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Water Regimes Questioned from the ‘Global South’ : Agents, Practices And Knowledge

Shubhagato Dasgupta, Rémi de Bercegol, Odile Henry, Brian O ’Neill, Franck Poupeau, Audrey Richard-Ferroudji, Marie-Hélène Zérah

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Conference Proceedings

WATER REGIMES QUESTIONED FROM THE 'GLOBAL SOUTH'

AGENTS, PRACTICES AND KNOWLEDGE

Edited by:

Shubhagato Dasgupta, Rémi de Bercegol, Odile Henry,
Brian O'Neill, Franck Poupeau, Audrey Richard-
Ferroudji & Marie-Hélène Zérah

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BLUEGRASS: Observers generally agree that environmental conflicts around water management are likely to harden and entail severe risks of social and political unrest in overpopulated cities, both in the South and in the North. However, the specific way whereby mounting environmental challenges reinforce and/or modify the traditional dynamics of water conflicts has received remarkably scant attention. It is partly due to a technicist bias that led studies to focus on the identification of best practices and efforts at joint regulation by stakeholders, rather than recognizing the pervasiveness of tensions, however evolving these tensions may be. By contrast, the BLUEGRASS project sets out to understand the evolving logics of water conflicts in a context of new environmental challenges, especially as they rise from the intersection of two processes: climate change and urban dynamics. It does so, in particular, by analysing the vagaries of the exportation of the "French model" and its two basic dimensions in the Americas. The research focuses on the way environmental problems are socially perceived and constructed, but also strategically appropriated by a wide range of protagonists. Case studies include cities and their surrounding rural area in the West of the United States, Mexico, Peru, Colombia, Bolivia and Brazil.

ENGIND is a research programme (2014-2017) funded by the ANR (French National Research Agency). This programme focuses on Engineers and Society in Colonial and Post-Colonial India. It brings together sociologists and historians, specialists of South Asia and of Europe, Indian and French scholars. This composition reflects one of its scientific ambitions: to review, through the Indian case, the models of industrialisation and social change, which have largely been derived from the historical experience of the West. The three main research areas of the ENGIND programme are: an analysis of the complex links between the rise of the engineer group and the stratification of Indian society; an assessment of the types of capitalist development in India; and the study of the effects of globalisation of the labour market on the restructuring of the Indian engineer group.

ENGIND has already organized a workshop at the CSH, Delhi in January 2016 and an international conference will be held in Paris in March 2017. A collective book is under preparation and will be issued by the end of the year 2017. <https://engind.hypotheses.org/>

The Indo French Water Network (IFWN) aims at developing and strengthening partnerships between India and France in the water sector with a multidisciplinary perspective, by bringing together private enterprises, public entities, individuals, academics and any other person or group from France or India working in the sector. Its main objectives are to create a structured, enduring dialogue between India and France on water, to enhance cooperation and collaboration within the context of water sustainability, to favour the exchange of information, expertise, and transfer of initiatives and to reinforce the visibility of the network and its members. It was launched in 2013. It is supported by the French Embassy in India and the National Institute of Advanced Studies.

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RATIONALE AND OBJECTIVES OF THE WORKSHOP

By Shubhagato Dasgupta, Rémi de Bercegol, Odile Henry, Brian O'Neill, Franck Poupeau, Audrey Richard-Ferrouddji & Marie-Hélène Zérah

Scientific Issues

During the 20th century, water distribution and treatment services (as well as gas, electricity, transportation and telecommunications services) emerged as a socio-technical system, vital for people living in towns and large metropolises. Deeply embedded in the materiality of social life and the environment, the system is closely linked to a physical geography (a hydric resource, pluviometry, terrain, ecosystem) that gives rise to economic factors (fixed assets) and legal institutions (norms, laws, contracts); it also corresponds to an institutional system that manages this resource in a specific territory occupied by social groups, with their conflicting interests; it requires specific skills in terms of administration and engineering and most of the time these are defined by the administrative services responsible for the management and construction of water infrastructures.

There is hence no doubt that water management constitutes an area of expertise in its own right, an area of study and specific action that tends to blur the distinctions between science, action and expertise. A study of the water sector in fact engenders a vast field of applied research, where public teaching institutions, research and development services within private enterprise, as well as management consultancy companies specializing in natural resources meet, exchange ideas, best practices and evaluation techniques – which all contribute to creating a consensus that impacts the choices of political decision makers. It is within the context of this *doxa* that the uniform and universal model of distribution and treatment of urban potable water was imposed. This model is often presented as the best, or even the only distribution model capable of implementing the objective of “water for everyone” in terms of quality as well as equal access; it is seen as a model capable of providing a homogenous service to every consumer. Within this “supply network” model, which is supposed to constitute a catalyst for spatial integration, we can identify several fundamental characteristics: an operator is associated with a territory, it presupposes the existence of a system of interconnected equipment and implies centralized and planned management.

While from the 1990's onwards the water domain experienced the controversies and social struggles against “privatization” of water services or critics of the hydro-bureaucracy and hydraulic mission, now the pivotal problem that water and research on this subject have to face seems to be: what is the relevance of this model that favors a constant extension of universal services? In many places projects have been challenged on the basis of their economic, social or environmental impacts. Water engineers have been challenged internally and externally. In the urban areas, the shift in focus was also largely induced by the current trend towards increasing urban sprawl and the growing scarcity of natural resources. Some of the other factors responsible for the questioning of the accepted model are: on the one hand, the model's failure to provide a universal service, and particularly its incapacity to overcome the obstacles to creating an infrastructure in peri-urban and rural areas; on the other hand, the problem of “water stress” prevalent in certain regions like the West of the United States, the high plateaus in the Andes, the Brazilian *sertão*, North Africa, the Arab peninsula, certain regions in India, Central Asia or Northern China. It in fact seems to be difficult to create a single, homogenous network in territories that are increasingly spread out and densely populated, particularly given the evolution of the equation between the availability of resources and the demand for services. Hence some voices are contesting this *doxa* and putting forward proposals for alternative or hybrid models: these are essentially based on a technical and administrative decentralization of services, a greater symbiosis between the socio-technical systems (treatment and energy production, for example) and the creation of a multiplicity of institutions to replace a monopolistic organization.

The main hypothesis of this workshop is that it is impossible to understand water policies without looking at those who implement policies and contribute to produce the *doxa* on water and its uniform model, especially the engineers that contribute to define their knowledge and practices as state capacities. The definition of skills and professional practices in these administrative services affect not only the types of infrastructures built for transporting water, but also the implementation of administrative practices within the services: contracts, areas in which the operators intervene,

infrastructure maintenance, price fixing, etc. The focus would hence be on States' corps of engineers as varied as the Army Corps of Engineers in the United States, the Corps of Bridges, Waters and Forests (Corps des Ponts, des Eaux et Forêts) in France, or as the Public Works Department/Water Board, in a number of States in India, who from the 19th century onwards, established models for technical systems that served to carry water to towns that wanted to "modernize". The case of the United Kingdom reveals another configuration, which has less to do with State expertise and where engineers have a different type of influence. As for the case of India, it exhibits a colonial model marked by relatively early intervention by the colonial powers, whose first large scale municipal works projects began with the water supply. While the works were managed largely by engineers employed by the administration, the private sector – essentially British companies - was involved to quite a large extent, through a system of contracts. The colonial authorities' control over the water supply system did not totally exclude indigenous initiatives, which sometimes valorized the use of non-British technology. Finally, China and Brazil present configurations which are essential to an understanding of the new management styles, given the importance on the one hand of mega-projects, implemented through hydric policies adapted to the respective phenomena of urban growth, and on the other hand, given the role these countries have played in the invention of alternative management models, better adapted to the diversity of local partnerships.

A study of local and/or national configurations within which this *doxa* developed historically, seems all the more necessary as it explains to a large extent the policies followed, the types of service management and the reforms which are, or are not carried out. These processes that serve to produce the *doxa*, are amongst the temporalities that vary according to the geographical regions studied and involve different categories of producers whose qualities and relations of interdependence are yet to be studied. It hence seems appropriate to question the administrative categories (principles of action as well as principles of vision and division in the social world) implemented by water policies and particularly their reorientation, since the 1970's, with the constitution of a strong "global water community" that has been trying to define easily exportable and transposable management models. This contestation has become all the more relevant since the establishment of world water forums and the internationalization of companies within this sector. We must therefore study the extent to which this *doxa* is imported and adapted to national and local contexts where distribution contracts are implemented and identify how these processes of importation are structured in a variable manner, depending on the regions studied, by specific national professions that are perpetuated and spread through the prevailing state corps of engineers.

Beyond analyses that seek to elucidate the constitution of national models for the distribution of water services, and the national or local logic behind the import of these models, we should also focus on the specifically transnational aspect of the process through which this *doxa* is produced and reproduced. On the one hand because engineering skills are not developed in an isolated manner, but in spaces of international exchange and reciprocal appropriation between countries that took shape during the 19th century. On the other hand, because this universal service distribution model has been largely shaped by national colonial companies, and hence it would be necessary to introduce a comparative perspective "South/North" that can take into account the manner in which different socio-technical systems were integrated into projects for modernization and universalization that were essentially in the service of colonial domination.

A second hypothesis explored during this workshop is that the challenge to the uniform/universal model of water management, with the political ambiguities it contains (particularly questioning the egalitarian ideal implicit in the idea of "water for everyone), has emerged mainly in countries in the "South", not only because they have a clearer perception of the difficulties the "old model" has to face, but also because of the reorganization of the systems that produce State expertise and their position within the field of power. We can thus put forward the hypothesis that the internationalisation of water policies represents an opportunity for certain agents belonging to these senior administrative and civil services, to shift out of the discipline of engineering by integrating leadership into their training and within their specific professional jurisdictions. Recent studies, carried out in different cultural and political contexts, enlight transformations in the role of water professionals and dimensions of the work that are non technical. They regard water professionals as policy entrepreneurs, intermediaries, boundary spanners or stewards. From this perspective, it would seem interesting to explore, by example, the manner in which historically, the "environment and management" courses that were part of Civil Engineering Departments at the major Indian engineering schools were originally set up; or based on specific cases, to study the positions of different categories of experts and engineers involved in the struggle for the preservation or adaptation of the dominant model –

adopting, on the fringes, alternative self-management models (cooperatives, small territorial systems, etc.) or more tailor made techniques of recycling and treatment (recycling outside the network, etc.).

Outcomes of the workshop:

1) This first workshop has allowed the formation of a scientific network between the researchers specializing in water and working on its agents (engineers, lawyers, etc.), knowledge and practices, particularly interested in an analysis of the socio-technical systems that were established to transform a natural resource into a service in the region under study. This wide perspective includes different approaches:

- Approaches focusing on engineering *doxa* in the water field. Hydric policies must respond to the socio-environmental crisis the water services have to face, as well as on the interdependence and linkages that connect the producers of the *doxa* to each other and to the protagonists of public action. We could examine this notion of a hydric policy that underpins the idea of a holistic approach to the problems (resources, services and interactions between rural and urban spaces), which the dominant sectorial position (urban water, irrigation) seems, on the contrary, to deny. These studies will look at the effects of reforms on the socio-technical transition of hydraulic infrastructures and the management transformations they bring about. In this context, we will assess the transformation of service (co)production systems, by identifying the circulation of, resistances to and re-appropriation of norms and practices as well as the new territories that these transformations contribute to creating. We will pay particular attention to the emergence of alternative technical expertise and the creation of a new post-colonial reference system for engineering as well as the places where this expertise (or counter expertise) is developed, particularly outside the State sphere.
- Socio-historical studies dealing with engineers specializing in water engineering and who are involved in the development, defense or the surpassing of the uniform and universal model. For each historical sequence studied, these presentations will attempt to situate the engineers involved, in terms of their training, the position occupied within the professional group as well as in a space where, depending on the periods, we see the intervention of private firms (foreign or national), state and pan state structure, the sites of scientific production, as well as NGOs, institutes responsible for administering international funds, and lastly the networks of activists mobilized around the stakes involved in water policy. From a socio-historical perspective, attempting to grasp the major issues that influenced the training of these engineers presumes, particularly for the colonial period, widening the analysis to include questions pertaining to models that served for water management in rural zones and the conditions under which they were transformed into urban services.
- New water regimes will also be examined from a political and legal angle with a particular attention given to the producers of policies and norms whether public or private. In doing so, it will contrast a variety of perspectives from the right to water as a nascent human right to the liberalization of water services and the global trade and investment regulatory developments and the implications of the latest at the local, national and global levels from policies to rules and dispute settlement.

2) It has contributed to the creation of a basis for the *formulation of an international and comparative research project*, which would include a relevant sample of countries, depending on the on-going research and our contacts in these countries. The case of France and the United States seem inevitable, on the one hand because of the fundamental role the major States corps of engineers in these countries play in the establishment of hydric policies and on the spread of their management models internationally. On the other hands, their domination is upset today, within the movement of decentralization in France or under environmentalist criticisms more generally.

SESSION I

Water Regimes Transformations

INTRODUCTION – A LITERATURE REVIEW: PLACING LITERATURE ON URBAN WATER SUPPLY IN INDIA IN A COMPARATIVE PERSPECTIVE

By Marie- Hélène Zérah

The Overly Focused « Water Literature » When Talking of Cities and Urban Services

To start with, it is important to place this short communication in the larger context of the Indian urban transition and of the urban reforms that have accompanied the liberalization of the economy and the political decentralisation at the beginning of the 1990s. The question of 'the urban' has become central to the national discourse and urban public policies have been a core element of the strategy for a rapid economic development especially since 2000. In this larger context, urban services are at the forefront, as the overhaul in the level of urban services - which remain non universal and of unreliable quality despite an increase in the penetration rates - is reiterated as a prime objective of urban reforms.

Consequently, the 'literary production' on the subject of water is a very interesting entry point to understand the nature of the debates and their shifts over time to urbanisation for two reasons: (i) first, due to its specificities, water opens up a range of questions involving socio-technical systems, institutions and governance, justice and rights, political economy, culture; (ii) second, since publications on water are very numerous (like in other countries), water is therefore a rich corpus to discuss urban India, even though this raises a biased understanding of the relationship between cities and urban services.

This presentation tries to make sense of an abundant literature, but it does not claim to be exhaustive. Urban services are at the crossroads of different forms of knowledge production that deserve to be qualified. A rapid conclusion will raise issues of international comparison.

Three Main Types of Knowledge Production on Water and The City

A first type of production remains prescriptive and normative. This is largely the product of the extensive documentation provided by international organizations (in India, mainly the World Bank and the Asian Development Bank), as well as government and consultancy organizations' reports. I will not retrace the genealogy of this work, but there is some embeddedness between these types of literature (as illustrated by the proximity between two important reports on urban services with international publications: the Rakesh Mohan Committee on the Commercialization of Infrastructure in 1996 influenced by the World Bank Development Report of 1994 and the Isher Ahluwalia High Powered Committee on Infrastructure of 2011 influenced strongly by the 2010 McKinsey report on Indian urbanization).

This form of knowledge production is centered on solving the problems faced by the sector, assessing the levels of investments required and making recommendations in terms of institutional, financial and organizational reforms, with questions dealing from cost recovery, to the introduction of the private sector. Most of this work has also constructed a narrative of crisis that therefore requires a major overhaul of water systems.

A second type of production corresponds to the "grey literature" produced by NGOs, think tanks and activists, as well as social movements. This is often city-based, but offers extremely rich insights into questions of equity and justice (around tariff issues, lifeline tariffs), rights to the city (in particular literature linked to the process of resettlement and evictions), levels of services in slums and poorer neighborhoods, and has produced an anti-privatization literature.

Thirdly, the academic literature has also engaged with the topics mentioned above, but has provided more theoretical reflections. Almost all fields in social sciences (economics, public administration, urban studies, geography, social anthropology) have conducted research on the question of urban water, with the exception of political science that has traditionally been less concerned about urban issues in India.

Finally, I would like to mention that there is also a periodization in this topic (though this claim might be biased by my own trajectory into this literature). In the mid-1990s, the focus was on institutional changes and questions of access (estimating the demand, linking demand with willingness to pay and tariff increases), and was then followed by a debate on alternative technologies (part of it under Indo-French cooperation). A more recent turn has seen water used as an exemplary tool to understand what Ananya Roy calls the “idiom of urbanization”. Recent research provides a much finer reading of users’ agencies and a more ethnographic work of organizations (though Karen Coelho’s research was a pioneering work in this domain) aimed at unpacking the nature of the State, which is a larger trend in Indian urban research.

The next sections will be focusing on three main topics that I argue help classifying this literature in relationship with the larger theoretical and action-oriented questions that are debated in contemporary India.

Water Governance and Institutions

This first strand of work originated from a public administration tradition but was later taken over by research works inspired by neo-institutional economics. In this approach, institutions matter, and the focus is either on adequate reforms (prescriptive literature) or on analysis of the outcomes of reforms around the classic “good governance triptych” of privatization, participation and modernization of public action. Within this literature, the notion of institutions can vary with the inclusion of formal and informal institutions (depending on the authors and the discipline). This whole work derives from and is sustained by a dominating discourse of an urban crisis, a crisis of finance, skills, resources and management.

