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Research Paper

Multilateral development banks investment behaviour in water and sanitation: Findings and lessons from 60 years of investment projects in Africa and Asia

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ABSTRACT

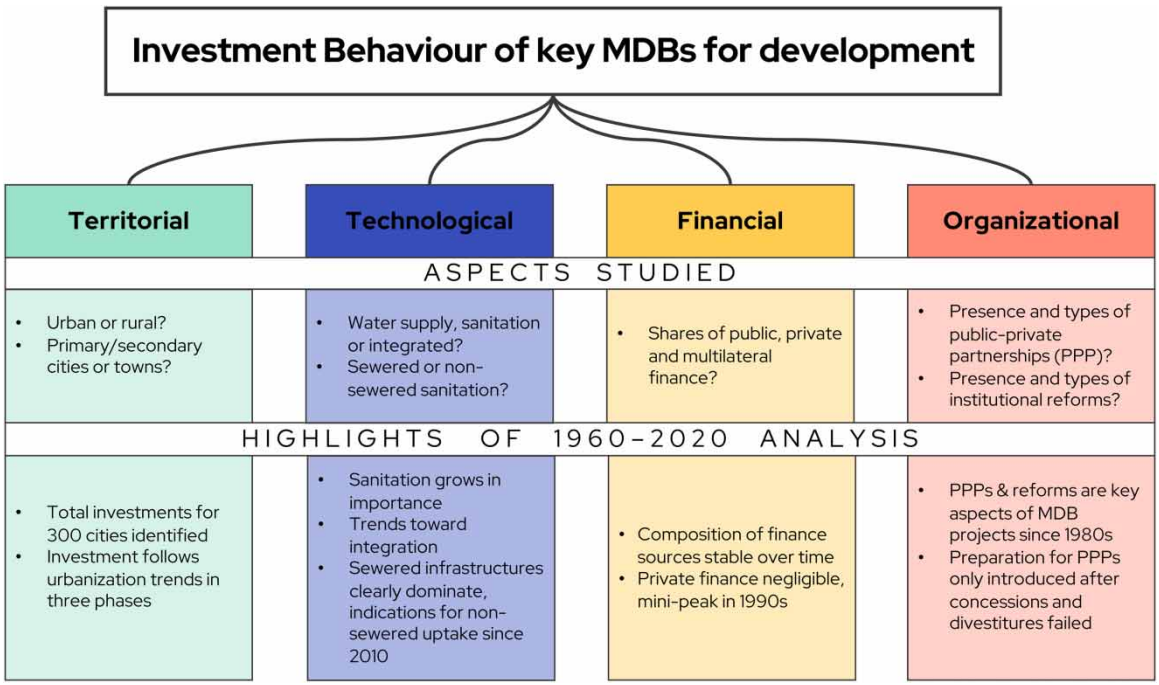
Multilateral development banks (MDBs) play a pivotal role in financing water and sanitation infrastructure projects and thus have a major impact on the development of basic services. Although information about the MDBs' investments is publicly available, it is dispersed and not easily comparable. A comprehensive compilation of MDBs' water and sanitation investments has long been lacking. To address this gap, we assess water and sanitation financing by the three MDBs most relevant to Africa and Asia between 1960 and 2020: the World Bank, the African Development Bank, and the Asian Development Bank. We compile a new dataset by drawing on 3,639 water and sanitation projects and assess territorial trends, technology choices, distribution of financial burdens, and reforms to institutional arrangements. We find that MDBs' investments align with changing patterns of urbanization and increasingly finance sanitation infrastructures including non-sewered technologies. However, our results also suggest that institutional reforms have addressed utility efficiency through investment in equipment and skills rather than through increased commercialization and private sector participation. The leverage effect of MDB investment on private financing is negligible, whereas co-financing from local governments dominates.

Key words: institutional reform, investment, multilateral development banks, sanitation, SDG6, water

HIGHLIGHTS

- New dataset on multilateral development bank (MDB) investment in water supply and sanitation between 1960 and 2020.
- MDB investment aligns to urbanization trend and moves towards integration.
- MDB's leverage for private finance is negligible.
- Co-financing from recipient governments dominates.

GRAPHICAL ABSTRACT



INTRODUCTION

By 2050, more than two-thirds of the world's population will live in urban areas. Africa and Asia are urbanizing fastest and will be home to more than 70% of the urban population by then (UN 2019). With accelerating rates of urbanization, the demand for basic infrastructures and services in water supply and sanitation is growing rapidly. In 2015, it was estimated that achieving Sustainable Development Goal 6 (SDG6) globally by 2030 requires new investments valued at US$ 1,700 billion, of which urban infrastructures for achieving SDGs 6.1 and 6.2 amount to US$ 350 billion (Hutton & Varughese 2016).

The political and scientific debates about where these funds should come from, how best to allocate them, and what infrastructures and institutional reforms to aim for have changed significantly in recent decades. How investments in water supply and sanitation respond to urbanization trends and policy debates will strongly influence the development trajectories of these cities and countries (Hutton *et al.* 2007).

