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# Coproduced urban water services: When technical and governance hybridisation go hand in hand

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This study questions the processes of technical and governance hybridisation in the coproduction of water services in cities of the Global South. The existing literature addresses the compensatory role that water services coproduction plays in urban and peri-urban areas, where access to centralised and reliable water resources is often lacking. However, less research focuses on the evolution of coproduced practices in relation to wider transitions of urban spaces, water resources, centralised infrastructure, and service delivery strategies. Still, the resulting technical and governance configurations stemming from these situations are largely unexplored. This study considers four cities, namely, Hanoi (Vietnam), Dar es Salaam (Tanzania), Cochabamba (Bolivia), and Addis Ababa (Ethiopia). All our case studies are somewhat characterised by rapid land-use changes, juxtaposition of rural and urban activities, varying urban typologies, and increasing poverty, sociospatial inequality, and exclusionary service provision. We draw on data collected from field surveys and participatory workshops with inhabitants and institutional actors between 2017 and 2020 as part of a recent research project. We explore the evolution of water coproduction from technological and governance perspectives. The cases analysed in the research highlight that the time and social development of water coproduction do not follow a linear path. It is rather characterised by cycles of emergence, maturation, and decline. It may build upon pre-existing forms of community-based water management that were established in rural areas (for irrigation or water harvesting, for instance). The results show that water coproduction may have different evolutions, entailing different hybridisation processes. Water coproduction can be characterised by either complementary or concurrent service configurations, by blurring actor categories, and by different drivers in the hybridisation process. Ultimately, evolution in urban coproduced practices appears as a process of technical and governance hybridisation, rather than as final and fixed hybrid systems.

## KEYWORDS

technical hybridisation, governance hybridisation, stare co-production, urban, water

## 1. Introduction

Nowadays, there is a wide consensus on the inability of conventional water supply systems, based on centrally managed networks, to provide universal and sustainable access to drinking water and sanitation facilities in many cities of the Global South (Bakker et al., 2008; Coutard, 2008; Furlong, 2014; Coutard and Rutherford, 2015; Moretto et al., 2018). In addition, networks are still far from the only form of service provision. An increasingly hybrid, localised, often decentralised, infrastructural landscape is emerging in the cities of the Global South (Bakker, 2003; Allen et al., 2017; Faldi et al., 2019, 2021), including connected, disconnected, preconnected, and reconnected configurations of the so-called post-networked city (Coutard et al., 2014). All these alternative, non-conventional service delivery options currently contribute to providing a broader offer of, and increased accessibility to, water and sanitation services.

Service coproduction for drinking water and sanitation is one of the alternative delivery options. We refer here to coproduction as a practice through which actors that are not in the same organisation (e.g., citizens, institutions, and other actors) contribute, sometimes collaboratively and at other times not, to produce/improve a service or a part of it (refer to Ostrom, 1996). In particular, we rely on the definition provided by Faldi et al. (2022, p. 146) that “service coproduction is a practice, institutionalised or not, often collaborative, that involves individuals or groups of citizens, intermediaries and the state (e.g., local administrators, state agencies), in one or more phases of the service delivery cycle (e.g., co-planning, co-design, co-management, co-assessment)”.

According to more recent literature about the coproduction of urban services in the Global South (Chatterjee and Kundu, 2022; Faldi et al., 2022; Rateau and Jaglin, 2022; Rosati et al., 2022), there is a broad consensus that service coproduction, whether individually or collectively operated, mainly developed as an alternative form of service delivery to bridge the gaps left by poor or absent centralised networks. Although coproduction has entered into international strategies for sustainable service provision (United Nations, 2016), and is considered promising in tackling place-based water problems (Yu et al., 2012; Faldi et al., 2019) and in fostering citizen empowerment and citizenship (Mitlin, 2008; Allen, 2013; Moretto et al., 2018), this option can present limitations for sustainability, being potentially subject to elite capture and exclusion of the most vulnerable groups (Ahlers et al., 2014; McMillan et al., 2014; Mitlin and Bartlett, 2018; Faldi et al., 2019, 2020). Furthermore, the literature has shown that coproduction can change over time (Furlong, 2014; Rateau and Jaglin, 2022; Rosati et al., 2022), assuming different service configurations defined as hybrid or hybridised in that they tend to involve non-conventional modes of governance and technological arrangements. A deeper understanding of coproduction’s potential role in sustainable water and sanitation services in the Global South, therefore,

requires a better comprehension of the relationships between different categories of hybridisation, and in turn the possible modalities through which coproduction practices might become hybrid. To pursue this goal, the present study does not directly address the sustainability of the practice. It draws, on the contrary, on the sociotechnical infrastructure and hybrid governance literature to explore the notion of hybridisation when applied to the coproduction of water and sanitation services further, specifically by analysing the characteristics of hybridisation in the configurations of technologies and actors, and the institutional drivers behind the hybridisation of service coproduction.

Recent research belonging to the sociotechnical literature on service systems (Rateau and Jaglin, 2022; Rosati et al., 2022) has studied the evolution of multiple and often coexistent types of infrastructure and sociotechnical devices to access urban services in the Global South. The concept of “technological hybridization,” as defined by Rateau and Jaglin (2022, p. 186), as a “situated combination of incomplete infrastructuralisation and uneven heterogenisation”, has been used to describe the patchworked landscape of service provision modalities in those contexts, ranging from large-scale centralised networks to rather small-scale technologies, often decentralised and/or off-grid/non-networked (Faldi et al., 2022; Rateau and Jaglin, 2022; Rosati et al., 2022). In Rateau and Jaglin (2022) definition, infrastructuralisation rests on the consolidation of networked systems through stabilisation, extension, or merging of more local networks, and heterogenisation lies on new forms of sociotechnical devices that complement or replace the centralised network, thus emerging as complementary or concurrent service configurations (Offner, 1993; Rosati et al., 2022). Relying on an understating of technology in service coproduction “as a socio-technical arrangement including both physical (e.g., technical devices) and social (e.g., actors-related skills) components” (Faldi et al., 2022, p. 147), technological hybridisation, therefore, mobilises, on the ground, not only multiple technical devices but also multiple actors’ capacities, expertise, and contributions in water provision.