- 1) The scope of the research questions is wide, ranging from an understanding of organizations to an evaluation of the nature of incentives to be put in place to reform the sector. Production has focused on the question of:
 - Economic efficiency, in particular the issues of tariff and equity (especially in the 1990s), the willingness to pay and a better understanding of the demand;
 - Financial sustainability with works focused on public finance, financial status of municipalities, levels of investments required;
 - Operational efficiency, with a focus on best practices and work on indicators (especially by international organizations) but also research on the question of relationships that organizations have with users (including corruption) and the impact of reforms inspired by the New Public Management school that include simplification of procedures;
 - Technical solutions with some amount of research on the “non-networked” solutions;

Some of these research works provide a synthesis of the institutional set-up and reform agenda (MacKenzie and Ray 2004, Zérah 2006) and underline the lack of economic and environmental regulation, the limits of decentralization and the lack of autonomy of water departments of parastatals.

- 2) Though it is not an obvious choice to mention the rich anthropological work on water organizations in this section, there has been indeed a rich literary production focusing on the daily practices of street level bureaucrats (Coelho, Anand, and Bjorkman). This work describes how technical decisions are made, how rules are circumvented to enable service provisions. This production contributes strongly to unpacking the nature of the State but also contributes to the understanding of public organizations and their estrangement from the “Weberian bureaucracy” model.
- 3) It is also important to mention separately the debate on the role of the private sector. I would argue that this debate has been wrongly framed both by the prescriptive literature on “public-private partnerships” and the critical literature on “privatization”. Prescriptive literature has produced a range of documentation on international examples of public-private partnerships, has documented the failures of PPPs in India and has mainly looked at institutional concerns (regulation, tariff and political will) without understanding the manner in which PPPs were implemented on the ground. Critical literature has engaged, on the contrary, on questions of democracy, impacts on the poor, spatial segregation and cherry picking without considering the larger embeddedness of the private operators with the State. I would argue (but not in this paper) that the question of the private sector needs to be

understood over time to comprehend the manner in which the implementing of projects have evolved in relation to the larger State redefinition.

Water and Deprivation or Water and Poverty

Defining a poor/deprived neighbourhood is complicated. Often the situation is locally specific and mostly cannot be reduced to the notion of “slum”. I want to emphasize the importance of understanding the question of “water deprivation” in its many dimensions.

Literature has demonstrated the reality of a very multi-layered access to water supply (Zérah 2008) linked to variations in modes of access, different forms of legalities (and their relationships with tenure), types of physical resources available (role of groundwater for instance) and other resources available to users (social capital, access to the State...). This set of conditions leads to different coping strategies to ensure an adequate level of services. These coping strategies have been widely documented in different types of localities (slums, residential localities, peripheries) and have allowed a fine analysis of the types of brokerage involved, the costs borne by users and the articulation with official networks. This rich literature highlights the major differences between poor neighborhoods and planned settlements, or, to simplify, between the poor and the middle classes in large cities. However, it has not ventured sufficiently into the smaller urban settlements, thereby insufficiently addressing the question of poverty (in absolute and relative terms).

In large cities though, some of these works have been able to shed light on the notion of “poor” by bringing to the fore the differences in terms of vulnerabilities of certain groups, in particular women, scheduled casts and tribes, and religious minorities. The literature, classified here under the title of ‘water poverty,’ is important because it points to the notion of differentiated citizenship. Indeed, water is an important entry point in the literature in order to engage in the debate on urban democracy, which, in India, has been discussed around the notion of citizenship and urban citizenship as shaped by the important works of Partha Chatterjee on this subject.

Water and the Nature of the State

A main result deriving from research on the nature of the State relates to its flexibility and its contingency. Rules and norms are ambivalent and they are reshaped by various factors. The works of Nikhil Anand, Lisa Björkman and Karen Coelho are the most in-depth research studies that demonstrate the functioning of public organization and unpack the functioning of what is loosely called “clientelism” or “patronage”. Their work is part of a larger proposition by Solomon Benjamin of a porous bureaucracy characterized by permeable relationships between the political and the administrative sphere that can prevent access to services but provide services as well. Ambivalence, and ad-hoc decisions are central to the nature of the State, which prevents considering access to water as a right, but rather considering it as a favour to be claimed and captured.

Unpacking the nature of the State therefore necessitates a much better analysis of the relationships between agents, and studies other than the one mentioned above, have given a place to some aspects left aside by the institutional literature such as the relationships between high level bureaucrats and street level bureaucrats, the role of plumbers, the ambivalent role of engineers in following policy reforms, among other examples.

Conclusion: the Comparative Perspective

Though I have only given glimpses of what can be found in the abundant literature on this topic, there is a clear resonance with the knowledge production (and its forms) that prevails in other countries of the South. Ideas circulate very rapidly indeed. There are specificities that I think deserve mention:

- The incredibly diverse range of mediation through a large set of brokers located in formal and informal institutions (or at the liminal space between formal and informal institutions) and therefore the very large and diverse range of users’ strategies (that can be seen in some way as a form of agency – to be debated)
- Compared to other countries, what seems apparent in India is the lack of skills and competences in localities (and especially in smaller municipalities at times deprived of even an engineer – a point that needs to be made) and the

lack of diversity of skills and competencies (despite the socio-political inventiveness of engineers themselves) that are very different from the condominium experience of Brazil or the decentralized treatment plants of China for instance.

ABSTRACT - PERFORMANCE INDICATORS TO DECIPHER THE STRATEGIC EVOLUTION OF A PUBLIC WATER MANAGEMENT OPERATOR

By Laurent Béduneau-Wang

Our paper deals with the performance of public water management service. To what extent, does water management service generate performance and create value(s)? What are the tools developed to track, what has been called recently, value creation? Engineers, economists and financial people develop mathematical tools and models to legitimate or predict certain kind of value. Our pragmatist approach is less focused on value itself than on the process of evaluation (*Dewey*). Based on an empirical case study with a constructivist “framework”, inspired from grounded theory (*Glaser & Strauss*), it aims at defining and categorizing which kind of profession, value and rationality are brought through water service delivery and its set of performance indicators. It is a long-term perspective, based on 4 modes of data production: historical archives from mid-19th century, ethnographic observation (> 3 years), interviews, more than 50 people, and management documents.

Our case study looks at public water services in France, whose cities are gathered into a single syndicate. Water management service delivery was delegated to Compagnie Générale des Eaux at the end of the 19th century. During the first century of the contract, the legitimacy to delegate water service to a private company was not really challenged publicly. Even if negotiations and conflicts were politically difficult, citizens were not involved directly. Initially, water quality was monitored with the help of organoleptic criteria. Then, it has gained complexity with chemistry, bacteriology and microbiology. Business figures were mainly based on the volume of treated water (m³).

Water management service was perceived as a discrete and technical issue. Water was mainly managed by technicians and engineers, with this sometimes considered a “technical citadel.” Engineer’s rationalities (hydraulics, chemistry, etc.), water quality improvement, and economic growth had formed a virtuous circle. With the 1960’s and 70’s, industrial and agricultural pollutions, hydraulicians needed to better cooperate with civil engineers and chemists in order to build new water treatment plants and innovate a filtration process. Being a generalist engineer was a key advantage to question the traditional process and improve water service treatment and delivery. In the 1980’s, CGE’s CEO decided to diversify into diverse areas related to cities’ mayor: waste management, telecommunication, housing, public health, etc. The ability to develop political acquaintances gained weight, relatively, compared to the expertise of engineers. In the meantime, the CGE Corporation became more and more visible. Whereas visibility could be a competitive advantage in most industries, after diverse scandals with politicians, which involved the water industry, it became a burden.

In the early 2000’s, the public-private model began to be questioned by local volunteers’ organizations, the media and some politicians. Performance indicators began to multiply strongly. This contrasts with the situation occurring more than a century earlier, when water management public service delegation was renewed constantly and the company’s branch was acknowledged in France and into the international arena, and a call for tender was launched by the syndicate. Several companies replied. The company won that competition. Today, the company’s local subsidiary needs to comply with a set of more than 100 performance indicators. To what extent does value creation lie in that set of performance indicators?

As a management tool negotiated between the company and the syndicate, it reflects their respective vision and concerns about what should be or should not be (through related financial penalties) called performance and value. Indicators create knowledge about operational activities. For example, beyond 200 rescued water stops a year, the company had to pay significant financial penalties. Initially, it was considered that attaining 200 rescued water stops was a signal of failure to maintain water networks properly. It could be also understood that beyond the rescued water stops, the company has no financial interest to rescue anybody. Of course, it does not fit the values of public services. Hence, company’s managers requested to adapt that indicator.

Indicators do not only create knowledge, they also create new links within an organization. They generate new relationships between entities and people, which have to collaborate in order to produce, validate, control and adapt indicators. Civil engineers lost weight in the organization relatively. New people and skills appear and/or get strengthened – for instance,

auditors, financial controllers, management consultants, process experts appear. Thus, a set of performance indicators should not be only considered a way of controlling operational activities, but also create a process to generate relations, to learn, to innovate and, implicitly, to make new professionals emerge. Improving the link between the visions involved in performance indicators and the people in charge of those indicators at diverse levels of organization challenges water management governance and public services retroactively. From the side of the private operator, it makes the concepts of value creation and performance debatable, internally, at each level of the group, but also externally, with the considered territory and its citizens.

From water treatment processes to performance indicators processes, employees' culture has developed in different ways to deal with complexity and uncertainties. Performance indicators reflect stability and consensus, but also uncertainties and conflicts. They are an 'invisible technology' (Berry), which enables employees to (re)-appropriate top-down strategy; adapt it locally, and conversely. In that way, performance indicators contain the plurality of strategic options. All this makes it possible to track performance indicators, their ancestors (parameters, standards, etc.) and the people in charge of them. In the long-term, this helps to decipher long-term strategic evolution.

ABSTRACT - THE (MIS)FORTUNES OF A (NOT SO) TECHNICAL CONCEPT: ZERO LIQUID DISCHARGE IN THE GANGA BASIN

By *Bérénice Girard*

The Ganges has been, over the last 30 years, the subject of several pollution abatement programmes. The evolution of these projects is symptomatic of contemporary changes in river management, with the adoption in 2008 of an integrated basin approach (Molle & Wester, 2009). One of the current main issues of concern is the long-term management of water in the basin. The independent consortium of experts, mandated by the government, emphasizes the 'increasing water-stress' and calls 'for major changes in how India's waters are managed'. They offer two main solutions: increased storage and more efficient water uses. This presentation focuses on their most preeminent technical proposal: the implementation of Zero Liquid Discharge (ZLD) for municipal sewage. Faced with a 'new definition of the problem', a 'new set of actors' offers a '(not-so) new solution', based on different technologies, but also different modes of management and finance. The objective of this paper is twofold: to understand how the 'new protagonists' define this solution and how it is received and modified. It is based on interviews and observations conducted during three different fieldwork missions and on analysis of several types of documents. Interviews were conducted with experts from the consortium, engineers from local and regional technical administrations, consultants, high-ranking bureaucrats from the different ministries in charge, as well as with activists and politicians. This presentation also relies on observations conducted in different public offices, visits to sewage treatment plants, as well as articles published in local and national newspapers.

The ZLD Project

The idea of ZLD is to transform sanitation into a 'water producing industry' in all *Class I* towns in the basin, by reusing all the treated water and other products. Such methods though still rare, have gained momentum worldwide and in India. The IIT consortium's project differs in two ways from other similar circular programs: first, they target Zero Liquid Discharge, which means complete reuse of all the treated water. And second, they target an innovative management model, to transform sewage treatment into a revenue-producing industry by selling the treated water. The ZLD concept also includes construction of decentralized plants and groundwater recharge through the restoration of surface water bodies.

This project, if implemented, would imply deep changes in the current techniques of sewage treatment in the Ganga Basin: first it would induce a very high quality of treatment and therefore involve a rethinking of previous technical choices. Second, the consortium advocates for decentralized small size plants, whereas until now the tendency was rather towards large, high capacity, treatment plants. Third, their management and funding model reverses the current balance of funding between capital and operating costs to ensure better operation and maintenance. Fourth, the operation and maintenance, currently under 'the jurisdiction of the States' technical administrations, would be left (for up to ten years) to private contractors. Finally, the initial ZLD project included the commercial exploitation of the treated water, which would go along with an increase of water rates. This project, presented as purely technical, has therefore deep political implications. But, these issues are 'depoliticized', through a 'locationless logic' (Mitchel, 2012; Harvey & Knox, 2015), which puts efficiency at the top and analyses the current failures of the system as management and finance related.

Who?

The consortium that proposed the ZLD project is composed of experts from the most prestigious technical universities in India, the *Indian Institutes of Technology, or IIT*. ZLD was mainly advocated by Professor Tare, the coordinator of the consortium. He describes this project as a personal one, for which he had to fight against other experts, activists and bureaucrats. Professor Tare is an expert in Zero Waste technologies and the head of the environmental engineering and management programme at the IIT Kanpur. This programme is part of the department of civil engineering, though autonomous from it, and it is one of the oldest environmental engineering programme in the country. The reports in which ZLD is presented are cosigned by several experts: all the lead experts are IIT professors and environmental engineering specialists. Many of them were trained either abroad or at IIT Kanpur. The Ganga basin could be therefore seen as a 'useful fiction', a laboratory for environmental engineers, a pretext to try out an already existing solution, that of 'Zero Discharge', but at a much larger scale. The ZLD project

is developed in a context, first, of the political establishment of an in-house expertise in river management, and second, in a context, which gives environmental engineering as a discipline, a big push in India.

From Opposition to Acceptability

The ZLD project was first faced with strong opposition within the consortium. Experts criticized the project both from a technical and a political point of view. These criticisms were followed by those of the politicians and environmental militants. The ministry of environment asked that the project be removed from the reports, and the whole project was given a halt for two years. But the harshest reactions came from the actors with a direct interest in the implementation: engineers from State administrations, technology providers and local contractors. But this strong opposition progressively gave ground to increased acceptability: in the fall of 2014, it appeared that the concept of Zero Liquid Discharge had gained momentum. Several pilot projects for municipal sewage were announced, tenders were published and a conference regrouping experts from the consortium, senior bureaucrats and more than a 100 private actors was organized in 2015. Though these projects might well only be a facade, it leads us to wonder: how could a sociotechnical concept such as Zero Liquid Discharge and its heavy social and technical implications become more politically acceptable?

Why?

Though many reasons could be underlined for the success of ZLD, we focus here on the dual dynamic of both de-legitimization and resilience of regional public civil engineering. Indeed, in the 1980-90s, in a period in which India was implementing its first liberalization laws and where at the international level, reforms and privatizations of the water sector were ongoing (Lorrain & Poupeau, 2014), a public funding and management system was chosen for water treatment in the Ganga Basin. These first programs were later heavily criticized and the general analysis of their shortcomings placed the blame on the states' technical administrations, accused of inefficiency, corruption and mismanagement. This led to a de-legitimization of regional public civil engineering as a form of expertise in wastewater treatment.

This 'loss of jurisdiction' by civil engineers left room for others and we see the progressive establishment of environmental engineering as a central form of expertise in river management. Though it hails from civil engineering, environmental engineering develops a different approach to resource management, with 'economically and management sound approaches'. Environmental engineers in India are gaining political leverage, at least in the case of the Ganga basin and are slowly imposing themselves as the instituted experts of river management. This 'displacement of expertise' (from civil to environmental engineering and from states' administrations to elite public institutions) is also linked to an increased interest in environmental issues and to the economic and political context: internationally (success of integrated basin approaches), nationally (liberalization, extensive criticism towards bureaucracy) and a professional context (regional civil engineering losing its jurisdiction).

However, regional public civil engineering also shows a high capacity of resilience: though it has lost ground on the design of infrastructures, it remains a central actor in implementation. Thus the ZLD project has been redefined and the delegation of powers has been slightly modified: we observe the strong perseverance of states' technical administrations, through their role in monitoring and the release of funds. The tertiary level objective has been maintained in most of the projects and tenders, but most of the management and financial dimensions of the project have been put aside. One will therefore have to look closely at the implementation of these projects. Finally, the 'comeback' of the ministry of Water Resources brings along questions on the relationship and common interests of environmental engineers and 'central civil' irrigation engineers.

ABSTRACT - KNOWLEDGE MONOPOLY AND CENTRALIZED CONTROL: THE CASE OF TRANSPLANTATION OF INDEPENDENT REGULATORY MODEL IN INDIA

By Sachin Warghade

This paper uses the framework of institutional transplantation to understand the role of knowledge production and dissemination in reforming of water regimes (Watson, 1974; Cairns, 2013). A case of institutional transplantation of independent regulatory agencies (IRA) in the water sector in India is presented in the paper to unpack the knowledge processes influencing the outcome of transplantation.

The regulatory reforms related to IRA are the manifestations of the belief in economic efficiency to be achieved through centralized system of production and delivery. IRAs are assumed to play the role of apex regulatory on water tariff, allocation and other crucial aspects of water governance. Such an institutional model is the outcome of the diffusion through transplantation of 'global standards' emerging through international discourse. This standard regulatory model assumes that creation of centralized engineering-based solutions to water makes it amenable for centralized control and regulation. In this context, the paper explores the validity of this assumption under which IRAs are transplanted in the global South. This is done by developing a case study of the 'Maharashtra Water Resources Regulatory Authority' (MWRRA), the first such state-level IRA established in India in 2005. The case study is developed based on document review, stakeholder interviews, and first-hand observation of regulatory processes. The analytical framework relies on comparison of the 'standard' model—as evolved in the global 'North'—with the transplanted model in India. The comparison is of the regulatory design, which involves the key assumption of centralized control through a centralized system of production and delivery. The role of knowledge processes and actors is assessed in the process of transplantation and its outcomes.

