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Urban Planning (ISSN: 2183–7635)
2023, Volume 8, Issue 4, Pages 340–350
https://doi.org/10.17645/up.v8i4.7155

Article

# Comparing Hybrid Urbanisms in the Global South: Water Delivery Configurations in Peru and Ghana

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Submitted: 5 May 2023 | Accepted: 20 August 2023 | Published: 26 December 2023

**Abstract**
Urban development processes in the Global South (and North) are often described as characterized by formal and informal practices of different actors and their respective material realities. In critical urban studies, the disposition for this binary conception of formal and informal urbanisms has been discussed for many years. To a certain extent, these sometimes align rather problematically with contrasting notions of the "structural" versus the "everyday." In this article, we explore an understanding of formal and informal urban practices (and respectively "structure" and "everyday") as always interrelated, and we develop a methodology for a comparative examination of such hybrid urbanisms. In doing so, we address a missing link in the surging theoretical debate on comparative/southern urbanisms, which has rarely been substantiated by methodological explorations. The adapted concept of "delivery configurations" combines analyses of actor networks, material realities, rules and regulations, discourses, and heterogenous arrays of urban practices of negotiating these. However, bringing together local particularities and structural commonalities and exploring their interrelation only provides a basis for understanding case-specific complexities. We argue that embedding the analysis in a multi-scalar comparative framework can further its analytical rather than descriptive attributes and provide deeper insights into issues such as social inequality. To illustrate our methodological contribution, we provide first insights from a comparative research project of water delivery in different neighbourhoods in the secondary cities of Sunyani (Ghana) and Arequipa (Peru). We highlight the practical challenges of comparing diverse urban contexts and examining the rather complex relationships between infrastructure delivery, urban development, and social inequality.

**Keywords**
delivery configurations; Ghana; hybridity; informality; infrastructures; multi-scalar comparison; Peru; water

**Issue**
This article is part of the issue "Between the 'Structural' and the 'Everyday': Bridging Macro and Micro Perspectives in Comparative Urban Research" edited by Nadine Appelhans (TU Berlin) and Sophie Schramm (TU Dortmund).



## 1. Beyond the Binary of In/Formal Urbanism

Urban development in the Global South is closely associated with informal practices and their social and material manifestations. For many decades, literature on informal urbanism has been based on a dichotomy/binary relation to formal urban development (Lombard, 2019; McFarlane & Waibel, 2016). Informal urban practices, combined with social inequality and especially poverty, are often considered immense challenges for planned urban development in cities (Mitlin & Satterthwaite, 2013; Roy, 2009). For instance, informal supply structures attempt to compensate for the absence of state-funded infrastructures but often cannot be reconciled with the ideals of formal urban planning (Assaad, 2015). In addition, informal urban development is understood as an independent mode of urbanism (AlSayyad, 2004), which, on the one hand, reflects the socio-economic realities of societies and, on the other hand, forms a gateway into cities for poor population groups. This is associated with opportunities for a higher standard of living and social advancement.

The increasing critique of the binary conception of urban in/formality has also been based on the observation that it tends to contribute to the marginalization of informal practices, associated parts of the city (e.g., informal settlements), and the stigmatization of respective populations (Banks et al., 2020; Fattah & Walters, 2020). In contrast, increasing attention has been paid to the interrelations of in/formal urbanisms. This perspective turns away from the assumption that informality is only a starting point towards a "better," entirely formalized development strategy, and it rejects the idea that formal planning necessarily leads to improvement. In the conception of "grey spaces" (Yiftachel, 2009), urban planning is rather seen to play a central role in generating informality. Planning can contribute to the intensification of social inequalities as it often responds to informality by either ignoring, neglecting, confining, or "whitening" (obscuring) it (Avni & Yiftachel, 2014, p. 490). In this context, Watson (2009) is calling for a discussion on new concepts for planning that are pro-poor and on how to deal with informality in different ways. Banks et al. (2020, p. 234) emphasize the importance of "moving away from viewing and analysing urban informality within particular sectors or settings or across particular outcomes." and searching for new ways of understanding how informal and formal practices are related to each other. A relational understanding of the structural preconditions for planning in the form of legislation, policies, and administration and, on the other hand, the everyday practices of different actors can help explore the complex interplay of informal and formal critically.

We propose to place this relationship between formal and informal urban development practices at the centre of the research interest and to renegotiate it based on the concept of hybrid urbanisms, i.e., the simultaneity, juxtaposition, dependency, and intertwining of formal and informal practices and materialities. We argue that both forms of development exist as social constructs, including sets of rules, customs, and specific local histories, which play important roles in different actors' "formalized" and "informalized" practices. Our focus is on deconstructing this socially constructed dualism and analysing how both concepts are interwoven in the diverse realities of water delivery configurations in the Global South. We thus follow the calls for more situated inquiries into the relationships of in/formal urbanisms. However, we argue that conceptually, the debate has not advanced in line with theoretical arguments. Our article focuses on a methodological contribution. To analyze hybrid urbanisms, we adopt a methodology of "delivery configurations" (Jaglin, 2017) in a structured, comparative multi-scalar framework. We argue that examining different manifestations of hybrid arrangements comparatively allows us to better understand local realities such as social inequality.