The widening of the coproduced service delivery process to multiple actors cannot but entail a structural change toward new and more complex governance arrangements and structures (Han, 2022; Smith et al., 2022) that include a variety of non-state actors. To characterise those forms of hybrid governance in coproduction, we rely on the concept of hybridisation, instead of hybridity, by borrowing this distinction from the debate on post-colonial peace, conflicts, and state-building studies (e.g., Peterson, 2012; Visoka, 2012; Albrecht and Moe, 2015; Kyed, 2017). Goodfellow and Lindemann (2013, p. 6) “define ‘institutional hybridity’ as occurring when rules and procedures associated with the state merge in some way with those of other organisations.” This may result in “integration,” “embedding,” or “incorporation” between traditional authorities and the state. The critique of hybridity

from Albrecht and Moe (2015, p. 5) rests on the argument that “the notion of hybridity gets stuck in a dichotomous approach” with respect to traditional categories such as state and non-state, informal and formal, and private and public. Accordingly, these authors propose “shifting the analytical focus from hybridity as a form, to hybridisation as an ongoing process of mixing and reconverting sources of authority and power” (p. 6).

Within the idea to move away from a binary approach to actors (state and non-state), the literature on hybrid governance refers to hybridisation as “a process of amalgamation and the resulting co-constitutive connections” amongst entities/actors (Albrecht and Moe, 2015, p. 5). In hybrid governance forms, this can further result in “the blurring and enmeshing of the boundaries between the different actors involved in such processes” (Colona and Jaffe, 2016, p. 178). Anyway, if for these authors, hybrid governance goes beyond institutional multiplicity (Goodfellow and Lindemann, 2013), the politics of hybridisation— as a process— “does not erase the production of distinctions in practice,” and thus the process of boundary-making amongst different stakeholders in governance (Kyed, 2017, p. 4). Meagher (2012), for instance, shows that there are both constructive and corrosive forms of non-state or hybrid order in Africa. Goodfellow and Lindemann (2013), on their side, argue that institutional multiplicity can be either concordant (when roles between state and non-state institutions are clearly demarcated) or discordant (when non-state institutions’ roles overlap with state ones or are different from those of the state).

Whether one refers to the post-colonial peace and conflict literature (Peterson, 2012; Albrecht and Moe, 2015), or to sociotechnical approaches to urban service (Rateau and Jaglin, 2022; Rosati et al., 2022), the concept of hybridisation, when applied to the coproduction of urban services, defeats conventional binary categories of actors (e.g., state/non-state, by introducing other actor categories, such as intermediaries), institutions (e.g., formal/informal, by investigating the moving boundaries between more or less formalised actors and organisations, and their driving capacity to steer coproduction), delivery options (e.g., networked/non-networked, by including alternative complementary and concurrent configurations in service delivery), and norms (e.g., regulated/non-regulated).

Building on this breakdown of binary categories, our study is based on two assumptions. Our first assumption is that hybridisation in technologies and infrastructure in service coproduction goes hand in hand with the hybridisation of the whole governance system. This can result in changes in the roles of actors involved in coproduction, with a progressive distortion and blurring of their roles and responsibilities (Colona and Jaffe, 2016). Or, it can entail a productive tension in boundary making: “hybridisation can be part of efforts to consolidate authority

and produce legitimacy by confronting and drawing on the boundaries that are articulated at a certain point in time” (Kyed, 2017, p. 13).

Our second assumption is that the coproduction of water and sanitation services is not a fixed-end solution. On the ground, coproduced practices may evolve over time— through hybridisation in reference to both or either referred to infrastructure and/or governance systems—and undergo progressive transformations or system integration (Furlong, 2014). The systematic literature on this issue is very limited, but existing research suggests that service-coproduced practices can break, change their nature,<sup>1</sup> or move to wider and more institutionalised forms. Accordingly, Steen et al. (2018) underline that service coproduction presents a dark side in the form of seven different evils (e.g., raising transaction costs, reinforced inequalities, failing accountability, etc.), mainly resting on the governance and managerial context in which coproduction is developed. These *seven evils* can clearly potentially affect the continuity (and/or triggering changes) of these practices. In addition, the literature has revealed a correlation between variations in the nature of service coproduction and some contextual elements, such as changes in the built-up space (Rosati et al., 2022), in funding schemes for service delivery (Steen et al., 2018), in large-scale public projects (Dobre et al., 2018), or in service technologies (Faldi et al., 2022).

Based on extensive research from authors on drinking water and sanitation service coproduction in Hanoi, Cochabamba, Addis Ababa, and Dar es Salaam, this article focuses on the coevolution of infrastructural systems and governance structures, together with the integration of hybrid configurations into conventional systems. We have a double objective. First, to understand the coevolution of processes of change in infrastructure and governance systems in service coproduction, by assessing whether hybridisation in service coproduction is reflected in hybridisation of governance arrangements. Second, to evaluate whether technical and governance hybridisation in coproduced practices moves toward sociotechnical systems coexistence (Furlong, 2014), especially with conventional water provisions, or rather toward hybridity in governance and technology.

## 2. Materials and methods

This study considers four cities, namely, Hanoi (Vietnam), Dar es Salaam (Tanzania), Cochabamba (Bolivia), and Addis Ababa (Ethiopia). In our case studies, rapid land-use changes are leading to a form of juxtaposition of rural and urban activities, leading to varying urban typologies, and often being

<sup>1</sup> By the nature of service coproduction, we mean all the levels, phases and factors of the coproduction practices as presented in Nabatchi et al. (2017) and Faldi et al. (2019).

accompanied by increasing poverty, sociospatial inequality, and exclusionary service provision. In such a rapidly evolving context, coproduction is a non-marginal phenomenon that plays a relevant role in sustaining access to water at a community level. We explore the evolution of water coproduction and resulting hybrid infrastructure in various urban typologies: condominium blocks in Hanoi, historical unplanned settlements in the inner city of Dar es Salaam, consolidated urban settlements in the North of Cochabamba, and *kebele* governmental housing settlements in Addis Ababa. The cases analysed in this research highlight that the time and social development of water coproduction do not follow a linear pathway. It is rather characterised by cycles of emergence, maturation, and decline. It may build upon pre-existing forms of community-based water management that were established in rural areas (for irrigation or water harvesting, for instance). The cases further highlight that hybrid configurations for urban services/infrastructure represent everyday means of accessing water. On the ground, coproduction may efficiently coexist with access to centralised public services, and different forms of water coproduction can develop in each area at the same time.