The paper argues that the process of transplantation of this model, from the global North to global South, is the outcome of the interplay of the knowledge process with the political interests of the actors. The interplay has ensured that the old regime prevails over the attempts to transplant the new regime. This is due to conflicting demands raised over the design and implementation of IRA. These conflicting demands can be traced to the differences in the body of knowledge applied by the actors in policy formulation. There are three main streams of knowledge-bases used in this process, namely, economic regulation through IRA, Integrated Water Resources Management (IWRM), and equitable allocation. There are differences in the emphasis given in the three knowledge-bases mentioned here. These differences are important since each of these knowledge-bases is embedded in specific experiences. For example, economic regulation through IRA draws its roots from the experiences in US and other developed countries with specific context of regulation of public utilities characterized as network industry. IWRM draws its roots from basin-level planning and management as experienced in countries like Australia. While equitable allocation is rooted in the local struggles in developing countries, like India, facing huge development inequities. These sources of knowledge give distinctness to the demands put by them on the design of the IRA model. They demand specific capacity from the policy actors for understanding, dissemination, and its utilization in the policy process.

The influence of these knowledge processes on transplantation resulted into an IRA model that mixes the various design elements of policy, emanating from particular knowledge streams, without an appropriate matching process. This mixing of knowledge streams without a match is evident from the non-coherent and non-integrated design and implementation of MWRRA Act.

This mixing without match is the result of the interplay of the interests of the various policy actors with the knowledge-base. These actors involve international financial institutions, legislators, interest groups, and techno-bureaucrats. Each of these actors has limited their interventions to the extent of protecting their own interests. These interests go beyond the strategies arising from the knowledge-base. These knowledge actors have created a symbiotic relation with other actors, especially the techno-bureaucrats, to further their respective interests. This symbiotic relation is reflection of the political economy of water with strong dimension of vested interest arising from the nexus between political heads, private water contractors and techno-bureaucrats.

This shows that each of these actors have appropriated the knowledge-base for their specific interest at the cost of loss of important opportunity of policy design and implementation. The appropriation is facilitated by the control exercised by these actors over the process of knowledge creation, dissemination, and utilization. The process, starting from technical assistance by the Bank to policy formulation and implementation, has been marked by lack of opportunities for creating and assessing options at policy formulation stage as well as implementation stage. The output of the technical assistance was not openly shared nor was there a drafting committee formed before tabling the first draft. The legislative committee had to work within the given framework of the first draft without addressing the need for thinking of alternatives to IRA model or to bringing cohesiveness in the demands arising from different knowledge sources. In this way, the key policy makers and influencers have exercised monopoly control over the knowledge processes. This monopoly over knowledge processes is the key driver in failure of evolving an effective regulatory regime in water sector.

DISCUSSION -TRANSFORMATIONS OF WATER REGIMES: STATE ENVIRONMENTALISM AS AN EMERGING PARADIGM?

By Karen Coelho

Papers in this session outline paradigm shifts in water management. Despite the very diverse nature of these papers, I propose that they all highlight different aspects of what I'd like to call "state environmentalism". I formulate this term picking up from Guha and Alier's (1997) and Baviskar's (2003) delineation of discernibly different environmentalisms – e.g. of the poor, or of the urban bourgeoisie – each marked by distinctive concerns, discourses and modalities. The papers in this session suggest how state environmentalism is distinct from, yet overlaps with, what Bakker (2011) called "market environmentalism" (by which she meant the application of market mechanisms such as tariffs, full-cost pricing, and water markets to address environmental problems such as water scarcity), as well as with her "municipal hydraulics" model (the supply-oriented, centralized, mass-scale engineering approach that has dominated water regimes from the mid-nineteenth to the late twentieth century). State environmentalism describes the paradigm of water management that we can discern around India from around the 1990s, corresponding with the launch of nationwide structural economic and sectoral reforms, perhaps related to them. The papers in this session illustrate several constitutive features of this paradigm, which I will pick up and point out, even as I comment on the papers themselves.

One important aspect of state environmentalism, which is flagged in this conference as a whole and in Girard's paper in particular, is that as an "ism", as a paradigm of knowledge and practice, as a regime, it involves the ascendance, valorisation and increasing dominance of environmental engineering – as a discipline, a sub-discipline, a specialization or an epistemic movement. Girard's paper here gives an excellent account of the National Ganga River Basin Authority and the institutional transformation it embodied, from the classic state hydraulic agency to the new species of state environmentalist institutions, with ecological concerns such as biodiversity conservation figuring on its agenda, with new stakeholders (including civil society representatives) included, and new bodies of knowledge built and deployed. This story echoes Wendy Espeland's classic 1998 work, *The Struggle for Water*, which is an account of the transformation of the US Bureau of Reclamation when the long-entrenched engineering culture of the "Old Guard" came under challenge by a New Guard, whose members came from diverse fields including environmental sciences, biology and sociology, but were united by new rationalities of planning and economic efficiency based on rational choice models and cost benefit analysis.

A second noteworthy feature of state environmentalism is the form: typically that of the project. The most visible manifestation of this paradigm is the proliferation of river restoration and eco-restoration projects across the country (although reforms in municipal water management also ride in on projects – e.g. of leakage reduction, infrastructure upgrades, pilot O&M contracts, e-governance, metering). The project form allows for an endless and ahistorical iteration. In every city, for every waterway –the Ganga, the Yamuna, the Sabarmati, the Cooum, one is invariably able to assemble a longish history of failed efforts at restoration. Yet each new project is announced as a fresh and distinct proposal, innocent of historical baggage, with no effort to address past failures. Or, failure simply fuels the need for a new and better project. It is the scholar's job, then, to subject this march of projects to historical treatment, to examine the genealogies of state environmentalism and to interrogate the "newness".

A third aspect of state environmentalism, seen again in Girard's paper, is that it is necessarily, inevitably, embedded in a political rhetoric. River restoration, cleaning, greening, world class cities, slum-free cities, zero discharge, zero waste, *Nirmal Dhara* - these are all slogans that can provoke aspiration and win support. Whether feasible, realistic, or not, they directly address the public imagination. However, this rhetorical component also influences the design of projects. Hence our analyses need to focus – as Girard's does to some extent - on how the rhetorical imperatives of state environmentalism shape the design of projects.

Girard's paper presents Zero Liquid Discharge (ZLD) as a sociotechnical concept, but does not explicate the social dimensions of this concept; it emerges rather as a techno-economic concept, with implications for cost and institutional efficiencies. On a related note, the paper does not discuss the social implications of and debates on the Ganga Action Project itself. The Ganga

basin is home to probably the largest concentration of residents of any river in the country. Typically (and I don't have actual data on this), at least in the urban areas, a large proportion would be squatters, poor residents with weak or no tenure rights. For these people, the announcement of a river restoration often spells disaster because it is inevitably accompanied by evictions, and by scapegoating of riverbank residents as responsible for the pollution. How has all of this figured in the Ganga Cleaning Action Plans?

I briefly touch on some other issues in Girard's paper. She suggests that the ZLD project proposed by Tare in 2010-11 coincided with an international interest in wastewater recycling and reuse. Here the timeline may be slippery. My impression is that these technologies were popular much earlier. In the mid-2000s many countries were already operating wastewater reuse systems. Second, she claims that small STPs would "imply management by municipal administrations" which are not "considered efficient or trustworthy". However, in reality, small plants such as water treatment plants, sewage pumping stations or effluent treatment plants have typically been outsourced for management to (small) local engineering firms. Indeed my own research showed that the large management contracts, to national or multinational firms, were seen as problematic from the perspective of local accountability and oversight.

A fourth theme that I flag in this discussion of state environmentalism, drawing on Girard's paper, is the increasingly influential and powerful role played by state-non-state actors – individuals that straddle the slippery boundary between the state and private corporations, institutions or civil society. This figure appears in both Girard's and Warghade's papers, in different roles and positions. In Warghade's paper it is the ex-government official that sits on the so-called independent regulatory body. Retired government officials are a particularly interesting category as many become active members of civil society groups and the most vocal critics of departments and policies that they were once part of. Consultants, field engineers, are other embodiments of that porous seam between the state and non-state that shapes state environmentalism in distinct ways.

Both papers also point to the figure of the visionary vanguard that drives many transformative projects of this kind, the charismatic individual that makes things happen. Girard's paper provides an excellent account of Vinod Tare's vision in the spirit of exegesis, a detailed and empathetic unraveling of his thoughts and efforts.

Sachin Warghade's paper is a very comprehensive and convincing account of the internal incoherence and inconsistencies in the Maharashtra Water Resources Regulatory Authority. It provides a thorough mapping of the process through which the regulatory reform has travelled and arrived at what it is today.

However, the analysis frames this point of arrival as a failure. Specifically, it asserts that the internal incoherence of Maharashtra's regulatory policy represents failure. I wonder if it is not possible to frame the story differently. Perhaps the author is taking the regulatory reforms too much at their word, endowing the original model with too much coherence in itself. Global standards, as they travel from global arenas and are deployed in the national or local, exhibit plenty of compromises, hesitations, and negotiations. These need to be taken seriously as indicating the possibilities and spaces of transformation and of translation of reform for local contexts.

Rather than declaring failure, if the paper can demonstrate *the effects* that this incoherence has had on the ground, then we can see some effects of failure, and perhaps some positive effects. I think the paper provides, at many points, quite nuanced analyses of the ways that regulation is used as an opportunity to pursue different agendas, some of them distributional. In my own research on reforms in Chennai's Metrowater, the Aide Memoires of the World Bank reflected the Bank's struggles with Metrowater, for instance over issues of subsidy and cross-subsidy, aspects through which the public water service defines itself and defends, even as it undertakes transformation.

The paper uses the idiom of transplanting a model. There is already quite a lot of work on the notion of *translation*, inspired by Latour. This concept might be useful to employ in this paper, as it explicitly accounts for the disruptions, diversions, subversions and mediations through which a policy or text or model gets materialized in a different domain. The starting point of this approach would be that the translation of any policy into a regime of practice involves distortions, struggles for control, and negotiations among different interest groups.

Along these lines, Martin Minogue, a regulation scholar whom the author has cited, had in 2003 envisaged that institutional reforms aimed at privatizing water could in many cases merely offer new opportunities for patronage, clientelism and corruption. However, he argued that in many instances, political “interference” and continued government intervention in regulatory functions were not simply a depressing tale of failure.

Perhaps... we are looking at regulation for development in the wrong way: if the main concern is to devise economic policies and institutions that can alleviate poverty, it is essential to recognize that developing countries need to be responsive to political values that place the needs of the poor above the requirements of economic efficiency or emerging markets (Minogue 2003).

On Warghade’s paper, I would also like to suggest that the explanation for how the regulatory system has panned out in Maharashtra cannot be entirely ascribed to the knowledge base, or to restrictive monopolies over knowledge. Here I think the knowledge aspect is being overloaded with causal weight. Perhaps some, or much, of the explanation for the outcome may lie in the way that the regulatory system is knowingly used or knowingly bypassed by bureaucrats and politicians to achieve certain agendas. Similarly, I think the paper overstates the role of donor conditionality in forcing change. We see in other studies that the push for reform also came from a wider national climate of reform, and from internal thinking. The Bank’s donor power had something to do with it, but we must not ignore the aspects that made local agencies, the state, the water utility “own” the reform.

Laurent Beduneau-Wang’s paper is an evocative little piece, which resonated a lot with my own research on water engineers in Chennai. But I call it evocative also because it raises more questions than it really answers, and remains at a very suggestive level, opening up areas of enquiry that it doesn’t really delve into. The key thematic it explores is the shifting politics of value in the private water utility, and in particular, the steady growth of a paradigm of indicator-based performance appraisal. This, I think, has to be seen in the light of a wider climate of reform in which audit has become a keyword. There is a significant literature on what in the late 90s was called the “audit culture”. Studies by Strathern (1996) and Shore and Wright (1999) analyze the spread of audit in a range of public organizations as part of the post-1980s attack on the welfare state and a key instrument of neoliberal reform aimed at enhancing institutional effectiveness. Responding to growing demands for accountability for public expenditure, and legitimated through the vocabularies of quality assurance and empowerment of users, the technologies of audit have laid out a punitive regime of surveillance, especially targeted at core professionals in public agencies. They employ a policing approach, reducing professional relations to quantifiable templates, and forcing commensuration of values and contributions. These authors show how the audit culture has spread from the field of financial accounting to other domains such as educational and health services, arts administration, and infrastructure utilities.

Some older classical works also travel these story lines – Theodore Porter’s work on when, how and why quantitative indicators began to be used as tools of public accountability. I suggest that this paper would benefit from a more concrete and detailed account of how quality concerns get rendered into quantitative variables, with examples of specific performance indicators and how they work – are they social, technical, economic? Which ones dominate? How does the culture of measurable performance transform the internal culture and the external relations of the organization? What conflicts result? What are the differential effects of specific performance indicators on different categories of functionaries of the utility? In my research it was the female engineers, who had been newly empowered by the reforms, who also found it hardest to perform along the new performance indicators.

SESSION II

Challenging the Dominant *Doxa*



INTRODUCTION: THE DOGMA OF A NETWORKED CITY

By Jochen Monsdat

Water and sanitation systems are critical preconditions for cities. These socio-technical systems have enabled the functioning and growth of cities by importing water resources for domestic and commercial uses, by discharging cities' wastes, by helping to control many forms of pollution, by protecting public health and safety, and by ordering public space (cf. Melosi, 2008; Kaika, 2005; Kooy and Bakker 2008). One of the most powerful dogmas that have influenced the construction and the planning of both cities and their water and sanitation systems worldwide since the nineteenth century is that of the networked city (Tarr & Dupuy, 1988). In their early work, Tarr & Dupuy (1988) explicate how the development of infrastructure networks has influenced the construction and management of cities in Europe and Northern America since the nineteenth century. Since then, technical networks were considered as most efficient means of supplying urban services; solutions to problems created by networks reside within the networks themselves (in their expansion/universalization, more centralized management and increased technical sophistication) (Coutard & Rutherford, 2016).

The modernist dogma of a "networked city" can be characterized as an ensemble of interrelated components: (1) the technological design and topology of cities integrated, ordered and confined by universal infrastructure networks that organize the exchange of goods, ideas, waste, power and people within and between urban territories, that order urban space and that define the boundaries of an urban territory; (2) the notion that urban monopolists provide for ubiquitous and standardized infrastructure services (or for "public utilities"); (3) the notion of passive customers that are not actively engaged in the production of infrastructure services; (4) the assumption that the provision of infrastructure services is closely attached to, or highly regulated by, the state; and (5) the concept of urban planning effectively regulating land use and guaranteeing the universal provision of critical services (Dupuy, 2008; Monstadt & Schramm, 2013; Coutard & Rutherford, 2016).

The Transfer of The Networked City Dogma to The Global South

Engineers, planners and public health officials worldwide have thus aspired to align with this circulating dogma of urban modernity, hygiene, universalization and rationalization of space in (re)producing cities (cf. e.g. Dupuy, 2008; Coutard & Rutherford, 2016). Since colonial times, this globally circulating dogma has also been transferred to cities in the Global South and has considerably shaped the planning institutions and strategies of local governments as well as the engineering cultures and investments of urban utility companies. Although that dominant dogma has, until today, continued to be politically and ideologically influential for planning cities in the Global South and has long been regarded as attainable by international funding agencies and national and local governments, the dogma of urban space rationalized and ordered by large centralized networks and public institutions remains an anomaly. In many cases the transfer of the networked city dogma has been challenged by patterns of rapid urbanization in many regions of the Global South, which differ greatly from those of the industrial countries in that they often represent a poverty-driven process.

Contrary to the modernist dogma of a unitary, orderly city integrated by universal networks, the massive colonial interventions in urban expansion and restructuring, the colonizer's transfer of this dogma to cities in the Global South has created a system of "spatial apartheid" via the exclusive provision of networked infrastructure in Europeanized urban quarters (Gandy, 2006). Today, urban infrastructures in the Global South are often spatially uneven and fragmented. Access to services is often shaped by more or less drastic discriminations against lower income groups, who are often disconnected from centralized networks and pay more for the provision of services (Gandy, 2006; Jaglin, 2008). Moreover, the model of public utility companies that are closely regulated by state institutions and have a monopoly in providing infrastructure services rarely applies. Instead, a large variety of private entrepreneurs or civil society organizations co-provide infrastructure services in a continuum between formality and informality where the infrastructure services of traditional service providers are inaccessible or unaffordable (cf. Budds & McGranahan, 2003; Mitlin, 2008).

Focusing on the deviance from hegemonic models, academic debates have long framed cities in the Global South as deficient, chaotic, decaying, or “off the map” of global interconnection (Robinson, 2002). Instead of dystopian narratives on the status quo of cities in the Global South, postcolonial critique argues that they should be regarded as “ordinary cities” (Robinson, 2002: 533, 546 with regard to African cities) emphasizing the terms of global connection and the dynamic ways in which they actually work (cf. Robinson, 2006; McLees, 2013, Myers, 2011; Watson, 2009; Silva, 2015). That shift in perspective does not solely entail the critical study of the colonial legacies and the ongoing transfer of hegemonic planning models to the Global South (cf. Silva, 2015; Watson, 2009), but also the distinctive and place-based patterns of modernity, creativity and urbanity. Compared to the burgeoning debate on urban development and planning in the Global South over the last decade, postcolonial studies of urban infrastructure are still rare (some of the exceptions are: Gandy, 2006; Rakodi, 2008; Silver, 2015). Instead, deficit analyses or problem-solving approaches dominate current debates on urban water supply and sanitation (e.g. Hardoy et al., 2001). Studies that critically address the colonial legacies of urban infrastructure in Africa, their capability to adapt to circulating technological and urban dogmas and models, along with their room for maneuverability and local creativity have, however, not yet attracted much scholarly attention.