## 2. Infrastructural Delivery Configurations in a Comparative Multi-Scalar Framework to Analyse Hybridity

In recent years, urban studies have taken an infrastructural turn (Graham, 2010): Infrastructural changes are increasingly examined as socio-technical constructs in order to learn more about social and political transformation, such as neoliberal urbanisms. Infrastructures can be understood as "complex assemblages that bring all manners of human, non-human, and natural agents into a multitude of continuous liaisons across geographical space" (Graham, 2010, p. 11). This definition is accompanied by the recognition that infrastructure production is not only a technical or financial development but also a political and social process.

The study of infrastructures and their social and material production is a particularly suitable research object for the analysis of urban development processes in cities of the Global South (Marais & Cloete, 2016). On the one hand, the provision of infrastructure is considered a central challenge in planning and development, especially in cities of the Global South (Rana et al., 2017); on the other hand, a direct link between improved living conditions and better access to infrastructure has been demonstrated (Jerome, 2012). For example, the availability of infrastructure in cities is closely linked to the migration of rural populations to cities (Issah et al., 2005).

In cities of the Global South, major limitations in the availability of networked infrastructure can be observed, especially in informal settlements, which are often characterized by poverty (Mitlin & Satterthwaite, 2013). This is mainly due to the limited local resources and weak state institutions, which struggle to provide infrastructure (Lawhon et al., 2018; Rosen, 2021). When poverty—low and irregular incomes—and high social inequality prevail, the sustainability of networked systems based on individual user contributions is limited (Pieterse & Hyman, 2017). As a criticism of the networked infrastructure model (Graham & Marvin, 2001; Tarr & Dupuy, 1988), it is also noted that the cities of the Global South are characterized by great heterogeneity, and thus, the local socio-technical problems cannot be addressed with standardized development concepts, mostly coming from examples from the Global North (Coutard & Rutherford, 2016). Instead of examining non-functioning or missing networked infrastructures, the focus can be placed on what is actually present and how it functions (Jaglin, 2017), including how parts of it are produced by the residents themselves in processes of "auto-construction'' (Caldeira, 2017). Starting from residents' perspectives and the value they ascribe to their infrastructures appears particularly fruitful, even if the systems on the ground may not be directly interpretable or appear deficient from a Western-influenced perspective (Pieterse & Hyman, 2017, p. 203).

Following this argumentation, hybrid arrangements of networked and non-networked infrastructures, of

public and private, as well as planned and grown structures—"technological bricolages" (Lemanski, 2021)—are examined. Also coming to the fore in this context are approaches that examine the creativity and potential of residents in dealing with existing resources and in establishing new infrastructures, as well as formulating a critique of neoliberal logics of exploitation with regard to basic fundamental human needs (Coban, 2018; Coutard & Rutherford, 2016). Co-production practices of infrastructures, which involve residents, play an important role in solving supply shortages and strengthening participation opportunities and highlight the importance of hybrid urban production practices in serving vulnerable populations (Mitlin & Bartlett, 2018; Moretto et al., 2018)—even if they are also characterized by limitations (Gribat, 2021). Simone's (2004) work goes a step further and outlines the importance of "people as infrastructures." The joint production of infrastructures also represents an important part in the emergence of an identity as a citizen. In this context, citizenship is not only to be understood as the state monopoly of rights and duties but also describes the dynamic processes in which residents themselves negotiate new practices and rules that shape life in their environment and also contribute to the social production of their cities (Isin & Nielsen, 2008; Lemanski, 2020).

Practically, Jaglin (2017), following Olivier de Sardan (2011), proposes that delivery configurations be examined. This includes the actors and institutions, the equipment and resources, as well as the different forms of co-production, from direct to indirect cooperation and temporary or permanent arrangements. Jaglin (2017) also suggests analysing the function of delivery configurations as a substitute, competitor, or complementary model to existing structures. By focusing on these dimensions of investigation, it is possible to overcome the boundaries of public and private, legal and illegal, commercial and non-commercial, technical and social, and to examine infrastructures in their actual complexity and different perceptions by the actors. Lawhon et al. (2018) and Sseviiri et al. (2022) share the same perspective with their concept of heterogeneous infrastructure configurations and thus describe the analysis of infrastructural artefacts as socio-technological configurations. Hybridity, as a term here, is criticized for its risk of an "etymological dualism" (Lawhon et al., 2018, p. 725) between a constructed binary of informalized and formalized practices of infrastructure production. Whilst acknowledging this critique, we argue that both forms of development exist as social constructs that need to be deconstructed by examining and comparing the diverse realities of delivery configurations in the Global South.

Understanding these complex local realities requires an analysis of the dynamic actor constellations. This is particularly helpful because water delivery often develops in a demand-driven manner at the small-scale local level. In this context, a multitude of actors from different sectors, such as the state administration, international donors and NGOs, civil society actors, and private-sector companies, can form several centres of power that have a strong influence on local developments (Jaglin & Rateau, 2020; Olivier de Sardan, 2011).