The development of case studies is based on extensive literature review and fieldwork within a large, 5-year research project funded by the FNRS (Belgian National Fund for Scientific Research). During fieldwork, the researchers applied different data-collection techniques on two levels of analysis, namely, government and community. At the government agency and municipal levels, data were mainly collected relying on international, national, and sub-national statistical databases; existing secondary data on socioeconomic indicators, including census data; existing official documentation on case study cities' spatial, infrastructural, legal, and socioeconomic features, including urban development, and urban and social policy; and semi-structured interviews with public servants. At the community level, data were collected through community household surveys; semi-structured interviews with dwellers and local officials; focus group discussions; direct and participant observations; and participatory mapping workshops with local communities. Data analysis encompasses several methods in an interrelated way, providing a richer interpretation of the complexities of service coproduction. The basic idea in the multiplicity of research techniques was to reach an articulation of these methods and the resulting different views of complexity, rather than seeking consensus (Ramadier, 2004; Smith and Jenkins, 2013). Data analysis rested on two steps. First, a qualitative-driven process has to be developed through a "qualitising process" to elaborate narrative profiles on the political, institutional, economic, and geographical context in which coproduction cases take place (Tashakkori and Teddlie, 2003; Bazely, 2010). Second, quantitative analysis benefits from generating frequencies from interview responses at the community level (e.g., counting on community perceptions in citizens' involvement) (Bazely, 2010). We draw on data collected between 2017 and 2020.

## 3. Results

### 3.1. Coca Cola *kebele* governmental housing, Addis Ababa

The *kebele* housing system is a traditional urban typology in Addis Ababa that constitutes a major part of the government rental housing stock. This system was formed after the socialist revolution of 1974, following the nationalisation of land and the incorporation of traditional private rental housing units into state ownership with the aim of redistributing housing to the poorest inhabitants at a low, subsidised fee. After 1994, with the fall of the socialist regime, the *kebele* rental housing system remained in operation, and today it represents about 30% of the housing in Addis Ababa (UN-Habitat, 2017), reaching higher levels in the inner city. Houses are allocated through the formation of urban dweller associations (*kebeles*) under the control of a governmental agency, the Kebele Rental Housing Administration (Tesfaye, 2007; UN-Habitat, 2017). *Kebeles* are generally built with wood, mud, and other waste materials and designed following a recurrent form composed of different ground-floor units arranged around a common space. This urban typology in Addis Ababa is generally high density and characterised by low standards of habitability and poor provision of urban services and infrastructure, which often leads to this typology being classified as slum housing (UN-Habitat, 2017).

Coca Cola is a historic residential settlement consisting of ~60% *kebele* houses. It developed from the 1960s in the surroundings of the first Coca Cola Company factory along the Little Akaki River, in the centre of Addis Ababa. Since its formation, the neighbourhood has been connected to the centralised municipal water network through communal fountains located in public spaces. Purchasing water from private vendors was another way to access drinking water. The installation of community fountains in public spaces followed an institutionalised process of coproduction between groups of inhabitants and the local government. Under the framework of the public community participatory system, groups of inhabitants, organised through local assemblies, can request the local government to install community fountains. If it agrees, the local government has the responsibility to allocate public land to install the fountains—respecting the land-use development plans developed at sub-city level—and to request the city water authority to install the infrastructure (i.e., pipes, taps, and meters). The funding of the fountains can be covered by the local government or through the involvement of NGOs. The local government remains the owner of the fountains but assigns their operation and management, including maintenance and payment of the water tariff, to the requesting inhabitants through the formation of water committees. Users collect water with jerrycans at a very low flat rate (€0.02 per 20-L jerrycan in 2018). A member of the committee is generally elected as a manager to collect individual fees, to manage water revenue in a dedicated bank account, and to pay the tariff

to the water authority for the total water consumed through the fountain.

Over the past 25 years, the strong population growth in Addis Ababa, together with the intensive urban development programmes that have been implemented, has significantly altered infrastructure and actor relationships for accessing water in the kebeles. On the one hand, urban development programmes have entailed the clearance, inhabitant relocation, and replacement of most deteriorated *kebeles* with subsidised collective blocks (condominiums) and private cooperative housing units (UN-Habitat, 2017; Larsen et al., 2019), thus revealing the temporary nature of this urban typology. On the other hand, with the centralisation of all planning, operation, and maintenance activities of the municipal water and sanitation system in the hands of a single authority (Addis Ababa Water and Sanitation Authority [AAWSA], 1995, Proclamation No. 10/1995), an infrastructure development strategy prioritising water commodification and increasing revenue water was implemented. For drinking water, for instance, it required the reduction in the building of new communal fountains in favour of the extension of the local tertiary pipe network for individual or group connections into the *kebele* (Addis Ababa Water and Sanitation Authority, 2011). A different form of coproduction was thus established, with a direct relationship—not mediated by the local government and water committee—between the provider (the water authority) and the users (inhabitants), the latter directly contributing to the funding of the tertiary piped infrastructure development and compensating for the deficiencies of the centralised system through individual water storage practices.

In Coca Cola, this emerging dynamic, combined with inhabitants' increasing desire for in-house connections, has led to a strong decrease in the number of community fountains. Currently, there are only two community fountains still used by the poorest inhabitants, who cannot afford the cost of installing the tertiary pipes. About 70% of Coca Cola households have an individual in-house connection to the centralised municipal system. Households pay the water authority for the installation of the tertiary pipe connecting their tap to the main pipe that runs along the principal neighbourhood roads. The cost varies according to distance and can be very high for houses that are particularly far from principal roads. Notwithstanding users' payment for pipe installation, the ownership of the networked infrastructure remains with the water authority. The other modality to access the municipal water supply consists in sharing one or more taps between households living in different units within the same *kebele*. The taps are located in the common space of the *kebele*, and their ownership is registered under the Kebele Rental Housing administration, which entrusts the management of the device to the *kebele* tenants. They organise sharing of the water fee measured by the single water meter and the costs of installing taps and tertiary pipes. Whatever the modalities to access water are, in recent

years, a strong increase in individual water storage practices through jerrycans, barrels, and water tanks has been observed. Despite the upgrading of the municipal water infrastructure in Addis Ababa, the recent population growth has determined problems of water frequency in the municipal system. In some areas of Coca Cola, water supply frequency can be limited to 2 days per week, thus making individual coproduction at the level of water storage necessary to overcome the shortcomings of the centralised system.