Translating The Dogma in The Global South

Over the last decade, planning studies and postcolonial urban studies have explored how planning ideas and practices travel from one place to another and what happens in the process of transfer (e.g. Healey & Upton, 2010). They stress that planning models and practices, which originate from a specific context and cannot be applied easily in another context, have to be translated into the particular circumstances of a different locale (Healey, 2013). However, empirical accounts that systematically address how exogenous urban ideals and planning practices “become ‘localized’, that is, drawn down, adapted and inserted into struggles over discourse formation and institutionalization” (Healy, 2013: 1520) in places in the Global South are still rare (as an exception: Silva, 2015; Beeckmans, 2013). More particularly, these studies have not yet systematically embraced the socio-technical dimension of urban policies in the Global South and the place-based experiences in translating infrastructural models.

In particular, science and technology studies draw more attention to the translation experiences and the localization of traveling technologies and their underlying dogmas and models. Some earlier studies have conceptualized the way technological and scientific innovations in the development of urban infrastructure flow from one place to another and result in place-based “regional technological styles” (e.g. Hughes, 1987). These researchers have mostly focused on (Western) Europe and Northern America and how innovations travel between the two continents (Tarr & Dupuy, 1988). Besides, work on circulation and appropriation elaborates the parallel processes of homogenization and differentiation in the historical development of urban technological innovations throughout Europe (Hård & Misa, 2008). On the one hand, the circulation of artifacts, people and ideas acts as “an engine of homogenization” for urban technology (ibid: 10). On the other hand, the transfer of technologies and ideas requires that they are modified and appropriated to suit the specifics of a particular locale (ibid: 12).

While these studies have rarely ventured into analyses in the Global South, an emerging debate in “postcolonial technoscience” has called for a more critical engagement with the present effects - intellectual, social and material - on former colonies of centuries of European technology transfer (Anderson, 2002: 644; Arnold, 2006), for an analysis of alternative socio-technical modernities, and for the “recognition of hybridities, borderlands and in-between conditions” (Anderson, 2002: 643). A specific strand of such “postcolonial technoscience” is exploring processes of “translation” involved in flows of technologies or technological models since colonial times. Arguing alongside Behrends et al. (2014), once technological dogmas and models travel, they are de-territorialized from their original setting and re-territorialized in new settings. The working of these models presupposes techniques in how to deal with a standardized model in place-based contexts. When circulating dogmas and models such as the networked city enter a new place with a different ontological and epistemic background, different social practices, institutional set-ups and technological infrastructures, they need to adjust to these

new circumstances in order to connect to them (Behrends et al., 2014: 3). This “editing process” (Sahlin & Wedlin, 2008: 226) creates a new reality in the local context so that the two ends fit each other and thus a local version of dogmas and models is produced.

In order to capture the broad range and diverse outcomes of translation processes, we can analytically distinguish between different forms of translation (cf. Behrends et al., 2014: 9): *Adaptation*, or the alteration of existing planning legislation and technologies to conform with circulating dogmas; *appropriation*, or the adjustment of the circulating dogma to accommodate available urban technologies, urban morphologies and planning practices; *hybridization*, or the creation of something new by combining elements of the new dogmas, models or technologies with existing ones; and the *refusal* of circulating dogmas through the rejection of, or resistance to, the new and the persistence of that which already exists. The concept of translation thus provides an analytical framework to explore the scope of local creativity in transcending technological models and the re-invention of alternative urban modernities that defy simplistic notions of a linear technology transfer. From that perspective, the hybrid socio-technical constellations of urban infrastructure in the Global South are no longer to be interpreted as deviant cases of European models, but as contextually creative translations to particular contexts of a rapidly urbanizing society.

Conclusion

Transferring technologies and infrastructural models is not usually a simple repetition of what happened elsewhere. Such transfer functions within a politically configured and culturally differentiated space, it is profoundly shaped by that context and follows a different technological path involving change and innovation. Arguing alongside Sahlin & Wedlin (2008: 219), as the dogma of the networked city has to be translated, and as this translation necessarily evolves differently in particular locales and domains, the transfer of this dogma does not necessarily lead to homogenization, but also to variation and stratification. Accordingly, the place-based effects of adaptation, appropriation, hybridization and refusal processes that follow diffused ideas and technologies can hardly be foreseen. The outcomes of those translation processes within the urban and infrastructural landscapes do not conform to plans by specific individuals or organizations, but are often unintended and contradictory. As several studies indicate, the place-based translation of the dogma of unitary, standardized, publicly regulated and secure service provision has paradoxically perpetuated the diversity of sanitation services, the urban inequalities in accessing critical services and the fragmentation of water and sanitation topologies.

The conclusion to be drawn for planning research and practice is that we need a more interactive, culturally nuanced, relational and multi-sited debate about how traveling technological and urban models function within specific places and infrastructural domains. Faced with the restrictions of a linear transfer of technologies, dogmas and planning models, I propose that more caution is required in planning debates on “best practices approaches” or “appropriate technologies” and their transferability from one context to another. Here, the study of cities in the Global South might be particularly productive and enables new empirical and conceptual perspectives on processes of adaptation, but also on the creativity and resistance involved in the translation of traveling models and technologies. Moreover, the study of the place-based infrastructural landscapes might be insightful for a better understanding of recent changes in the technological fabric of cities in the Global North, where urban and infrastructure planning are increasingly challenged by more diversified sociotechnical arrangements.

ABSTRACT - WATER GOVERNANCE IN UNAUTHORISED DELHI: REFORMING COMPLEX URBAN WATER SUPPLY SYSTEMS

By Matthew Birkinshaw

National and Local Context of the Research

Despite progress over recent years, India's water and sanitation indicators are fairly low and market-based 'reform' initiatives (Asthana, 2009; Björkman, 2015; Coelho, 2006; Gopakumar, 2011; Walters, 2013) continue to struggle (World Bank, 2012). Although a feature of daily life for many people, research on 'actually existing' alternatives to official water supply remains limited in the academic literature on India, however some research in Indian cities suggests that opposition from this area can play a powerful role in rendering reform projects unworkable (Zérah, 1999).

A key 'blind spot' in studies on India's urban water to date is the use of groundwater as an alternative option to limited public networks (Shah, 2014). India is the world's largest user of groundwater, which is now the main source across all uses (Cullet, 2012). Groundwater dependence is endemic across Indian cities with, on the whole, only large urban centres using a greater amount of surface water (Shah, 2014). Delhi too, uses a very large amount of groundwater, particularly in the south of the city and peri-urban unauthorised areas. Despite Delhi having no shortage of finance or administrative capacity, and receiving the highest, average, per capita volume of water in India (240-290 litre per person per day) Narain, 2011; Singh, 2005), in 2009 24.8% of the population were receiving water from the government only through tanker trucks (CAG, 2009). Delhi's water supply network performance was rated next to last in a survey of major Indian cities (Shaban & Sharma, 2007) and this inadequate supply forces users to use a range of alternative sources, particularly in the south of the city.

My primary study sites are two of South Delhi's largest clusters of unauthorised colonies and their surroundings. The first case study site (Sangam Vihar), which lies on Delhi's southern periphery and was, until recently, not supplied government piped water, offers a picture of water services in the absence of a public network. The heavy use of groundwater provides an environmental externality that tacitly facilitates minimal state provision. Various forms of micro-politics and intermediation, as well as material factors, structure water supply and access in this situation. The size of the discrepancy between 'actually existing water regimes' in South Delhi and a 'universal network supply', can be seen in the second case study (Malviya Nagar) which describes attempts to institute hydraulic modeling and continuous pressure water supply across a challenging but more centrally located area.

Research problem

My initial research questions, that I was unable to answer from available literature, were:

- How do people in Delhi access water outside of the mainstream public network?
- How does this diversity of supply modes impact (or not) initiatives to reform government supply?

Methods and Procedures of Evidence

The research, which this chapter is based on, was conducted over 18 months between 2014 and 2015. I employed an 'ethnographically informed' research approach, spending time with participants in their workplaces, homes and everyday surroundings and meeting on multiple occasions as far as was possible. In addition to longer semi-structured interviews, informal conversations, focus groups with local residents, 'survey' style questions and 'transect walks' were also useful. In Sangam Vihar I have spoken to over a hundred residents across six blocks, as well as local politicians across parties, water suppliers (tankers, bottles and borewell networks), real estate dealers, health workers and non-governmental organisation (NGO) workers. In Khirki (where I have lived for over 18 months: 13 months in Khirki Village and 7 months in Khirki Extension) and Malviya Nagar, I have spoken to fewer residents on water specifically (around thirty) but have had long conversations with staff at the Public Private Partnership project as well as local politicians, water suppliers, real estate dealers and NGO workers. I have also spoken with a number of people active more at the city level, including Delhi Jal Board (DJB) staff,



Main results

My research highlights the involvement of a wide range of actors in water governance, particularly locally powerful groups and small-scale private sector suppliers. The 'actually existing' water regimes in these areas are decentralized, differentiated and discretionary (Brenner & Theodore, 2002). Governance is already decentralized around different nodes of management, capture and control. Government network water quality, quantity, timings and mode differ between different areas, even within the piped network. The governance of water in these case studies is clearly happening within and outside state agencies, in ways that are a challenge for external interventions to work with. There are close connections between control over, and access to, water and social and political power findings (Anand, 2011, 2012; Coelho, 2006; Contractor, 2012; Jha, Rao, & Woolcock, 2007); key water governance roles are personalized and permeable to social relations more broadly (Benjamin, 2004, 2008; Benjamin & Raman, 2011; Chatterjee, 2004, 2008, 2011; Corbridge, 2005; Hansen, 2001; Kaviraj, 2010). This leads to heightened possibilities for personal discretion, patronage and bias in water allocation, both public and private, inside and outside of the government piped network. Further, these various water supply and access systems are unstable, dynamic and constantly changing. As a means of balancing competing demands for a finite, indeed diminishing resource, both public and private actors rely on environmental externalities, transferring the costs of unreliable state water supply onto natural resources, remote places and future generations. In the present this leads to sub-optimal outcomes for marginalised residents with little opportunity for redress.

These complex dynamics are more than norm in the 'global south' than the universal network supply model of OECD countries (Bakker, 2003; cf Graham & Marvin, 2001). Attention to 'actually-existing water regimes' even in a wealthy city like Delhi, forces us to go beyond a focus on state employees and private consultants, to consider the influence, substantial and unavoidable, of local residents, businesses and their representatives on the governance of water in many areas.

ABSTRACT – SANITATION IN A LARGE DEVELOPING METROPOLIS: A CASE STUDY OF DELHI'S SEWERS

By Rémi de Bercegol & Shankare Gowda

It is estimated that Indian cities generate over 53 million m³ of wastewater a day (CPCB, 2013). For many years, the authorities failed to adequately manage these phenomenal volumes of wastewater, up until wastewater management became a public action priority in the mid-1990s. In addition to the environmental damage caused, poor wastewater management poses a serious risk to public health (Brisset 2006) and has led to epidemics of plague (in Surat in 1994) and cholera (in Chennai in 1991-92, in Delhi in 1996), as well as renewed outbreaks of dengue fever. The Supreme Court of India's rulings, following numerous complaints from citizens' groups, mean that sanitation management has become a court-imposed obligation for the government; one which is enshrined in legislation and supported by the creation in 2010 of the powerful National Green Tribunal (Gill, 2014), to the point where it is now an unavoidable political issue. However, the public health ideal of a clean and hygienic urban India is a long way from being achieved. This is not so much for financial reasons but instead due to the fact that the socio-technical organizations selected are sometimes ill suited to deal with the specific features of developing metropolises. Analysis of wastewater management in Delhi, considered to be one of the most polluted cities in the world (Dupont, 2015), encapsulates some of these constraints while also highlighting potential solutions for achieving more sustainable urban development in the global South.

Delhi has the most extensive sanitation infrastructure of all cities in India. Significant investment has been made over the last few years, both through projects, such as the bilateral cooperation project, the Yamuna Action Plan (YAP), set up between India and Japan, and through World Bank loans or grants awarded by the numerous federal government programmes. As a result, the city now has a network of 6,000 kilometres of sewers and 34 large wastewater treatment plants, which are spread over 21 different sites and have a treatment capacity of 2.7 million m³ per day.

The paradox of this vast sewer system, however, is that it is poorly aligned to the situation on the ground. None of the 34 wastewater treatment plants are currently operating at their full capacity as almost half of the city's wastewater is not routed to the plants. According to the Delhi Jal Board (DJB – the government agency responsible for water and sanitation infrastructure in Delhi), in 2012, the treatment plants were operating at only two-thirds of their capacity (1.8 million m³ a day), whereas at least 1.8 million m³ of wastewater never reached the plants. This untreated wastewater comes not only from the numerous household wells found in the city, but also and in particular from the unplanned and informal districts that are not connected to the sewer system by the Delhi Jal Board (Zimmer, 2012), but which are nonetheless home to around 55% of the population.

The uncollected wastewater from these settlements flows into the gravitational drainage system, the slight gradient of which was initially designed to take storm water only, and ends up spilling over into the streets before polluting the soil and rivers. This situation regularly leads to institutional conflict between the Delhi Jal Board and engineers from the public works, environmental and planning departments, who all blame each other for the damage caused. This lack of coordination is exacerbated by the fact that the city has three types of administrative status - federal, regional and municipal - resulting in a variety of institutions with similar mandates, but who report to different levels of sometimes conflicting political authority, which prevents effective management.

According to Delhi Jal Board engineers, efforts need to be made to "limit the number of inhabitants so we can focus on existing infrastructure, but instead we are always having to extend our network to keep up with urbanization" (interview with the Delhi Jal Board, December 2013). Under the new 2031 Sanitation Master Plan, this infrastructure is set to be massively expanded through the construction of a further 9,807km of sewers and an additional 75 wastewater treatment plants. These new, reduced-size treatment plants are to be built on 38 new sites throughout the city and should help double the current treatment capacity to 4.4 million m³ a day. Engineers have been obliged to come up with costly technical solutions, such as the mega-project (launched in 2008 and currently under development) to construct an 'interceptor sewage system'. This involves diverting wastewater from districts not connected to the sewer network into Delhi's three largest drains (Najafgarh

drain, Supplementary drain and Shahadra drain) in order to prevent raw sewage from entering into and polluting the Yamuna River. This mammoth, 'white elephant'-type project has been criticized by activists for its high cost (350 million euros) and because it (literally) diverts attention away from the real sanitation issues encountered in informal settlements (CSE, 2009). Not only does sizing the facilities pose a technical challenge, but the key issue of sanitation infrastructure governance also needs to be addressed, along with the more political issue of land tenure status within the 'informal' areas of the city. In theory, it is not the Delhi Jal Board's responsibility to identify and regularize squatter settlements. Official recognition of these settlements is dependent on the political inclinations of a government elected for a five-year term and on the decision-making processes of the Delhi Development Agency, which is the agency responsible for the Master Plan and which allocates the land required for infrastructure construction and expansion. The only way to develop a more integrated vision of wastewater management for Delhi is through the formal recognition of the right to sanitation for all of the city's inhabitants, including those living in informal settlements.

Sanitation in Delhi is above all considered to be a technical issue and one that should thus be addressed by technicians using technical, conventional sewerage-based infrastructure. However, considering sanitation purely from a technical perspective means that the social, land tenure and institutional fragmentation of the city is ignored; this, in turn, diminishes the effectiveness of the city's extensive sewer system in spite of the massive financial investment made. Although it may lead to improved sector management, the ongoing liberalization of sanitation infrastructure does not notably focus on addressing these socio-political issues. These aspects of urban sanitation will need to be integrated into a revised governance approach that promotes synergy between the various institutions. To this end, taking the subaltern city into account, by recognizing the right to sanitation for people living in informal settlements, would be an important first step towards facilitating the sustainable management of urban wastewater.

ABSTRACT- (RE)PRODUCING ENGINEERING: RETRACING NAIROBI'S WATER SUPPLY PRACTICES

By Jethron Ayumbah Akallah, Remi de Bercegol & Elizabeth Kanini Wamuchiru

The 'networked infrastructure' paradigm has dominated engineering and policy implementation for urban water infrastructure since the mid-19th century. The 'networked infrastructure' aims at achieving a centralized topology of technical networks ordering and homogenizing urban space by provision of universal and standardized infrastructure services through public utilities, passive users and the close regulation by the state. However, its development in the Global South has been characterized by inadequacies that leave the bulk of the urban population off the networks. By examining the historic co-evolution of water engineering practices in Nairobi, Kenya and the dynamics of water provision beyond the formal networks, we offer a useful understanding of dynamics that face the implantation of the 'networked infrastructure' model in cities of the Global South.