For low- and middle-income countries, multilateral development banks (MDBs), such as the World Bank, Asian Development Bank (ADB), and African Development Bank (AfDB) are by far the most important multilateral lenders, amounting to an approximate share of 15% of total investments, compared with 75% for governments and maximally 5% for private investments (Estache 2010). MDBs provided over US$15 billion for water and sanitation infrastructure investments between 2010 and 2020 (OECD 2022). Due to their broad mandates and their role as 'knowledge banks' (Kramarz & Momani 2013), MDBs also act as knowledge brokers for infrastructural and institutional arrangements that decide how to best provide access to safe water supply and sanitation (Engen & Prizzon 2018). Despite the key role attributed to MDBs in financing access to water and sanitation, little is known about their investment behaviour: the territorial, technological, financial, and organizational characteristics of their investment projects. Although MDBs do report on their investments, the aggregated data does not lend itself to more detailed analysis. The International Organisation for Economic Co-operation and Development (OECD) official development aid (ODA) data cover MDBs, but the information with which MDBs' investment behaviour can be understood is incomplete. Research and MDBs' own analyses of water and sanitation financing are rare and limited in the technological, temporal, and institutional aspects studied, probably due to the challenge of obtaining accurate project-level data (El Khanji 2021). Quantitative analyses examining the financing of water supply and sanitation showed that financing capital investment projects is by far the most important approach and that multilateral agencies are the dominant institutions

(Winpenny *et al.* 2016), the institutional reform aspects typically prevail and non-sewered technologies are only marginally financed (Hutchings *et al.* 2018).

We assess the investment behaviour of the World Bank, ADB, and AfDB in water supply and sanitation from their first operations in the 1960s until 2020 and distil how they responded to trends in urbanization and the policy debates about governing access to basic services. The study draws on a newly constructed dataset of 2,449 investments drawn from the analysis of 3,639 projects. We operationalize investment behaviour by capturing key determinants of sanitation policies in the territorial, technological, financial, and organizational dimensions.

In the territorial dimension, urbanization driven by population growth and global migration has decisively changed the ecological and social conditions of human settlements over the last 50 years, whereas in the global North, the peak of population growth was reached between the 1960 and 1980s, more heterogeneous growth patterns can be observed in emerging economies, reflecting the inherent change in sociospatial structures and increasing economic polarization between urban and rural areas (Carlucci *et al.* 2020). Water and sanitation infrastructure differ significantly between urban and rural contexts in both cost and technology (Hutton & Varughese 2016). Since the adoption of the Millennium Development Goals (MDGs) in 2000, progress in access to safe water supply and sanitation has been disaggregated between urban and rural (Bain *et al.* 2014, 2018). We expect MDB's investment to develop as follows:

H1a: The proportion of projects addressing urban water supply and sanitation is higher than the proportion of projects addressing to rural water supply and sanitation.
H1b: Primary cities receive the lion's share of MDB investment projects with smaller amounts assigned to secondary cities and towns.

In the technological dimension, research has shown that water supply on average receives substantially more investment than sanitation, and large systems comprise over 80% of investment. Yet the disaggregation between large and small systems can be misleading as both urban and rural are mixed in small systems (Winpenny *et al.* 2016). The dominant urban sanitation solution has been sewered systems with centralized treatment throughout the 20th century and into the 21st (Nilsson 2016). More recent research has highlighted that sewered infrastructure is unsuitable for many cities of the global South because they are heavily dependent on large amounts of fresh water, require high investment and operating costs, are inflexible and thus demand long planning horizons (Reymond *et al.* 2016; Schrecongost *et al.* 2020; Schertenleib *et al.* 2021). As an alternative, the newly developed concept of citywide inclusive sanitation (CWIS) proposes a flexible technological approach that focuses on the integration of sewered and non-sewered sanitation solutions at the city scale (Gambrill *et al.* 2020). The core of integrating sewered and non-sewered technologies is the sanitation service chain concept, which unbundles conventional sanitation into five functional groups that need to be provided to achieve safely managed sanitation: containment, emptying, transport, treatment, and disposal or reuse (Tilley *et al.* 2008; BMGF 2010; Trémolet *et al.* 2010). We expect technological preferences to change as follows:

H2a: Water supply initially receives substantially more funding than sanitation. The gap becomes smaller over time.
H2b: Sewered sanitation is the dominant technology throughout the 20th century, and non-sewered sanitation solutions gain prominence after the year of sanitation in 2008.

In the financial dimension, research and policy have emphasized the need to increase investment in water and sanitation to achieve SDG6 (Hutton & Varughese 2016), yet the roles of various funding sources are debated. Some see a diminishing capacity of public finance and advocate that blended finance fills the gap by mobilizing private finance backed by MDB investments (Goksu *et al.* 2017, 2019). Others indicate the lack of evidence for and poor track record of private finance at scale in the water and sanitation sector (Hall & Lobina 2006; Kolker *et al.* 2016), predominantly because of its poor risk–return profile (Alaerts 2019); they argue that the role of public banks has been underestimated by research and policy (McDonald *et al.* 2021). Whereas public funds make up over 60% of non-household contributions to water supply and sanitation (UN Water 2019), there is little quantitative data on the relative importance of co-financing of public and private funds in multilateral investments to help understand the respective leverage effects of multilateral finance. We expect financing to shift as follows:

H3: With decreasing availability of public sector funding, we expect a tendency towards an increasing relevance of private and other non-public sources of funds.

