a major role in hydro-territorial rationalisation, often

associated in what can be called a rationalisation coalition: the General Council (GC) and the decentralised State services. The involvement of the GC is often traditional, proactive and multifaceted. The questionnaire conducted among all metropolitan GCs confirms and quantifies the critical dimensions of this involvement (priorities and means of action). The activities of the GCs can be grouped into two main categories:

- Political: through planning, water territories construction, inter-sectorial mediation (water/agriculture) or inter-territorial mediation (urban/rural)
- Operational, i.e. contracting authority, technical and financial assistance that is conducted directly or indirectly through organisations that constitute the GC’s strong arm

Our observations also confirmed close ties with the Chambers of Agriculture, in a long tradition of supporting farming activity and the intensive farming model, as well as water boards: because of their “proximity” to municipalities and their capacity as a contracting authority, the GCs are often key partners in the territorial activities of the water boards. Urban hubs, however, have far more autonomy, or conversely, exercise a form of hegemony within the department that the GC may try to mitigate, thus reviving structural frictions between the two territorial actors.

A target, instruments, and a range of options

This policy of rationalisation has turned elected water officials into primary targets of lobbying, and their reluctance to be persuaded is a major obstacle to

change. This reluctance can be attributed to a number of causes: fear of losing control of the price and mode of management; belief that the model being considered does not correspond to local interests, particularly with regard to the imperative of proximity which requires reactivity and the de-facto presence of a local elected official that users look up to as the guarantor of this critical service; inability to acknowledge problems and critical of overly cautious health officials; the existence of an ad hoc apparatus that supports the status quo by providing water managers with a range of services.

Backed by the coalition, rationalisation is sustained by a wide range of public policy instruments. They allow, in particular: to clarify the present and organise the future through a shared vision (planning); to put pressure on the actors (through conditionalities and regulatory pressures); to facilitate the resolution of certain problems (regulatory controls, usually through the negotiation of framework agreements to protect water catchment areas); to collect, organise and make use of information on water intended for human consumption, with information systems occasionally integrated in a department-level observatory. On an operational level, rationalisation is accomplished by a combination of relatively small arsenal of basic options. On a technical level, this means a tendency to focus on strategic resources, to establish interconnections and large production units. On an organisational level, several mechanisms aim, in a broad sense, to enlarge the territories (in terms of consultation/management/guidance/solidarity, etc.), and/or recombine tasks carried out at different territorial levels. We have thus been led to distinguish: i) sectorisation, which encompasses territories that share a common framework for programming public works and even ultimately coalesce under a single contracting authority; ii) a merger, which aims to bring to the fore organising authorities that are more powerful and control larger areas; iii) restructuring, which involves a partial transfer of purviews from basic entities to one (or more) supra-local institutions; iv) the creation of joint institutions, established to provide certain support tasks (i.e. assistance), without transferring purviews.

Long-term trajectories and convergence on some "territorial arrangements"

In general, the trajectories of rationalisation are long-term. There is the "carrot and stick" approach, used to keep actors mobilised, whose commitment tends to fade once the warnings have passed. Then there's the necessity to undo old habits and reinvent new operational modes, and finally the need to gradually harmonise water prices. The trajectories also follow a logic of compromise and composition, between rationalisation and proximity, between the letter and the practice in the exercise of one's purview, and between managerial paradigms (remedial vs. preventive). Articulating global and long-term vision and engaged at every opportunity for change, the coalition advances step by step. It may, however, possess just enough of what it takes to break with the past and embrace a new institutional architecture; but it will likely take some

time before the exercise of purviews becomes effective. Our investigations indicate that the current dynamics have not (at this stage) given rise to completely stable configurations. It is, however, possible to model a series of generic territorial arrangements resulting from previously identified logical sequences. Thus, compared to a baseline "radical" fragmentation of services not found in our case studies, four typical arrangements have been identified and categorized according to political regime terminology:

- "Multi-local": characterised by organising authorities in relatively large numbers, who retain all their purviews (production and distribution), and can rely on the support of a joint institution (federation of means)
- "Confederal": characterised by a shuffling of purviews that led to an intermediate meshing of structures exercising operational purviews (i.e. resource protection and water production) and maintaining functional relations between them by way of interconnections



- "Federal": characterised by the existence of a structure in charge of operational purviews (i.e. production) and support missions, but which are also and above all strategic roles: planning, information systems, and even financial solidarity to fulfil the objectives defined in the plan
- "Unitary/centralised": characterised by a total transfer of purviews to a departmental federation

Lacklustre performance

In general, the multi-local model is weak, and there is a strong trend towards federal and confederal models that includes, where applicable, an urban hub. The trend is accompanied by a specialisation in water for human consumption that has preferably adopted the new prevention-based security paradigm. With regard to the actors, the GCs have, for several years now, taken a back-seat role, very different from their proactive role in the 2000s. The trend is comparable to what has occurred at the territorial State level, where a reorganisation has shifted responsibilities to the regional level, prompting

a winding down of operational activities. Overall control could switch to a new coalition (typically a federal institution and government services) capable of activating a series of levers including the management of information, planning, subsidy guidance, negotiations with the farming sector, and sovereign pressure.

Rationalisation is far from complete. Until now, it has focused primarily on water resource protection and production. By choice (proximity imperatives, taking into account the pace of change), or by necessity (arbitration of priorities and means), distribution considerations have been neglected, while the prospect of an orphan issue may emerge (at least in the medium term): infrastructural renewal that small municipalities may not be in a position to afford. Other limitations and risks should also be highlighted. A realignment of purviews and responsibilities can at worst be a source of conflict, or at best create difficulties coordinating overlapping concerns, such as leakage problems in water distribution and production infrastructures. It is equally likely to lead to a concentration

of power over water within techno-structures that are held to low levels of accountability. Subsequently, the specialisation of resources has mechanically led to interdependencies between water services and supply sources outside their immediate perimeters, creating potential friction at the development level, which could have an impact on protective measures. At the same time, the potential abandonment of non-strategic drinking-water resources raises the risk that water quality is sacrificed to intensive farming, as efforts to curb such practices cease to be a priority.

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Chapter 4

How to build a new partnership between urban planners and service professionals?

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How to build a new partnership between urban planners and service professionals?

Engineers and architects, artists and surveyors, urban planners and network specialists: opposition between two world views and two concepts of cities: dream city or functionalised city. Beyond the caricature, this opposition highlights the complexity of cities, the diversity of competencies required for cities to be designed, built and managed, and the difficulty of working together, an essential factor for the success of sustainable city projects.

"Our Cartesian mind-set, states Marcel BELLIOT in the introductory article, *drives us to do things one after the other, theme by theme.*" How can this predisposition to segmentation be overcome? How can we respond to "the now-essential demand for cross-functionality"? The answer lies, first of all, in moving from a regulatory planning logic to a project-based logic. *"Before being a catalogue of rules, restrictions and requirements, an urban planning scheme must convey a collective spatial, economic and social transformation project, which brings together and federates the visions of all the stakeholders."*

This approach must first be supported by the policy-makers, emphasises Nicolas GENDREAU, based on his experience with the Urban Community of Bordeaux. It is up to the political leaders who represent the community of citizens, in all their diversities, to set the directions that are to "guide public action". It is then up to the "technicians" to adapt their visions and organisations. They need to make the transition from a compartmentalised logic (urban planning, waste, water, roads, etc.) to a regional rationale, in which all of the issues related to the development of a common space are addressed cross-functionally.

The example of water management, covered in the article by Nicolas GENDREAU, is central to the articles by Elisabeth SIBEUD and Isabelle SOARES. These two highly complementary articles illustrate the approach of the Urban Community of Lyon which, for 20 years, has no longer considered storm-water as waste to be drained from the city as quickly as possible, but instead as a resource to be recovered and reused. As in the previous articles, it appears that the main success factor is the capability of developing an "urban project" rationale, incorporating all partners and all competencies. Other aspects are also underscored, such as the need for a global, holistic vision of spatial planning, as well as the benefit of replacing "conventional restrictive regulations by an approach based on advice and support for projects".

The article by Philippe MAREST and his colleagues from the Nantes Métropole urban community deals with an example of a different sort: the preparation of a regional climate and energy plan for a large urban area. The highlights of this experience are that it proposes another entry point for thinking about the city of the future and that it uses something that could be viewed as a regulatory constraint in order to break down the internal and external barriers between services: internal barriers by laying the "foundations for multidisciplinary project management", and barriers with the outside by mobilising all local stakeholders, citizens in particular.

Breaking down barriers, developing global and multidisciplinary approaches and using a project-based logic appear in all of the contributions as key success factors. But are the city stakeholders ready for these new ways of thinking and acting? The article by Youssef DIAB shows how university curricula are being adapted so as to better train future city administrators on these emerging practices, in particular with the development of dual curricula (in particular engineering-architecture) and even double degrees, and the setting up of inter-faculty projects and workshops. It will take a long time, however, for today's students to become the majority among operational city stakeholders. Although changing the initial education and training of future leaders is a necessity, it will also be necessary to change the practices and habits of those who are already in place.

In a last article, Pablo DIAZ and Philippe BÉRAUD, the heads of a Masters in Political Science at Rennes University, which provides young professionals with training on urban policies and urban services in the countries of the south, underscore the specificities. The authors emphasise, in particular, the need for multidisciplinary approaches, the importance of getting professionals involved in teaching, and the benefits of team work and practical field placements. In their conclusion, they emphasise how necessary it is to build on international experiences in the area of urban policies and urban services.



a. From a sector-based/regulatory logic to a project-based rationale

Projects and cross-functionality: two keys to sustainable urban planning

by Marcel Belliot, AdP - Villes en développement

Cities are the primary place for the expression of tensions between Man and Nature. They are also the place where new practices are invented and tried in an attempt to domesticate nature without destroying it. It is in cities that the "sustainable development" battle, which will enable humanity to live and its children to survive, will be won or lost. In the last half-century, space has too often been considered in our country as an inexhaustible resource and urban development as "manna" to be distributed.

This was the era of "disposable" urban development with urban expansion rolling out in waves into the outlying areas with no concern for the space consumed or the future of the neighbourhoods left behind. The situation is changing now and emphasis is being placed on density, intensity and concentration. Demands for spatial frugality have always been taken into consideration in countries "restricted" by space or the vulnerability of their regions. This had not been the case in the past in France where space was allegedly unlimited. For half a century, with the help of the automobile, urban sprawl has been taking place around cities and submerging the countryside. The urban population of France was 22 million in 1946. It accounted for approximately 50% of the total population. Sixty years later, in 2006, it reached 50 million, i.e. about 80% of the total population. The growth of the urban population was accompanied by more than proportional growth of suburbanisation. Suburban areas housed 7 million inhabitants in 1990 with an average density of 75 inhabitants per km². They housed nearly 15 million inhabitants in 2008, with a density of 44 inhabitants per km². A quarter of the French population now lives in suburban areas. The public authorities have progressively become aware of the environmental, economic and social dead-ends into which these changes are driving French cities. In the last fifteen years, two major initiatives have been launched to remedy the situation.

In 1999, the Solidarity and Urban Renewal law (SRU) brought attention to the need to save natural and land resources. Through the new Schemes for Coherent Regional Development ("SCoT", which replaced the "SDAU" urban planning master plans) and the revisited local urban planning

schemes ("PLU", which replaced the "POS" land use plans), the authorities reiterate the preconditions for projects, the need for cross-functionality and the requirement that sector-based policies be integrated into urban planning documents and operations. In 2008/2009, the "Grenelle de l'Environnement" confirmed these objectives, putting them into the planetary perspective of the fight against climate change, the preservation of biodiversity and the reduction of the environmental footprint. The "grenellisation" of the regulatory urban planning framework as well as the ÉcoQuartiers and ÉcoCités projects presented in another article of this document illustrate the initial results of these national approaches.

Projects and cross-functionality: two keys to sustainable urban planning

"Sustainable development" challenges traditional modes of urban organisation and regional development. "Sustainable urban planning" challenges "zoning" policies which separate business parks and commercial areas from residential neighbourhoods or which reinforce regional disparities linked to the social division of space. It queries the role and operation of public facilities and spaces, the organisation of transport and mobility systems, urban structures and expansion modes, building standards, the urban/rural relationship, the place of nature in the city, consultation policies and governance methods, etc.

Two simple keys open the door to "sustainable urban planning". The first is "projects". Before being a catalogue of rules, restrictions and requirements, an urban planning scheme must convey a collective spatial, economic

and social transformation project, which brings together and federates the visions of all the stakeholders. A "neighbourhood project" or a "city project" should crystallise a collective vision and its strength resides first of all in common ideas and objectives. Land allocation choices, public facility programmes and rules on the use of parcels are simply tools for strategies and projects. Regulations always belong to an era, whose values, sensitivity and technical potentialities they express. They must not halt or paralyze uses, but instead prepare and accompany changes. To each project, its own rules. A shared project entails considerable dialogue, explanations and consultation, both between the public authorities, professionals and the civil society and between the different levels of public authorities. Making urban planning rules a tool to serve projects entails prior consideration of the project itself, the programme, urban structure and interaction with the rest of the city. Sustainable urban planning invites us to a "political revolution", in the true sense of the term.

Another revolution must accompany the political revolution. It is conceptual one: cross-functionality. The consistency of public policies cannot be decreed. It is built day after day through continual dialogue among all the professionals who make cities. What could be more "synthetic" than setting up and operating urban services, whose coexistence may not come naturally, in a neighbourhood with a limited amount of space? Our Cartesian mind-set drives us to do things one after the other, theme after theme. Constraints are "inherited" from decisions made upstream, over which actors have no further control. Each professional therefore jealously falls back on and guards his technical competence, which adds complexity and, as the project progresses, inflates costs. Sector-based visions have difficulty merging in cities and the rigid regulatory framework which has long prevailed in urban planning impedes the coproduction of urban space. The approaches promoted by the "Grenelle de l'Environnement" as well as the aim of consistency expressed in the Solidarity and Urban Renewal law (SRU) are intended to promote the construction of cross-functional projects. Local Urban Planning Schemes of urban communities will have to account for major urban themes such as housing or mobility and incorporate the PLH housing and PDU urban mobility plans. Much remains to be done, particularly in the area of urban services. Sustainable urban planning will be planning that manages to combine and optimise all urban functions: water supply (drinking water and other) and networks, the drainage and treatment of storm-water and waste water, the fight against flooding, the transport and disposal of waste, the generation and distribution of power. The requirement for cross-functionality, advisable in the past, is now crucial.

Sustainable development is not simply a new technical domain to be mastered. It is also a common value that involves all of society's stakeholders: the State, local authorities, businesses, inhabitants, etc. Cities, where half of the world's population now lives and the tensions and potentialities of our world are crystallised, have become the key places for a new humanism. Building with greater density to save space, reducing the production of greenhouse gases and limiting the use of automobiles, coproducing urban spaces with all the stakeholders, organising the city as a system rather than as a sum of functions. These ambitious objectives will only be achieved if they are understood and appropriated by inhabitants, businesses and society as a whole. Sustainable cities must also be desired. It is up to everyone, urban planners in particular, to work toward that goal.



How to develop a cross-functional approach to urban projects?

by Nicolas Gendreau, Water Division Director of the Urban Community of Bordeaux

In order to respond to an affirmed political ambition to make progress with urban development, the organisation of local authorities' services has been adapted in order to be capable of working in "project" mode. The example of the Urban Community of Bordeaux shows how, beyond a simple reorganisation of departments, this objective calls primarily for the development of a new shared culture.

It is the Urban Community of Bordeaux's Managers' Day. The date is 26 June 2012. More than 200 public service agents are in Talence, in the main amphitheatre of Science Po Bordeaux. The day begins, as it often does in this sort of event, with an introductory speech by the President. He gives his vision of the Bordeaux metropolitan area and the details of his political project. He explains his ambition for the ten years to come, specifying what he expects from the managers.

"The metropolitan factory," he tells us. This is the order we are to support, and to which we must respond, we the managers, engineers and administrative staff of the Urban Community of Bordeaux. The Bordeaux urban area has entered a new transformation cycle. Nineteen months of collaborative preparation, open discussions and unbridled imagination have shaped the contours of the 20-year Metropolitan Project and laid the foundation for a new way of shared thinking and building the city.

A year of studies, listening and commitments in 2011 led to the heart of the first major projects of this metamorphosis: the third phase of the tramway, the project for 50 000 homes around public transport routes, new Garonne river crossings, "55 000 hectares for nature" operation, the Climate Plan, Bordeaux Euratlantique, etc.

Never had so many projects been initiated. The cornerstones of a million-strong urban area, they will mark the 2011 - 2020 decade with the new stamp of the Bordeaux metropolitan area. The making of the metropolis must be organised to make the most of the process. Five divisions, five "directions" will guide public action. The future metropolis is intended to be solidarity-based, stimulating, sensitive, sober and singular, all at the same time.

These elements reveal a true ambition to transform the city and prepare it for the challenges of the future. But as receptive as we managers are to the projects set forth, providing responses to a solidarity-based, stimulating, sensitive, sober and singular metropolis is a real challenge. We are not accustomed to the vision being proposed, for which there are clearly new expectations regarding services.

The Urban Community of Bordeaux was created in 1966 and covers the following urban public services: collection, roads, water and sewage treatment. Up to recent years, there was one technical division for each area of competence, which operated autonomously without interaction between the divisions or with the other divisions of the local authorities (housing, nature, urban planning, etc.). Relations were episodic at most, on a few well-defined subjects, and not institutionalised in any way.

This operating mode was both the reflection of highly technical practices on the part of the local authorities' agents and a response to highly segmented political control. The vision of city planning was substantially compartmentalised.

Today, social demand has significantly changed and political control has evolved. The expectations of the President of the Urban Community of Bordeaux are much more integrated. The public authorities are striving to adapt their organisation and operation to meet the demands of the metropolitan project.

Today, the city is viewed as a space. Each urban planning project attempts to integrate the different uses of the space and, if possible, provide all of the expected functions. A new urban road system project now takes into account issues such as soft transport, storm-water management, collection, biodiversity, housing, sustainable development, etc. And the same issue arises for existing spaces, which are often subject to restrictive changes in regulations.

For example, in the Urban Community of Bordeaux region, there are dead-end streets without any turning areas. For safety reasons, refuse collection vehicles are no longer authorised to back up. This means they can no longer enter these dead-end streets. To comply with regulations, either turning areas have to be built, which is often impossible due to a lack of space, or else the collection service needs to be revised and residents must be requested to bring their refuse bins to the entrance of the street. In general, however, this solution is not acceptable since it is considered as deterioration of the refuse collection service. The departments have to communicate with each other and come up with common solutions.

Similarly, with the storm-water management policy of the Urban Community of Bordeaux, numerous holding ponds have been created to store the water from often violent storms. Among the ponds, some are open, particularly in separation areas, and often partially filled on a permanent basis. Up to now, these areas were closed off and reserved for the water department. Today, social demand, relayed by the political leaders, is driving toward opening up the ponds for other uses: fishing, walking, etc. This demand challenges the service departments. With the loss of full control over the ponds, how can the initial uses (storm-water retention) be reconciled with new uses? How can the initial functions be preserved and how can the issues of safety, maintenance, access, responsibility, information, etc. be managed? Here again, the departments in charge of storm-water must appraise projects cross-functionally with other divisions, associations and other local authorities: the municipalities.



Lafontaine Basin, Bordeaux Urban Community, 1999

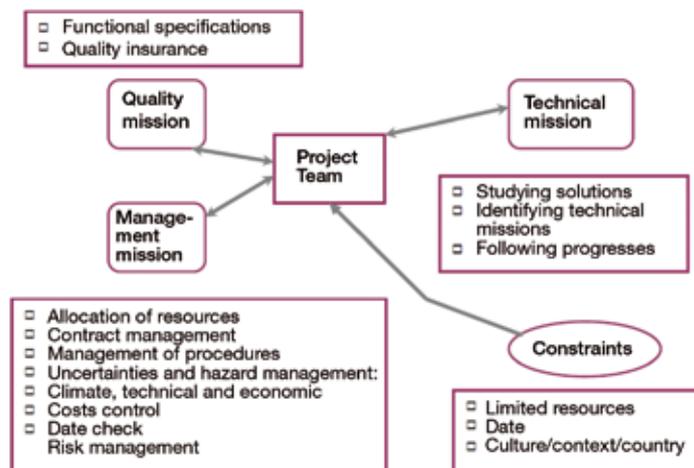
In order to adapt to the new approach, the administration of the Urban Community of Bordeaux underwent a full reorganisation in 2011, after nearly a year of discussions and preparation. The reorganisation resulted in two major changes:

- A fully revamped organisation, with the setting up of regional divisions;
- The emergence of cross-functional planning projects, extending well beyond the traditional scope of each division.

The aim of the creation of the four regional divisions is to provide a regionalised response. The approach is no longer technically segmented but integrated in the regions. And the central technical divisions (water, roads and collection, in particular) appear, in part, as service providers who meet the needs defined by the regions. In addition to the divisions' difficulties positioning themselves in relation to others and possible power politics, the approach is a real challenge. The organisation calls for a very different approach to projects on the part of the agents and, above all, a new culture to be developed.

The setting up of cross-functional projects involves project mode management. Whether or not this type of management is formalised according to the ISO 10006 standard, the local authorities are having difficulties getting structured to operate in this mode. The agents, whether project managers or participants, lose their bearings; they are not accustomed to these new operating rules.

The project culture needs to be developed, and this is a challenge for the managers of the Urban Community of Bordeaux.



Role of the project team, Cours d'Amir Nafi, Enges, 2009-2010

The sun is shining in Bordeaux today, on 26 June 2012. For the lunch break of our Managers' Day, there is a pleasant open-air buffet, good for exchanges. There is a form of perplexity in the air regarding the difficulty of rising to the challenge set for us by the President, but there is also a certain excitement over the ambition of a "Metropolitan factory" to serve the future million inhabitants of the Urban Community of Bordeaux.

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b. Examples of decompartmentalisation

Decompartamentalising services to improve water management

by Elisabeth Sibeud, Grand Lyon

Based on the successful example of the "Porte des Alpes" area, for 20 years, Greater Lyon has been developing a consultation and advice policy intended to produce high-quality environmentally-friendly infrastructures, better integrated into the city. The option of relying on consultation rather than regulations entails true decompartmentalisation of services and wide open-mindedness.

Satisfactory management of flows and effluents from the city during rainfalls has been a major issue for Greater Lyon ever since it was created.

To limit the risks of sewer overflow and water treatment plant malfunctions, the choice was made in the 1990s to treat storm-water at the source. To implement the new practices, Greater Lyon chose to give priority to advice and support for projects rather than conventional flow limitation regulations. This option produced high-quality environmentally-friendly infrastructures integrated into the city.

The Porte des Alpes site is the finest illustration of the benefits of the technical consultation and partnership project management approach. The issues of managing storm-water at the source were taken into account in the project from the start. Landscapers, urban planners and water experts worked together on the first planning sketches in order to identify the water flow patterns to be respected and the best sites for storing runoff water, including in extreme rainfall events. The choice was made to organise cascading management, using swales, draining trenches, wet ponds and infiltration basins. The final design called for numerous consultations with the roads and green spaces technicians and took into account each group's operating constraints as from the start of the project.

This high-quality multi-skills work was made possible by a project management organisation coordinated by the urban planning department. This dynamic organisation, which involved participation by all, produced a very high-quality project, bought into and complied with by all the urban services.

Still today, nearly 20 years after the design phases, the site's ambitions to create high-quality environmental and societal spaces are being perpetuated by the practices of the agents in charge of maintaining the site. The memory of the specific techniques implemented on this site remains very present despite the numerous changes of techniques and technicians that have taken place.

Work in partnership continues also in the management of the spaces shared with fishing and wildlife protection associations. Consultation actions will be initiated with the neighbouring shopping centre to align the two sites' environmental management practices and decrease the global impact on natural environments.

Backed by this outstanding success, Greater Lyon has deployed these technical cooperation methods in most planning projects, and has since added consultation with inhabitants.

This holistic vision of land-use planning will also be the basis for the preparation of the future Local Urban Planning Scheme, currently under revision. Similarly, the future Greater Lyon sewerage master plan is being structured with a plan to mirror "core competence" actions with partnership actions.

Our services and policies must be decompartmentalised if we want tomorrow meet the challenges of good aquatic environment quality as stipulated by the Water Framework Directive.

Even if it disrupts our established organisations, this open-mindedness is also an opportunity to motivate our technicians and experts and get them even more involved in the construction of the city of the future.

How to make better use of water in urban development?

by Isabelle Soares, Grand Lyon

The new approaches to urban storm-water management call for upstream thinking in projects and a truly cross-functional approach, for both the design and subsequent management of spaces and systems after the projects are completed. This article presents the practical experience of the Urban Community of Lyon in setting up multidisciplinary project teams.

“What is the added value of Water in the City?” In that case, why not ask “What is the added value of Air?” Quite a surprising question when everyone knows the qualities of water and its necessity for life. Why do we need to develop a business case to sell the positive effects of water in the City to be able to get water integrated into urban development projects? Obstacles to change, fears related to water (disease, flooding, etc.), the building up of our cities (culverts for rivers, underground drainage networks: disappearance of surface water), the organisation of local authorities’ services, our culture, training and technical language, costs... these are all barriers to be overcome in order to get water integrated into urban development.

To make storm-water management practices change and, in particular, to develop alternative techniques to pipes, a major communication and information phase is essential, for one, to explain the reasons and necessity for the change and, secondly, to make stakeholders understand that this change in storm-water management practices has an overall impact on the development and management of public space. Plus, to do away with opposition to change, opposition must be understood and appropriate answers found.

Limits of the existing system

In the second half of the 19th century, industrialisation, the rural exodus and urban explosion gave rise to new “disorderly” cities. Given this anarchical organisation of cities and, above all, poor sanitary conditions, a progressive Hygienist movement considered the City as a space to be organised functionally and rationally based on the progress of science and modern techniques, considering “typical” needs of “typical” human beings in a scientific manner. It was during this period that drinking water supply and sewer networks became widespread and urban parks were created, making Industrial Cities healthier and more human. As the Hygienist movement continued, at the start of the 20th century, strongly inspired by industrial economic theories and organisation methods, urban planners developed the modern city with a functionalistic vision, i.e. “Taylorised” cities. The idea behind this modern urban planning is to fight urban disorder by rationalising functions: home, work, recreation and mobility. The city was therefore broken down into single-function zones.

These urban planning and historical considerations have resulted today in a relatively compartmentalised organisation of the design and management of public spaces (road systems, water, green spaces, urban

planning, etc.) and strong technical expertise per area. The public service water “network” is based on this technical expertise and the distribution of tasks and spaces between the services and the user.

However, this modern city, dreamt of as being ideal, is nowadays in crisis: economic, environmental, social and there are impacts on water service, as on all urban services: the “all pipes” system has reached the technical, financial and environmental limits.



Ever larger (and costlier) infrastructures to manage rainfall events, but insufficient due to increasing soil sealing

A necessary change under way

Given the limits of the drainage system (network), alternative techniques have been developed to manage urban storm-water. However, in addition to the necessary changes in design and management practices for water stakeholders, the change in storm-water management also has an effect on all stakeholders who design and manage public spaces. The alternative techniques, such as swales and basins, now require surface area that had previously been reserved for single-uses (parks, green spaces, parking, etc.). The “pooling” of these spaces for multiple functions (recreational, green spaces, storm-water management, etc.) entails collaborative work between designers and hydraulic engineers from the design phase and adaptation of management methods. A change is necessary: one that will impact all public space stakeholders and not only those in the field of water.

For more than twenty years, the Greater Lyon Water Division has been developing a policy for storm-water management by retention/infiltration and has been striving to implement

these alternative storm-water management techniques in urban development projects. To help and accompany the change in design, in particular, tools have been produced, such as handbooks for professionals. Communication awareness-building operations have been aimed at urban development and road system project managers in order to better explain the approach and provide scoping assistance tools.



In addition, collaborative work with the Greater Lyon Roadside Trees and Landscapes department has begun in the design of urban projects and also in terms of common communication. With the concepts of bringing Nature back into the city, the cooling of cities, adaptation to climate change and control of public expenditure, storm-water and landscape strategies converge at many points, in particular in relation to the multifunctional use of space.

Awareness-raising regarding “water and landscape in urban projects” has been carried out in the framework of technical morning workshops with the green spaces managers of the Greater Lyon municipalities, the vice-president of road systems and landscapers and designers of public spaces.

Apart from awareness-raising and communication about storm-water management, the introduction of water into the city and the multifunctional use of structures are also advocated in Greater Lyon’s Local Urban Planning Scheme, in the following article:

13.3.2 ENGINEERING STRUCTURES FOR WATER MANAGEMENT

In land development operations and the construction of complexes, engineering structures for the management of water and the surroundings, common to these operations (such as holding ponds or infiltration basins, etc.) shall have, subject to their own characteristics, sufficient ground space and operating requirements:

- Landscaping must be done, consisting predominantly of plants, to contribute to the qualitative and functional integration of the structures into their natural and built environments;
- They must be designed for recreational or amenity purposes compatible with their use (green spaces for relaxation, games, etc.).

The acknowledgment of storm-water management in urban development has also been made possible by the organisation of urban projects in project management mode with validation steps. As from the upstream programming phases, based on an order from the elected representatives, all the stakeholders in the region concerned (designers, administrators) are involved and participate in the definition of requirements. For urban projects, the Water Division is often called upon, for one, to provide technical expertise and also to ensure that the operation of the future hydraulic structures is possible and facilitated.

The design and success of projects that include storm-water are made possible by this multidisciplinary participation and the cross-functional work of the project team, composed of architects, landscapers, hydraulic engineers, administrative services and project management.

The final validation of a project is issued by the elected representative: the integration of water into urban development therefore calls for political support.

However, there are still obstacles to change. Today, one of the main obstacles to the development of these alternative techniques for managing storm-water is management itself: which department will manage the shared space (green space + water) and cover the cost of maintenance? What type of management is appropriate (frequency of maintenance, type of maintenance, etc.)? Again, the issues of the silo-type organisation of city management and the cost aspect...

In the case of the ZAC Hôtel de Ville [Town Hall cooperative development zone] in Vaulx en Velin, the project team had to stop in the design phase, lacking validation by the municipality’s elected representatives. This urban requalification project covers 11 hectares in the urban centre. The architect and landscaper team decided to design the development zone around water and create rain gardens for storm-water management. The initial political order for the urban project included long-term sustainability of the structures. The elected representatives were unconvinced about the sustainability of the rain gardens and, fearing that the urban development project would turn into an experimental project with risks of failure, they asked for guarantees in terms of management.

The project team and the future managing services (Municipality and Greater Lyon) developed a set of arguments justifying the environmental, landscaping and economic benefits of the rain gardens such as:

- Urban quality and benefit to the City’s image,
- Bioclimatic benefit of the presence of plants: improvement of well-being in the city by limiting heat islands;
- Educational interest of raising the population’s awareness of water;
- Sharing of water for green spaces: limitation of watering system, favourable to water saving, resource preservation and cost limitation;
- Reduction of network capital expenditure;

- Optimisation of overall management costs by the multifunctionality of space.



Graphics designer J. Cormier

In view of the rain garden management issue, a proposal was made to set up a management committee including all the managing services (Municipalities green spaces and Greater Lyon roads-cleanliness-water). This “managers” monitoring group will enable better analysis of the shared management and operation of the rain gardens (overall management cost, frequency and type of operations, etc.) and also make it possible, if need be, to adapt the management methods according to uses and field observations. A management agreement protocol was prepared: it initially defines the scope of services provided by each manager of the multifunctional spaces and commits the local authorities to implementing the management committee.