We proceed from the hypothesis that the failure in delivering water supply to all citizens derives from inadequate engineering practices and weak post-colonial policies that, as a result, serve a class of a privileged few urban residents. For instance, we ask, what has been the engineering practice of water supply augmentation in Nairobi before and after independence? Is there (dis)continuity of colonial water engineering practices in the current water regime? On the other hand, some alternatives have emerged, essentially from the civil society but also from public engineering itself. They put forward a new agenda, which go beyond the centralized network by proposing more decentralized approaches. What alternatives emerge on the margin of the central network? Who is pushing these technologies and how? Which kind of socio-technical innovations do they reveal? In an attempt to answer these questions, we employ historical methods through archival research. Key-informant interviews with Nairobi water utility companies and city engineers constitute additional data for analysis. In addition, project documents, published material and informal conversations with Nairobi residents provide useful information. By and large, the chapter cites empirical cases in exploring the question of water supply in Nairobi based on the work of two current doctoral researches and within the framework of the program "*Urban Infrastructures in Transition in Nairobi and Dar es Salaam*", funded by the Hans-Böckler Foundation (HBS), Germany.

The study unravels the fact that the 'networked infrastructure' model was transplanted in Kenya's water infrastructure system during the British colonial era. Despite its prominence, the urban infrastructure system implemented in Nairobi never fully matched to the ideals inscribed by the networked infrastructure model. Water supply in Nairobi never reached a majority of the population, as it perpetually remained a scarce commodity. The connection and supply of water remained exclusive to the interests of a few, particularly serving the colonialists and the working population. The period after the First World War witnessed a highly skewed supply system that was rationalized based on race, further cementing a 'spatial apartheid' system of infrastructure development. Through the decades in the post-colony, different infrastructure regimes have continued to (re)produce colonial inequalities, leaving space for a variety of ways in accessing vital necessities beyond centrally regulated large networks. For example, water is supplied through wells, open water bodies, or vendors. Nairobi's inadequate water supply system has necessitated the centrality of alternative practices away from the networked system towards enhancing accessibility. By acknowledging that almost 60% of Nairobi's population is not connected to the water supply network, we conclude by arguing that the potential for a stable water supply for Nairobi lies in complementary roles of both the large and small-scale approaches instituted across the city.

DISCUSSION - INFORMING THE DOMINANT DOXA AND INFLUENCING POLICY ON URBAN WATER AND SANITATION SERVICES IN CITIES OF THE “SOUTH”

By *Shubhagato Dasgupta*

The discussions during the second session at the Water regimes conference was central to the debate initiated in the background note on the conference as it centered on ‘Challenging the Dominant *Doxa*’. The papers and discussions focused on urban water and sanitation theme and the dominant *doxa* of universal network coverage provided by citywide utilities to specific high technical standards not being materialized in most cities of the “south” was discussed. The discussions benefited from the opening literature review and analytical frame provided by Professor Jochen Monstadt from TU Delft. As the discussant to this session I looked at the questions emerging from the session from a state policy (maker’s) perspective.

In presenting the theme of the session Professor Jochen Monstadt focused on how network infrastructure provided a powerful and dynamic frame to understand the development of cities. He discussed how various network conceptions such as ‘Hydropolis’, ‘sanitary/bacteriological city’, ‘Electropolis’, ‘Autocity’, ‘Cybercity’, ‘internet or informational city’ and ‘Smart city’ have been made to explain city structure and envision futures, in literature. Having laid this foundation he raised the question of whether networked infrastructures while serving as drivers for urban development and innovation also restrict certain urban changes? Aligning with the background note, he explained how the dominant *doxa* of networked infrastructure and the ‘modern’ city were closely related, and questioned whether the water and sanitation regimes in cities of the ‘global south’ could be better understood as *diverse socio-technical assemblages* that respond to local social, political and technical realities, and thereby defy the paradigm of a ‘networked city’? He concluded with the hypothesis that while ideas inscribed in models and artifacts can only travel far if they are ‘translated’ or “localized” to be adopted to politically and culturally differentiated space, they can follow a different socio-technological path involving change and innovation; paradoxically the translation of the networked city ideal has perpetuated the diversity of sanitation and water services, leading to a messy situation for policy-makers and utility companies to respond to the socio-technical diversity and hybridity of urban water/sanitation regimes.

The three papers, ‘Technical sanitation regimes: a case study of Delhi’s contemporary sewers’, by Shankare Gowda, Rémi de Bercegol and Odile Henry, ‘(Re)producing engineering: retracing Nairobi’s water supply practices’, by Elizabeth Kanini Wamuchiru, Jethron Aymba Akallah and Rémi de Bercegol; ‘Water governance in unauthorized Delhi: reforming complex urban water supply systems’, by Matthew Birkinshaw, use different disciplinary lenses to study water and sanitation networks in Nairobi and Delhi two of the largest cities of Africa and South Asia. The session and the discussions were enriched by the different disciplines and methodologies adopted in each paper. The paper on Delhi’s sewer system, adopted a techno-social frame of analysis, to explain some of the more important reasons behind the unequal, inefficient and fragmented services being provided by the state. It also points to how a number of policy proponents have been advocating the utility of more decentralized and community/neighborhood based sanitation infrastructure and services. The authors conclude that a hybrid system may be required for the city but point out that for this to be possible the subaltern city has to be included in planning the new systems which would require that the right to sanitation for people living in informal settlements would need to be recognised.

In the second paper by Elizabeth Kanini Wamuchiru, Jethron Aymba Akallah, Rémi de Bercegol on Nairobi’s water supply practices, the authors adopt a historic and planning disciplinary lens to explain further the understanding of how Nairobi’s drinking water system continues to demonstrate fragmentation and colonial engineering practices, which leave one part of the city unconnected.

The third paper by Matthew Birkinshaw, used ethnographic methods to describe the drinking water hydric regimes operating in two areas in Delhi, India. Through a series of examples he highlighted the discrepancies between expert knowledge and local understandings. He hypothesized that due to a strong ‘localisation of governance dynamics’ a more sociological treatment of water regimes will be needed in the South than in Europe, as in the case of Delhi where the water supply system is very informal and central policy changes have had only a limited reach on the ground.

All three papers, also demonstrated how the water sanitation regimes in these two large metropolises are since quite recently also incorporating non-networked engineering practices within their service framework. In Nairobi the Nairobi Water and Sewerage Company now has an informal settlement department which seem to open up to adopting a demand based approach relying on decentralized technical options. In Delhi too the private operators have been trying to use local knowledge in developing new solutions and in sewerage decentralized wastewater options are receiving attention.

As mentioned above, the three papers with their similar themes but different disciplinary approaches engaged with the discourse on how the dominant *doxa* of northern models for water and sanitation networked infrastructure is translated on the ground and how colonial regimes and practices are opening up to new smaller scale models in delivering urban services in southern metropolises. While these papers produce evidence of both the concepts of 'translation' and 'localization' there are a number of questions that would need to be better understood if a wider policy impact and changes on the ground are to happen. 'Whenever a government makes a policy decision, it ultimately has to decide on three distinct issues: the choice of policy instruments, the setting of the levels of these instruments, and the timing of their implementation' (Klaus Mittenzwei, Bullock, Salhofer and Kola, 2011).

The first of the issues that comes to mind of policy makers is about the *data accuracy, validity and transparency*, even before it debates on the policy instrument. This point is also pertinent in this discussion as all three papers used different disciplinary methods for data capture and interpretation. As most policy makers and technocrats who are responsible for the domains of urban water and sanitation have had limited exposure to only particular disciplinary research methods they often find it difficult to understand and use data generated from other disciplinary studies. On the other hand while social scientists in furthering theory often do not engage with models or possibilities unlike planning and technical fields making the data and methods used opaque to policy makers. Given that the modern urban water regimes while running technological systems that human kind has built, specifically modern technological systems that have also intern shaped notions of what it means to be human living in urban areas, it is important that the social and anthropological studies also are considered in the analytical and policy making frame, going ahead.

In terms of the questioning of the dominant *doxa* too, policy makers believe that they act on behalf of what is the *perceived 'choice' of the wider community*. The question of whether there also prevails *other doxas within the non-networked users* and community at large and the extant that varies from the technocratic solutions propagated by the policy makers under the dominant *doxa* would also add immense value to better understand the drivers of the dominant *doxa* and its inertia.

Another primary frame of reference for policy makers in democratic urban centers is the notion of *fairness and equity*. This is especially contentious issue give that all the three studies clearly demonstrate the inequalities in networked systems in urban areas in the 'south'. In fact a number of scholars including among the three papers presented, discuss how the inequality and exclusion present in the access to the hydraulic regimes in these urban centers are so close to the way they were designed and operated in colonial times. Technocrats and policy makers in charge of the networked system and the doctrine of universal network coverage will how ever have often stated how non-networked solutions are intermediate options and not the solution that the society and the service provider aims to achieve, even if this takes many decades. Given that often the better of segments of the population are better served, arguments that universality cannot be archived by lowering standards of service for the currently excluded will not be fair or equal. Also the impact of non-networked services in terms of techno-economic epistemological considerations, has often found to be in lacking when compared to networked areas. This has sometimes led to the *modification and reinforcement* of the dominant *doxa*, that the decentralized or non networked approaches to service delivery are sub-optimal and at best temporary and that the network is an advancement on any non networked water sanitation service model.

Another question that all three papers need to dwell on more deeply is the question around whether decentralization of services is actually in opposition to the *dominant doxa* or is it the *emerging dominant doxa*? In looking at this question, the researchers will have to better understand the genesis of the hybrid models in each situation. Much of this expanded repertoire of socio-technical options of decentralized and non networked solutions are in many occasions less informed from the ground level conditions and more from international development organizations and networks quite similar to those that were very much part of the development of the dominant *doxa* in the field.

When looking at the policy dimension another issue that concerns policy makers and comes to mind is a question about the *capacities required for network operation* vis a vis *capacities required for off network solutions*. While people and communities at large have developed mechanisms to operate in non networked areas and secure some services, adopting decentralized and non networked solutions often have been seen to need more number and better prepared staff in the utility companies to manage and monitor such systems. For social science researchers understanding and explaining how the individuals and communities take responsibility and govern non-network systems would be an important area of study that could influence the current understandings and dogma around the un-manageable nature of decentralized options in large cities. This is closely related to the policy instrument and to the level of its application that could be put in place. Should the policy instrument change the behavior of the service providers or the users? Should it work at the level of funding the systems alone or also at the technical level? Understanding the dis-functionalities of each system in sociological and anthropological terms to better understand the level of technical and administrative decentralization required can be invaluable to better inform these questions.

Finally the issue that policy makers often deal with is the issue about the *timing of the policy reform*. While this is relatively lesser-studied, often overlooked and lesser-understood aspect of policy-making. Policy makers and state administrative (including technocrats) mechanisms are geared to avoid a breakdown of the socially accepted condition of the water and sanitation systems and to avoid perceivable crisis. However it has often taken crisis for new approaches and models to emerge as even in the case of the 'northern' water regimes and the subsequent establishment of what is understood as the dominant *doxa* in urban water and sanitation infrastructure and services in the global "south", today. To challenge the *doxa* in both theory and in policy making, social scientists and technocrats will have to better explain the complex web of questions in the sector which also lead to the strong resistance to change and risk taking among the policy makers and practitioners/operators.

SPECIAL NOTE: WATER AND SANITATION IN URBAN SLUM OF MUMBAI

By Seema Redkar

Ms Seema Redkar is an Ex-Officer on Special Duty at Municipal Corporation Of Greater Mumbai, now working as a voluntary adviser. She came to the workshop to present one sanitation project in Khotwadi, a slum of Mumbai where she has been working on as community mobilizer with a community based organization within the framework of the 'Slum Sanitation project' undertaken by the municipality. The summary of her intervention shows the shifting of the engineering paradigm towards a coproduction of sanitation services, with the active participation of the users in the management of decentralized utilities, to help the integration of slum in the sanitation policy of the municipality.

Mumbai the 5th most populated metropolitan city with population density of 28,834/KM sq and its extremely high degrees of disparity within different section of the society. A classic example of this is the Khotwadi slum area near the Western Express Highway and close to the Santacruz Airport, where Triratna Prerana Mandal (TPM), a community-based organization, which has been working on the issues of sanitation, water and entrepreneurship for over a decade.

The people in this slum have been living in sub-standard conditions with limited access to basic sanitation, leading to extremely unhygienic conditions and an increasing number of health problems. In the year 2001, this slum had 1 community toilet (CT) with 12 seats for a population of around 1200 people. As a result children and elderly were forced to defecate on the roadside. Moreover, people also dumped garbage on the roads.

The 'Slum Sanitation Project' undertaken by Municipal Corporation of Greater Mumbai (MCGM) targeted this slum to address sanitation and open defecation. TPM community was roped in planning, designing and construction of the toilet along with monitoring the construction work. With necessary capacity building regarding operation and maintenance the CT was handed over. Subsequently to sustain sanitation in slum they addressed the issue of solid waste management.

The vulnerable group of women, waste pickers was identified and awareness was created amongst stakeholders, emphasized was given on segregation of waste, vermin-composting and setting Waste collection sorting center. TPM realized that there was a need for generating employment vulnerable section so that they could afford a decent living. With this in mind, it formed 10 self-help groups (SHG) comprising 210 women from community. Vocational Training was provided for making of, mid-day meals, liquid soap, phenyl, tailoring, gardening, and computers. Today SHGs are successfully running home based enterprises like paper bags, cloth bags, snacks and have contributed their expertise to conduct a toilet survey on railway station for the Government

Acute shortage of water supply in public toilets during summer is common, which hamper the cleanliness and sanitation of toilets. This urged TPM to work on alternate water resources, with appropriate technical guidance they recharge ground water by trapping rainwater during monsoon in ring wells and they further reduced use of water in urinals by installed waterless urinals.

Approximately 6000 litres of water is used daily in the toilet from the recharge ring well. These helped TPM save and conserve 6000 litres of potable treated water from being washed out daily. This has also cut down TPM water consumption and water bills. Elimination of community dustbins and introduction of house-to-house collection of waste is part of the water and sanitation project. Workshops, film street-plays for education have changed the mind set of people change personnel habits and help water conservation. Sanitation and water project was the primary goal and once achieved, they further venture in the field of education, health, environment and entrepreneurship. TPM has won International and national award for its innovation in field of sanitation and water. Generating energy through options like biogas and solar energy panels is the priority for TPM for resource conservation of its community. The future plans to include a biogas plant and recycling urine into power with UK University.

SESSION III

**A New Generation of Water
Professionals?**



INTRODUCTION – A LITERATURE REVIEW ON WATER PROFESSIONALS

By Audrey Richard-Ferroudji

The workshop focused on agents and practices to question water regimes. Within this frame, more attention should be given to positions and professionals to address the challenges of water management, whereas most studies focus on institutions or tools. Indeed, the prism of practices of professionals or dynamics of professional groups is very fertile to understand changes in water regimes, at the crossroads of the sociology of water and the sociology of professions (Arpin, Bouleau, Candau, Richard-Ferroudji (Ed.), 2015, Gadea (Ed.), 2015). Water professionals are numerous (Engineers, well diggers, ditch digger, etc.). Yet, not much research has focused on such professionals even if they often appear in the story. We identified three types of writings on water professionals illustrated by typical writings for each category.

The first one gathers stories about water professionals: professionals sharing their experience (Ramaswamy, 2013), biographies on water professionals (Hager, 2014) or historical approaches involving professionals (Ingold, 2009). A second field of literature focuses on water administration from criticizing 'hydrocracy' or 'technocracy' to enlightening new models. Water professionals were not spared within the critiques of science and technology. Authors discuss how water bureaucracies have been challenged internally (within the State's bureaucracy or through political changes) and externally (by receiving critiques from civil society and academia, or by reducing funding) (Molle et al. 2009). Some authors call for new types of professionals, as there is no blueprint for facing the challenges in the water sector (Van Vuren et al., 2009) and new types of training that are in a transdisciplinary mode (Molle, 2009). More recent studies, carried out in different cultural and political contexts, highlight transformations in the role of water professionals and dimensions of the work that are non technical. They regard water professionals as policy entrepreneurs (Huitema et Meijerink 2010), intermediaries (Moss et al. 2009), facilitator, brokers, boundary spanners (Mollinga, 2009), steward (Richard-Ferroudji, 2014). Gender issues are also scrutinized (Zwarteveen, 2010). Finally, some authors study more specifically the dynamic of professional groups or professional activities with historical and ethnographical approaches. They focus on engineers (ENGIND project, Coelho, 2006), fishermen (Bouleau, 2008, Dedieu, 2003), water police (Bouleau and Gramaglia, 2015), etc. Professional activity is analysed in terms of caring and promoting good water management as a vocation for professionals devoted to the territorial management of water in France (Richard-Ferroudji, 2015). This review of literature encourages developing comparative researches on trajectories of professional groups, occupations and status, professional activities, trainings, professional networks, etc.

ABSTRACT - IS HYDROGEOLOGY A SUBORDINATE SCIENCE?

By Gaia Lassaube

Under the aegis of economic planning from 1950-1970, India has witnessed a growing use of groundwater resources. The role of groundwater was however downplayed in the water policy and hydro-geologists were not given a place of honor within the administration of both countries. The 1990s witnessed two major changes for the profession of hydro-geologists. First, with the new challenge of sustainable water consumption, the agenda of groundwater institutions have expanded. While hydro-geologists were used to provide technical support to public agencies for groundwater prospecting activities, they have now been imparted with new managing responsibilities. This shift has been sustained by the opening of public service positions to engineering profiles, against a general background of rivalry between 'generalist' and 'specialist' profiles within the administration. Based on qualitative interviews conducted with Indian hydro-geologists working in public administration, this work aims to assess whether those new functions have prompted a better recognition of hydrogeology as a professional jurisdiction. We have interviewed hydro-geologists from the regional renderings of a central institution dedicated to groundwater resources (Central Ground Water Board). At the state level, we have interviewed employees and managers from different institutions that deal with groundwater issues (Public Work Departments and Agricultural Engineering Departments).