Social inequality and its spatial manifestations also become visible through an analysis of delivery configurations. In poorer neighbourhoods, for example, the lack of access to basic services often makes residents more vulnerable. They seek alternatives that are often even more expensive, less reliable, and not necessarily safe or hygienic. At the same time, wealthier people can more easily compensate for the state's lack of services by purchasing them privately or moving to areas of the city where they are provided. This is illustrated by examples of infrastructures for the provision of water (Budds & McGranahan, 2003; Monstadt & Schramm, 2017; Moretto & Ranzato, 2017).

So far, the concept of delivery configurations has been productively used to describe the delivery of individual services, and it has also been shown that a subsequent comparison of the same services in different cities can be helpful in describing the specificities of individual cases (Jaglin & Rateau, 2020). Building on this, we propose embedding an examination of delivery configurations in a multi-scalar comparative framework in which comparisons at different levels become a central moment of research, promoting a structured critical analysis of the findings.

In this article, we use initial examples from our field research to make comparisons on three levels: (a) between the different neighbourhoods within the cities studied; (b) internationally, between two cities in Ghana and Peru; and (c) between different actor perspectives. We distinguish here, according to Ingold (2000), between the "dwelling perspective" of residents and the "building perspective" of actors professionally engaged in providing infrastructure. In the context of our project, there is also the comparison of water and mobility, which we do not discuss here for reasons of space.

In the following section, we examine some of the comparative insights and complexities of examining water delivery configurations in the neighbourhoods we encountered in our project. In doing so, our cases map the diversity of urban realities through the selection of very different local and supra-local contexts and allow us to make particularly good use of the advantages of comparative research. At the same time, our focused view on the delivery configurations of specific infrastructures allows us to analyze the conceptual differences in realization and use, as Robinson (2022, p. 11) describes it in the context of "generative comparisons" that "might emerge across shared features evident amid the rich fullness and complexity of urban life. These provide the invitation to generate conceptual insights across diverse urban outcomes.''

## 3. Insights on Infrastructure Delivery, Urban Development, and Social Inequality in Arequipa and Sunyani

Our comparative examination of the ways in which water is supplied focused on the secondary cities of Arequipa in Peru and Sunyani in Ghana, both being regional centres for commerce and services in their respective geographical contexts. In each city, we conducted research in three neighbourhoods: in Arequipa—Angeles de la Cruz, Sector 10 in Peregrinos de Chapi, and Casa Huerta las Lomas del Cural; in Sunyani—Berlin Top, Bakooniaba, and Kotokrom. Fieldwork was carried out for three months in each city in 2022. It included long-term stays in each neighbourhood, allowing us to participate in neighbourhood activities such as citizen workshops (*faenas*) on Sundays in all three neighbourhoods in Arequipa, or the protest march of neighbours for receiving their land titles in the city centre, and the inauguration of a newly constructed street in Sunyani, as well as regular community meetings with the traditional authorities in the Ghanaian case study areas. Besides these special events, we had the opportunity to participate in the everyday routines of the (future) inhabitants to better understand how practices around water use are shaped. This was accompanied by a total of 137 semi-structured interviews with inhabitants (dwelling perspective: 39 in Arequipa and 45 in Sunyani) and professional actors (building perspective: 35 in Arequipa and 18 in Sunyani). The actors from the building perspective comprised employees from different administrative bodies from the local to the national level, state, and private infrastructure providers, politicians, activists, and scientists. Our respondents either worked in the delivery of infrastructure (building perspective) or used the services (dwelling perspective). While actors from the building perspective were asked about their professional practices and the institution they were working for, dwellers were invited to tell us about their experiences around the topic of water. They would often show us around their houses or go with us for a walk to see relevant sites of water supply and then explain how things worked. Collecting relevant documents, focusing on reports, maps and legal documents, and photography from the perspectives of the researcher and of neighbours completes our collection of materials.

In this article, we present our initial findings from this rich body of material while we are still in the process of analysing and performing a multi-scalar comparison. This article does not present final summarizing results or figures. After transcribing and archiving the collected materials, we coded the interviews using different layers for the different dimensions of our planned comparisons. We used the graphic material to triangulate our findings to get a more complete picture of every single case to then critically discuss possibilities for productive comparisons.

The selected neighbourhoods in Arequipa and Sunyani are predominantly characterized by housing. Most of the houses are constructed by (or on behalf of) the families who occupy them. Only in Berlin Top in Ghana are there a few examples of larger housing developments that were constructed exclusively for rental. The neighbourhoods are at different stages of development, although construction of all commenced at a similar time: around the year 2000. An additional similarity is that they are either not serviced or are insufficiently serviced by networked water. In contrast, different water sources exist in each of the neighbourhoods, from communal taps, wells, and boreholes, to delivery by truck and other means.

### *3.1. Arequipa*

The three neighbourhoods in Arequipa are located in the North, West, and South of the city and are between five and 20 km from the city centre (see Figure 1). While Sector 10, Peregrinos de Chapi, and Casa Huerta las Lomas del Cural are located in large settlement expansion areas, Angeles de la Cruz is located on a hill largely enclosed by agricultural land and more established neighbourhoods near the Chili River.