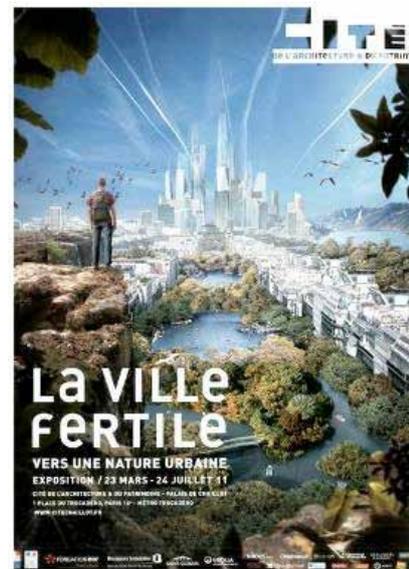
Backed by these management commitments, the elected representatives of Vaulx en Velin validated the urban development project with the rain gardens.



Garibaldi Project, Lyon 3^{ème}

A lot of time and energy can be spent in meetings in the upstream phase of studies in order to understand the constraints of each stakeholder and find solutions to reconcile their respective issues and interests. But this is not in vain, in the end, since including water in discussions at the start of design is an integral part of the project and no longer a constraint in itself. It even becomes a commercial asset for real estate sales: promoters’ advertisements often highlight well-being with pictures of landscaped hydraulic installations.

In conclusion, even if questions and limits still remain regarding the integration of water into urban development, as illustrated in the pictures below, there is a true awareness that water, like trees and green spaces, must be part of the urban landscape in order to let cities breathe again.



Exhibition poster

Nantes Métropole's "climate plan": an example of breaking down barriers between services

by Philippe Marest, the Assistant General Manager and General Director of Environmental and Urban Services Department (DGESU) of Nantes Métropole, Vice-President of the ASTEE; Maryline Guillard, Director of the Environment, Natural Spaces, Energy and Risks Division of the DGESU; Alban Mallet, Coordination, Sustainable Development and Climate department of the DGESU and Y. Gouriten, Director of Public Services Integration Mission at the DGESU of Nantes Métropole

The necessity of taking effective measures to fight climate change and its effects entails systemic and interdisciplinary approaches. This article shows how the setting up of the Regional Climate Energy Plan gave Nantes Métropole the opportunity to work on breaking down internal barriers between services and also barriers with the outside.

1. Introduction

Due to their systemic nature of the implementation of sustainable development, including the fight against climate change, local authorities must develop interdisciplinary approaches based on open and reinforced cooperation among stakeholders.

Due to their multiple competencies, local authorities perform highly varied functions, ranging from drinking water network management to development operations, and including the enforcement of land use regulations. A distinctive feature of the Climate Plan is that it breaks down the logic of vertical relations: the architect must "speak" to the network manager and vice versa in order for the principles of sustainable development to be implemented effectively.

Barriers must be broken down both inside and outside the local authorities. Internally, the authorities must lay the foundations for multidisciplinary project management (Agenda 21 or PCET) which is materialised by the coproduction of all services. Externally, the authorities must dialogue with local stakeholders in order to get them involved in a shared responsibility rationale.

2. Decomartmentalisation strategy: the case of Nantes Métropole's Regional Climate Energy Plan

The Regional Climate Energy Plan (PCET), aimed at combating climate change, is the first action of Agenda 21. The plan has two objectives:

- mitigation: the region's impact on the climate is to be limited by reducing greenhouse gases (GHG) according to the local authorities' own objective, which is part of the national and European objectives to reduce GHG by 30% between 2003 and 2020,
- adaptation: the region's vulnerability is to be reduced since the IPCC has now established that the impacts of climate change can no longer be entirely avoided.

The Regional Climate Energy Plan includes several dimensions: specific governance, mobilisation of public policies and strong coordination in the region, with operational tools in order to:

- mobilise the region's stakeholders to drive the dynamic among citizen-users, economic stakeholders, scientists and associations.

According to the estimates made by Nantes Métropole, only about 6% of the urban area's energy-induced CO₂ emissions are under the direct responsibility of Nantes Métropole and the municipalities (own activities: urban services energy, water, sewerage, public transport, heritage) whereas approximately 94% of the urban area's emissions are related to the region's activities to which the public policies of Nantes Métropole contribute more or less: individual behaviour regarding the use of automobiles, mobility, the real economic situation, state of housing, etc.).

The driving forces are represented within specific groups whose purpose is to:

- build and ensure strong governance and concretely materialise the climate plan in a way that closely meets the expectations of the different stakeholders;
- mobilise all public policies to serve the cause of combating climate change;

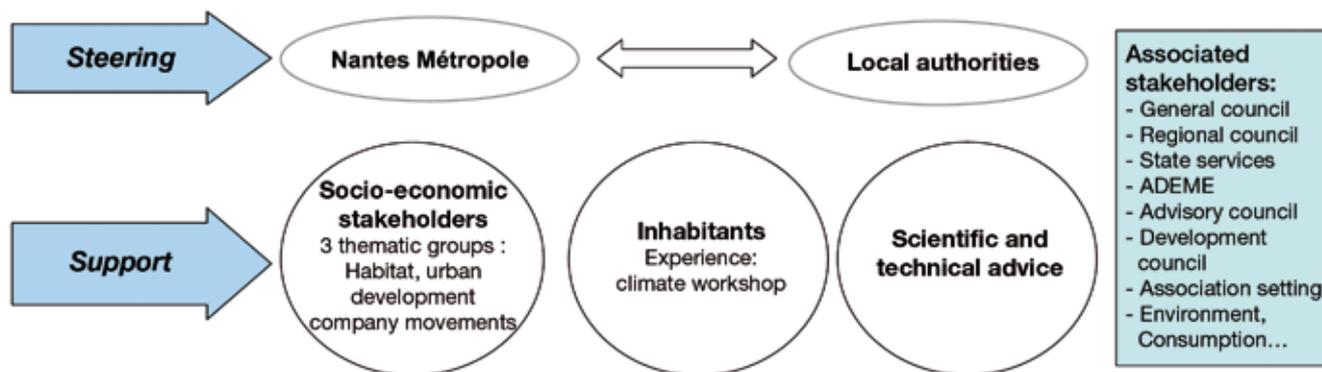
This includes participating on a day-to-day basis in the action of Nantes Métropole and also using leverage via the induced effects of public policies;

- mobilise all institutional agents: Nantes Métropole is developing and systemising the "climate culture" in all of its services, e.g. taking a carbon footprint of all the public services managed by Nantes Métropole: water, sewerage, waste, public lighting, public transport, etc.

2.1. Specific regional governance

Different governance structures have been set up in order to take action, with responsibility shared by all the region's stakeholders, from inhabitants to socio-professional actors. The governance scheme reflects the local GHG reduction issues and also the need to co-build an approach for fighting climate change in a context that is continually evolving from the scientific, technological and societal points of view.

The governance of the Regional Climate Energy Plan relies on a key factor: interaction with the municipalities of the Nantes urban area via the urban community structures. This municipalities/urban community co-construction is backed by the operational network of the local Agenda 21s.

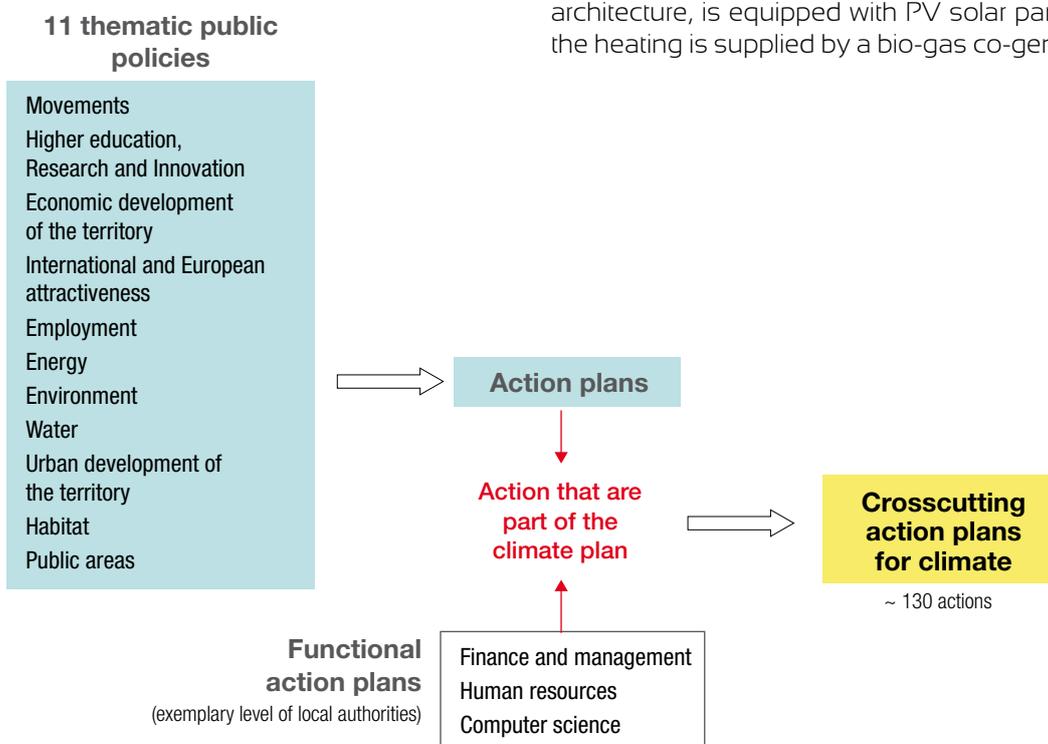


Some actors have a particular position in the governance system due to their coordination function and the fact that they act as interfaces between other actors. They are "link-actors", such as the Chamber of Commerce and Industry and the Union for Social Housing.

2.2. Implementation of a cross-functional climate action plan

Nantes Métropole is mobilising all of its public policies and action plans for the Regional Climate Energy Plan, in the areas of both mitigation and adaptation. The managerial approach of Nantes Métropole includes climate change in planning documents, in particular the Urban Mobility Plan and the Local Housing Plan.

Similarly, work is being carried out on the exemplarity of the urban community. Actions are being conducted on the community's built heritage, public lighting and industrial processes (drinking water, sewerage, waste). The "Petite Californie" wastewater treatment plant has a bioclimatic architecture, is equipped with PV solar panels and part of the heating is supplied by a bio-gas co-generation system.



(1) « Même si les émissions de gaz à effet de serre diminuaient suffisamment pour stabiliser la concentration de ces gaz, le réchauffement anthropique et l'élévation du niveau de la mer se poursuivraient pendant des siècles en raison des échelles de temps propres aux processus et aux rétroactions climatiques » (4^{ème} Rapport de synthèse - GIEC 2007 - Chap 6, Conclusions robustes, p 72)

(2) Espace Info Energie : service fournissant du conseil individualisé aux particuliers dans le domaine de l'habitat en particulier de la maison individuelle - Ecopôle : association du territoire offrant du conseil individualisé aux particuliers pour les bonnes pratiques de la vie quotidienne (alimentation...)

2.3. Coordination close to inhabitants and social and economic actors

In 2010, as part of its regional coordination scheme, Nantes Métropole set up a Climate Workshop for 150 households in the Nantes urban area. The Climate Workshop revealed the need to provide information as close as possible to inhabitants in order to improve effectiveness.

In addition, Nantes Métropole, in liaison with the municipalities, has implemented a coordination organisation for inhabitants and social and economic actors, which is based on coordination of local authorities' services and the regional actors concerned (Espace Info Energie and associations²).

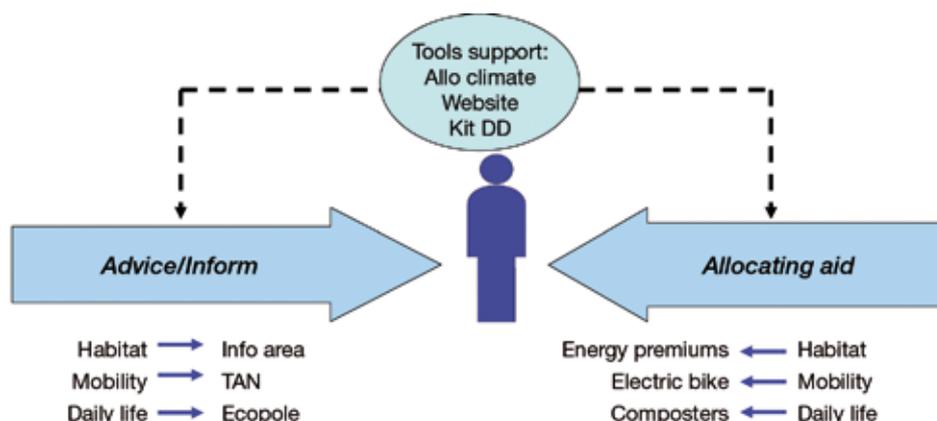
Nantes Métropole also provides inhabitants with:

- support services and tools:
 - Allo climat: hotline to give inhabitants initial answers to their questions in the areas of housing, daily life and mobility,
 - climate advisors: a Nantes Métropole team dedicated specifically to providing support to condominiums for the setting up of energy-efficiency retrofitting projects,
 - sustainable development kit: a practical information kit on multiple themes (energy, water, consumption, waste, mobility) for inhabitants.
- financial assistance:
 - "Eco prime": allowance for the replacement of old water heaters with high GHG emissions,
 - "prime solaire": allowance for the installation of thermal solar panels
 - allowance for the purchase of electrically-assisted bicycles
 - allowance for the purchase of individual composters

3. First effects of the strategy

3.1. Governance

With a co-construction rationale, the local stakeholders participate fully in the Climate Plan in the framework of structures organised by Nantes Métropole. The social and economic actors are involved in the "business theme group" and contribute to designing the coordination of business parks by contributing their expertise, field knowledge and know-how.



Another urban planning and development group is working on bringing together the viewpoints of the city's production actors, including energy suppliers.

The scientists and local experts on the Scientific and Technical Council (CST) provide insight into the debate on the fight against climate change, contributing their knowledge and outlooks on a variety of subjects, often not well understood by the local authorities, such as the quantification of CO₂ and consumption.

3.2. Public policies

The alignment of Nantes Métropole's public policies increases the effectiveness of CO₂ emission reduction actions. The fight against climate change is driving new synergies between public policies and favours cross-fertilisation of internal competencies, a source of innovation. Three examples illustrate these new synergies:

Housing / Energy

The local authorities, being in charge of organising heating networks, can develop through these networks a policy aimed at making the best use of the unavoidable energy produced by waste incineration, and at using biomass (in particular via the use of wood-burning boilers at the head of the networks), all of which contribute to reducing the city's carbon footprint.

Similarly, via the implementation of development zones, the authorities are working with developers and construction actors toward the adoption of shared rules to promote a high level of renewable energy production in projects.

Urban planning

Responsible urban planning enables the progressive building of a city that is more diverse, more compact and more polarised: a city with short distances and low GHG emissions.

The Local Housing Plan (PLH) is an essential tool in this respect, but policies for urban densification (e.g. via increasing building rights in certain sectors, public transport in reserved corridors and balanced building land offers) contribute as much to this objective.

Waste

Optimisation of collection services and experimentation with hybrid technology for the motorisation of collection vehicles (10% of the fleet) are aimed at making substantial energy savings. For public contracts, carbon compensation measures are also proposed by some operators for non-compressible GHG emissions.

Regional coordination

Through a consistent coordination scheme, Nantes Métropole provides the framework and conditions for behavioural change. The effects of regional coordination on inhabitants are being evaluated in 2013.

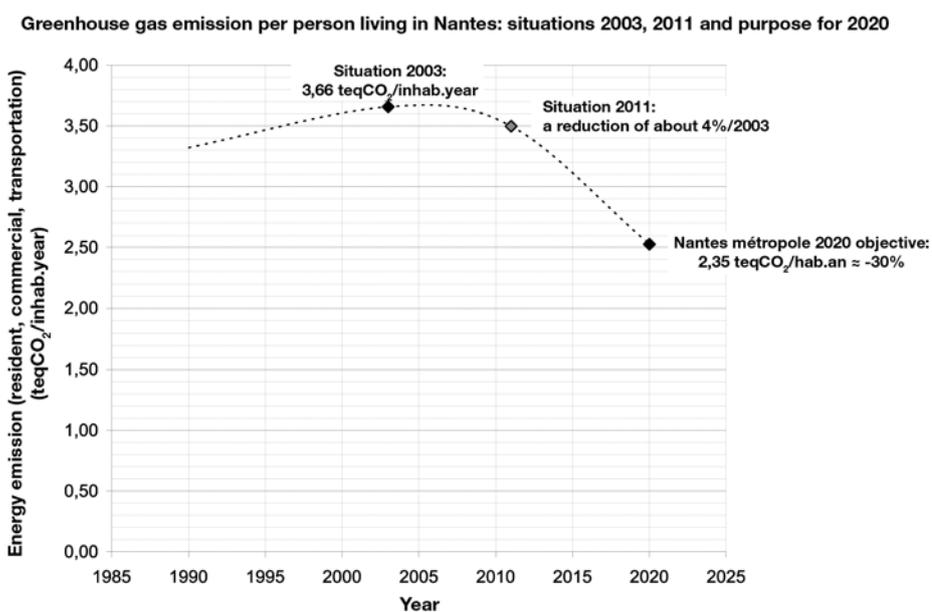
3.3. Carbon impact of the different measures

Thanks to the action undertaken by Nantes Métropole, a downward trend in emissions was observed between 2003 and 2011, with a 4% decrease in CO₂ emissions per inhabitant. This result has been obtained in particular by the impact of the Urban Mobility Plan (reduction of the modal share of cars) and proactive efforts by Nantes Métropole (energy and buildings).

4. Conclusion

In order to meet the challenges and be effective, Nantes Métropole has developed and organised a scheme to promote decompartmentalisation and cross-functionality. Added to the vertical logic, there is now a horizontal logic which increases exchanges and coproduction work. Today, nearly 80 stakeholders are mobilised in theme groups. Twelve leaders in research and technical expertise participate in the Scientific and Technical Council with the support of Nantes Métropole. All of the agents are participating in the preparation of the Climate Plan via public policy action plans or functional actions plans. 60 agents are project leaders for actions that contribute to the Climate Plan.

It is only by collective work shared by the different stakeholders that the objective can be reached and that progress can be made toward a more sustainable city.





c. The training

How should the initial training evolve?

by Youssef Diab, Professor at Université Paris Est Marne la Vallée and Science Director at EIVP

"In France graduate and undergraduate education for engineers and architects is entirely separated. Even though this lack of contact is not the only explanation for the actual partitioning of the jobs and roles, it constitutes one of the obstacles. This article shows how more and more university and graduate schools are trying to become closer, particularly through common projects or shared workshops."

Context and need for decompartmentalisation

The current transformations and evolutions of cities offer new challenges. Management of urban infrastructures and issues of sustainability are at the heart of governance challenges and urban development wanted by elected people, local decision makers, users, and practitioners. Each of them has a different role to play in the development of the city!

Urban issues are addressed within a different political context depending on the continents. Cities in developed countries are faced with structural inequalities for access to lodging and urban services. In developing countries, urban slums acquired a city status or became standalone neighbourhoods within existing cities. Yet, everywhere, there is a need for integrated approaches in the urban and economic development activities wanted by the elected officials.



The basic principles of sustainable urban development consists of finding a reasonable compromise between environmental, social and economic challenges and local governance, a compromise that is active and effective when it comes to public action.

One of the answers to the integration of sustainable development within activities tied to local and regional authorities is the principle of cross charing. This requires the opening up of disciplines and imposes a global vision. Spaces become multifunctional, projects are then no longer realized within a closed service but as a partnership between various services, within project teams (ASTEE, 2010).

Furthermore, issues of spatial scaling cannot be neglected. Confusion is rife in urban projects where the term eco-neighbourhood/ecodistrict or eco-project is regularly twisted in the planning process and especially in the management of this kind of urban development. The question of spatiality of urban challenges also forces the "decompartmentalisation" of disciplines involved in the conception and management of cities.

We should also note the appearance of the dematerialized city, based on the principle of the digital city. This principle calls for renewed public space practices. A new relationship between city and countryside emerges through questions raised by working from home. With regards to these transformations it is becoming urgent to rethink urban sciences, to revisit the paradigms and corpus that are the foundations of interventions and tools for urban planning, to review the ways in which we think about the sustainable management of cities.

The sciences of cities must now be situated between classic disciplines, which include on one side human and social sciences and on the other engineering sciences. They must also integrate all other dimensions and particularly life sciences, for example to better help assess ecological challenges and the new relationship which cities must now have with nature.

Sustainable urban development: an important factor in decompartmentalisation

Despite the exponential use of notions of sustainable development and sustainable cities, questions posed within this context remain largely subject to controversies once we try to apply them to urban services.

Modern cities were built from the 19th century based on the intensive, and nearly exclusive, use of technical networks developed to the scale of the city. Today the concepts are evolving and we try to develop solutions with much more diversified scales, either smaller than the city (the building, the neighbourhood) or bigger and different (the catchment area).

For example, the challenge no longer is to collect waste water and transfer it outside of the urban territory to be treated elsewhere but to consider developing operational solutions, such as treatment plants within the heart of the city. This type of reasoning must help disciplines tied to urban water and hydrology to evolve as well as those businesses specialized in urban conception and management who still advocate large infrastructural approaches, especially in developing countries (Diab, 2012).

The objective is thus to no longer work on the conception of urban systems but to instead work with a systemic vision on their global operations.

In the same scope, the multiplication of management tools questions the validity of the solutions put in place. Terms such as "eco-cities, eco-districts, green growth" and others are multiplying, yet they most often only offer a technical and technological approach to the problems identified. These solutions, listed based on concrete examples developed by a handful of cities, further feed the technological race with regards to sustainable cities.

Urban engineering and its recent evolution contribute to the revamping of research on the city and its modernisation. The classic disciplinary split has become inadequate, almost obsolete.

Within this perspective the question of training becomes crucial. The need is to transform the professional positions of engineers, urban planners, urban designers, architects and other varied experts of the city. How to exit a model ready for use to imagine an urban planning capable of understanding the challenges of institutionalised or private actors? (ESA, 2013)

The issue of training is one of the major conditions needed to put into perspective a change in the understanding and management of urban challenges, both from the point of view of the paradigm and of the tools (ESA, 2012).

These new training needs must be put within transdisciplinarity by opening up urban approaches and not by superimposing competences across classic multidisciplinary approaches. In the next paragraph we illustrate these innovative training approaches with some successful examples.



Innovative responses offered by engineer education:

1. The Engineer Architect double degree course

Students who complete engineer architect degrees are capable of globally handling projects with an architectural and urban design as well as on a technical level. On completion of their training they apprehend space and volume and are able to conceive urban and architectural projects in their environment with an esthetical, technical and regulatory approach.

Double-degree training courses for Engineer/Architect and Architect/Engineer are concrete and proven responses that answer this need for decompartmentalisation. Many schools have managed an efficient implementation of this kind of training. The Ecole des Ingénieurs de la Ville de Paris, the Ecole Spéciale des Travaux Publics with the Ecole Nationale d'Architecture de Paris - La Villette, the Ecole Nationale des Ponts et Chaussées with the Ecole d'Architecture Ville et Territoire de Marne la Vallée, without forgetting the Ecole Nationale des Travaux Publics de l'Etat and the Institut National des Sciences Appliquées de Lyon with the Ecole Nationale d'Architecture de Lyon and the Ecole Centrale de Nantes and Ecole d'Architecture de Nantes. Training of a similar nature exists in other institutions.

These trainings are balanced between the two schools (engineering and architecture) throughout the five or six years it takes to complete the degree, which is highly beneficial for the development of a double culture without simply superimposing architectural and engineering knowledge.

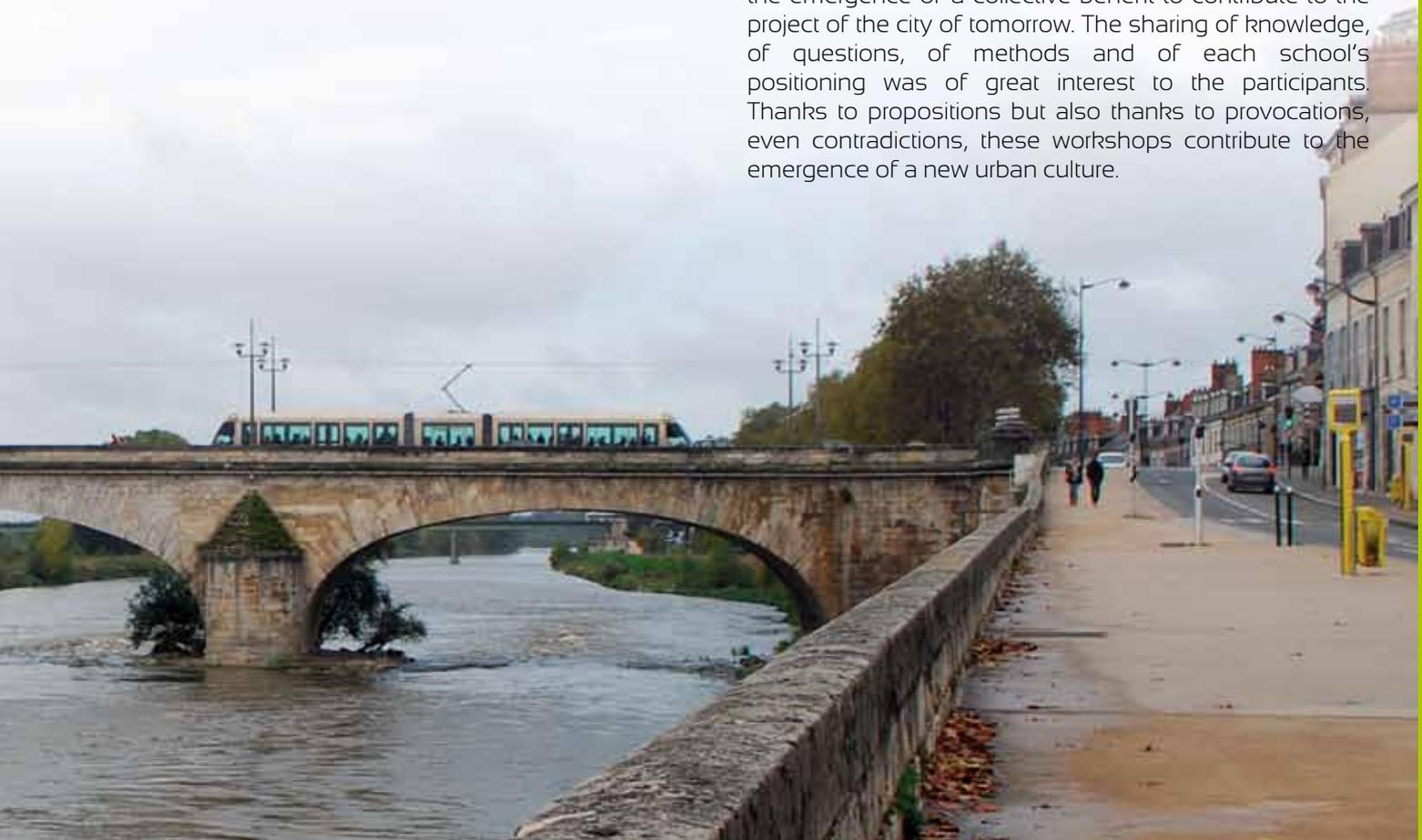
2. Inter-school urban prospective workshops

These exercises have been developed in recent years following a demand for work on the concept of urban creativity, which requires a strong opening of disciplines. As an example we would like to quote the renowned workshops of Cergy Pontoise, the recent works of Ergapolis and especially the Ateliers de Création Urbaine from the Ile-de-France region which in 2013 are in their sixth edition. Every year a transversal subject brings together many different institutions from different domains.

As another example we'd like to point out the second edition of 2009 (ACU, 2009), the theme of which was urban water. Five different and complimentary approaches allowed decompartmentalisation between the following:

- a political science approach developed by the Urban planning master of Science Po Paris;
- an industrial creation approach from the Ecole Nationale Supérieure de Création Industrielle;
- a multidisciplinary approach by definition from the Urban Engineering master of the Université Paris Est Marne la Vallée;
- an urban planning architectural approach from the Ecole Nationale Supérieure Villes et Territoires de Marne la Vallée;
- a rural engineering approach from Agroparitech;
- a landscaping approach from the Ecole Nationale Supérieure du Paysage de Versailles.

This crossing of competences across the analysis of a common "object" with different approaches has allowed work towards a new urban culture issued from different angles of approach. This diversity has allowed the emergence of a collective benefit to contribute to the project of the city of tomorrow. The sharing of knowledge, of questions, of methods and of each school's positioning was of great interest to the participants. Thanks to propositions but also thanks to provocations, even contradictions, these workshops contribute to the emergence of a new urban culture.



When all of the students' suggestions are put together, certain bias are put into question, inciting debate. Urban Engineering reversed the roof of buildings, transforming them into roof tanks and raising questions of classic architectural thinking. Designers proposed an artificial renaturation/revitalisation of river banks that question landscapers. Sciences Po and Agroparitech make a caricature of urban engineering's territorial autonomy (ACU, 2009).

Finally this decompartmentalisation adds to the debate of the city of tomorrow. It helps to break with classical modes of thinking and to deregulate practices that are preparing cities for a world where innovation is an important factor of economic development.

3. Double-degrees and semester exchange

Many formulas for double-degrees have been developed within engineer schools that specialize in urban and environmental sciences. We'll now mention some interesting examples:

- double-degrees with foreign universities, including countries from both developed and developing countries. Effectively these diplomas often allow for a cross fertilization between students of different disciplines and sometimes for a specific specialization required by certain domains which do not exist in the school of origin. ENPC, EIVP, ESTP, ENGEES and the INSA have managed to develop very attractive curriculum for French engineering students as well as those coming from developing countries.
- Complimentary French double-degrees: a perfect example of this type of partnership is the double diploma ENGEES/EIVP. EIVP is a specialist urban engineering school while ENGEES is specialized in water and environment. The double diploma allows students to receive a double certification and above all a better integration of physical and chemical sciences in the training of urban engineers and vice-versa for the engineers specializing in environment who can acquire urban knowledge and training.
- Finally many schools have orientated their course towards semester exchanges. European formulas such as Erasmus have favoured this thematic and geographic decompartmentalisation.

Conclusion

The operational demand from urban players has forced trainers in engineering schools to modify their offerings and to adapt to this demand from the industrial world. The main difficulty for those carrying these kinds of projects is to reconcile professional multidisciplinary needs with old-fashioned academic success which is by virtue tied to a single discipline focusing on the classical split of engineering sciences between physics, chemistry, mathematics and mechanic. This type of split is increasingly less suited to answer the needs of our cities and societies. While the successful examples in this article show the potential and need for a rich decompartmentalisation between establishments and disciplines, they remain exceptions to the rule. Taking into consideration the length of careers and the slow speed of evolution it will still take a lot of time and energy for all of the city's players to get to know and understand each other on the benches of their schools. The progressions made inside formative establishments will thus need to be completed by other means, for example using on-going, vocational training.

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Decomartmentalisation teachers and practices

by Philippe Béraud, Professor of Economy at Télécom Bretagne and Pablo Diaz, Deputy Director at Sciences Po Rennes, co-manager of the ISUR Master.

The training of young professionals who want to contribute to the global challenge of urban development plays and will continue to play an essential role. It is the reason for the Master degree in 'Networked Urban Services Engineering in Developing Countries' (ISUR) which was created ten years ago by Sciences Po Rennes.

The challenges we face

Since 2010 more than 50% of the world population lives in cities. Developing countries have suffered from this growth at an accelerated rate, to the point where the global urban population increased by approximately one billion in the last twenty years, 89% of which occurred in developing countries. The urban question thus becomes global, when cities in developed and developing countries find themselves facing common challenges in terms of governance, mobility, development and durability. Furthermore the shift of urban growth from developed to developing countries the world has seen for the last fifty years regularly reinforces the place of "cities of the future" within these challenges, whether they be developing, emerging or in transition.