The first part of this study shows the selection process of the aspiring hydro-geologists in public service and the work routine of the successful ones. A second part focuses on the way working conditions influence the production of knowledge on groundwater resources. A final part posits that despite the emergence of environmental concern and the subsequent 'managerisation' of working practices, the position of hydrogeology and that of its professionals is still a subordinate one within the state apparatus.

If the range of activities performed by hydro-geologists as groundwater experts has expanded, hydro-geologists have not gained much from these developments in terms of professional recognition. On the one hand, the public service reforms could have institutionalized this profession within public administration. However, hydro-geologists from civil service took the brunt of budget cuts and project-based employment. On the second hand, the specialization of activities has fragmented this group of groundwater experts. The institutionalization process that started in the 1990s stands thus unaccomplished. As of now, our hypothesis is that this specialization of work runs contrary to a broader understanding of groundwater issues. The administrative spectrum of groundwater resources is segmented between different departments and staff that abide by their own water rationale, as many different logics that run into each other. Further research in this area should question how this specialization takes a toll on the principles of integrated water management and also explore how hydro-geologists try to overcome difficulties and reconcile those contradictory water regimes.



ABSTRACT - ACTIVISTS FOR THE RIGHT TO WATER FACED BY ENGINEERS OF THE FEDERAL BUREAUCRACY

By Amaël Marchand

Public policies of water in Mexico are the subject of intense debate and numerous conflicts, whose intensity and visibility have increase since the 1990s. Political issues related to infrastructures, such as lack of investment, implementation of hydraulic megaprojects or environmental impact, are some of the main factors of these conflicts. They are also linked to management policies of the services such as price increases, water cut offs and private participation, or to external factors such as the drought in the north of the country. However, environmental problems, infrastructure issues and reforms of urban services have a long history in Mexico; they do not necessarily lead to conflicts on the public policies of water. For example, the increase of conflicts cannot be related to a general deterioration of water infrastructures. On the contrary, although significant inequalities remain, access to water and sanitation has improved in recent decades. A sociological approach is needed to understand the social conditions of conflicts arising from public policies of water in Mexico.

Mexico has a strong and powerful centralized federal bureaucracy in charge of water management at a national level. Since 1927, it has transformed the country by constructing big hydraulic infrastructures. But more than three decades after the implementation of neo-liberal reforms began, including decentralization and the transition to sustainable management, controversies about public water policies in Mexico are no longer the monopoly of government engineers and senior politicians. Water management is now divided in a complex institutional architecture distributed on different levels (federal, state, regional and municipal) while participatory management institutions are created for watersheds and groundwater (Vargas 2002).

In addition to technical and organizational changes, reforms and crises of the federal bureaucracy, the sociological profile of the agents involved in the discussions about the public policies of water, particularly at national level, have also changed. Heterogeneous actors are now involved in water controversies: international organizations, non-governmental organizations (NGOs), municipal officials, scholars, consultants, associations, social movements and private companies. In Mexico, a complex 'water community' (Meublat 2001) brings together different individuals and institutions with contrasting interests and often-conflicting positions. However, they are united by their participation in struggles over water policies' definitions and implementations. They invest different kinds of resources such as time, funding, infrastructure or expertise in this power dynamic. The Mexican water community can be understood trough the concept of a 'field of public policy production' (Bourdieu 2000), that is to say, a system of relations that brings together agents who compete about the definition and implementation of public policies.

The consolidation of the Mexican water community since the 1990s did not make the federal bureaucracy domination disappear in the production of public water policies, particularly at national level. Instead, the water management in Mexico is subject to the persistence and strong comebacks of authoritarian and centralizing tendencies since the early 2000s (Wester, Rap and Vargas-Velázquez 2009). In parallel, Mexican political powers are at the forefront of the recognition of treaties and policies promoted by international organizations on the right to water and sustainable and participatory management. In September 2011, the right to water secured by a sustainable and participatory management was integrated into the Mexican Constitution.

The resurgence of a powerful centralized and authoritarian bureaucracy is a specificity of Mexico, while water management remains officially decentralized, participatory and sustainable. This contradiction sheds light on the conditions in which debates and conflicts of rare intensity appear within the Mexican water community. The reorientation of public policies towards sustainable and participatory water management is for some activists, experts and NGOs, an opportunity to get official recognition and to consolidate their participation in the production of public policy. It is, for bureaucratic elites, both an obstacle in their actions, and a frequently missed opportunity to give it legitimacy.

A fraction of the Mexican water community openly opposes the federal bureaucracy while claiming the principles of sustainable and participatory management. It is mainly composed of activists from universities, NGOs and social movements. They advocate ecological and small-scale water management models, increasing the capacity of participatory institutions in decision-making and excluding private companies from the management of urban operators. They form alliances at a national level by regularly exchanging information and various resources, meeting at various political or university events at local, national or international levels. The role of activists in the production of water policy can thus be approached in terms of public policy coalitions. This concept refers to networks that involve a number of actors who orient policy-making processes and policy implementation and who share a common representation of their activities (Sabatier & Jenkins 1993; Boscarino, 2009).

Three conflicts were chosen as study cases because they bring out challenges to management models promoted by the federal bureaucracy, as well as those at local, national and even international level. The first two case studies focus on local conflicts caused by the extension of big hydraulic infrastructures in the southern urban periphery of Mexico City and by the opposition to private participation in the urban water service of a small city. The third case study is centered on the national controversy over the upcoming reforms of the General Law of Water.

Analyzing the resources and characteristics of the agents allows me to understand the distribution of power around these conflicts. Studying the social trajectories of the protesting agents is the main method I use to identify the resources that they engage to carry out the struggle to impact public water policies. This is not a study of social movements around water problems, but rather a study of the transformation of the field of water management as agents work to alter public policies. The public policy coalition approach has allowed me to focus on specific aspects of individuals in my sample, principally, the number of organic connections that are made between people by means of inter-personal interaction. Thus, the tools of statistical network analysis seem particularly useful. They help to map the social capital of members in the coalition. However, this approach can be complemented by analyzing the position of the members of the activist coalition within the Mexican water community through the concept of the field of public policy production. This concept takes into account all the resources mobilized by agents: institutional position, scientific expertise, language skills, mastery of legal language, in-depth knowledge of local situations, etc. The amount and types of social resources possessed by agents allow me to outline their position in relation to one another in the Mexican case. This method has allowed me to highlight the unequal distribution of social resources.

One main result of this study points to the proximity between the elite of the activist coalition and high-ranking politicians and civil servants. This proximity reveals the way the activist coalition contributes in framing the protests against the federal bureaucracy. In fact, protest elites are brokers. They facilitate the passages between multiple management levels, allowing conflicts over water to gain visibility far beyond the local level. However, these passageways between levels operate at the expense of the recognition of certain standards (legal discourse and defense of the environment, for example) and certain hierarchies (the domination of lawyers, academics and NGO leaders in particular).



DISCUSSION – INDIAN ENGINEERS IN THE FIELD OF WATER MANAGEMENT

By Roland Lardinois

To begin with, let me say that I am not an expert of water regimes nor am I a specialist of water management or public policies. I am a sociologist studying Indian engineers. Therefore my discussion will focus mainly on the methodology developed by Amael Marchand (AM) in his paper (*Activists for the right to water faced by engineers of the federal bureaucracy. Production and reproduction of water public policies in Mexico.*) I want first to congratulate AM for his presentation grounded on a rich fieldwork whose data are nicely elaborated; although studying a situation that is quite complex, AM presents a well-structured paper and a clear analysis of his material due to the firm sociological methodology he follows. I have three remarks in this regard. Firstly, all over the paper, data collected on the field take precedence over the theoretical approach that is never imposed on the material from the top. In other words, AM adopts a truly inductive way of elaborating his data and he never follows a deductive way of reasoning that gives the feeling that the scholar has understood his subject of research before starting the fieldwork.

Secondly, AM makes an important and clear distinction between his area or field of research and his problematic. He says, “I am not studying social activists on water issues but the actors involved in the conflicts arising from the changes in the public management policies of the water socio-technic system.” The fieldwork is encompassing all the agents or actors having a stake on water management, but the research questions focus on the changes that take place in the public policies.

Thirdly, the paper is situated at the crossing point of three sociological trends that used to be quite distinct so far, at least in French sociology. AM mobilizes the tools of the sociology of controversies, of the sociology of networks and finally of the sociology of field developed by Pierre Bourdieu. Until recently, each way of analyzing the social world was considered as more or less exclusive; the networks analysis and the sociology of controversies have even been used, in France, as a kind of counter-methodology in order to oppose the notion of field. AM rightly shows that a comprehensive understanding of public policies on water management involves an analysis of the different networks of actors who trigger controversies over water issues, but these networks are themselves embedded in a social space structured by the different positions taken by actors in these controversies. This is the reason why the concept of field of public policy on water management seems much more appropriate, much more fruitful in terms of sociological understanding than the idea of “water community” often used. As Magalie Bourblanc noticed in the discussion, although suggestive, the idea of “water community” is misleading because there is no unity over the water issues but divisions and conflicts among different groups of stakeholders in water management. Furthermore, AM does not forget to consider the analysis of the socio-technical system regarding the distribution of water, as well as the sociology of the actors/agents involved in the field. AM intends to combine an analysis of networks as well as an analysis of the field for which he will present the social properties of the agents and conduct a Multi Correspondence Analysis. However, in his paper AM presents only a preliminary view of his network analysis. He has identified three networks of actors involved in water management in Mexico, which he labels “coalitions”: they are the water-right activists coalition, the politico-technic coalition and, finally, the reforming coalition. The uses of the notion of coalition raise three questions.

First, is the coalition a construct of the sociologist or do actors in the field see themselves as being part of a coalition? Or, to put it differently, is the coalition the statistical outcome of the network analysis?

Second, are all the individuals observed part of one coalition only? Can we have multi-coalition positions? For example, an engineer might also be an activist? How can we classify these types of actors? Can we have individuals who are not being part of a coalition but who would be active in the field of water management?

Third, how can we articulate network analysis and the use of the concept of field? One way to ground statistically a study of field is to collect prosopographic data on individuals and their position takings, then to run a Multi Correspondence Analysis (MCA). In this regard, the structure of the field is an outcome of the MCA. What about the congruence, or not, of both analyses? It is both a practical and a methodological issue that is not yet clear for me? But I am anticipating the next stage of this research, as the paper does not present the analysis of the field.

To conclude, my last remarks deals with the work developed by the activists of the water right coalition. What strikes me, if I understand correctly the analysis presented, is that the legal, environmental, politics expertise of the activists contribute to expand the bureaucratic logics, even within areas where the bureaucracy was not present or active so far. It seems that the activists and the bureaucracy work within the same legal framework; therefore, the conflicts between the activists and the bureaucracy tend to reinforce the bureaucratic logic and its power over the field. In the paper that she presented at this conference, if I am not wrong, Bérénice Girard observes the same king of pattern in the field of management of the Ganga basin. These conclusions need to be further explored in order to better understand the logics at work in the field. But they question the uses of the expert knowledge that is required to be active in the field of public policies of water management. Concerning Gaia Lassaube's paper (*Is Hydrology a Subordinate Science? [Acting as a hydro-geologist: a France-India comparative study of a changing profession]*)

Gaia Lassaube's paper was entitled: "Is Hydrology a Subordinate Science?" But into brackets I mention the title of the paper that was announced in the program, as I will question the different emphases of subject in the title. Gaia Lassaube (GL) deals with a slightly neglected subject related to groundwater while the vast majority of studies are concerned with surface water. The paper contains a lot of information on different aspects of the work of the specialists of ground water, the hydro-geologists, which has been collected through interviews. In the 1990s the activities of the hydro-geologists have undergone a change from prospection and extraction to conservation and management. Parallel to these changes, reforms of the Public Service Commission have also expanded the recruitment of these experts of ground water. The aim of GL's paper is "to assess whether these changes have been beneficial or detrimental to the ground waters experts working in public administration." The paper is organized in three parts. The first part deals with the recruitment of hydro-geologists in the public service and the work they do. The second part addresses the issue of knowledge produced by hydro-geologists. Finally, the third part shows that "the position of hydro-geology and that of its professionals is still a subordinate one within the State apparatus." My comments will be limited to some methodological issues that this paper addresses.

The titles of the paper and its research questions point to some contradictory approaches cast in an evaluative form, which both need clarification. The paper balances between two different questions that seem to be considered as equivalent. On one hand, GL addresses the scientific content of hydrology in terms of science while, on the other hand, she considers hydrology and hydrologists as an occupation or a profession (the distinction between occupation and profession is not clear). Moreover, the problematic is expressed in a normative way. The paper is entitled "is hydrology a subordinate science?" but the paper focuses on another normative issue that is: have the changes in the work of the hydro-geologists been beneficial or detrimental to the profession? I am not sure that such an evaluative issue is the right starting point for the sociologist. We can presume that the opinions will differ within the group of experts concerned. In any case, we need first a good description of the occupation and its changes over the last three decades in order to understand the views that the actors would take over these changes. I agree that the content of the activity needs to be researched. But the two questions (hydrology as science *versus* occupation/profession) should be clearly distinguished, and the problematic should not be framed in such an evaluative form.

I would have started with a fine presentation of what constitutes "the group of ground water experts." Who are these people? What is their expertise? What are their qualifications? What are their professional positions? What do hydrologists do? What is their jurisdiction, to use the vocabulary of Andrew Abbott? Are hydrologists organized through professional bodies? Instead of asking if hydrogeology is a science or a subordinate science, it might be better to think in terms of disciplines. The question should be: what are the scientific disciplines concerned with the assessment of ground water resources? In this regards, GL presents a rich material that could be a starting point for further research. The disciplines concerned can be either geology (or applied geology), geophysics, hydrology, hydraulic-engineering, hydro-geology, hydro-chemistry, exploration (petroleum), seismology, earth sciences and engineering, and last, environmental sciences. What this list designs is a space of disciplines or sub-disciplines, which is both an academic, intellectual and social space, from where experts of groundwater can be recruited. In terms of qualification, GL shows that most of the hydro-geologists she met have a PGD, either a MA, a MPH or an MTech in one of the disciplines above mentioned.

Consequently, a description of this space of disciplines would be useful. Where are taught these disciplines? At the university, in the faculty of science? In engineering colleges? In the IIT, in the Dhanbad School of Mining? In public or private engineering colleges? We cannot understand the occupation of hydro-geologists without considering the system of higher education that produces experts on ground water. At this point we would study the posts offered to the hydro-geologists by the public service but in relation with the offers proposed by the private sector, particularly at a time of changes that blurs the frontier between public and private sector. As GL shows, the Indian public service is divided into three segments, the All India Service, India Administrative Service (IAS), Indian Forest Service (IFS) and Indian Police Service (IPS), considered as general services, then the Central Civil Service (divided into two groups A and B) dedicated to more technical services and, finally, the State Civil Service. GL rightly notes that the subject of water in part of the Concurrent List of the Constitution, which means that the subject is under the legislation of both the Central (Union) government and the State government. At the Union level, the Ministry of Water Resources deals both with surface water and ground water through two distinct agencies. The Central Water Commission in charge of surface water is an attached office to the Ministry, while the Central Ground Water Board is just a subordinate office in charge of ground water. “The precedence of surface water over ground water”, writes GL, “is fixed within the institutional landscape”. However, experts on ground water are also distributed along a hierarchical administrative line that opposes hydrologists working at the Union level and those who are working at the State level.

Yet most of the interviews mentioned seem to have been collected at the State Level. It would be useful to conduct interviews with hydro-geologists working at the Central Ground Water Board in order to better understand the hierarchy of work and function of this group of water experts. The interviews quoted in the paper should be presented with much more details regarding who is speaking, his/her gender (are there women working as hydrologist?), age, family, caste, regional origins, educational background, present position; a study of the professional career of the hydrologists would be welcomed. Without these data, it would be difficult to understand the viewpoint that the people quoted express.

For the past three decades (from the 1990s onwards) the occupations of hydrologists have undergone many changes regarding the content of their work, the conditions of their recruitment and their position into the public service, and the opportunities to join the private sector or start their own business. In order to better understand these changes, it would be useful to have a clear description of the situation of hydrologists before these changes occurred. That could be done in conducting interviews with individual belonging to the old generations, retired hydrologists or engineers that could explain the work they were doing in the 1970s and 1980s. Conducting structured biographical interviews should be very fruitful on this point. Then, the structural changes that have affected the occupation of hydrologist would be researched with much more details. Finally, the evaluation of these changes (whether they are beneficial or detrimental to the occupation) should be studied in analyzing the opinions of hydrologist themselves in order to understand what is at stake in the controversies regarding the changes that have occurred in the occupation of hydrologist?

SESSION IV

Reconfiguration of 'Hydrocracies'



INTRODUCTION - FOSTERING NEW WATER REGIMES: UNIVERSALITY, DECENTRALISATION AND BEYOND

By *Philippe Cullet*

The push for universality in the water sector has a long history and the aim of much policy concerning drinking water since the late 19th century has been universal coverage. This quest for universality has been reinforced in recent decades with the development of an international policy consensus on water that seeks to promote the same values, norms and methods in all parts of the world.

