Overcoming Institutional and Organisational Barriers to Sanitation: What's New?

March 2022
No. 68

Lessons from the 4th scientific meeting of the AgroParisTech - SUEZ Chair "Water for All - General management of water and sanitation services"

Technical Reports

Editors Marine Colon, Thierry Rieu
Coordination Sarah Botton, Alexandre Gaudry

AFD éditions
AGENCE FRANÇAISE DE DÉVELOPPEMENT

Editors: Marine Colon, Thierry Rieu

Coordination: Sarah Botton, Alexandre Gaudry

Authors: Pierre Bauby, Laurent Bibard, Christian Binz, Marine Colon, Olivier Crespi-Reghizzi, Shubhagato Dasgupta, Sam Drabble, Amal Ennabih, Lætitia Guérin-Schneider, Miriam Hacker, Adil Hasnaoui, Christophe Le-Jallé, Gilles Kleitz, Xavier Litrico, Pierre-Louis Mayaux, Claude Ménard, Dennis Mwanza, Milena Poncin, Marion Santi, Sophie Schramm, Bernhard Truffer, Gilles Trystram, Heloise Valette.

This technical report is based on the proceedings of the 4th scientific workshop of the AgroParisTech - SUEZ Chair "Water for All - General management of water and sanitation services" organised the 6th and 7th of May 2021 (remote sessions). This event was organised by AgroParisTech/JRU G-EAU with the support of AFD.

With the participation of 8 sanitation managers graduated from the International Executive Master "Water for All" – OpT at d'AgroParisTech in 2020: Polpitiya Acharige Samira ANURADHA (Colombo City, Sri Lanka), Zohaib BUTT (WSA, Pakistan), Mohamed Mansour DIA (ministère de l'Hydraulique et de l'Assainissement, Mauritanie), Dany DOURNG (Ministère des Travaux Publics et du Transport, Cambodge), Blaise FAYE (ONAS, Sénégal), Mahmoud MEHANY (HCWW, Egypte), François NAHIMANA (SETEMU, Burundi), Dominique OGA (BNETD, Côte d'Ivoire).

In partnership with:

For more details:
https://waterforall.utilities.management/action_apt/overcoming-institutional-organizational-barriers-sanitation/

Agence française de développement

Rapports techniques

Les nombreux rapports, études de faisabilités, analyses de cas et enquêtes de terrain produits par l'AFD contiennent des informations très utiles, en particulier pour les praticiens du développement. L'objectif de cette série est de partager des informations techniques, géographiques et sectorielles sur une dimension du développement et d'en faire un retour d'expérience.

Les opinions exprimées dans ce papier sont celles de son (ses) auteur(s) et ne reflètent pas nécessairement celles de l'AFD. Ce document est publié sous l'entière responsabilité de son (ses) auteur(s) ou des institutions partenaires.

AFD Technical reports

The various reports produced by AFD (feasibility, case studies and field surveys) contain very useful informations, especially for development practitioners. This series aims to provide technical, geographic and sectoral informations on development issues and to share experiences.

The opinions expressed in this paper are those of the author(s) and do not necessarily reflect the position of AFD. It is therefore published under the sole responsibility of its author(s) or its partner institutions.

Overcoming Institutional and Organisational Barriers to Sanitation: What's New?

Lessons from the 4th scientific meeting of the AgroParisTech - SUEZ Chair "Water for All - General management of water and sanitation services"

Editors

COLON Marine
AgroParisTech, UMR G-EAU

RIEU Thierry
UMR G-EAU

Coordination

BOTTON Sarah (AFD) and GAUDRY Alexandre (AFD)

Résumé

Ce rapport technique porte sur la manière de surmonter les barrières institutionnelles et organisationnelles au développement de l'assainissement. Il rassemble des communications de chercheurs et opérationnels sur des travaux qui apportent un regard nouveau sur cette question. Un consensus se dégage sur la reconnaissance de la multiplicité des modes de production du service de l'assainissement, tantôt collectif, autonome ou non conventionnel, qui accroit la complexité de sa gestion. L'enjeu est bien de construire un service public de l'assainissement intégrant cette diversité d'infrastructures et d'acteurs. Agences dédiées ou opérateur multi-service ? Organisation locale ou nationale ? La question des échelles d'organisation, de gestion avec les enjeux de coordination associés illustre l'un des nombreux débats abordés. Une approche conceptuelle fondée sur des études de trajectoires de régimes sociotechniques est proposée pour identifier les verrous à lever pour l'action. Ces trajectoires de changement qui portent sur les règles, croyances, représentations et structures organisationnelles reposent sur des processus incrémentaux qu'il est urgent d'engager pour faire face aux enjeux contemporains.

Mots-clés

sciences sociales, assainissement, changement institutionnel, organisation, régime sociotechnique.

Géographies

multi-pays, Afrique

Abstract

This technical report focuses on how to overcome institutional and organisational barriers to the development of sanitation. It compiles communications from researchers and operational staff on work that sheds new light on the issue. A consensus emerges on the recognition of the multiplicity of production modes of the sanitation service, sometimes collective, individual or unconventional, which increases the complexity of its management. The challenge is to build a public sanitation service integrating this diversity of infrastructures and stakeholders. Special agencies or multi-service operator? Local or national organisation? The question of organisational and management scales with the associated coordination issues illustrates one of the many debates discussed. A conceptual approach based on studies of the pathways of socio-technical systems is proposed to identify the obstacles to be lifted for action to be taken. These pathways of change, which relate to rules, beliefs, representations and organisational structures, are based on incremental processes that urgently need to be initiated in order to face contemporary challenges.

Keywords

social sciences, sanitation, institutional change, organisation, sociotechnical regime.

Areas

multi-country, Africa

Executive summary

Sanitation remains one of the great challenges of our time, especially in cities in Africa and Asia which are experiencing sustained population growth. According to the United Nations, in 2020, 53% of the world population did not have access to a sanitation service, collective or individual, while 26% did not have a supply of drinking water managed in a safe way, (WHO-UNICEF JMP, 2021). The result is that despite the progress made, the challenge remains immense, especially in urban areas where the rate of the world population without a sanitation service reaches 62%. Lack of sanitation seriously harms public health, the environment and development. Sanitation comprises a chain of activities ranging from private hygiene practices to the collection, treatment and disposal of waste, through infrastructure with or without a collective network. For the first time in 2015, the United Nations set a specific sanitation target with the 6th sustainable development goal "Guarantee universal access to water and sanitation and ensure sustainable management of resources in water". According to Goal 6.2, all countries should, by 2030, ensure access to adequate and equitable hygiene and sanitation for all and end open defecation, paying particular attention to the safety and needs of women, girls and people in vulnerable situations (UN, 2015). Sanitation is a particularly complex subject, because it involves a wide range of stakeholders, a diversity of technologies, develops in public and private spaces, and relies on individual and collective behaviour patterns based on intimate practices that are taboo and relatively inflexible.

Since 2016, AgroParisTech has been facilitating a space for dialogue between researchers and managers on this subject through a partnership chair with SUEZ and supported by the AFD entitled "Water for All". The Scientific Council of the Chair unanimously decided to initiate research work on this theme. Through its training and research activities, the Chair trains water and sanitation managers to transform their service. The 3rd scientific meeting (2016) focused on the challenges of sanitation. It concluded that the barriers to sanitation are primarily institutional and organisational. This new concern is shared by many stakeholders, researchers and operational managers. In these approaches, the term "institutions" refers both to rules (legal rules, rights, norms, standards, but also to representations, customs, traditions and beliefs) and to bodies that convey it, whether at the macro (legislative and regulatory framework), meso (translators of rules and regulations) and micro (services in particular) levels. Organisation refers to the means of providing the service. In this perspective, the 4th scientific meeting which took place on 6th and 7th of May 2021 sought to create the opportunity to present and discuss research work and operational experiences aiming at either better understanding and identifying the institutional and organisational obstacles, or to designing ways of overcoming them. This document compiles the papers presented and reflects the wealth of discussions held during the session.

This document is divided into seven parts. It opens with Bernhard TRUFFER's proposal to consider sanitation as a socio-technical system called a "regime", the development of which must be analysed over the long term. This outlook draws on studies on transitions which attempt to understand the conditions for deploying technological innovation in a sector for development against a background of climate change. With regard to sanitation, recognition of the limits of the conventional approach by the centralised network prompts questions about the dissemination of alternative modes of providing the service. Institutional and organisational issues thus become parameters of the socio-technical system. As a result, the development of sanitation is based not only on appropriate technological innovation but also on a set of institutional and organisational parameters which must be consistent. This proposal is discussed by Claude MENARD.

Secondly, two papers confront the issue of building a public sanitation service against this background of the coexistence of diverse service production modes. Pierre BAUBY reports on the experience of the European Union in the process of developing a common definition of the concept of service of general interest. Applied to sanitation, he highlights the points of divergence but also the common points of a cultural and institutional nature in understanding the notion of public sanitation service. This point is crucial so that sanitation is no longer considered solely as a private problem which exempts the public authorities from intervention. In addition, Christophe LE JALLE presents, through the example of Dakar, the way in which we can think of the different modes of production of the service adapted to a given region. Between the centralised network and individual wastewater treatment, he illustrates an intermediate approach with mini sewers tested in Dakar. These were set up in neighbourhoods where the ground is impermeable, and the streets are too narrow to install a collective network. He insists on the need to involve a wide variety of stakeholders, and to set up technical and financial monitoring mechanisms to control the correlation between the objectives pursued and implementation in the field. These proposals are then discussed by Lætitia GUERIN-SCHNEIDER.

The third part focuses on the interest of including the analysis of sanitation in the long term to better

identify the obstacles to change. Two case studies present how cities in the South today view the regime based on an all-network model. Sophie SCHRAMM has developed an in-depth historical knowledge of the sanitation development of Hanoi in Vietnam since the colonial era. It is based on the emergence of a multiplicity of public and private stakeholders, technological solutions and modes of governance, in other words, a coexistence of heterogeneous interdependent socio-technical regimes. This heterogeneity, which creates a high level of complexity, has its origins in the history of urban planning, and the diversity of power issues. Failure to take this multiplicity into institutional account is the first obstacle to be lifted for the development of sanitation in the city. Then, Shubhagato DASGUPTA presents the Indian case where a deep institutional change is under way. Since 2014, with the "Swachh Bharat mission", the Indian government has launched an unprecedented movement in favour of the development of sanitation throughout the country. He shows the way in which this movement is taking shape and is contributing to the emergence of a variety of institutional models breaking with the conventional model of the "whole network" model inherited from the colonial era. The question of the treatment of waste in rural areas emerges as a new challenge to be taken up and as an institutional innovation that has yet to be designed. The two case studies are discussed by Pierre-Louis MAYAUX. This third part ends with a reaction from Dennis MWANZA, an expert in the sector, to the papers developed in parts 2 and 3.

The fourth part examines the role of research in addressing the issue of institutional change. The latter is defined as the changes in rules, representations and beliefs associated with modes of production of the sanitation service. Christian BINZ and Miriam HACKER present the results of work on cases of overcoming institutional barriers through the deployment of innovative solutions leading to the in-situ reuse of wastewater. The socio-technical sanitation regimes in San Francisco and Beijing are characterized on the basis of an analysis grid comprising six institutional and economic parameters: the regulatory and legislative framework, market and industry structures, financial arrangements, control of technological knowledge, legitimacy and equity. They highlight the institutional complexity to be overcome in order to setting up innovative technical solutions on a large scale. Institutional change is slow and gradual in a sector such as sanitation. While Christian BINZ and Miriam HACKER highlight the interest of developing analytical frameworks designed to help stakeholders better identify institutional and organisational obstacles, Sam DRABBLE prefers to highlight the work of supporting sanitation stakeholders by researchers. WSUP brings together researchers who support sanitation stakeholders in six African and Asian countries. Action research is therefore a means of catalysing change. Through a review of the literature on institutional change and three case studies, he concludes that institutional change is slow and that it must be led by a legitimate change agent. It can only be achieved in a context where the responsibilities of the stakeholders are clear, where monitoring procedures are planned and where the resources are sufficient. The discussion is led by Claude MENARD.

Two contrasting cases of institutional innovation are then presented: (i) A social marketing approach to develop access to toilets in Madagascar, at a local scale and under the impetus of an NGO, GRET, by Marion SANTI and Milena PONCIN and (ii) an innovation in the financing process of a national sanitation programme in Morocco supported by the Moroccan government and the AFD, by Adil HASNAOUI and Olivier CRESPI-REGHIZZI. (i) Social marketing relies on the creation of a latrine market involving local private operators, adapting as closely as possible to the populations needs and by deploying awareness-raising actions. In ten years, 17 local entrepreneurs have been trained and have provided 10,000 sanitary toilets in urban or rural areas. In the Moroccan case (ii), the innovation lies in the simplification of the financial management of a European multi-donor programme (KfW, EU, AFD, BEI) dedicated to the deployment of the sanitation infrastructure. In practical terms, a one-stop-shop is set up in order to improving efficiency in project management, for example, with reduced procedural times and greater flexibility in the use of funds. These contrasting situations are discussed by Marie-Hélène ZERAH.

This session ends with an astonishment report by Laurent BIBARD who brings a philosopher's perspective as co-director of the Edgar Morin Chair of Complexity, at ESSEC. Discovering the sanitation sector through these presentations three key words come to mind: separation, collaboration and local. Indeed, the great diversity of situations, points of view, experiences, expertise, constantly separates the stakeholders on a daily basis. Thus, the role of the change agents is to recreate the link that daily life constantly breaks, in order to maintain a global vision. We can also consider that it is an objective of these two days. It seems essential to achieve a common critical scrutiny to the problems that bind us, such as that of sanitation, which are of general interest. It is urgent not to let ourselves be distracted by everyday life in order not to lose sight of the essential issues. The link with the local situation and the field is essential to initiate the dynamic of a common critical scrutiny and to communicate. Engaging in this change process must be done by relying on the skills and

organisational identities present which need to be better recognized and valued.

The sixth stage is followed by the presentation of the work of young researchers. Amal ENNABIH presents the main results of her PhD work in which she compares public policies for the reuse of treated wastewater (REUSE) in Morocco and Tunisia. While in Morocco, this public policy is still under construction, it is institutionalised in Tunisia where REUSE has been given a legal framework and has been implemented since the 1970s. Based on surveys conducted on irrigated schemes in the two countries, Amal ENNABIH explores the following question: how does the policy of irrigation by treated wastewater reshape social relations and power relations within state institutions on the one hand, and between state institutions and farmers on the other? She highlights three main results. First, REUSE requires coordination between two very distinct forms of hydraulic expertise: that of sanitation on the one hand and that of agricultural irrigation on the other. This situation is an obstacle to the construction of a broader governance framework. Furthermore, the practice of irrigation from REUSE has helped the professionalization of farmers. They are better able to negotiate with the State and to circulate their know-how. Finally, REUSE would seem to call for a greater commitment by the State in a situation from which, on the contrary, it tends to be withdrawn. Héloïse VALETTE continues with the presentation of a literature review conducted as part of her post-PhD work within the Chair "Water for All" at AgroParisTech under the guidance of Marine COLON. The aim was to report on the advances made in social sciences applied to institutional change for the development of sanitation. While the benefits of sanitation are well known, how can we explain the obstacles to its development? Analysis of 70 articles identified six lessons learned from this research. They relate to the conditions for change, the dissemination of innovations, their sustainability, the scaling up of these innovations, focusing on the question of the legitimacy of the stakeholders but also the acceptability of the solutions proposed both from the point of view of the beneficiaries and that of professionals in the sector. These lessons converge with other work presented in this report. They are discussed by Sarah BOTTON.

This report ends with the stance and perspectives by the three partners of the 4th scientific meeting of the Chair "Water for All" on the event on which this report is based. Xavier LITRICO explains SUEZ's point of view. He insists on the interest of research and working in partnership to move towards innovations, slowly but surely and together, for the improvement of sanitation. Gilles KLEITZ underlines the AFD's interest in the questions raised during the scientific meeting: the importance of considering sanitation as a subject in itself, and of not neglecting on-site wastewater treatment, of focusing on institutional issues and of finding "simple, robust and low-cost" solutions. With regard to AgroParisTech point of view, Gilles TRYSTRAM recalls the importance of identifying research issues to be explored in the short term on this so essential issue, in order to contribute to the development of training for managers who will have to deal with the issue of sanitation. This space for dialogue between researchers and operational staff offers major opportunities for creating links and opening up new perspectives.

Introduction

Sanitation remains one of the great challenges of our time, especially in cities in Africa and Asia which are experiencing sustained population growth. According to the United Nations, in 2020, 53% of the world population did not have access to a collective or individual wastewater treatment service, while 26% did not have a supply of drinking water managed safely, (WHO-UNICEF JMP, 2021). The result is that despite the progress made, the challenge remains immense, especially in urban areas where the rate of the world population without a sanitation service reaches 62%. Lack of sanitation seriously harms public health, the environment and development. Sanitation comprises a chain of activities ranging from private hygiene practices to the collection, treatment and disposal of waste, through infrastructure with or without a collective network. For the first time in 2015, the United Nations set a specific sanitation target with the 6th sustainable development goal "Guarantee universal access to water and sanitation and ensure sustainable management of resources in water". According to Goal 6.2, all countries should, by 2030, ensure access to adequate and equitable hygiene and sanitation for all and end open defecation, paying particular attention to the safety and needs of women, girls and people in vulnerable situations" (UN, 2015). Sanitation is a particularly complex subject, because it involves a wide range of stakeholders, a diversity of technologies, develops in public and private spaces, and is based on individual and collective behaviour patterns based on intimate practices that are taboo and relatively inflexible.

Since 2016, AgroParisTech has been facilitating a place for dialogue between researchers and operational staff on this subject through a partnership chair with SUEZ and supported by the AFD entitled "Water for All". The Scientific Council of the Chair unanimously decided to initiate research work on this theme. Through its training and research activities, the Chair trains water and sanitation managers to transform their service. The 3rd scientific meeting (2016) focused on the challenges of sanitation. It concluded that the barriers to sanitation are primarily institutional and organisational. This new concern is shared by many stakeholders, researchers and operational staff. In these approaches, the term "institutions" refers both to the rules (legal rules, rights, norms, standards, but also representations, customs, traditions and beliefs) and to the bodies that convey them, whether at the macro level (legislative and regulatory framework), meso (translators of rules and regulations) and micro (services in particular). Organisation refers to the means of providing the service. In this perspective, the 4th scientific meeting which took place on 6 and 7 May 2021 sought to create the opportunity to present and discuss research work and operational experiences designed on the one hand to better understand and identify the institutional and organisational obstacles, and on the other hand to design ways of overcoming them. This document compiles the papers presented and reflects the wealth of discussions held during the sessions.

The document is divided into seven parts. It opens with a new conceptual perspective of conceiving sanitation, as a socio-technical system called a regime whose development must be analysed over the long term. Secondly, two papers confront the issue of building a public sanitation service against this background of the coexistence of diverse service production modes. The third part deals with the work which shows the interest of taking into account the long term to identify the obstacles to change. The fourth part of the report examines the place of research in addressing the issue of institutional change, that is to say changes concerning the rules, representations and beliefs associated with modes of production of the sanitation service. Fifth, two cases of institutional innovation are presented, one carried at the local level by an NGO and the other at the national level by the Moroccan State and European backers. The sixth phase is followed by the presentation of the work of young researchers:

(i) PhD work on a comparative analysis of Moroccan and Tunisian public policies for the reuse of treated wastewater (REUSE) and (ii) on a social studies literature review on institutional change for the development of sanitation. This report ends with the stance and perspectives by the three partners (AgroParisTech, Suez and the AFD) of the 4th scientific meeting of the Chair “Water for All”.

1. A socio-technical framework for analysing the institutional and organisational barriers to sanitation

1.1. New perspectives on sustainable sanitation. Insights from socio-technical innovation and transition studies - Bernhard TRUFFER

The social-technical innovation and sustainability transitions field opens new perspectives on sustainable sanitation. The core topic of this interdisciplinary research is about how large economic sectors like energy, electricity, transport or urban water change sometimes very fundamentally, and how this transformation will impact the sustainability of services. This section presents main concepts and pathways in five steps. It starts with an historical example of socio-technical transitions and the definition of some key concepts; second, it analyses how significant this approach is for urban water; third, it tackles the issue of the pace of transition; fourth, it focuses on specific challenges of transition in the Global South; and finally, it re-claims some benefits from socio-technical perspectives.

1.1.1. An historical example of socio-technical transitions: emergence of automobile cars

The transport field provides with an example of sociotechnical transition when it moved from horse carriages to automobile cars. Along with horse carriages were a value chain with breeders, blacksmiths, carriage constructors etc. and a set of specific rules and capabilities. The automobile came at the beginning of the 20th century in a context of rapid urbanisation. Alternatives options started being offered, that were horse carriage without horses: vapour-propelled vehicles, internal combustion engine, and electric vehicles (rare). At the beginning these alternatives were too costly, dysfunctional and in conflict with horse carriage and pedestrians. At that time, nobody would have imaged that they would one day become the dominant transport service. Then a model, the internal combustion engine, became the dominant design along with the associated value chain, with a significant disruption in the subsequent designs. Currently, variations in design of compact cars are very tiny in comparison. This is an example of a socio technical transition. Technical innovations do not diffuse or become dominant solely due to their technical superiority, but because they coevolve with a new institutional conditions and development challenges. And it also works the other way around, it is not that rules and incentives determine which technological solutions will emerge. Thus, institutional structures and technologies have to co-evolve over time so as to reach stable socio-technical configurations.

Once such configuration is reached, socio-technical systems are extremely resilient to external disturbances. Consequently, their basic configuration remains stable and may go through sudden disruptions once every few decades, so that their development may be considered as rather incremental. That is what is also called punctuated equilibrium.

The transition community of researchers aims to explain disruptions and transformations of socio-technical regimes. B. TRUFFER presents a model of sociotechnical transitions as a three level interacting processes. Socio-technical regimes designate the dominating combination of technology, infrastructure, culture and symbolic meanings, industrial networks, value chains, knowledge, policies, markets and user practices that may dominate a certain sector over long time spans. Once established, each item will relate to each other way, so that it is difficult to change one element without changing all the others.

Two external factors may influence the evolution of socio-technical regimes: landscape developments on one side, and technological niches on the other. For instance, rapid urbanisation led to more people having to use transports, which produced externalities in big cities such as huge amounts of horse manure to handle on the streets. In addition, technologies alternatives to horse

carriage started developing, and, with time, contributed to shaping new reconfigurations of the regime towards the automobile regime. Such changes unfold over long periods of time (century). Researchers have conducted such analysis in various fields (electricity, food etc).

1.1.2. Socio technical transition in urban water

Regarding urban water, the dominant sociotechnical regime has been for the past 100 years centralised treatment and long-distance transport. This regime made our cities liveable. It keeps evolving, but incrementally only. In countries like Switzerland, Austria, the UK or the Netherlands, above 95% of households are connected to centralised treatment systems. Transitions need to occur because of external factors (climate change, new pollutants etc) and because, in many countries, this regime has not diffused. A large part of the world population has not access to a centralised network and this is revolting. Alternatives have emerged for the past 20 years (recycling showers, waterless washing machines, stand-alone toilets), that do not require a sewer system anymore and gain space (Larsen et al, 2016). Sewers represent 80% of the total cost of sanitation system. Therefore, niche technologies have a disruptive potential. We are, maybe, at the beginning of a transition.

1.1.3. How quickly could a transition happen?

However, some urban water experts doubt this may happen soon because current investments are meant to last for the next 35 up to 100 years. So as to assess how quickly the transition could be, B. TRUFFER and colleagues have tried to assess the cost of transition. He presents the results of this study summarized on a chart (Eggimann et al, 2016). The cost per capita per year of a central sewer system varying according to the connection rate is as follows: it is maximum for 0 connection and decreases up to around 65% connection rate, from where it then increases due to expansion of sewers up to 100% connections. Regarding decentralized systems, costs vary in a very different way. A minimum density of decentralised systems is required so that the maintenance and repair service are cost effective. Mixing both curves suggest that there would be an optimum degree of centralisation or decentralisation. However, more detailed studies conducted in local regions of Switzerland suggest that the optimum is very sensitive to the cost of decentralised technologies. In countries where decentralised options have diffused widely, it makes sense to connect up to 20 / 25% of the population. This poses a problem to utilities who have invested recently for 100 years. This has been observed in the electricity or automobile sector recently, when leaders of these sectors had underestimated the pace of development of alternatives such as solar panels and electric cars.

1.1.4. Challenges of transitions in the Global South

What about transition in the Global South? In slums like the ones in Nairobi, Kenya, the situation is much more complex. Expectations from the population are for flush toilets. There is like in the post-Haussman Paris public toilets and innovation niches. So how can we make sense out of that, and answer the question about sustainability transitions?

Van Welie and colleagues (2018) conducted a study in the city of Nairobi and found out there is 5 different regimes. (i) One is the global standard that exists in large parts of the city, with a city utility in charge with a very high level of capability and competence. There are also (ii) shared ownership sanitation regimes, particularly on a plot of a few households, where it's more like pit latrines or septic tanks, where the organisation and maintenance are done by landlords or the households themselves. (iii) Then there is the "coping" regime, with open defecation and "flying toilets" where people resort to using plastic bags. (iv) Then we have a number of mostly international donor-driven initiatives that try to bring in some novel configurations, on how to deal with the sanitation problem. These regimes coexist, with no relationships between them and even conflicting.

Should we go towards a monolithic regime, which is the sort of standard in Zurich, Paris, New York, or would it not be better to try to drive towards a polycentric regime, including these different services (not all of them)? Open defecation, for instance, should probably not be stably established in a modernised form. However, seeking for complementary regimes could be a way forward. For instance,

in the transport regimes, besides automobile and public transports services, cycling regime has become in some places well-established and offer services in a reliable way with multiple alternative ones.

What would be a way forward to set up a polycentric regime? This implies identifying main agents as driving forces, barriers and steppingstones. Van Welie and colleagues (2018, 2019a, 2019b) identified the utility, as obviously one of the most important entities in the city.

- Social enterprises, related to the donor-funded initiatives, setting up new technologies,
- NGOs,
- community-based organisations,
- Small-scale private operators,
- Landlords of the home plot systems,
- And last but not least, the households that have an active share in these offerings.

Not all of the actors are competent on the whole range, but rather they are specialised for certain regime structures. Not only the technology differs according to the type of regime, but also the institutional context, users' aspirations and the finance models. How far could the utility become a sort of key agent in driving the system toward a more polycentric structure?

In one paper, van Welie and colleague (2019a) looked at the reasons why the utility of Nairobi has been rather challenged, if not to say unable to put up reliable and profitable services in informal settlements. The challenge was to understand the rules, regulations, aspirations and visions that exist in the public toilet regime. The utility's strategy had difficulties to align their new services with the paying abilities and maintenance procedures to the contexts of the informal settlement. They hired a new department mainly run by sociologists trying to build up more locally adapted services, but then these business models didn't tally with the organizational procedures and bookkeeping standards. As a reaction, they tried to introduce solutions more in line with their own rationalities, but they were not compatible with the everyday practices and abilities of informal settlement households, which led to refusal of the new services or even active vandalism. So, the socio-technical perspective proved to be very valid to explain where the problems are and perhaps where the solutions would be.

A second paper was about different competing social enterprises engaged in the building of new container-based regimes (van Welie et al, 2019b), and why they were successful in some settlements, such as Kibera, and failed in others such as Mathare. This was mostly also due to not understanding the institutional structure and being convinced that a fantastic technology could have just convinced people to adopt it.

A third paper was more about looking into the households (Cherunya et al, 2020). It was a case study about a container-based solution that was introduced. The promoters made a proper marketing campaign before, they did surveys among the residents, and they were enthusiastic, because they got very strong positive feedback. But then, two-three months after distribution, most of the people discontinued because it didn't really work in their everyday practices, and the rules and the cultures that prevailed.

1.1.5. Insights from a sustainability transitions perspective

The conclusion elaborated the benefits of the socio-technical perspective, focusing on the interdependencies of technologies and institutions, and to be very aware of how they co-determine each other to bring them to success. Thus, the socio-technical system is the core concept that came forward.

The centralised system might not be the gold standard anymore in the future, because things might change rapidly, and so if a lot of effort goes into achieving a centralized solution at all costs, one might end up with a lot of stranded investments and achieving improvements for the informal settlement

households will take a long time. So, it seems better to prepare for a higher-quality polycentric regime structures. Our approach is to provide with some insight into that. Coming back to how quickly this may happen. Of course, transition processes take a long time. They can even stretch over two or even four decades. But still, "landscape pressures"[1] are likely to increase in the coming decades, because of climate change, because of urbanisation and so on. Therefore, it is very difficult to close our eyes on that. The key question, in urban water management, is the time to react. If an investment runs over 80 years, and a disruptive technology is coming up in 15 years, then one has to consider it now. Indeed, in 15 years, one will still have to come up for 65 years of stranded investment. Therefore, one should be forward-looking. The socio-technical transitions perspective can support in better anticipating these futures (Hoffmann et al, 2020).