### 3.2. Manzese historical unplanned settlement, Dar es Salaam

The first unplanned settlements in Dar es Salaam developed from the 1960s in Tanzania's post-independence period, following the first massive rural-urban migration process (Kironde, 1994; Kjellen, 2006; Peter and Yang, 2019). They were mainly located around the city centre along the major communication routes. In the following years, as the city grew, these settlements saw a progressive process of densification, consolidation, and inclusion in the inner city, which distinguished them as a historical typology of unplanned settlements from the more recent informal settlements in the peri-urban areas of the city that have been developed since the 1990s (Kironde, 1994). Manzese is one of the earliest and largest unplanned settlements which has been developed since 1963 around the Morogoro Road, one of the main communication and commercial roads in Dar es Salaam (Sliuzas, 1988). Similar to other historical unplanned settlements in the city, Manzese is characterised by high density, obsolete houses, and inadequate infrastructure (e.g., water, sanitation, drainage, and roads) (United Republic of Tanzania, 2012), thus making it classifiable as a slum (UN-Habitat, 2009, 2010; Slum Dwellers International, 2017). The urban morphology follows a typical structure consisting of a series of attached and irregular ground-floor housing units arranged within single parcels. These units are usually inhabited by different households sharing a common space within the plot. The case of Manzese, specifically the Kilimani neighbourhood that we have studied, shows the typical evolution of sociotechnical and governance systems in the coproduction of water service in Dar es Salaam's unplanned historical settlements, following the recent upgrading of the water infrastructure operated by the Dar es Salaam Water and Sanitation Authority (DAWASA), which connected the neighbourhood to the centralised municipal water system in 2017.

Before the extension of the centralised system, the inhabitants of Manzese-Kilimani used two main shared modalities for accessing drinking water, in addition to individual purchase from water vendors (at generally high cost): a community public fountain and a community well. The public

fountain consisted of four taps connected to a 5,000-L tank, refilled with a truck by the water authority when needed. Most inhabitants used this option by collecting water with jerrycans. The community well was built with funding donated to the local government by a private individual. The water supply from the well was operated either in loco through jerrycans (at a lower cost than the public fountain, since groundwater is salty in the area), or through a decentralised network for in-house connections. In total, 20 in-house connections were installed after the building of the well, with the cost of the connection charged to users varying according to the distance between the house and the primary pipe running from the well (ranging from €73 to €103 in 2016).

Both infrastructures—the fountain and the well with its decentralised network—were owned by the local government and managed by a water committee, which was established at neighbourhood level and elected every 5 years by the inhabitants gathered in a general assembly. The committee was directly connected to the local government (the two actors performing as coproducers of the drinking water service), from which it had to receive approval prior to any infrastructure development activities, as well as an annual audit during the general assembly. Composed of six members working on a voluntary basis (chairman, secretary, accountant, and three technical members), the water committee's role was to organise the refilling of the fountain tank, pay salaries to hired technicians and guards, manage the extension of in-house connections, fix the groundwater tariff, collect revenues, and perform ordinary and extraordinary maintenance of the infrastructure. The profit of the water committee was generally used to pay DAWASA for metered water consumed from the fountain and to extend the primary decentralised network from the well.

Following the upgrade of the city water infrastructure and the connection of the settlements to the centralised water system in 2017, a radical change in sociotechnical and actor arrangements for water occurred. Currently, some of the inhabitants of Manzese-Kilimani are directly connected to the centralised system. Generally, the costs for in-house connections—which in 2020 could vary from €117 to €155 depending on the distance to the primary network running along the Morogoro Road—are shared between families living in the same parcel. Notwithstanding family investments for laying the tertiary pipes connecting houses to the centralised system, the water authority remains the owner of the entire piped network. The metered water tariff is €0.61 per unit (1 m<sup>3</sup>), but it can increase depending on the level of consumption. Still, most of the inhabitants of Manzese-Kilimani purchase water using jerrycans, mainly from residents who possess in-house connections and resell water from their private taps—either for solidarity or for profit—or, less often, from the communal fountain. The communal fountain is currently connected to the centralised water system—therefore, it does not require any more water refilling activities *via* trucks—and the number of

running taps has halved due to reduced demand. Since the resource (i.e., water from the centralised system) and the cost are the same for both private resellers and the fountain (€0.04 per 20-L jerrycan in 2020), residents' choice of supply source depends purely on proximity. In particular, the communal fountain is generally used by inhabitants living within a 200-m radius. The communal well is no longer used due to a lack of demand. Inhabitants prefer water from the centralised system rather than salty groundwater, even though it has a lower cost (€0.02 per 20-L jerrycan in 2020). Groundwater is generally considered a backup solution in the event of an interruption of the centralised system.

At the level of actor relationships in water coproduction practices, changing sociotechnical systems implied a reorganisation of governance arrangements, corresponding to a transition from institutionalised group coproduction mediated by the water committee to individual coproduction mediated by new private intermediaries. The water committee was dissolved mainly for financial reasons due to the reduction in usage of the community water supply sources in favour of the municipal centralised system. As a consequence, the local government privatised the management of the communal fountain by entrusting infrastructure operation and maintenance, as well as water sales activities, in a for-profit logic, to an individual, i.e., the same person, previously hired by the water committee, who was in charge of managing everyday fountain operation activities. Individuals selling water in the neighbourhood, from both the fountain and private taps, emerged as new semi-institutionalised intermediaries, i.e., not legally entitled to sell water, but fully recognised by other actors, *de facto* replacing the water committee in the role of intermediary between the water authority and the citizens.

### 3.3. The Khu Tap The condominium, Hanoi

Between the 1950s and the 1980s, with financial and technical support from the Soviet Union, the Vietnamese state sustained the country's economic growth linked with urbanisation through the construction of collective flats (Khu Tap The, KTT). Nguyen Cong Tru is one KTT area built in the 1950s on French cemetery land located in the South of Hanoi. The entire area includes 14 4-storey residential building blocks as well as several public buildings, such as markets, schools, and kindergartens. The original dwelling unit consisted of a 30 m<sup>2</sup> room, with a service unit with a kitchen and toilets in the common areas shared by three neighbouring apartments. In the earliest phases of the neighbourhood, drinking water, sanitation, and energy were distributed through centralised networks. These infrastructures were built and maintained by the government. For water supply, drinking water came from

the main pipes running along the road to serve the shared kitchens in each residential block, after storage in collective concrete tanks located on the roofs. For sanitation, toilets were connected to collective septic tanks, two for each staircase. Water and sanitation services were subsidised by the government, as each household contributed only to drinking water provision with 3,000 VND per month (€0.11), regardless of consumption. The government also sustained the costs for the maintenance of the drainage system, as well as for desludging the septic tanks connected to the shared toilet through sewer lines.