With such a dynamically increasing number of "potential" users facing us the development and management of networked urban services (water, sanitation, electricity, gas, telecommunications, roads, transport, waste management, etc) is a real challenge. The question of infrastructural needs in cities of the developing world is thus not up for discussion, it is fact. Therefore the answers we must formulate to questions of financing, origin of contracts, redistribution, solidarity, access to vital infrastructures and equipment failure that impacts the environment remain more important than ever and must be imagined by professionals who work within this domain (engineers, urban planners, architects, researchers).

This quest for answers from professionals must be done around new institutional architectures, products of a mix between imported models and native codes which can be devised only by bringing to it unsuspected innovations and renewed multidisciplinary skills.

The training of young professionals who wish to contribute to solving such a global challenge plays and will continue to play an essential role. It is the reason for the professional Master degree in 'Networked urban services engineering in developing countries' (ISUR) which was created ten years ago by Sciences Po Rennes.

Objectives and contents of the ISUR Master

The objective of this diploma is to train specialists in the urban policies of implantation and management of networked urban services in developing countries. In the context of rapid urbanization, where multiple parties interact (local authorities, donors, civil societies, operators etc), the diploma trains students to take into account local (sociological, historical, political, cultural) and global (technical, environmental) specificities in order to allow them to act as mediators/facilitators for private operators, public bodies or donors. The objective is to define the economic, social, financial and legal norms most pertinent to allow for the creation and/or sustainable modernization of the networks. This happens via the acquisition of skills within the realms of management and institutional models of regulation, regulatory tools and evaluation indicators, benchmarking (performance comparison), management costs, tariff systems, norms and standards and governing tools.



These teachings must allow young professionals to be capable of analyzing urban services from an economic point of view taking into account local specificities (social, historical, political), to answer bidding calls, to put together and evaluate implantation and upgrading of urban service networks in developing countries, to negotiate conventions and concessions, to build regulatory frameworks for local authorities managing urban services and to ensure their management, reform or restructuration.

Original institutional anchoring

The ISUR master degree is jointly organised by Sciences Po Rennes and Telecom Bretagne, Grande École de l'Institut Mines-Télécom. This cohabilitation relies on common work between both institutions drawing from their respective focus, on one side human and social sciences and on the other technical sciences and engineering. The joint organisation has allowed a merging of existing resources and a crossing of respective competencies but also the creation of new training courses and appropriate curriculums, notably favouring a pedagogy focused on projects. The objective remains to meet professional needs that do not stem from classical training and therefore require the design of specific active pedagogies.

The heuristic value of these new programmes, born of a cross fertilisation between the two institutions, has been given further added value with the participation of companies which have committed to helping with the pedagogical aspects of the training, similar to Veolia and Alcatel.

The need for specialised training

Training young professionals for the problems facing urban networks in the cities of the developing world is the great ambition behind the ISUR Master. Its originality is that it doesn't relate to only one network and service and that the way in which it is governed is subject to particular attention. Professionals who work on urban services in developing countries must be brought to question themselves on the management and decision processes, from the different forms of delegation all the way to the evolution of monetary systems, tariff setting, investments, accessibility and mobility while taking into account the needs of the different parties invested in the domain of networked urban services, whether they be local and regional authorities, large network operators, donors, national and international coops or even think tanks specialised in these activities.

The necessary multidisciplinary approach

The diversity of disciplinary approaches is necessary to face the complexity and particularities of local contexts in cities of the developing world when analyzing networked urban services. This multidisciplinary approach requires the articulation of different assessment tools and a mix of professionals who contribute to the Master degree (civil engineers, telecommunication engineers, urban planners, economists, financial analysts, geographers, sociologists, historians...). This multidisciplinary approach is a prerequisite to apprehending the various conditions for exercising social engineering, within the context of setting up vast planning projects.

The necessity of training by professionals

80% of the training dispensed within the ISUR Master is done by professionals belonging to all relevant structures (consulting firms, private operators, bilateral and decentralized coop, urban agency, research bodies). This collaboration allows the effective transfer of competencies and know-how. Thanks to the addition of professional trainers, students learn to work with assessment tools and real world analyses, which place them in real situations.

The importance of professional networks

Professional networks can have a lot to say on the training of young professionals and the Master aims to add them to the students' training. Partnerships have been built with AdP-Villes en développement, the PFVT, Veolia, the Groupe-Huit, the AFD and more. These exchanges have allowed to grow the pedagogic map and to stay close to reality and the needs of work on the ground. The objective is to create a permanent dialogue and reflection, to anticipate the training needs and to mobilise expert networks on controversial subjects to better build shared projects.

The primacy of collective apprenticeship

The priority given to pedagogy by project translates via a collective apprenticeship which takes the shape of work undertaken in groups throughout the year, started and overseen by the Master's tutors and the professional trainers. This apprenticeship privileges project management, knowledge sharing and reflection as well as shared progression towards objectives defined communally. The different specialized exercises as well as the shared level testify to this want of sharing competences within the scope of the Master. Team spirit, intellectual opening, listening and responsibility are also part of this project pedagogy.

Exemplary hands-on experience

Students of the ISUR Master are asked to manage projects during their degree which place them in situations where they have to evaluate and decide using professional methods and techniques: analysing responses to call for offers, formalising requirements for evolution based on concrete, studied situations, acquiring content via practice during lengthy placements etc. The degree's professional partners allow students to find quality placements, which they are required to do in pair for a minimum of 18 weeks in a city of a developing country. The placement extends the degree's training and professionals are once more asked to shadow and evaluate the students' experience and their scores.

The wish to attain diversity in recruitment

The objective is to ensure mixed promotions, by diversifying admissions with students from France and abroad, females and males, from different disciplines (Sciences Po, engineers, architects, urban planners...), in the first stages of their training or on vocational training, all in the hope of benefiting from their diversity in the course of the work. The complimentary nature of the students' profile is a necessity, in direct response to the multidimensional requirements of professional needs. To achieve the necessary degree of quality and ensure alignment with the shadowing requirements of professionals, promotions are voluntarily reduced to 20 students. This is not gratuitous elitism but rather a will to maintain the level of requirement and motivation tied to the degree.

The necessary international dimension

This allows a broadening of the fields of experimentation, an open implication for competences and reflection as well as the renewing of questions that arise from the diversity of contexts and preoccupations. These advantages are made possible by the collective work of the Master's many promotions intended to compile an expert report on networked urban services in cities of the developing world. The final stage, done in pair, allows the students to complete their knowledge thanks to on the ground experience with the help of degree tutors and professionals.

Finally decompartmentalisation teachers and the practices of young professionals with the aim of acquiring renewed multidisciplinary competences can contribute to a better response to the challenge of development and management of networked urban services in developing countries.



Chapter 5

**What social role
for services?**

Chapter 5

What social role for services?

Faced with the economic crisis and the exclusion of certain citizens, urban services have an important social role to play. The "right to the city" cannot limit itself to a "right to be lodged" which is often difficult to apply. The concept must be broadened by incorporating everything that represents the city, notably urban services. Rich or poor, everyone intends to use running water, have their street cleaned and their rubbish picked up. The welfare state has passed by even if the right to energy and public transport raises issues. In fact an urban service isn't only a technical offer which needs to be put in place, it's also about a price scale which will make the offer usable by the most amount of people, or not. Social cohesion is, we often forget, the third pillar of stable development. A sustainable city is therefore also a city of solidarity where the levels of urban services do not change according to neighbourhoods or the wealth of its inhabitants. Urban services are powerful tools for social integration and cohesion. How to ensure their universal characteristics and guarantee their free access in a context of economic hardship and widening social and territorial disparity? We will find in this chapter various contributions to this idea.

In a first article, Henri SMETS, from the Academie de L'Eau (Water Academy), looks at the mechanisms that allow for the affordable pricing of water for those who need it most. Looking over a certain number of French experiences in that field, notably that of the city of Dunkerque, he analyzes the difficulties of applying such mechanisms. The precise identification of "those who need it most" is a first obstacle as it necessitates access to administrative and social records the origin and exploitation of which can cause problems. The technical choice of how to apply reduced tariffs and the ways in which it is compensated with regards to all consumers are other issues. First band of consumption offered for free or for a reduced price, evolution of the prices depending on consumption, prices tied to the user's income, "water allocation" compensation allocated to the poorest consumers etc many solutions have been experimented with. The social price of water, concludes the author, still awaits the law that will render it fully operational.

The article by Frank RIGOLLE, from the Poitiers Mayor's office, looks at an "urban object", the street, the apparent banality of which shouldn't mask the important role it plays in the daily lives of city dwellers. The street, the first urban service, is of course the place in which we move and from which we access lodgings. It is also where we talk, where we observe, where we sometimes play and fix things. Fixing a street is not an easy job and the article proves it. The author points to ulterior motives and highlights the contradictory wishes that make it difficult to obtain consensus on a project. The author proposes a method put into practice in Poitiers which allows the removal of opposition and completion of a project within an established time frame, thanks to consultation, that everyone agrees on.

In a last article, Joel FORESTIER and Sophie DAGNAUD, from the Direction des déchets of Nantes Métropole (Nantes Waste Management Service), tell how they have managed

to mobilise the inhabitants of the greater Nantes area to take part in waste collecting and valorisation programmes. This action, which is part of the "Grenelle Environment Forum", has taken different shapes. It included help for individual composting in residential districts (13,500 lodgings). It promoted collective-scale composting and the swapping of skills in communal buildings by relying on a specialised association. It also conducted an experiment in "waste recovery" where, with the help of integration structures, it was possible to recycle and valorise abandoned objects. In all cases the involvement of citizens was systematically sought.



Water at an affordable price for those who need it most

by Henri Smets, Academy of Water

In July 2012, French prime minister Jean-Marc Ayrault declared: 'We will put in place a progressive tariff with a double objective, social and ecological. This objective aims to reduce judicial constraints that stop water and sanitation local authorities from benefiting of the progressive tariff. In September 2012, the government submitted a law amendment that, once adopted, would allow to partially free the progressive tariff from the judicial claws it finds itself in. The way is lit for affordable water tariffs for those who need it most...

New initiatives

Without waiting for the law to be passed, cities such as Dunkerque have adopted a social tariff for water (see box 1). Paris did it before by helping since 2011 4% of households to pay their water while Libourne set the precedent in 2010 by offering to all a water quota at a symbolic price. Other cities have opted for the distribution of water checks to households who need it, based on a scale that is becoming increasingly more important (see box 2).

Water tariffs are controlled by local authorities who benefit, in principle, of large potentials to introduce any necessary tariff reforms. They can put in place dual tariffs, progressive tariffs¹, seasonal tariffs or even social tariffs. They are not obliged to create a progressive tariff but they have the moral duty of bettering access to drinking water and sanitation for all.

Constraints in tariff setting for household water

While very free in their choices of water tariffs, local authorities must respect the constitution, international treaties, EC law, laws and general principles of what is right. In particular, tariffs that are applicable to different categories of users cannot differ from each other too much for similar consumption levels or they risk being seen as unfair or even discriminatory and thus potentially ruled to be illegal (due to violation of the principle of equality). This risk is not theoretical: the State Council has censured millions of EDF (French Electricity Board) bills which were found to be illegal. Tariff setting for drinking water and sanitation should contribute to the sustainability of these services and ensure a just split of the services' spending between all users. Firstly, authorities should balance income and spending from water and sanitation services (financial aim set in law). Secondly they should give to all access to drinking water and sanitation that is affordable (social aim set in law). Furthermore they often have environmental concerns. We foster savings for drinking water but keep an eye on not penalizing big families with tariffs that are out of reach. Regardless it should be remembered that the reduction in consumption within households can have negative effects if the networks aren't equipped to handle sensibly reduced volumes of water. Even though the law doesn't state it, a good water tariff should guarantee households of 2 to 5 people a unified price for their water consumption.

Different tariffs for households

Creating a first band of water consumption at a reduced price will enable guaranteed access to drinking water for all. This egalitarian measure works by making the first cubic meters of water cheaper than the standard price even if it means increasing the cost of the highest consumptions. This practice generally implies the reduction of the subscription price (partly fixed) and of the unit price of the first cubic meters consumed in order that the median price paid by smaller households within the first band of water consumption does not go over the median price for consumers in standard households. In the same spirit we can include in the tariff a small band of consumption at a symbolic price to satisfy the vital needs of households. Thus in Libourne, as in Beauvais, the price of the first band of 15 cubic meters per year was brought down to 10 cents per cubic meter. In Roquevaire the price is even more symbolic: 3.3 cents per cubic meter. With this approach we can recoup within bills variable parts that are much higher than the variable costs of the service.

The particular case of shared buildings

Within buildings with a single, collective meter it is hard to create a progressive tariff that is fair without knowing the number of users served in the building. As the size of lodgings isn't proportional to the size of households, smaller households within large flats will continue to subsidize the water of large households in smaller apartments. If we knew the number of people in the lodgings it may be possible to make use of a progressive tariff within buildings without individual meters. This solution is already in place in Spain, Portugal and Belgium and should shortly be put into place in France.

Affordable tariff according to French law

The social consensus as expressed by the French parliament and the Conseil National de L'Eau (National Water Council) is that all households should not spend more than 3% of their income for drinking water and sanitation expenses. This objective has been taken on by many water providers such as SEDIF. It is of particular interest to poorer households as water, which is generally less than 1% of the budget of medium-sized households, can make up more than 5% of the budget for those entitled to the RSA base in certain cities.

Even with the existence of a progressive tariff, the price of water paid by the poorest households risks being considered unaffordable. For the poorest users we will no doubt need to add to the progressive tariff a further reduced tariff, for the benefit of a small number of people, also called social tariff, or by giving them a proactive assistance that can be used towards water payments. This movement has started and could grow in size if the law being discussed allows the circumvention of certain judicial obstacles.

The difficulties that need dealing with consist of defining the category or categories of the potential beneficiaries of these measures and of choosing procedures that are such that almost all of these beneficiaries effectively receive the aid, which they are entitled to. The rate of unclaimed welfare benefits is sometimes quite high due to the complexity of certain claiming procedures. Thus 35% of those eligible to the RSA Socle (previously RMI) do not claim it despite being in dire need of it. The rate of those not claiming their social tariff for energy reaches 68%. In the case of the latter the procedure was finally automatized in 2012, which has allowed for a better effectiveness in the distribution of aid. As French law recognised the right of each and everyone to benefit from drinking water at a reasonable price in

order to satisfy basic needs, the local authorities should choose tariff or assistance terms such that everyone pays for drinking water at a price which is not in excess to their means!



DUNKERQUE SETS UP FRANCE'S FIRST SOCIAL WATER TARIFF

In Dunkerque the water tariff for households is now progressive. Among a total of 84,600 water-consuming households, 8,600 households with a low income freely benefit of the CMU-C complimentary medical cover. In addition, within the scope of the new water tariff, these low-income households receive a reduced tariff from their water providers of 0.51 Euro per square meter in relation to the price of the first band of their water consumption (up to 75 cubic meters per year). The aid received in the name of this social tariff is of 38 Euros on a normal bill of 88 Euros for a water consumption of 75 cubic meters, or an aid of 43%.

The list of beneficiaries of CMU-C is sent to the provider by the health insurance companies which allow to automatically distribute tariff deductions tied to the social tariff to all low-income beneficiaries.

Information about the makeup of households not being available a corrective system was introduced for bigger households in the form of water cheques that can be obtained with supporting documents. A total of 1,800 households of more than 5 people will benefit from a water cheque of 12 Euros per year, per person beyond the fifth person. In buildings with a single meter (20% of consumers) a water cheque of 40 Euros will be given to poor households as it's not possible to introduce deductions on water bills. The financing of this social tariff is possible by the solidarity between all water consumers.

The change of tariff in Dunkerque manifested with a tariff reduction for 80% of consumers who do not receive the CMU-C. Thus a family of 4 who consume 90 cubic meters per year will benefit from a reduction of 8.86 Euros per year compared to their initial tariff. If the family is a beneficiary of the CMU-C, the reduction rises to 48.42 Euros per year.

But at this stage it is not an obligation on municipalities or its departments as the law omitted to specify to whom the task belonged.

To better the situation two approaches have been put in place on a voluntary basis:

a/ the adoption of a tariff reduction, that is a special reduced tariff reserved for the poorest (named social tariff), and
b/ the distribution of preventive aids (known as water allocations) which will be deducted from the water bills of the poorest. These may take the form of water cheques, which will be deducted from the water bills or communal charges of the building that include water supplies. These cheques could be distributed to the poorest by the CCAS or FSL, the CAF or even water providers.

In this type of solution, users in their whole finance the tariff reductions or aid attributed to a minority of users (internal equalisation).

To help all potential receivers of aid, automatic systems can be put into place that allow to identify, without excessive costs, those who should receive the social tariff. For example, water aid is given to all those who already receive a welfare allowance such as CMU-C, as is seen in Dunkerque (view Box 1). But other choices are also possible, such as for example the RSA base or certain types of lodging allowances, as exists in Paris. The amount of tariff reduction or aid will depend on the chosen indicator and the local price of water. The SEDIF, for example, finances 1 Million Euros in water cheques given to communal centres, inter-municipal social action centres or to departments (FSL). These actions are financed, ultimately, by the users. On the other hand, the General Council of each region generally offers an additional water aid to the poorest (low income aid). These regional aids could be matched, where required, by solidary aids financed at the national level, for example by a charge on water use estimated by water agencies. Even though various possibilities have been foreseen by the Parliament, no national solidarity mechanism has so far been created. Solidarity for water remains solely in the hands of the regions.

Conclusions

The introduction of a first band at reduced price is a measure which appeals to the majority of users and which is perfectly feasible if the band remains low. This measure is often combined with the creation of a band at a higher price which discourages excessive consumptions. A well conceived and progressive tariff has obvious advantages despite the complexities it introduces. It can also turn out to be deceiving if it does not produce positive results at a social level.

The lessons from Libourne showed that a progressive tariff allowed the sensible reduction of water consumption for all users and of water bills for most. The Dunkerque experiment showed that it is possible to create an automatic and progressive eco-inclusive system that marries the social and ecologic spheres. Similar results on a social level can be obtained with water cheques as long as they are distributed in significant volumes. However we have yet to see an example where a significant volume of water cheques has been distributed.

The most important aspect in terms of water aid is the total volume of aid effectively given to those who need it to allow them access to drinking water and sanitation at an affordable price. It's about helping all users in precarious situations, that is many per cents of the population, not making ourselves feel better by giving charity to a small number of people in desperate situations. Box number 2 shows that this action is possible at the local level and that it has already been put in place ahead of laws.

Social tariff for water is not yet put in practice on a grand scale in France and will only become fully operational when the aforementioned law will be passed. France, which has recognised the universal right to water, will be able to put into effect this tariff by calling on automated systems to help most of the poorest households.

The progressive tariff seems to have a bright future ahead of it thanks to the advantages it brings at a social level. This tariff can also sustain politics of reduction of water consumption without forgetting that flexibility of consumption with price is weak for households. On the other hand it does not help to reduce water spillages within distribution networks. In the case that water shortages should happen, it should be noted that the category of domestic users generally represents a low amount. It is therefore non justifiable to raise the price of water for households in order to compensate for the over consumptions by other categories of users. Raising water prices for households does however have the advantage of lightening public spending on water without impacting the competitiveness of businesses.

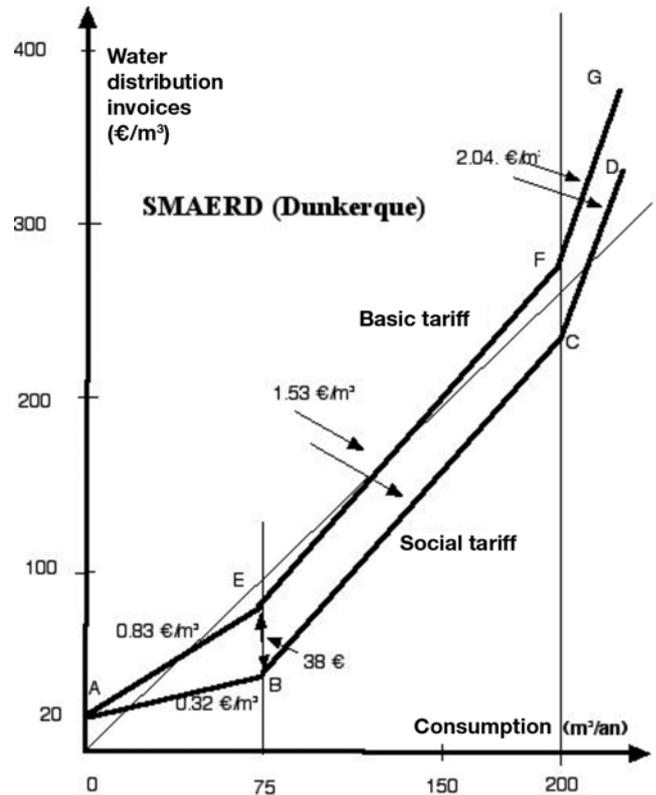


Fig. 1. Water tariffs in Dunkerque

The 3 range progressive pricing AEFGB is close to a proportional tariff when in the range 50-200m³.

Users in most need enjoy a social pricing ABCD which is a unit price in the first range (0.3 instead of 0.8€/m³). The maximum difference between the tariffs is 38€/year.

(1) Henri Smets : La tarification progressive de l'eau potable, Editions Johanet, Paris 2011. Plus d'une cinquantaine de municipalités importantes en France ont choisi le tarif progressif à deux ou trois tranches. Dans la région méditerranéenne, la France est l'un des rares pays qui n'utilise pas généralement la tarification progressive.

(2) Henri Smets : Les nouveaux tarifs pour l'eau potable, Editions Johanet, Paris, 2013. La proposition de loi Brottes « visant à préparer la transition vers un système énergétique sobre » sur le point d'être finalement adoptée établit les bases juridiques nécessaires pour une généralisation des tarifs sociaux de l'eau en France.



EXAMPLES OF SOLIDARITY MEASURES FOR WATER IN FRANCE

Helping one per cent of the population to pay their water expenses is a realistic objective that was surpassed in many French cities and also abroad. The solutions adopted to achieve it were as follows:

A/ Payment of a preventive aid / water cheque to poor households

In many municipalities, the water supplier or the city pays to the FSL or to the CCAS subventions that are then distributed between poor people to help them pay for their water consumption. The SEDIF, which serves 4 million inhabitants of the Paris suburbs, pays 1 Million Euros in water cheques or subventions to the FSL, equivalent to 50 Euros paid to 20,000 households (when the system is fully operational it should help roughly 1.1% of inhabitants).

In Limours (6,500 inhabitants), the CCAS pays 46 Euro per year to 120 households (6% of the inhabitants). In Vannes (33,545 inhabitants) the CCAS pays an aid of 77 Euros per household to 670 of them (4.6% of inhabitants). In Libourne, the delegate authority pays 1% of water fees to the CCAS. In Beauvais (55,000 inhabitants), the delegate authority gives water cheques (worth 25,000 Euros) to the CCAS for poor households. In 2011, 1,485 households were helped. Numerous other examples exist of municipalities distributing, in conjunction with delegate authorities, both curative aids for water and preventive aids (water cheques). It is a great step forward as no curative aid existed before.

B/ Water allocation tied to municipal living aid

Paris (2.2 million inhabitants) helps 44,000 households (3 million Euros) from a total of 1 million households, or 4.4% of households. This aid comes on top of that paid by the FSL for overdue water bills (5,500 households).

C/ Social water tariff

Dunkerque helps 8,600 households from a total of 84,600, or 10% of all households.

D/ Reduction of secondary costs (connection, access costs etc.)

The cities of Varcès, Allieres, and Risset have sensibly lowered the secondary costs for those entitled to APL.

NB: For a long time we only partially took in charge overdue water bills from poor people who had completely filled in a form for curative aid. The system of abandonment of claims (38,800 files in 2011) was put into place by delegates in more than 73 regions (2.5 million Euros per year). The Treasury wrote off as unrecoverable debts from clients of the water authority when water bills are perceived by the Treasury (the write offs represent roughly 2.8% of the bills' total but the precariousness of the household is not the main reason for non payments). National statistics for aid towards unpaid bills show a contribution from FSL (10 Million Euros) for 66,000 households in 71 regions, or roughly 0.2% of all households. Helping 1% of households would mean multiplying by five the actions currently put in place for water spending by the FSL.

The streets and its residents, how to appropriate a universal “urban service”

by Franck Rigolle, Poitiers Mayor’s office

We’ll talk about the street of mister everybody, the neighbourhood street, the street which never makes itself heard, the street that constitutes the urban tissue of the city and where the majority of inhabitants live. Why talk about “my” street? Because they will develop it.

Introduction

I won’t be talking of the street of a new Habitat UDZ, nor the city centre street renovated under the aesthetic authority of a great architect, nor the street traversed or borrowed by a TCSP (be it named TRAM or its modest version BRTS).

I want to talk about the street of mister everybody, the neighbourhood street, the one which never makes itself heard, which constitutes the urban tissue of the city and where the majority of inhabitants live.

Why talk about my street? Because they will develop it.

Based on a process that only they know, made of returning moaners, accumulated potholes, programmed network renovations, the necessity of finding a second itinerary tied with another project, of hazards and accumulated “pieces” of credits, the technical services have designated, amid hundreds, my street as candidate and it has been validated by the man in charge.

This is the decision, my street, a residential street with no public equipment – the school is on the next street along – and which is also not a commercial street, even if the neighbourhood shop at the end of it does bring us some benefits, and sometimes some problems, is to be revamped.

This project, an exceptional one for residents – at best a street is revamped every 30 to 40 years, or twice per century – is almost banal for technical services.

It’s the preserve of technical services. The game comprises between 3 and 6 streets per year, or around 30 streets per mandate. It’s not yet an industrial system but it’s far from the prototype of public works.

After confronting the respective views of residents and technical services on the street to be revamped, we will examine the actual process of consultation and the ways of amelioration that we envision.

Usages and challenges

What is my street for?

Merely 30 years ago, my grand-father, on the Belgian border, would put his chair on the pavement soon as a ray of sun appeared and would make use of the street even though he had a back garden.

Even today, while on holiday in a small Spanish village, every night we put out the badminton net across the street and it transforms itself in a space of games and friendliness with our neighbours despite the language barrier.

In every city, today, the spirit of community favours neighbourhood parties, neighbourly diners, symbol of living together and the spirit of citizenship.

And within all this, what’s my street for?

To fix kids’ bikes on the pavement? Play football? Learn to cycle? Talk with my neighbour? Take it easy? Call people? Wait? For my daughter, the removal truck, my friends, the postman? Read? Parking? Driving?

What needs does it answer? Access for residents, access to the neighbourhood, a transit road, an alternative route, a bus route?

Depending on the physical characteristics of the street, its accepted or tolerated uses and its explicit or underlying challenges influence a space-sharing project and its rules of behaviour:

The promise of the idealised street versus requirements of robustness and adaptability

When a resident learns that his street will be revamped, he immediately hears, consciously or not, the promise of an idealised street where thanks to the forthcoming revamping work, the rules of the city will be respected:

- Upon completion of the works, motorists will drive slower
- All residents will have their parking spot, always free, reserved, in front of their house.
- Noise will cease.
- Annoyances (detritus, dog poo, bin permanently located on the pavement) will disappear.
- Pavements will be freed so that children can go to school safely.
- Moving by foot will be a pleasure.
- And finally, if he owns his house, the resident expects an increase in the value of his property and of his address.

When we, the services, think about the revamping of a street, we think about:

- A street up to norms: accessibility, gyration, networks, panels, fires, lighting, etc.;
- A robust street: where the materials (of which we’ll have made certain choices based on taste/trends/aesthetics) will need to last for the next 30 years, where the revamping choices will need to accommodate daily waste collection, fire engines, delivery trucks, removals, making us think about gyration, storage, access, rhythm, and where the problems tied to maintenance and upkeep will have been integrated;

- A street able to receive urban services and adaptable:

If the radius of gyration of the refuse collection truck is an integrated and accepted constraint, it's a different matter for pre-collection equipment (bins, containers, etc.) which often suffer from the NIMBY complex usually found when dealing with refuse: I don't want the glass container near my house, my bin is clean and well presented, that of the neighbour stinks and is always misplaced between collection hours this regular stream of micro-uncivil behaviour is often a source of discord in public meetings.

When it comes to water and sanitation, these networks are generally underground and do not cause issues with the sacred parking spots. Of course they delay greatly the needed time for works because technical services refuse to carry out a complete revamping of public spaces without taking the precaution of ensuring that networks will remain more or less ok for the next ten years, but generally these kinds of works on networks are easily accepted. The changing of lead service pipes in our time of zero risk is socially wished for and the dimensioning of waste water and rain water networks is not a subject of discussion: make it go away from my street and do it well.

As for buses, also sometimes subject to NIMBY, I don't want the stop in front of my house, they are generally well received and changes and adaptations to it are accepted. Even if my street does not have a bus line running through it, the question of knowing whether or not in case of temporary or definitive changes a bus line will come through it is an important one for the structure of the street, its dimensioning and therefore the development costs.

In all cases, during work phases, the know-how of services and dealers allows the resident to benefit in a normal, or slightly diminished, way of its urban services.

And yet we get there, what methods and what limits?

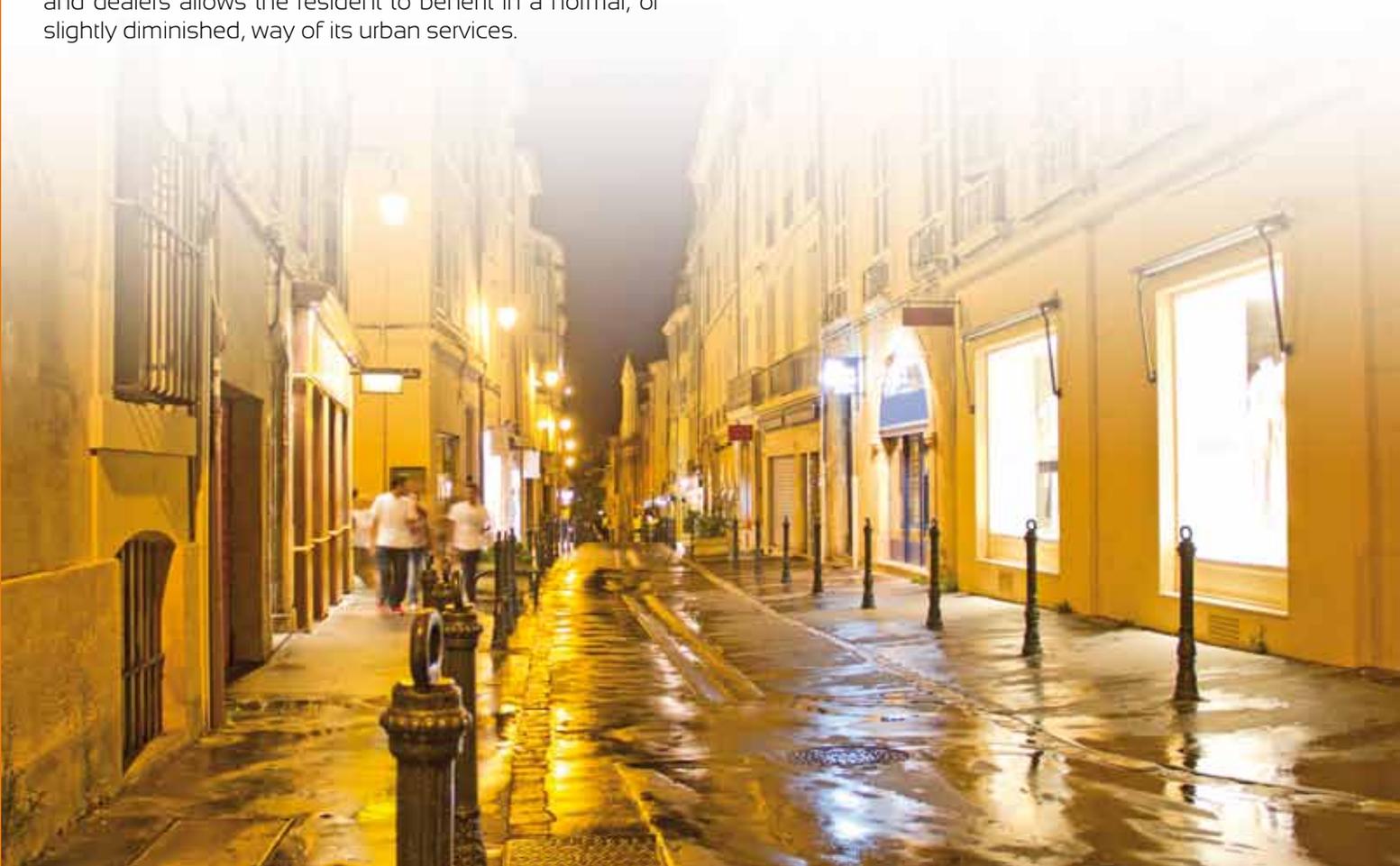
Today in Poitiers, when everything goes well, the revamping of a street means a minimum of three public meetings.