In the organizational dimension, the discourse on the provision of public services evolved since the 1950s in three main phases, from public administration through new public management to new public governance, leading to a succession of actors at the core of the institutional arrangements (Mumssen *et al.* 2018). Under the public administration approach, government agencies aimed to provide water and sanitation services to the entire population through a centralized network infrastructure to which all households were connected by managing it as a monopoly (Mumssen *et al.* 2018). Under the new public management paradigm, ring-fenced, autonomous, and ideally private utilities replaced governments in managing natural monopolies (Cruxên 2021, 2022) along commercial principles (Bakker 2003; Hall *et al.* 2013). Households paid for services through tariffs that were expected to cover the entire cost of operation, maintenance, and investment (Abeysuriya *et al.* 2005; François *et al.* 2010). Initial subsidies and public funds were phased out and replaced by private credit to the utility, by public–private partnerships (PPPs) and even full divestiture (Finger & Allouche 2002; Marques 2016). In the sanitation sector, new public governance is reflected in the organization of sanitation as a service chain along which enterprises offer sanitation services (Schaub-Jones 2011; Diener *et al.* 2014; Orner & Mihelcic 2018) in a market environment (Couder & Kibutu 2020; Mallory *et al.* 2020) to meet households' demand (Mara *et al.* 2010). Reforms under new public governance focus on creating demand among households, stipulating an enabling environment for the sanitation economy, and regulating the emerging service providers (WSUP 2020; IWA 2021). Whereas some see this development as logical steps towards efficient water and sanitation services (Kolker *et al.* 2016; Goksu *et al.* 2017), for others it is emblematic of the tendency of MDBs to push for economic liberalization, leading primarily to the depoliticization of basic service provision rather than expanding access (Chwieroth 2008; Sanchez 2019; Bigger & Webber 2020). We expect organizational arrangements to develop as follows:

H4a: Institutional reform components appear in the 1980s and follow the 'maturity ladder'.
H4b: The use of PPPs increases over time.

METHODS

Datasets available from MDBs and the OECD lack information to describe MDBs' investment behaviour in detail. Therefore, this study draws on a newly constructed dataset compiled from project appraisal documents derived from the open-source repositories of the MDBs. It is based on all investment projects with possible relevance to water and sanitation,[1] irrespective of financial instruments and subsectors as defined by MDBs (World Bank $N = 1{,}587$, ADB $N = 1{,}692$, and AfDB $N = 484$). While cleaning the dataset, 1,204 projects were excluded. Reasons for exclusion were duplication or cancellation, pure technical assistance, or a focus on water-related activities not linked to SDG 6.1 or 6.2, such as irrigation and integrated water resources management. For the remaining 2,435 entries (World Bank $N = 1{,}181$, ADB $N = 879$, and AfDB $N = 375$), we coded 40 variables in four sets to operationalize the dimensions of investment behaviour by analysing project appraisal documents and online project summaries.[2]

To outline the territorial dimension and understand how MDB investments respond to urbanization trends, we describe whether investment projects are implemented in urban or rural contexts and differentiate between primary and secondary cities. To provide detail on the technological dimension, we differentiate between investments in water and sanitation infrastructure. For sanitation, we further differentiate between sewered and non-sewered technologies, and for non-sewered, we specify the type of technologies that are financed by grouping them along the sanitation service chain. To capture the financial dimension, we code the contributions of public, private, and multilateral investors. To provide detail on the institutional dimension, we record whether an investment project promoted PPPs or implemented a specific PPP arrangement. Furthermore, for the World Bank's urban water and sanitation projects, we code each institutional reform component along the World Bank's 'maturity ladder for the urban water sector' (Goksu *et al.* 2019: 32) and the emerging regulatory frameworks for CWIS (WSUP 2020; IWA 2021) separately. The dataset was analysed using R.

[1] For a detailed comparison between the information reported by MDBs and OECD and details on data collection, see Supplementary Appendix 1: Data.
[2] For details on all variables, refer to Supplementary Appendix 2: Variables.

RESULTS AND DISCUSSION

Regarding H1a, we find that investment projects in urban water and sanitation comprised 67% of the projects between 1960 and 2020. Projects that relate to both urban and rural contexts are mostly national and regional projects accounting for 15% of projects since the 1970s. The territorial focus underwent three phases (Figure 1(a)). In the first phase, between 1960 and 1980, urban investments in primary cities dominated, and rural investments were nearly absent. The 1980 and 1990s were marked by a rural turnaround, in which the importance of investment in rural water supply and sanitation projects increased significantly. At its peak at the end of the 1990s, more than 30% of the investment projects approved focused solely on rural areas. The third phase after 2000 supports H1b, the trend reversed and investments in urban areas gained importance, increasingly in secondary cities. These phases correspond well with the demographic trends in the recipient countries. At the beginning of this period, investments targeted the capital cities and the main postcolonial economic centres (see Figure 1(b)). During the rural turn, the newly independent governments aimed to expand access to basic services for all with the support of multi- and bilateral agencies as part of a general attempt to slow rural–urban migration and address areas with poor populations (Schertenleib *et al.* 2021). The post-2000 urban turn coincided with accelerating urbanization patterns in the global South, where secondary cities and towns became more important (Carlucci *et al.* 2020; UN Habitat 2022). The projects that relate to both urban and rural contexts are mostly national and regional projects that originated in the 1970s and whose relative importance remained stable at around 15% of projects since then.

The studied investment projects differ in the range of activities and infrastructure financed. We refer to them as sectors and distinguish between pure water supply ($N = 463$), pure sanitation ($N = 210$), and the integration of water supply and sanitation ($N = 656$). In addition, other activities such as waste management, roads and transport, and slum rehabilitation are increasingly linked to investments in water supply and/or sanitation across the period. Such projects are marked with a +: Water +($N = 376$), Sanitation + ($N = 156$), and Water and Sanitation + ($N = 574$).