1.2. The sociotechnical approach of sustainable transitions discussed by an economist - Claude MENARD and Bernhard TRUFFER

The key issue of the socio-technical approach of sustainable transitions is about how to work through transition periods. This approach advocates for a mixed system, which raises a few questions. First, the comparison with the car system may not be very enlightening, because of specificities of the water and wastewater system, which are particularly important. We assume that there is a rapid standardization of wastewater treatment technology, which is not obvious. However, according to engineers, there are possibilities or options that are emerging for rapid standardisation. Especially for the decentralized treatment plants, they are very similar to cars: they have this manufacturing logic, enabling standardization at a much higher rate than the single engineering of centralized treatment plants. New technologies are developing very rapidly, such as in sensoring, and telecommunications. New solutions are available far beyond what one could have imagined ten years or twenty years ago. Standardization should not be such a problem for decentralised sanitation systems. Transition may take another ten years, or twenty years, but the opposite assumption, that this will never happen, is even less plausible.

A second question raised is the cost of the decentralized systems that has to be taken into account. Decentralisation needs some coordination, which can be very costly. Also, there may be some substantial maintenance costs for these new technologies. The problem is indeed that current utilities are not able to manage whole herds of decentralized systems. It needs new institutional arrangements, new management and governance structures, new business models, new user routines. In some countries, there are decentralized heating systems, that are readily managed. So obstacles can be overcome. Nevertheless, new structures have to be developed.

A third issue relates to the institutional conditions for making the quick transition possible: what are the institutional arrangements that can guarantee the connection rate and its sustainability for users in the Global South? And the other aspect is: what kind of institutions could follow up? In case of decentralisation: how to make sure that the system is safe, that people are respecting the rules? So, what kind of institutions need to be taken on board for favouring that? This may be addressed by a combination of technology and new institutional structures, such as the sensoring and remote control.

[1] Editors' note: "Landscape pressures" refer to a concept used in the conceptual framework designating the "macro level", while the regime is the meso level and the innovation niche the micro level. Landscape pressures are context factors such as housing prices, electricity prices, wars, political coalition etc. that may exert pressure on the studied sociotechnical regime.

2. Sanitation as a service of general interest: which mode of production for which service?

2.1. Building the sanitation service as a general interest service: analyses based on the European experience - Pierre BAUBY

Setting up a sustainable sanitation service requires a move from sanitation as an individual problem to sanitation as a collective problem. Sanitation services need to be instituted as service of general interest. In that prospect, the European Union experience of the past 70 years deserves our interest. This implies clearly addressing the blockages and difficulties that may exist in terms of access for all to sanitation, in terms of appropriation by the stakeholders and by the population, acculturation, and ultimately the legitimacy of sanitation. What are the obstacles? How can they be overcome? The European example is not presented here as a model to follow. It shows the way in which the European Union, with the construction of Europe, has succeeded in integrating the different histories of highly diverse countries in their national construction, their traditions, their institutions, their cultures, and in their reference frames.

The European Union comprises 27 Member States today - there were previously 28 - This represents 24 official languages, histories, and extremely diverse national constructions, resulting in a diversity of institutions. Institutions that can fit into centralised unitary states up to decentralised federal states, with all the intermediate forms that may exist in the matter, but also legal doctrines, which are different in their history and cultures.

From this point of view, in its long History, each State, each country, has defined what the French call a "public service", and that each of them calls a different way, implying a wide variety of forms and terms – sovereign, administrative, socio-cultural, industrial – which cover a wide variety of management methods. The European Union, in this respect, is diversity – diversity and unity, and this is what made the construction of a common conception possible. What we call a "public service", is based on a triangle of legitimacy, built in the long history of each of the European countries: (i) the right of each inhabitant to have access to essential goods and services in every respect, but also (ii) relationships of cohesion, solidarity, equal access, collective construction, a national right enabling individual rights. And (iii) the third pillar of the triangle of legitimacy is the long term, preparing for the future, what is now called sustainability.

The European Union is a diversity of forms, traditions, of Histories. It is also a unity of common factors. On these bases, for 70 years, a process has been set in motion, designed to find a common conception, with competences shared between the Member States, and the construction of a common and specific reference framework of terms. It was accompanied by the establishment of a Charter of Fundamental Rights of the European Union, the basis for social rights, common values identified in Protocol 26 of the Treaty of Lisbon. All done in order to achieve a combination of unity and diversity. The common European values in this area are threefold: again, three pillars.

- The essential role, the wide discretionary power of national, regional, and local authorities, to meet the needs of users. From this point of view, the common conception is not imposed from above; it is co-constructed between all the institutions, at every level.
- Diversity, disparities in needs, which are different from one place to another in Europe, user preferences, different geographical, social or cultural situations.
- And the third factor which is common to all: the search for a high level of quality for every inhabitant and citizen, in terms of safety and in terms of affordability, equality of treatment, promotion of universal access for all and promotion of user rights. These six key factors are common to all the features of the European construction of services of general interest.

Sanitation in all of its forms corresponds to all the criteria defining a service of general interest. Bernhard TRUFFER's text in this report recalls the extreme diversity of forms that sanitation does cover and can cover. The obstacles to its development are numerous, be they technical, financial, institutional, or organisational. But sanitation does not have the same supports, the same social acceptability, or the same legitimacy as water. Water is recognized as obvious, since it is a vital product, defined as relating to the general interest. With sanitation, there is a greater tendency to externalise it and consider that it is not as essential. There are different levels of consent to pay for the service. The difficulty then is to legitimise, to make the social acceptability of sanitation as strong as that of access to water. The challenge is to build a social and societal legitimacy for sanitation, which is necessary to overcome the technical, economic, financial and technological obstacles. From this point of view, the European experience of the gradual construction of a common conception, legitimising sanitation as a service of general interest can be a necessary tool, even if it is not sufficient, to combine a panoply of means, to combine unity and diversity. Sanitation is a challenge, and this challenge can only be met if there is participation and support from all of the stakeholders.

2.2. Complementarity between the different forms of sanitation within the same area: The case of Dakar - Christophe LE JALLE

This complementarity between collective and non-collective sanitation is addressed in the case of a large city of a developing country, that of Dakar (4 million inhabitants). The Senegalese capital city suffers from a real problem of access to quality sanitation, "safely managed" for the entire population. Complementarity between various forms of sanitation are necessary due to the heterogeneity of the area. An area, even an urban one, is made up of a diversity of zones, which can be differentiated by a series of criteria relating to:

- the urban constraints (has the area been planned or not?),
- the available land, population density and constraints resulting from roads or other urban constraints,
- the nature of the soils, in particular their infiltration capacity, the level of the water table,
- the type of water supply present in the areas in question, and the level of water consumption per user,
- and finally, the socioeconomic issues, and user demand.

These criteria define the various homogeneous zones within an area and make it possible to select the most appropriate sanitation options for each.

These options may include non-collective sanitation and collective sanitation. Non-collective sanitation includes different technical methods: with in situ treatment (which is not often found in developing countries), with regular emptying and treatment stations, with the management of faecal sludge, and "container-based sanitation", which is more specific. Collective sanitation is either conventional or unconventional, relying on small-diameter wastewater evacuation pipes, called mini-sewers, simplified or decanted small-diameter networks, or condominium sanitation, in Brazil, and in other regions of the world.

In Dakar, the management of sanitation and drinking water is not a competence that has been transferred to local authorities. The National Sanitation Office (ONAS), a public office under the supervision of the Sanitation Department, is responsible for the sanitation service in urban areas and now also in rural areas. ONAS is thus responsible for the zoning and planning of sanitation, at the level of the conurbation, in conjunction with the various municipalities within it. It is interesting to note that ONAS is no longer concerned only with conventional sanitation, but also with non-collective sanitation. In this way, the complementarity between the different forms of sanitation is taken into account by the authority which is responsible for the service.

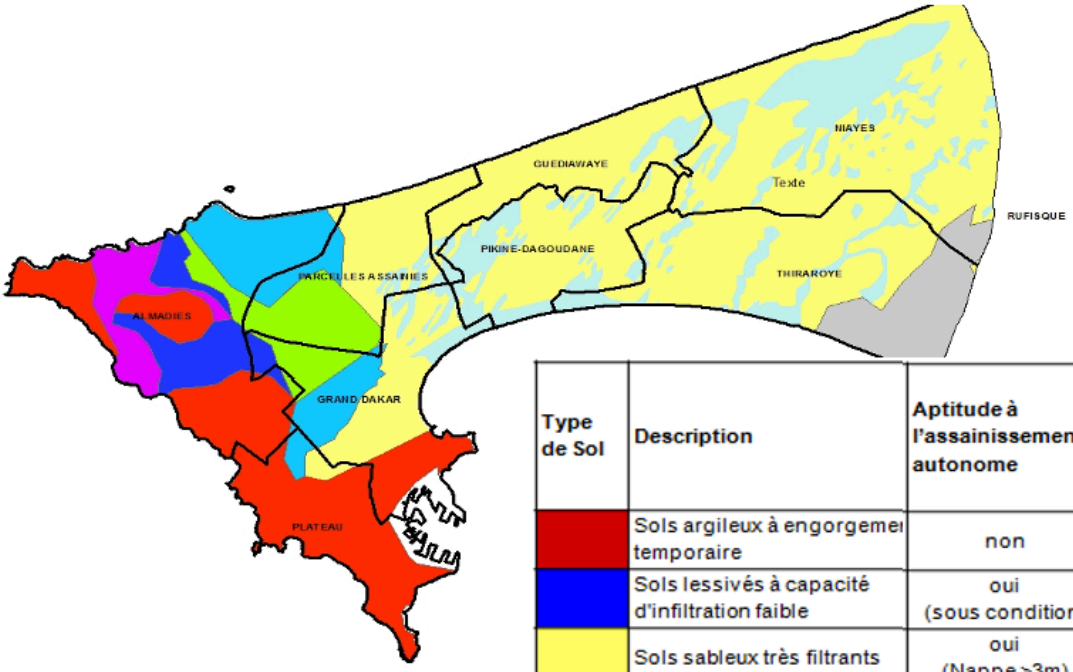
This development has also occurred in other African countries where there were water and sewerage companies, which have become water and sanitation companies. If beforehand they were not at all

concerned with non-collective sanitation, it is increasingly being used today. Through its historical role, ONAS operates sanitation networks and wastewater treatment plants. However, in recent years, it has set up an on-site wastewater treatment department, and has initiated a specific project for on-site wastewater treatment in the Dakar region, called PAAD. Several faecal sludge treatment stations have been set up, the management of which has been delegated to a private operator. ONAS is also heavily involved in the emptying market, to better structure it: emptying is carried out by certified private emptiers. In an interesting innovation, the agency has launched a major programme to facilitate the equipment of emptiers thanks to a guarantee fund, which allows them to access financing for their emptying trucks. Likewise, it also deals with domestic sanitation equipment by organising campaigns to promote improved sanitation systems and monitor their operation. It also takes into account sanitation in schools, health and shopping centres, paying attention to take into account gender and disability.

Dakar represents a diversity of situations. Of course, during the appraisal required to choose the type of sanitation to improve, all the criteria mentioned above must be taken into consideration. One of the criteria is the nature of the soil and its infiltration capacity. The map below (Illustration 1) shows the diversity of contexts:

- In the areas in red, purple, light blue and grey, the soil has a very low infiltration capacity or involves a risk of infiltration into the water table. On-site sanitation cannot be developed in these areas, therefore collective sanitation will be more appropriate;
- In other areas where the nature of the soil allows infiltration, there is the possibility of developing non-collective sanitation.

Illustration 1. Dakar soil impermeability map (Source: GRET, 2018, p.187)



Type de Sol	Description	Aptitude à l'assainissement autonome
	Sols argileux à engorgemer temporaire	non
	Sols lessivés à capacité d'infiltration faible	oui (sous condition)
	Sols sableux très filtrants	oui (Nappe >3m)
	Sols filtrants à risque de polution de la nappe faible	oui
	Sols ferrugineux non lessivés à bonne capacité d'infiltration	oui
	Sols rocheux et argileux	non
	Sols hydromorphes des Niayes et anciennes vallée:	non
	Sols calcaires et vertisols (marneux)	non

ONAS has defined a zoning for many years, based on a large series of criteria. Some criteria are cited in this communication, but many others have been used to define the most appropriate form of sanitation. ONAS has defined three zones:

- One zone suitable for conventional sanitation networks, on the Plateau and in the central parts of Dakar, which are very densely populated.
- An area suitable for non-collective sanitation with regular emptying. The various situational factors allowed this option and showed that, for the moment, it was the most appropriate technologically.
- An area in which the nature of the soil and the density of the habitat did not allow the establishment of non-collective sanitation, and the narrowness of the streets did not allow the development of conventional collective sanitation. As a result, non-conventional collective sanitation has been implemented.

An important focal point for this session concerns the multiplicity of the stakeholders involved. Whereas for collective sanitation only one or a few main stakeholders need to intervene, as soon as non-collective sanitation is involved, many more stakeholders are involved.

- The users, who are important key stakeholders, because they have to build substantial infrastructures on their private property. They are the investors and owners of the equipment.

- The builders of these toilets and pits, to ensure that they implement the appropriate infrastructure, meeting defined standards.
- The emptiers, who are numerous, with emptying trucks and who meet the high level of expectations of users.
- The public authority and the public sanitation service, the authority being responsible for the service and owner of the faecal sludge treatment stations,
- And the operator of the faecal sludge treatment plants.

There are other institutional stakeholders, in particular the municipality, which also has a role to play. Regarding sanitation in schools or health centres, there is the same diversity to which should be added the decentralised services of the states, in charge of schools or health centres. It is therefore necessary around non-collective sanitation to involve a wide variety of stakeholders throughout the process of implementing the service, but also afterwards, in monitoring it.

Finally, the alternative approach to collective sanitation through mini sewers is emphasized. In Dakar, there are many small networks of mini sewers. It is a decentralised form that was developed either on the initiative of NGOs, initially with community management methods that have developed over time; or through programmes supported by the World Bank, set up in conjunction with ONAS. A frequent difficulty for these operators is the takeover of networks that they have not developed, involving a technology with which they are unfamiliar or do not necessarily know sufficiently well. Take for example the Ngor district, traditionally inhabited by fishermen, which has developed in an unplanned way, with a very dense habitat and with a narrow road system which does not allow the use of earthmoving machinery or the installation of conventional collective sanitation.

Sanitation by mini sewer, with pipes that can be buried at a shallower depth since there is no risk of being crushed by vehicles that cannot pass in these alleys, makes it possible to meet the sanitation requirements of these specific situations. There is still a great deal to discuss concerning the diversity of the stakeholders to be taken into consideration, the need to set up a technical and financial monitoring mechanism to ensure that the service always meets users' needs and provide quality sanitation.

2.3. Lessons from the European and Senegalese cases - Lætitia GUERIN-SCHNEIDER

Both the European and the Senegalese cases presented previously raise following issues: the specificity of the sanitation service compared to the drinking water supply, the lessons learnt during the construction of a common conception of general interest services in Europe and its application to sanitation, the financing of sanitation - collective and non-collective -, the adaptation of individual systems or existing mini-networks when setting up a project to modernise a district, the terms of competition between emptying operators, and the incentives for households to connect to the network.

Historically, the drinking water supply has preceded sanitation for being recognized as a universal service. This is because access to water is vital, whereas sanitation, although an essential service for environmental health reasons and for users' safety, has been appropriated in different ways and more recently. Centralised sanitation is the closest to the drinking water service as it involves the same stakeholders. On the other hand, non-collective sanitation is a sector which relies on a wide variety of stakeholders, and in particular the households themselves. The responsibility of actors must be globally assumed for the coordination to be effective and lead to an efficient service.

What solutions can be expected from the new directives in Europe? The current public health emergency shows that Europe, despite its operating complexity, is capable of adapting to a need imposed by facts. Sanitation is not explicitly specified as a shared competence, but this competence is induced by public health and the environment and could be implemented, driven by stakeholders present in European institutions.

The non-collective sanitation sector is divided between several project owners and managers: private facilities, collection of excreta, evacuation by emptiers and treatment of faecal sludge. Its financing is therefore complex and does not follow a single model. The crucial points identified are support for the private equipping of households with sanitary equipment (in particular toilets) and the establishment of an efficient and sustainable evacuation system. The financing of sludge treatment facilities is *a priori* easier because it comes under clear project management. One proposed solution would be to co-construct a common water-sanitation framework so as not to impose a single model and involving the entire range of socio-technical models.

In the field, individual measures have been spontaneously implemented. Their inclusion in a sector raises the question of their adaptation so that they can be emptied and accessible to emptying trucks. Here again, a concerted approach with all of the stakeholders is essential. To illustrate this fact, in rural areas, the construction of toilets does not necessarily have to be accompanied by flushing when water resources are limited. The more difficult question to resolve is that of their maintenance and effective use.

Emptying individual wastewater treatment systems represents a recurring and significant cost for households. Several innovative experiments of competition between emptying operators exist, ranging from setting up a competing municipal operator to a call centre providing this function. The crucial and preliminary point is the existence of easily accessible treatment facilities to avoid illegal dumping.

Convincing households to connect to collective sanitation systems is a recurring question, especially when a network is available or planned. Beyond access to toilets for health, social and safety reasons, flow control protects groundwater from infiltration and limits risks to the environment. The benefit that results from the connection is collective, and the cost of the connection could be borne by the local authority, at a minimum, for social connections.

.

3. Urban sanitation today: the outdated conventional network approach

3.1. Changing Sanitation in Hanoi: governance, organization, technology - Sophie SCHRAMM

Historical studies on how sanitation develops in a city provides with important knowledge. Schramm (2016) presents the case of sanitation in Hanoi. After a presentation of the conceptual framework based on a sociotechnical approach, the main features of Hanoi are exposed to understand how sanitation works there. A historical perspective on sanitation in the French colonial era is then proposed. This paper concludes on the current situation.

Conceptual framework

Technology is considered as a space of possibility that allows for various, but not infinite, ways of organising and governing it. Technology of course does not determine the way to govern, use and organise it by humans, but it gives us a space to appropriate it beyond pre-design and planning. This space has limits. This is one aspect we can borrow from the analytical tradition of large technological infrastructure systems, or socio-technical infrastructure systems, as it remains useful when considering heterogeneous infrastructure systems in cities of the global South.

While the heterogeneous infrastructure systems of Hanoi question the analytic tradition of large technological infrastructure systems, this tradition remains useful in understanding the basic relationship between technology, governance and organisation, as well as the circulating ideal of the "dry and sanitary city" that still shapes sanitation across the globe, or what TRUFFER called "gold standard" in this report. The analytic distinction between technology, governance, and organisation helps us to understand how according to these ideal infrastructures are supposed to work.

Mayntz differentiates between industry and governance structure of sociotechnical systems. The industry structure consists of the technological artefacts and networks and the organisational services, as we just heard about, e.g., the organisation of septic tank emptying services, which is very relevant for the case of Hanoi.

The governance of these systems concerns the rules, regulations, and decision-making procedures that shape sanitation or other infrastructures. Of course, we need to take into account that particularly in cities of the global South, infrastructure systems are heterogeneous. As exposed earlier in the workshop in the case of Dakar by LE JALLE in this report, services are not provided through a single uniform system, but a range of actors, be they public utilities or private entrepreneurs, or just regular people, use very different technologies and ways of governing and organising when it comes to basic service provision. In order to understanding these heterogeneous infrastructure regimes, the analytical frame with its distinction of technology and governance is still relevant for us to understand how these two relate in the manifold ways actors provide for their daily needs.

Sanitation in Hanoi

In Hanoi, the city's sanitation system has been explored in its manifold relations with broader urbanisation dynamics. Hanoi has not only a post-colonial, but also a post-socialist past. It has always been subject to external visions of modernity and progress, and these visions have always been locally adapted. That happened in the colonial as well as in the socialist projects of modernisation. There have always been grandiose plans that have, in different ways, affected but never replaced space-specific dynamics of city-making. In terms of sanitation, this means there were different attempts to modernise the systems in terms of technology, organisation and governance, that have always over time, co-existed with traditional ways of wastewater management and these traditional ways have themselves evolved. However, they have always been negated by modern planning, and they are still being

negated today. One reason for this is that they have very severe health implications. Today, specifically, speculative urbanisation dynamics shape not only the city of Hanoi, but also the way sanitation works specifically at the urban fringes.

Historical perspective on sanitation in Hanoi

What happened in post-colonial planning? What was common practice in Hanoi, as in other Eastern Asian places, such as Shanghai, was the night soil collection system: people would leave buckets outside with their waste and in the morning, and private "entrepreneurs" would handle this material, and often it would be used in agriculture. This practice clearly resonates with current calls toward resource reuse and sustainable resource management. However, at the same time without any treatment of sludges this practice allows faecal bacteria to travel from the city to the agricultural areas, and then back to the city where vegetables are consumed. This is one reason why modern planning and modern visions of Hanoi never embraced this practice. Since the colonial era colonial engineers and planners have considered it as disgusting and backward. According to a colonial sanitation planner of Hanoi, it was a "défi aux règles d'hygiène les plus élémentaires" (challenging basic hygiene rules). So, this reuse of faecal sludges happens largely outside State control and planning, and it was to be eradicated by French colonial planning already with its goal to modernise sanitation.

The septic tank played a central role in colonial project of modernization. Septic tanks were supposed to be connected to a larger sewage system, i.e., they were supposed to be part of a centralised sewage network. This colonial project of modernisation as well as the following ones were based on the idea that they could create a long-lasting social and spatial order in Hanoi that was to be regulated by the State. This vision is in accordance with the ideal of the networked city, or specific to sanitation, the dry and sanitary city which pursues a city where waste is invisible, and smell is absent of the public space. In the sanitary city, human wastes flow underground, in a large network of pipes and canals separated from public space, controlled, and regulated by the state. Since the septic tanks of Hanoi were supposed to be part of this modern system, there was a clear line that French colonial sanitation planning drew between these modern septic tanks of the time and the night soil system that was regarded as unfit for modern urbanisation. The history of septic tanks is exposed by Schramm (2016). Ironically, the septic tank system that remains the main mode of sanitation today features aspects of the night soil system that the French wanted to eradicate. The technology is different, which means that the black water is hardly cleaned in these septic tanks anymore. The sludge is not centrally treated as the French wished it would be. Instead, untreated sludge, in the pre-colonial era and today, is used in agriculture or dumped into the sewage system. This makes it rather useless. It's not handled by any public utility, but by private entrepreneurs. Furthermore, it is hardly controlled by the local state, it is mostly a private business.

These are features of the night soil system which the French wanted to do away with by planning septic tanks. The interesting thing is that the boundaries between these systems, which were opposed by planners as unmodern versus modern, actually blur. Thus, as opposed to the French colonial imagination, there was not a transition from an unsanitary system to a sanitary one, multiple elements of different systems were merged way beyond formal planning and regulation. The core difference between colonial sanitation planning and the actually existing septic tanks of Hanoi is the way black water is handled: it is regularly used in agriculture. Even if this was a source of disgust by colonial planners and it continues to be that by planners today, the use of human faeces in agriculture continued. This and the fact that the overall treatment performance of the currently existing septic tanks in Hanoi contribute to current sanitation planning, which is happening with consultancy from the Japanese development agency JICA, largely ignoring septic tanks. In a recent study by JICA, they hardly mention them, saying only that they do not function satisfactorily and can reduce pollutants only slightly, which is certainly true. So, they are dysfunctional in terms of sanitizing Hanoi.

With the side lining of the decentralised septic tank, sanitation planning today envisions a system that is more centralised than earlier sanitation planning. It envisions a river basin-oriented wastewater system with strategically located treatment plants on the level of technology that are supposed to be connected to a separated system. The urban sanitation utility should work in a monopolistic way,

financed by fees, there would be forced consumption, obviously, governance would be ideally hierarchical decision-making with the state regulating service provision. That is the ideal of the sanitary city in terms of technology, organisation and governance. In reality it doesn't work that way.

Sanitation today in Hanoi

Sanitation in Hanoi remains very heterogeneous with private entrepreneurs providing basic services. These are not necessarily informal, as many are licensed as the result of an attempt to legalise private sanitation entrepreneurs. Another important group of actors in everyday sanitation are neighbourhood groups who repair and maintain local drainage channels. The sanitation company – formally the most important agent of Hanoi's sanitation – also tries to improve the city's sanitation situation. However, the company is severely underfinanced. It does not have capacity to empty any of the city's septic tanks, even though that is its formal mandate. Also, it hardly manages to maintain the underground sewage system, a legacy from the French colonial era which actually covers only 10% of the city. It's almost 100% dependent on subsidies.

This company has not undergone a great transformation since the socialist era. Indeed, even though there is a government decree since 2008 stipulating that provinces should charge a wastewater tariff (supported by the German international cooperation GIZ), there is no wastewater tariff in Hanoi, so the company doesn't have any revenue. Its staff is hardly able to drain the sludge from the sewage channels and there is no way they can engage in septic tank emptying. Even though they still claim to do so, this is in the hands of private entrepreneurs. These entrepreneurs sometimes drain the septic tank sludge into the sewage system, which makes it completely inefficient. The sludge – in opposition to any modern vision of Hanoi – It is also used in agriculture. Raw human waste is traded in early-morning markets at the urban fringes, and it is known as being particularly good for certain kinds of vegetables. This practice continues today. So, there is a multiplicity of actors, technologies, governance forms between the market and State regulation that shapes sanitation in Hanoi.

Today, in Hanoi, sanitation still depends on septic tanks that are installed in individual buildings. They overflow into the drainage network, and the septic tank sludge is regularly disposed of back into the drainage networks, from where the sanitation company empties it again to dispose of it at landfills. In terms of organisation, there are two structures. On one side, the septic tank emptying system shaped by competition between public and private companies, market prices, payment for individual performance. It's voluntary use, this means that it is not compulsory to have a septic tank emptied: On the other side, the existing sewage network in contrast is maintained by the public utility, itself financed by taxes (not by tariffs) and also through local labour contributions. So, people provide basic services in their neighbourhood, which is a disputed issue in a post-Socialist country but is still happening in Vietnam and Hanoi. The governance of the septic tank system can be described as self-organisation, negotiation based. It's not a hierarchical system. Of course, where the public utility is involved, there is hierarchical decision-making. Nowadays, in times of speculative urbanisation at the edges of Hanoi, the utility is not gaining ground. Even though the New Urban Areas, high-rise apartment estates emerging rapidly at Hanoi's urban edges appear very formal and planned, it's not the utility that is active here, but the housing companies who develop and maintain these estates.

To conclude, in the course of its history, Hanoi has not witnessed a transition from one system to another, but the emerging of plural, fragmented and heterogeneous regimes. These regimes are contingent on manifold interests and power relations and importantly, urbanisation dynamics beyond planning. Hanoi's sanitation planning and policy have, since the colonial era, rested on and pursued the modern ideal of a uniform fixed and long-lasting sanitation system. However, related organisational and governance arrangements have been realised only superficially. For example, institution of the wastewater tariff has not been put in place even though there is the expectation that service provision should recover its own costs. Policy and planning need, therefore, to recognise the complexity of heterogeneous sanitation regimes, in terms of technology, governance and organisation, their dynamic change, and their interdependence with wider urbanisation dynamics

3.2. Institutional evolution or transformation? Legitimizing the non-sewered sanitary city in South Asia – Shubhagato DASGUPTA

This part tackles urban sanitation systems in India. Are we witnessing further institutional evolution, or a transformation legitimising non-sewered sanitary city in Southeast Asia? From the 1850s onwards the current times, the service of pipe water and underground sewage systems have made much of Western urbanisation possible. For a long period of time, only 10% of the population was urban. It was only after some of this infrastructure was put in place in northern Europe and the United States or in the Northern Americas, that urban population could rise to the levels they are in those continents. The framing of this idea of what has been referred to as the "gold standard", has this historical context, where it remained exclusive to parts of the world. At the same time, when Europe was doing a set of actions on sanitation, its colonies were experiencing quite a different approach, led by the same Parliaments and Governments that Europe had. The theoretical discussion on socio-technical systems, about the network as being the content of the city that makes it viable is now being approached and is facing sudden urbanisation. In the near future, urbanisation is going to actually take place in Asia and in Africa. Regarding sanitation, India resembles the west, where we had a very flat urbanisation rate through the medieval times into the colonial period. Though the latter changed the urban structure: much of what are India's megacities today were colonial implants and were not in the urban landscape in medieval, pre-colonial times. With independence, there was growth in urbanisation and to some level; possibly, there has been some stability in this urban structure for a very long time. Unlike Vietnam, which not so long ago came out of this civil strife, India's urbanisation structure for the last 200 years has been quite stable, since colonial times.

Given this context, where are we with sanitation in urban India? In 2011 in spite of much progress, the city-wide sewer systems are essentially based in cities of more than 1 million (metropolitan cities) which are 50 or 52 in number currently, while the rest of the 4500 cities have much less sewerage. The rate of sewered part of the cities rapidly decreases with the size of the city.