- one launch meeting, with no plan, where we exchange our challenges we identified and listen to, as much as possible, the demands of those who have made the effort to come, among which the "professionals" of neighbourhood consultation;
- one meeting to present the project this time with the development plan elaborated by our services;
- one meeting to begin the works and explain its constraints: phasings, modification of circulation schemes, impact on parking and waste collection, etc.

Thus, and at least three times, under the pleasant presiding of the elected official in charge of highways, services explain their choices, propose, try to listen to and to bring together the expectations of the choices they have taken. Every time, there is a note on the website, an article in the press, a flyer this is consultation.

Are the participants satisfied? Do they carry with them the needs of the street? Of the neighbourhood? Did we listen to them? How did we answer? Do we speak the same language?

We don't know and we have a project to put out a satisfaction survey on one of our latest revamping projects to try and learn what the resident understands and accepts and what satisfies him.



SATISFACTION SURVEY / EVALUATION

How is the revamping of a street (the end result but also the way of doing it) understood, perceived, imagined, wished for by the residents of the neighbourhood?

Why a satisfaction survey?

A satisfaction survey for a street recently renovated (a normal project for us but extraordinary for its residents) to understand:

- what the residents have understood of the challenges of the city and of the consultation phase;
- what the residents think of the execution of works (networks, use of public space), if they perceive the constraints, how they understand them;
- what the residents perceive of the services' efforts during the phase of works to bring to them "normal" services: waste collection, stationing, access, water, pedestrian access etc. / It's incredible, it's our job but it's invisible.

In my mind this survey is a lever for change almost independently from the results of the survey and should help us improve the internal production quality, to challenge our processes and especially the under-process of design and discussion:

- confront the conception of projects and their implementation with regards to assessing usage;
- evaluating the challenges, the construction of the programme;
- construct a discourse of the city, the rules of the "game", identify the "game" zones proposed to residents in tandem with dialogue.

Isn't the image that residents have in mind of our revamping project that of a sanitized city where, thanks to the magic of revamping, each citizen is endowed with an exacerbated civic sense of duty, everyone respects everyone else from motorists to pedestrians everyone brings their bins back in, drives slowly, picks up rubbish after them etc.?

What is the border between dialogue and co-design?

In a time where the youngest among us contribute to many blogs, regularly like or unlike with their smartphones, browse Facebook pages for their cities, neighbourhoods, opinion leaders, is consultation based on public meetings enough, adequate? Will a grandma who doesn't wish to meet her annoying neighbour be more attracted by a different approach where she can question and give her opinion on the project?

The English have deployed for many years now consultation methods that are much more open with games and co-conception alongside residents. (www.sustrans.org.uk - DIY Streets Do It Yourself where residents can take part in a re-design of their street so that it becomes more respected, safer, more attractive, and more pleasant to live in).

The German are developing processes of street production in two phases: the first building site, classic, closer to our public market of works and the second one where the residents are invited to take the public space, create it, modify it, make it live.

If these experiences by our neighbours seem today very ambitious compared to our day to day, we often find ourselves facing a lack of capacity to debate between services and participants of public meetings: how to get out of the "I want MY parking space", how to share and convince on the challenges of a street which cannot be reduced to a role of parking/movement?

In order to facilitate this debate, build the appropriation of challenges by citizens, we are examining the potential to create a common language, a sort of "street for dummies" in order to escape the unique "utilitarian" vision of the street, in order to get rid of common codes and avoid the frontal impact between "I want my parking space" and "the development of public spaces or green areas will create a street we can live in".

Building a common language, putting into place tools for sharing (website, systems of question and answer etc), undertaking the evaluation of completed works via a systemised satisfaction survey, that is the lead we examine. We hope that our efforts to better consultation (debate) by the implementation of a common language (street for dummies) will allow moving forward between the egoistical expectations (me first, my parking space, my pavement etc) and the willingness to go towards more of "us" (local solidarity, street life, shared spaces, etc.).

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Mobilizing residents for waste collection, the Nantes experience

by Joël Forestier, Director of the Waste Division at the Environment and Urban Services Department, and Sophie Dagnaud, in charge of prevention at the Waste Division of Nantes Métropole

In the framework of its Waste Action Plan, and specifically as part of its waste prevention actions, the urban community of Nantes, known as Nantes Métropole, has developed close partnerships with social economy organizations and professional integration structures specialized in composting, recycling and reuse to support the implementation of its actions at the grassroots level. These actions fall within the framework of both European guidelines (Waste Framework Directive n° 2008/98/EC dated 19 November 2008) and national guidelines (Programming Acts for the implementation of the Grenelle Environmental Initiative dated 03.08.09 and 12.07.10) that give priority to waste prevention, ahead of reuse, recycling, recovery (particularly waste-to-energy conversion) and elimination in the hierarchy of waste management methods. This experience is worth relating...

The implementation of the Waste Action Plan and citizen mobilization

The Grenelle laws defined reduction and recovery objectives for 2012, including notably a 7% decrease in the quantity of household waste produced in 5 years and a 15% decrease in the quantities to be incinerated or landfilled. For the Nantes urban community, the decrease in household waste between 2006 and 2011 meets the Grenelle's objective of 7%, with waste production in 2011 at 336 kg per inhabitant. Applied to the next 5 years, this effort must be maintained to continue to drop the tonnage down to 316 kg per inhabitant in 2014.

To implement these actions, Nantes Métropole decided to promote changes in behavior by supporting and giving weight to citizen initiatives concerning waste management questions and, more generally, ways of improving the quality of life of residents in their communities. Two examples are given to illustrate these citizens' initiatives.

The promotion of composting in the districts and social housing developments

Nantes Métropole is encouraging composting through different actions:

Support to individual composting:

In July 2010, following successful pilot operations in 2005 and 2007 in three zones (Orvault, Bouguenais and districts of Nantes) of the 24 municipalities of the metropolitan area (8,300 households equipped with a composter, average decrease of 10 kg per inhabitant of organic waste in the residual trash), Nantes Métropole decided to continue its incentive policy for residents by proposing a new incentive to buy an individual composter or wormbin (20€ of purchase reimbursed per household).

Since the start of these incentives, 13,500 households (11% of individual homes) have been equipped and almost 5,000 took advantage of the 20 € subsidy. This represents roughly 950 tons of waste that are not binned (calculation hypothesis: 70 kg/household/year of composted waste). A survey carried out in January 2013 made it possible to complete this data and to assess citizen awareness of Nantes Métropole's composting promotion measures

(individual and collective), to have more information concerning citizen's attitudes regarding composting and their practices (in particular to assess the share of households that currently compost, with or without incentives from the municipality), to identify drivers and impediments to composting, etc. in order to maintain or build up the Nantes Métropole offer.

Support for collective composting:

Collective or shared composting allows the residents of a neighborhood or building to deposit their kitchen waste in an adapted shed, installed in a public or private space (in a shared garden, at the foot of apartment buildings, green space, etc.). These composting areas are regularly open to the residents, with a system where residents themselves are on duty, thereby creating a place meet, to discuss and exchange experiences with the population.

Nantes Métropole has supported the non-profit association Compostri since 2007 to develop collective composting with residents and public establishments (mostly schools).

The public authorities have several goals:

- to encourage as many people as possible to compost,
- to mobilize and involve citizens in collective projects in their communities,
- to inform and raise awareness about waste: organization of practical workshops, practical tips in the "waste" guide intended for residents, school events, etc.

To date, almost 70 facilities have been installed; half are managed by residents in their neighborhoods or at the foot of their buildings, and the other half concern schools. At the end of 2012, 10 of the 24 municipalities had set up facilities and in the city of Nantes itself, 9 of the 11 districts had at least a shed. In total, roughly 1400 households compost in a collective manner.

The implementation of composting projects requires an essential element: resident involvement in the project, which is indispensable for the sustainable success of composting. The residents take ownership of the projects and begin to manage their organic waste independently. The association Compostri, in association with its partners (Atao



A second life for objects: encouraging residents to give away their old objects, furniture and clothing rather than throwing them away

In order to encourage better management of “bulky” waste and to encourage the reuse of objects, Nantes Métropole is working in partnership with associations, professional integration structures and social landlords to set up “ressourceries®” (resourceries) and object drop-off centers to encourage reuse in the neighborhoods.

The ressourceries® collect used objects, furniture, decorations... to repair them if necessary and to sell them at a modest price while raising the environmental awareness of residents.

Since 2012, these partnerships organized by Nantes Métropole made it possible set up spaces in the metropolitan area’s waste collection centers where residents can donate objects to partner associations and professional integration structures:

- 3 professional integration structures located at Saint-Herblain:
 - LE RELAIS ATLANTIQUE, collects clothing, linen, and shoes,
 - L’HOMME DEBOUT, collects mainly furniture,
 - ENVIE 44, collects electrical and electronic equipment
- 2 ressourceries®, La Ressourcerie de l’Île in Rezé and L’Atelier du Retz Emploi in Pellerin.

In the districts and especially in social housing neighborhoods, a participatory movement is being created. Nantes Métropole’s action is based on the synergies created between partners, project organizers in the neighborhoods, social landlords, residents’ associations and others, as well as on the organization of meetings, the sharing of experience, the dissemination of information concerning the projects (directory of associations, project mapping...) and support provided to project organizers.

These shared composting or resourcery projects in the neighborhoods show that, beyond their impact on waste reduction¹ (1/3 of bin content, or roughly 120 kg per inhabitant is compostable. According to the Ademe, reuse makes it possible to avoid throwing away roughly 20 kg per inhabitant that end up in the trash or waste collection centers), they enable residents to take ownership of their environment and they create areas of activity. They are also vectors of socialization and civic involvement. For object reuse, the resourceries provides access to objects for people in need.

professional integration structure, residents’ associations, etc.), accompanies and trains the residents, coordinates the network of volunteers involved in this practice, sets up composting equipment and is in charge of monitoring and assessment. These composting projects are opportunities for residents to meet up and work on common actions: presentations during annual meetings of co-owners, leading meetings for the volunteers who manage and staff the composting sheds, events to celebrate the opening of composting facilities (inauguration of the equipment, residents on duty during the opening of the shed, etc.).

Nantes Métropole also supports the implementation of these projects in social housing areas by developing partnerships with the social landlords, creating networks comprising associations and landlords, and training partners, etc. Initially started with Nantes Habitat, the historic landlord of the city of Nantes, (leading social landlord in western France, managing over 24,000 dwellings and equivalents), the partnership made it possible to raise staff awareness, notably in the local agencies in the neighborhoods, to inform tenants and identify requests for projects.

A first composting shed was thus inaugurated in the autumn of 2012 in the Nantes Nord district, followed by other projects in 2013. Thanks to the positive results developed with Nantes Habitat, this system is being developed with other social landlords in the metropolitan area.

A few results: A trial carried out in two municipalities in 2007, with a strong incentive to equip homes with individual composters (roughly 50%, or almost 6300 households equipped) made it possible to measure a real decrease of 6 to 7% in household waste (some 16 to 19 kg/inhabitant/year) and a 7% decrease in the plant waste brought to the waste collection site.

Zoom sur les acteurs

L'Atelier du Retz Emploi, Gildas Houssais, director:

“The two aims of the association created in 2006 are to find new uses for as many objects as possible in waste collections centers and to create jobs. A professional integration company for 3 years, the structure's aim is now to maintain the jobs of its nine employees and to build up their professional skills. The association runs two shops that sell the objects collected at low prices to give them a second life: clothing, dishes, furniture, etc. The idea is to make it possible for people in difficulty to make purchases. The association will go to people's homes free of charge to collect objects. And to boost their efficiency, the Atelier du Retz Emploi is now present in two of the city's waste collection centers. Awareness raising is done in schools and in other structures to teach people to be eco-citizens. The work done jointly by the actors of the social economy and the local authorities is beneficial. We feel that we are heard and there is real recognition for the work done.”

www.l'atelierduretzemploi.free.fr

COMPOSTRI, Pascal Retiere, Director:

“At the request of some residents, the neighborhood's first composter was set up in 2006 with the support of the association Compostri on Quai de Trentemoult, in Rezé. Created in 2007, Compostri's goal is to develop collective composting in the city of Nantes and to create social interaction and local jobs. “Composting is a real solution to reduce our waste, such as coffee grounds, fruit and vegetable peels, tea leaves, etc. Fermentable waste represents one third of the volume in our bins, i.e. 125 kg per year per household. We have set up some sixty shared composting sites. The sheds have been set up in different neighborhoods, at the foot of apartment buildings, in community gardens, schools and other collective structures (retirement homes, community centers), etc. Compostri, financed by Nantes Métropole and the Loire Atlantique County Council, with its staff of four, is planning on installing its composting sheds throughout the department. In the long term, we would like to set up a network of composting guides to train and support users, raise awareness, organize events and monitor the operation of each composting shed.”

www.compostri.ouvaton.org

La Ressourcerie de l'île, Laurence Roussel, director:

“Certain people can't come to us, so we go to them “ Based on this concept, the association Ecorev, that works on the reuse of waste, launched their Util'o'bus in late October. It's a travelling thrift shop. “We have been working on this project for a year and a half”, indicated Laurence Roussel, the director of Ecorev, “in collaboration with the neighborhoods in which we observed that there was a real need”. The Semitan* was therefore called on. “We created a partnership with the Semitan that provides us with an unused bus that they refitted and repainted for us”. The bus decorated with the Ecorev colors will carry an on-board shop and will drive through certain neighborhoods of Nantes. “Les Dervallières and La Bottière to begin”, said Laurence. “We worked with community workers upstream, as close as possible to the residents and we saw that it was difficult for them to come to us”. During events such as Sustainable Development Week or Waste Reduction Week, the association carried out “prefiguration” operations. For one of these events, a “show apartment” was created with everyday objects for sale: dishes, decorations, furniture, etc. “This worked really well”, explained Laurence, “and it allowed us to best target the needs of the residents”.

(* SEMITAN is a semi-public company that operates the urban public transport system in Nantes Métropole. The Util'o'bus essentially proposes dishes, small furniture, clothing, decorative objects and toys. It makes a monthly half day stop in each neighborhood.

This operation is aimed to be a lasting one and will initially be tested for a two-year period. It enabled the hiring of a new employee in this association that had a headcount of 17.”

www.laressourceriedelile.com



Chapter 6

How do citizens perceive and imagine services?

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Technicians build systems to meet the needs of city residents but what do these residents build with the systems that they are provided with? Do they perceive them for what they really are or do they imagine them otherwise? How do they repurpose them? Water and waste have a high symbolic value in the subconscious mind of all individuals but how is this symbolic value projected onto the departments that manage them?

"Water comes from the tap just like electricity comes from the socket and money from the bank", stated Alfred Sauvy. Up to what point are city residents interested in the reality and complexity of the systems that they use? Do they really feel completely without responsibility? Are they really expecting a sterile city, without any dangers, that effortlessly provides them with all their essential needs? If the answer is yes, how can we guarantee them this type of service? Is a sustainable city really one without any risks?

We have observed that reintroducing the citizen/urbanite/taxpayer/customer/resident into the process of rethinking services is far from simple and raises questions that go well beyond those normally taken into account in their management. And yet, this is the delicate question that the authors of this article have tried to address in this chapter.

The first article, proposed by Jean-Yves TOUSSAINT and Sophie VAREILLES, directly addresses the system/practices relationship. They put forward that, although a system is originally created to meet an identified need, this system, by virtue of its simple existence and the "offer of practices" that it proposes, will lead to the development of new practices, which can be in line with those expected or sometimes completely different. Any new system can hence be seen as an instrument capable of allowing its users to understand the world differently and thus to live in it differently. The ability of citizens to take ownership of new systems is therefore difficult to anticipate. From this observation, we could doubtless infer that an approach integrating a high reaction/retroaction capacity associated with the implementation of means to observe practices will be more effective to work towards a sustainable city than an approach strictly based on planning.

This thinking is well illustrated in the article written by Guillaume FABUREL who proposes to design ecodistricts using an approach based on the analysis of the real values perceived by the residents (solidarity, mutual assistance, conviviality, sharing, etc.) rather than on high principles set out a priori that measure performances in a very compartmentalized way. Guillaume FABUREL thus indicates, in a way that is quite consistent with the analysis made in the first article, that users in ecodistricts are simply restricted to the role of "consumers of space, shapes and esthetics" to whom "virtuous attitudes and behaviors" must be taught.

Three other articles present original and completed projects with citizens involved in shaping future services.

The first experiment, proposed by Rémi BARBIER and Clémence BEDU, presents the creation and the work of a "citizens' workshop" whose aim is to "collectively determine methods to enable a greater involvement of residents in water service governance". This approach is interesting because it has two levels. It doesn't only aim to have citizens contributing to the organization of the service, but also contributing to think about how they can better contribute as time goes on.

The second experiment, carried out in Nantes Métropole like the previous one, is presented by Paul CLOUTOUR and Laurent COMÉLIAU. It deals with a completely different subject: the way to reduce greenhouse gas emissions in the city. It is also different in that it involves a lot more people (150 people instead of a dozen). One of the most interesting aspects is the very high level of involvement of the participants who accepted to participate in 7 work weekends organized throughout one year.

The last experiment comes from further afield and concerns water management in Melbourne. Presented by Tim FLETCHER, it is more standard in its form and uses more traditional means, based more on professionals and researchers than on citizens (surveys, communication and information campaigns, technical guides, modification of governance, etc.). An interesting point is that the project was simultaneously studied by a team of sociologists to try to determine the success factors for the different actions.

In any case, these three experiments show that it is possible to mobilize citizens to participate (or at least some of them) and that the question of urban services is not yet completely foreign to them.

What do citizens make from the systems that we make for them?

by Jean-Yves Toussaint and Sophie Vareilles, INSA Lyon

A city constitutes a vast artifact built by human to dispose of a more "livable" environment. This structure comprises many different systems that were designed and built by technicians to satisfy well-identified needs. But how do users use them? The original point of view developed in this article is that each time we build a new system to satisfy an identified need, this system will create a new offer and engender new practices that are potentially very different from those originally envisaged. May we conclude that it is therefore not possible to think out a city a priori by creating objects that seem necessary to its operation, since each new object will modify the demand for services?

Our research concerning the creation and uses of public urban spaces around urban water management systems leads us to several hypotheses concerning the role of technical systems and objects in daily urban activity.

Detouring and repurposing appear as the two main characteristics of the action. The term detouring refers to people's ability to imagine the many possible paths to achieve their ends. There are many ways of achieving these ends and few are direct or immediate: for example, making a glass to drink from, a bicycle to get around or a tool to dig or build. The means are regulated and not all of the paths are good or acceptable: the ends in no way justify the means (at least according to the moral precepts that define just and fair behavior for everyone). Repurposing, which ergonomists call "catachresis", refers to human beings' ability to find, in their environment, objects or systems, or more generally non-humans suited to assist them with their actions or activities. Typically, when there is no hammer at hand to nail a thumbtack or a nail into the wall, people tend to grab an object (glass, stapler, tape dispenser, etc.) and to use it as a striking tool, without making a mistake concerning its density or strength.

Detouring and repurposing fit into the same categories: they are relationships between the environment and the action here and now (action situations make the elements composing the environment in which the action takes place significant). For people, detouring and repurposing consist in finding elements in the current action's or activity's environment that can be used to meet and satisfy their needs, or if necessary, creating them. The choice of objects in the action would depend on what Gibson¹ calls "affordance", limiting it to visual perception what is perceived as useful and interesting in the action's environment and then opening it up to all living beings in the framework of ethological studies. Detouring and repurposing are specific to living beings and are derived from strategy or instrumental rationality (the adjustment of the means to the targeted ends). In other words, they fall under skills humans stand out from other living beings because they can objectivize, capitalize and pass on these skills (relationship between language and skills as constructed by anthropologists). Detouring and repurposing would be the result of an effective gesture and its learning through which Marcel Mauss² defines skills. They concern the body

and all the learning required to have it function with objects in view of an activity (learning gestures and body position, educating muscles and reflexes for both sports and tool usage. For example, learning to ride a bike starting from the ability to balance).

The city is one of the largest human artifacts, one of the technical and spatial systems that makes the world livable and that allows human beings to provide for their needs and existence. In urbanized worlds, the non-humans at the disposal of human activities (objects, systems, fauna and flora mobilized or enrolled in human activity) require organizations that ensure their existence. Hence, there are no available objects or systems in daily urban activities that do not involve one or several organizations. This is how "urban services" are rendered. In these conditions, any repurposing would be both a repurposing of the aims defined for objects and systems during their design and fabrication and the repurposing of the organizations that contribute to their existence. This is true for the urban water management systems studied. Here are two examples from among the cases studied.

The first example concerns the construction of an artificial ditch (or a "moat" in the language of its designers) in a public urban space designed halfway between a square and a public park. The layout of this moat incites children to play new games. Its access is forbidden and fencing has been installed to this end. However, the gabion wall that separates the accessible space in the garden from the moat (in fact the wall of the moat) creates possibilities for children to climb and play new games. There is little danger, not enough in any case to warrant the strict application of the rules. The moat in this way allows a certain type of learning of "disobedience" (escaping authority) and, as a result, of autonomy. The children are breaking the rules without engaging in criminal activities, by taking "risks" under the "benevolent" eyes of their parents, who see this as a way of releasing their energy and especially as a way of socializing. The gabions make new games possible: they can be imagined as ramparts or cliffs to be climbed and are also elements of an initiation ritual enabling kids to conquer their fears in the presence of others. This is how an artificial rainwater collection ditch was transformed into a playground and a place for socialization that have nothing to do with the reason for which it was built, yet

give this construction a set of meanings that enables it to be enrolled in daily urban activities that go beyond the technical and organizational objectives of sanitation.

The second example concerns the construction of a reed bed filter to ensure the retention and treatment of water from a stormwater overflow in a small housing estate. At the request of the residents, this structure, which was to have been landscaped, was fenced off instead. A palisade encloses it and prevents it from being seen. The neighbors felt that the landscaped option for this sanitation system presented more risks than advantages: risks concerning new fauna and new nocturnal human activities (groups of teenagers drinking beer and making noise, unauthorized occupation, etc.) that would tend to devalue property already considered as fragile by the owners. This palisade was chosen because it would provide the best value to the property and because it also solved a dispute between neighbors about property boundaries. As a result, the new sanitation system made it possible to solve problems that weren't linked to the alternative sanitation strategy chosen by the authority owning the structure. It was repurposed to ensure the resolving of private business. It was enrolled by the residents who found opportunities for action in it.

In these two examples and in all those that this article is based on, two elements always appear: 1) the appearance of new technical systems and objects or the modification of urban design modify practices, and 2) the new practices prompted by the objects and systems always seem obvious a posteriori.

1) The technical systems and objects constitute offers of social practices (affordances). Any new object or system that appears in the world creates a new offer of practices. In this way, urban objects and systems function like instruments: they make the world comprehensible in a different way at each of their appearances and thus participate in modifying individual and collective behavior by making it possible to carry out uses in renewed or new ways.

2) When we examine the shape of the moat or the place where the stormwater overflow equipped with a reed bed filter was built, the new practices that take place are not surprising. In fact, the fencing that is to prevent access to the moat and that creates a stimulating obstacle for children is an illustration of the placement of objects aimed to inhibit practices. The idea of landscaping the stormwater overflow also participates in the prediction of the effects of this development on the local real estate values to make it more acceptable for the residents. In other words, not just anything was taking place. The observed behaviors are not erratic and the repurposing of functions isn't random: it's the emergence of practices regulated by uses (since they can't be taken for granted and they make sense).

The new objects and systems constitute openings in the contingency of the worlds that we are building, but these openings are just as soon closed by the objects' ability to offer new methods of applying rules of usage. Once the opening is shut, the objects become native and are part of the shared goods available for the activities.

Without the opportunities for action that they offer and their enrolment in actions and activities, the technical systems and objects, as well as the organizations that participate in their existence, would be difficult to understand for urban residents and therefore difficult to be perceived in a positive light and accepted as environments in daily activities. The problems appear only when the objects and systems don't open themselves up to any new meaning and don't allow the creation of usages as new practices. In this case, the objects remain something permanently new and produce erratic practices. For example, the technical boxes in the public urban space don't signify anything for the urban residents other than "insignificant" interstices that become places of waste and unauthorized posting, conducive to behavior that must be hidden from others, incivilities and other criminal activities; in short, activities that cause scandals in common spaces. Similarly, black tarp-lined retention ponds, designed only for their technical role and "lost" in the middle of road networks or abandoned urban lands, fit into this category and can generate non-regulated practices. The only public for these objects are the roads and sanitation technicians for whom these objects have meaning. The urban public, for whom these objects and the organizations participating in their existence are intended, thus appear as erratic actors, unable to respect the objects that provide them services. In fact, this last type of object never becomes native. These particular objects are not absorbed into the daily activities of urban publics and therefore cannot contribute to the public good. Hence, they give rise to practices non-regulated by usages and thus to erratic behavior that cannot be confused with repurposing, which is actually the ability to perform usages differently by involving new objects in the practices.

(1) Gibson James, 1986, *The Ecological Approach to Visual Perception*, London-Hillsdale (NJ), Lawrence Erlbaum Associates

(2) Mauss Marcel, 1999, *Sociologie et anthropologie*, 1ère éd. 1950, Coll. Quadrige, Ed. PUF, Paris, 482 p.

How do we define and qualify a good sustainable neighbourhoods project?

by Guillaume Faburel, Professor at the Institut d'Urbanisme de Lyon, Université Lumière Lyon II, UMR Triangle (CNRS and Ecole Normale Supérieure Lyon), Coordinator of the Research Department on Amenities: Development, Environment, Territories

This article is based on the analysis of 78 sustainable neighbourhoods pre-selected for the French Ministry of Territorial Equality and Housing's call for ecodistrict projects. Its aim is to determine the basic principles and values that make it possible to judge project relevance. The main conclusion is that standard assessments measuring performances in a very compartmentalized way are not very effective and that we should replace them with an approach based on the usage values experienced by the residents.

Introduction: sustainability... the blind spot of principles and values

Due to their rapid proliferation, sustainable neighbourhoods often tend to be promoted as one of the major forms of urban development and urban planning. They seem to be becoming prototypes of urban models whose prevalence is now taken for granted. Nevertheless, though they may be seen as "a new way of thinking and acting" (PUCA, 2008), in discourse in any case, "are they really paradigm change shifters or is there an inevitable return of the 'same old thing' in their 'genetics'?" (Bonard and Matthey, 2010). For some, it would now seem appropriate, if not to answer yes (Souami, 2011), at least to plausibly define the hypothesis of change (Levy and Emelianoff, 2011).

To begin with, in France and elsewhere, sustainable neighbourhoods focused on the technological-ecological entry point (Faburel and Roché, 2012), based on the reasoned management of a set of sector-based topics (mobility, energy savings, waste collection and treatment services, qualitative and economical water management, vegetation management, etc.). All of this was essentially made possible by the innovations developed by the professionals of theoretical design. The importance of technical engineering meant that for quite some time projects focused on the physical and morphological characteristics of the territories.

Yet, "() it would seem that uses and habits, i.e. the reality of social practices in the city, create the main resistance to the development of sustainable neighbourhoods". (Renauld, 2011). And these social practices can reveal lifestyles and living styles in the district that may be based on certain values and certain principles⁴, whose analysis was sidelined for a long time due to the essentially technical

approach. In 2012, we researched this topic for the firm AD4 and for the Eco-Neighbourhood project now organized by the French Ministry of Territorial Equality and Housing - METL (Faburel and Roché, 2012). This work is based on the analysis of all of the Eco-Neighbourhood projects submitted during the national call for projects in 2011, sorted in two phases (78 pre-selected projects and then 16 more bottom-up initiatives) in order to more precisely decode and analyze the value and principle systems used, registers of justifications, intervention repositories, etc.

The Eco-Neighbourhood project: searching for a common base of principles and values?

To begin with, we studied the ministry's Eco-Neighbourhood project. This involved observing internal meetings and discussions and then analyzing the content, with the aim to assess in vivo how principles and values were addressed, how assessment criteria were elaborated (based on what fields of knowledge and project experiences), then possibly deployed (between what type of knowledge and competencies, to what aim).

We learned that although the Eco-Neighbourhood project undeniably made it possible to bring together professionals to work on common challenges and initiatives to create sustainable territorial actions, no common framework emerged from the observed meetings and exchanges. The positions and messages heard certainly often mentioned building a common base of values and principles but according to very different experiences and justifications. Nevertheless, during the discussions, particularly in the club's assessment group, the culture of risk came out as a new paradigm, which essentially revealed the need for an instrumental or even managerial conception of the action.

From work carried out by the METL in several sessions with some fifteen participants (mainly professions associated with Assistance to the Contracting Authority, particularly architects) produced a list of 6 terms described as values to be found in all ecodistricts: accessibility, appeal, scalability/sustainability, integration into the urban ecosystem, safety and solidarity. The targeted objectives limit the exercise to an instrumental intent, thus explaining why the so-called values system proposed mostly comprises intervention principles, aimed at creating monitoring criteria for the assessments (and therefore for recognition).

An asymmetry in the frames of reference of territorial action: instrumental vs. experimental

On this basis, the second part of the method consisted in analyzing the values and principles put forward in the sustainable neighbourhoods projects submitted to the call for projects in 2011. We initially looked for occurrences and associations in the 78 projects pre-selected in 2011, and then added a more in-depth study of a tighter group of 16 cases selected from among the candidate projects for their openness to experimentation and axiological innovation. This stage of our work revealed the asymmetrical cohabitation between two "models" which are deployed in discourse on the development of sustainable neighbourhoods, tending between:

(A) Firstly, a top-down action regime (institutional), which is largely dominant and marked by a legacy of founding myths (development, technical progress, mobility, diversity...), in an urban construction that still has a very strong normative and regulatory base.