Regarding H2a, we find that investments in water supply have become relatively less important than those in sanitation over the past 60 years. Until 1980, water supply accounted for more than 70% of investments; after 1990, this proportion fell to less than 50%. Pure water supply projects accounted for more than 50% between 1960 and 1980, whereas pure sanitation projects have never accounted for more than 20% of total projects. The integration of water supply with sanitation as well as with other activities has become the predominant practice since 1980, whereas in 1980, the proportion of integrated projects was 25%, by 2020 it had grown to 50% (Figure 2(a)). The World Bank was a pioneer in integrating projects

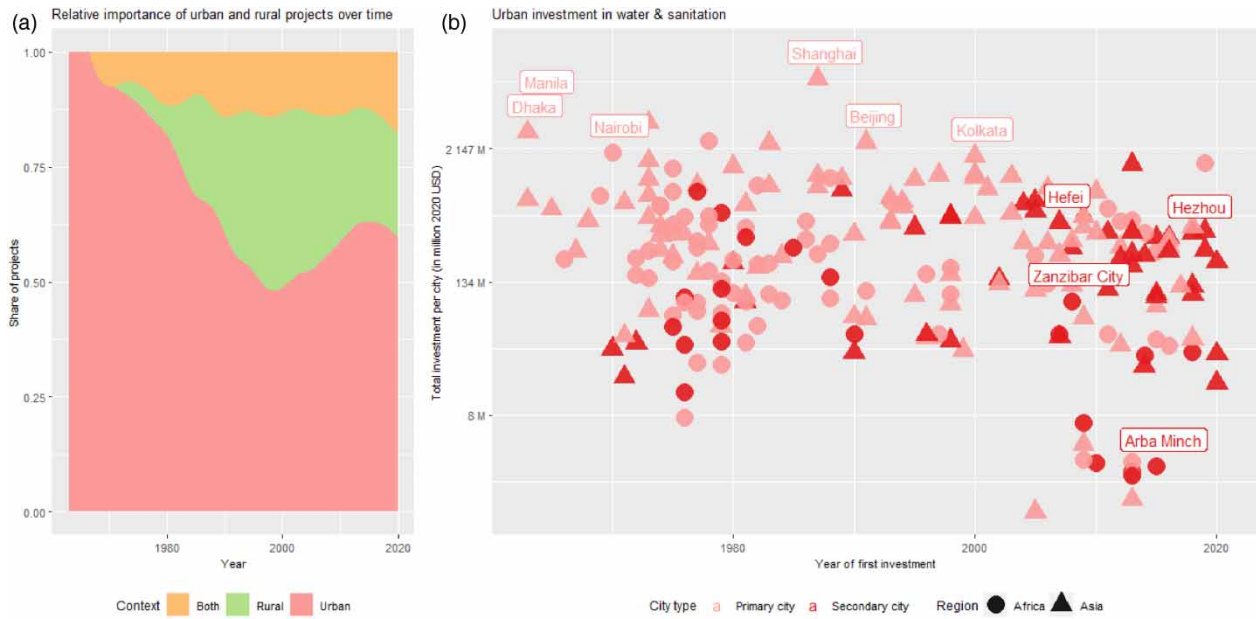


Figure 1 | Changes in territorial focus of MDB investment projects over time. Comparing investments in urban and rural context (a) and in primary and secondary cities (b) between 1960 and 2020.

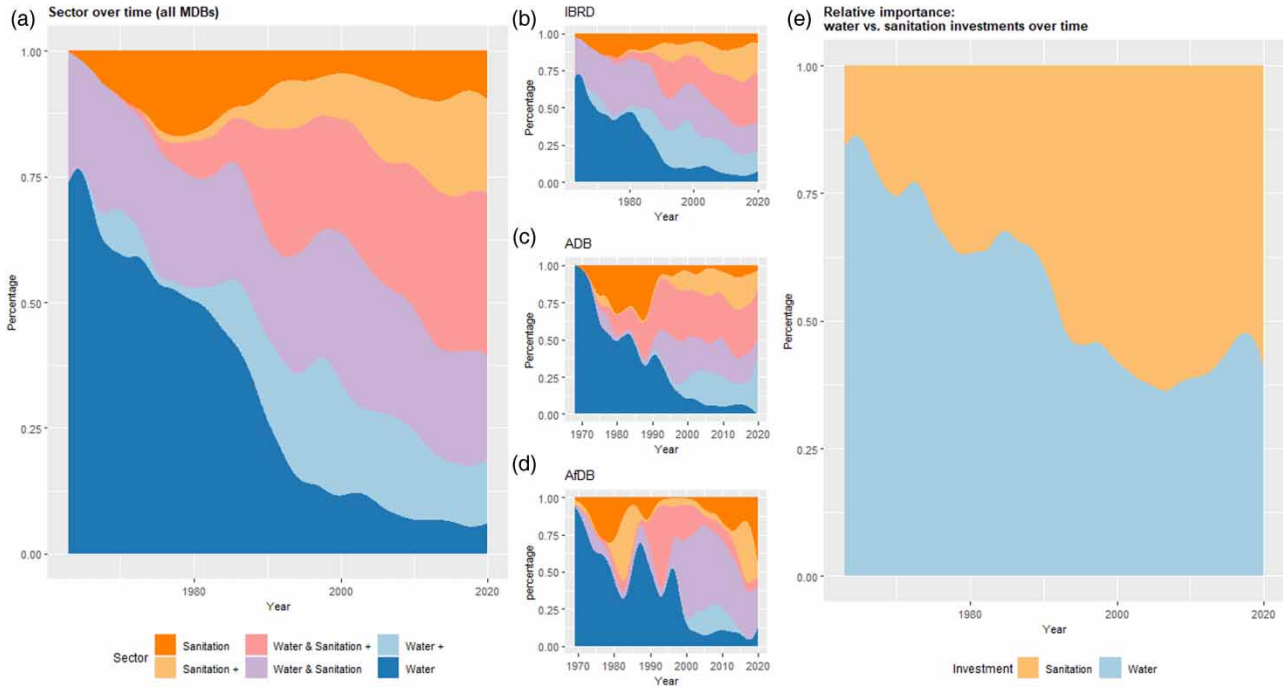


Figure 2 | Changing priorities between water supply and sanitation sectors over time. (a–d) refers to the number of projects per sector. (e) The relative proportion invested in water supply versus sanitation infrastructures. For pure water supply and pure sanitation, the amounts represent total investments. For integrated projects, the amounts have been derived from project documents.