In terms of wastewater management too, much of it at the national level concentrates around wastewater management in these 200 largest cities in India, out of which 52 of them, with a population above 1 million, have higher levels of sewerage connections. However, even in these larger cities, only 15 of them have more than 50% sewage. 35 of them are a bit less than 50% sewerage. Then, there is a long tail too, to the urban system in India, which has not witnessed to be a global standard, or being articulated as a global standard. Of course, this urbanisation that India is witnessing is expected to get wider and deeper. It is over the next twenty years and has been in the making for ten years now, which means that the equivalent of the whole population of Indonesia or Brazil moving into cities in India. So, the scale just in terms of numbers is large.

The primary utility of sanitation has changed quite significantly: the health benefits that draw the underlying conditions to putting sewerage in Western Europe are no more the driving factors in continents and geographies of the South. Sanitation and its health connection have different forms of articulation. The pure public health benefits are easier now to realise out of clinical medicine than just sanitation infrastructure. This was not the case in the 1850s to 1900s, in Europe. Most of the antibiotics came in after that period. There are now issues around resource efficiency, water deficiency, climate change and resilience – the wider economic benefits of having clean spaces and well-managed wastewater, and of course the equity and dignity issues around poor class divisions within our urban geographies.

So, the process that we are witnessing today is quite dramatically different from the one that Europe experienced, and from what seems to be a hegemonic idea of a global standard. Recently, in India, we witnessed a very large programme called the Swachh Bharat mission, which kind of built on a few generations of earlier efforts, but has seen the rapid scaling up of toilets within the house, which has been one of the big constraints of the evaluation of sanitation in India, both in urban areas as well as in rural areas.

Along with that, it is not only that our small cities are large in itself, but also that there are a lot of large dense villages. Almost 50% of the total rural population can be identified to be living in these large dense villages, where the challenge of sanitation is perhaps changing from what might be seen as a rural approach to sanitation to what is urban. Sanitation policies in India have started in the 1970s and 80s, with the international attention to water and sanitation in geographies in the South and a host of national programmes have emerged in multiple generations since then. The Swachh Bharat mission, in 2014, gave this a lot more national priority and national attention than many of these programmes in the past had done. The common vision was that everyone uses toilets, and very much more driven by rural sanitation than urban. With the changing and growing urban population in India, there has been an urban target term.

A first pilot project is presented. It is located in Orissa, which is a State of 50 million inhabitants with around 10 billion urban residents. It is part of a new effort coming from Swachh Bharat across India to make it aligned, first with the MDGs, but now in response to the SDGs. A new exercise on our alternative sanitation was initiated. This state has 111 urban areas. Across these 10 million populations, only 9 of locations are 100000 and above, and the bulk of the population is therefore in mono-settlements. It did take the State a lot of institutional effort at multiple levels not only to first implement a couple of pilots, but now to scale it up so that all these 100 towns are covered the desired option. The option is not by underground sewerage, but by faecal sludge management systems, which is the alternative sanitation model that we are discussing today across the different presentations. Beyond this, as next steps in response to rural needs, these 100 locations are also tying up with the local rural areas, to bring in waste from the rural areas.

This situation led to an institutional evolution, from having a provincial State utility to the city governments themselves serving the population in close to 100 cities across the State. The new institutional structure gives the city the priority to operate their own systems, the provincial utility only plays a technical supporting role, and the operations are hired off to what are called technical cells, essentially community groups trained to operate in this area. With that, Orissa has developed an institutional model, which goes into looking beyond what would be classified as a critical juncture to establishing something that will create a new part for sanitation delivery systems, in contrast to what was the known European model. Orissa is not the only State; there are four or five other states that have done similar exercises.

Meanwhile, the national government has recognised this and has put in a lot of resources. In the budget earlier this year, USD 20 billion was earmarked to be put into systems like this to cover the 4,500 smaller and secondary cities across the country. The institutional pathways are going to be quite different, because these are sub-national issues. But in each State, different pathways are developing. They all challenge the singular model of a centralised sewerage system we witnessed so far. With the large emerging need for treatment of faecal matter in rural areas, too, we are expecting that some of the future trajectories will only strengthen these institutional models.

3.3. The cases of Hanoi and India - Pierre- Louis MAYAUX, Sophie SCHRAMM and Shubhagato DASGUPTA

Both cases presented above have clearly shown that all socio-technical systems and practices are varying dynamics, that are constantly evolving, whether through individual and collective practices in the case of Hanoi, and more through real policy initiatives, in the case of India. They have shown that they not only evolve alongside each other, but they constantly interact and shape each other as heterogeneous systems and regimes. Both speakers have highlighted the potency of the modern ideal of the sewered city. TRUFFER in this report refers to the “gold standard” of the sewered city. SCHRAMM and DASGUPTA present many alternative practices or initiatives that challenge this ideal. However, practices and initiatives that have been described are mostly pragmatic. They do not seem to be underpinned by aspirations and symbolic meanings that would be as powerful as the imaginary of the large centralised socio-technical system that is the sewerage system. The alternatives described

are unlikely to be perceived as an alternative model for the future. They tend to be perceived by the population and by policymakers alike as merely a second-best option.

In Hanoi it is the case. Hanoi has to be understood in terms of its history: there has been a huge increase of wealth since the opening up of the country to the market economy and increase of wealth and knowledge and adoption of this modern ideal and modern standard. People want to live according to modern standards of sanitation, they want to have a flush toilet in their house, and they don't want to spend a lot of time thinking about how to deal with sanitation. This question makes her think about this ideal of travel which is one of "appropriate technology". It was also quite a strong ideal that the World Bank also promoted – travel across the globe, already in the 70s. So already then, there was already this idea that we cannot just go on building bigger and bigger things. We need appropriate technologies. Monstadt and Schramm (2017) concluded on a Tanzanian case that people perceive these alternatives as a second-class solution. People don't want to do without modern amenities. This whole idea of decentralised sanitation only works if it doesn't reduce the comfort of people. The idea of modernised mixtures is useful and is being circulated in academic circles and within NGOs. According to Van Vliet and colleagues (2017) for instance, the sanitation challenge is how to connect these different components of the heterogeneous system, and not think in dichotomies, e.g., "decentralised-unmodern" versus "centralised-modern", but to see how we can combine them.

As for India, alternative imaginaries of modernism have always been around. However, politics have driven one over the other. In cases like Orissa, the sewerage system as an infrastructure ideal has been seriously challenged. So, this mediatory, complex, coordinated, interaction of multiple systems is in one sense what technocrats from the earlier technical utilities are now coming to face. So that is being seen very much as a compromise for multiple imaginaries to come together. An issue however remains that in smaller municipalities where the bulk of urbanisation in south Asia and in Africa is going to happen over the next significant period of time, that is where all the tension is going to be. After 70 years of urbanisation none of the metropolitan cities are fully covered by sewerage systems yet. If you were to try to reach the smaller cities or the rural areas, that would take a century, maybe. So, the sewerage system as an ideal has limits fostering inequity and new outcome-based ideals based on pragmatism have become the norm. The weakening of the utility model is also being driven by a whole set of crises, be it water, be it environment, be it multiple uses and waste of resources. The control of individuals means, often, these larger utilities, especially in developing countries where they are not really strong and capacitated are more drawn to failure than when individuals or communities control their systems. So, it's going to be a mix of how the real politics of these multiple alternatives evolve. The idea of a sewerage system as an ideal fail to meet equity concerns.

Political will to develop sanitation services, and new approaches such as "Inclusive City-Wide Sanitation" pushed by the World Bank may help to improve and finance the build-up of safe management systems for on-site sanitation. There was a five-year period when the political will was the strongest. But the challenge is now beyond political will, it's about getting institutions to reform, getting technical systems in place. A lot of innovation has happened because of the space that the politics has offered. In the last ten or seven years, there has been more guidance, more government documents on non-network sanitation across states in India than there has been on sewerage. The investments in sewerage are still higher, because yes, each of those systems costs more on a per capita basis. But with the recent announcement of the second phase of the Swachh Bharat Mission and if India can still afford it, beyond this health crisis, then it will put in very much an equal part of now-sewered sanitation systems. And even larger cities and metropolitan areas are adopting the new technical standards coming out with new models. A lot of action is happening, which is seriously challenging the institutional mechanisms through which these services were delivered in the past as hierarchical, bureaucratic, top-down systems. This is very interesting because it kinds of transfers not only onto sanitation, but to a whole bunch of urban services going forward.

Regarding new urbanised neighbourhoods in Hanoi, big buildings have replaced smaller houses which is a challenge for sanitation also. There are multiple situations in the so-called new urban areas of Hanoi. There is this emergence of new urban areas, orderly planned suburban estates, very dense.

Wastewater is treated there with a Japanese technology called Johkasou, compact waste water treatment plants in the underground of the buildings. It is only being used very sporadically in Hanoi. In this new urban area, there is just local wastewater treatment plant for the whole area. The interesting thing in terms of organisation and governance is that it is run by the local housing company, or the State-owned housing company, called HUD, and not by the utility. So, this is a State-owned company that is a joint-stock company now that is running the wastewater plant. Users pay to this company wastewater tariffs and a fee for on-site wastewater management. This is a further decentralisation of services also in these planned estates. The utility still isn't present there, even though it is State planned.

Financial partners such as Japanese Development Bank play a big role. JICA has launched the current project to upgrade sanitation of Hanoi. It's relatively expensive, so compared to Bangkok, it is more expensive per capita than the big sewerage rehabilitation in Bangkok. JICA does not finance alone. Hanoi (Vietnam) has to pay the loan back. Three wastewater plants have been built, but these are partly out of order. One is running on a pilot level. The utility particularly and sanitation policymakers of Hanoi are also, nowadays, not convinced by the septic tank model. So, they are also trying to build this large technological system, though not in a very consequential way. For example, if this system is to be built and run, the utility needs to have money from somewhere. However, the charges or tariffs are not in place. So, there is a urge to build these large technologies, without considering the governance and organisational factors that would enable this technology to work. So, it's kind of superficial urge to build this modern city, which is not really backed by other measures than trying to secure loans and building technology.

The history of sanitation in Hanoi questions the pace of change which appears to be very slow. The superficial adoption of this modern ideal of the sanitary city may explain this pace. Loans are taken on, technologies are supposed to be built, but then the necessary governance and organisational arrangements that would back up this system and make it work are not really taken into account. So, sanitation may not be such a political priority. The only State actors who really pursue it, are the construction companies, the housing companies, those who are involved in constructing new urban areas, because one cannot sell living in a new urban area if there is not proper sanitation. The rest, like the many urban and peri-urban villages, are just left out. So, it's a disregard of the governance aspect, and focus on those aspects of planning and urbanisation that are potentially profitable.

3.4. Feedback from a watsan expert - Dennis MWANZA

Sanitation is one of the biggest development challenges that is facing us. The solution for urban sanitation is best divided into four segments: institutional, technical (in terms of solutions), financing (infrastructure and service delivery) and finally organisational. The paper from DASGUPTA emphasises urbanisation dynamics in India, similar challenges are in many countries, where a lot of cities are also growing. However, sewer networks (which have been assumed to be the gold solutions for urban sanitation) have not been growing at the same pace as the cities. SCHRAMM described a situation in Hanoï where everyone is needing a toilet. Everyone wants to live a modern life. And modern life, in this case, is defined – as far as sanitation is concerned –as having a flush toilet in the house and not to think about what happens once you have flushed: Yet if are the house owner after one month, six months, one year, two years, you have to think about emptying your septic tank (if you are not connected to a working sewer network). Which means that, in theory, everyone wants to be connected to a sewer system, where you just flush and that is it. But that is not possible especially in most developing countries with limited sewer networks. And so, we definitely have one common vision, as actors in this sector, and that is that everyone must have a toilet. But the SDGs go beyond just having a toilet but having safely managed sanitation meaning having faecal waste treated in one form or another.

Some of the takeaways are fist that a clearly defined or identified accountable government ministry or department responsible for urban sanitation is needed. This helps to elevate the prioritisation of

sanitation in terms of government intervention. Sanitation affects everyone. It is a public service which can either be a nuisance or indeed a development tool. This needs to have effective leadership with clear policies: policies that give guidance on technology, financing approaches, as well as organisation. Who is going to be responsible for delivery of sanitation service, whether municipality or utility or private company? And obviously to give a strategic direction, effective planning is required and for the government to have a dedicated budget line. In many countries, sanitation is hidden under water. Having stronger institutions, stronger coordination and focused oversight provides for a high level of accountability.

In terms of service delivery, there is a multiplicity of approaches. The common way is to address the different segments of the sanitation value chain separately, starting from containment, emptying and transportation, and of course treatment and reuse.

Containment. In terms of the toilet systems, the issue is whether it is connected to a sewer or a septic tank. The pit latrines which are solutions for many people living in informal settlements, that is of course is another challenging area -and is not usually water based. Responsibility for putting in place the toilet systems is usually that of the owner of the property. Public institutions (schools, hospitals, Universities...) and public places (markets, bus stations) need their own solutions. Addressing some of these challenge through a market based approach i.e. using the pay per use principle. Normally, this is managed either by the organisation that manages the market, or by a private individual or company.

Emptying and transportation of the sewage, or the "faecal sludge". The sewage network is very limited in many countries. Less than 50% of the urban population in India is actually connected to a sewer network. In Africa as a whole, according to the JMP report, less than 15% of the urban population is connected to a sewer network. The solutions really are those which are not connected to a sewer network. Issues of emptying and transportation are therefore key. Usually, emptying and transportation are managed by the private sector. This raises two questions: about licensing, as to whether everyone must be licensed; and regulating the price of emptying, because that sometimes can be a barrier.

Treatment and reuse. This activity usually is a public sector item: governments and ministries need to invest in building some form of treatment facility, for faecal sludge or a mix of faecal sludge and sewage treatment: those have to be put in place. Who pays for this? For the infrastructure itself, most likely, governments, but who pays for maintenance? Should it be tariffs or taxes from government? Which invokes the question of regulation: in a lot of countries, sanitation has not really received the attention it deserves, so there is not a clearly regulated sector, and yet there is every benefit in defining some kind of regulatory framework of sanitation services, whether it is – the benefits are basically in terms of tariff, or even the quality of the service that is being provided.

Governance. Who is responsible for this service? How do you interact with customers, consumers and the users themselves? There has got to be a very strong relationship between the users and the providers. As a conclusion, there is no one size fits all solution, and we have to look at different solutions. The history and context are important to consider before deciding on which way to go. Sometimes a solution is driven by a crisis. Whatever the case, we need to look at the users, the history and the context.

4. The role of research in institutional change: opening up analytical perspectives and supporting action

4.1. Navigating institutional complexity in sanitation transitions: juxtaposing insights from developed and emerging economies - Christian BINZ and Miriam HACKER

This section is about navigating institutional complexity in sanitation transitions. It presents work done both in developed and emerging economies. Introducing on-site sanitation actually not only means introducing new technologies to the sector, but also a new institutional logic. This, by definition, creates conflicting demands or moral prescriptions in a sector, which is hard to deal with for the actors. In many cities, experiments with on-site sanitation happen already, but there a few cities where configurations that work have been established. Often, on-site systems are installed, but then the operation and management are not done in a safe and well-managed way. The transition process has been analysed in two cities that have experimented quite strongly with these on-site systems. We try to learn how they were able to navigate this complexity in the transition process.

In this research study, technologies depend on quite complex institutional support structures, in particular in the sanitation sector. At the level of technology, performance will depend on the design, the kind of technologies in treatment plants, the management, the monitoring and quality control. In addition to that, there's this very complex institutional broader support structure where different elements have to be tailored to the technology so that it works well. Based on an extended literature review, six generic elements appear key in the sanitation sector to analyse the transition process (Hacker and Binz, 2021):

1. Legal and regulatory frameworks, like water quality standards that have to be tailored to novel on-site systems.
2. Industry and market structures, firms that are able to sell treatment systems and markets where goods and services can be exchanged.
3. Financial arrangements, investment into the installation of on-site infrastructure, but also long-term operation and maintenance.
4. Technological knowledge, skills and capacity with the operators, with the utilities, and again, with firms that provide treatment systems.
5. Legitimacy, which means that the public and key decision makers in a given region conceive of on-site systems as something that's in sync with local culture and values and norms.
6. Equity also becomes more and more important, that is questions around who gets access to what type of infrastructures, what service levels etc.

These six elements have to play together to make systems work well. Yet, for on-site sanitation, there are often gaps with several of these dimensions at once.

The second key point is about institutional logics and that sanitation services can actually be provided with different underlying guiding rationalities. Fuenfschilling and Truffer (2014) have identified three distinct rationalities or institutional logics in the sanitation and water sectors, which differ fundamentally in the ways in which sanitation services are provided. The first, oldest one is the 'hydraulic logic', which builds on large-scale centralised infrastructures and the government and public actors as the main organisational form. In that configuration, the public utility is a key actor. Funding comes from tax money. The government plays the most important role, and security of supply and national welfare, connecting as many people as possible to centralised systems is an underlying key value. The second logic developed later in the 80s and 90s, with the liberalisation and privatisation waves in many infrastructure sectors. Here, a second, 'water market' logic was created, where the key actor is the private firm and funding comes from consumers that pay for sanitation or other services

in normal markets. Public-private partnerships are the key organizational form, and the management profession plays a much more important role than only the civil engineering knowledge that's dominant in the hydraulic logic. Then, there's a third 'water sensitive' or 'sustainability' logic. Many of the on-site sanitation systems we talked about in this workshop actually follow this logic, which again diverges from the other two, because here values around social and environmental sustainability are the guiding rationality, and the community really is the key organisational form. Technologies are adapted to local context conditions and funding often comes from community structures themselves. Regulation is quite complex, as many different actors have to coordinate in polycentric governance arrangements. Also, knowledge is much more transdisciplinary than the other two logics.

The key point now is that on-site sanitation programs usually follow a water-sensitive logic, which diverge in several aspects from the still dominant hydraulic logic. Introducing on-site sanitation in a city thus brings a new logic into the sector, which will cause a lot of frictions. New values will have to be institutionalised while others will have to be de-institutionalised. A lot of confusion, conflicts, and misunderstandings in the sector may happen. How to reconcile and navigate the complexity?

The two case studies. One is San Francisco, which is increasingly considered a lighthouse for on-site reuse. More than 90 on-site water reuse systems are already in the planning, building or operation stage, and a very sophisticated governance arrangement has been developed, especially for operation and maintenance. A quite strong regulatory framework for that has been set up. C. BINZ and M. HACKER have conducted an in-depth case study there in 2020. The second case is Beijing, which was also considered a lighthouse city in the 2000s as it has more than 2,000 on-site water reuse systems installed in its core and suburbs. But it eventually abandoned this idea to some degree. It can be considered a failure case by now. The key question then is: How do actors in these cities deal with this institutional complexity?

San Francisco. In San Francisco, there was a gradual, well-planned implementation process, which started with a demonstration project. The local utility decided to introduce on-site reuse in their new main headquarters and used that to learn about what it takes to implement on-site reuse in the city centre. First, they used this implementation to learn about the roles that all the different actors have to take when implementing an on-site water reuse project. And they realised very early on that they had to reorganise themselves internally to make it happen. They basically created a new division, which was focusing specifically on water reuse, which was set apart from the normal wastewater and the normal water divisions and doing its own thing and also creating a new role for the utility in this on-site sanitation space. The next step, a few on-site reuse systems were installed with the support of grant and subsidies in very high-profile, high-rise skyscrapers in the city that created a lot of visibility for the idea and legitimacy for pushing the path forward.

Based on this experience, in 2015, a new mandate was passed by the city council, which forced all new developments from a certain size to install on-site reuse, which further sped up diffusion. Two things had to be sorted out first. On the one hand, local firms, the utility, the regulators and consultants joined forces to create a whole new regulatory framework for on-site reuse. They departed from the normal regulations used for centralised treatment in the hydraulic market logic and created a new one for on-site reuse, framed around the water sensitive logic. Some engineering consultants and sustainability consultants also really actively created a new storyline around on-site use, which was essentially a hybrid of the water market and the sensitive logics. They were saying that on-site reuse can be profitable and sustainable at the same time. This was then the storyline that was taken up by many actors in the city and also by tech firms in Silicon Valley, who then used this to implement on site re-use, also on their campuses to improve their eco-friendly image and further legitimise on-site reuse idea. Currently, this path is poised to grow and further diffuse in the city. For example, the firms that are providing systems have created a new design-build-operate business model. They design on-site systems, they certify them, they install them in buildings, and they also do the operation maintenance. With this model, they can make profits in all stages of the value chain, and also act as an intermediary in the system to make the whole system work smoothly. In parallel, the utility has engaged with creating operator certification and training, especially for the firms and actors that are involved in the operation maintenance, which lack deep technological expertise.

Beijiing. In Beijing, there's a different story. At the beginning, it looks similar. On-site reuse was also introduced in a specific niche market in large hotels that had enough investment available and also technicians that could operate systems well. Because this was successful, two things later happened in parallel. On the one hand, the city also realised that they needed to better specify the roles of all involved stakeholders and actually opened additional niche markets and government buildings and university campuses to learn more about how these systems work and how to maintain them. But, at the same time, an ordinance was passed that also mandated that all new residential districts in Beijing from a certain size on had to include on-site reuse. But at this time, many of these institutional frictions and incompatibilities had not yet been resolved. So, in this new mass market, a big mess was created because, for example, developers didn't know how to install these systems and how to maintain them. The newly created water quality standards were never really enforced, and so many of the systems did not perform up to standards. There were many firms active in this market that did not really have the capacities and capabilities to really create safe systems. This has led to a deep de-legitimation of the idea in Beijing. This is a real pity, because in parallel there were still some niche applications that worked really well and are still being maintained up until today. So, for example, in the suburbs of Beijing and in restaurants and resorts, on-site systems are working quite well. There is also a really interesting O&M model, where the utility in these suburbs actually install and maintain and run these systems together with sub-contractors from private firms. This notwithstanding, on-site water reuse is currently considered a second-best option in comparison to the old conventional logics with the gold standard of large-scale, centralized infrastructures.

Conclusion. So, what does this all tell us? Three key reflections could be drawn from these examples. The first one is that institutional complexity and how to deal with this, is of key importance in both developed and emerging economies. The basic challenges are these incompatible institutional demands and how to navigate them. Of course, the forms of complexity will differ between contexts. In particular, the coexistence of different service regimes at the beginning of a path certainly plays a big role. In San Francisco, you had a very monolithic regime at the beginning, which is now more and more being hybridised in a way. In other cities like maybe Nairobi, there is a very splintered regime at the beginning with many different service provision logics co-existing in the same place. And then, of course, it is much more about coordinating between them than overcoming an existing very strong regime in the first place. That also brings us back to the point that SCHRAMM made in this report about modernised multiplicity. So, there is certainly no one-size-fits-all way in how to deal with institutional complexity in sanitation transitions. Each city will have its own form of institutional complexity that the actors have to navigate and settle. And there's, of course, also strong differences in financial and organisational capacities between cities. San Francisco could implement on-site reuse with a very expensive top-down approach. In many other cities, it cannot be done in the same way. But still, certain aspects like this regulatory framework that they've created could serve as a template also for other places.

The second key point is that creating this institutional support structure takes a lot of time. If a city wants to go for on-site reuse, the stakeholders will have to know that this is a 10-year experimentation and learning process at least, mainly because there is a need for a lot of collective action to reconcile these conflicting institutional demands. Institutions tend to be very path-dependent and resistant to change. And this cannot be done very quickly; this is about a long-term learning and policy experimentation process.

The third key point is that there are different roads to failure. One is that targeting a mass market or large-scale diffusion too early, as in the case of Beijing. This will very likely create confusion, and a big mess in the city, because exactly these institutional demands would not be reconciled and would just create a lot of misunderstandings. Another related point is that if the actors locally do not have enough time to create new or adapt existing institutions, this would also very likely lead to failure. And one key point that came out from San Francisco very clearly is that there is a need for some system intermediary that coordinates this long-term transition process to some degree. So, in San Francisco, the utility took this role, but private firms and some consultants also increasingly played a role in keeping the strings together, keeping the system moving forward and solving the largest institutional bottlenecks, one after the other in a quite strategic way. And that was clearly missing in Beijing. So, to

make the transition to on-site reuse a reality, cities in both developed and emerging/developing economies should start experimenting in a well-structured way. And they should probably also start learning more from each other, because there are really a lot of key lessons, especially from this institutional perspective that can be shared and potentially translated between contexts.

4.2. Institutional change for the urban poor, how can research help? - Sam DRABBLE, WSUP and Urban Research Ltd

Institutional change, takes time, and it's also wider than the institution. There were many other enabling factors that must be in place in order for institutions to be positioned to drive forward processes of change. Research has a powerful role to play in unlocking barriers and catalysing change. But research is most effective when it responds to and aligns with the evidence, needs and priorities of institutional partners. So, it's important to go through a process of co-creation around identification of research priorities that can help to unlock institutional change. WSUP is an implementing organisation. It has six country programs in Africa and Asia. Its entry point is always the mandated institution, the institution that is responsible for providing city-wide water and sanitation services. WSUP works with those institutions to develop capacity to test service delivery models. Research and evidence have been built into a theory of change from the outset. Researchers at WSUP believe very strongly in the power of research to help to drive forward these wider goals.

In her a review of theory and practice of institutional change in the urban water sector, Chenguelly (2019) begins by setting out the historical context. Regarding interventions supported by World Bank projects, institutional reform was much less commonly a part of projects then than it is now. There is increasing momentum and an acknowledgement of the critical importance of institutional reform and sanitation is increasingly now discussed in relation to governance and institutions rather than, as perhaps previously, more of a technical issue. The focus of this report is absolutely right in that regard and reflects the direction of travel. Chenguelly (2019) identifies four key factors to look at institutional change in the urban water sector. One is cultural norms. Within institutions there remain strong hierarchies. It's difficult for junior staff, for example, in water institutions to have an influence on senior staff because of those hierarchies, complex bureaucratic practices and decision-making processes. There's a donor culture that still predominates in some settings. One impact of that is there may be a tacit expectation that extending services to slum areas or informal settlements, poor service provision should be funded by donors, not necessarily the responsibility of institutions or of domestic resource mobilisation. The idea that sanitation is a household responsibility is deeply rooted. Sanitation is still not universally regarded as a public good. That, again, reduces the level of accountability on institutions and the level of public finance that is allocated. This review underlines the institutional change takes time.

Three examples of research to drive institutional change are given. They are taken from the Sanitation Research Initiative, which is a four-year programme that has just recently been completed, funded by UK Aid. It had been designed primarily to drive sector change in three of WSUP's focus countries: Kenya, Ghana and Bangladesh. All of the research that was commissioned through this programme was based on close consultation with WSUP's institutional partners in those countries to understand the key evidence gaps that they perceived and where new evidence could help to unlock barriers to change. There was strong research into policy focus. There were five thematic areas under this programme, really looking across the totality of what is required to deliver urban sanitation at scale. One area is institutional frameworks and capacity.

The first project was around barriers to local government delivery of urban sanitation in Bangladesh. The aim of that project was to assess the current practice of three city corporations in Dhaka North, Rangpur, and Chittagong, three of the largest cities in Bangladesh. Those city corporations are responsible, mandated to provide citywide sanitation services. This research was aiming to understand whether they have the capacity and, in a sense, the organisational attitude to deliver against those mandates. We found that the city corporations had limited capacity and sanitation planning investment management. Importantly, no city corporation had a citywide master plan, and

many different municipal and national departments are involved in sanitation. In addition, there is a lack of coordination and leadership. However, there were some positive impacts that came out of the recommendation. The research recommended that city corporations establish sanitation units to coordinate, fund and provide Faecal Sludge Management services. Looking at sanitation overall in the context where WSUP works, establishing a dedicated department within the utility or the city corporation is a formative first step in many cases. Rangpur City Corporation since formally approved the creation of a committee to drive that sanitation unit forward.

The second example is a one of how researchers and those commissioning research need to be opportunistic in looking for the moment in time where they can support processes of institutional change. Through the middle of this program, an opportunity arose that was that the Ministry of Sanitation and Water Resources in Ghana (a new government) had stated their intention to establish a national sanitation authority to provide the institutional home for sanitation sector development. WSUP commissioned this research to support the consultation process and to directly inform the design of that new institution. This was an international comparative study initially, which looked at a wide range of countries that had institutional set ups that perhaps could inform the NSA, perhaps comparable institutions to the proposed NSA, to see what could be learned in terms of the roles of this new institution in Ghana. There was quite a clear recommendation that emerged from that research, which was to focus the scope of the NSA because the initial ministry view was that the responsibilities of the NSA would be very wide, ranging from capacity development to regulation to infrastructure. Out of that, a consensus was formed that the NSA should be set up alongside a separate national sanitation fund as opposed to integrating those two functions. The outcome of this is still with the ministry as they begin to take forward their thoughts around the NSA.

Then the final example from this program is on barriers for female decision-makers in Kenya's sanitation sector. Gender inequity is a huge issue in sanitation overall. The research focused on to what extent that dynamic is reflected within sanitation institutions. Researchers looked to map gender representation in those institutions and to analyse gender inequity and to assess if gender also makes a difference to decision-maker attitudes towards urban sanitation. They found the corporate leadership roles within these institutions aren't evenly split between genders. There are some very rich primary data around the challenges that women experience, which limits their professional aspirations and influence on policy. Interestingly, the research also found that participatory approaches, which tend to be more typically supported by NGOs, involving women in the design and implementation and monitoring of interventions: those really allow gender perspectives to come to bear and lead to gender-sensitive programming and policies. Institutions, currently, perhaps are not as strong driving those participatory approaches.