=> This regime is nonetheless updated by the risk paradigm (supra), its frame of reference of adaptation (institutional), instrumental methods and behavioral injunctions (infra). Cohesion values are central but without questions concerning the types of solidarity at play, the targeted

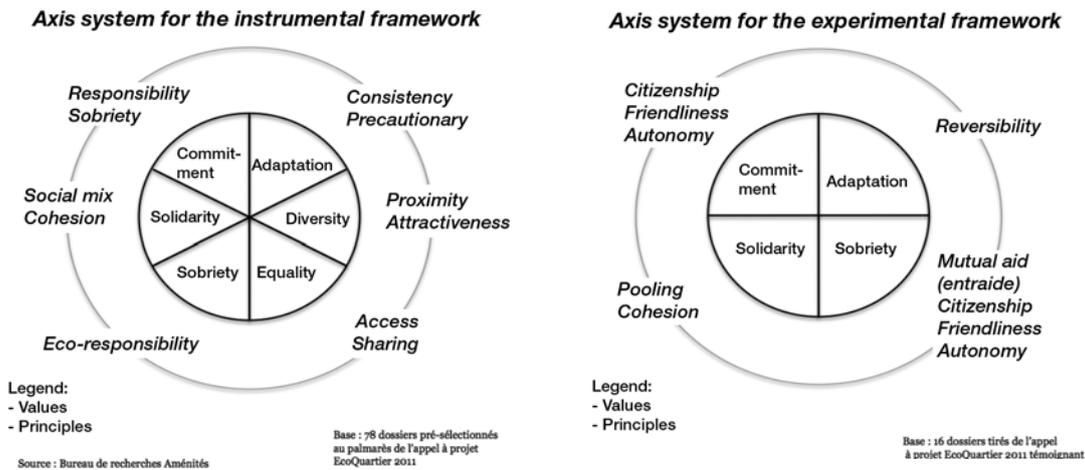
democratic coherence or what really creates shared worlds, particularly mutual aid.

(1) Diversity largely dominates many axiological statements in the project applications, with the standard mobilization themes: habitat (social diversity) and local activity (functional diversity). We are unquestionably in contact here with action justification habits (and their regulatory foundation in the different professional fields). Moreover, (2) accountability stands out as an increasingly important action principle and is mainly focused on professional practices. To a lesser extent, (3) cohesion appears to be in (re)construction, though once again, with some regulating statements leaning towards "living in the community". (4) Finally, sobriety stands out as a principle of accountability through its essentially technical nature.

(B) The other is an experimental bottom-up regime, with a weak signal, on the fringe of official ecodistrict projects, putting forward other socio-environmental possibilities. This regime seems to distance itself from simple adaptation to consider transformation more directly with local societies (infra).

=> Here, in the thirty some applications open to this, sobriety clearly appears as a reforming (declared) value for lifestyles, transition (and no longer strategic support) as the current watchword, and also the declared and shared principle of inclusion of residents as resources (with their diversity of experiences and skills).





The two main operators of the instrumental frame of reference: public space and usage support

The instrumental frame of reference is dominant and based on a type of organization of social behaviors rather than on the direct involvement of residents, other than simply through uses. It's mostly through incentives or even injunctions from amenities, programming, awareness raising measures and pedagogy (of the project) that new lifestyles are firstly considered or thought of. Two mechanisms (operators) play a key role in this.

The first is public space. Through its federating role, it appears as the promoter of local uses and thus acts as a substantive operator. Indeed, it appears as the center of life for a neighborhood and truly supports intra- and inter-neighborhood social cohesion. It is presented as the seminal common space for sociability, a symbol of renewed lifestyles: those that are local thanks to "new" social links and an intensification of renewed relationships with nature. In fact, public spaces are firstly thought of as organizers of new behaviors (including professional), and here, the terms uses and practices are mainly associated with the encouragement to change daily behaviors, with in its wake, a few statements on the new values of solidarity and sobriety focused on "living in the community" (supra). As such, this intervention theme basically directs the message towards the empowerment of the uses/users.

The recurring presence of a second operator (procedural), i.e. support, reinforces the action of the first in the organization of behaviors. Support acts above all through a register of awareness raising and pedagogy, or even the learning of virtuous attitudes and behaviors, through tools such as guides essentially focused on ecological information or knowledge about energy savings, taking ownership of the neighborhood through the development of shared spaces, and presentations or events organized mainly for schools. In fact, the asymmetry causing the first model to dominate the second shows that the change advocated by the

Eco-Neighbourhood matrix finds one of its main limits in people's difficulty in taking ownership of policies characteristically marked by a strong sector base and with a vision of the residents focusing narrowly on uses and their organization. The axiological consistency as a whole (that can be simplified to the extreme as a search for empowerment in and through the support of - new - uses), is logically built by operating some relinquishments, singularly those linking democratic constructions and lifestyles.

The question of resident involvement and new lifestyles

Though it is difficult for the transformation towards a sustainable city to move away from the persistently dominant logic of instrumentation, at the same time, much weaker signals show an emerging development (in reaction?). We studied these weak signals in our work recently and showed that one third of the 78 pre-selected applications were open to a different conception of residents, support and the regulation of practices. This shift encompasses different inclusive measures and a variety of cases, from major urban renewal projects to small projects in rural areas.

These openings directly involve the idea of a greater proximity to resources to satisfy other needs, and that of a possible alternative to the market, especially for housing, through greater citizen involvement. These initiatives would likely involve more solidarity, mutual aid, conviviality, sharing and thus, perhaps, another model of cohesion that is socio-environmental.

The weak signals given off by this new cohesion model most often include measures for sharing (goods and services) and shared management (gardens, vegetable gardens, orchards, rainwater recovery tanks...). It is also a question of concepts like project reversibility and scalability by public spaces in particular, in order to enable an adaptation to real uses. Self-promotion, participatory habitat and resident co-op systems are also emerging but

more discreetly.

Moreover, we were able to observe collaborative approaches and project co-construction (integral) as more experimental methods, mostly limited to very small-sized projects often located in rural areas. Examples from other countries could nonetheless put this collaborative situation into perspective in more urban areas and show another type of innovation inspired by life principles and values (and not just action, development and organization of space) (Emelianoff, Stegassy, 2010 ; Faburel and Tribout, 2011).



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(1) With respect to knowledge, principles work as standards while values, which are more sensitive and subjective, are moral and ethical references guiding action.

(2) Ecovillages in Bertignat (Bertignat); Champatrel (Clermont-Ferrand); Les Résidences du Parc (Graulhet); Bouchayer-viallet (Grenoble); Teisseire (Grenoble); EcoQuartier fluvial (Ile St Denis); L'esprit village (Limans); La Duchère (Lyon); S. I. Energie (Lys-Les-lannoy); Les grisettes (Montpellier); Plateau de Haye (Nancy); EcoQuartier gare de Pantin (Pantin); L'Union (Roubaix); Manufacture Plaine Achille (St Etienne); La Martinière (Villaine-Les-Rochers); ZAC Rn305 (Vitry-Sur-Seine)

Involving citizens to improve water service governance

by Rémi Barbier, UMR Irstea-ENGEES GESTE and Clémence Bedu, formerly UMR GESTE, currently Val de Marne County Council

This article presents the establishment of a "citizen's workshop" by Nantes Métropole to "collectively determine methods to enable more active resident participation in the governance of the water utility".

Democracy is an important dimension of a sustainable city. But just how far can we democratize the management of a utility like a drinking water one? This was the question posed to a panel of citizens in the framework of the Dem'eau project, "Democracy and drinking water", managed in partnership with the Nantes Métropole Water Board. Its ambition was to collectively determine methods to enable stronger resident participation in the governance of the water utility, going beyond the CCSPL (advisory commission for local public services) imposed by the law. We will summarize the way in which the ACD (Atelier Citoyen Dem'eau) was set up and run and will also present the main findings.

Setting up the citizen's workshop

From project validation to the formulation of the mandate

Following a phase of examining and assessing existing participatory processes, a citizen's jury-type protocol was proposed in 2008 by the Dem'eau6 team. The workshop would include ten to twelve randomly selected "laymen" and three members of associations. The following mandate was given to the panelists:

"The Nantes Métropole Urban Community and its Water Board, convinced that it is both useful and necessary to find new balance in their relationship with user-citizens, invite the members of the Atelier Dem'eau to work together to:

- propose improvements and additions to the existing processes allowing citizen's participation in the life of the public drinking water utility,
- describe a future vision for a new, more participatory governance of the drinking water utility.

To this end, the members of the ACD will receive all the required elements of information. After deliberation, they will present their recommendations to the elected officials in charge of drinking water and civic life, who agree to publicly report on the follow-up given to these recommendations six months later".

Recruiting the panelists

The laymen were selected randomly from a list of subscribers to the water service and were then contacted by telephone. In total, almost five hundred calls were made to recruit a dozen panelists. The persons contacted generally took in the "water management" aspect of the mandate rather

than the "governance" aspect. This misunderstanding was one of the main sources of difficulty for the operation.

When recruiting the association members, care was taken to involve associations already working in the existing participatory structures, to avoid having Dem'eau appear as an attempt to bypass the privileged relationship between Nantes Métropole and these associations. The associations belonging to the CCSPL (advisory commission) were asked to appoint three members to participate in the panel. This request was met with strong skepticism regarding the added value to be expected from this project and the reality of the desire of citizen's to participate. In the end, only UFC Que Choisir sent one of their activists, who was voluntarily not a water specialist.

It was important to recruit citizens from disadvantaged categories to take up the challenge of social inclusion, which was central to the project. The Dem'eau team requested the assistance of a municipal employee in charge of a disadvantaged district of Nantes, who recruited two volunteers. During the recruiting process, specific targeting of people under thirty was added and two members of the Nantes Youth Council (CNI) were recruited. The final panel comprised seven men and eight women, including ten randomly selected "laymen", a member of an association, two young people and two people from disadvantaged neighborhoods.

The workshop program

The program conventionally proposed three major sequences, spread out over three weekends and associated with different postures for the panelists: training on the stakes (learning posture), investigation of the existing system and the alternatives (critical study posture) and deliberation (proposal posture).

A volunteer "expert observer" attended all of the workshops. He was to act as a spokesperson for them, if necessary, and report on the project approach during the final presentation, etc. In fact, he helped the panel to take ownership of the mandate and also participated quite actively in the debates. He had a real influence on the group dynamics.

The course of the project

The training session

All of the planned panelists were present, except for one randomly selected citizen and one member of the youth council, who were most likely discouraged by the complexity of the questions. This first session was used

to restate the project objectives and for initial training. The elected officials reminded the panelists of the rules of the game and underscored the strictly advisory nature of the recommendations that would be made at the end of the project.

The first comments from the panel members quickly showed the prevalence of the misunderstanding concerning the workshops objectives: it was clearly the water management topic and not participation or governance that motivated the panelists. This ambiguity was partially overcome but only at the end of the second weekend.

The training alternated between didactic presentations, testimony from stakeholders, and sketches put on by a theatre troupe⁷ Myrtil. They used role-playing to get the panelists to talk about their concerns, wishes and hopes for the workshop. The session concluded with the selection of speakers to be invited to the second weekend. The guidance of the Dem'eau team was a deciding factor: this choice was proposed late in the afternoon when the panelists hadn't fully taken ownership of the mandate and their attention levels were dropping.

Training-investigation

The two panelists from the disadvantaged neighborhoods missed almost the entire second weekend. This session, essentially involving presentations from experts and outside stakeholders, was intended to consolidate the ownership of the mandate and to begin collective production.

Presentations were made by the officials in charge of the CCSPLs of Nantes Métropole and of Le Grand Lyon to compare the two systems. This was requested by the Dem'eau team and approved by the panelists who wanted "to start by seeing how we can improve the existing system before we propose new measures". These presentations quickly led the panelists to challenge the Nantes model. Then presentations were made by two academics who focused on the current strong points, limits and challenges of participation. They made it possible to encourage the panelists to think about the possibilities for the second part of the mandate.

Deliberation

The third and last weekend was organized a fortnight after the first two sessions, in order to send the reports to the panelists and to give them the time to reflect. The expert observer invited the panelists to read the documents sent to them, to highlight the fundamental elements that should appear in the final recommendations and to try to formulate counter-proposals to the criticisms of participatory processes put forward by one of the academics.

The session started with two complementary presentations on examples of participatory processes. The theatre group was present and enabled the panelists to role play in different sketches, taking on the roles of an "ordinary resident", a citizen belonging to the CCSPL or the mayor of a small town. The remainder of the session essentially consisted in ranking the main ideas that were the object of a consensus. A leading group emerged. Another,

more silent part of the panel remained in a listening and learning posture. Two elements also weighed heavily in the orientation of this ranking work: the strong and deliberate guidance policy of the meeting facilitators and the importance of the tutelary image of the expert observer.

Formalization of the recommendations and their public presentation

Caught up in the process, certain panelists spent a whole additional weekend finalizing the recommendations, which they wanted to be "clear and well constructed". A restricted proofreading committee of 5 volunteers was in charge of reading the first version of the recommendations, previously sent by the Dem'eau team. Each term was painstakingly examined and, sometimes, there was a real temptation to continue the drafting work under the guise of corrections. After the collective validation of the new version, comprising many suggestions concerning the revamping of the CCSPL, a date was set for the presentation to the general public.

A specific meeting was organized with the CCSPL, and the members who attended expressed real reservations and challenged the legitimacy of the panel to give an opinion on possible reforms to the CCSPL. A mixed CCSPL/panelists group was set up to "discuss the proposals put forward in the citizens' recommendations and those set out by the associations". This was an opportunity to debate the question of the inclusion of laymen citizens into the CCSPL, which was proposed by the panel "to vary the viewpoints and not to replace the role of the associations". Basically, all parties stood their ground. In the end, the elements of response to the recommendations were presented by the elected officials during the closing meeting six months after the official delivery of the citizens' contribution.

Elements of analysis

Concerning citizen's deliberation

Although a discussion group was set up, it was difficult to create truly deliberative sequences, i.e. the organization of a regulated exchange of arguments on a limited topic, over a sufficient period of time, between participants fully engaged in this activity. There were many obstacles, first and foremost, the channeling of people's attention and their ability to stop for breaks. Secondly, the production of the recommendations was closer to an importing and compiling mechanism, characterized by the "cutting & pasting" of the ideas that seemed most relevant to the majority of the panel members than to a real forum to create a new and "made-to-measure" proposal. Thirdly, the deliberative dynamics can be explained by other more contingent or more strategic elements than simply the collective and regulated exchange of arguments: they include verbal confrontations, consensus seeking between two points of view, avoidance or censoring, silent approval, copying or the opposite - systematic skepticism, letting an idea slip by or blocking it depending on the collective level of vigilance, etc.

Generally, deliberative quality seems highly dependent on three essential elements that are insufficiently considered in the practice of citizen workshops/juries, which seem to be increasingly prevalent: 1) the choice of teaching, investigation and expression tools according to the participating panel, 2) the time to acquire a feeling of collective competence, 3) the meeting "style" and the opinion production method proposed to the panel. The use of a theatre-forum, which was decided to allow modes of engagement in the debate that are less solemn than taking the floor in front of the group, turned out to be positive.

In terms of the social inclusion objective, it seems that the individuals less equipped with sociocultural and economic capital are those that have the most difficulty in taking ownership of the topic. This isn't necessarily due to a lack of understanding but perhaps rather to a lack of interest: a subject considered to be too abstract and distant from the relevant level for improving water management, that of daily behaviors.

On the transformation of public action

The elected officials did effectively commit to revitalize the CCSPL by organizing thematic sessions dedicated to examining a specific public policy. However, they did not follow up on the request to set up thematic sub-commissions and include laymen. An official from Nantes generally credits Dem'eau for boosting "civic dialogue" by having "given credence to innovative citizen dialogue initiatives, of which the citizen's workshop is one of the most advanced forms".

In terms of how participatory processes were accepted in a major technical department, did the actions undertaken help lift some of the skepticism that initially surrounded this issue? This workshop partially succeeded in rehabilitating the figure of the citizen in the consumerist model that dominates drinking water services. It revealed a series of citizenship stakes in the management of this type of service that well and truly concern an active user-citizen. What's more, the project raised and detailed the conditions for multiparty dialogue between experts, elected officials, associations and lay citizens. Having said that, these positive possibilities remain to be confirmed in projects underway, notably through the setting up of a participatory evaluation of drinking water policy.

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- + appendices

(1) A longer version of this text has been published in the special issue of the journal "Sciences Eaux et Territoires" dedicated to water consumption. The team comprised D. Verdon and P. Cloutour from Nantes Métropole and Christophe Beurois from Médiation et Environnement, in addition to the two authors.

(2) A troupe of actors act out a 15 minute fable on subjects concerning the social, economic and other realities of a community. Then, the members of the audience are asked to re-act out the scene and/or intervene during key moments.

Involving citizens for the climate

by Paul Cloutour, Director of the Citizen Dialogue Mission at the Nantes Métropole Territorial Coherence Department and Laurent Comélieu, in charge of the Activities Cluster at the Nantes Métropole Environment and Urban Services Department

This article presents a "citizen's workshop" set up by Nantes Métropole to consider ways of reducing GHG emissions in the city. This experiment is very interesting since it succeeded in involving over 150 people who accepted to participate in 7 work weekends during one year.

In 2007, Nantes Métropole adopted its Climate Plan with the aim of reducing GHG emissions from energy sources by 30% per inhabitant, between 2003 and 2020. This objective places it among the global and European cities engaged in the fight against climate change.

The territorial climate plan is based on three success factors:

- Public policy;
- Internal exemplarity;
- Territorial leadership through the climate workshop in particular.

Through its Climate workshop run in 2010 and 2011, Nantes Métropole organized an original citizen's dialogue initiative shared with 150 households in the metropolitan area to reduce greenhouse gas emissions, with three main expectations:

- a critical reading of our public policies to get an opinion on their relevance
- a degree of citizen engagement in the behavioral changes

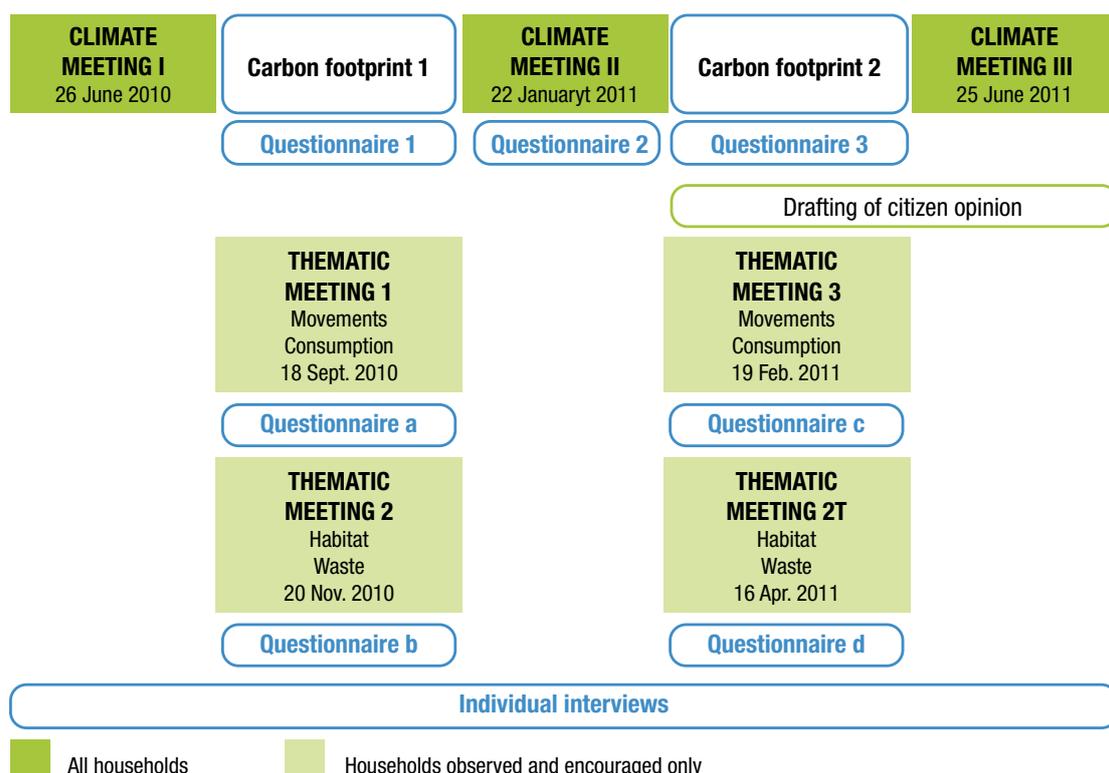
- putting citizen involvement in perspective to pursue our actions.

Organization and method

The Climate workshop was organized over one year and 150 households participated. Seven work weekends made it possible to debate and discuss a participatory mandate formulated as follows:

- What do you plan on doing individually and collectively to contribute to Nantes Métropole's climate objective (30% reduction in greenhouse gas emissions between 2003 and 2020). Why?
- What are the main obstacles that you are encountering today to significantly reduce your greenhouse gas emissions?
- What would enable you to further reduce your greenhouse gas emissions? How can Nantes Métropole contribute to that?
- How can the 600,000 residents of the metropolitan area contribute more to further reduce greenhouse gas emissions in the area?

Link between phases of animation and data collection



The selected method consisted in meeting with people already concerned by the question of climate change and others less concerned by the topic. Over time, during the meetings, sessions and thematic workshops, the households were able to freely ask questions and express themselves to bring forward a collective opinion based on their individual experiences.

Following an examination of the results by its different departments, the President of Nantes Métropole at that time responded to all of the recommendations during the Climate meeting of October 2011.

A quantitative approach with the carbon coach

In order to estimate the ability of Nantes Métropole residents to reduce their CO₂ emissions, the project team gave workshop participants a series of tools to understand individual motivations and limits to changes in daily practices. Throughout the process, questionnaires made it possible to identify the practices of participants and to measure the obstacles to and levers for changes in behavior.

The workshop also used a tool that was being developed by the Ademe (French Energy Agency) and ran an exclusive test prior to its public launch in the fall of 2010. The Carbon Coach, via one hundred lifestyle questions, estimates the CO₂ emissions of each household. The members of the workshop calculated their carbon footprint at the beginning (July 2010) and then at the end of the workshop (May 2011) to measure the change in emissions. It allowed them to better understand the idea of "CO₂ emissions" and to tangibly visualize the impact of their daily practices.

Other projects carried out in France have proven that information and awareness raising campaigns with individualized support to residents can generate a 10% reduction in greenhouse gas emissions per year. This was not the subject of the Climate workshop whose goal was not so much to achieve such results in one year with the participating families but rather to understand how to best act sustainably at the scale of its 600,000 residents.

A challenge and an ambition

This project was very original for several reasons:

- the high number of participants (150 families)
- their investment (several weekends)
- the all-encompassing consideration of the question of greenhouse gases (consumption, waste, travel, habitat, energy).

This workshop represented a challenge and an ambition: to enable the cross-cutting examination of public policies and resident's practices and to ensure that it resulted in recommendations shared by both the public authorities and the residents.

In the context of the strong implication of Nantes Métropole in the fight against climate change, the will of the local authority was to have a global and cross-cutting approach, in parallel to the adoption of concrete local examples.

The main findings

After one year dotted with several working days far enough apart to allow personal progress between sessions, the Climate workshop showed and confirmed that the question of individual involvement in environmental protection via the reduction of greenhouse gas emissions is complex. It involves psychology, civic attitudes and family budgets all at the same time. The value of exemplarity, local information and support from public policy turn out to be essential to remove doubts and hesitations and to trigger a desire to be an actor in the fight against global warming.

"During this year of engagement, you have proven that each and every one of us is able to change our behavior and you asserted your will to work towards sustainable development in the metropolitan area. Secondly, you reinforced our choices and the direction of our public policies."

This response to the citizen's recommendations sums up the main contribution of the climate workshop, which is that evolutions and indispensable changes must be made together, in a coordinated way, by both the public authorities and the residents.

Four delicate points highlighted by the elected officials were those that they decided to focus on in the response to the recommendations.

- The first concerns the adaptation of public services and the exemplarity of the local authorities. For example, for mobility, the upcoming implementation of a series of measures (chronobus lines with longer hours, recyclable waste collection for almost all residents by 2013) answer a good part of the strong demands expressed by the residents during this workshop, but the elected officials also noted that they needed to further focus efforts on a certain number of points (bike paths, safety).
- The second is the right balance to be found between constraints, regulations and incentives. After residents indicated their preference for incentives, the elected officials reinforced this desire, citing company mobility plans as an example.
- The third is a necessary vibrant community life in the metropolitan area to foster exchanges between residents. To boost action, there is nothing better than the exchange of practices and sharing of experience.
- The fourth, and not the least, is the question of information and communication. The desire was expressed to go beyond negative and guilt-provoking messages to find the right formulas to foster involvement and change.

The follow-up to citizen involvement in 2013

Two initiatives taken since the climate workshop illustrate the desire for more citizen involvement as expressed in their recommendations.

The first concerns Positive Energy Families in which each team involved worked to reduce their average consumption by at least 8%. After the first group succeeded with this wager, a second group of 80 families also started the adventure in November 2012.

Another example is the call for civic projects for Nantes Capitale Verte (Nantes Green Capital). The response to the citizen's recommendations concluded with the following announcement: "finally, with a view to Nantes Capitale Verte 2013, Nantes Métropole will launch an extensive call for projects to support the best initiatives from residents and associations on topics linked to the environment".

This call for projects, initiated in the summer of 2012, was very successful, going beyond the hopes of its promoters. In a few months, two hundred projects were submitted to Nantes Métropole, projects that were evenly spread out between the city center and the other municipalities of the metropolitan area, and with a wide palette of themes addressed.

In total, several dozen projects were selected based on these 4 criteria:

- a leverage effect on new publics;
- cooperations and partnerships;
- reproducibility in France and in Europe;
- the degree of innovation.

Let's wager that their implementation will actively contribute to a vibrant and lasting community life in the Nantes region in 2013 and beyond!



Involving citizens in sustainable water cycle management, the example of Melbourne

by Tim D. Fletcher, Department of Resource Management and Geography, the University of Melbourne (Australia)

Australia is subject to severe climate constraints, in terms of both flood risks and water shortage risks. Moreover, environmental demands are high. The city of Melbourne has for many years now organized a program aiming at better global water resource and aquatic environment management. This program was carried out with a high level of involvement from the city residents. This article summarizes the main program phases as well as the conclusions that were drawn to develop similar approaches in other Australian cities.

Evolving towards sustainable management: the participants and the key moments

The city of Melbourne is aiming to be an example of integrated and sustainable water cycle management in cities. Its evolution enables us to understand the key factors in reaching this type of sustainable management. We will describe the elements that marked its evolution, based on the history proposed by Brown and Clarke (2007). The first steps to change took place between 1965 and 1989, with three motivations marking this transition period. Firstly, the government of the time proposed to discharge the wastewater of the city of Melbourne directly into Port Phillip Bay. This generated a lot of controversy and led to a study on the management of the bay, which showed that there was a risk of its eutrophication due to the pollution in wastewater and stormwater. Secondly, during this period, citizens started to realize that the water bodies (including the Yarra River, the most well know river in Melbourne) had become outlets for polluted water to the detriment of the natural environment. Thus, in 1975, the Environmental Protection Agency (EPA) created the 'Port Phillip Bay State Environment Protection Policy', which led to passing laws to protect Port Phillip Bay. The third factor for change was the construction of a bike path network along the rivers. This led more people to use these areas and gave greater value to the rivers, which generated political pressure to improve the management of the rivers and bays.

According to Brown and Clarke, the following stage was marked by a closer working relationship between stakeholders, including researchers (research has always played a major role in this evolution towards sustainable water management, with several major centers of cooperation bringing together universities, industrials and water agencies). These cooperations made it possible to develop new stormwater management policies, such as the 'Best Practice Environmental Management Guidelines for Urban Stormwater' (Victorian Stormwater Committee, 1999). This guide was intended for property developers and municipalities in charge of stormwater management; Melbourne Water being in charge of catchments as of 30 ha of surface area. This guide proposed standards on water pollution abatement for all types of new constructions. Between 1996 and 2005, Melbourne Water created large stormwater management facilities, including dozens of

wetlands. An exemplary neighborhood was built in 2000: the 'Lynbrook Estate' residential neighborhood comprising bioretention trenches, vegetated ditches, a wetland and landscaped artificial lake. A study carried out by Lloyd et al (2001) demonstrated the success of this project in terms of pollutant retention, flow attenuation, and also the level of acceptance of this type of approach by the new residents. This project has become an important example that shows what is possible.

Episodes of severe drought (starting in 1997 and with the most serious consequences between 2006 and 2010) also heavily impacted water management methods as of the early 2000's. Despite all the negative impacts, these droughts increased the awareness of residents about the importance of water management in cities. The regulations forbade the use of drinking water for any outdoor uses (including watering or the washing of buildings or surfaces) and it limited the use of drinking water for indoor uses (maximum shower length of 3 minutes for example).

This drought made citizens more sensitive to a new vision of urban water cycle management. It also facilitated grouping and cooperation between professionals working in water management, urban planning and receiving environments. Although the government of that time decided to build a desalination station to fight against this major water shortage, the evolution towards more sustainable management was already underway

The government created a new department two years ago called the 'Office of Living Victoria' with the following objectives: 1. to integrate sustainable water management in town planning at all levels and all scales, 2. to integrate this type of management in the construction of both public and private buildings and, 3. to develop an understanding of sustainable urban water cycle management shared by all stakeholders, including residents.

The analysis of the evolution in water management in Melbourne enables us to highlight several factors of success:

- Firstly, the role of champions is mentioned by several authors (Brown and Clarke 2007, Taylor, 2009). Melbourne was lucky to have had several very involved spokespersons defending this type of management. Some came from the world of research or government and some were ordinary citizens;
- Secondly, the context (pollution of the bay, important role of waterways in urban planning, droughts) had a strong impact on Melbourne's stormwater management policy. It resulted in awareness about the importance of flood protection, receiving environment protection (reduction of the pollution and non-modification of the hydrological regime) but also of water resource preservation (via a drinking water saving policy);
- Thirdly, a strong cooperation between the water agencies, researchers and industrialists has existed for more than 15 years now. This collaborative work has created trust and a shared vision to go beyond the doubts and criticisms that can otherwise block this type of evolution. Two types of collaborative groups, the Cooperative Centre for Catchment Hydrology and the Cooperative Research Centre for Freshwater Ecology are often mentioned for the important role that they play;
- Fourthly, these cooperations have enabled the research world to provide the tools and knowledge necessary for the development and implementation of alternative technologies, as well as standards for the expected performance levels of these technologies.

Encouraging resident involvement: the example of the Little Stringybark Creek project

The goal of the Little Stringybark Creek project (LSC; go to www.urbanstreams.unimelb.edu.au and Fletcher et al., 2011) was to test the hypothesis that sustainable water cycle management can restore a receiving environment that is already urbanized and hence degraded. Hence, the project took place at the scale of a 450 ha catchment with 13.5% of active impermeable surfaces. With approximately 750 homes, LSC represented a pilot catchment capable of demonstrating the large scale results of a new stormwater management concept. This pilot corresponded to an existing urbanized neighborhood. The project was carried out in a cooperative way with researchers (Universities of Melbourne and Monash), water agencies (Melbourne Water, Yarra Valley Water), the local authority (Yarra Ranges Council), and the state (Department of Sustainability and Environment).

The project took place in several stages. Firstly, the catchment residents were surveyed to understand (i) their comprehension of water cycle management in an urban area, (ii) their knowledge of the creek and the catchment, (iii) their interest in participating in the installation of alternative technologies (for example, a stormwater recovery tank, an infiltration trench or rain garden, Figure 1) on their property.



Figure 1. Examples of systems at the scale of an allotment (a and b)

The second stage of the project involved setting up (i) a call for projects sent to the residents for stormwater retention at the scale of an allotment, and (ii) a proposal to the municipality for larger-scale projects. An 'auction' system was used to select (and partially finance) the proposals from residents with the best price/efficiency ratio. Efficiency was assessed by simulating hydrological and purification performances (using software designed for the project). The residents drew up their proposals using a website that assisted with the design of stormwater management systems. Builders were associated from the outset to help with the design and budgeting of the proposals. The project comprises, above all, monitoring at all scales of the effects on the hydrological regime and the evolution of aquatic environment quality. Ecological indicators are also tracked in the creek and its affluents. The aim in fine is to prove the interest of a more extensive implementation of this approach for the city of Melbourne.