So far, only Angeles de la Cruz has a provisional public water network, which is connected to a reservoir on a neighbouring hill. At night, the water is replenished by trucks from Servicio de Agua Potable y Alcantarillado (SEDAPAR), the public water company. Then, it is piped downhill through another neighbourhood and pumped up the Los Angeles de la Cruz hill to reach households there. All 13 residents we talked to rated this solution as inadequate because the reservoir does not have sufficient capacity, being exhausted as early as 05.00 to 06.00 am:

> Yes, at least there is something. Here, they suffer from water [shortage]; they no longer wait like the neighbours say from 03.00 or 02.00 am in the morning. They have to be waiting with their [individual water] containers all night. Sometimes, there is no pressure, so they are waiting for it to come out [with no water coming]. You see, those who live down there in the valley take advantage of it….Those who live up here suffer….I can't live here because of the [lack of] water. (Neighbour 12 in Angeles de la Cruz)

This dweller only lives in Angeles de la Cruz part-time. He has another place to stay while constructing his small home on-site up the hill at Angeles de la Cruz whenever he is not at work. Sometimes, he also sleeps in this house. It already features one finished room with a solid roof. Before he is willing to move into the neighbourhood permanently, he is waiting for the water connection to be installed. Some of the full-time residents have installed their own water storage tanks on their houses and get water delivered at a much higher cost. For many, however, this is not an alternative, as not all of the properties on the hill are located on a paved road for access

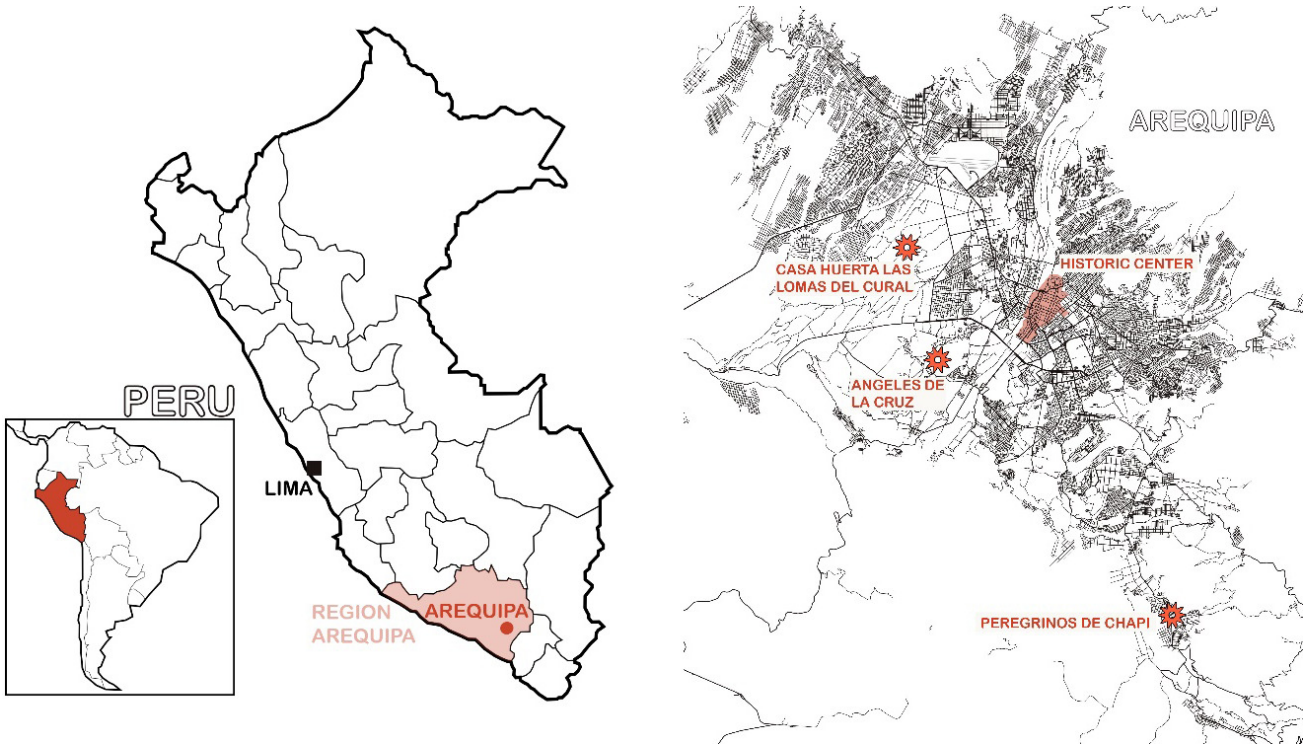


**Figure 1.** Arequipa, Peru, and the case study neighbourhoods.

by water trucks. Officials of the Sachaca district have repeatedly told the *dirigente* (a kind of elected neighbourhood chief) of Angeles de la Cruz that they are about to start building an improved connection to the public water network; however, this has not yet happened. Residents are thus still waiting to get connected and do not see much sense in investing money in advanced self-supply solutions. Policy decisions on when to build a paved road and a connection to the public water network greatly influence residents' decisions on how to get water. The expectation that the connection will be established soon makes finding an alternative long-lasting solution less urgent. This form of dependency on formalized policy decisions is what we conceptualize as one possible form of hybrid urbanism.