(Figure 2(b)). Since 1980, integration with other activities (+) has accounted for 20–40% of World Bank projects. In contrast, the ADB (Figure 2(c)) and AfDB (Figure 2(d)) focused on pure water supply or sanitation projects until 1990, and followed this with a rapid change towards integrating projects. This trend corresponds well with important policy developments. The International Decade for Drinking Water Supply and Sanitation between 1980 and 1990, which treated water supply and sanitation equally as human rights, led among other things to a better understanding of the impact of improved water and sanitation on health and as an entry point to economic development. This led to a widespread perception of them both as integral to economic development policies thereafter (Najlis & Edwards 1991; Schertenleib *et al.* 2021).

Regarding H2b, we find that investments in drains and conventional sewers are sanitation technologies that most frequently received investment. Out of the 138 World Bank projects analysed, 134 had an infrastructure component. Of these, 105 were purely network infrastructure such as sewerage and wastewater treatment plants (WWTPs), six were purely non-sewered technologies, and 19 projects invested in both (Figure 3). Non-sewered sanitation is significantly less important throughout the period, but there are two mini-peaks, one in the 1980s and one after 2008, with the most common investment being in containment technology. The first peak occurs in the Water and Sanitation Decade and coincides with the discussion of low-cost sanitation technologies promoted by the World Bank's Water and Sanitation Program (Kalbermatten *et al.* 1982; Kennedy-Walker *et al.* 2014). The second peak follows the International Year of Sanitation in 2008 and coincides with the establishment of the sanitation service chain concept (Tilley *et al.* 2008), which was adopted and promoted by the World Bank and the Bill and Melinda Gates Foundation (Trémolet *et al.* 2010). Since 2010, non-sewered sanitation has become more common in urban contexts, but its adoption in World Bank investments is only a fraction of conventional sewers and WWTPs.

Regarding H3, we find that the composition of sponsors has neither changed significantly over time (Figure 4(a)) nor does it significantly differ between MDBs (Figure 4(b)). MDBs and governments are by far the most important investors. As MDBs' investments are predominantly loans that governments have to repay, public investments account for over 80%. Government funding becomes relatively less important between 1980 and 2000. These are mainly replaced by multi- and bilateral funding and less by private finance. Overall, private finance accounts for less than 5% of the investments. This balance does not