A new research is looking at some of wider factors that must be in place for institutions to drive forward change processes. It focuses on three core functions to support citywide inclusive sanitation: (1) clear responsibilities; (2) clear accountability; and (3) sufficient financing and resourcing. This research maps to existing mandate structures for urban sanitation. Typically, responsibility for sanitation sits either with the utility or with local government. A key issue is that the responsibility for sewerage sanitation and for on-site sanitation is often split, i.e., sits with different institutions, and that presents co-ordination challenges at the citywide level. But encouragingly, a number of countries are actively reviewing institutional responsibilities for sanitation and initiating connected processes of institutional change: in Zambia, driven by the regulator, in Bangladesh and Tanzania. Looking at Latin America, that is also the case in Colombia. Mandates are not static. For institutional change to take place, responsibilities have to be clear.

Accountability also has to be clear. This is a parallel paper where WSUP's researchers explore some features of effective accountability systems. For institutions to enact processes of change, they need to be: clear incentives, clear service objectives and transparent monitoring. In Kenya, there is a water and sanitation regulator, WASREB. It issued a national sector-level report. WASREB is really leading the way as a national level regulator that is actively looking to create the incentives for institutions to reorient and to drive service provision to low-income areas, informal settlements specifically. It's a good illustration of the time that is required and the different steps involved in institutional change. At

Nairobi Water and Sanitation Company, there was a 17-year process beginning in 2002 towards where the utility is now, because it has a very well-staffed, significant department that is responsible for providing water and sanitation services to informal settlements. The utility has gone from a situation where, in 2009 they created these informal settlements department, just had two people at the time. And then a series of steps have followed, strategies, key performance indicators have been introduced, and that department is now expanded to over 200 staff responsible for serving informal settlements. Again, a formative step can be creating a department actually within the institution itself that is responsible for water or sanitation.

Institutional change takes time. It requires long-term partnerships and strong leadership. An interesting fact about the Nairobi water experience is that the first leader of the informal settlements department, when it was just two people, went on to become the Managing Director of the utility. Thus, that was really significant in promoting continuity of that vision. Strategic mind-set is required from those leaders. Practical solutions: when looking at sanitation, that needs to be an understanding of service delivery models that can support, for example, or to respond to the practical realities of informal settlements. Simplified sewers are one example that Nairobi Water is looking at closely, as it is particularly well-tailored to informal settlements. And a supportive enabling environment including critically strong regulation. This is where WSUP has to come to now, in its programmatic work: they have developed a utility diagnostic, a framework that really conceives, conceptualises the journey of institutional change as an eight-step process, which includes working with the institution to diagnose relative strengths and weaknesses and priority areas to move forward. They think this is a really helpful tool to break down and understand what institutional change involves.

As a conclusion, the key messages are:

- institutional change takes time;
- it is much wider than the institution;
- institutional change requires the wider enabling factors in place, like clear responsibilities, accountability, financing;
- research has a really powerful role to play, but it needs to respond to the priorities of institutional partners. It can't be imposed externally.

4.3. Barriers and drivers for institutional change - Claude MENARD, Christian BINZ and Sam DRABBLE

Both BINZ and DRABBLE expose in this report the complexity of the institutional environment. How these elements can really be disentangled, so that their respective importance may really be assessed in a specific environment? What are the steps for operationalising that checklist, so as to prioritise the factors involved? Looking at the framework by HACKER and BINZ (2021), having this generic six dimensions as an important first step to understand this complexity, and to think through it / engage in deeper theorizing about potential interconnections. The question is also how complexity might differ between specific contexts. Could we somehow typologise this a little bit? That's certainly a way forward for future research. A place like San Francisco has much more social and financial capital available to make on-site water reuse happen. At the same time, they also have a disadvantage because they have a deeply locked-in system that they have to argue against. Many emerging developing contexts might in turn be lacking technological capability and financial resources, but there may also be a weaker pre-existing infrastructure regime that one has to argue against, which leaves a lot of open space to develop new solutions. In a way, these challenges may balance out a little bit with each other. A way to prioritize it to rely on stakeholder coordination, let stakeholders set identify prioritises. WSUP has recently developed an evaluative tool, the Sector Functionality Framework, which sets out the different elements of a functional sanitation system. But looking at systems the key point is to identify leverage points, what actions can be taken that will have positive catalytic impacts on other parts of the system? WSUP has been bringing together different institutional actors in the cities where they work to assess the relative strengths and weaknesses of the sector, and to reflect on what might be considered to be those leverage points. But that's very challenging and it needs very careful analysis.

One immediate step can be to identify simply low-hanging fruit and then plan further steps. What is the sector position to deliver, to make progress against, being careful, to think through what impacts that would have on other parts of the system? So, bringing stakeholders together to think that through together would be one point around prioritization.

Along with this issue of managing institutional complexity, institutional change requires leadership. There's an important role of leadership to make the change successful in the long term, which raises a problem, which is that usually political appointees or political leaders are there for a relatively short period of time and it changes for a long period of time. Then, there's a problem of leadership here to maintain the continuity of the projects. What are the conditions for the strong leadership with continuity, which is very challenging because precisely the institution changes very slowly? Leadership is often complex and distributed. For example, in San Francisco, the key was to have some system intermediary to push the transition forward, which is not necessarily only the government or the utility, but also other actors in the system. It could well be the building owners, for example, or an NGO, so also in developing country contexts, developing such intermediaries with a long-term perspective that try to orchestrate the implementation and coordination process a little bit might be crucial. It could also be that firms take over this key position in the mid-term future, because they see a business model like in San Francisco and then really push the implementation forward. So, in that sense, there are different pathways in which leadership can be enabled. A strategy to sustain leadership has been experienced by WSUP in a work with Southern Water, which is a utility in Zambia. To mitigate the impacts of a change in leadership, SWUP has engaged all departments in the strategy, so that all departments within the utility have an active voice in defining priorities. Even if there is a change in top-level leadership, an impetus for change has started being embedded. Both in the San Francisco case, which was relatively successful, and in the cases studied by WSUP as exposed in this report, it seems that there's a strong problem underlying these experiences, which is a coordination problem. For example, in the case of Ghana that was mentioned, to deal with that coordination problems, there is a suggestion to have different institutions. For example, separating the national fund as the entity that is responsible for the finance, and the national regulator.

Multiplying institutions to implement the system and to control its success, is multiplying transaction costs and coordination problems. But it can be necessary to ensure strong accountability. What could be the solution for that problem? One solution in San Francisco was that they actually created a complex governance arrangement, where they defined one responsible party, but who exactly was that party remained flexible. Basically, their ordinance says with each system, somebody who is ultimately responsible has to be designated. But that's not always the same entity. In some cases, it is real estate developers and in other cases it is the firm who installed the water reuse system. By this, they could lower the coordination costs, allow for flexibility and even encourage different actors to play that intermediary role. By that, the different actors in the system could deal with this complexity and resolve places where high costs accrued and find solutions that could bring the costs down to levels that are still high, but could in the mid- to long-term future, then also become competitive with the existing system. These costs may be mitigated through coordination, polycentric governance in these systems. Having multiple institutions creates challenges that can be overcome if roles are clear. For example, in Ghana, the proposed roles of the NSA were just too broad that it would create complications. It's perhaps preferable to have multiple institutions, but with clear roles. And there is certainly an important place within that system for external actors, that might be donors or NGOs, to support coordination. But in the countries where WSUP works, the regulator is really the key. This is specific to water and sanitation. The national level regulator has been the key coordinating institution in driving forward the key sector reforms, in Zambia, in Kenya, in Mozambique. It is the regulator that is bringing the actors round the table. However, that may be related specific to those countries.

For the past 20 years, one of the key drivers of institutional change has been the introduction of regulators. What role for regulators to sustain institutional change along with non sewered sanitation operators as well as sewerage operators in citywide environment? In WSUP's programmes, regulator leads the institutional change. It's the regulator that is best positioned to enact or to introduce the incentives that are required to provide services to informal settlements. In Zambia, there has been a very significant process of national sector reform led by the regulator that connects again to

responsibilities. It is supporting the execution of mandates so that commercial utilities now take responsibility for on-site sanitation. But we are still early in that process. There are still a lot of questions to be answered around how institutions will respond to that change in mandate. And that's something that needs to be monitored closely because the realities of on-site sanitation are very different from sewered sanitation, the market is more complex. There are many different elements in the sanitation chain. The responsibilities need to be clear at every step of the chain. Enforcement needs to be effective. The incentives need to be there. WSUP is seeing movement in countries like Zambia, perhaps also in Kenya and Mozambique but is not at the point where they are able to demonstrate that the regulator has been effective in driving forward those improvements to on-site sanitation. But as agreed, it is a long-term process. Isn't there a contradiction between developing a national regulator like the ones mentioned for the sewage system and at the same time promoting a very decentralised, polycentric system? What's the role of regulator? What is the capacity to implement and or is it just one more bureaucracy? In San Francisco, regulators initially came in with a very strong public health and hydraulic logic. So, they are used to having full control of checking the effluent water quality of specific plants. It's easy to have consistent measurement of all pollutants in centralised systems, because there are only a few key control points. When moving into on-site sanitation systems, what is needed from regulators is openness to get into a new role, because in this space, the regulator does not have full control anymore unless there is a very sophisticated online monitoring system, which doesn't exist yet. So, in a way, they have to delegate some of the responsibility in a governance arrangement in which firms that provide systems and the real estate developers, the operators, all play a role in guaranteeing safety and maintaining consistency of the effluent quality. This openness is key. It also means that there are these polycentric governance arrangements in different cities. A national regulator for on-site infrastructures may not be relevant. What is needed is locally, highly capable regulators that are able to create new regulatory frameworks, safety rules and governance arrangements and then deal with these systems in a context-sensitive way, which is a huge challenge. The choice for a national versus a local regulator really depends on the context, on whether for example it's a federal country with different institutional arrangements and different roles for the regulator and different accountability mechanisms, also depending on who is responsible. The role of the regulator would be quite different if it's interacting with a utility relative to a municipality. WSUP has recently investigated the different accountability mechanisms at play, even whether it's a national utility or regional level utility, a city level utility. The interaction with the regulator and the optimal level of decentralization is going to vary significantly.

On this reflection on who could lead the change, one can wonder if innovative organisations that would have helped leading to change emerge. In the sanitation sector, there are a number of innovative organisations that are supporting new technologies and technological innovation. In terms of supporting institutional innovation, they may not be as visible. One is in San Francisco. A local sustainability consultant firm played an important role in legitimizing the idea. They created public outreach documents with storylines on why it is a good idea to do on-site sanitation and explaining that to developers and to regulators and to the sort of research community and everybody involved in the system basically, in a very approachable way. They were really active in networking and keeping, also creating narratives to legitimize this whole idea. Another example is from Bangalore, where local NGOs plays a key role in pulling the strings together, basically making everybody who is involved in this governance arrangement, talk to each other and network. They're doing this with idealism, really trying to push this idea and actually are now a key facilitator and intermediary in the network pushing things forward. It's a very locally based organisation that took on this task. There's quite some innovation coming from innovative, bottom-up actors.

Sanitation is very often not an attractive sector, with salaries that are relatively low and little commitment from public administration. What is the role of workers as a key element in the development of sanitation system? And do we need to institutionalize specialized courts that will be paid with the specific regulations? It's really crucial and also a gap in many of the operation & maintenance systems. The status of these workers needs to be improved over time, especially by reframing what sanitation is in the future. Currently it is framed as this end-of-the-pipe type of work that is dealing with human waste, which is really low-profile in most countries. That requires really government commitment to prioritise basic services like sanitation and ensure that skilled workers

who enter municipalities, for example, are rewarded for their contribution in that area. Going for SDGs and circular economy framings may help to reframe this type of job as something that's actually creating key inputs like fertiliser, or resources needed to grow food. This business can also be improved in any context recognising these are people that are really crucial for keeping our cities clean and healthy, to provide resources to agriculture and so on. It is really a problem to get people, qualified people into this business.

Another barrier to change may be having to deal with both innovation and existing infrastructure. Do we need new cities to build ideal sanitation schemes? How to deal with the implementation of the new approach in existing systems? In China and Beijing in the 2000s, this was still a booming city with lacking infrastructure. It wasn't like the cities were built from scratch, but they were expanding so quickly that at the fringes, whole new districts were being created in a few years. This was a perfect context for leapfrogging to on-site sanitation. Developing a new model that's tailored to local contexts, conditions and doing something dramatically different to the status quo, especially in an emerging-economy context, where some money is available already as well as technological capabilities. But then, it's not that simple because the conventional, centralized regime was already present, many consultants and firms were already there and many key decision-makers in the Chinese water sector had a mental picture of what a successful water and sanitation infrastructure would look like (Binz et al, 2012). And it wa**s** the gold standard, centralised solutions. So then, when on-site reuse was implemented, it was seen as an inferior or temporary solution from the start and there were all these frictions, institutional frictions, in the system, even though there was still a lot of space for experimentation. A completely new city would still struggle with the regime structure that exists in decision maker's heads, while the key experts and right support structures to support on-site sanitation would most likely not be in place locally. The key model is rather to have a few lighthouse cities around the world in different contexts, where one can argue this on-site sanitation is a success case, since they have really well specified certain parts of the value chain and of the governance arrangement, and then to somehow learn from these different experiences and come up with an overarching idea of what a best practice for on-site reuse and especially governance and operation & maintenance systems would look like. It is critically important to work with the grain of the city and the structures that exist. There always needs to be an awareness of that, and there needs to be a foundational analysis around the current institutional structures. In Visakhapatnam in India, the Swashh Bharat mission is looking to eliminate open defecation. In that city, the program worked very effectively with what was quite a complex administrative structure in the city. There, women's self-health groups proliferated across the city, and they have a very important voice in civil society. That programme engaged those groups very effectively to support this, what became a ward-by-ward approach to eliminating open defecation (Drabble and Gautam, 2017). That's a very good example of working with the grain of the administrative structures, acknowledging that it's not going to be effective to impose new structures externally. One has to assess what's there and what changes can realistically be made within that context.

5. Institutional innovation at national or local level: feedback from cases in Morocco and Madagascar

5.1. Can an NGO help moving institutional barriers? From working with a group of small private operators to building a social franchise by GRET - Marion SANTI and Milena PONCIN

We are going to focus on the case of Madagascar and see how an NGO can cooperate with small private operators to remove these institutional barriers that are present in the individual wastewater treatment sector. In Madagascar, at the national level, only 11% of the population has access to a basic sanitation system. 45% of the population defecate outdoors. The situation is even more degraded in rural areas, where 57% of the population defecate in the open air. The impact of the lack of access to sanitation on such a scale is immense on public health, living and working conditions, nutrition, education, the environment and even the economy. For example, diarrheal diseases are the second leading cause of death after malaria.

As stated in this report, the first major barrier to access to sanitation is institutional. The authors refer to social norms, beliefs and representations at the household level. For example, it is not common practice to have a private latrine for Malagasy households. It is also the last feature to be added when a household builds a house. In addition, it is only built if there are funds available, which is, in fact, rarely the case. In Malagasy social representations, toilets are seen as being dirty and unhygienic and are not at all considered a priority. As a result, latrines cannot be sold as conventional goods to households. The second barrier, a very strong one in Madagascar, is the organisational barrier. The toilet market is very small. For the most part, masons sell toilets, which are generally too expensive for average households and poorly suited to their preferences. There is therefore no really suitable offer.

To respond to these barriers, the GRET, since 2010, has used the social marketing approach to sanitation. It cooperates with small local entrepreneurs so that they produce and sell toilets in toilet stores called “sanimarchés” in French or sanimarkets in English. In this case, we are referring to the social marketing of sanitation, since conventional marketing tools are used in order to have a social impact and get households to equip themselves with toilets and, consequently, to improve their sanitary conditions. In sanitation social marketing projects, households make a full or partial financial contribution for the purchase, construction and maintenance of a toilet. This ensures that households genuinely want the infrastructure and services for which they are paying, and therefore appropriate toilets on a long-term basis. Finally, the implementation of sanitation marketing mobilises the local economic fabric by supporting small operators to ensure the sustainability of toilet stores.

First, to change the perception households have of toilets in order to create demand for something that does not initially appear to be a priority, raising awareness is the first key step. The GRET relies on information, education and communication techniques to raise awareness about the importance of toilets, to improve community hygiene, and for the well-being and development of households. Awareness-raising interventions are carried out as close as possible to the households concerned so that the benefits and messages are fully integrated. For example, through public events or through door-to-door activities with facilitators. These operations require a lot of investment and personnel. The awareness-raising sessions do not only highlight the GRET solution, which is called the Diotontolo, since the interest really is to convince households of the usefulness of equipping themselves with individual toilets. GRET's experience indicates that awareness-raising alone with hygiene messages will not be enough to trigger purchases. Awareness-raising provides a favourable groundwork. It is then supplemented by social marketing, which is used to provide a solution tailored to needs. The use of marketing communication makes it possible to adapt to the value system and preferences of households. For example, it is necessary to promote toilets that are robust, inexpensive and odourless, using specific local communication channels, via radio messages, events in markets or

during holidays, from door to door. Once the demand has been created, it is still necessary to structure the offer to adapt to this new demand.

In parallel to stimulating demand with marketing communication tools, the GRET worked to structure the offer, first of all by organising the toilet distribution channel. Initially, the GRET worked with masons to support them in no longer just producing and installing toilets when households came to request them, but in a proactive approach, canvassing and selling toilets, and to organise the management of a sanitation company. In this organisation, the GRET has a role similar to that of a franchisor since it provides technical know-how, marketing tools, a brand to support these entrepreneurs so that they have access to a network of sanitation companies, and in addition, to a subsidy fund. Initially, it was the masons who were targeted for this process because it became clear that they did not have a proactive entrepreneurial approach, their habit being to wait for customers to come and solicit them. The canvassing necessary for the sale of toilets did not occur because toilets are not a product in which households are particularly interested. The demand has to be created.

To demonstrate that it was possible to sell toilets, the GRET undertook to recruit and supervise sales teams, who carried out the canvassing and sale of toilets. In this organisation, the masonry contractors were only in charge of the production and installation of the toilets. It also benefited from a number of marketing and mass communication operations to support the approach of salespeople. The approach has borne fruit without ensuring its sustainability due to its dependence on the GRET. In order to have a more sustainable approach afterwards, the GRET has tried to train entrepreneurs in the new sales business line. This step turned out to be difficult to take and the GRET focused more on identifying people who already had an entrepreneurial approach, who already had a business and who were prepared to acquire sanitation know-how, rather than starting from people who had sanitation skills and became entrepreneurs. Another obstacle has been the willingness of households to invest. It led the GRET to seek solutions to bridge the gap between the real price of equipment and the households' ability to pay. The solution tested was the use of a grant financed by the project paid directly to the contractor.

The GRET has been using this approach for some ten years in Madagascar. Over the decade, the store network has sold more than 10,000 sanitary toilets in rural and urban areas. They are installed by 17 local entrepreneurs. In parallel to this experiment, the GRET began to reflect on the sanitation business model in order to achieve a sustainable model that is not dependent on external funding.

Other challenges must be met in order to set up a complete sanitation sector: the existence of emptying services, treatment facilities, participation of the private sector. The main challenge is to maintain the social objective of the approach and to prevent entrepreneurs from trying to sell their toilets only to solvent households and not to households with lesser means. Beyond the recourse (probably necessary) to subsidies, organisational methods need to be invented, such as social franchising, social enterprise, and the longevity of recruited staff. It seems necessary to have a structure that is permanently present to collect funds from external backers or endogenous financing in Madagascar, in order to redistributing them. The advantage being that the presence of entrepreneurs makes it possible, once these funds are supplied, to very quickly transfer the subsidies to households. Another challenge is to reach the most vulnerable households, to mobilise the economic fabric of entrepreneurs and to be able to use an intervention fund.

5.2. An innovative approach: the example of the European joint co financing to ONEE (Morocco) in order to implement the national sanitation programme - Adil HASNAOUI and Olivier CRESPI REGHIZZI

This paper presents an institutional innovation regarding implementation of the funding of the national sanitation programme in Morocco via ONEE. This program is co-financed by several development agencies: the AFD, the European Investment Bank (EIB), the German development bank KfW, the Belgian Development Agency (Enabel) and by the European Union.

In Morocco, municipalities and communes are responsible for drinking water and sanitation services. They operate the water and sanitation service, either directly, or through the creation of a management company, or by delegating it to a private or public operator, such as ONEE. The public operator, ONEE, is the main operator for drinking water and electricity in Morocco, resulting from the merger in 2012 of the National Electricity Office and the National Drinking Water Office. It has also been in charge of sanitation since 2000. Morocco is obviously a country facing significant water stress, which is accentuated by climate change. Against a background of climate change and significant water stress, the National Sanitation Programme, launched in 2005, is part of an even larger programme called the National Programme for Pooled Sanitation and Reuse of Treated Wastewater which also includes targets for the reuse of treated wastewater. The extension of sanitation and purification is a key issue, not only in terms of positive externalities, in terms of hygiene and public health, but also in terms of the protection of water resources, with a focus on adapting to climate change. The shared national sanitation programme is therefore an important part of Morocco's strategy for adapting to climate change.

The reciprocal initiative for the recognition of procedures between the EIB, KfW, the EU and the AFD seeks to promote the effectiveness of aid in the spirit of the Paris Declaration. On the basis of this initiative, the supervision of the projects can be carried out by one of the said institutions on behalf of the others. As part of this programme (National Mutualized Sanitation Program), the AFD has been selected as the lead backer and is the one-stop-shop in relations between the borrower, ONEE, and the backers. This organisation involves joint assignments, for example, for the funding and then it is the AFD which is mainly in charge of the regular monitoring of the programme with ONEE. The programme is 50% co-financed by the Moroccan counterpart, for example, dedicated funds such as the Liquid Sanitation and Wastewater Treatment and Reuse Fund (FALEEUR), under the coordination of the Ministry of the Interior. And it is the administered funds that secure the budget and its use. A programme approach of this kind is a very important point to underline. Following the success of the first phase of the European co-financing "AFD, KfW, EIB and EU IVF" of the PNA, there was a second phase, PNA 2. In this context, there followed the approval of a procedures' manual and not just a list of projects. it includes eligibility criteria, project optimisation, with environmental and social provisions, acquisition, monitoring, audit reporting, etc. It is also possible to occasionally derogate from certain optimisation criteria by justifying the existence of exceptions. In the end, about 60 small and medium-sized urban centres in Morocco receive investments for sanitation.

The National Office for Electricity and Drinking Water was created in 2012. It is the result of a merger of two offices: the National Electricity Office and the National Drinking Water Office. In terms of drinking water, we operate within the framework of three strategic areas of focus:

- Securing the drinking water supply throughout the Kingdom.
- The generalisation of access to drinking water in rural areas.
- Active interventions in sanitation issues.

The drinking water production capacity is around 1.2 billion cubic meters per year. The rate of access to drinking water is around 97.8%. In terms of sanitation, the Office operates in 142 centres.

Governance of the sector takes place at three levels:

- the advisory bodies of the Higher Council for Water and Climate;
- in terms of planning, given that water is used for irrigation, hydropower and drinking water, a series of ministerial departments are involved: Agriculture, Energy, Sustainable Development, Department in charge of Water and the Ministry of the Interior which ensures the supervision of local authorities;
- the operators: the municipalities, the city councils, the ONEE, the private operators and the ORMVAs in charge of agriculture.

Regarding the deployment of European funding, ONEE looks for clearly defined projects within the framework of a programme approach by defining eligibility criteria and allocation criteria. The support of the Moroccan part is carried either by the communes if they have the necessary resources, or by

the State by using specific funds (FALEEUR, TVA, etc.). The initial deployment of the projects was by basin. Today, deployment includes many centres according to a programme approach. ONEE has in the past financed projects within the framework of basins. But the approach taken with European backers is to focus on centres that are spread over the whole of the country on the basis of a long list.

The appraisal was coordinated by the AFD with the support of other backers: the EIB, KfW, and the European Union. To do so, a procedure manual common to all backers has been drawn up. It sets the rules for allocating projects, acquisition processes, environmental and social clauses, auditing, monitoring, reporting, etc., and which is applicable to all backers. However, a financing contract is concluded with each European backer with specific clauses which differ from other contracts with European backers based on the procedures manual that is applicable to them.

The key success factors are:

- cooperation with backers. This takes place within a study group which provides a space for sharing and discussion and which allows an appropriation of the issues, challenges and constraints;
- the sector is a priority for backers as well as for their Moroccan counterparts;
- the pooling of funding via the grouping of backers has made it possible to have significant amounts to effectively finance several projects. This practice avoids the multiplication of counters, instructions and follow-up assignments.

This type of deployment, with a single manual of procedures, also enables the interchangeability of funds by creating a special fund receiving all of the contributions from backers. This results in reduced deadlines for the appraisal and construction of projects.

In conclusion, this approach has made it possible to harmonise the interventions of backers and to appropriate the procedures of ONEE, which represents the local party. The lead partner played a decisive role in creating synergies with all the backers and with ONEE.

5.3. Discussion - Marie-Hélène ZERAH, Milena PONCIN, Marion SANTI, Adil HASNAOUI et Olivier CRESPI-REGHIZZI

The two cases exposed here-before seem to be extremely different examples. On the one hand, (NGO / Madagascar), there is a system of financing, or aid to financing, of an extremely decentralised and private sanitation market. On the other hand (State / Morocco), conversely, large-scale funding from backers is pooled to help finance a strategic plan at the national level. If these cases relate to two extremely different scales, they clearly show that, for each infrastructure process or system, extremely varied and specific financing tools are required.

As far as the Moroccan case is concerned, the advantage of pooled funding is obvious since it allows greater flexibility and broader funding. But sometimes having several financing windows also allows some leeway for negotiation, perhaps to define different programmes, to have different approaches. How this single window influences the asymmetry between the funding agencies and the recipient of the funding? There was no competition, but rather complementarity. When managing financing, there are three factors to take into account: the pricing conditions, the legal conditions of the financing contract and the operating mode which makes it possible to manage the financing from end to end. In terms of tariffs, ONEE has backers who are part of development aid. The tariff conditions result from a discussion between the AFD, ONEE and the Ministry of Finance. In addition to that, with this co-financing, there is also the interweaving of the European Neighbourhood Investment Facility and, in the case of a subsidy, it implicitly helps to increase the cost of financing. On the legal terms' sheets of the contract, there is a historical relationship with the backers. The negotiations are held in the general interest of the services, which have externalities on the economic, environmental and social level. In terms of operating mode, this complementarity of service management has made greater control of the operational context possible so that implementation is rapid. The Millennium Development Goals and the Paris Declaration for the Harmonisation of Aid call for a local modus operandi, given that ONEE has

considerably added value and a lot of comparative advantages. In terms of acquisitions, ONEE has purchasing regulations which provide assurance for all of the stakeholders. The operations manual has made it possible to converge on an operating mode. It is constructive, highly operational, and down to earth, allowing us to move forward quickly while encouraging the optimisation of projects. There is no competition, but rather a complementarity between the three aforementioned factors. As for the development of the MRI "Mutual Reliance Initiative", it is important to extend its application to all the terms of the contracts with a view to having a single financing agreement applicable to co-financing from the backers concerned

Then, in the case of Madagascar, we can clearly see what is being done to promote sanitation. But how can we assess this type of highly decentralised programme? There have been several assessments: conventional end-of-project assessments, which have made it possible to conduct household surveys, to check that they were indeed satisfied, and that they were using their toilets. But these assessments are made after a relatively short period of use. In addition, the GRET had to visit all the toilets to set up a localised monitoring system. This visit confirmed that all of the toilets (99%) were still in use. This exhaustive inspection also made it possible to observe that they were maintained and often fitted out, testifying to their appropriation by the users. They have become "their" toilets.

As a conclusion, the cases exposed in this report shed light on diversity of sanitation regimes and clearly show their implications in terms of organisation, financing methods and the diversity of tools that actually underpin these infrastructural systems.

5.4. Discovery report - Laurent BIBARD

Three key words emerge from the papers on institutional change in this report (section 4 and 5):

- Separation: that of the stakeholders in the field,
- Cooperation: it results from the common issue at stake and leads to the need to be coordinated,
- The place, an issue given particular attention.

Other equally meaningful words, such as "contradiction", "diversity", "variety of cases" could have been mentioned. Indeed, sanitation is an extremely multi-coloured world, with a wealth of complex situations due to the high complexity of the systems used and the considerable variability between situations. The result is a high level of diversity, which could be seen as of the first presentations, it seems to me in particular in Madagascar with the importance of sanitary toilets and in Morocco with the funding system supported by the European Union.

All the cases present, in one way or another, something which falls under what I call "separation". The latter is not deliberate, and concerns all stakeholders, including users. In Madagascar, this is perfectly illustrated by the fact that the population is highly insensitive to the possibility of accessing a sanitary toilet service. Separation is a very general concept and obviously applies to the area of water and sanitation that I am discovering. It includes the universal difficulty which makes our lives so complex: daily life separates us humans, wherever we are and whatever our job or profession: experts, contractors, operators, users, employees involved in the field of wastewater, and with all the dangers for operators in the field.