Results and findings

The survey carried out before the start of the project showed that a small minority (35%) of residents understood the role played by stormwater management in the protection of the receiving environment. This figure increased significantly (64%) after the first auction. Knowledge concerning alternative technologies used for regulation at the source grew from 14% to 93% during the project. None of these increases occurred in a neighboring catchment, which we used as a control group for this survey. The results show that the knowledge and perceptions that citizens have regarding urban water cycle management are limited if they are not involved. Our project has demonstrated the importance of sharing water management responsibilities with citizens.

Since the start of the project (2007), 177 homes have been equipped with allotment-sized stormwater management systems and 6 large stormwater recovery-treatment-retention facilities have been built. Collectively, the systems treat an impermeable surface of roughly 7 ha, or 35,000 m³ of stormwater per year. The price equivalent per m³ of water supplied (for all indoor and outdoor uses other than drinking) is \$3.30 (roughly 2€), which is what is envisaged for drinking water in Melbourne two years from now (the construction of a desalination station required a major increase in the price of drinking water). This cost (2€) seems

lower than the current average price in France (3.62€ according to Salvetti et Wittner, 2012).

The project was also assessed by a sociologist, Helen Brown, from the University of Sheffield. Her study concerned factors influencing the involvement or non-involvement of residents in the project. The results showed that the main levers of participation are:

- financial incentives;
- the participants' "ecological" convictions;
- the personalities of the team's personnel;
- the link with a university (instead of a project set up by a government agency) and the research aspect.

On the other hand, there were several obstacles to this involvement:

- The perception that the project was a swindle ("nothing is ever free!");
- The procedure to put together and submit a proposal was too complex and residents didn't have the time to deal with it (the procedure was simplified for the next 'auction');
- The perception of risk taking: spending money to build a system without then being paid back, risk associated with the alternative technologies (flooding, mosquitoes, etc.).

This sociological study, performed without any association to the project team, helped us to improve our procedures. It allowed us to identify effective actions to involve citizens in the integrated management of the urban water cycle. In short, this study showed that trust between citizens and the public service is extremely important. It takes time to build this trust and it is vital to take this into account for this type of project. You must give people enough time to understand and then be confident enough to participate.

Melbourne Water, the agency in charge of managing the entire water cycle in Melbourne (including river and receiving environment management) launched a new project in 2011: the Dobsons Creek Project. It is based on an approach similar to the one used at Little Stringybark Creek but with a more pragmatic implementation (without the strong involvement of a research team). This project will thus make it possible to see if this type of approach is manageable in the long term at a much larger scale.

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Chapter 7

What cities for the future?

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What cities for the future?

The previous chapters demonstrate clearly that today's urban societies are affected by numerous pressures and need to weather changes of large magnitude. Which adaptation and evolution strategies should be implemented? What can be said about the city of the future, its urban shapes, its needs and its operation? How will urban services be impacted by these evolutions as to missions, content and technical means to be implemented?



It was decided to address this issue by pondering two very emblematic examples of requirements and current transformations: more energy-saving cities and cities in which digital technologies will prevail. These two viewpoints are discussed by Seghir ZERGUINI et Jean LATERRASSE on the one hand and Gérard HÉGRON on the other hand.

It is worth noting a major difference between the two approaches: in the first case, energy saving requirements drive innovation, whereas in the second case, technical innovation (e.g. the digital revolution) drives change. Despite these initial positions radically opposed, numerous similarities appear and the same notions fuel the core of the discussions: dealing with complexity; thinking cities as systems; taking behavior into account; developing simulation tools that make it possible to enter into a decision making process in full knowledge of the consequences.

Fortunately these very notions are at the core of the NRA "sustainable cities" research programme of which Pascal BAIN reminds us the main stakes, successes as well as difficulties. Says he: "a city is comprised of stocks, flows and human beings" and the whole must be approached globally. Therefore traditional academic boundaries must be abandoned and a truly interdisciplinary approach must be implemented that combines engineering, human as well as environmental sciences, since the relation between cities and nature needs to evolve. If one reads between the lines, one sees that the article seems to indicate that even though the national scientific community has played the game and has implemented fruitful collaborations, significant efforts remain to be made for a true urban interdisciplinary science to be elaborated.

The last article - proposed by Bernard BARRAQUÉ and Laure ISNARD - illustrates perfectly the approach followed by numerous research works conducted within the framework of the "sustainable cities" programme through the "Eau&3E" project. The objective of this project is to study the sustainability of water services within the context of global changes. The difficulty arises from the complex interactions between processes totally different in nature: regulatory evolutions, modification of tariff schemes, change of behavior and modes of consumption, stressed resource, governance organization, territorial scales at which the issues are addressed, etc. The solution selected which consists in running a prospective exercise and in elaborating possible decision-support scenarios, takes up again word for word the ideas proposed in the contributions to digital cities and energy-saving cities



Tomorrow, a more energy-saving city?

by Jean Laterrasse and Seghir Zerguini, Université Paris-Est, LVMT

With energy resources getting scarcer, energy costs getting higher and GHG emissions needing to be reduced, it has become necessary to design more economical cities. There are numerous items of energy expenditures in urban systems the two main ones being heating and air conditioning on the one hand, transport on the other hand. These two items are directly linked to the urban shape (density/sprawl). Controlling these parameters involve numerous interactive elements: business activities, urban development and housing policy, transport and mobility, economic and social policy, users' behavior, etc. The present article proposes an original approach which consists in addressing the complexity of these issues through the elaboration of integrated models that take into account the various processes and their interactions.

Ever since the founding works of Newman and Kenworthy [Newman and Kenworthy, 1989], there has been a strong correlation between the energy consumption of urban areas and urban sprawl. Today, numerous studies indicate far more complex relations between a city spatial dimension and its energy performance.

The energy efficiency of buildings could be discussed here. Even though urban density minimizes heat losses from buildings into the environment, it is far from compensating for the differences that can be observed as a function of the materials and the construction principles used when it comes to the energy efficiency of buildings themselves (hence the energy consumption per inhabitant), which may vary within a 1-to-10 ratio.

Behavior is another major issue. Depending on the context, behavior may lead to either higher consumptions or regulated consumptions. Thus, in the observations made by Newman and Kenworthy, the spatial expansion of urban areas in the US is strongly correlated with low energy costs, which in turn induces including in food consumption energy intensive ways of life. Conversely, it can be noted that although the area covered by cities plays an undeniable role (the difference in urban surface area between US cities and European cities is 3-to-1), for almost similar surface areas, contrasted urban designs do not necessarily induce highly different energy consumption patterns [Le Néchet, 2011], due to the multiple adjustments made by individual players in the daily operation of cities. This is why certain authors would rather not use terms such as density or sprawl but instead the term coherence, which

refers not just to the spatial dimension of a city, but also to the articulation between the way functions are located and how urban players implement their arbitration capacities [Korsu, Massot, Orfeuill, 2012].

Thinking tomorrow's city or re-orientating the trajectory of existing cities?

The above-mentioned observation enables several lessons to be drawn when thinking tomorrow's city. The first lesson is that it would be useless to imagine an ideal city: the complexity of the urban system and of the processes which regulate its operation prohibits that form of shortcut vision. Improvements that will be implemented to achieve lower energetic development modes will not be able to ignore the history and the specific features of each city. In each case and for each territory, the first issue is to identify energy efficiency opportunities and from this diagnostic, the improvements which can be achieved without affecting the economy, the living environment, and the social relations. The virtuous paths will need to preserve the balance between these dimensions, or even rely on lower energy consumptions carbonated or not to foster employment and fair development.

Second observation: when thinking about the city of the Future from both practical and conceptual viewpoints one can hardly ignore the reference economic model. In previous decades, the metropolization process came together with higher transport system performance mainly road systems and individual cars and this has enabled lower middle class households (especially in the North) to

benefit from appropriate dwellings generally as a function of the expectations which means often individual houses as the reference [Veil, 2007], at the periphery of large city while having to put up with fairly constant commuting times.

In the sixties and seventies, the expansion of so-called "new-cities" came with the will to establish a better adequacy between residential areas and employment areas in the periphery of large metropolitan cities. This very short term urban planning vision only enabled partial polarization of peri-urban growth to take place [Aw, Laterrasse, Leurent, 2010]. Later on, this growth took place in a scattered manner, translating into notable extension of commuting durations and into the use of cars by most commuters.

Today, this urban development model is being openly challenged. First, economically acceptable speed gains in transport modes are far more difficult to achieve. Second, the energy crisis – whether analyzed as a crisis of fossil resource depletion or as a crisis linked to the awareness of environmental impact and climate change issues – will lead inexorably to higher energy costs.



This situation has potential consequences especially on the inhabitants of suburbs or even more so of those of peri-urban areas who face high energy expenditures for both their households – often due to the mediocre conditions of their dwellings – and their motorized transits. These consequences are better understood by the political decision-makers even though they struggle to understand the full scope of the impacts. In France, where the methods for housing financing are better controlled, it is not unreasonable to exclude a crisis similar to the US "sub primes" in a context where cumulative transport and housing expenditures of households often amount to 50 - 60% of their income [Hass et al., 2006]. Yet, it would be wrong to ignore the fact that the issues of mobility but also the urban modes of production which have prevailed in our societies since the fifties must be reconsidered in depth.

Designing new urban planning methods and tools

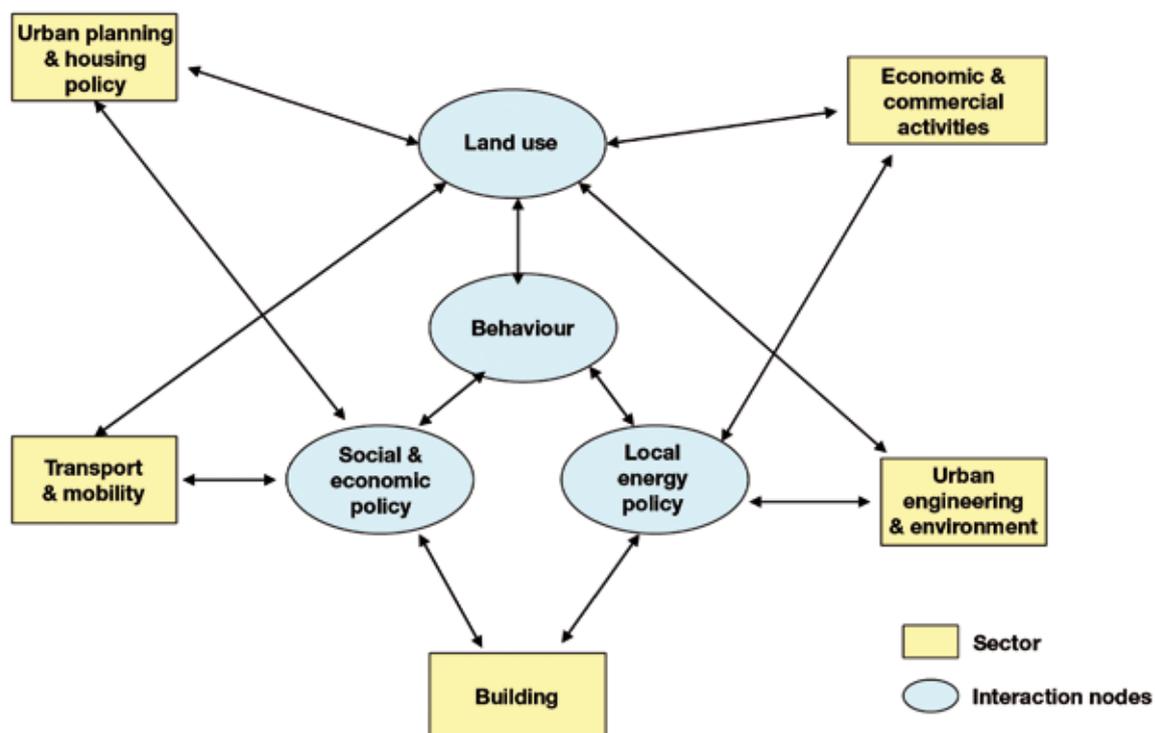
Numerous countries are pondering these issues. In France, the Grenelle II law and the decree of July 11th 2011, following on the provisions for energy labeling and the reinforcement of thermal regulation in the building industry, encourages local authorities to use new instruments provided by the Territorial Climate Energy Plans (TCEP) in a more ambitious and collaborative manner. More specifically, the TCEP becomes a mandatory planning instrument for urban entities with more than 50,000 inhabitants. This obligation comes with reinforced links with urban planning documents and new action levers to seek better coherence between land use, location of functions, transport infrastructures and services: the opening of new planning zones being subject to their public transport services, obligation to respect reinforced energy and environmental performances, definition of minimum building density in areas located near existing or planned public transports. These approaches also encourage changes of scale, extending the reflection to the inter-municipal level or to the scale of population catchment basin, especially when it comes to mobility.

Still, today, decision support tools designed to assist territorial authorities in their choices for more energy efficient forms of development have limited operational efficacy. These are mainly sectorial tools, ill-suited to anticipate "system effects" associated with the intrinsic complexity of urban territories: interactions between the location of functions and access to them, between the planning of transport infrastructures and the different markets (namely land property and real estate), between urban shapes and local energy management, not to mention the "rebound effects" induced by the technological progress on behaviors.

For this complexity to be fully understood and for the energy consumption trajectories of urban systems to be re-orientated durably, two complementary approaches appear today as essential [Aulagnier, Laigle, Laterrasse et al., 2012]:

- the first approach consists in implementing stringent TCEPs elaboration and monitoring methods. These methods make it possible to associate civil society and as much as possible citizens, and to capitalize progressively on return of experience useful not only for "on the run" corrections of what needs to be improved, but also to get progressively a better understanding of the complex processes at work in the territory(ies) concerned. As to the monitoring of TCEP more specifically, and preliminary territorial diagnostic, a set of "coherent and exhaustive" performance indicators must be implemented including all the iterations this implies;
- the second approach calls for the progressive design and implementation of simulation tools that will enable exploring - at different time horizons - possible futures for the territory(ies) concerned in terms of GHG emissions and more generally energy consumptions. The land use models meet this requirement in their principle. Among other functions, they make it possible to simulate the operation of markets and to process endogeneously the arbitrations between economic and individual players. Within the framework of a recent ANR project, we proposed such a model that takes into account the systemic interactions generated by five domains which comprise most of the actions and functions ensured by a territorial authority: transport and mobility, construction and building, urban engineering, urban planning and housing, commercial and business activities. Moreover, this model is based on the empirical observation that an agglomeration can be broken down into zones the

hierarchy of which especially from the viewpoints of land property and real estate markets remain stable in time (except in the case of a voluntarist action which can be integrated into the development scenario to be evaluated). The algorithm selected [Zerguini, Laterrasse et al., 2011], based on successive random draws and an auction mechanism includes, taking into account the input parameters (especially socio-demographic data and mobility data), the calculation of an equilibrium, especially in terms of household allotment vis-à-vis the built stock (in the first version of the model, the only one tested so far, employment location is processed exogeneously in development scenario). This auction mechanism is itself based on the utility function of the different types of households and their respective revenues. This does not imply the lack of regulation (which could be antinomial with sustainability): the model makes it possible to elaborate scenarios of the rules which govern, for example, the limitation of rents or the limitation of added-values. From a technical viewpoint, the choice has been that of a specialized modeling platform that enables coupling the modeling of dynamic systems (DS) with a multi-agents (MA) modeling. Each of these modeling paradigms open perspectives in the exploration of urban interactions: DS because they allow a simple formalization between a large number of variables (retroaction loops) and their time evolution; MA because they make it possible to model changes of scale between agents (households) and the territory simulated.



Model conceptual diagramme

The prototype of the model has been tested with data corresponding to the territory of the Mulhouse agglomeration which is a partner of the project. The tests carried out have shown the feasibility and the interest of an integrated simulation approach. They have also evidenced the efforts that remain to be made before having effectively operational tools: the modeling paradigms used induce long periods of setting and validation. Moreover, these models are heavy data consuming tools and their implementation still faces the issue of data availability, especially for landownership and real estate prices, or even tertiary surfaces.

Finally, the scientific validity of certain options remains to be confirmed, for example by testing the capacity of these models to reproduce past evolutions, and more generally, by gaining the indispensable hindsight that can only come from their implementation in different and varied territories. These models are nevertheless a promising lead and reasonable hope that territorial authorities will eventually have suitable tools for planning strategies.

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A digital city in the future?

by Gérard Hégron, Ifsttar

Since the beginning of the 21st century, the development of information and communication technologies has caused a shift into the information society. Cities cannot escape this revolution. The present article describes the large digital families and illustrates the way these new tools will modify deeply our representation of the city, as well as our understanding, management and control of its evolution.

Digital city

The development of information and communication technologies (ICT) and especially the web and broadband networks has made us shift into an information society. Cities have appropriated these new technologies that transform deeply their social, economic and spatial characteristics, the relations between the local and global scales, between the city and its regional, national and international environment.

The concept of digital city^[1] thus emerged in the nineties, a period during which several pioneer cities initiated innovative approaches: Bologna developed a local policy based on ICT through the creation of adequate communication infrastructures and new services to the population and to the local administration; Sacramento has facilitated the advent of a digital community through the creation of the Area Community Network concept; other cities such as Kyoto have created portals that provide virtual city guides; other cities such as London provide a tridimensional model of the city that facilitates the design of development projects, etc.

These initiatives have spread progressively to most urban communities. The digital telecommunication infrastructures and the associated services now form an integral part of the investments made by our cities. The recent and massive diffusion of mobile communication tools has accelerated their domestic and professional uses. They provide ubiquitous access to the resources available on the web and its users.

The large families of digital systems and their uses

There are three large families (non-exhaustive list) of digital systems and tools: city monitoring and management systems; city modeling and simulation tools; information and communication systems.

City monitoring and management systems

The monitoring systems make it possible to collect information utilized to improve our knowledge on the condition and evolution of an urban system. They rely on either the in situ data diffusion from sensors connected to a central data processing unit, or on surveys or on data mining. Depending on the phenomena observed, data acquisition can take place at different time scales: real time (traffic management), or very long durations especially to monitor the evolution of economic activities. Utilizations are multiple:

- Monitoring of incidents to anticipate on risk-management scenarios;
- Urban heritage management (diagnostic and maintenance);
- Management of polluting agent flows for air and water quality monitoring;
- Traffic management (digitalized transport system, navigation aid);
- Water and energy consumption management for the regulation of production and the improvement of our consuming habits.

Thus, cities can equip themselves with effective observatories to analyze and manage all phenomena and dynamics at play.

City digital modeling and simulation

Multiple models or simulations are used increasingly. They address all phenomena at play in cities and in their territories^[2]: interactions between built environments and physical phenomena, representation and space dynamics, anthropology, sociology, economy and hazards, nature and life in cities. These different models enable:

- understanding the phenomena at play at the various space and time scales;
- planning the development, design, construction and management of urban zones or infrastructures;
- ensuring the urban economic and social development;
- more generally, assessing urban development policies for decision making support during the planning and design phases.

Cities are open systems i.e. they interact with their external environment. Hence, it is impossible to forecast what they will become, it is only possible to formulate scenarios characteristics and environmental and socio-economic impacts of which can be assessed and compared by means of models. Moreover, a city is a site where all space scales and natural and anthropic phenomena are interacting. The so-called integrated modeling which is growing rapidly makes it possible to combine coupled phenomena and to assess their interdependencies. We could take as an example the combination of physical and anthropic phenomena to assess the energy consumptions in transports or buildings.

The models do not provide the answer to a given problem since the decisions taken for a development project usually lead to a compromise between the economic, environmental, cultural, social and political dimensions. Models are more a support system that enables asking the appropriate questions and preventing major malfunctions, or a representation, dialogue and communication tool to be used by all stakeholders involved in a project.

Information and communication systems (CIS)

Owing to the deployment of fixed or mobile digital networks, an endless range of communication services and means is available^[3]: they increase the competitiveness of a territory since businesses have access to broadband networks, service platforms and innovative business parks. They foster the local development of competencies through education-oriented ICT and easier vocational training courses in digital economy and creation. They transform the relations to work, time and space owing to the development of remote-services that minimize business trips.

Moreover, CIS amplify the identity and creativity of a territory. Portals for a local authority, local community or even a district are communication vectors for local diffusion of information, especially social and cultural. These are new territories that act as virtual sites of citizenship and socialization thanks to on-line forums or societal initiatives. Digital communication can improve interactions between citizens, administrations and elected officials, thus serving as a participatory instrument for the development of a more democratic and egalitarian territory. This is referred to as a cyber-administration owing to the quick and less expensive access to information, especially for disabled citizens; or even as cyber-citizenship thanks to on-line public consultations. This holds true assuming all citizens have access to internet and know how to use IT tools. Thus, the digital divide must be reduced through the creation, for example, of public internet access desks, multimedia spaces, schoolchildren IT education and vocational training.

Representation of the city for the users

An image is one of the key representations. It is an interface, or even a language that translates information so as to make it visible, interpretable and understandable for different groups of public (elected officials, developers, clients, general contractors, associations and community groups, inhabitants, citizens). Images make it possible to simplify the information at risk of distorting it. Therefore, it is necessary to ensure that simplification takes place without destruction or loss of meaning of the information. Moreover, images should make it possible to represent quantitative as well as qualitative data.

The different representations of the city should also act as interactive supports that combine image, sound, movement and discourse in order to enable the user to navigate in the database, to enrich it and to retrieve information. This approach is being generalized to other domains such as collaborative urban planning where virtual and enhanced

realities are mixed with different representation and interaction modalities.

As an illustration of this issue of urban representations two domains are being discussed below. They are considered as especially important since they contribute to the sustainable design of cities; one is centered on space analysis of territories and the other on collaborative urban planning.

Spatial analysis of urbanized territories

Today, various planning (TCS, LTP, UMB) and project-design (JDZ, POIHE, eco-districts) tools - which must be given consistency - enable local authorities to develop their territories in a more sustainable manner. Managing the complexity of a city in which all elements form different systems, requires representation and evaluation tools to understand the phenomena at play; moreover various scenarios must be compared in order for choices to be made. Spatial information plays a very specific role as the visual and spatial representation of the information observed or processed enables understanding in a much easier way the condition of a territory as well as its evolution in time. Spatial information has become an indispensable support at every step of the territory development process: from diagnostic to decision, from consultation of experts and citizens up to the communication of results.

Coupled with spatial data infrastructures (SDI) geographic information systems (GIS) make it possible to archive, process and map spatial data^[4]. They constitute an efficient means to aggregate and cross-check a set of various data and to integrate data acquired in situ or produced by digital technical means (simulations, indicator assessment), and as such GIS make it possible to evaluate the adequacy between the components of built or non-built space, its usage features and economic and social dimensions.

SDIs which interface with internet portals provide raw or processed data. They are mostly thematic and hardly allow cross-checking information of various origin or nature which is constantly at play in sustainable development issues. One challenge is to propose a heterogeneous database operating system that enables easier extraction, sharing and combination of information. Recent works on semantic web offer new possibilities to query database in a transverse way by virtue of semantic link mechanisms. How could these systems be adapted to geographic information? How could they assist users in their information research works? Can they facilitate the structuration of ever increasing data volumes?

GIS enable information to be visualized and rendered in a synthetic form within its geographic context making that information understandable by most players. Maps remain the indispensable form of spatial information, and their utilization has been facilitated significantly by digitalization. Despite the diversity of existing map production tools, numerous impediments remain. For this, maps and their formats must evolve still to integrate heterogeneous data, interactive media, and be visualized regardless of their delivery media. New approaches in data graphic analysis and representation will need to be developed in

order to facilitate the interpretation of the complexity of certain situation and the semantics of the data produced. Moreover, these approaches need to integrate the potential resources of Web 2.0 technologies for the development of new services in businesses.

Collaborative urban planning

Social appropriation and involvement appear as the optimum guarantee for the quality of use and sustainable co-management of urban spaces. They express the political will to make a city both a shared project and a common good. Yet, how is it possible to leverage individuals and communities, while making cities globally more coherent and performing?

New information and communication technologies contribute to the development of more collaborative urban planning forms owing to the combination of scientific expertise and citizens' knowledge as well as closer involvement of inhabitants in the decision-making process. Approaches are being developed that are based on dynamic tools and practices for the observation and appropriation of urban landscapes within the perspective

of cooperative social and urban development of territories. The LBAIO association has experimented with an interactive system that makes it possible to edit and render dynamic hypermedia contents (sound, image and text), that reconstitutes the landscapes of the Malakoff Pré Gauchet district near the city of Nantes. The inhabitants of the district were involved in the production of these contents based on the memory and observation of the site so as to enable them to become aware of the identity, the history and the complexity of the district. The hyper-media system makes it possible to integrate an urban development project and to reconstitute the landscaping impacts in order to initiate a dialogue among the inhabitants about the various scenarios possible, thus fostering consultation, dialogue and social diversity.

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Research efforts on sustainable cities: first reviews of the ANR program

by Pascal Bain, Program Officer, French National Research Agency (ANR)

Initiated in 2008 following the "Grenelle Environment Forum", the ANR "Sustainable city" research programme is intended to gather the national scientific community around a research effort on cities which are perceived as complex systems interacting with their environment. The present article shows that the challenge of multidisciplinary cooperation has been won partly owing to a significant wealth of issues and approaches treated. This effort should be continued however, since the construction of a true systemic approach to cities is a long term process.

Genesis of the ANR 2008-2010 "Sustainable Cities" research program

The conclusions of the Grenelle Environment Forum emphasize the fact that a city is a territory where several environmental protection issues and more generally, sustainable development issues, are at stake. Yet, the idea of a collaborative research programme on sustainable cities emerged from Agora 2020, a Foresight exercise initiated in 2004 by the Prospective and Scientific Intelligence Center of the Ministry of the Equipment. Starting from emerging needs and medium/long term stakes within the scope of action of the Ministry, the purpose of Agora 2020 was to identify future issues and research axes. This project involved not only researchers but also the whole of civil society (local authorities, community groups, businesses, citizens, etc.).

Cities have been identified as a point of convergence of numerous challenges; some research directions proposed by Agora 2020 enable the scope to be assessed: "oil-free cities and transports", "design of transport systems at the scale of large urban areas", "adaptation of buildings and urban areas to climate change", "life cycles of buildings, from design to recycling", "modeling and reliability of urban systems", "vulnerability of territorial systems: what global approach?"...

Since the questions posed by society to science are orientated by action stakes and are inherently holistic, one of the key messages of Agora 2020 was that researchers needed to address these issues in a more systemic manner than what they were used to and that a research programme that fosters dialogue between engineering sciences, environmental sciences and human and social sciences is necessary to follow that path.

Within this scope, in 2008 the ANR initiated a three-year research program on issues raised by the construction of urban sustainability. The idea was to fuel interest for research efforts on cities considered as complex systems. This "sustainable cities" program, with numerous transverse themes (mobility, development, governance, infrastructures, urban engineering, biodiversity, environmental protection...), was intended to overcome well known divides - sectorial, disciplinary divides, divides between basic and more applied research works and to foster research efforts at the interfaces. The idea was that the territorial approach would enable links to be established between the various themes. The favored entry point of the

program was to provide answers to urgent environmental and energy issues especially through the reduction of the negative environmental impacts of cities, albeit not to the detriment of the two other pillars of sustainable development.

Prior to giving a brief review of this program, three fundamental dimensions of a city must be recalled: stocks, flows, human beings. First of all, a city is a highly anthropised space, with a fairly dense fabric of buildings and infrastructures. It is also a place where numerous flows converge: people, goods, water, energy, etc. Finally, a city is an area where a large majority of people especially in Europe live, work, enjoy recreational activities. The "Sustainable cities" projects include these different dimensions at various levels.

Three years after its implementation, first conclusions can be drawn on the ability of the scientific community to deal with the subject and respond to the questions.

Rather traditional issues extensively addressed

Flow management is a well identified research domain that has generated numerous proposals. Most of these works look into flows of people which are sources of a significant portion of local pollutions and GHG emissions; it consists notably in pondering anew the relationship between transport and urban planning. This relationship is too often perceived in terms of compatibility but insufficiently in terms of reciprocal influences. However, the evolution of mobility practices influences urban shapes and land use policies determine the mobility modes. The aim of the MIRO2, PLAINSUDD, Eval-PDU, Trans-Energy and POSAMU projects is to design analysis and evaluation tools (especially simulation models) to inform and support public decision making in this domain.

Goods are not forgotten: the FLUIDE project which examines the ways waterways and urban ports could be better operated to support logistics; the CONSUMER-Log project explores consumers' logistics; the MODUM project whose aim is to construct an "ideal" model of goods distribution in cities.

Urban water management is another topic which attracts significant national research efforts that translated into the INOGEV, OMEGA and EAU&3E projects.

Although there are numerous research works focused on the energy efficiency of buildings and transport vehicles, supported by other programmes (PREBAT, PREDIT), **energy**

transition at city scale necessitate transverse, multi-sectorial approaches more difficult to implement, in view of the retroactions and uncertainties linked to the impacts of decisions, especially to identify win-win strategies and actions without regret. For example, if it is clear that, today, private cars are one of the main sources of CO₂ emissions, it is not known to which extent electrical cars coupled to peri-urban positive-energy individual houses would be more efficient than a denser urban area, which is not very suitable for local energy production and cooling in summer (notably because of the urban heat island phenomena which is likely to increase the demand for air-conditioning). A spatial organization elaborated to minimize motorized travels lowers significantly CO₂ emissions but it is not just a question of density as it is often perceived. The well-known study of Newman and Kenworthy shows a good correlation between transport energy consumption and density. However, some cities deviate from the curve: for instance, the urban density of Copenhagen is three times lower than that of Vienna, yet the energy consumption per inhabitant is the same in the two cities. This reveals that it is necessary to take into account other parameters than density alone: functional diversity, public transport infrastructures, “ecological” behavior of inhabitants, etc. It all depends on the type of density, the lay-out of city blocks, networking of transport infrastructures. The ambition of the ASPECT 2050 project was to shed light on these interactions through a radically systemic approach and to propose action leads at the interfaces between sectorial policies.

The AETIC project has adopted a complementary approach which consists in establishing a hierarchy of sectorial actions (building, transport, energy production), based on their marginal abatement cost (€/tCO₂ avoided) to reduce GHG emissions. Finally, the MUSCADE project objective was to produce economic-climatic scenarios of the evolution over a century of the greater Paris urban area and to analyze their consequences on energy consumption.

The relation between “city and nature” have also been widely studied: the aim of the VegDUD project is to quantify the role that vegetation can play in minimizing the scope of urban heat islands. More generally, numbers of ecosystemic services provided by nature in cities have been the objects of very interesting research efforts in the TrameVerteUrbaine and VegDUD projects.

The development of sustainability knowledge, measurement and assessment innovative tools

Several projects intend to develop methodologies in order to characterize the “sustainability” of a territory:

- at the scale of a district, using a life cycle approach (ACV Quartier);
- at the scale of a large urban area, using an industrial ecology type approach to analyse the metabolism of a territory (Confluent);

Other projects aim to assess the impacts of public policy tools like the Eval-PUD project, focussed on analysis of the environmental impacts, and the socio-economic consequences of an urban mobility plans.