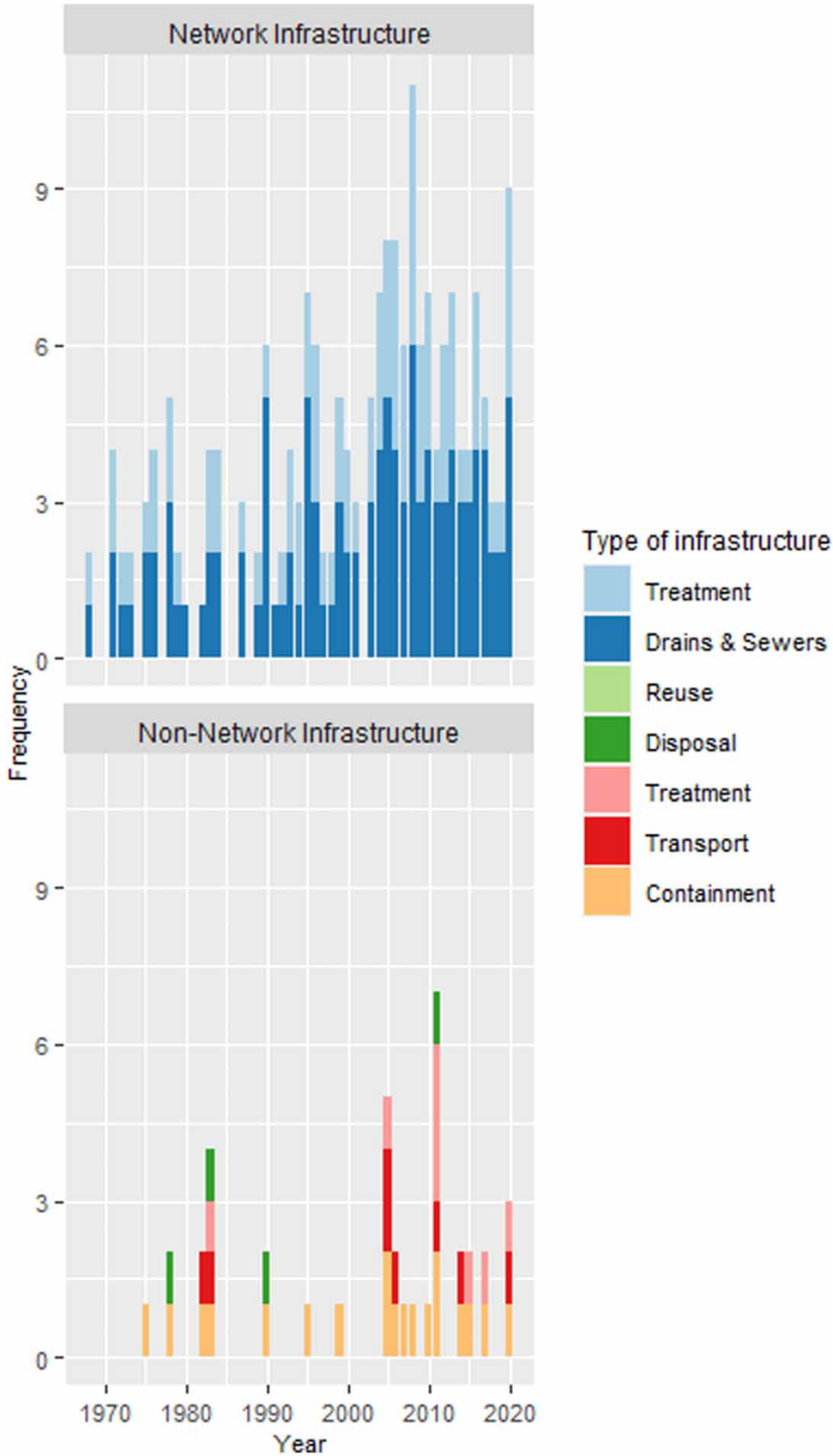


Figure 3 | Sanitation technologies over time in the World Bank's urban water and sanitation projects ($N = 134$).

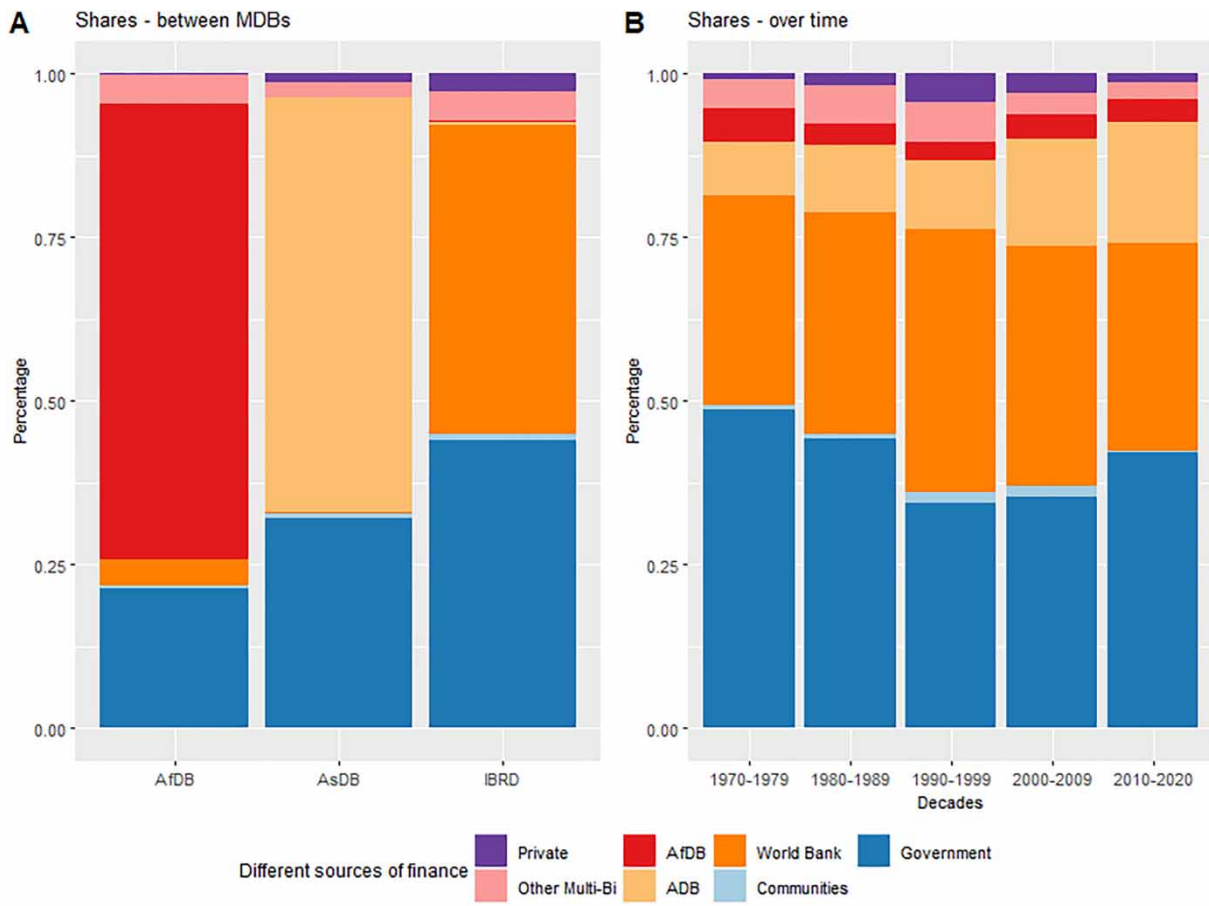


Figure 4 | Total investments for water supply and sanitation disaggregated between sponsors.

correspond well with the main policy developments. Since 1990, numerous reports, above all those promoted by the World Bank and the OECD, have called for greater private finance investments in water and sanitation infrastructure while delegitimizing the role of public finance (Briscoe & Garn 1995; Goksu *et al.* 2017; OECD 2019). On the contrary, our observations indicate that if this discourse has had any effect at all, it has been to reduce public investment in water supply and sanitation (Bayliss & McKinley 2007; Castro 2008; McDonald *et al.* 2021).

Regarding H4a, we find that investments in organizations, institutional reforms, and the introduction of PPPs have become core aspects of MDB projects in water supply and sanitation, especially since 1980. We analyse reform components along the World Bank's 'maturity ladder for the urban water sector' (Mumssen *et al.* 2018) and find a clear difference between the first two steps of the ladder and the others (Figure 5(a) and 5(b)). 'Battling inefficiencies' and 'capacity building' cannot be understood as institutional reforms *per se* but are attempts to make organizations more efficient through technical improvements and building on human capital. In contrast, steps 3–5 are institutional reforms attempting to attract greater private sector participation as a means of potentially further improving the efficiency and accountability of utilities. Capacity building is the most important institutional reform component throughout the analysed timeline, whereas the others seem to follow a temporal sequence along the maturity ladder.