While universality has been a strong part of the water sector *doxa* concerning drinking water supply, this has not been applied consistently. The case of Delhi illustrates this well since the very idea of providing piped drinking water has for decades excluded the many lakhs of people living in various non-regularised parts of the city. This does not mean yet that there has been no provision by the state (e.g. tankers) but confirms that the reality of 'universality' is much more complex than what the mainstream literature assumes. Another example that illustrates the fact that universality has not been implemented in practice fully is that of 'water user associations' (WUAs). Here, in the name of fostering 'participatory irrigation management' (also an international level policy initiative), WUAs have been set up in effect to foster better access to irrigation. Yet, the very membership of WUAs that is limited to landowners exclude a variety of people using water for growing crops, hence negating any potential push towards universality.

While universality remains the dominant paradigm, decentralisation has gained significant ground over the past few decades. This is found both in international and domestic policy frameworks. Decentralisation based on the principle of subsidiarity is a most welcome change from a policy framework that seeks to fit everything under one model and then fails to provide its benefits to everyone. There is thus a lot to say in favour of fostering decentralisation in all parts of the water sector. At the same time, decentralisation cannot be something, which is implemented at the expense of universal norms. The future must thus be traced along lines that recognise the need for compliance with universal norms, such as the fundamental right to water, water quality standards and environmental norms while providing flexibility to respond to local hydrological, climatic and economic conditions. This does not provide any space for decentralisation becoming an entry point for new discriminatory policies, whether based on land ownership or on economic factors (cost recovery). The need to rethink the place of water bureaucracies in the water sector must be undertaken in a context that takes into account realities on the ground as well as the universal norms that provide the backdrop for a water provision framework that fosters equity and justice rather than one that fosters efficiency and cost recovery.

ABSTRACT - COMPARING HYDROCRACIES IN MOROCCO AND SOUTH AFRICA: WATER REFORM AND BUREAUCRATIC RESTRUCTURING IN A NEO-LIBERAL CONTEXT

By Magalie Bourblanc & Pierre-Louis Mayaux

In both Morocco and South Africa, since at least the mid-20th century, water has been entrusted to powerful state bureaucracies embracing a 'hydraulic mission', what some authors have dubbed 'hydrocracies' (Molle, Mollinga and Worster, 2009). In Morocco, the emergence of a powerful hydrocracy can be traced back to the French Protectorate in the 1920s, under the Resident General Steeg (Pritchard, 2012). Since the late 19th Century, South Africa has started building a strong water administration and soon developed a world recognized expertise especially in massive inter-basin transfers (Blanchon, 2012). Its civil engineers have managed to export their know-how on the African continent (and even to the rest of the world) and take an active part in the water epistemic community at the international level, especially through the ICOLD (International Commission on Large Dams). However, both countries also went through a neoliberal State restructuring in the 1980s and 1990s, a process that was susceptible to challenge this bureaucratic dominance. This paper seeks to explore the ways by which these hydrocracies have reacted and adapted to these challenges.

Based on semi-structured interviews, this paper argues that powerful hydrocracies still exist in Morocco and South Africa, but that they have been considerably reshaped over the last two to three decades. In Morocco, the Public Work administration reacted to these challenges by pre-emptively seizing the IWRM discourse and taking the initiative to draft a new water law in 1995. The law was conspicuously inspired by the new global norm but was in fact carefully and ambiguously worded. Subsequent regulations were drafted in close cooperation with the Agriculture administration, and put less and less emphasis on demand management, and more and more on renewed supply-side solutions. It is therefore unsurprising that the number of dams increased from 110 in 2004 to 139 in 2015, the national strategy for water now intending to push this number to 170 by 2030.

At the same time, the palace significantly increased pay and working conditions for top public engineers (Vermeren, 2003) while middle-tier public water engineers faced less favorable changes. Within the public works administration, and private consultancy firms now carry out more and more studies. As for agriculture, the *Offices régionaux de mise en valeur agricole* have seen their number of staff curtailed and a number of services of technical assistance have been privatized or outsourced. Under the neoliberal agenda (privatization of expertise, transfer of irrigation management to users, individualization of farmers' water strategy), the Moroccan hydrocracy has therefore been dualized: top civil servants managed to reassert their authority, while middle-tier public water engineers have faced more precarious conditions and have been increasingly forced to negotiate with a number of newly-empowered actors.

In South Africa, new political elites from the ANC have held a key role in reforming the water sector in the mid-1990s. They drafted a new National Water Act (NWA, 1998) whose objective was to bring about more equity and ensure proper access to water for the Black population especially. While busy revising their water policy, policymakers were also very much influenced by international concept such as IWRM and its emphasis on water demand management for instance. The democratic transition in 1994 also triggered a new policy of "transformation", i.e. a restructuring of the State apparatus in a bid to reflect more the South African society's racial composition. As a result of this combined transformation process, the institutional identity of DWA changed, especially as the new recruits had seldom had any civil engineering educational background. Yet, up until recently, DWA former white elite has managed to maintain a supply-driven approach of water resources management for the country, in particular thanks to its long-lasting relationship with private engineering consulting firms. In that respect, both case studies show an increased reliance on the private sector and question the capacity of top-tier bureaucrats to coordinate the sector. In South Africa specifically, over the past 5 years, the hydro-bureaucracy seems to be experiencing the most change, with a competing global network of water experts coming to the fore and promoting alternative water resources management approaches and policy solutions around green technologies (waste water reuse, desalination, leakage reduction from distribution networks, increasing water use efficiency in agriculture, etc.).

ABSTRACT - THE SOCIOHISTORY OF A (FAILED?) DEVELOPMENT PROJECT. THE ENCOUNTER BETWEEN CIVIL ENGINEERING AND SOCIAL MOVEMENTS AROUND THE GOSIKHURD DAM

By Joël Cabalion

This contribution aims at engaging a sociological analysis of the various stakes of struggles located around the reconfiguration of the water regime today prevalent in Western and Central India. The State of Maharashtra therein remains one of the principal dam-building states in the Nation. At a time when the emphasis is put on a path of economic development symbolized by Special Economic Zones, airports, highways and new high-tech industries, the Green Revolution appears outdated. What is forgotten, however, is that many regions in rural India are still expecting the realization of this decades-old developmental paradigm. Each passing election reminds us of this fact: the Green Revolution is an inexhaustible reservoir of political promises of high-added value. Yet the evolution of the economic field seems to postpone ever more the objectives of a rural development that would be articulated around its implementation. Based on the case of the Gosikhurd dam in Vidarbha, this contribution illustrates such a regional trajectory of expectation, and in doing so comes back on some of the socio-historical reasons, which have led to the delays and the defeats of the Nehruvian perspectives.

National and Local Context of the Research

The region of Vidarbha lies in Eastern Maharashtra and extends towards Central India, bordering the States of Madhya Pradesh in the North, Chhattisgarh in the East and Telangana in the South. It comprises the two administrative divisions of Amravati and Nagpur, covering eleven districts stretching over 98,340 km², amounting to about a third of the State area for 20.5% of its population (Census 2011). The region is drained by the Godavari and the Tapi river basins wherein the Wainganga River flows southwards in the Godavari sub-basin. Being the most important watercourse in Vidarbha, the Wainganga today embodies its greatest hopes of rural development and the possibility to accomplish a Green Revolution already long awaited. Mostly rice producing in its Eastern part; Vidarbha also holds the largest forest cover in Maharashtra. It has a command cultivable area of 57,000 km² with an estimated irrigation potential of 22,000 km², out of which 7,000 km² had been irrigated by the year 1997.

Research Problem

The objectives of this research lie in the analysis of what can be termed a 'state science', intersecting various forms of legitimacy dominated by the encompassing position of state civil engineers. Initially managed by the Irrigation Department of the Government of Maharashtra (GoM), the Gosikhurd project was eventually transferred to the Vidarbha Irrigation Development Corporation (VIDC), founded in 1997 in order to expedite and improve the management of water-basin projects in that region, albeit lacking the necessary funds to do so. When the GoM created the VIDC, it initially transferred 10 major irrigation projects to be completed within 5 years. As the report of The Comptroller Audit General (CAG) of India pinpointed (Comptroller Audit General, Ch. 2, *Report n°2 (Civil) for the year ended 31 March 2011*, p.65), the GoM continued to transfer projects to the VIDC at a fast pace, totalling 320 projects by 2009 thereby creating long delays due to fund crunches and a lack of preparation.

Until 2004 the project remained a major struggle between Western Maharashtra and Vidarbha due to the paucity and irregularity of allocated funds. The mediation of the Government of India (GoI) made it gain momentum first in 1997 through the Accelerated Irrigation Benefit Programme (AIBP, see Ministry of Water Resources, New Delhi). The VIDC had since then lobbied for a complete conversion of its status as a National Project in order to get central funding up to 90 per cent. The Technical Advisory Committee (TAC) of the Central Water Commission not only sanctioned all the revised budgetary estimates but also allowed its conversion as one of the 14 national priority irrigation projects eligible for central funds (the TAC depends directly on the views of the Principal Secretaries and of the Minister at the Ministry of Water Resources in New Delhi). It is the first National Project of its kind to be accepted from the state of Maharashtra.

Methods and Procedures of Evidence

Research methods articulate a body of interviews with civil servants (engineers, politicians, bureaucrats of various sorts and ranks), social movements' activists and leaders as well as affected people (whether beneficiaries or displaced peasants). The qualitative component of this research is complemented by document analysis and statistical surveys combined with rural ethnography.

Main Results

The emergence and the evolution of the Gosikhurd project is not the irremediable product of the modernization of the State or of its bureaucratic management. It did not obey, as one could think, some sort of a natural impetus of development but depends upon specific individual trajectories and professional ideologies. The official proposal of the project is the *ad-hoc* decision of a major politician from the region. The proposal of a major dam benefiting the region therefore played a major role in the early consolidation of his political career and his future promotion to the constituency of Nagpur. However, in spite of the importance played by political agents in getting such a project on tracks, the credit originally goes to the engineering and technical departments of the regional government.

Through the analyses of the various 'players' involved in the making and unmaking of the Gosikhurd's project objectives, one can trace the evolution of water regimes in Western and Central India, if not map to a certain extent the evolution of the field of water policies in the Nation in relation to a host of other critical issues: rural-urban linkages, river-basin development and industrialization, forced displacement and new villages, regimes of dispossession and social movements, etc.

This contribution thus situates itself at the juncture of critical development studies and sociology of inequalities. By engaging with the emergence and dynamics of a large development project, it now entails to embrace a sociology of expertise and professions in order to unpack the relation between civil engineers, the State and social movements in the region of Vidarbha and Maharashtra.



ABSTRACT - ENGINEERING RELOADED. HYDRAULIC BUREAUCRACY AND WATER CRISIS IN THE WESTERN UNITED STATES

By Joan Cortinas-Munoz, Brian O'Neill & Franck Poupeau

Presented as the new frontier where individualism would thrive, Western America came to be one of the most powerful hydraulic bureaucracies of the 20th century, having a foundation in scientific and centralized management driven by engineering objectives. The project to tame the waters of the West was at the crossroads of local interests and federal agencies as some saw a future of small farms and locally governed water, while others had plans to create expansive infrastructure, which would largely be funded by the federal government. This model, driven largely by engineers, helped to prove scientific efficiency and skill with public megaprojects like the dams and canals that supported the economic growth of the region. Vast sociotechnical infrastructures were created, but it also spawned a network of individuals and to be even more precise, the system in place in the Western United States has been constituted as a social field that has been consolidated all along the 20th century.

Important changes came to the West as the bureaucracy grew larger and water scarcity remained a problem, despite the phenomenal infrastructural changes: agroindustry, urban growth and high tech industries increased the demand of water. The social structures of the old model began to change by the 1970's, if not before, when the federal government refused to fund large projects for budgetary reasons. As this occurred in synchrony with the growth of a larger environmental reform agenda, issues revolving around the conservation of resources, became a central political tenant.

But how is it possible to understand the seemingly paradoxical alignment of political interests, economy and a new "conservation ethic?" The hypothesis is that if there is a current "crisis" in water management in Western America, it is because growing water scarcity (exemplified by the current drought) reveals not only a transformation in the models of water management and of the networks associated with the utilities, but also a shift in the bureaucratic powers of state engineering that has defined water management (with big infrastructure and the re-direction of flows). By focusing on the transformations of water policy coalitions from the end of 19th century to today, and reconstituting the field of water management that shapes them, it becomes possible to link the levels of action as well as the managers themselves as they struggle to define a model for the future.

As new coalitions were formed, and the bureaucracy proliferated with the introduction of new laws and norms in water management and policy, the conservation ethic was able to find its way into the minds of powerful bureaucrats, perhaps exemplified in Bruce Babbitt, who was known for path-breaking conservation measures, and in Arizona, a Groundwater Management Act in 1980 that brought about a new water regime creating new positions and greater mobility for people in the bureaucratic field, as well as an opening for conservation policy to move from the local level into higher offices.

By understanding the system of institutions managing the waters of the Colorado River Basin as a field, governed by its own norms and a general agreement on the objective reality of drought, it is possible to problematize the situation in a way that moves us past issues of problem solving and much of the existing applied policy research that is so prevalent today. Indeed, it is possible to question why state and local water conservation policy (WCP) is such a key aspect of contemporary management and policy strategy. WCP is not only the preservation of biodiversity and natural ecosystems, but the implementation of specific ways of using water, that is, domestic reuse, collective uses of storm-water, ecological restoration, groundwater recharge techniques, etc. Arizona is particularly useful to analyze, because this WCP is presented as a way to face the potential crisis of the network city and of the uniform model of water management (one single operator on one territory) that could be the consequence of Colorado shortages, in a context of urban growth and climate change.

However, due to the developing nature of the bureaucracy and these new norms, engineers could no longer drive the system alone. In fact, it could be argued that although engineers played a defining role in the early years, their aims were never possible without the proper alignment towards other forces of power, namely businessmen, politicians and lawyers.



Today, the bureaucratic field encompasses planners, policy analysts, economists, historians, legal scholars, ecologists and more, all of whom have something to say about the vast sociotechnical system that has been built over the past century.

The traditional model of water management has shifted as water has become scarcer, the population of the West has grown and economic and political concerns infiltrated the field. Nowadays, institutions look for consensus and try to build collaborative projects that traverse the institutional divisions that so often hampered early water management efforts. With the challenge to the old engineering perspective came new professionals with new expertise, giving rise to a more “strategic vision,” consisting of diversified water portfolios, conservation plans and drought preparedness reports. Local administrations are encouraged to participate in state level processes and high-ranking managers find themselves advocating for advanced techniques on matters of the use of reclaimed water, water meters and healthy forest plans. Instead of seeing division, the modern water professional looks for areas in which to collaborate across fields and across institutions. As these professionals seek to manage their collective water scarcity reality, it provides an excellent canvas upon which to understand the transformation of the hydrocracy from federal hegemony to the spread of local ideas.



DISCUSSION: COLONIAL LEGACY AND THE TRANSFORMATIONS OF HYDROCRACIES

By Vanessa Caru

Two general observations could be made regarding these three papers.

The first relates to the persistence of colonial legacy in the three different contexts. It is obvious in the South African case where the racial domination and discriminations have had enduring effects on the evolution of the public engineer's corps. But one can also assess the legacy of the colonial irrigation policies in the Indian and Moroccan cases. The colonial belief in the economic and social benefits of large-scale projects (like dams) was not only partly transplanted, but also gained a new legitimacy, in the developmental perspective of the new nationalist states. As asserted by James Scott, the agents who implemented these projects had a false sense that they could control complex natural and social processes. And as Joel Cabalion's paper has highlighted, one has to take into account the (in)capacity of the peasants' movements to impress their claims upon the state, to understand how this top-down approach was carried on by the post-colonial state.

The second observation pertains to the evolution of hydrocracies. Echoes could be found with what has been said in a previous session about the management of the Ganges. Local Moroccan engineers, as local Indian engineers, are progressively being supplanted by "experts" and "consultants". In analyzing this evolution, two dimensions should perhaps be more carefully taken into account. The first one concerns the status of the workforce. State engineers, who have dominated water policies for a long time, benefited from job security and regular income (which, in certain contexts as in India or Morocco, included them in the privileged section of the workforce). It may be interesting to ascertain how the retrenchment of the state and the casualization of labor (with the multiplication of consultants hired on precarious contracts) have contributed to the general decline of engineers' hold on water projects. The second dimension, which was not addressed in any of the three papers, is the gender issue: how do these (recent) evolutions affect the position of women in a frequently male-dominated domain? The collective discussion first focused on an apparent specificity of the Indian case: the fact that the domination of engineers on water policies (and even on the rehabilitation side of projects) has not been yet challenged by the emergence and affirmation of new experts who do not have necessarily a technical background. No answer could be given to this question, which therefore can constitute an interesting problem to be addressed in a comparative perspective. The gender issue, the impact of the specific political context of the South African state and the influence of urban development (and vested interests like real estate) on water policy were then discussed.

CONCLUDING REMARKS - WATER REGIMES AND ENGINEERING: ACROSS OUTLOOKS

By Odile Henry

The international workshop on water policies, which took place from the 14 to the 16 January 2016 at the Centre for Policy Research (Delhi), brought together 25 participants; it was supported by a number of partners (Centre for Policy Research, Centre de Sciences Humaines, Institut Français of Pondicherry, UMI i-GLOBES CNRS/University of Arizona, ANR ENGIND, ANR BLUEGRASS, Indo French Water Network et Institut de recherche pour le Développement). The research focused on comparisons between different case studies in a range of countries (USA, Kenya, South Africa, Morocco, Mexico, France and India), adopting an approach situated at the crossroads of geography and sociology. This international dimension proves particularly appropriate for a study of 'water regimes' as is consubstantial to their development: beyond the models often identified as "national", from the 19th century onwards, we can identify rationales of transfer involving knowledge, expertise, skills and trained agents, that from the beginning of the 20th century have to be included in the complexity of potential circulations: North-South transfers, as well as South-North and South-South transfers (see infra the Box on 'The international processes of production and circulation of knowledge').