Subjects to be brought to the fore or to be reinforced

Unfortunately, the program has not been able to provide sufficient support to research works in domains which had been initially identified as especially important. The following can be mentioned:

- management and maintenance of the **built heritage**, as well as the ability of such built stock to evolve and adapt to new challenges such as sustainable development. Indeed, the European cities, which were the main targets of the program, are already largely built, unlike cities in emerging and developing countries. Besides the EAU&3E project already mentioned, a few projects, nevertheless, addressed these issues from a purely technical angle: Evadeos (concrete cracking), MEDITOSS (tunnel inspections);



- the development of **adaptability engineering** to complete or replace partly an engineering approach today mainly focused on the optimization of solutions expected to meet known needs and constraints; there are indeed strong uncertainties on the scale of changes to come (climatic, demographical...), which means that it is necessary to imagine systems which will be more flexible and adaptable - at low cost - to different situations. The INCERDD project deals with the issue of decision making and choices within a context of uncertainty;
- **time scale articulations**: it is often said that the urban structure changes very slowly. This is only partly true and substantial changes remain possible, especially within a 30-40-year time scale:
 - First at the level of urban practices, with the advent of teleactivities, teleservices or the spreading of telework;
 - Next, through new assignment of buildings, and redeployment of infrastructures;
 - Finally, there is often an reorganization and urban renewal potential at the first peripheral circle of large cities, in moderately dense spaces, where public transport can provided satisfactory accessibility. As an example, this was the object of the BIMBY project which examined the most favorable conditions to increase the density of peri-urban residential areas;
- **spatial scale articulations**, with the example of the IMPETUS project whose aim is to propose a methodology to optimize the integration of a new urban local project within its territorial context and to articulate the project with the global sustainable development strategy defined in the urban planning documents;
- a better understanding of what makes urban resilience and the ideas to improve it, with only one projects RESILIS - which looks into the subject;
- the role of **information sciences and technologies for sustainable urban development** as well as their positive and negative effects;
- the role of the inhabitants, the participative dimension and collective intelligence in the construction of urban sustainability have probably been put to the fore insufficiently, taking into account the impact of behaviors and practices, even if the human being is at the core of the BIMBY, ENERGIHAB, PAGODE, PUMDP and Trans-Energy projects.

Conclusion

The "sustainable cities" program has shown an amazing wealth of topics as well as research postures that range from the production of new knowledge to innovation and development of decision-support tools, meant to of professionals.

This program has also evidenced the interest of a dialogue between scientific disciplines but also between researchers and local actors on site: one third of the projects supported by ANR have at least one local authority as partner; in fact a larger number of them have been conducted in close collaboration with local authorities, be it for data access, validation of models or methodologies using case studies, or even experimentation and interaction with public policies. Very few projects were limited to lab research only intended to produce new knowledge; a true effort of diffusion to the practitioners has often been undertaken.

Finally, resolutely systemic approaches come as effectively innovative and fruitful, even though their scientific construction remains a long term process. However, they should not replace totally a research more focused on specific issues, especially when such efforts have been identified as key issues to better understand and facilitate the construction of urban sustainability.

ANR sustainable cities program: the example of urban water services' sustainability

by Bernard Barraqué and Laure Isnard, CIRED-CNRS-Agroparistech

The aim of the Eau&3E research program is to study the sustainability of urban water services within the context of evolution of consumption modes, of aging infrastructures, of growing poverty, and of modification of management territorial scales. The approach selected is based on the construction of prospective scenarios. This approach is a clear illustration of one of the strong research axes in the sustainable cities program.

A sustainable response within a context of water services crisis

Within the scope of the Eau&3E¹ research project funded by ANR Sustainable Cities, we discussed the sustainability of public water services while improving the knowledge necessary to achieve appropriate management, then through a prospective exercise that enables strategic lessons to be learned. The whole project takes together into account the four issues that might lead responsible cities into diverging (and even opposite) directions:

- For the last twenty years there has been a reduction of water consumption at least in city centers: how long will this last? This phenomenon is positive for the environment but it progressively lowers the revenues of consumption-based charging systems (billing). A new modeling approach refining the traditional econometric studies is being tested in Paris (CIRED) and on various sites in the Languedoc Roussillon (under the stewardship of the BRGM economics department and Irstea, both in Montpellier);
- Infrastructure ages and must be renewed, and there are numerous decision support tools available; yet should the long term renewal of infrastructure restore the systems to their initial conditions or should we imagine a step back from the fully centralized principle? Where will the funds come from? What kind of loopholes can be expected under various management formulas? (ADES Bordeaux, ENGREF-Montpellier, and COGITE);
- Low income households face difficulties to pay their water bills which have significantly increased, and it is difficult to imagine lower average water tariffs! What should then be preferred: internal cross subsidization

between users or general social aid? On this axis we are modelling the global redistributivity of tariffs and of their changes, between categories of users, and between users and the utility itself (GESTE-ENGEES);

- Finally, if sustainability consists in dealing with the three conventional axes 3E: economy, environment, equity it does not sufficiently place the emphasis on the public policy dimension of water services. Hence, our project comprises a fourth axis i.e. the territorial dimension of water management and governance (CIRED and all teams).

Grasping complexity through the use of prospective

To make headway and enable water service managers appropriate these issues a prospective exercise has been carried out within EAU&3E. According to Yves Barel: "prospective is a reasonably scientific assertion concerning the choices - hence the problems - the future has in hold"². Stretching somewhere between forecast, prophecy and utopia, prospective should notably make it possible to better understand the current system, and to shed light on stakes, actors and medium/long term inter-relations. Thus, prospective prepares decision-makers for their strategic choices directly related to action. For this, prospective can rely on the design of scenarios which provide possible images of future systems owing to a coherent and global discourse. The scenarios also make it possible to identify the motivations of the various stakeholders, to shed light on evolution processes, or to take out the heat and structure the imagination of the future by enabling discussions and comparisons between coherence and credibility of the alternative scenarios and possible options.

Thus, prospective leads to the identification of knowledge-based futures and involves the scope of values. Prospective helps stakeholders identify desirable or non-desirable evolutions, management choices to be avoided, or the category of stakeholders who will suffer most from the changes considered. Following are the major outcomes of the approach developed within the EAU&3E project.

Possible scenarios

In 2012, having worked on the four above mentioned axes, the partners to the project elaborated global and consistent scenarios. These eight scenarios can be broken down into two groups. The first scenarios examine the financial equation of drinking water services; the second group describes the territorial fragmentations and recompositions, desirable or risk bearing, which could appear between a management unit, neighboring local authorities, other services or even the resource. All these scenarios question the medium/long term sustainability of water services, faced with the irruption of a disturbing event.

Maintaining financial balance without exiting the current management paradigm: an impossible challenge?

In the first three scenarios, we remain within the current water service management paradigm, which is characterized by the strict application of the "water pays water" principle. The technical, environmental and sanitary choices adopted during the previous decades are globally approved by the various stakeholders. Yet, maintaining the status quo rapidly proves to be a disaster for the service sustainability: the rapid increase of the water bill becomes unbearable for a large segment of the population whereas the degradation of public services continues.

The adoption of new technical and management tools increasing block tariffs, generalization of smart meters, social modulation of progressive tariffs to prevent unpaid bills, emerging alternative techniques to network in peripheral zones, etc. does not necessarily improve

sustainability, especially if they come with a lack of vision from the authority in charge. Finally, the increasing quest for water conservation could lead to a technical and regulatory drift, controversial in terms of social as well as financial acceptability. However, none of the scenarios that consider preserving the current management paradigm seems desirable.

Finding new financing models or challenging the equal access to the service: at what cost?

In the following scenarios, the difficulties faced by water services lead them to evolve considerably. As a first option, the "water pays water" principle is abandoned and new financing strategies are being explored: for instance, sanitation and firefighting are removed from the bill, or mutualisation and economies of scope are sought through merging with other urban services. In the latter case, this could imply institutional reshaping and the creation of multi-service public companies that would call for a deep change in the management culture (according to the German-Swiss model).

Another scenario envisages challenging the "network service for all" system and opting for dual services. The standard public service is then reduced to a universal service with lower quality to prevent any excessive water tariff increase. In parallel, a Premium Service is developed which offers higher quality for those (households, blocks or neighborhoods,) which are ready to pay more.

These two scenarios make it possible to maintain sustainable financial balance for water service. Yet, they raise questions as to the political feasibility of the necessary evolutions or even on the desirable character of the choices made to achieve it.

Territorial reorganization: more than just an easy solution to deal with water services' issues

Three other scenarios study the possible reorganization of water production and supply territories. They consider both the *up-scaling* approach, consisting in a widening of the territorial limits of the service to enhance access to the resource and pool infrastructure, as well as the *down-scaling* approach which supposes to drift apart from the



current technical paradigm, in shifting from centralized networks to partly decentralized technology solutions.

In the first scenario, the State promotes the grouping of water services in order to achieve economies of scale, rationalize drinking water production and implement territorial solidarity. Joint boards at the level of the *Départements* are being developed all over the territory.

At the local scale, there can be varied forms of territorial reorganization. As such, the second scenario shows how a large city may negotiate with the neighboring authorities and all water users to achieve an optimum use of the water resources available, even if it means paying for environmental services.

In the last scenario, the analyzed water services choose the solution of a "Technology-based isolationism": in a system with scarce water resources, the city goes for technical-engineering solutions, sea water desalination, waste water recycling, etc., and grows more and more autonomous from its traditional water resource territories.

All these scenarios have been discussed by about thirty stakeholders of French water services (public and private managers, elected officials, representatives from users and employees, State agencies and administrations, etc.), during a prospective workshop organized in November 2012. The aim of this day was to validate collectively the credibility and relevance of the scenarios, but also to identify the strategic issues raised by this exercise for water services managers to achieve sustainability.

Lessons drawn from the exercise: towards a new governance?

The prospective workshop provided a wealth of lessons about the prospective approach itself, but also about the strategic choices which drive water services towards more or less sustainability. Once more, it appears that the issue of governance must be clearly included within the strategic reflections of the managers. More than a simple issue of "proper scale" of management, it seems that it is the relationship between the service and its broader environment that proves essential: the water service has to carefully consider other sectors, such as sanitation, agriculture, rural territories, hydro-electricity generation, as well as to include water resources management, citizens, housing policies, or even the role played by the central State. It would therefore be necessary to broaden the circle of stakeholders involved in water service management decisions, so as to better integrate all players and widen the scope of solidarity.

This discussion is especially important since the European Water Framework Directive intends to derive

water management policies from the recovery of aquatic ecosystems, and thus encourages water users to get involved in the territory where the resource is shared. In most cases, this territory is regional or basin-based, so often broader than that of the services themselves. Hence, the authorities that organize the services have to invent new forms of governance – in this case a multi-level one for the institutions which remain at the heart of urban water management in numerous European countries: the municipality or the *syndicat intercommunal* (joint board water authority). The literature survey we have conducted about this subject in Europe, the USA and Australia shows evidences of this new governance, at least for the pooling of funds, and sometimes for the joint production of drinking water and waste water treatment. In France, we studied the controversial role of the *départements*³ (challenged by the French 2006 Water Law and by the current territorial reform project considered by Government), or of some regions (the Greater Paris for water, Brittany, etc.).

Moreover, the media coverage of some aspects of water services issues encourages militant or self-interested practices which could further worsen the service crisis: on the one hand, advocates of eco-neighborhoods and of lower water and energy consumptions, are seeking to produce their own energy, food and water on site (the famous nexus); on the other hand, users distrusting high priced water install various autonomous devices (private wells, recycling, rainwater collection). This double offensive/defensive movement renders the interaction between elected officials, service operators and users even more indispensable. Yet, is time gained or lost when citizens are involved in the management of the service? What additional costs will be avoided later? Finally, although water service management receives lots of media coverage, it does not necessarily come with a well anchored political vision: here again, the prospective exercise proved the importance of a return of the political responsibility in these issues.

(1) See the project's blog: <http://eau3e.hypotheses.org>

(2) Yves Bareil. « Prospective et analyse de systèmes » in Travaux et Recherches de Prospective, coll. Schéma général d'aménagement de la France, n°14, février 1971, 175 p.

(3) EAU&3E partly furthers the Aquadep project coordinated by Rémi Barbier (Iristea-GESTE), and supports the reflection on resource-service interaction in the Gironde département, conducted by the SMEGREG.



Conclusion

Created in 1905, the general association of engineers, architects, and municipal hygienists (AGIAHM), became the Association Scientifique et Technique pour l'Eau and l'Environnement (ASTEE) in 2004, actively participated in the modernisation of French cities. Its activity is in line with the ideas embraced by the Musée Social and "municipal socialism". It has united a wide range of professionals, who have played a very important role in their effort to help urban services make French cities healthier, better organised, safer, and more functional. The last two centuries of urban modernisation would not have been possible without them. In his article, Pierre-Alain ROCHE, President of the ASTEE, describes the perseverance of all those who developed the principles and defined the rules of "urban engineering". The members of the association were at the very heart of post-war boom activities and played an important role in the re-emergence of urban engineering at the end of the 80s. The adventure continues, though it is now animated by the new challenges posed by "sustainable development", the dynamics of "metropolisation", the widening gap of territorial inequalities, or the search for more resilient urban systems. The undertaking is considerable, and the ASTEE will fully assume its role, concluded the President of the ASTEE.

A century of urban engineering in France: lessons for tomorrow?

by Pierre-Alain Roche, President of the ASTEE

Looking back over a century of relations between public networks and urban planning, with particular attention urban engineering through the articles published in the journal TSM, we have tried to reassess the issues raised in this book from a historical context. Some aspects, dealt with in the preface, will not be repeated here.

Introduction

At the conclusion of this book, it is only normal that we ponder what role the ASTEE, which organised this conference, should assume in promoting the concept of transversality called for by Marcel Belliot and Bernard Chocat. Already, Patrice Cosson, writing in behalf of the ASTEE in his 2009 white paper "Urbanisme et Propreté" (ASTEE, 2009), prefaced his remarks with the following: "urban planning and urban waste management: two worlds that don't communicate sufficiently".

But to draft a response to the confident conclusion of BELLIOU and CHOCAT synthesis ("*The adventure continues [...] The ASTEE will know how to respond.*") is more complicated and challenging than it may seem. And this leads us to cast one more look back over the history of relations between urban networks and urban planning. Without wishing to paraphrase the very interesting contributions of Sabine Barles in this book, the common thread that should be retained is that of urban engineering, backed in particular by the articles published by the journal TSM, which constitutes a unique historical legacy that is our duty to make known.

When reconsidering urban models, it is always useful to recall the basic associations between urban planning and urban services. During the 6th General Assembly of the World Water Council on the 18 November 2012, Joan Clos, General Director of UN Habitat, stressed that the issue of urban networks and their connection with urban planning is still very much relevant in a large part of the world, where urban growth continues at an unprecedented pace¹. He then stated that the development of basic services cannot proceed without urban planning that clearly identifies land where construction is legally permissible and where it is not and the means to enforce it. He pointed out that public spaces generally represent 40% of total surface of developed cities (49% in Manhattan), while this figure is between 10 and 20% in developing nations, and only 2.5% in slums. Thus the first obvious key to the link between urban services and urban planning is the setting aside of a public framework that will adequately allow for the organisation of services².

Throughout the 20th century, four major periods are dominated by urban models and very different economic and social circumstances. When addressing the current period, detailed questions regarding the meaning of the so-called post-modern societies have arisen, as have questions regarding the potential evolutions of urban models and urban services to meet new challenges.

The Musée Social and ASTEE's ancestor retrace the beginnings of urban engineering

In Europe, a comprehensive approach associating the city and its urban services was already present in 1830³. Its first remarkable manifestations found in Haussmann's remodeled city in which urban spaces were reconfigured to accommodate networks of urban services (drinking water, sewers, then public lighting, city gas, and even communications). These symbols of modernity (ROCHE, 2010) even contributed to the quality of public spaces, as ornamental parks and gardens appeared, and sidewalks soon lined city streets. This same model, emulated in most of Europe's major capitals (Paris, Berlin, and London), would soon be adopted as the model of a modern city. Ildefons Cerdà, the urban planner from Barcelona who designed the Eixample, an extension of Barcelona built following the destruction of the old city walls, is generally considered as the person who coined the term urbanisation with his work "General Theory of Urbanisation," (CERDA, 1867). Cerdà's checkerboard urban grid, its city blocks hierarchical and regular with truncated corners, is clearly intended to enhance functionality and allow for the development of urban networks, as it meets the need of urban expansion in response to the industrial revolution⁴, much like Lyon's expansion east of the Rhône, or the development of Strasbourg. One of the primary recurring threads of this design, largely motivated by the devastating effects of epidemics and fires (not to mention a concern for maintaining order⁵), is that of the emergence of public health policies; but this, as we'll see later, actually corresponds to a much more vast social project⁶.

The public space will also assume a major role in the so-called culturalist approaches to urbanism (Camille de Sitte's analyses of urban morphology ("*der Städtebau*", 1889), for example). Public space was also central to Edward O'waid's reflections ("*Tomorrow: a peaceful path to social reform*", London, 1898) on the garden-city that had a major influence on social urbanism in France.

Upon the creation of the Association générale des Ingénieurs, Architectes et Hygiénistes municipaux (AGIAHM⁷) in 1905, thanks to the impetus provided by Edouard Imbeaux⁸, the founders had a broad perspective of its concerns: "everything that has to do with municipal service", as one of its first presidents, Georges Bechmann⁹, put it. Article 2 of the association's statutes stated this meant "all questions that pertain to the art of applied urban hygiene and municipal engineering" and the "improvements to be pursued in laws governing Hygiene and Urban Engineering". Edouard Imbeaux, in his introductory speech at the association's founding session,

described it as: “the marriage of the art of the engineer, the architect, and the science of public health,” [...] “a union of the disciples of the Darcys, of the Dumonts, of the Belgrands, of the Trélats, and the disciples of Pasteur”. In the early days of the AGIAHM, the hygienist/engineer dialogue was often overly emphasised, to the detriment of the architect, who nevertheless played a significant role. In addition to articles on the drinking water and sanitation processes¹⁰, not to mention studies on dams, hydrology, metrology, flooding, fires, epidemics, garbage and sludge (gadoues¹¹), some of the earliest issues of association’s journal¹² included articles on “the unsanitary air of our homes¹³” (ALBERT-LEVY, 1906), “the layout of public streets and squares¹⁴” (VIERENDEEL, 1906), “a normal lifestyle for children¹⁵” (GANGE, 1906), “combining water services and public lighting services in small cities¹⁶” (SACKETT, 1906), “the development of automobile traffic in Paris¹⁷” (MARNIER, 1906), “plans for expanding the city of Lausanne¹⁸” (JACOTTET, 1907), “low-cost housing¹⁹” (MARNIER, 1908), “modern roads²⁰” (VINSONNEAU, 1907-1908), “city expansion plans²¹” (REY, 1909), “free spaces in large cities²²” (LOVERDO, 1910). In 1916, the tenth anniversary of AGHTM was celebrated at the Tuileries with an “exposition of ideas” (urban projects and plans) and an “exposition of objects” (construction processes, component of a complete village).

The broad vision of the founders of AGIAHM was no coincidence. It was the product of a strong collective dynamic otherwise known as municipal socialism. In France, the municipal socialist movement²³ gained momentum thanks to the decision taken in 1888 to institute municipal elections. The Musée Social, founded in 1895, was a private foundation that played a pivotal political role in the promotion of a “social peace” to counter emerging revolutionary movements. The museum became a harbour to a group of movements that were created and encouraged: le mouvement coopératif, l’habitat social (called HBMs, or low-cost housing), le mutualisme (Léopold Mabillean, director of the Musée Social, was the first president of the Mutualité Française, founded in 1902), le mouvement urbaniste, which promoted garden-cities, and the creation of the Société Française d’Urbanisme in 1911. The AGIAHM was directly involved in this movement, and the association’s inaugural meeting was held at the Musée Social between the 22nd and 25th of November 1905. In the presence of L. Mabillean, Docteur Imbeaux stressed the “social character of our work” in his introductory speech. These were the same circles that would have a strong influence on the very first town planning laws: the Cornudet law of 1919²⁴ and 1924²⁵. The emergence of city planning, public health, and urban networks coalesced into a single movement that helped bolster municipalities whose strength had already been reinforced by municipal elections. At the turn of the 20th century, this was indeed, the project that paved the way for what we call today a

sustainable and responsible city. Thus the early work of the AGIAHM played a role in the development of modernist²⁶, progressivist and egalitarian ideologies.

It was indeed a comprehensive view of the city and its networks that was put into place. This perspective, which was not without controversy (public health proponents clashed with the ideas of a budding urban engineering (CLAUDE, 1987), which we’d probably call a global, or holistic perspective, is oddly similar to today’s debates, a full century later. And Merlin and Choay’s Dictionnaire de l’Urbanisme et de l’Aménagement makes the following remarkable statement in the entry on urban engineering: “expression that was first employed in 1905 by the AGHTM (sic) and later re-employed in 1984 by the Ministry of Urban planning, Housing, and Transportation”.



Urban engineering at AGIAHM: a “transversal” project

Has this urban engineering project promoted by AGIAHM prospered? Not at all, if we are to believe Serge Thibault (2000), who had no hesitation in proclaiming that “the first attempt at urban engineering by AGIAHM was scarcely fruitful because the technical, professional, corporatist, political, and territorial issues were just too great, diverse, and contradictory. Most notably, the supporters of a municipalisation of the design and management of urban techniques were pitted against those who supported the externalisation of urban management towards the private sector, considered to be more qualified [...]”. This comment over-characterises the public-private dispute as a conflict that beset the AGHTM in its early years. The diverse angles of approach found within the TSM journal, including accounts of occasional heated exchanges over the respective areas of competence of engineers and hygienists, are evidence of internal conflicts, but also demonstrate that collective work continued.

The period between the two wars were economically and socially difficult, during which time the overall standard of living failed to improve and even declined with the crisis in 1929. Urban construction models and networks followed the patterns prevalent at the end of the 19th century (“Up until the 1950s, the urban scene and its relationship with its territories remained essentially the same as they were during the second half of the 19th century” (CHOAY, 1998)). The reconstruction of cities devastated by WWI provided an opportunity to test the concepts that had been forged earlier. In the 20s, the AGHTM remained very involved in this process and open-minded: it reported on housing conferences, and there are a number of articles in TSM on projects for urban planning, garden-cities, urban embellishments, urban planning in Germany, Morocco, Great Britain, schools, the protection of small children, “asylums for alcoholics”, low-rent housing, and BIT news (Bureau International du Travail/International Labour Office). In 1927, Chalumeau wrote an article entitled “Urban

planning in Lyon in 1926: pursuing the work of Claude Bernard". "Urbanism" became one of the main headings for articles in 1932 and from 1933 to 1936, for the first in the organisation's history, its president, André Fijalkowski, was an architect (engineer-architect to be exact). As the Cornudet laws were not immediately enforced, the AGHTM reported on conflicts that arose between elected officials and technicians. In 1928, Mr. Forestier (1928) proposed an approved list of "men capable of en drafting urban development plans" and in 1929, a competition was held for the realisation of these plans, which sparked a discussion on the merits of associating "two types of specialties" (implicitly, he meant engineers and hygienists) (FORESTIER M. , 1929). The AGHTM sought to remain a forum where difficult inter-professional issues could be openly debated.

In the 30s, more conceptual visions by Le Corbusier²⁷ (1935) came to the fore and won media attention in France. As subdivisions grew, the concept of a "grand ensemble" was forged (the Prost plan for the Parisian region was published in 1934 and approved in 1941; it was an inspiration to post-war reconstruction). The so-called grand urban theories championed by progressists (Garnier, Gropius, Sert, Le Corbusier, etc.) developed, pushing the functionalist premises of 19th century utopias to an extreme (Owen, Fourier, Proudhon, Godin, Considérant, Richardsons, etc.). The theories soon acquired dominant status and set about creating rational universal models that broke radically from earlier models that banished the urban street vocabulary²⁸. They clashed with the culturalist schools (Ruskin, Morris, Sitte, Howard, Unwin, etc.) that were at times clearly nostalgic for the preindustrial urban models and the naturalist models (Broadacre-City by Wright) that held sway most notably in the United States (CHOAY, 1979).

The post-war boom

Essentially, these were concepts from the second half of the 20th century that once again reshaped the urban landscape that we live in today²⁹. Despite the apparent de-politicisation of the urban project compared to the militant urban social project of the turn of the century, the invocation to rationality, the omnipresent scientific reference eventually established this discipline and gave it voice. The AGHTM, on the other hand, seems to have been distanced from these considerations: urban planning had found its place elsewhere; it has its specialists who squabbled between themselves in other circles, in other journals.

In 1945, a major article entitled Urban Planning and Public Hygiene, a review of a conference held on 13 December 1944 written by M. Gibel, director of urban planning and building construction at the Ministry of Reconstruction and Urban Planning, described the need of an urban approach marked with progressivism: "activities should be grouped in accordance with their nature; residential areas should be built far from noxious industries, but not so far as to compel excessive travel of workers; transportation should be provided for; city centres should be developed with free spaces necessary for the ventilation of overcrowded neighbourhoods ; road and railway networks should

be adapted to facilitate faster and denser circulation ; drinking water and sanitation networks should be built in accordance with the surface development ; public services should be capable of accommodating new constructions" (GIBEL, 1945).

This ministerial prescription provoked little debate at the AGHTM, which accepted it as a roadmap or framework to which it would contribute its widely acknowledged skills: public hygiene and urban networks. Despite TSM's review of Le Corbusier's book "Propos d'urbanisme" in 1946, the ASTEE focused its work on aspects of public hygiene in the urban planning and sanitation laws. In 1955, the question of "network coordination" in the rebuilding of Royan is addressed by M. Chardonnet. By 1956, urban planning once again became one of the journal's major article headings. But article contributions continued to be sector-specific, restricted to technical research, very active in seeking processes for improving drinking water, and emerging water treatment processes.

The first period of the second half of the 20th century is that of the post-war boom (1950-1980). Pierre Veltz (VELTZ, 2002) recalls that the period was also marked by a remarkable increase in agricultural productivity that dramatically reduced the need for farmhands and fuelled industrial development, creating "Taylorised" jobs primarily in medium-sized cities in the provinces and generating an active urban expansion phase. French consumer spending, which stood at a third of US consumer spending in 1950, reached equivalent levels by 1980. In 1950, average household income had remained unchanged since 1900, but increased 4.5 times within thirty years (PIKETTI, 2001). Manufacturing jobs jumped from 5.5 million in 1950 to 7 million by 1980, only to drop back to 1950 levels by 1990, while service-sector jobs climbed from 12.3 million to 14.3 million between 1982 and 1990, absorbing most of the jobs lost to de-industrialisation. As Pierre Veltz (VELTZ, 1996) remarked when Jean-François Gravier (GRAVIER, 1947) published "Paris et le Désert Français", the density of the population actually sparked a demographic growth in most provincial French departments³⁰.

What impact did these socio-economic changes have on the urban fabric and public services? There is little doubt that the urban planning of the post-war boom period, which some call promethean and others pompidolien, would be particularly striking.

Cities were soon dissected by cross-town expressways, then ring-roads, urban bypasses and express-ways, which both drove and accompanied the peripheral development of shopping centres and activity zones, where signs were substituted for architecture. Suburbs would soon overshadow the historical centres of the cities, absorbing other lesser city centres either with an indistinguishable residential subdivision, or with unfolding "grands ensembles".

The road infrastructure, optimised with the sole objective of ensuring automobiles' fast travel, led to a paradox: instead of reinforcing the open, mobile, shared-access model, the automobile was creating a new fragmentation, a new urban segregation. The new infrastructure, despite being public, created impassable barriers, and the distances forced

suburbanites to travel by car, developing new segregations. Jacques Marsaud (MARSAUD, 1998) later indicated that Saint-Denis, a suburb outside Paris, experienced five ruptures: spatial rupture (shopping centres, disappearance of local municipal-scale facilities, development of alternative migrations leading to a dissociation of daily routines and the dissolution of social ties); civic rupture (loss of influence of trade unions, and social support structures that cemented working class communities); traditional wage rupture (unemployment, job instability); social rupture (impoverishment of large portions of the population); urban rupture (severing of infrastructures). Many similar reactions could be cited. This progressivism, which was supposed to be beneficial to all, did it not contribute to isolation and the dehumanisation so well portrayed in Hopper's paintings?

The emergence of environmental considerations and the public participation process of the 70s

In the 70s, the AGHTM took growing interest in emerging environmental concerns with the creation of a government ministry in 1971 (most notably with a water policy), the creation of water basin agencies in 1964, and the development of rural networks, that were strongly supported by the State's external services. In TSM, the emergence of an environment heading came at the same time as a noticeable reduction in the weight of articles specifically dealing with urban planning issues (the heading became "urban planning-public facilities"). The emergence of environmental issues was a revolution in the scientific fields of urban planning and public health, as it was for many others. At the same time, the maturation of thinking on public participation or on environmental impact studies (leading to the Bouchardeau law of 1983), was nonetheless imperative.

These dimensions (which alone merit elaboration but not here), would ricochet to form a general climate of concern that led all actors in the sector to reconsider urban models.

The rupture of the 80s and the re-emergence of urban engineering

From 1982 to 1990, the growth of metropolises (against a backdrop of crisis and de-industrialisation that was prejudicial primarily to cities in the provinces), picked up pace in the Ile-de-France, Rhône-Alpes, and along the Mediterranean coast. The GDP per capita in the Ile-de-France (responsible for 28.7% of the nation's GDP in 1990), and most notably that in Paris, was five times higher than that of the Creuse (VELTZ, 1996). Conversely, the Ile-de-France, with greater exposure to the crisis in the 90s, saw unemployment climb over the following decade.

As Pierre Veltz pointed out, "this polarisation (toward the French capital) in the 80s was not a continuation of the trend [...] in the Taylorist division of the post-war boom" (VELTZ, 1996). In fact, the levels of qualification were more

inclined to be blurred, but that is the very nature of qualified service jobs as they are propitious to polarisation. In the 90s, growth in the Ile-de-France was twice as weak as it was in the 80s.

At this point we should focus on the collective effort coordinated by Claude Martinand³¹ on urban engineering (MARTINAND, 1986). He formalised the concept of urban engineering through a set of definitions, one of which Claude Martinand called "disturbing to some". The definition is as follows: "Urban engineering is the art of designing, building, and managing technical urban networks, where the term network implies both a support network and a service network".

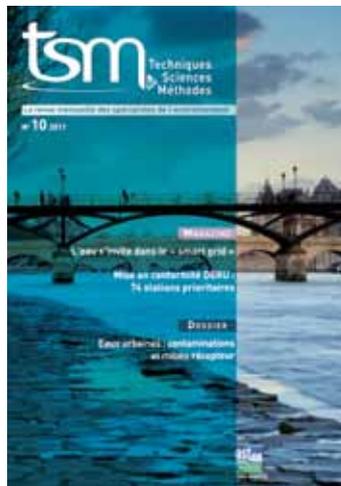
This work summarises and formalises a renewed ambition to return to a comprehensive perspective of urban systems. He owes much to earlier work conducted by the likes of Claude Raffestin and Gabriel Dupuy, who in 1975 began working on the organisation and role of "technical networks" (DUPUY, 1985) ("all the lines and conduits providing service to the same geographical zone and managed by the same operator"). Gabriel Dupuy later proposed the concept of the "urban planning of networks" (DUPUY, 1991): territorial organisation, made possible by the networks, provides a wide range of connection possibilities that should be maximised to enhance life in an urban setting. The journal TSM would add a sub-heading in 1987: "Urban engineering Rural engineering", and it reported on Dupuy's works, but curiously, no article was ever published that developed Claude Martinand's conclusions. The AGHTM then got actively engaged in issues related to the management of water resources at the ecosystem, river, and watershed level.

The AGHTM, in this same revisionist approach to the urban development model, will play a direct role in the development of alternative techniques of controlling storm waters at their source and of the "water in the city" movement that opposed hiding, channelling, and covering urban streams and rivers. This was one of the earliest and most concrete manifestations of the conceptual swings of the 80s that were spearheaded by several figures (most notably Bernard Chocat, Michel Desbordes, André Bachoc and Jean-Claude Deutsch) and of the Service Technique de l'Urbanisme (STU, 1991), with the creation of GRAIE and of the urban hydrology section of the SHF in 1985, of EURYDICE in 1988, and of the AGHTM's "storm water" group.

At the end of the day, these shifts only really got started once the urban development phase began to wane for reasons essentially linked to changes in the structure of the employment market, as if one had to wait until the progressivist city matured enough to feel free to reassess it³².