A substantial increase in the population of the KTT (almost 3,000 inhabitants in 50 years) placed heavy pressure also on urban services and allowed for a densification of the built fabric, which has mainly happened through the incremental extension of the housing units and the occupation of the open spaces in between the buildings (Rosati et al., 2022). Because of the Doi Moi reforms (1986)—including the progressive retreat of the state as a monopoly and the opening to markets, also in the building sector—residents regularly faced decaying living conditions, as well as increasing service shortcomings, such as inadequate drinking water pressure, clogged drainage evacuation, and poor septic tank maintenance (Koh, 2006). The official response was represented by the *House Repair Cooperative Schemes* promoted by the Hanoi city administration, developed in the 1980s. This model, while granting private ownership for the apartments, was also aimed at renovating the KTT areas through the repainting of facades, the repairing and extension of pipes, and financing the construction of individual kitchens and toilets. These forms of coproduction arrangements included the provision of the institutional framework and financial support from the government, and in-kind and financial contributions from the residents. Currently, drinking water is accessed through a coproduced extension of the centralised network. While the public Water Supply Management Department continues to be responsible for water storage in the neighbourhood station and its pumping into a secondary piped system, inhabitants (coproducers together with the public agency for water) individually store water in their own tanks and—also individually—connect them to their own kitchens and toilets.

Wastewater collection followed a slightly different path, involving a form of group coproduction. At the time of the KTT construction, the state was the only one responsible for septic tank maintenance and drainage system cleaning. With the end of state monopoly and the progressive privatisation of apartments, only the main pipes are managed by the Hanoi Sewerage and Drainage Company, Limited, while the secondary pipes—between the buildings and roads, and collecting stormwater as well as septic tank overflows—are under the responsibility of resident groups (TDPs). TDPs are “both state and community organizations” represented by resident-elected leaders, for a duration of 4 years (Koh, 2006). In Hanoi’s urban areas, these hundreds of small-scale organisations have a crucial role in both

the management of common areas and the coproduction of sanitary services, as they oversee collecting fees from inhabitants with the aim of performing the periodic desludging of septic tanks and prompt unclogging of the drainage system. In KTTs, as in Nguyen Cong Tru, TDPs are generally formed by the residents of two-facing blocks. Their role in mediating with local authorities became more relevant with the sale of the state-owned housing stock: in particular, they played an active role in negotiation and bargaining with local authorities for issuing construction permits on behalf of the community. TDPs thus combine the management of sanitary networks with that of public spaces in between the building blocks. This results in the reduction of residents’ fees, as payments generated by the rent of shops and parking spaces pay for desludging and unclogging. This dual role of operators of public, collective space, and sanitary services is particularly effective from the point of view of control over the area and the creation of economic and management forms that continuously create added value and new services for the neighbourhood. However, although the current community-based management has advantages over the previous state-based management, whose infrastructure maintenance times were much longer, the excessive densification of the building fabric, which has not been compensated by an upgrade of the sanitary infrastructure, makes cleaning and maintenance work constantly necessary, with frequent flooding in the neighbourhood, especially during the rainy season.

### 3.4. Villa Moscu: A consolidated urban settlement in the north of Cochabamba

Villa Moscu is a consolidated urban neighbourhood located in the north of Cochabamba, on the slopes of the Tunari Mountains. Founded in 1959 and registered as *Junta Vecinal* (Neighbourhood Council), the neighbourhood has been progressively developed in the absence of state planning, through the spontaneous allotment of agricultural land. The urbanisation process took place in stages, with dwelling units occupying different territorial areas or sectors, progressively built up in parallel with the opening of roads. Today, about 7,000 people live in Villa Moscu, and most of them have middle-upper incomes. The *Junta Vecinal* was the small neighbourhood organisation that autonomously, in the absence of state provision, planned, built, and managed the main neighbourhood services. The main infrastructure networks in the area (the water, electricity, and road systems) were built by the inhabitants through collective work and funding. As new inhabitants settled, the networks were progressively extended. Today, the area has two water distribution networks. The oldest one, which is decentralised, is still managed at the community level by the former *Junta Vecinal*, and it is now recognised as an OTB (Territorial Base Organisation). The recent one is

centralised and managed by SEMAPA, the municipal water distribution company.

The water provided by the OTB (coproducer for drinking water with the support of the water agency) comes from two main sources: a spring located in the upper community of Andrada (about 20 km away) and a well (120 m deep) drilled in the neighbourhood in the 1980s, as the demand for water was increasing—as were the conflicts with the Andrada community for the control of water distribution. Both water flows are conveyed into two storage tanks before being distributed in the neighbourhood. Households pay a flat rate of 31 Bs/month (€4.17), which includes 20 Bs (€2.69) to cover water-related expenses, a mortuary fee (meaning the cost of organising funerals) of 10 Bs (€1.35), and a contribution of 1B (€0.13) for the police. This decentralised network was developed incrementally, by adding connections, extending pipelines, and increasing water storage capacity by adding a new tank in a process of mutual adaptation to the demands driven by land occupation. This logic, simple and rational, has allowed the network to settle and progressively consolidate.

With a decrease in available water resources, the community organisation first adopted a series of incremental strategies to maintain control over the network: upgrading strategies (increasing storage capacity), rationing strategies (decreasing water use), and the search for an independent resource (drilling of a well). Later, when the neighbourhood increased in size and inhabitants and the resource became scarce, it opted for more radical actions. Indeed, the growth of the district and the rationing of water due to increasing conflicts with Andrada created instability in the community network system. To respond to this crisis, the neighbourhood council decided to freeze its boundaries, by refusing new affiliations to the water network. This policy excluded new residents (both those occupying the more recent sectors and those buying from older residents affiliated with the network) from access to the community network and opened an option for the centralisation of the water supply. The centralised network, therefore, started to be extended in this neighbourhood in different phases from the 2000s onward. The initial cost for installing SEMAPA in the neighbourhood and joining the network was 2,000 Bs (€270), but it has now fallen to 78 Bs (€10.49), since inhabitants initially contributed with funding and work to extend the main pipelines in the area. The cost of water purchase from SEMAPA varies according to consumption and the level of consolidation and finishing of the buildings, which are divided into categories. In general, the cost of those using the centralised network is around 200 B (€26.90) per month, a much higher figure than the community one.

In Villa Moscu, there is currently an overlap between these two networks. It is estimated that about 80% of residents are connected to both systems, because even though the resource is scarce and the monthly volume of water has been reduced, the community service from the OTB is still functioning, and it

is economically more profitable than that offered by SEMAPA. Most households use both systems. To reduce the expenses related to water consumption, households prefer to consume water from the OTB and complement it, where necessary, with the more expensive water distributed by SEMAPA. However, the survival of the community OTB network is threatened, on the one hand, by the extension of the centralised network and, on the other hand, by the progressive decrease in local resources. Indeed, the water currently extracted from the well, which covers about 20% of the district's water needs, is likely to reduce and probably disappear within 5 years, according to the OTB's forecasts.