The other two neighbourhoods are located in the dry lowlands on Arequipa's periphery and are already accessible by transporters throughout. However, infrastructure for drinking water has not been installed there. SEDAPAR fills public wells with non-potable service water in some places in Casa Huerta las Lomas del Cural. In Sector 10 of Peregrinos de Chapi, the local *dirigente* and some neighbours have built their own water network fed from a large tank on a private lot. A limited number of residents are connected to this network and are paying fees. Apart from this, residents in both neighbourhoods can only supply themselves through their own water tanks, which are filled up by private providers with transporters.

It is not possible to install private boreholes or wells in the three neighbourhoods because the city is located in an arid zone. The National Water Agency also predicts that the springs currently used to pump water in the region will only provide enough water to supply the existing public water system until 2030. In all three neighbourhoods, there is a widespread consensus that having access to the public network is of great value. Residents prefer this option over self-supply with water in the long term. Even in Sector 10, where an alternative networked system has already been set up, residents emphasize that it only represents a transitional solution, which will be replaced by a public networked system. The example of an elected neighbourhood representative's son further illustrates the hybrid decision-making processes around water delivery. His father is part of the team that runs the provisional piped water system. As seen on other occasions during fieldwork, families buy plots close to each other to maintain family support structures. The son lives down the street from his father's house and is also connected to the provisional grid. He describes this system as expensive and not always reliable due to the dependency on the private water providers and their trucks arriving on time:

> My dad buys [water] for the water tank up there. But to fill it costs a lot….Sometimes we stay without water for about four or five days. We don't have the money to pay for it, and often [water] trucks are delayed, too. (Neighbour 8 in Sector 10 of Peregrinos de Chapi)

The son would prefer to be connected to the public grid, seeing it as a more reliable and affordable system. Investing in a provisional system only makes sense for residents if a public network connection is not likely

to be established soon. The provisional system is still cheaper and more reliable than individual tanks and water delivery for each family. Residents request transparent communication by SEDAPAR of plans on when and how to connect neighbourhoods so they can make informed decisions on how much to invest in alternative supply solutions—especially in the mid to long term. Formalized and informalized practices of the production of a piped water system are highly intertwined here. Hybridity is shown in the relevance of plans for a formalized network for the potential extension of the described auto-constructed informalized alternative.

In Peru, residents' rights to their land are closely tied to the connection to the public water network. All three neighbourhoods are informal settlements created after the land grab of unplanned state-owned areas of the city, undertaken by resource-rich and well-connected actors who sell individual parcels of land to future residents but also often keep large areas as an investment. Investors and settlers apply for the formalization of the emerging neighbourhoods to Organismo de Formalización de la Propiedad Informal (COFOPRI), an independent state authority under the umbrella of the Ministry of Housing, Construction and Sanitation. Only after formalization by COFOPRI is complete, the landowners receive state title deeds for their land, which greatly increases its value. According to COFOPRI, a prerequisite for the formalization is the connection to the water network. A water connection not only guarantees access to water but also represents a step towards tenure security. Actors from the building perspective, such as politicians, employees of the administration, and of SEDAPAR, argue that the expansion of the water network into Arequipa's periphery cannot be realized in a timely manner because it is extremely expensive and the settlement density in the peripheral neighbourhoods is very low. As a result, public investment in the peripheral expansion of the network tends to have a poor cost/benefit ratio. The expected drying up of springs was not discussed as an issue in connection with the expansion of the network at the time fieldwork took place.

The overview of water delivery in three neighbourhoods of Arequipa, as well as the assessment of the situation by the inhabitants and by actors professionally involved in the supply, shows how water delivery is guaranteed (at least for some time) through diverse arrangements. There is a lack of reliable and affordable access to water. The close relationship between a connection to the public network and formalizing land rights contributes to explaining why the delivery to date is so poor in many peripheral places and why residents often rely on temporary transitional solutions. At the same time, residents press for an early connection to the grid in order to speed up the process of formalization.

Actors from the building perspective emphasize the difficulties in expanding the network. Against the background of the prevailing water shortage in Arequipa and the lack of resources for the construction of ever more expansive and extensive networks, there is great potential for conflict. This could occur between neighbours and authorities/public suppliers on when and how to get connected but also between the inhabitants of different neighbourhoods about who gets connected first. The inhabitants of Peregrinos de Chapi regularly protest for the basic right to clean drinking water and the formalization of their land rights. Direct communication of actual grid expansion plans by the authorities and making a network connection not necessary for the formalization of land rights could help to realize already existing hybrid supply solutions on a larger scale. It could create more confidence in the benefits of solutions such as in Sector 10 in Peregrinos de Chapi, which provide safer and cheaper access to water than individual approaches.