The work that we have to do, the life that we have to live, gradually results in our point of view of a given situation narrowing, whatever the position we occupy, whatever the job we have, whatever the task performed, whatever the use made of it. And, by narrowing down, that is to say by limiting oneself to where one is and the place that one occupies, one gradually ends up losing sight of the overall situation or of the context in which we live.

The purpose of scientific workshops, such as the one on which this report is based, obviously is to recreate that link. As mentioned by BINZ and DRABBLE as researchers: it is the purpose of research, and the link must be done with institutions. But for what reasons? Because everyday life and daily routines

break that link, resulting in a form of spontaneous entropy. MENARD, BINZ and DRABBLE state that "leadership is created, not found". Leadership breaks down because reality breaks ties. Fostering effective communication within their organisations is a crucial role for any leader. The difficulty of our existence is that we do not sufficiently perceive how daily life, with our own preoccupations, leads us to a partial view of reality. It obliges us - if ever we realise it - and calls on us to permanently recreate the link and, therefore, cooperate, the second key word.

The situation is dramatic when sanitation is no longer seen as a matter of the common good. Perhaps because the issue at stake is not spontaneously very visible. It is therefore absolutely necessary to re-share this characteristic and make this issue one of the main issues in the sector. From this perspective, the term "critical scrutiny" becomes very useful because we are all, on a daily basis, caught up in life and the short term, in pre-existing responses, in an approach based on solutions. This is both irreducible and legitimate. The difficulty, on the other hand, is that then the problems to which one is supposed to answer are sometimes even often overlooked. Indeed, we are flooded with solutions, especially since the explosion of artificial intelligence and new technologies. These solutions are answers that we are expected to spontaneously buy as consumers or users. And words themselves then become fetish words or portmanteau words, losing their meaning. This observation means that we are embroiled in everyday life which makes us lose sight of what is essential and, if I exaggerate a little, precisely to underline its importance, we no longer think. In the present case, we lose sight of the fact that sanitation is essential. The case of Madagascar clearly shows that even the population does not feel concerned and that the problem is not seen to exist. Critical scrutiny is essential.

The marketing operation for sanitary toilets carried out by GRET is remarkable for its effectiveness in developing a sense of the common good and in raising the awareness of a population on the possibility of leading a better life. This example leads to the third key word, "place", illustrated by the work of the GRET in Madagascar. The difficulty of the complexity to be managed in the water sector is in fact universal, because in fact we are contradictorily separated on a daily basis when the collective good is taken for granted. We must constantly relearn how to share issues and communicate, first and foremost, in the field.

To conclude this discovery report, an essential point we have to insist on is the difficulty of any critical scrutiny is that we take the collective good for granted because daily life separates us, and we do not realise it. On a daily basis, within the same company, we believe that we know in depth the work of our colleagues just because we work "with" them, and this is not true. One after the other, we miss many details, which can turn out to be essential. We believe in cooperating when in fact we operate in silos because we have the naivety to believe that we know each other well. So, the effort of cooperation, of remaking contact, to make sure that we are talking about the same things, is necessary for the complexity to be diluted, to critically scrutinise them together and thus be able to create a collective good. It follows that a good leader is someone who knows that we do not know each other, and who brings their teams together, who really makes them work together by making them talk about what they know how to do, and does so very locally and pragmatically, in the field.

It should be added that promoting change requires relying on history, on what we already know how to do and not only to consider the future. Generally speaking, when an organisation or a company has to change, it looks exclusively and unilaterally towards the future, presupposing more or less unconsciously that what one does or was doing until then must be left behind. This is a considerable managerial and strategic error. On the contrary, it is essential, in order to move towards the future, to recognise what we have been able to do in the past and which continues in the present. It is also essential not to change everything at once in an organisation, because this is at the cost of losing all identity. But the identity of an organisation is made up of its skills. And anyone, whatever their specific skill, whatever their social level, whatever their level of action and especially in the field, can effectively contribute to improving work and committing to change, as long as people are led to understand the importance of their work, to value what they already know how to do.

6. Work of young researchers on institutional change in the sanitation sector

6.1. A comparative study of wastewater reuse policies in Morocco and Tunisia - Amal ENNABIH

Morocco and Tunisia are two countries that suffer from water scarcity, due to drought, and the policy of irrigation with treated wastewater, commonly called REUSE, is presented as one of the solutions for adapting to climate change. This policy, based on a technical innovation, is highly interesting to study from the point of view of political sociology, because it is accompanied by the construction of a new form of governance, which involves a multiplicity of stakeholders shaping new relations both between institutions and the State, and between State institutions and farmers. The origins, fabric and implementation of REUSE are different between Morocco and Tunisia, which justifies the comparison that we propose. In Tunisia, the policy was instituted in the 1970s and 1980s, during the flagship period of the development state, and therefore before the creation of irrigator associations. In Morocco, the policy dates back the 2000s, therefore with a much more liberal state at the local level, where a practice of using raw wastewater for irrigation has developed in peri-urban areas. The communication of A. ENNABIH breaks down into three stages. First of all, it indicates what REUSE represents in Morocco and Tunisia, the legal framework and the institutional framework. Then it presents the methodological approach and finally some results obtained.

The reuse of treated wastewater in Morocco and Tunisia

In Morocco, despite some experiments in the 1980s, REUSE was only really thought of after the launch of the national sanitation programme, which started in 2005 and as a result has allowed the proliferation of wastewater treatment plants. The number rose from an installed base of 50 wastewater treatment plants before 2005 to 153 wastewater treatment plants in 2021. It was the National Water Strategy which, in 2009, for the first time set a reuse goal for irrigation of 300 million cubic meters of water per year by 2030.

In Tunisia, the first irrigation with treated wastewater took place in the 1960s and was, in fact, a crisis decision whose objective was to save citrus fruit in an area surrounding Tunis. This was made possible by the availability of a nearby wastewater treatment plant, because unlike Morocco, Tunisia had started its sanitation programmes in the 1960s and 1970s, in particular because of the wish to develop the tourism sector. This explains the installed base of 122 wastewater treatment plants for 12 million inhabitants, and the creation of 32 irrigated areas since the 1980s.

Regarding the legal framework, the laws and regulations are more precise in Tunisia than in Morocco. For example, in terms of standards, Morocco distinguishes, according to WHO recommendations, three categories of water and each authorises a type of irrigation and a list of crops. But the law does not define the governance procedures, for example. In Tunisia, the legal framework was drawn up in the 1970s and 1980s, to support agricultural projects, and to institute precise Tunisian standards translated into specifications setting out the prerogatives of each stakeholder and a strict list of authorised crops. Preventive measures for agricultural workers exposed to treated wastewater have been planned.

In Morocco, the institutional framework was created by pooling three distinct programmes: the national sanitation programme, the national rural sanitation programme, both managed by the Ministry of the Interior, the Department of Water and the Department of the Environment. To these was attached a Master Plan for the reuse of purified wastewater, drawn up by the Ministry of Agriculture, in 2016, which defines the agricultural areas of interest for irrigation projects.

In terms of process, first of all, there were two stages of state investment in infrastructure: the construction of sanitation projects and the creation of irrigated areas and hydraulic equipment. Finally, the third stage is the irrigated management delegated to the associations of irrigators who cover the

operating expenses (salaries of water workers among others) and also organise the eight water towers.

The process is similar in Tunisia: first the construction of a sanitation project defined by the National Sanitation Office (ONAS), then construction of the areas irrigated by the ministry of Agriculture. The difference lies in obtaining a prior authorisation from the Ministries of the Environment and Public Health. The delegated management of irrigated areas did not become effective until 2001 with the creation of the association of irrigators. In the areas irrigated with treated wastewater, the decentralised service of the Ministry of Agriculture has assumed responsibility for the management of water towers and certain operating expenses, such as the salaries of water workers, pump attendants and technical directors. The objective set is for the associations to take charge of other expenditure items such as energy and network maintenance in the long term.

The methodological approach

As part of this PhD research, A. ENNABIH carried out field surveys between March 2018 and January 2020 in the irrigated areas of Tiznit, in southern Morocco, and Zaouiet Sousse in Tunisia. These two irrigated areas were mainly chosen for their arid climate, a similarity in the sizes and profiles of the farms.

The Tiznit project was launched in 2006 and is still under negotiation. Covering an area of 287 hectares, it is intended for fodder and olive crops. It is important to know that farmers previously used raw sewage water to irrigate palm trees. The relocation of the treatment plant has interrupted the possibility of irrigating and this project is a way of returning water to its historical users.

The Zaouiet Sousse area has been operational since 1987 and is in fact one of the first areas to use treated wastewater. It represents a surface area of 257 hectares with, like the Moroccan area, fodder and olive crops.

My research question can be formulated as follows: how does the policy of irrigation by treated wastewater redraw social and power relations between State institutions on the one hand, and between state institutions and farmers on the other?

The first results

The development of defence strategies in the face of uncertainties within State institutions. The change brought about by this public policy creates competition between two forms of hydraulic expertise: sanitation, with its own logic, which is environmental in nature; and agricultural irrigation, with its logic of rural development, and therefore involves a search for an increase in water supply. These two areas of expertise have difficulty coordinating together, and agriculture most often depends on the sanitation projects that are developed. It therefore depends on the sizes of the wastewater treatment plants, and their locations. Then, the issue of water quality and the associated uncertainties (health, etc.) push stakeholders to develop avoidance strategies, or even fallbacks, where each player defends its core business and avoids taking initiatives, which could, in the long run, help to build an extended governance system.

The second result is the professionalisation of farmers, facilitated by liberalisation at the local level. In fact, over the course of the irrigation projects, farmers have been in contact with State agents, consultants, technicians, even researchers, and have been able to develop, and also accumulate, practical and technical knowledge related to irrigation and the reuse of treated wastewater. They have developed analytical and operational capacities. They can thus better negotiate with the State, in discussions between experts. The farmers also help circulate know-how. In Tiznit, for example, the President of the association has formed a group with the other association presidents of the other two areas irrigated with treated wastewater, and exchanges frequently with them on the progress of projects. He is also in contact with reuse professionals to keep abreast of innovations. In Zaouiet Sousse in Tunisia, the former president of the irrigators' association shares and exchanges his practical know-how with the farmers' union at the local level, of which he has become the President.

As a third result, there is growing demand for commitment from the State, which has transferred its responsibilities to associations. In Morocco, since the launch of the 2020-2027 emergency water supply programme - launched in 2020 - agricultural REUSE has been given lower priority than a few years ago. But the project persists in Tiznit, thanks to the members of the association, who want the State to assume its responsibilities. This has resulted in farmers negotiating the level of state involvement at each stage of the project. In Tunisia, the programmed withdrawal of the State has been slowed down by farmers who refuse the increase in water prices and demand first of all a sufficient quality and quantity of water.

In conclusion, it is a relatively recent policy of "DIY" in Morocco, a policy which has been institutionalised in Tunisia, a policy at the junction of two forms of hydraulic expertise, which produces institutional fragmentation, a policy that brings together and professionalises farmers, and furthermore that tends to balance the relationship between local State representatives and farmers. In the end, it is also a policy which calls for a stronger commitment from the State, in a context in which the latter tends to withdraw. This study, based political sociology, makes it possible to understand the effects of technology on social relations and power, hence the importance of analysing the stakeholders who are part of the larger and more complex processes. Also, through this presentation, we have seen that reuse is not only a technical project, but that it is part of more general agricultural policies, which are also covered by social and political mechanisms.

6.2. Discussion - Sarah BOTTON and Amal ENNABIH

The paper by ENNABIH is based on extensive and well-documented empirical work, recalls the importance of the field in conducting work in social sciences, with also a choice of areas, regions, stakeholders who will be the subject of surveys, and the long-time factor, which is extremely important because it allows us to grasp the ways in which institutions are constructed and deconstructed. Such type of research studies may lead to unexpected results. What is interesting in making and then implementing public policy, is that in both cases, whether in Morocco or Tunisia, the discrepancy takes effect at the level of the final target population and influences public policy later. For example, in Tunisia, as this is a very old policy, made local leaders have changed: transition from the development State, then the years 90-2000 to a slightly more liberal State, with a local level which is developing with associations, then with the Jasmine Revolution in 2011. And from there, the policy itself has changed. Hence my explanation in the presentation of much stronger demands which are expressed at the local level, where farmers, in a certain way, negotiate with the State to define public policy at the local level. In Morocco, when we see the making of public policy, we imagine something automatic, in the sense that we imagine the state investment at the beginning, then the keys are given to the associations which will manage the policy at the local level, no matter what it is. But what we see at this level is a change in leadership, in the sense that these target populations - there has been a lot of work by rural associations that document this, where they are in fact leaders - there is a shift in the rural elite, which means that they are younger, more educated leaders who are multi-positioned and who in turn are able to negotiate with the State. And that was not foreseen in the making of the public policy at central level. So, as in Tunisia, we find ourselves with farmers who negotiate with the State in order to be able to control the future of public policy - before receiving the keys from the State to manage the policy thereafter.

One can wonder how trust between sanitation operators and irrigators may improve at the local level. One of the channels for thought could be to include irrigators in the quality process of wastewater treated as such, in the sense that, at the level of tertiary treatment, operators could work together with the irrigators. For example, in the case of Morocco, the authorities generally prefer to stay in their core business, which is sanitation, and would like not to integrate tertiary treatment, which is very costly for them, especially for farmers, for a use which is limited to the irrigated area and to needs, even seasonal ones, and so on. What could be interesting would be to have farmers and sanitation operators work together, in order to go beyond this level of issues. In a way, it can also raise farmers' awareness about the level of water quality and all the work that is also required to produce this water. Whereas, until now, the main contact for irrigators remains farmers. So, the whole question of water quality, the

funding behind it and all the energy that is required to produce that water is somewhat obscured for irrigators. It would therefore be interesting see if work could be done together at that level.

6.3. Institutional change in the sanitation sector from the human and social sciences viewpoint - Héloïse VALETTE and Marine COLON

Why is sanitation in the countries of the South still an underdeveloped sector compared with others such as water or telecommunications, even though the lack of sanitation constitutes a major obstacle to development and health? The lack of sanitation endangers the populations, harms the dignity and the safety of the people, and even the environment. Despite this observation, a discrepancy persists between needs on the one hand, and the development of sanitation infrastructure, on the other. Even if innovative technologies are regularly promoted by international organisations, backers or foundations to respond to these challenges, very often they do not succeed in becoming established durably in the South (Muller, 2020).

In an attempt to answer this question, this presentation analyses the contributions of works in human and social sciences that study sanitation. It is part of a dynamic perspective, focusing on the study of change. The change includes both technical and technological change, but also "everything around it": changes in rules, the reconfiguration of the roles of stakeholders in the sector, changes in practices, and even of mind-sets. In institutionalist jargon, this is "institutional change". Institutional change is "a multi-level process", therefore at the micro level (users and companies), at the macro level (organisations, national policies, States), and also at different administrative and regional scales with the creation, modification or disappearance of institutions. The concept of an institution is understood here to mean anything that will provide stability and meaning to social life. For example, in the institutionalist vision, families and currencies are institutions: they give meaning, they go "without saying" and allow stakeholders to have common reference points, to coordinate and have regularity of behaviour. According to neo-institutional sociology, an institution is based on three cornerstones (Scott, 1991):

- *cognitive*, which is related to the dominant know-how and thought patterns;
- *normative*, which relates more to representations and conventions. For example, the literature indicates to a considerable degree that representations relating to sanitation are considered taboo, intimate and private (Black, Fawcett, 2008);
- *regulatory*, i.e., is linked to rules, be they formal or informal, that is to say laws, contracts, surveillance measures, but also habits and customs.

For there to be institutional change, it is necessary to target the three cognitive, normative and regulatory cornerstones. In the literature on sanitation - in the social and operational sciences - institutional factors are seen as major causes of underdevelopment of the sector (Cummings et al., 2016; Shinaroy et al., 2019). Our study focuses on the analysis of these institutional factors, which constitute obstacles, but which can also be drivers of change.

Before presenting the methodological approach, let us point out that by sanitation, we mean any action that aims to remediate, enable access to treatment, or even reuse sludge. Sanitation can be collective and not collective. On the other hand, here we only address the issue of liquid sanitation and not solid waste.

Concerning the method, a corpus of articles in human and social sciences has been created with the Web of Science database, over every period. We have selected articles classified in the human and social sciences6 and in English. We have excluded health, engineering and operational literature approaches. We have also excluded the articles which deal jointly with water and sanitation because very often the issue of sanitation is outsourced. This resulted in a corpus of around 300 scientific papers. From this corpus, we selected a little more than 70 recent articles which address more specifically the change, the nature of this change and its conditions.

The results presented are still preliminary. We have identified six lessons regarding institutional change for sanitation development.

Lesson no. 1: For there to be change, not only are prerequisites necessary, but also a combination of factors.

The first lesson deals with the conditions for change. Many prerequisites are mentioned repeatedly in the literature, such as the need to have functional infrastructures, suitably located and adapted to the contexts for the populations to use them (Simiyu, 2016), sustainable funding for maintenance and management (Davis et al., 2019), or land tenure security (Scott et al., 2013; McGrahanan, 2015). On this last basic prerequisite, if there is a risk of foreclosure, whether on the part of the State or landowners, households will not tend to invest in sanitation facilities. These prerequisites are necessary for any change leading to sustainable toilet use, but there is also a combination of factors. For example, the article by Davis et al. (2019) shows that in addition to funding and management plans to be put in place to maintain sanitation infrastructure in a region, there must be both awareness-raising activities coupled with municipal planning, for example, or there must be clearly identified sanitation-related priorities and community participation. In conclusion, a single lever rarely serves as a condition for change.

Lesson no. 2: Stakeholders drive change when they succeed in gaining legitimacy at the local level and with policymakers

The second lesson concerns stakeholders. They spur change when they succeed in gaining legitimacy at the local level and with decision-makers (Mitlin, 2015; Tomlinson, 2015; François et al., 2021). The acquisition of local legitimacy is well known in the literature on participation: a project for the establishment of sanitation infrastructure is much more likely to function when NGOs and community associations are not created ex nihilo by development programmes but are legitimate, active and committed in the regions in question. However, local legitimacy is not enough. The stakeholders spurring the installation of sanitation infrastructure must also gain political or institutional legitimacy. Indeed, if the decision-makers do not validate or support a project, it will have little chance of functioning over time. For example, Tomlinson (2015) shows that a successful implementation of toilets in slums in Pune, India was made possible no doubt by the involvement of community organisations and NGOs, but also through the involvement of a municipal civil servant, who notably fought to facilitate connections to networks. This lesson also shows that the State - central government, but also State agencies and decentralised authorities - remains a key player. In the 1970s, the trend was towards the monopolisation of the central State for the provision of essential services; then, in the 1980s and 1990s, the opening up to the private sector supplemented by community participation was given preference, the tendency being to bypass the state. One of the results of this literature review reaffirms that few initiated projects can be institutionalised by dispensing with state stakeholders on different scales. This lesson ties in with D. MWANZA's paper presented in this report on political commitment.

Lesson no. 3: Sanitation projects are successful and more easily transposable to other situations than applicable on the larger scale

The third lesson is linked to the previous two. It relates to the scale of change. Let us take the example of the installation of toilets in slums in India developed by Tomlinson (2015). When attempts were made to replicate and generalise this successful project at the national level, the results were much more disappointing because 1) the mayors and stakeholders of different opposing parties did not necessarily support the project (lack of local political support); and / or 2) the World Bank and the Indian State funded projects based on this success on a larger scale, but without necessarily waiting to be in contact with civil society organisations rooted in the regions. On the other hand, this success has been replicated in other contexts, particularly in East Africa, but on a more limited scale. Thus, upgrading to the general level is more difficult because it requires meeting the previous conditions and dealing with the proliferation of stakeholders concerned with sometimes contradictory interests.

Lesson no. 4: Beyond the problems of management, maintenance, or the inadequacy of infrastructure to needs, the rejection of the facilities by users in makeshift neighbourhoods is due to cognitive factors relating to modernity, dignity and citizenship.

This fourth lesson focuses on the cognitive factor for change, through the question of the acceptability and appropriation by precarious populations of the sanitation infrastructures put in place (del Carmen Morales et al., 2014; Robins, 2014). It shows that dry toilets, which require a direct commitment from the user, particularly in emptying, are sometimes synonymous with backwardness, obsolescence and a two-speed service. Conversely, flush toilets are seen as a symbolic object of modernity, since it makes the sludge invisible. This helps to explain the failures of initiatives aimed at recovering faecal sludge, since there is a direct commitment - psychological and physical - from citizens. Access to "dignified" toilets is also in some case studies synonymous with citizenship, as in Argentina (del Carmen Morales et al., 2014) or South Africa (McFarlane, Silver, 2017; Robins, 2014). Finally, this lesson indicates that change is facilitated when there is a shift in a subject from the private and taboo to the public sphere in representations. We then see the emergence of social demand for a certain type of infrastructure.

Lesson no. 5: In addition to being suited to the daily needs of users, innovations in sanitation must become legitimate in order to be appropriated by stakeholders.

This fifth lesson concerns innovations (Ecosan toilets, antibacterial garbage bags, etc.), and can be developed in the discussion. It shows that the legitimacy of these innovations, both with development stakeholders and users, is a prerequisite for their adoption.

Lesson no. 6: Change in the sanitation sector is seldom radical

The sixth lesson deals with the nature of change. According to this literature review, little radical change is taking place in the sanitation sector. Attempts are analysed, for example with the implementation of niche technologies, but they rarely manage to become institutionalised. The discussions will therefore focus on which cornerstone - normative, cognitive or regulatory - to use as a priority to bring about change. Some (Öberg et al., 2014) recommend measures targeting the cognitive factor as a priority, by shifting from seeing sludge no longer as waste but as a resource for example. Others recommend acting first on the regulatory factor, in particular by avoiding overlapping institutional mandates (Sinharoy et al., 2019).

In conclusion, here are some perspectives that emerge from this work. The first concerns the deepening of the question of the change of scale: how to apply a success on the general level? How does the local level help the revision of rules at different scales? When there is a strong political will at the national level, how can the local contexts be successfully into account? The second perspective concerns intra-organisational changes, that is, within organisations. This is what was developed by C. LE JALLE in this report: how do traditional operators adapt their practices in relation to the dissemination and legitimation of non-collective sanitation? A third perspective is to better understand the processes involved in the construction of rules and institutional frameworks adapted to the contexts and to the diversity of arrangements. On this point, AgroParisTech has launched work with the support of the Chair "Water for All".

Finally, let us specify that at this stage, this work does not have the ambition of recommendations for action. It highlights recent results in the social science literature. A presentation in this venue allows us to confront our results with the analysis of development practitioners, backers and operators, and to initiate a discussion on the conditions and nature of change in the sanitation sector.

6.4. Discussion - Sarah BOTTON, Héloïse VALETTE and Marine COLON

The work presented by VALETTE and COLON recalls the importance of scientific positioning, of the way in which research work fits into scientific discussions and therefore goes beyond disciplines and subjects; literature reviews are extremely valuable for defining research agendas and knowing how to

position oneself in the debate. Does this literature review reveal any glaring discrepancies, over-representations, or thematic or disciplinary under-representations? Did the authors expect to see some things that are not listed? A first surprise concerns the over-representation, or even a distortion in the corpus of Indian case studies. This can be explained by ambitious national sanitation programmes such as Swachh Bharat, because India is a large country and because the body of work was in English. It was not necessarily easy to rebalance afterwards. Regarding the regions under study, there was a clear under-representation of the entire Middle East - North Africa zone. Here again, several hypotheses can be made. First of all, this subject can be considered taboo, therefore less worthy of interest compared with other subjects which have reconfigured societies such as the Arab Spring. Of course, there is also the question related to the constitution of the corpora, which is in English and not in Arabic or French. The language of publications is a very interesting topic as far as scientific output is concerned. Regarding the disciplines involved, the majority of the articles were positioned as development studies, but this is not necessarily surprising. A methodological difficulty was more to determine the border between publications in engineering and social sciences. Another point, each discipline has its markers and favourite themes. In economics, many articles deal with innovations, socio-technical transitions, decisive factors for the adoption of infrastructures, or even include cost-benefit analyses; in socio-anthropology, the questions about perceptions dominate. Finally, on the themes addressed, the vast majority of the corpus focuses on the most precarious populations and / or those living in slums and urban makeshift neighbourhoods. This represents more than three-quarters of the corpus.

Regarding the factors of change, do we need a dramatic crisis to trigger off disruptive change? Exogenous shocks may indeed initiate in change. Regarding the health crisis we are going through today, it is indeed a key moment to study, and it will be interesting to see what impacts the current crisis will have on the development of the sanitation sector. On the other hand, the corpus as it stands was not able to take it into account because the articles on the subject have not yet been published. The conditions for change have been documented. As we know, crises, and in particular health crises, play an important role in making things happen. After that there must be stakeholders who seize those opportunities. Neo-institutional sociologists call “institutional entrepreneurs”, those who lead change, are the drivers of that change, and the whole question and the related paradox is why, in certain countries where there are still regular cholera outbreaks, is there no change? For there to be change, there must be stakeholders, who must become a subject for discussion, the object of demands and there must be stakeholders who are capable of acting to initiate change and move towards the construction of this sector. Peer-to-peer partnerships may be as a factor of institutional change in the sanitation sector. “peer partnerships” between decision-makers in the North and in the South be a factor of change so that decision-makers in the countries of the South are immersed in real learning and see to what extent they can adapt. “Peer partnerships” between stakeholders from the North and the South could become, are factors that deserve to be further studied, for example in the literature on institutional change. This represents a very interesting research perspective.

7. Comparative analyses on this report

7.1. The viewpoint of the scientific committee of the Chair "Water for All" - Thierry Rieu

This title brings us back to a meeting of the scientific council in November 2015, where the council finally agreed to give priority to the theme of sanitation as this issue is both strategic and the most urgent to address. An approach through a multidisciplinary way, transversal to the different levels of governance and organization was considered as the most adequate.

By making a similar observation, the international organizations and literature facilitated this consensus. In fact, from that time on, the theme was in full development as it was considered as an issue that did not waver, which led to innovations with concrete applications, on the emergence of institutions and on the ways of setting it up. This report bears witness to this by giving pride of place to the organisational, economic and social facets and by mobilising global approaches based on territorial and urban dimensions.
Another way to discuss this issue is to observe the initial demand for training to enrol in the International Executive Master "Water for All" – OpT, and for the auditors, who are mainly coming from cities of the South, the professional thesis topics they have chosen. They reflect the training and skills acquisition needs expressed by their home company or department. The map below provides some more information about their distribution around the world.

Figure 2. Places of work of the sanitation managers trained at the IEM "Water for All" – OpT, AgroParisTech during the period 2010-2021 (Source: AgroParisTech)

It is a world map on which the students' missions are positioned. Thus, over the period 2010-2021, i.e. over a period of ten years, 40 missions were used as a basis for the dissertations of the students of the "Water for All" – OpT. The number of students, which is not negligible, shows the interest of the urban

services of cities in the South in this topic. Secondly, the distribution at the country level appears to be rather homogeneous in all the regions (Africa, Asia) where the Chair is involved. The sanitation issue is not the concern of a few countries in a sub-region. It is shared. Finally, the fact that they are entrusted to young service managers testifies to the emerging and strategic nature of the theme for the services.

Another way of looking at the current state of issues and the importance given to the sanitation one is to carefully read posters prepared by the students. There you can find questions that are being refined, debates between society and sanitation services and tentative solutions. In short, these are two elements, beyond the scientific and societal news, which allow us to form an opinion, or even to debate it, on the choice made by the Scientific Council.

Finally, a second, essential dimension is the valorisation and dissemination of the results. The results of the 3rd scientific meeting were made widely available to both the technical and scientific public, respectively through the Agence Française de Développement's technical series No. 42 of March 2018 and the following special issue dedicated to sanitation of the journal Utilities Policy. In the conclusions of the latter, three points were highlighted for the future of sanitation. One of them was stated as follows: "What coordination is needed between on-site and networked sanitation, and at what scale?" This was the starting point for this present report, with a discussion of the conditions for successful sanitation services. They are sometimes contradictory and they lead to the debates here reproduced.

7.2. The viewpoint of SUEZ - Xavier LITRICO

The health crisis in which we go through could have put science and research at the right level. However, scientists have struggled to make their voice heard. This, however, does provide an opportunity to suggest the difference between research and science. Science is ultimately a body of established knowledge on which a whole set of scientists agree. Theories may be in opposition or in discussion by research. Science is what we rely on, on its solid foundations to develop solutions. Sanitation is also a complex subject because it involves many stakeholders, and we do not necessarily have all the knowledge needed. That is, there is no one solution that would be better than the others. What TRUFFER expose in this report is quite enlightening in this respect. The gold standard of centralised sanitation as we imagine it in our large western metropolises is undoubtedly not the solution that can be applied everywhere in the world. And of course, the solution will undoubtedly be a mix. There is a balance to be found, perhaps, between these different solutions.