Regarding H4b, we find that promotion and preparation for the introduction of PPPs and the implementation of specific PPP arrangements in MDB-financed investment projects increase rapidly after 1990. Counterintuitively, specific PPPs were sporadic but dominant until 1995, yet preparation for them was absent. From 1995 onwards, both promotion and implementation rapidly became more important, while Figure 6(a) suggests that promotion lagged behind implementation. Although PPPs in water supply emerged somewhat earlier than PPPs in sanitation, there is no significant difference between the two sectors. However, as most utilities provide both water supply and sanitation, projects that seek PPPs for water

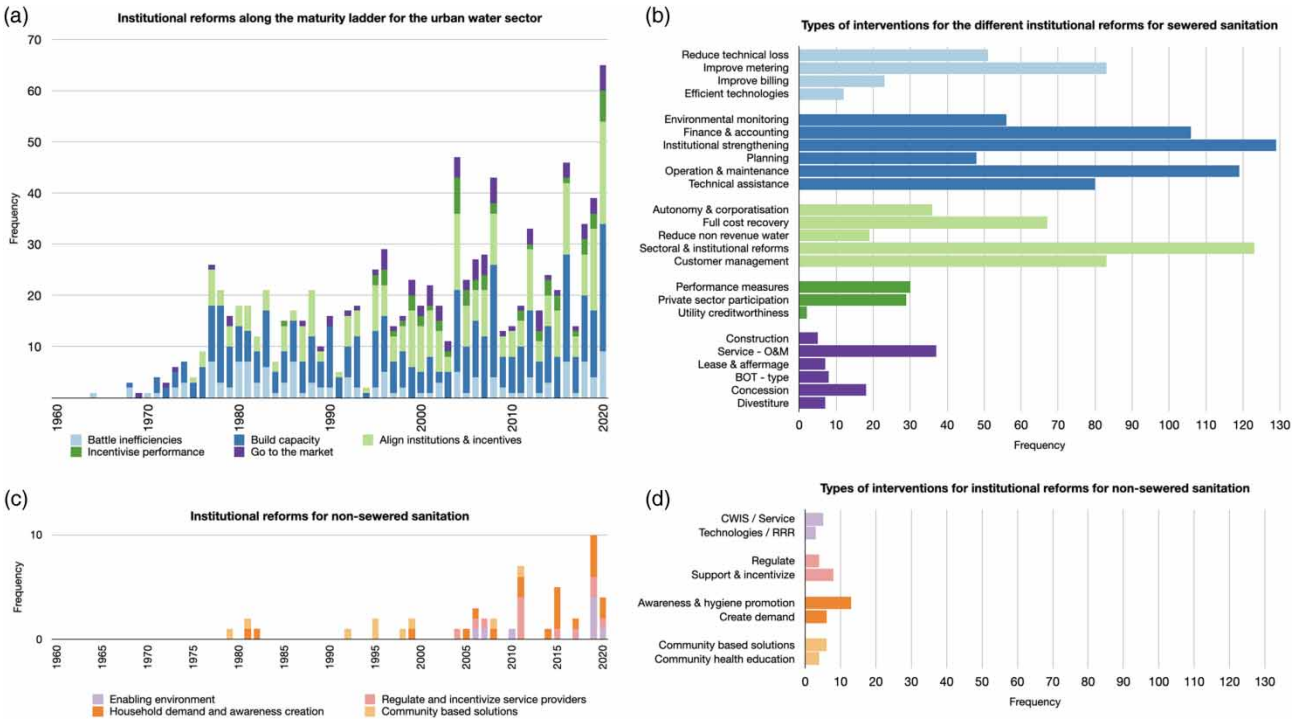


Figure 5 | Institutional reforms for sewered sanitation (a and b) and non-sewered sanitation (b and c), differentiated over time (a and c) and between different interventions (b and d) in World Bank's water supply and sanitation investment projects from 1960 until 2020.