The result is infrastructure network hybridisation, which goes hand in hand with a loss of solidarity and collaboration between community members. Indeed, when the community network was initially built, households were not considered simple service users or customers, since they were required to contribute, either with work or money, to community work. This attitude of coproduction in the neighbourhood has changed with its growth: the more people inhabited the area, and the more services were guaranteed through an affiliation tariff, the less need for association and contribution to community works there was. Citizens turned progressively into passive customers and the neighbourhood council into a private service provider. As the water resources dwindled, the organisation responded with stop-gap solutions and allowed the extension of the centralised network in the area. The construction of the Masicuni Dam in the north of Cochabamba, a large-scale water basin expected to guarantee water provision in the metropolitan area and the promise of a more durable water supply system, poses new challenges to the current OTB management, which will need to reorganise itself and to define a new role considering the changed urban and environmental conditions.

## 4. Discussion

### 4.1. Complementarity and/or concurrency in service configurations

Drawing on [Offner \(1993\)](#), [Rosati et al. \(2022\)](#) observed technically hybridised practices under their potential for complementarity or concurrency. We argue that complementarity rests on all the transformations, modifications, and additions (e.g., tanks, pumps, and tertiary pipes) of centralised delivery-networked systems, aimed at their improvements; while concurrency refers to the co-existence of the centralised network with other sociotechnical systems for service access. In the cases presented in this article, technical and governance configurations in service coproduction mainly complement and, more seldom, co-exist with conventional systems, based on centrally networked and managed apparatus. More specifically, sociotechnical coproduction grounded on



collective or group practices—either old or new—can be based on complementary and/or concurrent technologies, while individual coproduction always originates from a hybridisation process based on complementary technologies.

Hanoi bears witness to a complementary process of shift from public management of water and sanitation services to mixed management, in which the centralised network is flanked by a range of individual water supply and group sanitation practices. In this process, parts of the initial networks have been dismantled (the collective water storage tanks) and parts have been altered and adjusted by adding a series of tertiary pipes, and related technical devices built and managed by households (Rosati et al., 2022). Coproduction *de facto* complements state responsibilities by guaranteeing a regular water supply and sanitation. Anyway, the consequences of citizen management tend to jeopardise the distribution of benefits and services, and they lead to a general state of obsolescence in buildings and water infrastructure.

The case of Villa Moscu, in Cochabamba, is slightly different, as the hybridisation process takes place in multiple forms. On the neighbourhood scale, there are two distinct concurrent networks serving the area: the decentralised one, managed at the community level by the OTB, which serves the earliest settlement areas, and the centralised one, which serves the more recent ones in the neighbourhood. There are also some areas in the neighbourhood in which both systems coexist: as the decentralised system is providing less and less water, the higher-income residents increase their access to water by using the centralised system. On the individual scale, there are complementary practices and technologies. Faced with irregular water supply from the centralised network, inhabitants, on an individual level, must complement the network with a series of water storage and distribution devices inside their houses. In this case, forms of individual coproduction complement the centralised network, as in the case of Hanoi.

In both African cases, the original idea of institutionalised coproduction, operated at group level through shared fountains managed by institutionalised committees acting with the local government as intermediaries in water supply, appears as purely complementary to the centralised service with the aim of giving more people access to water even if they lack funds. Fountains were connected to the centralised system either directly through a piped network in Addis Ababa or through water refilling operated by the water authority in Dar es Salaam. In both cases, users complement the service by fetching and storing water at the fountains by using jerrycans. In Dar es Salaam, institutionalised group coproduction was also undertaken with the use of competing technical arrangements, specifically in the case of the community well considered as an additional supply solution to the centralised system in the neighbourhood. The recent upgrading of the centralised infrastructure, in terms of both increased network branches (Addis Ababa and Dar es Salaam) and volumes of water provided (Dar es Salaam), on the one hand, strongly reduces group coproduction,

either complementary or concurrent, in favour of individual coproduction practices, in both cases based on the installation of tertiary pipes for in-house connections (Addis Ababa, Dar es Salaam), alongside the ongoing use of storage devices to complement service shortcomings (Addis Ababa). On the other hand, it allows for emerging new private actors acting as both complementary extensions of the centralised service and new intermediaries in service delivery through for-profit water reselling from public fountains or private taps, now connected to the centralised system (Dar es Salaam). In both African cases, we, therefore, observe that this evolutionary process of hybridisation of coproduction, involving changes in the technologies and in actors' responsibilities, mostly followed the original logic of complementarity between coproduction and the centralised system (i.e., shared fountains in Addis Ababa and Dar es Salaam), putting aside concurrent solutions (i.e., a community well in Dar es Salaam). Hybridisation specifically built upon this situation through occupying new complementary spaces, namely the cavities left by the uncompleted upgrading of and lack of universal access to the centralised infrastructure.

## 4.2. Sliding and blurring actor categories?

Hybridisation of actors involved in the coproduction arrangements takes different forms. Our aim here is to analyse whether the different coproducers maintain their specific distinctions, interests, and roles, or whether the boundaries between involved actors overlap and blur (Colona and Jaffe, 2016). As highlighted earlier, the literature on hybrid governance focuses on the forms that non-state participation can take, resting on collaboration or conflict amongst actors and distinguishing between constructive and corrosive, and between concordant and discordant (Meagher, 2012; Goodfellow and Lindemann, 2013). Although conscious of the debate on how, in post-colonial contexts, state and non-state actors “are always themselves hybrid already, the result of previous hybridisations” (Kyed, 2017, p. 13; Peterson, 2012), we focus here rather on the possible processes of actor hybridisation, which could eventually lead to hybrid governance in some cases.

In the cases presented, (non-state) committees are recognised and formed officially by institutions, following a request (or, in some cases, pressure) from inhabitants, in Addis Ababa, Dar es Salaam, and Cochabamba. Committees are born, grow, and—sometimes—die as institutionalised structures. They are jointly responsible for some phases of the water service cycle (mainly financing and managing), but there is no clear overlapping of roles in these forms of coproduction, mainly because coproduction happens outside (e.g., concurrent decentralised water service options) and/or beside (e.g., complementary locally connected networks or storage facilities) the centrally managed conventional network. As well as coproduced initiatives, they basically rest on a concordant form of institutional multiplicity, and they seldom

display corrosive and discordant forms of stakeholder relations. This is particularly evident in the case of Addis Ababa, where committees emerged as a transfer of institutional governance structure. They have been established as an emanation of the local government at the request of citizens' groups in local assemblies, in compliance with the regulatory framework for public community participation that assigns to local assemblies a consulting role in neighbourhood urban development issues, including water. With the progressive disappearance of water committees, we observe the establishment of a more demarcated direct relationship between users and providers in coproducing the service.