Solely technological solutions to these major issues are not sufficient. Suez is convinced. In fact, human factors and technical factors, therefore socio-technical, as mentioned by TRUFFER, are essential. The interaction between technical solutions and their appropriation, the use, the institutional context, the way in which sanitation affects people. Sanitation is a very intimate subject. We are working on a subject which is essential to life, essential to health and which touches the intimacy of our lives and persons very closely. As a result, inevitably, the vision of a "die-hard" engineer does not answer the question. From that point of view, taking the human factor and change into account is fundamental.

Innovation is key when working on change. When we talk about innovation in business, people think about incremental innovation, ultimately is gradual evolution; but there is also disruptive innovation, that of a radical change, which completely undermines a market or an existing solution. Disruptive innovation may not exist without a series of incremental innovations. Silberzahn (2021) suggests to talk about "small wins". This term refers the fact that change does not happen suddenly, through evolution or even a revolution. Ultimately, it is the result of a gradual change that at some point emerges. The notion of emergence is interesting. What are you doing when you really want to bring about a change over time, in a community? It involves trying to work collectively starting from the base on factors with limited ambitions, but which have a lasting impact. And that, in fact, can be what we call small wins. And the accumulation of small wins can bring about a change which can be really important.

It involves working on people's mental models. When we work on change, in any case, in an organisation, we work a lot on supporting change and therefore on this factor of mental models.

Because everything depends on the way we represent the world, as BIBARD stated above. The capacity for thought, the capacity to have a global vision, when obviously we are all in our silos, but sharing things together and in particular sharing mental models also allows us to move forward together with a common direction. From this point of view, the work that we are doing within the Chair "Water for All" is really focused on that direction. And when we talk about mental models, when we decide, Suez, the Suez Foundation and AgroParisTech and all the stakeholders around this Chair to work on *capacity building*, on training water and sanitation stakeholders, we are making a bet. We are betting that we can quite fundamentally transform the operation of sanitation and access to water, by working with the people, the men and women, who work on systems that manage water and sanitation at the local level.

According to an African proverb "alone we go fast, together we go far". The ability to create links, the ability to work together, to understand each other, even if we are not all in the same lane, but working collectively at what we do, that is really very powerful. It's complicated. That approach makes people want to get on-board, resulting in a collective strength which is undeniable. So, the Chair is really an emblematic example. And it has been so for over ten years. Here we are, we have re-engaged collectively for four years, with a renewed ambition, with the will to associate and work very closely with partners who are not only academic, but also partners in the South, in the broad sense in the emerging countries. It really is an ambitious project and I think we all share the same ambition.

Suez in Senegal committed to set up a centre of research and excellence. We are going to inaugurate the centre this year and we already have a PhD thesis which is being launched with the University Cheikh Anta Diop in Dakar and with the IRD. Our ambition is in the same spirit of mind: it is to join forces with local stakeholders because they are in contact with the people, with the problems, with the solutions too, which are undoubtedly very different from those that one can design in a research centre in Paris; to build a long-term relationship to introduce these solutions in complementary fashion between stakeholders, with academics, universities and all the local fabric which has a very strong capacity for innovation, and also the capacity of an industrial group, which allows us to industrialise the solutions, deploy them at scale and build long-term and fruitful partnerships together.

7.3. The viewpoint of AFD - Gilles KLEITZ

The topic of this report is important for us, since it is discipline-specific and cross-disciplinary at the same time and in our department which deals at the same time with agriculture, biodiversity, water, sanitation and to fully understand the factors, the cross-disciplinary factors, what we now call nexuses between planetary subjects and human subjects are crucial. The subject this year in institutional matters, change and institutional efficiency, is central to all of our analyses, whether they concern water and sanitation or other subjects such as agriculture or resource management.

Sanitation is a fundamental condition of human dignity. That sanitation is a driver of public health and at the same time, a key factor in preserving the natural environment and fighting against climate change. However, when you are a backer, when you talk a little with the entire backer community, sanitation remains a subject that is still too neglected in most developing and emerging countries. And finally, there are many consequences to that neglect. Also keep in mind the fact that one in four people still does not benefit, on a global scale, from a basic sanitation service. And that 80% of the planet's wastewater is discharged into the natural environment without treatment. Therefore, this scientific meeting, in particular, on the issue of institutional change, is therefore essential to highlight the obstacles to achieving universal access for all to adequate sanitation, as SDG6 commits us to do, in order to allow development stakeholders, including the AFD, to adapt our intervention methodologies.

Through its support for the Chair "Water for All", and in a global way, its support for the water sector represents about a billion commitments per year in many countries. Our goal, roughly, of reaching a billion people, is something we actually achieve regularly. We have managed to ensure that 28% of our sector funding goes towards sanitation. It represents about € 300 million per year, mainly in the

Mediterranean area. We obviously want to do better by further increasing this contribution to sanitation from 30 to 40%. This is an objective that is consistent with the policy options that have been taken with the Ministry in its strategy or only internationally, in order to rebalance funding efforts between water and sanitation by 2030. And for us, and especially in my Department of Ecological Transitions at the AFD, sanitation is above all an important issue to achieve the climate and biodiversity objectives that we have set ourselves globally, but at the AFD in particular, which is a 100% Paris Agreement agency and where, ultimately, we have decided that 30% of our climate co-benefit finances should be favourable to ecosystems, resources, water and biodiversity.30% of solutions based on nature in our climate effort. That is most important. Obviously, sanitation is a major sector for contributions from this financing and is central to the AFD's priorities.

The approach on which we should focus is obviously unique, but should be all-encompassing, seeking both to develop collective sanitation, but also on-site wastewater treatment. In terms of collective sanitation, and this is where institutional issues play a major role, we are faced with institutions that are really in need: in need of transformation, of acquiring new capacities, collective intelligence, inclusiveness, and often reform. As a result, our often very technical and very economical support programmes systematically make the effort to effectively integrate gradual pathways for institutional construction. By being gradual in our ambitions, we can gradually achieve more inclusiveness, greater recognition of women and gender rights, more open dialogue, better governance and transparency. These issues are generally part of our programmes. It is true that the stakeholders of sanitation in the South often cruelly lack quality human resources, financial resources. We are here to try to train and respond to that need. Sanitation also means on-site wastewater treatment. We have to admit that these solutions are often the most neglected among the neglected sectors, no doubt because of the specific institutional organisational issues they involve. If we want to offer, via on-site wastewater treatment, a level of service equivalent to collective sanitation, we must really work on the links, the key links: access to toilets and latrines, collection, treatment and waste recovery. Our approaches try to cover all of these issues, and in this area, I would say that simple, efficient and robust, low-tech solutions are absolutely crucial.

In conclusion, institutional barriers are central to the ways and means we use to resolve them. And in the organisation of sanitation, nothing can be done without strong political will. We have together - research, educational institutes, operators, development agencies and development banks - a role to play in bringing about the removal of institutional barriers. The Chair “Water for All” is well placed to effectively bring together the stakeholders in the sector. Our role is also to tirelessly recall the many benefits of sanitation on several SDGs in our business.

7.4. The viewpoint of AgroParisTech - Gilles TRYSTRAM

This report is important, following previous scientific activities that have taken place around the Chair “Water for All”. The latter is a joint initiative by and between Suez and AgroParisTech, and to which ESSEC has now been added, at least for training issues, and it has long benefited from the support of the French Development Agency. This is an opportunity to discuss research studies in light of practice, and share a common aim on the issue of water services. That aim is to increase the skills of the people who are in charge of public water services, in the diverse ways they are provided around the world. To move forward on these questions, we are all convinced of the need to confront our various viewpoints, organisations and actions, and to collectively reflect, and therefore necessarily identify the issues we need to work on, in particular research issues. This Chair has the ambition to facilitate discussion on research.

Sanitation is an extremely important subject, brought to the fore by the associated health and safety issues: epidemics, the transmission of viruses... As in the case of water, sanitation issues are vital. And, since 2017, they have been naturally integrated into the sustainable development goals. All these factors constitute an excellent justification for holding a seminar taking stock, at least, on

organisational issues, on institutional issues as well as on all the contingent issues on which research can focus.

This report gathers contributions from different stakeholders who are concerned by this issue. It is important for AgroParisTech and its UMR G-EAU to be associated with this analysis. The research questions that come out of it interest us in several ways. They interest us because obviously, collectively identifying the right research issues is very important in order to then prioritize them, organise answers, and have researchers, PhD and masters' degree students and even student engineers work on these issues. That is the first point. Secondly, there is the point of view of a higher education institution: these research issues must also input training courses by identifying the subjects to be covered and informing us about the skills for which we must prepare, on the pedagogical forms, on the place of field work, on research work adapted to training. This is naturally true for the International Executive Master "Water for All" – OpT, but it is also true for AgroParisTech in the master's degrees dealing with water, or in engineering training courses, which are devoted to these questions.

Answering these questions require to plan for the medium term: sanitation issues will not be resolved immediately, everywhere in the world and in the same way. We must therefore have a horizon and considerations that look at least to 10 years from now, and even beyond. Your work should therefore be positioned by projecting into the future as far as possible, because the executives we train will work in future years for the benefit of all that involves sanitation and water, especially for human consumption. The authors who contribute to this report represent a remarkable observatory of all the sanitation issues, with different viewpoints, and comparing those viewpoints is a very important issue.

Bibliography

Black M., B. Fawcett (2008), The last taboo: opening the door on the global sanitation crisis, Routledge, London.

Binz C., B. Truffer, L. Li, Y. Shi, Y. Lu, (2012), "Conceptualizing leapfrogging with spatially coupled innovation systems: The case of onsite wastewater treatment in China", *Technological Forecasting and Social Change*, Vol. 79, n°1, p. 155-171

Chenguelly S. (2019), "Institutional change in the urban WASH sector A review of theory and practice", Ed: Drabble S. and Renouf R., WSUP, Discussion paper, London, UK. https://www.wsup.com/content/uploads/2019/03/DP012-Institutional-change-in-the-urban-WASH-sector.pdf

Cherunya P.C., H. Ahlborg, B. Truffer (2020), "Anchoring innovations in oscillating domestic spaces: Why sanitation service offerings fail in informal settlements", Research Policy, n° 49, Article 103841.

Cummings C., I. Langdown, I. Hart, M. Matoso (2016), "What drives political leaders to improve urban sanitation?", in Shaw, R.J. (ed). Local action with international cooperation to improve and sustain water, sanitation and hygiene (WASH) services, Proceedings of the 40th WEDC International Conference, Loughborough, UK, 24-28 July 2017, Paper 2635, 7 p.

Davis A., A. Javernick-Will, S. M. Cook (2019), "The use of qualitative comparative analysis to identify pathways to successful and failed sanitation systems", *Science of The Total Environment*, n°663, p. 507- 517.

Del Carmen Morales M., L. Harris, G. Öberg (2014), "Citizenshit: the right to flush and the urban sanitation imaginary", *Environment and Planning A*, vol. 46, n°12, p. 2816-2833.

Drabble S., Gautam A. (2017), "A Ward-by-Ward Approach to Eliminating Open Defecation: Experience from Visakhapatnam, India", Capacity building for Swachh Bharat Mission (Urban), SWUP, https://www.wsup.com/content/uploads/2017/08/02-2017-A-ward-by-ward-approach-to-eliminating-open-defecation.pdf

Eggimann S., B. TRUFFER, M. Maurer (2016), "The cost of hybrid wastewater systems", *Water Research*, vol. 103, n° 15, p. 472–484.

Francois J. N., J. Kakeu, C. Kouame (2021), "Do Better Institutions Broaden Access To Sanitation In Sub-Sahara Africa?", *Contemporary Economic Policy*, vol. 39, n°2, p. 435-452.

Fuenfschilling L., B. Truffer (2014), "The structuration of socio-technical regimes—Conceptual foundations from institutional theory", *Research Policy*, vol. 43, n° 4, p. 772-791.

GRET (2018), Mémento de l'assainissement, Mettre en œuvre un service d'assainissement complet, durable et adapté, GRET Quæ, France.

Hacker M., Binz C. (2021), "Characterizing non-technical barriers for on-site alternative water systems - an overview of findings from peer-reviewed literature", report, EAWAG.

Hoffmann S., U. Feldmann, P. M. Bach, C. Binz, M. Farrelly, N. Frantzeskaki, H. Hiessl, J. Inauen, T. A. Larsen, J. Lienert, J. Londong, C. Lüthi, M. Maurer, C. Mitchell, E. Morgenroth, K. L. Nelson, L. Scholten, B. Truffer, K. M. Udert (2020), "A Research Agenda for the Future of Urban Water Management: Exploring the Potential of Non-grid, Small-Grid, and Hybrid Solutions", *Environmental Science and Technology*, vol. 54, n°9, p. 5312-5322.

Larsen T. A., S. Hoffmann, C. Luthi, B. Truffer, M. Maurer (2016), "Emerging solutions to the urban water challenges of an urbanizing world", *Science*, n°352, p. 928-933.

McFarlane C., J. Silver (2017), "The poolitical city: "Seeing sanitation" and making the urban political in Cape Town", *Antipode*, vol. 49, n°1, p. 125-148.

McGranahan G. (2015), "Realizing the right to sanitation in deprived urban communities: meeting the challenges of collective action, coproduction, affordability, and housing tenure", *World development*, vol. 68, p. 242-253.

Mitlin D. (2015), "Will urban sanitation "leave no one behind"?", *Environment & Urbanization*, International Institute for Environment and Development (IIED), vol.27, n°2, p. 365–370.

Monstadt J., Schramm S. (2017), "Toward The Networked City? Translating Technological ideals and Planning Models in Water and Sanitation Systems in Dar es Salaam", *International Journal of Urban and Regional Research*, vol. 41, n°1, p. 104-125.

Muller, M. (2020), "Have Five Decades of Development Engineering Research Improved Sanitation in Southern Africa?", *Journal of International Development*, vol.32, n°1, p. 96-111.

Nations unies (2020), *Rapport sur les objectifs de développement durable 2020,* Organisations des Nations Unies, New-York, 65 p.

Oberg, A. (2019), "Problematizing urban shit (ting): Representing human waste as a problem", *International Journal of Urban and Regional Research*, vol.43, n°2, p. 377-392.

OMS (2018), Inheriting a sustainable world ? Atlas de la santé infantile et de l'environnement. 2018, 164 p.

Robins, S. (2014), "The 2011 toilet wars in South Africa: Justice and transition between the exceptional and the everyday after apartheid", *Development and Change*, vol.45, n°3, p. 479-501.

Schramm S. (2016), "Hanoi's septic tanks – technology of a city in flow from the late 19th century till today", *History and Urbanism Resilience: Planning and Heritage, 17th International Planning History Society Conference Proceedings*, vol. 17, n°4, TU Delft.

Scott P., A. Cotton, M. S. Khan (2013), "Tenure security and household investment decisions for urban sanitation: the case of Dakar, Senegal", *Habitat International*, vol. 40, p. 58-64.

Silberzahn P. (2021), Petites victoires - Et si la transformation du monde commençait par vous ?, Diateino, 200p.

Simiyu S. (2016), "Determinants of usage of communal sanitation facilities in informal settlements of Kisumu, Kenya", *Environment and urbanization*, vol.28, n°1, p. 241-258.

Sinharoy S. S., R. Pittluck, T. Clasen (2019), "Review of drivers and barriers of water and sanitation policies for urban informal settlements in low-income and middle-income countries", *Utilities policy*, vol. 60, 100957.

Tomlinson, R. (2015), "Scalable community-led slum upgrading: The Indian Alliance and community toilet blocks in Pune and Mumbai", *Habitat International*, vol.50, p. 160-168.

UN-Water (2018), *Nature-based Solutions for Water*, UN World Water Development Report.

Van Vliet B.J.M., G. Spaargaren, P. Oosterveer (2011), "Sanitation under challenge: contributions from the social sciences", *Water Policy*, vol.13, n°6, p. 797–809.

Van Welie M., P.C. Cherunya, J. Murphy, B. Truffer (2018), "Splintered regimes in developing cities: the case of sanitation in the squatter settlements of Nairobi", *Technological Forecasting and Social Change*, n°137, p. 259-271.

Van WelieM., B. Truffer, H. Gebauer (2019A), "Innovation challenges of utilities in informal settlements: combining a capabilities and regime perspective", *Environmental Innovation and Sustainability Transitions*, p. 84-101.

Van WelieM., B. Truffer, X.S. Yap (2019B), "Towards sustainable urban basic services in low-income countries: A Technological Innovation System analysis of sanitation value chains in Nairobi", *Environmental Innovation and Sustainability Transitions*, p. 196-214.

Water Aid (2012), *1 in 3 women lack access to safe toilets*, Briefing note, 19 November.

Williams M., R. Mayer, M. Minges (2011), Africa's ICT Infrastructure: Building on the Mobile Revolution. Washington, DC: Banque Mondiale.

WHO-UNICEF JMP (2021), Highlights from Progress on household drinking water, sanitation and hygiene 2000-2020: Five years into the SDGs. ISBN 978-92-4-003084-8

Authors' biographies

Pierre BAUBY is a political science researcher, specialist in public action and public services in France and in Europe; Director of the Observatory of Public Action of the Jean Jaurès Foundations; expert for the European Economic and Social Committee (EESC); author in particular of The effects of the liberalisation of public services, European Parliament, Brussels, 2019; Co-constructing the future of Europe, Note from the Jean Jaurès Foundation, 2018; Public service, public services, La Documentation Française, Paris, 2nd ed. 2016; The Europeanisation of public services, Presses de SciencesPo, Paris, 2011

Laurent BIBARD is a professor in the Management department of ESSEC, where he directed the MBA platform from 2005 to 2010. He teaches political philosophy, sociology, and economics. Now in charge of the Management and Philosophy department, he works in particular on the approach to vigilance issues in crisis situations. He is also Academic Director for ESSEC for the International Executive Master "Water for All" – OpT in conjunction with AgroParisTech. After his work published in conjunction with Edgar Morin, entitled Complexity and organisations, Facing the challenges of tomorrow, his latest book is on a Phenomenology of sexualities, Modernity and the question of meaning (January 2021).

Christian BINZ is head of a research group within the Department of Social and Environmental Sciences at the Swiss Federal Institute of Aquatic Science and Technology (EAWAG), and an associate post-PhD researcher at the CIRCLE of Lynd University (Sweden). His main areas of interest are the spatial and institutional complexity of sustainable transitions. By combining recent contributions from studies on transition, economic geography, and institutional sociology, he explores how multi-scalar institutional arrangements hold back or support radical innovation in clean teach industries as well as sustainable transitions in infrastructure sectors such as water and energy.

Marine COLON is a researcher at UMR G-EAU associated with Montpellier Research in Management, and a teacher at AgroParisTech. She has been the Secretary of the Scientific Council of the Chair "Water for All" since 2017. She specialises in the management of public water and sanitation services, analysed from the viewpoint of management sciences. She works in particular on the way in which management tools support service transformations for more sustainable and universal services. Trained as an engineer, she has a six-year experience working with water and sanitation utilities in rural areas in France. Since the end of 2021, she has been the deputy director of UMR G-EAU.

Olivier CRESPI REGHIZZI is Project Team Manager within the AFD's Water and Sanitation Division. In particular, he is responsible for the portfolio of water and sanitation projects financed by the AFD in Morocco. Olivier is also behind the call launched by the AFD for a Water Finance Coalition. In the past Olivier worked for the AFD in Senegal and Mexico as well as for Eau de Paris.
Olivier is an engineer from Politecnico di Milano and Centrale Nantes and has a PhD in economics from AgroParisTech and Bocconi University in Milan. His PhD thesis is entitled "A long-term analysis of the financing of urban drinking water and sanitation infrastructure: essays in public economics" is available online
https://www.publicfinanceforwash.org/resources/long-run-perspective-urban-water-and-sanitation-infrastructure-financing-essays-public.

Shubhagato DASGUPTA is a senior fellow at CPR and director of the Scaling City Institutions for India (Sci-Fi) initiative. His current research focuses on drinking water and sanitation in India and the world, with particular reference to flagship government programs and service delivery challenges in smaller cities. Other major areas of work include urban infrastructure and service delivery financing, housing and slum rehabilitation, urban sector public finance, and urban environmental infrastructure planning, management, and investment, alternatives.

Before coming to CPR, Shubhagato led the Support to National Policies for Urban Poverty Reduction project, a collaboration between the UK's Department for International Development (DFID) and India's Ministry of Housing and Urban Poverty Alleviation to develop pro-poor urban policies in 20 cities across 15 states. Prior to this, he has also worked on issues of urban development with a wide range of other public, private, multilateral, and non-governmental organisations, including as Senior Urban Specialist at the World Bank, Assistant Vice President at the Infrastructure Development Finance Company (IDFC), the Housing and Urban Development Corporation (HUDCO) and The Action Research Unit. In addition, Shubhagato has also been worked on private sector participation projects in urban and drinking water programs in eastern and southern Africa for the International Finance Corporation and the Acumen Fund.
Shubhagato Dasgupta was trained as an architect at the Centre for Environmental Planning and Technology in Ahmedabad and holds an MSc in housing and development planning from the Development Planning Unit of the University College London. He is also currently undertaking a PhD at the Centre for Urban Studies at the University of Amsterdam.

Sam DRABBLE is the head of research evaluation and training at Water & Sanitation for the Urban Poor (WSUP), a non-profit that helps transform cities for those without access to water and sanitation. Since joining WSUP in 2013, Sam has led numerous research projects as well as projects and programme evaluations within the 6 countries where WSUP is at work; he is the author of over 50 publications on different aspects of urban WASH. Prior to that he worked as a Program Evaluation Analyst at RAND Europe, a non-profit research institute whose mission is to help improve public policies and decision-making through research and analysis. This backed his experience in the Institute for Government (UK) and the European Economic and Social Committee.

Amal ENNABIH is a PhD student in political science at Sciences Po Lyon. As part of her thesis, she analyses the process of recomposition of power relations between the State and farmers through the study of the construction and implementation of the treated wastewater irrigation policy in Morocco and in Tunisia.

Lætitia GUERIN-SCHNEIDER is a researcher in management sciences at the National Research Institute for Agriculture, Food and the Environment (INRAE) within the UMR Water Management Actors Uses. She has been working on the management of public water and sanitation services for many years. In particular, she has contributed to the development of performance indicators monitored nationally. Her recent work, in conjunction with local communities, focuses on the dissemination of management systems linked to new public management and environmental assessment. Since 2018, she has also been deputy director of the UMR GEAU.
Previously, she worked at ENGREF (National School of Rural Water and Forest Engineering), then as council for communities on the management of water services within Service Public 2000 (now Espelia).

Miriam HACKER is a Research Implementation Lead at The Water Center at Penn, University of Pennsylvania, United States. She has a background in civil engineering from the University of Washington and a passion for understanding social implications from water and wastewater issues. Her professional experience includes stormwater regulation at a local level and strategic coordination in international development. Her doctoral research in civil engineering investigated the coordination of temporary accommodation for people seeking asylum in Germany, Sweden and Lebanon. Most recently, her work as a postdoctoral researcher with the Swiss Federal Institute for Aquatic Science and Technology (Eawag) focused on the socio-technical barriers for adoption of on-site water reuse at a city level in the United States. As cities look to adapt water and wastewater infrastructure to climate

change, Miriam's passion lies in the organizational and institutional response to these initiatives and impacts for the local community.

Adil HASNAOUI is head of finance at the Office National de l'Électricité et de l'Eau potable of Morocco, water branch.

Gilles KLEITZ worked from 1988 for more than ten years in Africa on the management of natural resources, agriculture and the conservation of biodiversity, as a researcher and as coordinator of conservation projects for the MAEE, the GRET, the CIRAD and the FFEM. After returning to France in 2002, for the Ministry of Agriculture he instigated measures of the Common Agricultural Policy for the agro-environment (pastoral policy, protection of breeders against predators) then for the Ministry for the Environment he coordinated the implementation of the National Strategy for Biodiversity. He was rapporteur for the Grenelle de l'Environnement then technical advisor to Minister of State Jean-Louis BORLOO. He was then project manager and biodiversity specialist with the French Development Agency for 4 years and developed numerous operations and partnerships in Latin America, Africa and Asia, as well as in the French overseas territories. He joined the cabinet of Minister Delegate for Development Pascal CANFIN (Ministry of Foreign Affairs) on 2 April 2013. For the past twenty years, he has participated in the negotiations of the conferences of the Parties to the Convention on Biological Diversity and has served as an expert for the secretariat of this convention. He was Director of the Amazonian Park of Guyana between 2014 and 2018, and since September 2018, he has been Director at the AFD for the Agriculture, Water and Biodiversity sectors. Gilles KLEITZ is an agricultural engineer, General Engineer of Bridges, Water and Forests, and obtained a PhD on the implementation of biodiversity conservation policies in Africa. He is a Knight of the Legion of Honour (2012).

Christophe LE JALLE is Deputy Director of the Water Solidarity Program (pS-Eau), in charge of deepening knowledge and contributing to international debates. PS-Eau is a multi-stakeholder network that is committed to guaranteeing universal access to water and sanitation in developing countries, in line with the targets of SDG 6. Prioritising support for local stakeholders, it has enabled exchanges and organised consultations between stakeholders of decentralised and non-governmental cooperation for more than 35 years. Present in France and abroad with focal points in the countries in which French aid is concentrated, he produces knowledge, supports local initiatives and promotes solidarity for water and sanitation. His activities, backed by a team with multiple skills, aim to increase the number and quality of cooperation operations.

Xavier LITRICO, a graduate of the Ecole Polytechnique, General Engineer of Bridges, Water and Forests, holds a PhD in water sciences and is authorised to supervise research in Automation. After a 15-year career in public research (Irstea, Inria, UC Berkeley), he joined the SUEZ Group in 2011 to head LyRE, its R&D centre on water management located within the University of Bordeaux, where he has developed numerous ambitious research projects in conjunction with university partners, nationally and internationally.
In 2017, Xavier Litrico was appointed Scientific Director of SUEZ, in charge of intellectual property, standardisation and scientific partnerships for all of the Group's activities.
Since 2019, he has been Research and Scientific Director, in charge of the network of R&D centres in addition to his previous role as Scientific Director.
He has published more than 100 scientific articles and communications, including more than 50 in international peer-reviewed journals. He is the co-author of 2 books and several chapters in scientific books.

Pierre-Louis MAYAUX is a political scientist at the International Center for Agriculture and Development (CIRAD, G-EAU research team). A graduate of the Institut d'Etudes Politiques de Paris,

hecompleted a doctoral dissertation on the legitimacy of public-private partnerships in Latin American water services (*La Privatisation dans tous ses Etats : protestations et consentement dans les services d'eau d'Amérique Latine*, L'Harmattan, 2017). His current research focuses on the political effects of water scarcity, based on comparative studies in the Maghreb and Latin America. Between 2014 and 2019, he was a visiting researcher at the Mohammed VI Polytechnic University (UM6P) in Rabat, Morocco. He recently published (with S. Barone): *Les politiques de l'eau*, LGDJ - Clefs/politique (2019); and "Institutional perspectives on water services", in T. Bolognesi, M. Farelly and F. Silva Pinto, *Handbook on Urban Water Governance*, Taylor & Francis/Routledge (2022).

Claude MENARD has been a Professor in Economics at the University of Paris (Pantheon-Sorbonne) at the Centre d'Economie de la Sorbonne since 1983. He holds two PhDs, one in Economics, one in the History of Science. He has been visiting professor or researcher at several foreign universities. Since 2014, he is Professor Emeritus, focusing on research projects. His main field of research has been and remains the economics of organizations and institutions. Over time, he has been increasingly involved in the economics of infrastructures, with a special emphasis on the water sector; in the analysis of internal properties of organizations; in inter-firm agreements ("hybrid" arrangements, such as joint ventures, strategic alliances etc.); and in the interaction between institutional reforms and organizational change. He has created and directed the Center ATOM (Analytical Theory of Organizations and Markets) from 1991 until 2009, when it merged with the Centre d'Economie de la Sorbonne. He has been co-founder of the International Society for New Institutional Economics, with Ronald Coase, Douglass North, Oliver Williamson, and a few others. He has been co-editor of the Journal of Economic Behavior and Organization from 1998 to 2011 and is director of the Advances in New Institutional Analysis series (Edward Elgar Pub.)

Dennis MWANZA is a senior advisor on water, sanitation and hygiene (WASH) at RTI's International Development Group and an expert in the water and sanitation sector. His responsibilities include support for the implementation of water and sanitation projects, the development of new work and research on the management of sanitation and the water supply in urban areas. He has more than 25 years of experience in the water and sanitation sector, public policy and strategic policy options for the implementation, management and mobilisation of the resources necessary for the implementation of various programmes within the water and sanitation sector. The two years he spent with the Bill and Melinda Gates Foundation made him aware of the challenges and solutions for urban sanitation especially in developing countries. Dr. Mwanza can shed light on the obstacles that local governments face, and the institutional reforms needed to improve the water and sanitation sector.

Miléna PONCIN has training in international development, supplemented by training in water management. She has been working for 16 months for the NGO Confluence as a water, sanitation and hygiene project manager in rural villages in mountainous areas in Laos. Previously, she notably worked on capitalizing on the sanimarket developed by the GRET in Madagascar.