### *3.2. Sunyani*

The three different neighbourhoods in Sunyani—Berlin Top, Baakoniaba, and Kotorkrom—are located in the North-West, West, and North-East, respectively, between two to five km from the city centre (see Figure 2). While Berlin Top is located rather centrally and favourably on a hill near the city centre, Baakoniaba is a bit further on the same road (which is currently being transformed from dirt to paved road); Kotorkrom is further away from the centre and represents a settlement expansion area. All areas share a common reality regarding water delivery, as water supply from Ghana Water Company (GWCL) is limited and largely inaccessible.

Officially, GWCL (a state-owned limited liability company) is responsible for the production and distribution of water in urban Ghana, Sunyani included. For Greater Sunyani, the main water source before treatment is from the Tano River. The water production site for the city was last expanded in 1998. It currently produces 1.5 million gallons of water per day, which is about 4 million gallons per day short of the calculated need, resulting in rationed provision of water (once in three days). GWCL and international organizations such as The World Bank are currently expanding the water production facilities, which are expected to be complete within the next three years. To facilitate an easy water supply to households, GWCL distributes water through a networked system, which is projected to run from the pumping station to the different neighbourhoods and eventually to all city households.

In order to be connected to the network, households need to apply and pay a connection fee based on their location. The application involves filling in a form, writing a letter, and adding a site plan validated by the district assembly. Upon receipt of an application, GWCL sends personnel to visit the site to authenticate the details. They also use GPS to check the location and ensure that no structures will hinder the connection when they start. When a household is connected to the grid, meters are installed, and clients are billed monthly. Eventually, it is expected that every household will use water provided

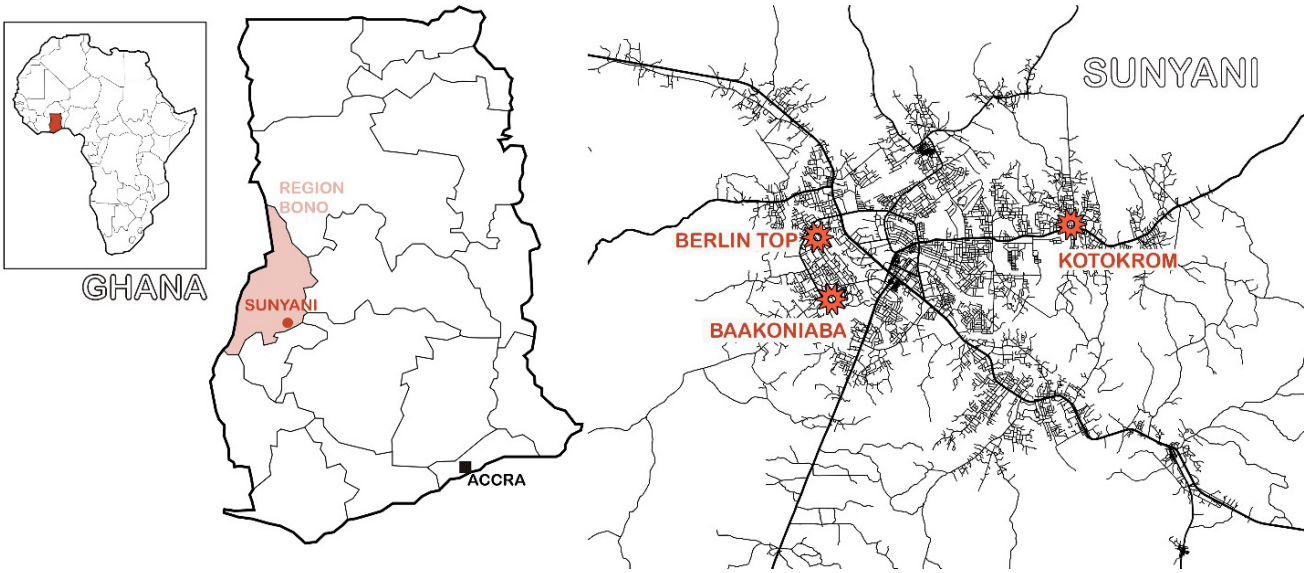


**Figure 2.** Sunyani, Ghana, and the case study neighbourhoods.

by GWCL, but so far, few households have applied. There are several reasons for this: The process is bureaucratic, and non-educated people find it difficult to produce the required site plan; Many areas are not constructed according to or as part of a municipal land use plan, so residents are hesitant to seek an official validation of their site plans; In addition, GWCL has a catchment area, which does not cover the whole urban area of Sunyani. An older and educated female resident we interviewed claims that she decided to dig a well when she felt fed up with the bureaucratic procedures of GWCL.

In the selected neighbourhoods, nearly all households currently have their own means of getting access to water. Depending on their income level, residents have either constructed a mechanized or non-mechanized borehole or well, bought water from a communal water standpoint, or commissioned someone to get it for them or fetch water from a neighbour's well for free. Residents in all three neighbourhoods did not express much interest in getting connected to the piped system from GWCL: "We don't have a water challenge. Our only challenge is the road" (Neighbour 9 in Baakoniaba).

Their major concerns were that water from GWCL was unreliable, of poor quality (due to pipes not having been changed for decades), and unaffordable, as well as that the company's customer service response being slow.