Some exceptions and particularities occur anyway. The Manzese area, in Dar es Salaam, for instance, has seen a transformation from water committees to private individuals as intermediaries of water service coproduction *via* private taps or the shared fountain. In this city, the new intermediaries that emerged with the upgrading of the infrastructure (private water resellers) were usually not connected with the previous coproducing actors (except for a former employee of the water committee entrusted by the local government to manage the shared fountain due to his accumulated knowledge of operating that infrastructure). In fulfilling their bivalent role as users and intermediaries, they maintain a concordant form of institutional multiplicity. Although they are not legally entitled to sell water, their activity is recognised and tolerated by the institutions (i.e., the water authority and local government). In Cochabamba, on the contrary, the OTB of Villa Moscu, similar to other national OTBs, has a well-defined role in the management and organisation of water production and delivery. At the same time, today, the municipal government is co-funding the OTBs and allocating resources for neighbourhood development, for example, by building sports facilities, schools, and health centres.

A different situation applies in Hanoi, where forms of overlapping roles and responsibilities for the involved actors take place. This mainly happens when community-based organisations enter the state apparatus through their institutionalisation, through a form of hybridised authority between state and non-state, in the terminology of Kyed (2017). In the KTT Nguyen Cong Tru of Hanoi, for example, the heads of the TDPs act as a sort of Janus face: part of, and elected by inhabitants, leaders represent the residents of the buildings (usually, two facing blocks), on one hand. On the other hand, they have been institutionalised as bodies dedicated to the supervision and management of the built environment and related infrastructure in Vietnamese urban areas. As also underlined by Koh (2006), public authority and decision-making are shared between the government and TDPs; the latter takes public responsibilities according to a logic of self-regulation of space and water infrastructure, as evidenced in the apparently hectic, but highly organised configurations of water pipes and tanks.

### 4.3. Who drives hybridisation in service coproduction?

Service coproduction in the Global South is mainly driven by the purpose of “universalization of service access in terms of existence and affordability” (Moretto and Ranzato, 2017, p. 13). To improve services, coproduction initiatives can be promoted by the state playing the role of key instigator (Jakobsen, 2013) or by grassroots organisations working to engage the state (Mitlin, 2008). In the first case, coproduction is an invited space into state regulation, and in the second case, it is rather an invented space (Miraftab, 2004). In both cases, the long-term existence of these practices over time is not always guaranteed.

In both Addis Ababa and Dar es Salaam, group coproduction was initiated by the state when requested by the inhabitants, through institutional procedures regulating participation (i.e., local assemblies). In Hanoi and Cochabamba, the state actively promoted citizen involvement in water services. In Hanoi, water service coproduction started with the progressive move from government to citizens' management and control over water infrastructure. The process has been clearly government-driven, alongside a progressive shift from a centralised housing system, in which the socialist state had a regulatory role, to a decentralised system that involved communities as key players in the reorganisation and management of the urban space and associated infrastructure. In Cochabamba, the 1994 Public Participation Law initiated the hybridisation of the governance system by shifting from a clan form of organisation to a more bureaucratic organisation (the OTBs).

In all these cases, at a certain point, coproduction became convenient for both the state and the inhabitants, at least until other changes occurred. In the African cases, for the state, group coproduction appeared as a pragmatic strategy to share the cost for infrastructure development and the responsibility to satisfy water demand, especially in settlements lacking adequate water service. This pro-poor strategy was the product of two main drivers. First, the increasing funding pressure from international donors, who considered community participation as leverage for sustainable water provision. Second, infrastructural development policies (i.e., the 1995 Proclamation No 10/1995 for Addis Ababa and the 2002 Tanzanian National Water Policy for Dar es Salaam), which, since the late 1990s and early 2000s, supported, on the one hand, centralisation in the management of the municipal water network in the hands of newly formed city water authorities and, on the other hand, decentralisation in the decision-making and engagement of local government and inhabitants in the management of the water service in areas poorly served by the centralised network. For inhabitants lacking options for accessing water other than purchasing water individually from private vendors at a high price, coproduction became the most reliable solution, which guaranteed some support from state actors and a reduction

in the cost of accessing water due to sharing the operation and maintenance of the common infrastructure. Recent water service development strategies in both Dar es Salaam and Addis Ababa have promoted significant infrastructural upgrading and recentralisation in the management of local sociotechnical configurations, with the goal of both advancing toward universal service provision and increasing revenue water for city water authorities. This change, along with the legitimate desire of a growing proportion of residents who can now afford to have individual in-house connection, has contributed to the decrease in group coproduction practices in favour of an increase in individual coproduction (storage and tertiary pipes). It has also favoured the resurgence of water reselling for profit, now performed by various inhabitants with an in-house connection to the municipal network.

In Hanoi, today, the long-term existence/sustainability of coproduction practices—and the resulting hybridised new sociotechnical arrangements—is in danger. The various spatial practices highlighted earlier, criticised as illegal and unsafe, together with the increasing decay of the buildings, are used to justify a government plan meant to clean these areas and redevelop them through private sector investments. In this sense, we can say that Nguyen Cong Tru, similar to other KTTs, is experiencing a form of transition. Since the liberalisation period following the Doi Moi reforms, the private sector has become increasingly involved in the construction of property and serviced infrastructures. Accordingly, a distinctive combination of recentralisation and deregulation is taking place, in which the state is returning to a central role in planning while leaving housing supply and service management to the private sector, whose capital is injected into state agencies.

Finally, in Cochabamba, the process of institutionalisation of the *Juntas Vecinales* into the OTBs has been marked by the expansion of the boundaries of the decentralised network to increase the number of affiliations, and so to increase access to municipal resources. This expansion of coproduction boundaries has facilitated better access to economic resources and consequently contributed to a progressive improvement in services in the neighbourhood. However, with the decrease in water resources (both spring and groundwater), the long-term existence of coproduction has been called into question.