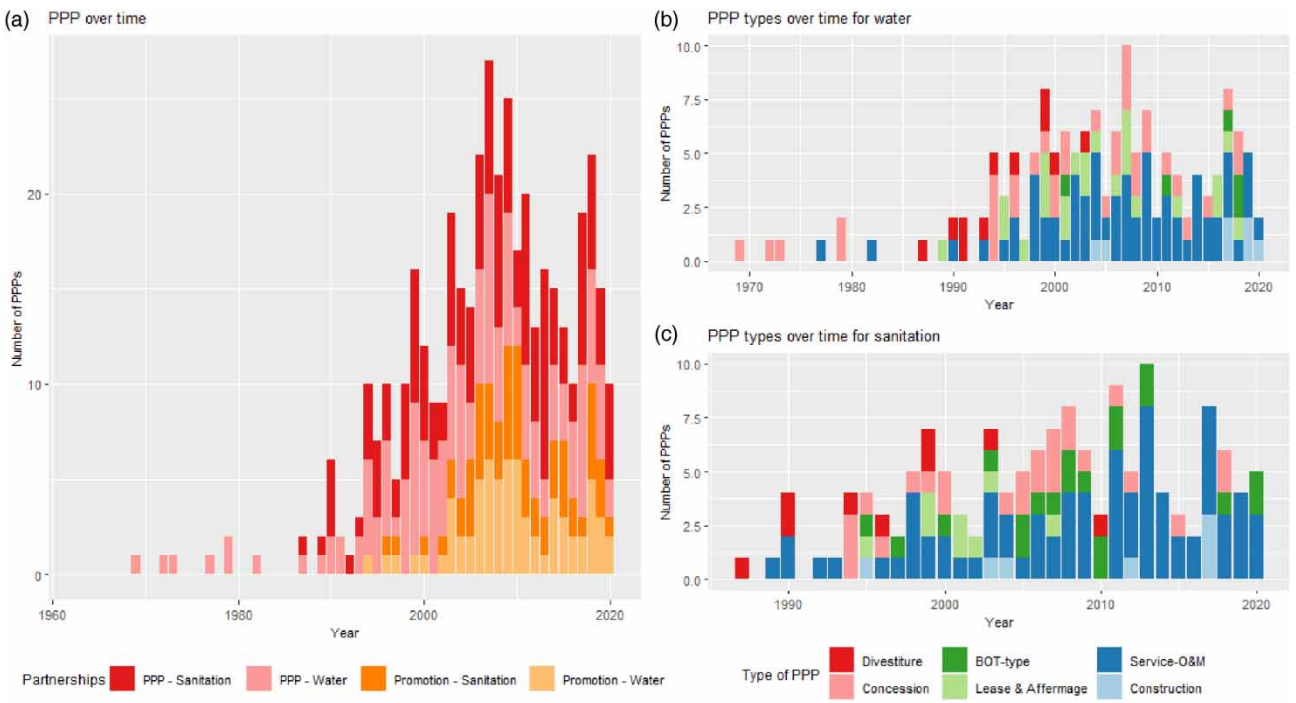


Figure 6 | Number of and types of PPP over time. For all MDB's urban water supply and sanitation investments.

supply and sanitation together prevail. A second trend concerns the distribution of risks within PPPs. In the 1980s and early 1990s, PPPs where private actors bear all or most of the risk, such as concessions and divestments, dominate. From 2000 onwards, PPPs where the risks are borne by governments proliferate (Figure 6(b) and 6(c)). While supporters claim that this is the result of a learning process (Marin 2009), critics claim that privatization efforts in the water and sanitation sector have failed and that new forms of PPP risk privatizing profits and leaving the costs to the public (Hall & Lobina 2006; Bayliss & McKinley 2007; Castro 2008; McDonald *et al.* 2021). Information about institutional reforms for non-sewered sanitation is too sparse to identify clear patterns, but the analysis indicates that sanitation marketing to create demand at households along with regulating and incentivizing service providers have become the key institutional reforms pursued, which replace community centred approaches that were dominant in the 1980 and 1990s (Figure 5(c) and 5(d)).

CONCLUSIONS

We presented a novel dataset of MDB investment in water supply and sanitation that allowed us to study the investment behaviour of the World Bank, ADB, and the AfDB between 1960 and 2020. We operationalized investment behaviour through the four dimensions of territory, technology, finance, and organization to understand how MDBs respond to changing problem pressures and policy trends.

Our descriptive analysis of 2,449 projects found that MDB investments are in line with urbanization trends. While progress towards SDG 6.1 and 6.2 is disaggregated by urban and rural areas, MDBs are not yet tracking their investments accordingly. To understand how progress can be accelerated in both contexts, this could be helpful. Similarly, MDBs investments have responded to changing challenges by adapting the technological dimension of investment projects. The silo focus on pure water supply versus pure sanitation seems to be disappearing and sanitation is continuously gaining importance. The integration of water supply and sanitation with other activities underscores the nexus function of water supply and sanitation for sustainable development but makes tracking the effective investments in specific activities more challenging.

The issue that dominated policy trends was the role of private actors in financing and organizing access to safe water supply and sanitation. In contrast to the responsiveness that MDBs showed to changing contexts, they seem to have been weaker in critically analysing their performance and readjusting strategies, particularly in financial and institutional policies. In the light of the time period analysed, the introduction of PPPs in the 1980 and 1990s seems rather arbitrary and less of a strategic response to pressing problems in the field of sanitation. This is indicated by the observation that concessions and divestments are the dominant forms of PPP endeavour until 2000. Only after repeated failure to divest and concede water supply and sanitation throughout the 1990s were PPP arrangements fine-tuned through shifting risks to public actors. The analysis of institutional reforms for non-sewered sanitation in World Bank projects indicates a significant risk that history may repeat itself. The reforms aim at enabling a sanitation economy by targeting households to stipulate demand through awareness and marketing campaigns and incentivising businesses to respond to the potential demand. The market-based approach is in line with early PPPs, where private actors bore the costs and risks of the investments, which they were expected to finance through cost-recovery tariffs. Given the repeated and failed attempts to divest and concede water supply and sanitation through PPPs, the hypothesis that a sanitation economy for non-sewered sanitation can successfully achieve the same transition towards private responsibilities and cost-recovering tariffs to ensure access to safe sanitation does not seem to be empirically supported.

MDBs and the OECD have called for a greater role for private capital and commercial investment in water and sanitation since the early 1990s and are currently stressing the importance of private finance for non-sewered sanitation. This discourse has promoted a leverage function for MDBs in initiating the transition to more private investment through blended finance. Our analysis shows that such leverage has not occurred. Instead, our analysis has shown that MDBs leveraged public investments, which on average account for 40% of the total investment sum in MDBs' investment projects. Over the past 60 years, governments and public utilities have been the main implementing partners in MDB investment projects in water supply and sanitation. Our analysis suggests that MDBs can increase their impact if they focus on leveraging national public funds and abandon attempts to mobilize private funds for water and sanitation, which have not even been marginally successful.

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DATA AVAILABILITY STATEMENT

All relevant data are available from an online repository or repositories (https://doi.org/10.25678/0008DA).

CONFLICT OF INTEREST

The authors declare there is no conflict.

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