Most of the residents at Berlin Top can afford to construct a mechanized borehole in their homes. They have one or more large tanks of more than 1,000 litres installed on their houses for water storage, which, in turn, provides a constant water supply through the water pipes in the house. The existing connections to the GWCL water network in Berlin Top (which were few to start with) were disconnected due to road construction during our fieldwork in 2022. In Baakoniaba and Kotorkrom, the situation is different, as the residents are not connected to the GWCL water network due to the high cost. In contrast, most households depended on community water standpoints and wells. These households also use water storage devices, but instead of large tanks on the roof, such as in Berlin Top, they tended to use smaller devices inside the house, such as buckets, pans, and big bowls, to store water for at least a day or two. In most cases, no water pipes are installed in these neighbourhoods' houses.

In summary, even though almost none of the households in the three selected areas are connected to the networked water system of GWCL, residents do not perceive the situation as problematic as they all have access to water, which they perceive as largely sufficient. From the dwelling perspective, access to water is not an issue in Sunyani's neighbourhoods. From the building perspective, the large water deficit and the low number of customers is a problem. However, since a connection to the water network is not instrumental for the security of tenure, citizenship, or anything else, there is very little external pressure for residents to get connected. In contrast, the precondition of having to produce a validated site plan and several other documents to get connected makes it particularly difficult for informalized residents, even apart from the high costs.

How much water is available to residents, at which cost, and how readily available it is depends on the financial capacity of the household: More affluent residents tend to have mechanized boreholes, larger tanks, and pipes in their homes while poorer residents use non-mechanized boreholes, wells, or communal water points, or have smaller containers to store water; there are no pipes in their houses.

The short and focused descriptions from the six neighbourhoods in Arequipa and Sunyani show how different the practices and realities of water supply are. The use of delivery configurations as a framework is

helpful in generating material of the individual configurations, and at the same time, it enables a multi-scalar comparison based on the shared approach to all cases. In the following section, we show how a comparison based on the three proposed dimensions of a multi-scalar design looks like and what findings it brings to light.

## 4. Findings From the Multi-Scalar Comparison of Delivery Configurations

Examining all six cases from Arequipa and Sunyani comparatively, we show that a connection to the public water network by public service providers is either not immediately planned by the actors from the building perspective or not wanted by actors from the dwelling perspective in the neighbourhoods studied. Only in Angeles de la Cruz, in Arequipa, are there plans to extend the existing network, which the residents support even though construction has been repeatedly postponed. A comparative look at the neighbourhoods and their distinct water delivery configurations shows that very diverse practices and materialities have emerged of what we conceptualize as hybrid urbanisms that temporarily or permanently supplement or replace public services. Various local factors play an important role in shaping these hybrid arrangements. Examining related practices in depth reveals the major differences between the studied neighbourhoods in the two cities. Particularities such as morphological characteristics and the development of other services such as roads (both in Angeles de la Cruz and Berlin Top), the commitment of certain actors such as the *dirigente*, and collective social practices of the inhabitants, such as the protests (e.g., in Peregrinos de Chapi), can help to explain the specificities of each neighbourhood in the study of the delivery configurations of water.

The institutional and regulatory set-up and the available resources around water in the context of the two cities are as diverse as the local practices and materialities of delivery in the different neighbourhoods. To understand them, a lot of foundational work is needed in order to perform the international comparison in both cities. At the same time, each case brings out new aspects in the other, which would not have been examined in depth if it were not for the comparison.

First, water availability is very different in Arequipa compared to Sunyani. While the potential for getting one's own water is highly limited in Arequipa, it is easier in Sunyani. Ghana is not located in a dry zone, and there are sufficient individual or collective alternatives for self-supply, aided by easy access to groundwater. Even though the expansion of networked water provision by GWCL has stalled, primarily due to a lack of resources, this is not considered a major problem by the residents. Arequipa, in contrast, is located in a dry zone, and inhabitants cannot easily access groundwater. The market for the supply of potable water is, therefore, central to all of the new neighbourhoods in Arequipa. In Sunyani, but also in Sector 10 of Peregrinos de Chapi, alternative markets for water have formed: residents sell it to neighbours from boreholes, from communal water points, or from a self-built network. These delivery configurations complement or build on private-sector services. Residents in both cities rate the water supply by public service providers as inadequate, either because it is unreliable and considered bureaucratic and expensive (Sunyani) or because it is not yet built or is being built too slowly by the public providers (Arequipa).

Second, comparing the water delivery configurations in the different neighbourhoods, different supply solutions can be observed. In Arequipa, reasons for not being connected to the grid ranged from waiting and hoping for their homes to be connected soon to building their own system to replace a service that would not be realized in the near future. In Sunyani, different forms of self-provisioning can be observed, such as mechanized boreholes, wells, communal public or private standpipes, or all sorts of buying and selling of water from a range of sources. From comparing the situation in the different neighbourhoods, it becomes clear that two factors determine the local solutions for water supply. On the one side, local specifics such as morphology and groundwater levels or the accessibility by street have an influence on which solutions work. On the other side, the perception of how reliable the public network is and/or how likely it is to be connected also influences how much inhabitants are willing to invest in alternative solutions.