Thierry RIEU is graduated from the Paris Panthéon Sorbonne University and from the Ecole Nationale du Génie Rural, des Eaux et des Forets. He is acting as chairman of the scientific council of the Chair "Water for All" and as associated researcher in the joint research unit "G-EAU" (Water Management, Stakeholders and Uses) in Montpellier. He has been working for 30 years as researcher and lecturer in economics in various French public research institutes for agriculture and environment. He has been participating to several research projects, in France and abroad, with special focus on water policies, water services, governance and economic instruments.

Marion SANTI is an engineer in water and environmental engineering, with additional training in water and sanitation management in developing countries. She has been working for the GRET for 7 years. Currently in charge of a sanitation project for Burkina Faso, Madagascar and Senegal, she has

developed expertise in sanitation marketing, particularly during her experience as a technical assistant on a field project in Burkina Faso. She participated in the drafting of the Sanitation Memento, published in January 2018.

Sophie SCHRAMM holds a Chair in International Planning Studies at the Faculty of Spatial Planning, TU Dortmund, Germany. She received a PhD for her thesis on "The City in the Flood: Sanitation of Hanoi in the Light of Social and Spatial Transformations" (in German) from TU Darmstadt. She has worked as a junior leader of a research group at the University of Kassel and as an assistant professor at the University of Utrecht. She studies the diversity of the dynamics of constructing cities in the countries of the South with a focus on heterogeneous infrastructures, planning and housing.

Bernhard TRUFFER heads the Research Department in Social Sciences of the Environment at the Swiss Federal Institute of Aquatic Sciences and Technologies (EAWAG) and is a professor at the Copernicus Institute for Sustainable Development at the University of Utrecht. His research focuses on sustainable transitions and the dynamics of green industries in major infrastructure sectors such as urban water management, electricity or transport in Europe, United States, Australia, China, Africa South and Kenya.

Héloïse VALETTE is a lecturer in economics and planning at the University of Toulouse 2 Jean Jaurès, Interdisciplinary Laboratory Solidarities, Societies, Territories (LISST), Rural Dynamics team. She works on water governance in Southern contexts.

Marie-Hélène ZERAH is research director at the Institute for Research for Development (IRD) and member of CESSMA (Centre for Social Science Studies on the African, American and Asian Worlds). She has carried out research on metropolitan governance at the IRD in the cities of Mumbai and Hyderabad in India before leading the Urban Dynamics axis of the New Delhi Human Sciences Centre between 2009 and 2013, during which time she created a monthly seminar on the city (www.cprindia.org/CPR-CSH-Workshop) and coordinated (with V. Dupont and S. Tawa-Lama Rewal) a book on rights in cities in India. Previously, she worked for the Water and Sanitation Programme of the World Bank and the Suez group from 1999 to 2001 and has also been involved in various projects funded by the Ministry of Research and the European Union.
Her research focuses on urban infrastructure, governance and urban democracy in India. Her recent research focuses on the dynamics of small towns in the urbanisation process and on issues of energy governance.

List of acronyms and abbreviations

AFD	French Development Agency
EIB	European Investment Bank
FALEEUR	**Fund for** Sanitation and Wastewater Treatment and Reuse
IRD	Research Institute for Development
KfW	Kreditanstalt für Wiederaufbau
SDG	Sustainable Development Goal
ONEE	National Office for Electricity and Drinking Water
PNA	National Sanitation Program
Ps-EAU	Water Solidarity Program
REUSE	treated wastewater reuse
SDG	Sustainable Development Goal
EU	European Union
UMR G-EAU	Joint Research Unit Water Management, Actors, Uses
WSUP	Water and Sanitation for the Urban Poor

Annexes

8 managers trained at AgroParisTech expose their cases of institutional issues regarding sanitation in their city. Their analysis has been developed throughout the training program: International Executive Program Water for All funded by the Chair “Water for All”. They graduated in 2020.

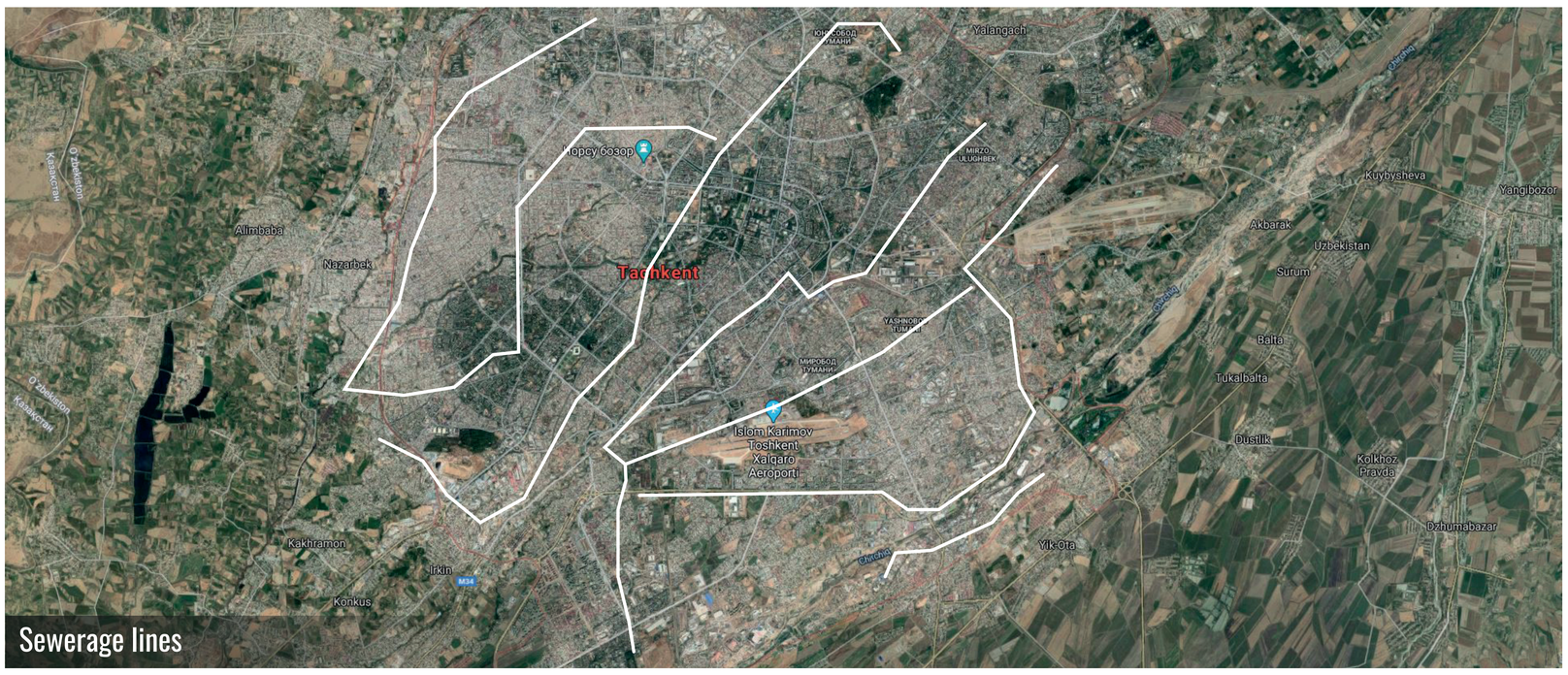
1. Management of wastewater and stormwater in a context of institutional collaboration restructured – Samira ANURADHA, National Water and Drainage Board, **Colombo, Sri Lanka**
2. Setting up the first wastewater treatment plants of Lahore (Pakistan) – Zohaib BUTT, Chief Engineer, Water and Sanitation Agency, **Lahore, Pakistan**
3. Towards the construction of an institutional framework for off grid sanitation in Nouakchott - Mohamed Mansour DIA, Ministry of Hydraulics and Sanitation – Sanitation Department, **Nouakchott, Mauritania**
4. Improving sanitation service in Siem REAP and organisation of players - Dany DOURNG, Ministry of Public Works and Transportation, **Siem Reap, Cambodia**
5. Facing multiple operational and institutional challenges while developing on site sanitation in Dakar - Blaise FAYE, National Sanitation Office, **Dakar, Senegal**
6. Main sanitation issues in Alexandria from an institutional point of view – Mahmoud MEHANY, Holding Company for Water and Wastewater, **Alexandria, Egypt**
7. The creation of the Office Burundais de l’Habitat de la construction et de l’Assainissement (OBUHA) for protecting the Lake Tanganyika in Bujumbura – François NAHIMANA, OBUHA, **Bujumbura, Burundi**
8. Improving sanitation in Abidjan: protecting urban and coastal watersheds - Dominique OGA, Bureau National d’Etudes Techniques et de Développement, **Abidjan, Ivory Coast**

A short biography of these 8 managers follows the cases presentation.

TOWARDS A BETTER PERFORMING SANITATION SERVICE IN TASHKENT CITY:
HANDLING INDUSTRIAL EFFLUENTS

Maksud ABBASKHANOV - Chief engineer of SUVSOZ - Tashkent - UZBEKISTAN

SANITATION CHALLENGES: INDUSTRIAL EFFLUENTS POLLUTION AND UNCONTROLLED ONSITE SANITATION



Sewerage lines

Industries such as textile companies don't comply with treatment standards, such as color limits.
Industrial effluents prevents biological wastewater treatment plants to work properly and sludge stabilization is often not effective.
There is a lack of incentive to make industrial companies to invest in pretreatment facilities.

ONSITE SANITATION

About 10% of the inhabitants use septic tanks. Private operators are in charge of emptying activities.
Onsite sanitation is controlled by sanitary epidemiological center.
Low interest in developing and controlling onsite sanitation.

THE WATER AND SANITATION OPERATOR: SUVSOZ

Suvsoz company is one of the 13 regional drinking water supply and sanitation utilities.
It operates under the responsibility of the Ministry of Housing and Communal Services.

Its mission is to ensure access to safe drinking water and sanitation services for all the citizens of Tashkent city through:

- Operation and maintenance
- Rehabilitation and extension of the existing system according to population growth
- Planning, design and construction of new water supply and sewage
- Billing and collection of water and sanitation provided to the consumers

SUVSOZ'S STRATEGY

The strategy of Suvsoz company will be developed for 10 years from 2020 to 2030 to create a successful and innovative showcase for Central Asia. The aim is to turn Suvsoz company into world class utility, providing public services at the ISO standards while optimizing functioning costs and existing resources.

OBJECTIVES

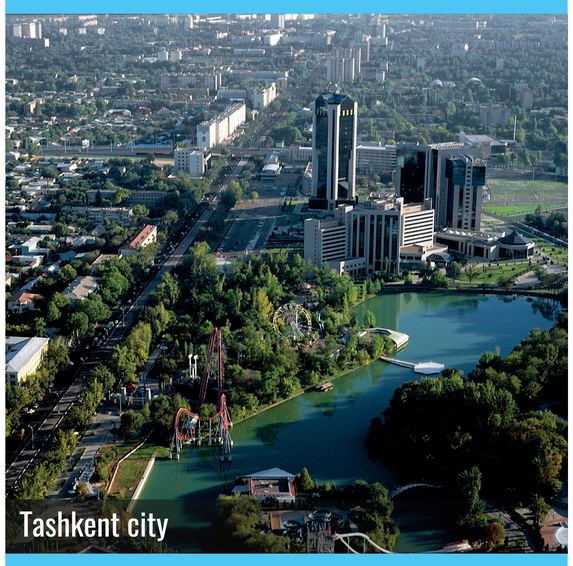
Prevent release of untreated effluents in the river:

- Impose treatment of industrial effluents onsite and quality of discharge in the public sewerage
- Increase the number of industries using treatment facilities
- More inspection and cooperation between Suvsoz and Industries to design, monitor and control treatment facilities

- Stabilise the biological treatment with discharge objectives well monitored
- Extension of sanitation coverage to 100% with extension of sewerage
- Regulate and control the public-private partnership for sludge management

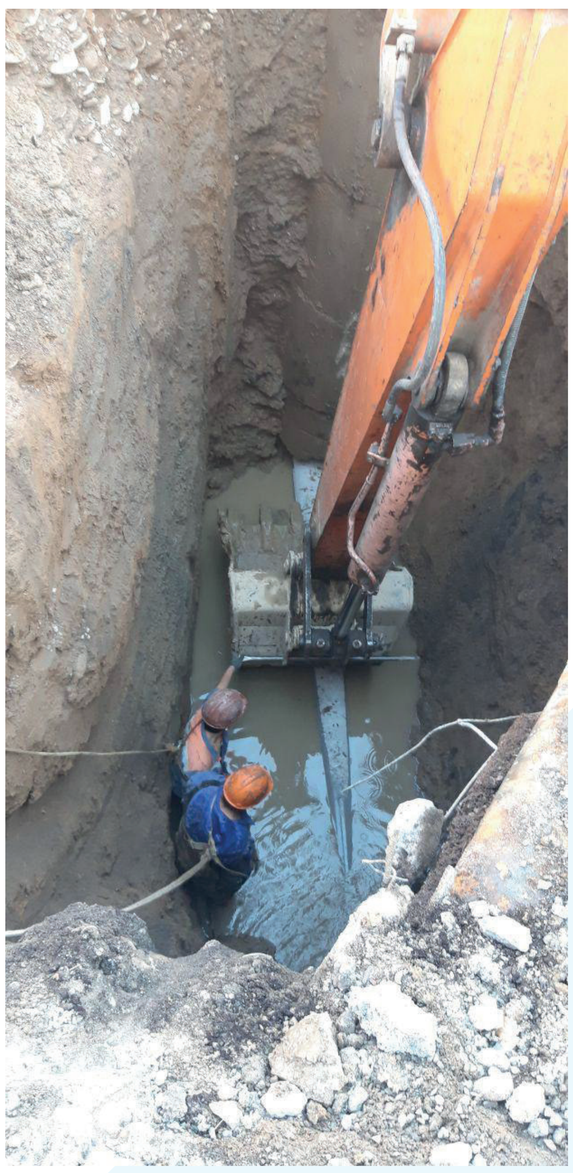
Tashkent

Capital of UZBEKISTAN


Tashkent city

Population: 2,500,000
Area: 340 km²
Annual growth rate: 1.14%
Sewerage service coverage: 92.6%
Average water tariff: 0.4€/m³
Sanitation tariff: 0.022€/m³
Sewerage network: 2,653 km
More than 105,000 manholes
23 pumping stations
3 sewerage plants

Leak detection

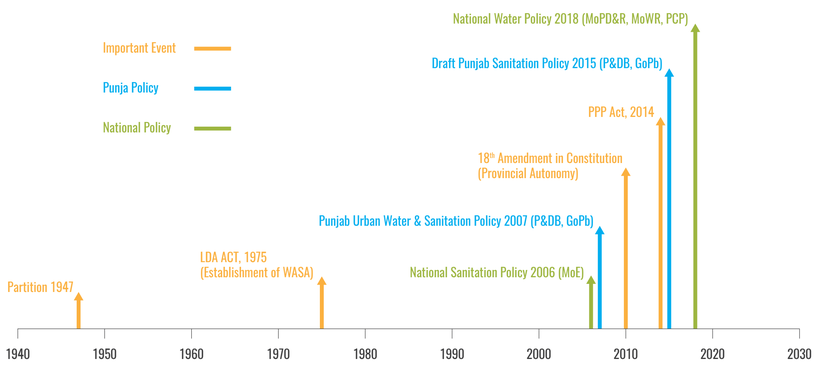


Conception : LABOPIXEL.fr

SETTING UP THE FIRST WASTEWATER TREATMENT PLANTS OF LAHORE

Zohaib BUTT - Deputy Director Procurement - Lahore - PAKISTAN

SANITATION STAKES AND KEY NUMBERS



Main evolution of the legal framework

There is no wastewater treatment facility in Lahore. This has serious health and hygiene implications for residents of Lahore and major environmental implications on Ravi River aquatic life. This also causes huge threats on groundwater, which is the main source of drinking water.

Massive migration to the city creates problems of congestion and thus resulting in inadequate infrastructures. With increasing urbanization and industrialization, the volume of domestic as well as industrial sewage being produced is steadily growing in Lahore city.

Existing sewerage systems have become depleted: greater burden on the regulating authorities, bulk conveyance and treatment systems for the domestic and industrial wastewater.

MAIN CHALLENGES FACING LAHORE WASA

WASA Lahore is the second largest water utility of Pakistan serving population of 8 Million, and operating in the area of more than 350 Sq.Km with the huge workforce of 8,642 personnel. Established since 1976 and is responsible for Planning, Design, Construction, Operation & Maintenance, and Billing & Collection of Water Supply, Sewerage and Drainage systems of Lahore.
The existing sewerage system in some of locations consists of oval shaped brick masonry sewers of old British time and other majority sewerage system was laid 25-60 years ago. The instant sewers are deficient to cater the flow from adjoining areas particularly, the silted/choked sewer lines and drainage channels are serious hazards to the urban environment.

ORGANIZATIONAL ISSUES FACED BY L-WASA

AREA	CHALLENGES
Organization & Strategy	Limited autonomy due to no proper line ministry and weak tariff (frozen since 2004)
Human Resource Management	Limited capacity building & high staffing ratio
Financial Management	No reliable budgeting, cost accounting & cost control policy
Technical operations	No wastewater treatment plant and Limited Asset Management
Commercial Management	Very few metering, limited customer database and low collection efficiency

INSTITUTIONAL ISSUES

No Institution addressing Policy focusing on Urban Water Management, no Focus on IWRM and Water Conservation.
No regulatory Body for urban water and Sanitation management issue and overlapping in role of functions with respect to that of a regulator. The role of a regulator is partially performed by the two institutions i.e. Housing Urban Development & Public Health Engineering Development and Lahore Development Authority. The Governing body of LDA is comprised of political convenor ship and members along with other official members, causing less sufficiency in autonomy of a regulator.

Autonomy issues regarding especially tariff setting along with absence of roadmap for technological design and to deal with fraud and illegality when people don't pay their bill or don't comply with sanitation regulation.

Too many departments are responsible for the same tasks, which also creates complications in addressing any agenda in the best possible time. The utility usually suffers that to whom it has to be reportable for a certain matter. The utility is solely responsible to control & monitoring of the Operation and Maintenance.

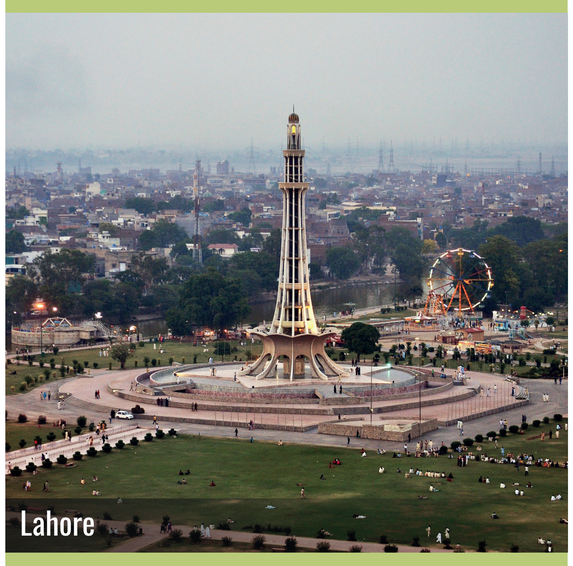
ACTIONS TO BE TAKEN

Building of infrastructures:
Number of previous studies recommended for immediate setting up of Wastewater Treatment Plants (WWTPs) and identified six locations for the establishment of Wastewater Treatment Plants (WWTPs) to treat wastewater of Lahore city. Therefore WASA Lahore intends to construct Six Wastewater Treatment Plants (WWTPs) on priority basis.
These plants were proposed in anticipation of sewage load of L-WASA in 2030. These WWTPs will have a treatment capacity ranging from 25 to 175 MGD. They will be funded by AIIB, AFD and DANIDA.

Institutional actions suggested:
Owing to deteriorating financial health and lack of autonomy of the utilities, there is a quest for the establishment of an impartial entity which will handle Principal-Agent problems by setting critical regulations.
Now, an impartial referee is inevitable of the sustainability of the WASA Lahore.

Lahore

Second largest city of PAKISTAN



Lahore

Population: 11,130,000
Area: 1,772 km²
Annual growth rate: 3.12%
Sewerage service coverage: 61%
Population served by L-WASA: 8,000,000
Sewerage coverage: 92%
Total length of sewerage: 5,140 km
Length of Drain: 495 km
Number of Disposal stations: 14
Number of Drainage stations: 4
Number of Lift Stations: 105
Sewerage connections: 702,685
Wastewater produced: 2.45Mm³/day
% Wastewater treated: 0%
Staff/1 000 sewer connections: 12.31
Billing efficiency: 91%
Collection efficiency: 85%

Ravi river basin

EXPECTED OUTCOMES

- Wastewater disposal in conformance to National Standards to determine
- Restoration of natural ecology and aquatic habitat of River Ravi and reviving of recreational activity at River Ravi
- Mitigation of the environmental and public health threats from disposal of untreated wastewater and possible contamination of ground water
- Improvement in efficiency and serviceability of the utility
- Trust building of utility among customers

IMPROVING SANITATION SERVICE IN SIEM REAP AND ORGANISATION OF PLAYERS:
TARIFF INCREASE, EXPANSION OF SEWERAGE AND CESSPOOL EMPTYING SERVICES

Dany DOURNG - Director of General Affairs and Information Department - General Directorate of Sewerage and Wastewater Management
Ministry of Public Works and Transport - Siem Reap - CAMBODIA

SANITATION OPERATOR

Siem Reap Sewerage and Wastewater Department (SR-SWTPU) is the administrative unit created in 2008 in purpose to operate the sewerage system. SR-SWTPU operates under the Department of Public Works and Transport of Siem Reap Province.

The main income of SR-SWTPU is the monthly revenue, collected from the customers. Block tariffs were established on the size of the building and type of business. The average cost recovery is 50% of the OPEX (excluding amortization and/or debt service). This gap is usually filled through grants from Government.

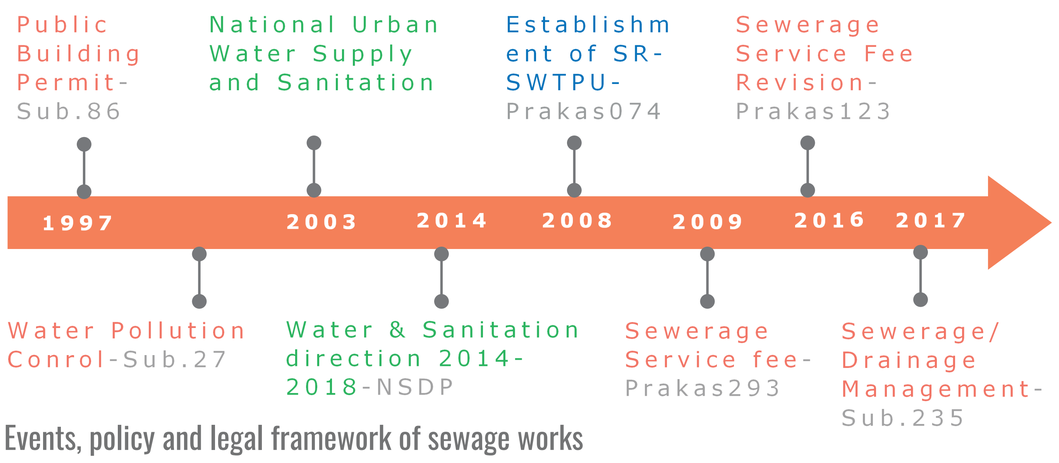
SANITATION CHALLENGES

About 75% of the population have access to basic sanitation, among which 24% through a sewerage system.
Only a small amount of the sewage is collected through a combined system plus a relatively small-scale separated sewerage system and treatment scheme. Shallow aquifers of Siem Reap city are deeply polluted.

Only 9% of the faecal waste in Siem Reap city is collected and properly treated. Treatment capacity in 2020 and 2030 are about 11,471 m^3/day and 27,996 m^3/day and currently 12,500 m^3/day, which need to improve immediately.
There is no proper mechanism to manage the fecal in the city.

INSTITUTIONAL CHALLENGES

SR-SWTPU lacks autonomy. The approbation of main sewerage administrative works lies under SR-DPWT whereas, planning, budgeting, master plan and big capital investments are under the administrative power of central government MPWT. The Ministry of Public Works and Transport (MPWT) plays many roles.



Events, policy and legal framework of sewage works

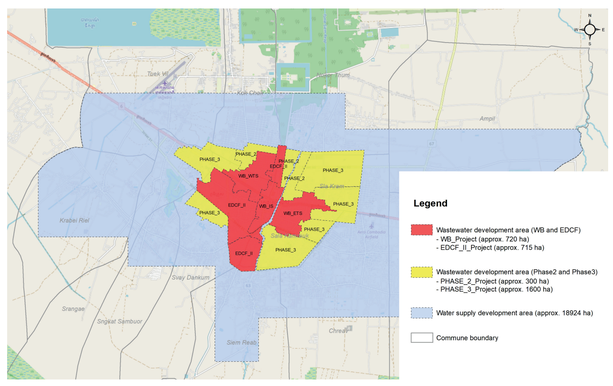
KEY OBJECTIVES AND INSTITUTIONAL ACTIONS

ACTIVITIES	OUTPUTS	OUTCOMES	
Revise the tariff	New tariff grid	Adequate tariff with acceptable price	The revenue can cover operating cost or plus amortization
Sub-contract sewerage bill with SR-WSA	Join billing sewerage and water supply	High collection rate	
Construct separate sewer & sewerage treatment plant	Length of sewers laid in city Volume of WW treated	Households covered by sewer connections	Increase access to improve sanitation
Conduct sludge emptying service	Number trip emptying & volume of sludge collected	Households receive faecal sludge emptying service	

Increase access to improved sanitation through collection, treatment and maintenance

Increase revenue to cover operating cost through reformation tariff and combine bill between water supply and sanitation fee

Set up an independent regulatory body and improve capacity building for SR-SWTPU to handle planning activities



Plans for sewerage expansion

Siem Reap

City of CAMBODIA

Tonle Sap river basin

Population: 139,458 (2018)
Area: 472.73 km^2
Annual growth rate: 1.41%
3 to 5 Million tourists/year
Average sanitation tariff: 0.08€/m^3

Sewage disposal

Institutional framework

MACRO	MESO	MICRO
MPWT: Making Policy, Legal Framework for Sewerage Management & Development	MPWT&PDPWT: Making regulation, Prakas, Monitoring, Evaluation	SR-SRWTP: Operation and Maintenance
MoE: Setting Up National Water Quality Discharge Standard	DoE: Monitoring Water Quality discharge	MPW: Planning & Design
MOP: Making Notational Planning all sectors including sanitation	DLMUP: Approving and Inspecting on Septic construction	
MLMUP: Setting up National Building Permit	Apsara Authority: Assess on environmental impact from the sanitation in term of ecological and preservation	
MEF: Allocating funds	Provincial Admin: Implement regulation for penalty and facilitator	

Conception : LABOPIXEL.fr

STRENGTHENING AND IMPROVING THE PERFORMANCE OF SANITATION SERVICES THROUGH THE UPTD PAL IN BOGOR CITY:
A FOCUS ON FINANCIAL AND TECHNICAL CHALLENGES

Mrs ULYANI - Head of Technical Services Unit of Domestic Wastewater Management
Department Public Works and Spatial Planning - Bogor - INDONESIA

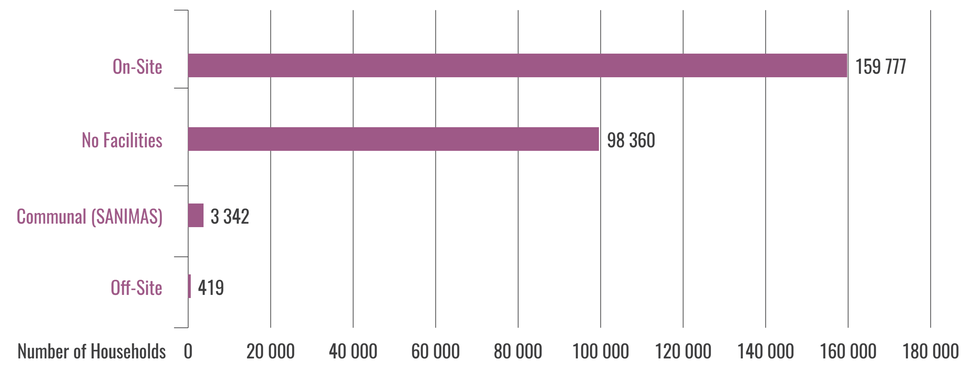
SANITATION CHALLENGES

62% of the population have access to sanitation, in great majority through onsite systems (61%). According to the Department of Public Work, only 489 households do maintenance by emptying their septic tank.
The challenges and complexity of domestic wastewater management in Bogor City will increase with acceleration of population growth and density. In the next 10 years, urban wastewater treatment in Indonesia will be dominated by individual household and community-based sanitation systems besides an increasing number of piped systems.

The City of Bogor has planned to establish a sustainable wastewater system. The plan is consistent with the national target that requires cities to provide proper sanitation access to 100% of their population by 2030.