## 5. Conclusion

### 5.1. Hybridity vs. hybridisation

In all cases, changes introduced by coproduction arrangements mostly rest on an ongoing process, rather than on an end product. These processes are either now moving toward new forms of coproduction (Addis Ababa and Dar es Salaam) or the result of the evolution of previous coproductions, which are today under threat (Hanoi and Cochabamba). We

then argue that these transformations can rather be considered a process of hybridisation, at both the technological and the governance levels, than as a form of hybridity (according to the definition provided by [Albrecht and Moe, 2015](#)).

With respect to infrastructure and technology, coproduction processes and arrangements not only lead to a multiplicity and co-existence of various sociotechnical devices (concurrent configurations) but also involve transformations of existing networks, which are progressively consolidated, extended, mixed with local ones, or completed with new/additional sociotechnical devices (complementary configurations). In the case of drinking water in Hanoi, for instance, the centralised network is hybridised through individual coproduction practices that consolidate it and expand its sociotechnical portfolio by including household storage and treatment technologies, such as water tanks, pumps, filter columns, and boiling devices. In contrast, hybridisation, in Cochabamba, occurs at the group level. Water coproduction is mainly collective and operated at the neighbourhood level (although individual forms of coproduction also exist to increase service accessibility and quality). Also, in Addis Ababa and Dar es Salaam, the centralised network is now hybridised through individual coproduction practices, either directly from users (storage, tertiary pipes, pumps, jerrycans, etc.) or, only in Dar es Salaam, by new intermediaries (water reselling). In both cases, this hybridisation process was linked to the fluctuating evolution of the municipal centralised infrastructure. If we consider the current infrastructure development strategies in both Addis Ababa (e.g., construction of a new dam) and Dar es Salaam (e.g., extension of the network to the south of the city, capitalising on existing community-based decentralised systems), this process can still be considered ongoing.

Governance hybridisation often rests, first, on the sharing of roles and responsibilities between state and non-state actors for service delivery, either for some phases of the service cycle (e.g., funding and management) or for different technologies (e.g., in the case of the local water networks managed by the OTBs in Cochabamba, or the shared fountains and community well managed by former water committees in Addis Ababa and/or Dar es Salaam). Second, on the appearance of new coproducers, who are basically intermediaries, taking roles and responsibilities between the traditional actors involved in the water production and delivery systems. Coproducers mainly fit into the category of a concordant institutional multiplicity. In the case of Dar es Salaam, for instance, individuals newly connected to the municipal centralised water system replaced water committees through water reselling activities tolerated by the institutions. Intermediaries can also act beyond water service delivery. In the provision of water services under the responsibility of resident councils (OTBs, in Cochabamba), the funds collected from the water bills are also invested in social activities (funerals, health, education) and in the delivery of infrastructures for local inhabitants (for instance, roads,

children's playgrounds). There is a strong overlap between land management policies and water management policies. Indeed, many community organisations in Cochabamba are engaged in the management of common areas, including public buildings and public spaces, required for the operation and maintenance of the coproduced water service. The same link between land and water infrastructure policies can be found in Hanoi, and it is embodied in the figure of the TDP representative who not only manages collective infrastructure (drainage and septic tanks) but also manages communal and open spaces and collects financial resources from renters. The KTT condominium is an example. In effect, the management and maintenance of the network rely on the TDPs, as a rather hybrid actor, representing the state and citizens at the same time. In the KTT condominium, for example, hybridisation in governance and infrastructure configurations appears as an independent process.

The evolving practices and arrangements of water coproduction that we have presented here “stay in the tension” (to use again [Albrecht and Moe \(2015\)](#), terminology). The tension between different categories and entities (state/non-state, institutionalised/informal, networked/non-networked, etc.) pertains to a “structurally multi-actor and multi-technology nature” of the coproduction process ([Rateau and Jaglin, 2022](#), p. 192). Governance and technological hybridisation, in moving dynamically between these categories, have resulted in changing coproduction practices. These practices have cleverly adapted to contextually changing conditions (at institutional, physical, or infrastructural levels), as in the case of drinking water in the *kebele* case, with the move from community fountains to individual connections, or in the KTT, with the change from collective to individual tanks. Despite these continuous processes of adaptation, in all case studies, hybridisation shows a tendency toward the increasing establishment of coproduction as a pragmatic practice, i.e., one aimed at solving an existing water-related problem, instead of a practice aimed at sustaining democratic governance. This tendency emerges whether coproduction arises as an invited (Addis Ababa, Dar es Salaam, Hanoi) or an invented (Cochabamba) space; in other words, whether it arises as a subsidised (top-down) or deliberative (bottom-up) mechanism ([Mees et al., 2018](#)). Different drivers favouring hybridisation of coproduction are found in the case studies. Drivers may range from changing regulatory frameworks, such as the introduction of new legislation regarding community participation in the production of urban services (e.g., Addis Ababa, Hanoi, and Dar es Salaam), to the favouring of a for-profit rationale in the management of water services at the local level (e.g., Dar es Salaam and Hanoi), environmental changes that modify the boundary conditions of the resource (e.g., Cochabamba), and infrastructural development strategies at the municipal level aiming at the universalisation of the service and at the increase of revenue water (all cases).

In the case study presented here, all the changes in coproduction practices affected their communities differently, but apparently they never definitively resolved the problems of equity and sustainability. Access to coproduced arrangements—and thus to water services—became unequal between older and newer residents in Cochabamba because of decreasing water availability. The extension of the centralised network in Addis Ababa and Dar es Salaam made the group form of coproduction through the water committee disappear over time. Given this dark side of hybridisation, the potential of hybrid governance and technological practices to answer the abovementioned challenges can be still questioned. Room for research exists. Further research is needed, first, to establish the connections between drivers of change and hybridisation patterns, such as through building conceptual and analytical frameworks for a deeper categorisation of different hybridisations in relation to specific drivers of change according to governance, techno-environmental, and spatial dimensions ([Faldi et al., 2019](#)). Second, to investigate to what extent and which hybridisation processes can lead to a transition toward more sustainable water-related services, for instance, through exploring whether and how coupled categories of technological (concurrent and complementary) and governance (concordant and discordant) hybridisation, driven by specific drivers (coproduction as invited or invented space) can confront potential elite capture and group marginalisation in service coproduction in specific contexts. Third, to explore the existence—if any—of hybrid forms of service coproduction, in the sense of a final and conclusive mix of governance actors and technological options, not subject to further changes. This would facilitate a deeper understanding of their capacity to trigger an equitable and long-term form of service delivery, without just “outsourcing governance” ([Meagher, 2012](#)) to marginalised communities and to provide service access to partly unreliable and inefficient service options.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

The studies involving human participants were reviewed and approved by Université libre de Bruxelles. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

## Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships

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