Third, at the same time, the rationalities around being connected vary starkly. In Arequipa, the desire for connection to the public water network is greater than in Sunyani. This is strongly linked to the legal status of the neighbourhoods studied there. Founded as informal settlements, formalization and the granting of official land titles to the inhabitants is only possible after connection to the water network. Policies on the national level, therefore, play an important role in delivery configurations in Arequipa. In Sunyani, however, residents' desire to connect to the network is very limited. The quality and reliability of the services the GWCL offers are doubted, and the self-organized alternatives appear more reliable and affordable to many residents. Trust in the state-organized water supply can be considered low in this context, and because of the requirement of a validated site plan, it also comes with an added scrutiny of the status of residents' buildings. The comparative view of the different institutional frameworks and natural preconditions in both cities helps to explain the big differences regarding the needs of the residents for a networked water connection.

Fourth, the comparison of the actor perspectives "building" and "dwelling" reveals another important difference. Most of the interviewed actors from the building perspective (especially those close to political decision-makers) idealise water provision through a networked system, as advocated by UN-Habitat and in the national water policies of both countries. Examining different case studies comparatively shows the limitations

of these policies and how different a dwelling perspective looks like in the examined neighbourhoods. While we found a strong dependency on the extension of the networked water system in Arequipa, this is not based on trust in the local system but can be explained by the special preconditions in the context of land formalization. In Sunyani, residents have found permanent solutions for water supply that replace service by the networked system, which has limited capacity and is very unpopular. Hybrid urbanisms can thus only be understood when analysing the expectations and practices of actors from a dwelling perspective in the context of the plans and concepts but also practices of actors from a building perspective.

## 5. Conclusion

In this article, we introduced the concept of hybrid urbanism to illustrate the individual and diverse forms of water delivery configurations. Using examples from fieldwork in the secondary cities of Arequipa in Peru and Sunyani in Ghana, we examine the complex relationships between formalized and informalized practices. We conceptualize a multi-scalar comparison across the levels of the two cities in entirely different geographical contexts, between neighbourhoods, and between the building and dwelling perspective. In doing so, we aim to contribute to the critique of a binary understanding of in/formal urbanisms as a characterizing feature (not only) of urban development in the Global South by introducing our concept of hybrid urbanisms, i.e., the simultaneity, juxtaposition, and intertwining of formalized and informalized practices and materialities. We highlight the methodological and empirical benefits of a structured comparison that such a research design entails. A large amount of material had to be analyzed to reconstruct the specifics of each layer of comparison and each case constellation and filter out relevant similarities and differences in the context of a "generative comparison" as Robinson (2022) calls it. We show (a) how the availability of water sources in the different cities encourages or slows down the production of hybrid delivery solutions, (b) how neighbourhoods in the same city find different approaches to secure water delivery and that hybrid solutions are influenced by the expected future availability and reliability of the public network, (c) that different rationalities exist whether it is beneficial to be connected to the public system at all, and (d) how the views on water of actors from the building perspective in both cities are dominated by the ideal of the networked and fully formalized delivery of water whereas actors from the dwelling perspective often prefer hybrid solutions including auto-construction processes (Caldeira, 2017) to secure the delivery of water. It is a strength of the presented approach that the layers of comparison help us to reflect on the different conditions under which diverse forms of social practices come to life. It highlights the case-specific situatedness in a more systematic and critical way.

Employing delivery configurations as an analytical tool in a multi-scalar comparative research design allows us to critically interrogate the materiality of the infrastructures studied with the social processes of production among the different actors. A more holistic picture of emergence and use is provided while highlighting the resulting social realities for the residents of the neighbourhoods and their rationalities.

Through hybrid urbanisms as a conceptual framework, it became possible to see informalized and formalized practices as social constructs that affect the practices of actors from both the building and dwelling perspectives. However, the realities of the water delivery configurations are far more complex than this constructed binary. They always include individual configurations of structures and practices, which tend to be assigned to one or the other form of urban development. Our notion of hybridity tries to deconstruct and overcome this often-practised binary conceptualization while acknowledging its presence in the argumentations and practices of actors. The frequent coexistence, juxtaposition, dependency, and intertwining of formalized and informalized elements that we showed in the examples from our fieldwork strengthen our argument for more research on the predominant in/formal binary in its relation to the complex realities of what we framed as hybrid urbanisms.

The results from our analyses show that water delivery configurations are linked to social inequality in the neighbourhoods studied. Regarding the Ghanaian neighbourhoods, various hybrid arrangements for water delivery were described that allow access to water based on the resident's financial means. In Peruvian neighbourhoods, waiting for connection to the grid involves high costs for transporting water in vans and purchasing large water tanks. Especially in Arequipa, water provision represents a significant financial investment. Here, sustainable solutions can hardly be financed by the residents' own resources. At the same time, our analysis also shows that other approaches, such as working with regulatory bodies that monitor boreholes or investments in decentralized water tanks managed by the neighbourhoods could contribute to a better and more affordable water delivery based on the social and material realities of the existing water delivery configurations.

## Acknowledgments

We acknowledge the support of the German Research Foundation and the BTU Cottbus-Senftenberg.

## Conflict of Interests

The authors declare no conflict of interests.

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