A city adapted to a post-modern civilisation?

We will now address the fourth period of this history, the current period, for which is not easy to assign a beginning



date with respect to the previous periods. From an economic standpoint, it is characterised by the emergence of new economic powers (the Emirates, China, India, Korea, Brazil, etc.) and the impoverishment of Western economies most notably the French economy. Technologically, the period is marked by the sweeping advent of information technologies and communications, as well as access to these technologies at a low price both for professional and private-sector applications. From a conceptual standpoint, it can be described as the period that first came to an awareness of the finiteness of the world and to the impact of human activity on human activity. Climate change, even more than the damage inflicted on biodiversity, has had an impact, despite our failure to take strong action. The articles in this book have largely addressed these new paradigms. At the same time, and in relation to these decisive factors, our society has evolved and is often qualified as "post-modern"³³. Paradoxically, today's society is reputed to be more individualistic, consumerist, and materialistic, but is in reality more inclined to turn its back on progressive individualism, and is openly more gregarious, mimetic, communitarian, even mystical than ever. It is rather a more visible resurgence of a collective tribal behaviour that traditionally served to cement humanity's constitutive fraternity, as well as an occasion for frenetic celebrations so indispensable to human society. These expectations are facilitated by the web, social networks, links and internet sites³⁴, and mobile telephones (over 6 billion currently in use in the world more than those with running water in their home). The "I" of today can also easily multiply affiliations to become "WE's" (HEURGON & LANDRIEU, 2003), and participate in various circles, facilitating unlimited complexity³⁵.

This resurgence will coincide with the waning power of the modern Western vision, based on progressivism, linearity, rationality, individual autonomy, which, as noted earlier, had such an impact on network and urban planning practices. The notion of "progressiveness" emerges (MAFESSOLI, 2008) to describe a more interdependent concept, both with nature and with the others. This notion seems particularly well adapted to the city: the concept of a progressive city which, like culturalist models, does not ignore its history or geographical context, but which, contrary to the culturalists, doesn't ignore changes in scale and the changing expectations of its inhabitants.

These elective geographies, more open, less confined by proximity, and more complex than an interconnected global city, do not seem to be hampered as much as one had assumed by their affiliation with the territories. Whether neighbourhood, city, region, or country, their existence translates into the same tangible differences of vocabulary, gesture, lifestyle that were once associated with a village, valley, or rural countryside whose relationship with the rest of the world was limited to peddlers, conscripts, and a few seasonal migrant workers; or a working class whose association with migrant communities, the army, major protests, and trade union activities forced them out of their isolation.

Cities do not operate anonymously or in isolation as was promised in the second half of the 20th century (referred

to earlier with Edward Hopper). Local associations and unstructured modes for organising festive encounters or political and social events through social networks, occupy a real and significant place in society. The role of public authorities as the guardian of social cohesion, mutual respect, and civil order is constantly questioned. Such discussions address the question of the priorities and the challenges facing territorial governance. This archipelago world, as Pierre Veltz (1996) described, has seen distances melt away by the ease and low cost of transportation and communications. In this global network that serves to cement the solidarity of diasporas, economic actors have not hesitated to revive local tribes: the medieval streets lined with drapers, bankers, tanners, or butchers, have been replaced by technology parks, scientific clusters, competitiveness clusters, financial centres those places where just being there is a symbol of success, and where today, the university campus and the suburb finally function similarly in terms of identity.

At the same time, as Gabriel Dupuy (2011) demonstrated, the differentiated capacity of populations to exploit the advantages of networks and universal services has not necessarily reduced social cleavages. The work of Henri Smets on social pricing provides us a concrete example, and the questions raised by the Eau&3E programme on economic evolution scenarios of water services show that nothing is less sure than the reproduction of an existing model.

Today, public service users are widely considered as clients (and rarely as citizens participating in decision-making processes that gives them a choice of service without any real alternative), which is also justified by the fact that the rates they pay go a long way in financing the cost of service. The examples given of Melbourne, Lyon, Bordeaux, or Nantes are evidence of the new attention political actors have attributed to this dimension.

This post-modern trend was introduced as contemporary, opportunistic, instantaneist, reactive, emotional, erratic, even protean, and seems to have eschewed the rigour of an inorganic, constructed, well-planned organisation with a well-defined future-orientated vision.

At the same time, the discrediting of a planned project, associated with an awareness of long-term and wide-scale interactions, is accompanied by a proliferation of rules that take into account each of these issues but no doubt in a manner that is fragmentary, sectorial, and often contradictory. Finally, at the very moment when the issue of complexity is raised and a federating concept ensuring overall coherence is called for, is this not the most egregious case of sectorial fragmentation if not public schizophrenia accumulating paradoxical injunctions while in a total state of social fragmentation with multiple yet ephemeral affinities?

The city of the future

Today, we feel the need to destroy buildings and infrastructures that were built not even fifty years ago. We rebuild, as Franck Rigolle pointed out, streets with shared usage, often resembling the way they looked a century earlier. A quick inventory of desired new projects in the

Haut de Seine revealed new tramway or high-frequency bus services that are not that different from the tramway maps of 1920! This is a sure sign of the non-sustainable nature of urban projects during the second half of the 20th century³⁶. It is, of course, just one of many symptoms. In the preface of this book, we spoke of the challenges facing the city of the future:

- Resilience, financial and economic sustainability in a context without development;
- The emergence of so-called disconnection models aiming for greater equilibrium at the neighbourhood scale while threatening urban-scale solidarity systems and networks;
- Sustainable urban eco-cycles;
- Life cycles and responsibility with respect to other territorial areas, either those that are interrelated and within the immediate proximity, or by contribution to overall results; etc.

One can only be impressed by the creativity of the latest terminology: the question “is a diffuse (nebulous) city sustainable?” was asked during a Ariella Masbounji workshop in February 2012; while we often speak of a dense city, a few new adjectives should be added to the list: compact³⁷, intense³⁸, frugal (HAENTJENS, 2011), and even fertile (Lyon, as cited earlier by Isabelle Soares), and affordable (“Affordable City and Metropolis, by whom, and how?” was headlined at the summer camp of the French Council of Urban Planners in 2012). The remarkable collective work of AGORA 2020 (BAIN, THEYS, & MAUJEAN, 2008) has done much to clarify these questions and developed some very interesting proposals for further work. It is rather surprising that a modest personal survey I took of those who had expressed interest in the subject revealed that it had gone largely unnoticed except for the many who had contributed to it.

Is it that the guiding concept of these urban project formulations is facing an uphill battle? Does it suffer from a lack of clarity, or doesn't this all represent variants of the very same urban, social, and technical project?

Yet today, despite all these efforts, the critical step has not been taken that would lead to a collectively desirable, stabilised formulation, capable of giving substance to the “sustainable city” project, thus synthesising a new federating ideology that, in the logic of the socio-political projects at the beginning of the last century, would rally actors into action, enabling them to more readily identify with a given project.

Is this federating ideology really necessary? The hallmark of this post-modern period, is it not to turn its back on this search for unitarism? To the contrary, it is to focus on the opportunity given to municipalities, however ephemeral, to bring their collective project to fruition, and to exchange

and learn from all these experiences in a decentralised and egalitarian manner. Local authorities, their electors, service providers, users and the operators they've chosen, form (if they are so motivated) one of those communities that is fraught with contention regardless of the relations. The “collaborative urban planning” G. Hégron spoke of, the call of the president of the Urban Community of Bordeaux for a “metropolitan machine” as quoted by Nicolas Gendreau, or the citizen workshops that Rémy Barbier spoke of, are ample evidence. We are “realigning the trajectories”, “preparing the transitions”, not inventing the future. No doubt the only answer to the question “What urban model are we building for this new society?” is: “this is our experience, our modes of operation, our capacity to be responsive to needs, our successes and failures.” From this standpoint, the transversal thinking and feedback from the Eco-Neighbourhood and Eco-Cities calls for projects, and from the SCoT schemes and the ANR (National Research Agency), introduced here, are essential.

Of course, certain key concepts are firmly established: social equity, respect for natural resources, control of environmental imprint, economic pragmatism, and the participation and involvement of the stakeholders. But their mere accumulation to qualify for sustainable city status is wishful thinking, and open to interpretation. The diversity of practices making reference to a same conceptual corpus or should we say same vocabulary can be misleading. The certifying and labelling of the approaches, as much for procedural reasons as for their substance, form a useful counterweight to the proliferation of lax references and labels that will likely discredit

the approaches; of course, this supposes that the objectives can be evaluated, and requires a battery of comprehensive indicators and that process assessments are conducted from real situations that are very diverse. From this perspective, the work begun by the ASTEE on the performance of public water and sanitation services (ASTEE, 2012), well adapted to the relevant benchmarking of evolving approaches in heterogeneous situations, may be very useful in developing such indicators.

This project of urban planning is at odds with other expectations that are also increasingly pressing: the attainment of homogeneous levels, compliance with standards, and social mechanisms that erase differences and handicaps. These local and circumstantial (if not situational!) systems clash with the increasingly prescriptive standards of the State or the EU. We must live with these standards as they reflect the intransigent fundamentals of social expectations. In the tensions between local projects, sustainability, social acceptability and standards, local public environmental services are, due to their social and environmental dimension, more than ever at the centre of the urban debate: yes, the city is a set of organised entities, but more fundamentally, it is a set of accessible services.



Conclusion

In the hygienist cities of the Progressivist mould at the beginning of the 20th century, the ambitious path of urban services was clearly marked and was central to the social construction: turning the city into a safe, clean place; providing drinking water and organise sanitation services; manage waste disposal; reducing air pollution produced by heating and industrial activities; improving living conditions and the quality of public spaces; renewing ties between historical city centres and quickly-built working-class suburbs; and democratising access to services. This is the urban project that will bring the benefits and welfare of the economic revolution to the greatest number. Public space, infrastructures, and public services form the heart of the project a project that is political, simple, clear, and unifying. From the beginning, the authors of the TSM journal were people of conviction, passionate ambassadors of a model they upheld against visions they judged to be outdated and backward. They were set on satisfying the ambitions of as many as possible. The technical revolution (concrete, steel, and then telecommunications) brought solutions and opened new possibilities that were more effective, less expensive, better adapted, addressing the issue of galloping town planning and making it more accessible through growing collective prosperity.

There was no room for doubt in Post-war cities either: the revolution of street grids to make room for the automobile, the mono-functionality of neighbourhoods, and the response to the pressing issues of reconstruction and immigration all became imperative.

Urban engineering models not just practices underwent a revolution in the 80s, but soon lost steam as early enthusiasm faded. New urban engineering practices that required less energy and were more environmentally friendly were implemented here and there. Conscious of the imperative to avoid errors, urban engineering relearned to proceed with modesty, listen to residents, analyse the complexity of integrated design, and appreciate the importance of human sciences.

The fourth period commences now. Economic conditions are once more starting to change. Tensions are on the rise: we go from being out of breath to trying to find a second wind in a bid to avoid asphyxia. Post-modern behaviour, as such, only appears to be individualistic or consumerist, yet in reality, solidarity and the tokens of social compatibility grow strong. The burdens of our inherited urban systems weigh heavy, but they ensure a level of well-being that we sometimes take for granted. Elsewhere in the world, particularly in Asia, such questions would never be raised in these terms (except in certain circles); they forge ahead as was done in Europe in the 19th and 20th centuries. They face the same difficulties we faced, but on a vastly different scale.

We will have to fight to give renewed meaning to our collective project. Regardless of their good will, public stakeholders see their scope of action reduced, thus compromising their ability to initiate new projects. But, despite these difficulties, lest we forget, these means are exceptional both from a historical standpoint and when compared to the rest of the world.

Scientific and technical communities also seem ever more riddled with doubt. As new formulations emerge, new words and names are associated not knowing if these terms depict the process by cloaking it with an aura of believability or if they actually constitute promising innovations that are desirable and within reach. We say we want to create a system, but putting a complex reality into words makes the message difficult to share. We must state, loudly and clearly, that truths too easily come by are a recipe for failure, that doubt is a component of intelligent action, that modesty is a bulwark against failure, and that the lessons of history and the experience of others should never be ignored.

We know that we want cities that are better integrated into their territories through short economic circuits, that provide access to services that reduce inequalities instead of increasing them, that have urban systems that are more resilient to natural and technological disasters, that use resources sparingly, and that are internationally attractive for their living standards. We know this is possible because, unlike many on our planet, we are extremely fortunate to be able to solve our problems from a foundation built of solid performance. To accomplish this, our cities must innovate, exchange, and operate in networks to actively, but modestly, bring about these changes with determination.

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(1) A few figures would suffice to convince the sceptic that this is not mere rhetoric. In 1950, 29% of the world's population lived in "urban" zones. This figure is expected to reach 65% by 2050. In 2000, 16 cities already had more than 10 million inhabitants. According to the UN, that number should climb to 29 by 2050.

(2) If we just take the example of city streets, changes to any public right-of-way are very rare. In general, all functions are organised or reorganised in accordance with an existing space that is already built in which usage and rights-of-way are already established. If, in the past, public roads were reserved for cars and public parking, then bicycles and public transportation were later allowed to share the space cars previously dominated, today, we see the pedestrian and paradoxically the most naturally present is now reconquering this public space and is the most common user, despite being the most vulnerable. This fact throws into question the long-held doctrine of the separation of flows to best ensure safe cohabitation. While this token of the social compatibility of public spaces is evolving very rapidly (concepts have changed radically in the last 20 years), these changes can be made without engaging a major overhaul of the public space-network interface. It is the width of these rights-of-way from one side to another that ensures a flexible adaptation. Even the phenomena of residentialisation, which are omnipresent today (which some might consider a re-appropriation of open public space for private usage), do not jeopardize this interface.

(3) In Western Europe, the industrial revolution completely transformed cities as early as 1830. It would not be accurate to restrict this period to Haussmann's renovation projects. Development began in the French capital well before Haussmann. From a total of 547,000 inhabitants in 1801, the population of Paris reached one million around 1935, then two million in 1860 (before absorbing its peripheral suburbs in 1860), three million around 1885, and about four million in 1900. Transformations during the Second Empire were drafted under the reign of Louis-Philippe (1830-1848), when Rambuteau was the first to bulldoze a road through the old city a road that still bears his name. But the breadth of Haussmann's renovations in just 15 years was nothing short of spectacular: 18,000 homes were demolished between 1852 and 1868, or about 60% of the city of Paris. Of course, we could go back much further. For more historical background, see the writings of Marcel Belliot and Bernard Chocat, and the articles written by Sabine Barles and Gilles Billen et al. in this book, as well as the works of André Guillemet (1983) (1995).

(4) Cerdà, at the same time, considered that history is the knowledge one needs to put urban science into practice: P. Merlin in the introduction of the dictionnaire de l'urbanisme et de l'aménagement (MERLIN & CHOAY, 2009), stated: "ni fin en soi, ni supplément de savoir, elle est le chemin obligé sans lequel on ne peut comprendre la signification et le problème des villes. Mais cette histoire est discontinue, elle évolue au rythme et au gré des mutations de la technique, et par exemple des mutations des techniques de locomotion." (It is not an end in itself, nor is it a supplement to knowledge; it is the only way to understand the meaning and the problems of a city. But history is fragmented and it evolves at the mercy and pace of technical advances, like changing techniques of locomotion.)

- (5) Although essentially linked to the need to control riots, this dimension of the modern project cannot be ignored. In general, it has more to do with a broader project of modernity expressed by the imposed social norm "discipline and punish" (FOUCAULT, 1975). Of course, Haussmann comes to mind, who transformed the little Poland district of Paris into the posh Saint-Augustin district, and who created broad arteries that were reportedly conducive to maintaining order, firing cannon, and charging rioters. (Haussmann is reported to have said: this "responded to a triple need of security, traffic, and hygiene", although I haven't found this quotation in his *Mémoires*. Even though this quote often cited by modern commentators, his purported concern for security is hardly apparent in his *Mémoires*, which are dominated by his search for an economic development model based on "productive investment" with a strong social component, influenced by Proudhonism). One might, notwithstanding the second empire and its undeniable preoccupation with maintaining order, refer to Jean-Pierre Garnier's critical analyses of "petit bourgeois" urban socialism in his work "Le Socialisme à Visage Urbain", (GARNIER & GOLDSMIDT, 1978) which was recycled as the title of a recent symposium held in Nantes in 2011.
- (6) The desire for a city that was de-compartmentalised, salubrious, and equitable was no doubt fuelled by the very segregated, unhealthy, poorly planned urban centres during the industrial revolution (MORET, 1998).
- (7) It became the AGHTM in 1911 following a division sparked in 1908 subsequent to a refusal to grant special status to private « associate members » (ASTEE, 2006) then became ASTEE in 2004.
- (8) This is a review of the original contribution of Edouard Imbeaux (1861-1943), engineer at the Ponts et Chaussées who also passed his medical exams in 1897. Imbeaux was an iconic figure in municipal hygiene, a precursor of the multi-disciplinary vision of urban issues. He also contributed many historical considerations on the history of technical designs throughout the 20th century in a collective work entitled "De l'hygiène à l'environnement cent ans d'actions" published in 2006 by the ASTEE to commemorate its 100th anniversary (ASTEE, 2006).
- (9) Remarkable example of a comprehensive approach", noted Claude Martinand on the first page of his report on AGHTM's Urban Engineering activity upon its creation (MARTINAND, 1986).
- (10) The English term "sewage" was often used. Reference is often made to the controversial discussions between engineers and hygienists with respect to Doctor Calmette's (director of the Institut Pasteur) famous speech at the Congrès de Lyon in 1907 on biological water treatment (ASTEE, 2006).
- (11) This term is most often another synonym for mud; however, here, it designates fecal material taken from cesspits, or a mixture of plant residue, household refuse and sludge collected in the streets to be used as fertilizer.
- (12) This journal, created in 1906, was successively called "La Technique Sanitaire" until 1910, then "La Technique Sanitaire et Municipale" until 1958, then "Techniques et Sciences Municipales" until 1985, and finally "Techniques Sciences Méthodes" today. It represents a valuable historical window to the worries, scientific advances, projects, and achievements of the association's community.
- (13) Prevention of carbon-monoxide poisoning.
- (14) We read, for example: "The laying out of a new city street or neighbourhood is artwork. [] To be successful, it takes competence and feeling. [] All modern technical and hygienic requirements must be followed to the letter [] but it must be done with art and that is what is most challenging."
- (15) This is a plea calling for children to be educated through outdoor activities (not just pleasure outings: "life is not just made of excursions, walks, and holidays"). It advocates "continuous and varied exercises in the open air", and it denounces "sedentary" teaching methods ("school benches should be banned"), citing an example of a Brussels school where young girls stay indoors and spend 12 hours a day sewing.
- (16) A public lighting commission for a small town of 1000 to 2000 inhabitants in the U.S. is not economically feasible, but can be profitable if combined with drinking water production facilities through economies of scale.
- (17) We read: "One mustn't exaggerate the seriousness of the supposed crisis of the automobile industry. While many people hesitate to take a "tax-auto", fearing prohibitive prices Rates could be standardised, although that could prove difficult due to the differences in construction from one automobile to another", "improved service from vehicles that are better maintained would allow for rates that are only slightly higher than those charged by horse-drawn carriages." Moreover, "a maximum speed of 35km per hour on the level would seem sufficient for operators wanting to restrict their service to Paris", however, for automobiles intended to drive outside the city, more powerful motors would be required".
- (18) A very interesting summary of the urban expansion plan; the land-use rules and the building regulations for the city of Lausanne established prescriptions that are surprisingly modern.
- (19) He offers to quickly get started on the initiatives of the Society of Economic Housing created by Dr. A. Broca, based on the 1906 law authorising the deployment of local municipal funds.
- (20) This is a proposed technique for improving the durability of wooden paving blocks with exotic wood that is cut and treated with an antiseptic (coal tar).
- (21) It was an appeal for urban planning, but not on the disproportionate scale of Düsseldorf calling for development plans for between 290,000 and 1 million inhabitants, or "in America". Emphasis was placed on early land management in cities to avoid speculation (as was done in Ulm and Nancy), rather than relying on belated and costly expropriations.
- (22) The article supported the League for free spaces, sanitation and sports, presided by Paul Doumer. The objective was to promote the declassification of Paris's fortifications and transform them into green spaces, sports fields, public facilities, and roads. Costs were to be recovered from the construction of housing covering one-third of the area. The project was introduced jointly with the Anvers project that was very similar.
- (23) According to Wikipedia, municipal socialism can be described as:
- The collective appropriation of urban services (direct municipal operation of maintenance, construction and management of social housing, public health, culture, school, public transport, energy, etc.)
 - Educational (support for secular schools) and social (assistance to the poor, unemployed, elderly, public hygiene with municipal showers, etc.) services funded by a redistribution of independent tax revenues from the State (usually based on middle-class property tax)
 - "Egalitarian" and rational urban planning of municipal land tax appropriation, construction of public housing, sports facilities (stadium, swimming pool), cultural buildings (libraries, museums, etc.) by municipal officials (as opposed to "paternalistic" social actions instigated by a few employers).
 - Popular cultural, sports, and educational activities specifically targeting the working class, provided by "partner" associations that are funded, equipped, controlled and promoted by public programmes.
- (24) The law of 1919 required municipalities with more than 10,000 inhabitants to have a "plan for development, embellishment, and expansion" that must be accompanied by a "for health, archaeological, and aesthetic easements". Though one might not necessarily follow Viviane Claude and Pierre-Yves Saunier when they make a somewhat radical claim that once this obligation was put into place "city "specialists", under the thumb of politicians and bowing to State pressure, began to reconsider the place of residents, dictating what space they have been paternally reserved. From that point, urban planning was a lost cause." (CLAUDE & SAUNIER, 1999) But it is clear that the highlighting of this need for planning was a potent issue, one in which AGHTM would play a role.
- (25) The law of 1924 would complete these provisions to provide a better framework for controlling the explosion of private housing projects.

- (26) Based on the idea that the action of individuals should be bound together by a social contract, becoming, as it were, masters and possessors of nature, and that the social contract be established on an egalitarian basis.
- (27) The Charter of Athens is the text drafted at the conclusion of the 4th CIAM (the International Congress of Modern Architecture) on "The Functional City" held on a boat in the port of Piraeus in 1933. It was republished anonymously in 1942, then republished and widely distributed under Le Corbusier's name in 1957; it became the manifesto of progressivist urban planning. Criticising the contemporary city (chaos has entered the cities), it advocated zoning based on the identification of four basic functions (home, work, recreation, circulation).
- (28) "In our era [streets] symbolise circulatory disorder"; "[Conversely, what is required is] the reciprocal independence of built volumes and traffic routes." (CORBUSIER, 1946)
- (29) The pre-haussmanian urban fabric occupied only 1.5% of today's city surface; if the haussmanian period is included, it wouldn't exceed 3% (CHOAY, 1998).
- (30) Except for the 14 departments that remained almost exclusively rural and in which density rates dropped below 40 inhabitants/km² in 1980s, while density rates were only 4 inhabitants/ km² in the middle of the 19th century (LE BRAS, 1993). Contrary to popular belief, population levels of the so-called rural countryside (as defined by INSEE) remained unchanged between 1962 and 1999.
- (31) This is a report to the Minister of Infrastructure, Housing, Spatial Planning, and Transportation, commissioned by Paul Quilès and given to Pierre Méhaignerie. It is based on a collaborative effort that was scrupulously described by Claude Martinand, for which the author "personally" assumed entire responsibility. The unusual tone of his conclusion reveals the sincerity of his commitment: "I would like to explain, as an engineer, what it was that motivated me [] I would hope, first of all, that a technical culture be cultivated and elevated as a separate and important aspect of our general culture. Conversely, I would hope technicians make an effort to improve their social integration [] My ambition is therefore primarily cultural. It is my hope that this movement fully play its role in the emergence of a new urban civilisation and become an effective right in the city."
- (32) Françoise Choay repudiated the use of the word city here, preferring the word "urban" to describe the current situation (CHOAY, 1994). The notion of a "mature city" is used here, despite potential criticism, to imply a city's quantitative characteristics (population, access to services).
- (33) What M. Maffesoli (MAFFESOLI, 2012) implied here was "a synergy of the archaic and of technological advances".
- (34) This new virtual geography opened the door to a much larger number of actors to participate in selected circles of exchange. These international "elective affinities" were once reserved for but a few. The intensity of their epistolary exchanges and the role travel played in the lives of intellectuals are still striking today. This democratisation disinvests opinion leaders of a special aura, feeding the local debate with a much broader expertise. But more prosaically, these easy contacts, inexpensive and permanent, even with close friends or family, enable a level of sharing and close daily contact, the utility of which might seem difficult to comprehend except that it helps break down the walls of isolation and anonymity that many struggle to overcome.
- (35) Of course, one might think of the "uni-dimensional man", criticised by Herbert Marcuse (MARCUSE, 1964), reduced by capitalism to its productive function, but also to man, who immersed in his community, in his neighbourhood, in this environment that appears to help build his individuality, is locked in stereotypes that were imposed by decorum and overcrowding. The term "social ties" is evidently particularly appropriate.
- (36) Let reason prevail, however. Evolutions in construction techniques have also made cities less vulnerable to major fires that used to ravage them on a regular basis. No doubt modern cities have not been renovated (rebuilt from top to bottom) any more than they were in the past. The "urban renewal" programme initiated by the City Interministerial Committee on 14 December, 1999, then by the Urban Renewal and Solidarity Law of 13 December 2000 falls within a long history of urban renewal laws followed by the Borloo law of 1 August 2003 (urban renewal framework and planning law). With the impetus provided by progressivist urban planning, urban renewal has been very active since the 50s.
- (37) The notion of a compact city was introduced in the 80s. Between 1983 and 1985, Amsterdam and Rotterdam, most notably, embraced an opposite stance from post-war policies of opening up urban centres that were particularly strong in Northern Europe (Great London in 1944) or Stockholm (1952). Urban density continues to dominate current trends in master plans.
- (38) We are familiar with this term (purportedly borrowed from German urban planning), primarily thanks to the Lille Métropole project: "Lille Métropole has ambitions to be an intense city, an ambition that has social, solidarity, cultural, and economic dimensions as well as ecological and civic and that responds to an urban project by virtue of the shape, quality, and intensity of its plans for development. This intense city will be realised everywhere, in the new urban expansions, in the renovated neighbourhoods, and in the progressive mutations, accompanied and promoted by public policy in all the areas and territories that make up the metropolis. (Report from "Making an Intense city" adopted 26 June 2009 by the municipal council. This concept was given much attention during the Grand Paris discussions for the SDRIF 2012 project, as they have been in preparatory work for Nantes 2030. For example, in issue 9 (December 2009) of the journal *Urba* of the University of Lausanne, various perspectives on urban intensity are introduced. (ZUNINO, 2009). At the world congress of Singapore cities (Liveable and sustainable Cities - integrated urban solutions ») in 2012, James Close, of Ernst & Young, addressed this theme: "Making a virtue of an intense city How to win in an increasingly competitive global market". He made reference to three key questions: "How do you anticipate future growth and ensure the right type of growth? How do you finance infrastructure and services? What do you need to do to turn intensity from a resource threat to a resource opportunity - water management, energy infrastructure and efficiency?" He added, "If cities address these questions they have the opportunity to prosper but if they don't they will fall behind" et "Do you wish to rise? Begin by descending. You plan a tower that will pierce the clouds? Lay first the foundations of humility".

ACRONYMS LIST

ACD	Atelier citoyen Dem'Eau	LEPS	Local Environmental public service
AFD	French Development Agency	LGCIE	Civil Engineering and Environmental Engineering Laboratory
AGHTM	General Association of Municipal Hygienists and Technicians	LSC	Little Stringybark Creek
AGIAHM	General Association of Engineers, Architects and Municipal Hygienists	MA	multi-agents
ANR	French National Research Agency	MEDDE	French Ministry in charge of Ecology, Sustainable Development and Energy
ANRU	French National Agency for Urban Renewal	OMEGA	Methodological tool supporting integrated management system of urban water management
ASTEE	Scientific and Technical French Association for Water and the Environment	PADD	Sustainable development and planning project
BRTS	Bus rapid transit system	PCET	Energy Territorial Climate Plan
CCAS	Caisse Centrale d'Activités Sociales	PDU	Urban Transport Plan
CCSPL	Advisory Commission for Local Public Services	PED	Developing countries
CDT	Territorial Development Contracts	PIRVE	Interdisciplinary Research Programme on the Environment and the City
CG	General Council	PLH	Local Housing Plan
CLE	Local Water Commission	PLU	Local Urban land use plan
CNRS	National Centre for Scientific Research	PPRI	flood risk prevention plan
CO2	Dioxyde of carbone	PPR	risk prevention plan
CREIDD	Centre for Research and Interdisciplinary Studies on Sustainable Development	SAGE	Water management and development scheme
CSTB	Scientific and Technical Centre for Building	SCoT	Territorial Coherency Scheme
CUB	Urban community of Bordeaux	SD	Dynamic System
MIDMR	Municipal Information Document on Major Risks	SDAGE	Water management and development Blueprint
DOO	Guidance and Objectives Document	SDI	spatial data infrastructures
DREAL	Regional Directorate for Environment, Development and Housing	SDRIF	Master Plan for the region of Ile-de-France
DRIEA	Regional and Interdepartmental Directorate for Equipment and Facilities	SEDIF	Union waters of Ile-de-France
DRIEE	Regional and Interdepartmental Directorate for Environment and Energy	SHF	Hydrotechnique Company of France
DS	Dynamic Systems	SIAAP	Interdepartmental Union for Greater Paris area Sanitation
EIVP	Engineering School of Paris	SIGEIF	Gas and Electricity Union in Ile-de-France
ENGEES	National Engineering School of Strasbourg on Water and the Environment	SIPPEREC	Electricity and Communication Networks Union of the Outskirts of Paris
EPTB	Local Public Basin Establishment	SMEGREG	Joint association for the study and development of water resources in Gironde
GHG	Green gas emissions	SPANC	Public On-site Sanitation Services
GIEC	Intergovernmental Panel on Climate Change	SPIRALE	Permanent Secretariat for the Prevention of Industrial Pollution and Risks in the greater Lyon area
GIS	geographic information systems	SPPPI	Permanent Secretariat for the Prevention of Industrial Pollution
GRAIE	Rhône-Alpes Research Group on Infrastructures and Water	SRU	Urban Renewal Law
HPP	Hazard Prevention Programme	SYCTOM	Joint Association for the Collection and Treatment of Household Waste
IFSTTAR	French Institute of Science and Technology for Transport, Development and Networks	TIC	Information technology and telecommunications
INSA	National Institute of Applied Sciences	TSM	Techniques, Sciences, Méthodes (Technology, Science, Methods)
INSEE	National Institute of Statistics and Economic Studies	UMR	Joint Research Unit
IRSTEA	Research Institute of Science and Technology for Environment and Agriculture	UPMC	Pierre et Marie Curie University
ISUR	Engineering services in urban networks in developing countries	ZAC	Concerted development zone
IUP	Planning Institute of Paris	ZAD	Deferred development zone
LEESU	Water, Environment and Urban System Laboratory		



“ Urban planning and urban services: the essential alliance ”

The ASTEE 2013 congress will occur in Nantes at the beginning of June. This year, the congress will focus on its central theme “Assisting sustainable and responsible cities” and will deal with the link between urban public services and urban planning. This link should be obvious in modern cities. However, it comes most of the time with a bunch of issues and difficulties, both in the designing and in the building of urban policies.

Before any discussion about these topics and in order to shed light on the main issues that will be discussed about during the congress, an introductory document has been written.

It gathers written contributions from scientists, professionals and experts in the field of cities and services. Indeed, this document includes thoughts, testimonies and experiences that show the real need to make engineers and urban planners working together for “sustainable and responsible cities”. It also includes proposals that may improve this link.