As Franck Poupeau mentioned in the introduction of the workshop, we have to come back here to the basis of the collective perspective that instigated this workshop, and especially the debates around the *uniform and universal model of distribution and treatment of urban potable water*. In order to make this more precise, and to show its specificity in comparison to approaches of 'hydraulic bureaucracies' such as the ones studied by Wittfogel (1957) in his classical work, *Oriental Despotism*, Worster (1985) about the western United States and more recently François Molle in a special issue of *Water Alternatives* (2009) on hydraulic bureaucracies. The main hypothesis of the workshop assumed that *this crisis of the network city (including water, electricity, etc.) is not only the effect of structural problems related to demography, urban growth, environmental limits, governance stalemates, etc., but also the expression of a general transformation of a certain kind of knowledge associated to the implementation of water regimes: a scientific knowledge on nature and the management of natural resources, which is also a practical knowledge of organizing social life; a knowledge produced by professionals, by water bureaucracies involving more or less centralized ways of governing the commons or planning water infrastructures, etc.; a knowledge that is challenged now by its relative maladjustment to new socio-economic structures, but also by a general reorganisation of the social conditions of production of knowledge, amongst which we can mention:*

- The production of big data, and their utilization for the management of urban networks
- The production of open data, which is correlated to exigencies of transparency and participation of the public to the processes of decision making in environmental issues (cf. *Water Alternatives*, 2015)
- The diversification of the producers of knowledge: the latest research programs of the European Union refer to "open science" and data management plans, but we can mention more generally the movement of "citizen science" which is getting more and more involved in participation processes and in environmental management, challenging the monopoly of water bureaucrats on the issues of management issues.
- In terms of reorganization of the production of knowledge, we cannot ignore one of the main effects of generalization of higher education: the fact that water managers are as educated as the scholars that pretend to study water and environmental issues (PhD in engineering, law, etc.), so that the institutional division between academia and stakeholders, promoted in all the research programs since the 1990s, does not make sense anymore.

Before exploring the various dimensions of this transformative knowledge, we should return to the practices to which this knowledge is connected, and to the transformations of the models of water management. To start with, we should emphasise that the analysis of water policies and the forms of competition between these policies, reveal stakes that go far beyond

questions of water and are related to the imposition of legitimate views of economic growth and development, and the promotion of management models. Encouraged by engineers, but not only by them, these visions of the world — which can be challenged, or transformed to last or disappear — are at the heart of the research that was presented in New Delhi. This approach does not underestimate either the materiality of the infrastructures — which also includes bureaucracies and reified engineering knowledge — or the technical, spatial or environmental restrictions that affect the solutions adopted: it posits that sociotechnical systems exist at the crossroads of the territorial and social worlds.

A first series of works looked at the *socio-historical transformations that took place within the “hydrocracies”*, questioning both the position of engineers within them and the shift of the borders between the public and private spheres in water management. Other studies, from a more sociological and/or political science perspective, dealt more specifically with the *processes involved in the production of public policies*, resituating the hydrocracies in a wider space, in which other categories of actors intervene (NGOs, consultancy firms, activist networks, international institutions, private firms). The analysis of the knowledge and types of expertise mobilised, as well as the management instruments implemented, are central to this approach that converges with the spatial issues relating to the implantation of sociotechnical networks. This perspective opens onto the *history of mobilisations*, which no longer focuses so strongly on struggles against water “privatisation” but on the dysfunction of the centralised network model, or the policies of population displacement. This approach reveals the processes over the course of which certain agents belonging to social movements attempt to impose themselves as partners in the process of designing public water policies. Finally, although it was not a focal point of the research presented at the workshop, the analysis of the *international processes of production and circulation of knowledge*, in the sense of disciplines (for example ‘environmental management’), expertise and management tools, was evoked in various communications.

The International Processes of Production and Circulation of Knowledge

Jessica Teisch, in her book *Engineering Nature* (2011), showed how India represented the birthplace of modern hydraulic engineering and served ‘as an international school for civil and hydraulic engineers’. Famous American engineers, who contributed later, by the end of the 19th century, to create the office of state engineers in California, declared that Indian irrigation was superior to any country in the world (Teisch 2011: 28-29): they mentioned Bombay’s Bathgur Reservoir, the Barea Doab Canal at the foot of Himalaya and Punjab, and some legal frames such as the Northern India Canal and Drainage Act. The Indian influence contributed to the elaboration of a water regime built in the United States all along the 20th Century. The Reclamation Act of 1902 institutionalized the intervention of the federal state into the building of water infrastructures in western America. Its objective was to support the economy of small farmers with a scientific vision of a centralized water planning; as many historians and sociologists of the environment have showed (see Donald Worster, Marc Reisner, Robert Gottlieb), the mega-projects were quickly subordinated to the expansion of agro-industry and to urban growth, transforming the West into the breadbasket of eastern America. Anyway, the American engineers had taken advantage of the models of India, and of its limitations, to implement specific socio-technical systems and water regimes different than the European ones, that would support the economic growth of the country, with all its contradictions: water for all, but exploiting the natural resources of the country.

This Indian-Californian dialog is just an example of international circulation of engineering ideas and practices that should be related more precisely to the sociology of the administrative and scientific fields in which they are conceived and where they get their funds, on a national and an international level. Not only because Californian engineers went to Australia and South Africa to develop their model; or because European engineers, French or German especially, went to South America to bring their expertise to cities who wanted to step into “modernity”; but because these examples draw the outlines of a large and complex system of relations, interconnections, exchanges, that cannot be reduced to North-South influences (even if colonial structures cannot be ignored); they have to be apprehended in all their diversity: N-S-N, S-S, N-N, etc. And precisely here, we’ll pay a specific attention to the questions brought into the debate on water management and policy by countries from the ‘Global South’.

This conclusion will develop each of these themes, revealing on the one hand, the contribution of the research presented during the workshop and the discussions that ensued, and on the other hand, identifying elements that need to be more deeply questioned and areas that deserve further research.

The Socio-Historic Transformations of the 'Hydrocracies'

The socio-historic transformations of the 'hydrocracies' were mentioned in a number of communications. Although the socio-historical articulations need to be more closely analysed, they emphasised the continuity between the colonial belief in the social and economic benefits of large scale projects (like dams) or the supremacy of centralised and bureaucratised technical social systems and the development perspectives of the new independent states (Vanessa Caru, Elisabeth Kamini Wamuchiru and Jethron Aymba Akallah; Magalie Bourblanc and Pierre-Louis Mayaux). Several works pointed to the effects of the neoliberal shift and the application of New Public Management (NPM) to the hydrocracies, for example in South Africa, Morocco or Kenya. Nonetheless, and in order to avoid the traps of nominal identity, it would be better to replace this "neoliberal turn" in the historical, economic and political context of the societies studied. The systems that generally serve as vectors for this would also deserve to be better contextualised, that is to say the NPM or even Public private partnerships (PPP). In India, for example, the latter in fact have a long history (Marie-Hélène Zérah). A more precise historical analysis of these institutional systems could allow for highly pertinent comparisons, particularly with the French context (Bezes, 2009, Deffontaines, 2012, Mazouz, 2009), or even help put the genesis and evolution of a given system into perspective in the national context in which it was developed, and in the global history of normative legal frameworks in which international exchanges went on to take place.

While questions of 'the Retreat of the State' (Strange, 2011), and the withdrawal of its engineers, the increasing porosity of the frontiers between the public and private sphere, and the instability of work conditions, with the increasing use of consultancy firms, have been looked at innumerable times, it seems obvious that it is impossible to sketch a linear history of neoliberalism that inexorably leads to the State engineers' global loss of control over water policy. Firstly because, although since 1980-1990, middle or lower level engineers see some of their prerogatives questioned (Bérénice Girard) and a decrease in their salaries along with their working conditions (Magalie Bourblanc), the neoliberal regime tends, in an apparently paradoxical manner, towards a concentration of power over the State in the hands of 'State Elites' (Henry et Pierru, 2012). The coexistence of decentralised and privatised elements, accompanied by a reinforcement of bureaucratic power in the hands of the State elite, is confirmed in China, South Africa and Mexico (Amaël Marchand). Now, the composition of these State elites varies depending on the national context and has yet to be characterised in a sociological manner: while in France we note a reinforcement of so called central ministries, like the Finance Ministry, what is the situation in the other regions studied? In particular, what is the proportion of State engineers that belongs to this Elite at the highest echelons of the State? And what transformations are taking place in engineering schools, which traditionally trained the State's technical elites, to respond to the new constraints created by public management and career opportunities outside state employment (in France for those trained at the Ponts et Chaussées, Gervais, 2007)?

In addition, as the analysis of water policies in South Africa shows, the State's growing dependence on consultancy firms is not only the result of 'State withdrawal' or the relatively recent application of the NPM principles that favour a rationalisation of public expenditure and a fragmentation of services. It is also one of the effects of a far older decolonisation process. In the case studied, the reservation policies contributed to a shortage of qualified engineers working for the State and the rise of private engineering firms. Here too, it would be worth carrying out a diachronic analysis of the social trajectories of the agents who populate these private consultancy firms. For example, how many former State engineers shifted to these consultancy firms? And what do these consultancy firms do to the State, particularly in the area of water policy?

Water Policies, Governance and Engineering Skills

In order to situate the different developments of the hydrocracies in the wider context of the field of power requires adopting solid theoretical frameworks suitable for the objectives of international comparison. The discussions revealed the contribution that the sociology of professions can make, questioning, for example, the dynamics of the borders between professional groups (Audrey Richard-Ferroudji), and also revealed the contribution made by analyses of field, space or network. All these approaches provide adequate tools that enable the construction of structured spaces that can be relocated within the field of power that the various private and public actors involved, who belong in water management, to varying degrees.

Thus, the long term analysis (from the end of the 19th century to date) of water policies that marked the West of the United States (Brian O'Neill et al.) questions the decline of the engineers' power that began in the 1960's, that is to say 'their power to head coalitions that allowed them to control water policy and impose their scientific vision of the world'. This type of issue immediately places the engineers connected to State bureaucracies within social groups open to other types of power: that of the jurists, the leaders in the economic field and the politicians. Hence, the object here is less the transformation of the engineer group in charge of water, than that of the coalitions active in the area of water policy or more precisely, that of the power relationship established within these coalitions.

The question of the decline of the power enjoyed by the engineers to the benefit of other professionals, nonetheless remains open, as what we see here is less the decline of a social group taken as a whole, than the re-composition of the modes of elaboration of water policies and the implantation of socio-technical systems. These are accompanied by the questioning of a corpus of knowledge: traditional engineering, as it developed with the army corps, the technocratic, scientific and authoritarian vision of the early 20th century engineers, and their disinterest in any considerations of a political nature (particularly local politics), as if the scientific vision was a given in itself. The new forms of expertise that tend to compete with the vision of the world propagated by the first generation of engineers, borrows from other traditions of knowledge: not only hydrology and geology, but also law, as it is necessary to resolve conflicts between interdependent states, environmental and or ecological knowledge, economics and 'business administration' (management).

Does this imply that the engineers in charge of water policy in the United States did not take part in promoting these renewed forms of knowledge? Did they follow a process different to what we find in France, where the profession of consultant engineer was developed precisely at the intersection of law and industrial science (in order to avoid any kind of judicialisation) and was managerial knowledge was appropriated by engineers reputed for their work in geology or chemistry (Henry, 2012)? We must hence go on to analyse more closely the contribution made by engineers to these new types of knowledge, 'State environmentalism' for example, which seems to be occupying an increasingly dominant position everywhere, in order to study the genealogy of these areas of knowledge and to relativize what is seen as their complete novelty (Karen Coelho).

In other communications, we see the difficulty of defining what the 'core of knowledge' (and identity) would be for an engineer, or more precisely, the difficulty of doing away with an historical vision of the engineer, which consequently remains marked by essentialism. For example, if the analysis of the trajectory of the engineer responsible for the policy of large dams in Maharashtra clearly underscores the assets that were required for him to be able to occupy such an efficient position with the field, it has difficulty reconciling the scattered visions of the knowledge employed (Joël Cabalion). On the one hand, the engineer is supposed to promote a 'physical' or topographical view of social realities, which are then considered mere supports for infrastructure projects; and on the other hand the engineer is presented as an expert on rehabilitation and rehousing, he has a knowledge of anthropology (pays attention to the distinction between the cooperative logic of mutual support and the capitalist logic of the project), he is an intermediary (broker) between the interests of the World Bank and those of the activists, and pits national interest against the interests of foreign powers in order to create the conditions for large projects to be accepted.

As François Vatin (2008), clearly showed, the knowledge engineers possess — in this case, engineers from the Ponts et Chaussées who had dominated the profession in France for over a century — was from the outset composite, and has constantly oscillated between industrial science and economics, constantly encouraging the conceptual import/export interplay between the two disciplines. *In fine*, François Vatin defines the spirit of an engineer as a mode of construction of knowledge marked by a concern with measure, formalisation and calculations and by a pragmatism that focuses on the capacity to direct action rather than formal consistency. We could complete this definition by underscoring the very high propensity engineers have to equate values, that are sometimes incommensurable, and to put forward optimum productive levels based on yield maximisation (on this point see Laurent Beduneau-Wang's communication on the rise of performance evaluation models based on the production of indicators). And it is precisely in the name of this 'rational spirit' that many engineers have progressively colonised areas of expertise, such as sociology (social engineering), management and accounting, financial analysis and strategy, and have fought over these areas occupied by other professional categories, who belong to different traditions of thought and training backgrounds. Thus, rather than treating the engineer group and their knowledge or their spirit as a monolith, maybe we should see them as contortionists, who possess a range of skills, redefined by this spirit, that allows them to play at political, scientific and practical opportunism.

Activists and NGOs: The Sociology of Actors Involved in Public Action

Several presentations emphasised the 'field of production of public water policies' (Bourdieu 2000), a concept preferred to that of 'water community' that tends to erase the divisions and conflicts that exist within this space (Roland Lardinois, Magalie Bourblanc). The object of these works integrated different categories of agents (activists, NGO, academics, associations, international organisations, etc.) currently or previously involved in social struggles around water. These new actors actively criticise bureaucratic power and fight to occupy positions within the coalitions responsible for developing public water policy in Mexico (Amaël Marchand). By doing this, they contribute to standardising the different forms of political contestation with the frameworks of bureaucratic logic, sometimes going as far as imposing these frameworks in zones where they had been ignored so far.

In India, popular uprisings related to water have long been embedded in the history of social and farmers' struggles and they became autonomous long after the policy of constructing large dams, with protest movements against population displacement (Joël Cabalion). As is true of the activists involved in public water policy in Mexico, everything leads us to believe that in India, the engineers who plan large projects and activists fighting against the effects of these projects, share a number of categories of thought as we can infer from the fact that the activists rarely question the policy of economic development itself.

While other communications also mention the growing weight of representatives from 'civil society' in the pilot committees of large projects (Bérénice Girard), it would seem that we still need to look in depth at these categories of activists or politicians ('activists', "NGOs" for example), that assemble widely socially heterogeneous groups under the same label. These political mobilisations that should be studied more precisely, taking into account the national and historical context - for example in India the manner in which these movements inherit very old conflicts related to the structural history of the largely (Ambedkarist and Marxist) 'left' wing political forces - are, it would seem, an inherent part of a common research object that could be reformulated around the field of production of public policies. How are these mobilisations and protests remodelled, not only due to the effects of forces of globalisation combined with the increased weight of international institutions, but also given the on-going transformations within the field of public action?

Towards an Analysis of the Processes of International Circulation of Knowledge and Management Tools?

The analysis of the circulation of knowledge in the wide sense was not the object of any specific communication, but is presented in a number of papers. It is certainly Sachin Warghade's work that focuses the most closely on this issue. Nonetheless, as Karen Coelho underscores, the perspective this study adopts is that of an evaluation of the effects of 'transplanting a model designed in the North' (Independent Regulatory Agency, IRA) to the South, and it concludes that it is a failure. It seems that the viewpoint could be different, not only less normative, but also more concerned with describing and analysing what these transnational institutions that produce models actually are (their structure, genesis, evolutions, internal power balances etc.). Thus several studies mentioned that certain key actors belong to the International Commission on Large Dams, ICOLD, but this institution was not the object of further investigation (Joël Cabalion, Magalie Bourblanc), while it could, in itself constitute a truly transnational object of research. In the same manner, a number of paradigms and programmes mentioned in the communications still need to be studied in detail, going beyond the acronyms, to look at the genesis and the usages that vary according to the national contexts (for example Integrated Water Resources Management, IWRM, or even the 'Zero Liquid Discharge', ZLD). Lastly, although it has already been mentioned above, it would certainly be useful in future projects to leave more room for approaches oriented towards the sociology of law and an analysis of international legal tools: how has the Right to Water, adopted in the constitutions of several countries (Kenya in 2010, or Mexico in 2011, South Africa and derived from other types of rights in India, for example) played a role in a profound redefinition of public policy?

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