ALTERNATIVE MODES OF PRODUCTION: THE SANITATION SERVICE

Community-based sanitation systems, usually funded by the Government of Indonesia through programs such as SANIMAS, consist of intermediate sanitation system such as public toilets. These programs established small decentralized wastewater treatment systems with additional sanitation facilities. Local communities are responsible for operation and maintenance of these infrastructures. Each unit of SANIMAS in Bogor City is designed to cover more or less 100 households. There were 115 units in 2019. UPTD PAL only provides desludging services for these community-based sanitation systems, because wastewater treatment plants need maintenance every 3 years.



General Sanitation Coverage in Bogor City in 2017

Off-site sanitation systems, collecting household's black water and grey water pumped through a piping system to the sewerage treatment plant. Only about 0.42% (900 households) of Bogor's inhabitants have sewerage pipeline. Currently only one wastewater treatment plant (WWTP) operates in Bogor named WWTP Tegal Gundil.
It was constructed in 1996 and serves a small part of East zone services with coverage of approximately 22 hectares. The total volume of treated wastewater is 300m³/day.

SANITATION OPERATOR

Indonesia is a decentralised country. Water and sanitation services lie under the responsibility of cities. Bogor City has a small and simple institution with a specific function to operate wastewater service, the namely is UPTD PAL or Local Technical Unit of Implementation wastewater management.
UPTD PAL currently is the only operator of wastewater services in Bogor under the Department of Public Works and Spatial Planning.

As an operator, their tasks include:
- managing desludging services (on-demand and scheduled desludging), sewage treatment and sewerage services
- operating toilet bus
- promoting the services
- billing and collect payment from the customers


Expansion of network and house connection

OBJECTIVE

The main objective of UPTD PAL is focused on improving the level of performance, becoming well-performing to provide a reliable and sustainable sanitation services including effective and professional management for collection, transport and treat wastewater in the next 10 years. When the service area is getting wider, handling thousand customers and collecting thousand bills along with operating bigger asset, a well-established and professional institution such as Local Community Service Agency (BLUD) or Local Company (BUMD) specialty in domestic wastewater management is needed.

- Strategy: adoption of "quick fix" on-site solutions and off-site system solutions for long-term.
- The existing wastewater services have desludging services and sludge treatment plans which can be capitalized as the seeds for the future scheduled desludging service. A pilot project is scheduled for desludging in priority location with benefits expected in long-term and short-term.
- Similarly, the existing decentralized sewerage services can be improved to complement the upcoming citywide sewerage service.
- Increasing coverage service area will be done through short-term investments such as improving access or network and increasing capacity of existing WWTP.

Bogor
One of the fastest growing cities in INDONESIA


Bogor Presidential Palace

Population: 1,064,687
Area: 118.5 km²
Annual growth rate: 1.53 %
8,985 inhabitants/km²
Off-site sanitation tariff: 0.04€/m³

ACTIONS TO BE TAKEN

ON-SITE SYSTEM

Increasing capacity sludge treatment plant from 30m³ per day to 100m³/day by 2023 funded by the national Government

Establishing the scheduled desludging services by the next 10 years: 80% of the whole households targeted (123.305 customers) to ensure the large financial and commercial sustainability.

OFF-SITE SYSTEM

Increasing capacity of the WWTP in Tegal Gundil Site from 900 HH objective to 3,000 HH in 2024 funded by the national Government

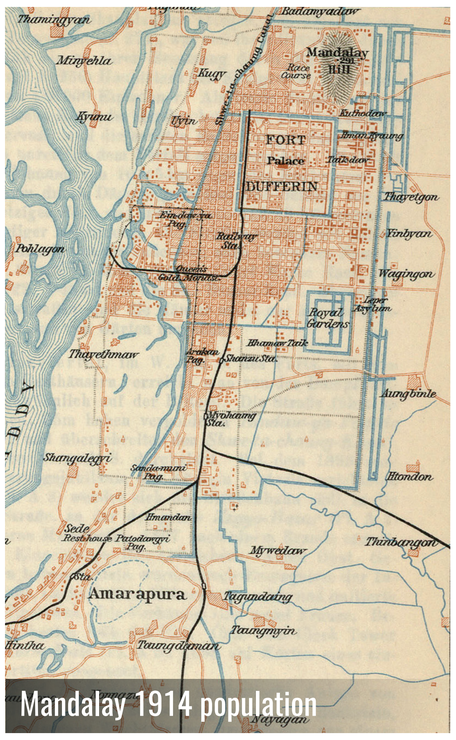
Bogor Wastewater Project by Citywide Sewerage Infrastructure:
the project aims at providing 20% off-site sanitation systems of Bogor population by 2030. Its phase 1 targets 100,000 inhabitants, with infrastructure investments amounting to USD 75 million

Conception : LABOPIXEL.fr

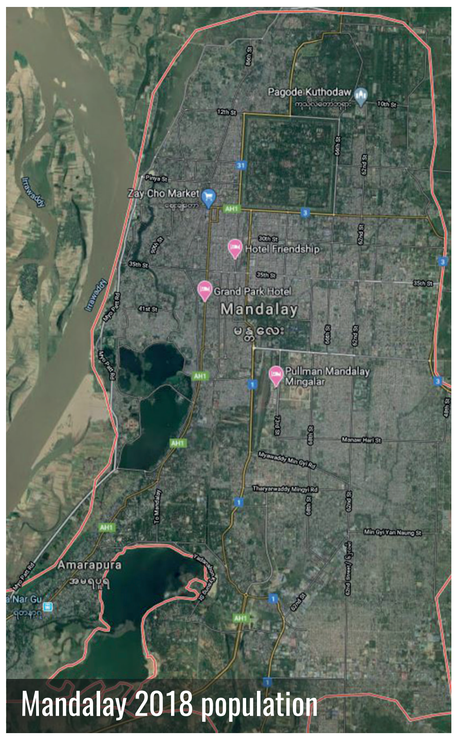
SANITATION IN MANDALAY CITY:
AN URGENT NEED TO BUILD A SANITATION DEPARTMENT AND AN ENABLING INSTITUTIONAL FRAMEWORK

MYA KHWAR NYO - Assistant Director / Project Manager
Mandalay City Development Committee - MYANMAR

CONTEXT AND SANITATION CHALLENGES



Mandalay 1914 population



Mandalay 2018 population

The city of Mandalay develops on-site sanitation. While only 6% of the population don't have access to toilets, the city lacks any collective sanitation infrastructures.

Wastewater is released in open channel waterways without any treatment. These waterways have their outlet in rivers.

TYPE OF ACCESS TO TOILETS	% OF POPULATION
Septic tank	62%
Pit latrines	32%
Open defecation	6%

CURRENT MANDATE OF SANITATION SECTION UNDER WATER AND SANITATION DEPARTMENT

- Building licenses for individual septic tank construction in household
- Provide public toilets as well as mobile toilets
- Solve public complaints

IN COLLABORATION WITH OTHER DEPARTMENT UNDER MCDC

- Provide desludging service
- Check and take actions on industrial waste disposing from factories
- Control the wastewater sluice gate
- Construction, operation, maintenance and management of pumping stations

ORGANISATIONAL CHART

Committee Member (Water and Sanitation)

Director (Water and Sanitation)

Deputy Director (Water and Sanitation)

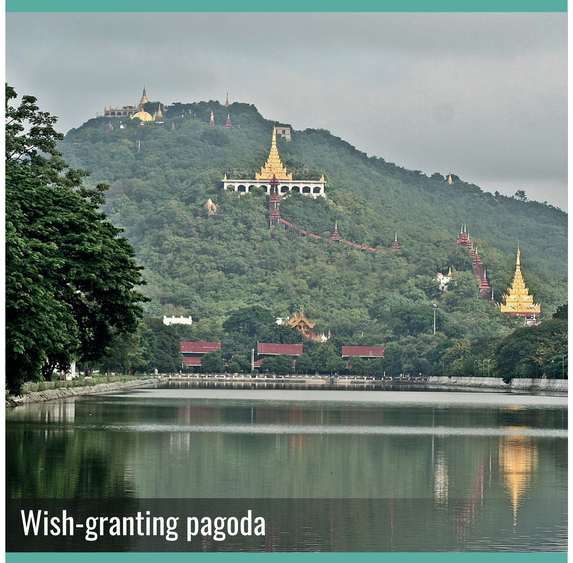
- Water Distribution Section
- Tube Well Section
- Sanitation Section
- Procurement and Procurement Section
- Project Management Unit

ORGANISATIONAL AND INSTITUTIONAL BARRIERS FOR SANITATION EFFICIENCY

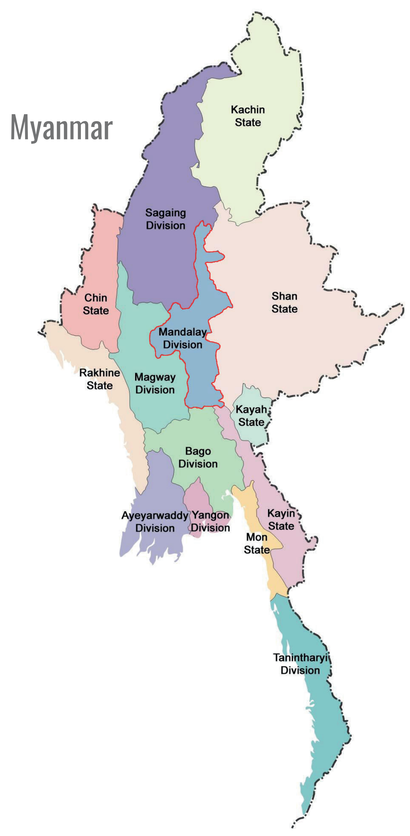
- Lack of planning and no master plan
- Lack of autonomy of the sanitation department into the municipal management
- Responsibilities between Committee, Direction and Deputy direction not well framed
- No specific sanitation improvement budget, nor management funds neither economy of service
- Lack of infrastructures to treat wastewater even if collective projects are on view but silo management with others sections
- Overlapping or gap of responsibilities that prevents action
- Low managerial capacity vertically and horizontally. No entrepreneurship issue and mainly bureaucratic behaviour.

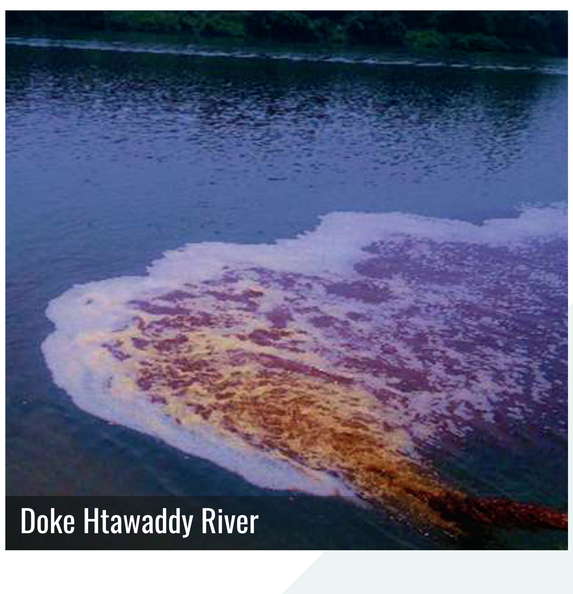
Mandalay

Center of MYANMAR


Wish-granting pagoda

Population: 1,200,000 (2014)
Population by 2040: 1,800,000 (+63%)
Area: 314.7 km²




Doke Htawaddy River

ACTIONS TO BE TAKEN:

- Building the sanitation Infrastructure
- Strengthening the Institution
- Improving the management system

Conception : LABOPIXEL.fr

MANAGEMENT OF WASTEWATER AND STORMWATER
IN A CONTEXT OF INSTITUTIONAL COLLABORATION RESTRUCTURED BETWEEN THE "MUNICIPAL COUNCIL" OF COLOMBO AND THE NATIONAL WATER AND DRAINAGE BOARD

Mr Polpitiya A.S. ANURADHA - Chief Engineer - Regional Support Center
NWSDB - SRI LANKA

SANITATION CHALLENGES

Colombo city wastewater system collects 142,000 m3 of wastewater daily and directly discharges through sea outfall without any treatment. Colombo city has 100% access to water and sanitation while the country has 92% and 94% which is best in south Asia.

However, direct disposal of wastewater to sea create an adverse effect on marine biodiversity and pollution of seawater.
The sewerage infrastructures are old (constructed between 1906 and 1925 to serve 373,000 people in 1951).

SANITATION OPERATOR

Drainage section of the Colombo Municipal Council (CMC) manages the wastewater of Colombo city while National Water Supply and drainage board supplies water. The wastewater management system was constructed in 1925 with treatment and later 1960's treatment plant decommissioned. Initially, both water supply and wastewater management systems were owned and maintained by CMC. In 1996 water and sewerage assets were transferred to NWSDB. However, operation and maintenance (O&M) of wastewater system continues by the CMC for system operation and maintenance funded by CMC and NWSDB. This ambiguity led to weakening the system and data management. In 2009, the Attorney General confirmed CMC as the owner.

MAIN DYSFUNCTIONS AND WEAKNESSES FOR SANITATION MANAGEMENT

- No well limited responsibility between CMC and NWSDB
- Constraints for rehabilitation and development (Resettlement, Road space availability, Lack of competition in contracting)
- Difficulty in attracting and retaining qualified staff
- Sea outfall without treatment
- No cost recovery with metering and tariff structure
- Sanitation Section funded by an allocation from the Colombo Municipal Council income (amounts not known)
- No capacity on staff in order to match the present demand due to rapid development of Colombo
- A difficulty of changing the behavior of sanitary workers to wear appropriate clothes and take standard safety measures during the O&M
- An inability for meeting the capital cost of renewal of sewers to improving the Capacity and/or sewer condition and O&M


Colombo City


Colombo City

MAIN STRATEGY OBJECTIVE

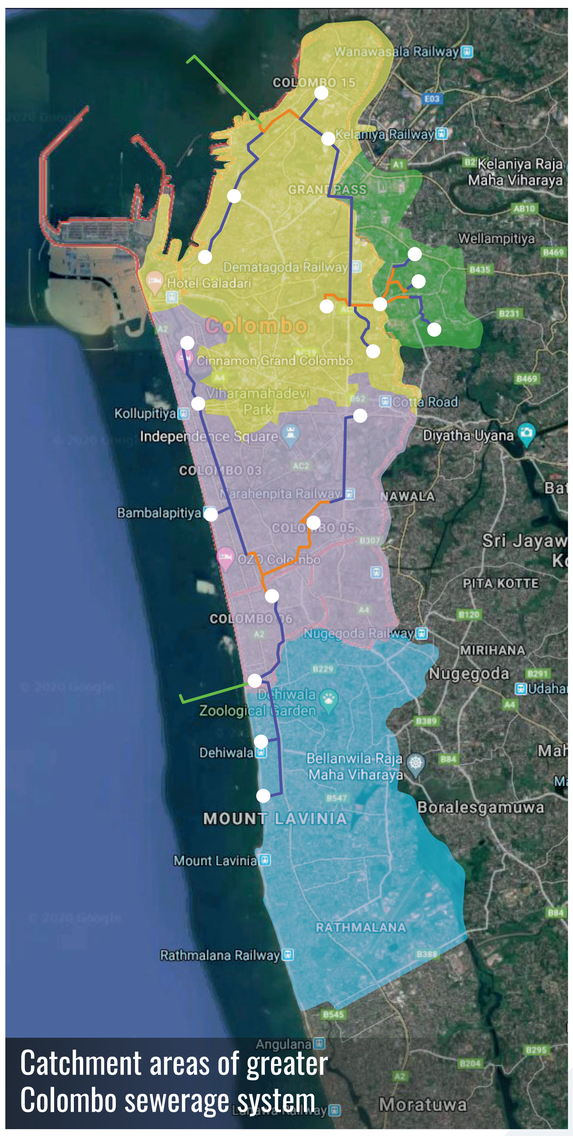
- Introduction of regulatory cell and independent regulator for the sector
- Infrastructure development and rehabilitation including wastewater treatment plant
- Capacity development
- Economical reform with volume-based wastewater tariff
- Utilizing a wide range of financing sources
- Public-private Participation (in view but not decided)
- Determine safety and health standards and objectives of discharges

Colombo

Economic capital city of SRI LANKA


Colombo City

Population: 1,000,000
More than 27,000 inhabitants per km²
Rich with water bodies
Total length of main sewer network: 287 km
Total length of storm water network: 780 km



Catchment areas of greater Colombo sewerage system

- Pumping station
- Gravity transmission sewer
- Force mains
- Sea outfall
- DMMC area
- Kolonnawa area

CMC main catchment
- North catchment
- South catchment

Conception : LABOPIXEL.fr

MAIN SANITATION ISSUES IN ALEXANDRIA FROM AN INSTITUTIONAL POINT OF VIEW

Mahmoud MEHANY - Water safety plan department Manager - HCWW - Alexandria - EGYPT

SANITATION CHALLENGES

70% of the population in Alexandria is connected to a sewer. Almost 100% is connected to safe sanitation system.

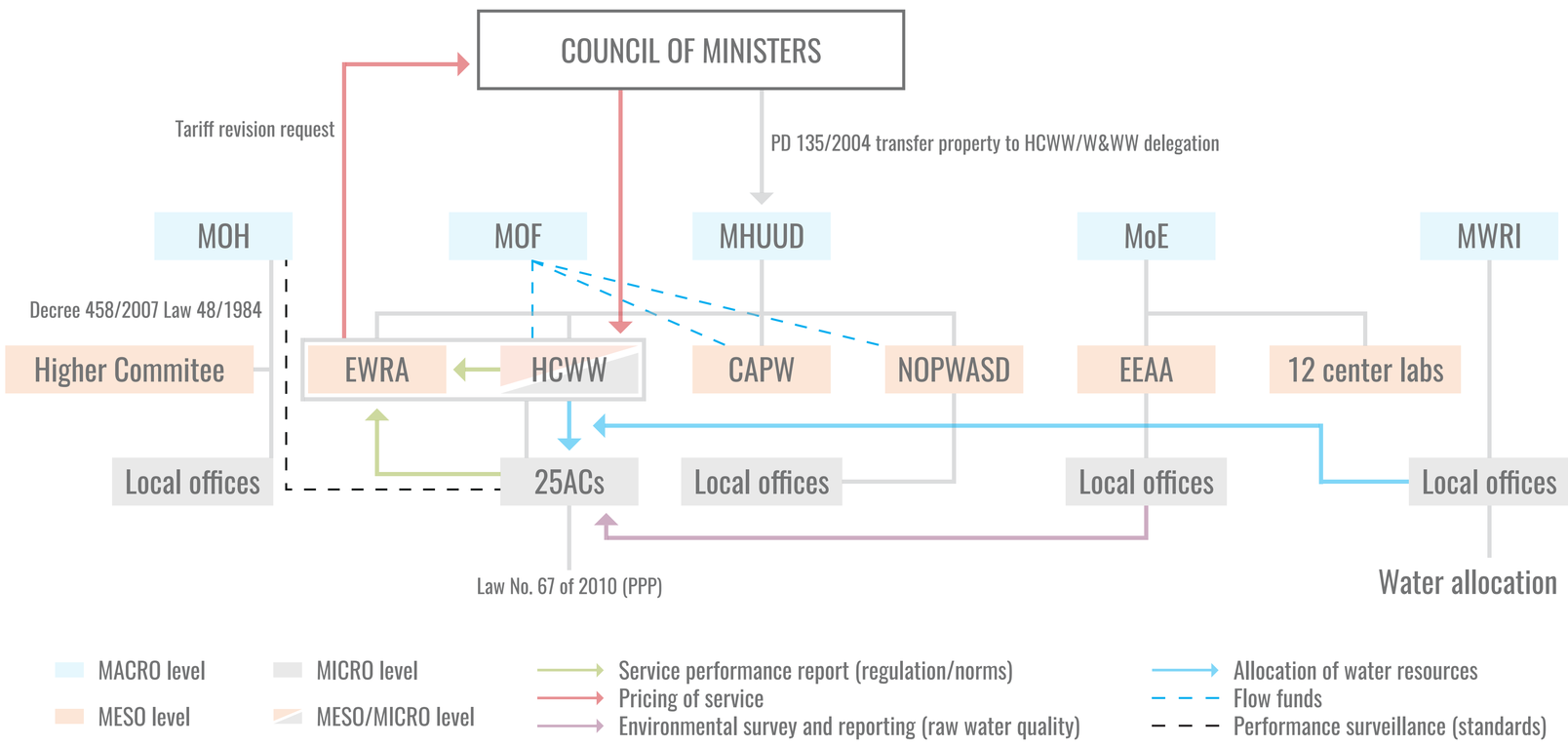
Alexandria host 18 Waste Water Treatment Plants (WWTPs), that treat around 1.4 million m^3 in a daily basis. 2 WWTPs are operated by private operators. 6 WWTPs don't work well (2x 3,000 m^3/d do not work, 1x807,000 m^3/d face operational problems, 1x462,000 m^3/d only has primary treatment, 1x35,000 and 1x6,800 are overloaded).

Environmental agencies take notes. However, in many cases, the low quality of treated wastewater is not due to operations but to overloading. Moreover, around 30% of the treated waste is only primary treated (400,000 m^3/day).

SANITATION OPERATOR

In Alexandria, two Affiliated Companies (ACs) - part of HCWW - are in charge of water and sanitation :
Alexandria Water Company (AWCo) is the water company of the city and the governorate (province) of Alexandria, Egypt founded in 1860,
The Alexandria General Organization for Sanitary Drainage (AGOSD) created in 2004 and later renamed to Alexandria Sanitary and Drainage Company (ASDCO), is in charge of the sewerage and wastewater treatment functions.

INSTITUTIONAL FRAMEWORK



TO STRENGTHEN THE COORDINATION MECHANISM BETWEEN DIFFERENT STAKEHOLDERS

HCWW should submit a proposal of formulation of the Egypt Water Bureau to the MHUUD minister to be submitted to the President and Egyptian parliament. The Bureau is formed from the different stakeholders in the water sector. The political situation and the water scarcity are two success factors for this proposal (long term action).

To push in the way for approval of the water law that unifies all laws and decrees related to water. This law includes also a group of incentives for water resources protection. This will allow further and smoother coordination mechanism between stakeholders (long term action).

To form local committees for Sanitation Safety plans' implementation to coordinate between different stakeholders (short term action).

TO ALLOW ASDCO TO IMPLEMENT A FAIR TARIFF THAT ENSURE A SUSTAINABLE GOOD PERFORMANCE OF SANITATION SERVICES

Submit tariff increment proposal linked to inflation rate to EWRA and MHUUD, attached by forecasting modules of the situation if the tariff is not adjusted. Allow different ACs to have different tariffs according to technologies used in wastewater treatment, regarding demography, and socio-economic situation.

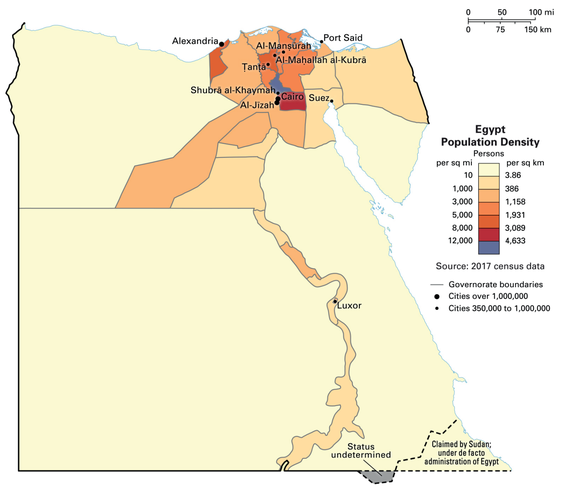
Develop innovation portal for contribution of the staff to develop less costly and efficient sanitation technology.

Alexandria

Second-largest city in EGYPT


Alexandria

Population: 5,281,000
Area: 2,679 km^2
Annual growth rate: 1.91%
Average sanitation tariff: 0.075€/m^3



Population density

INSTITUTIONAL OBSTACLES FOR ASDCO

Legalization:
- No unified water law
- Sophisticated specifications

Financial:
- Low tariff (0.075€/m^3)
- Highly costly wastewater treatment technologies that will be used for reuse purposes

Environmental:
- Many conflicts witn environmental agencies due to improper runing of the wastewater facilities

Organization:
- Lack of coordination between different stakeholders
- MWRI play monopoly in implementation of IWRM

Polpitiya Acharige Samira ANURADHA is a Senior Engineer / Area Engineer in Colombo City West / Fort. He is employed by National Water Supply and Drainage Board (NWSDB) since 2014. His present duties are basically focused on reducing of non-revenue water and its sustainability by developing, standard operation and management procedure for District Metering Arrangement (DMA) management, functioning of NRW laboratory, continuous knowledge and system development and improvement of commercial functions to ensure total consumer satisfaction by coordinating with the on-going Greater Colombo Water and Wastewater Management Improvement Investment Program (GCWWMIIP) project in Colombo City which is implemented under the funding assistance of Asian Development Bank(ADB).

Zohaib BUTT is a civil engineer. He has been working in the Water and Sanitation Agency of Lahore since 2010. He has contributed to the design and implementation of many projects. He is graduated from AgroParisTech's International Executive Master "Water for All" – OpT in 2020 (Gérard Payen class).
Mohamed Mansour DIA has a Master's degree in Environment with a major in Water Treatment and a professional Master's degree in Water Treatment Process Engineering. In 2014, he joined the Ministry of Water and Sanitation and is directly attached to the Sanitation Directorate as a sanitation study engineer. Since 2015, he has been in charge of monitoring and evaluation and head of the water treatment division in the same department.

Dany DOURNG has been working as an engineer for 8 years, specializing in water and sanitation. Currently, she is working as director of General Affairs and Information Department / General Department of Sewerage and Wastewater Management / Ministry of Public Works and Transport, in Cambodia. Her duties in terms of wastewater management are making policy and strategy, making national plan, marking urban master plan, making regulation framework, support sub-nation level in capacity building, customer operation, organization management and institutional arrangement.
Before working as a public server, she has been working with NGO name WaterAid as program officer of urban sanitation, she has worked for project planning for faecal sludge management, faecal contamination, project planning and education program.

Blaise FAYE, born in 1983 in Senegal, Electromechanical Engineer (Polytechnic School of Thiès); Master in Project Management (ISM of Thiès); International Executive Master "Water for All" – OpT.
He is currently Head of Technical Department at ONAS; President of the Board of Directors of the IPM of ONAS and, Representative of the Technical Services of ONAS for Public Tenders.

Mahmoud MEHANY holds a Ph. D. degree in Chemistry (water treatment). He is working for the Holding Company for water and wastewater since May 2006 as the WSP Department manager. His position as WSP- department manager allow him to collaborate and coordinate with many stockholders in the field of water treatment and quality in Egypt like Ministry of Water Resources & Irrigation in Egypt, Ministry of Health, and Ministry of State for Environmental Affairs in Egypt. He also has collaborated with international water institute and consultants as KWR "Watercycle Research Institute, Netherlands" and VNG-International "International Cooperation Agency of the Association of Netherlands Municipalities" through the WSP project activities.

François NAHIMANA holds a degree in Agricultural Engineering from the University of Burundi obtained in 2011. Since 2012, he has been working in the field of sanitation in the Municipal Technical Services of the City of Bujumbura (SETEMU) now OBUHA, which is in charge of sanitation and storm water drainage in the City. Since the beginning of 2018, he has been Head of the Department for the Operation of the Wastewater Network and the Wastewater Treatment Plant; this has given him a great responsibility in the protection of Lake Tanganyika against pollution due to wastewater from the City of Bujumbura.

Dominique OGA is an executive manager, project manager in charge of studies and control of sanitation works at the Bureau National d'Etudes Techniques et de Développement de Côte d'Ivoire where he started in 2014. He has more than 13-year experience as an engineer in urban hydraulics, sewerage and solid waste management. He has started his carrier with NGO SOLIDARITES in 2007 as project engineer in charge of wells and boreholes rehabilitation. He graduated from AgroParisTech in 2020 for the International Executive Master "Water for All" – OpT.

Agence française
de développement
5, rue Roland Barthes
75012 Paris I France
www.afd.fr

Éditions Agence française de développement (AFD) publishes analysis and research on sustainable development issues.

Conducted with numerous partners in the Global North and South, these publications contribute to a better understanding of the challenges faced by our planet and to the implementation of concerted actions within the framework of the Sustainable Development Goals.

With a catalogue of more than 1,000 titles and an average of 80 new publications published every year, Éditions Agence française de développement promotes the dissemination of knowledge and expertise, both in AFD's own publications and through key partnerships.

Discover all our publications in open access at editions.afd.fr.

Towards a world in common.

Disclaimer
The analyses and conclusions of this document are entirely those of its author. They do not necessarily reflect the official views of the Agence française de développement or its partner institutions.

Publishing Director Rémy Rioux
Editor-in-Chief Thomas Melonio
Graphic creation MeMo, Juliegilles, D. Cazeils

Legal deposit 1st quarter 2022
ISSN 2492-2838
Printed by the AFD reprographics department

To see other publications in the **Technical Reports** series, visit:
https://www.afd.fr/en/collection/technical-reports