IGC

Cities that Work

POLICY TOOLKIT

Policy Options for Expanding Urban Water and Sanitation

Water, sanitation and hygiene (WASH) systems are fundamental to healthy and productive cities. Yet as urban populations grow rapidly, many cities struggle to expand and maintain safe water and sanitation services. Poor WASH infrastructure increases exposure to infectious disease, reduces labour productivity, and imposes disproportionate costs on low-income households.

This policy brief outlines four key principles to help governments expand safe and affordable water and sanitation services in rapidly growing cities.

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Policy Options for Expanding Urban Water and Sanitation

Cities are engines of economic growth because density allows people and firms to share ideas, specialise, and innovate. However, density also amplifies health and environmental risks. When water and sanitation systems fail, it can accelerate the spread of disease and environmental contamination.

Waterborne diseases are a leading cause of illness in many cities, while poor sanitation is estimated to cost African economies 1% to 2.5% of GDP through lost productivity, healthcare costs, and environmental damage.[1] Globally, water-related illnesses account for more than 440 million lost school days annually[2], undermining human capital development and long-term growth.

Improved infrastructure reduces disease transmission, increases labour productivity, and frees time for education and work. A dollar invested in water generates roughly $2–4 in economic benefits; a dollar invested in sanitation $5–9.[3] Gains are particularly large in dense urban areas; improved sanitation enables cities to support larger populations and maintain health and environmental quality.[4]

However, many cities struggle to translate investment into sustained improvements in service delivery. Infrastructure is often built but poorly maintained; networks reach neighbourhoods but households remain unconnected; utilities lack the capacity or incentives to reach under-served communities. Informal providers frequently fill the gaps, but may charge more for lower-quality services.

This brief highlights key considerations for policymakers in expanding water and sanitation services for rapidly growing cities:

1 **Match water and sanitation technologies to density and capacity.** Networked systems deliver the greatest benefits in dense cities, while decentralised solutions can provide cost-effective services where infrastructure and institutional capacity are limited.

2. **Governments must ensure access, affordability and service quality while allowing flexible service delivery.** Services may be delivered by public utilities, private operators, or regulated informal providers, but governments must oversee outcomes.

3. **Financing requires funding infrastructure, connections and maintenance together.** Sustainable systems require funding for large infrastructure investments, household connections, and ongoing operation and maintenance costs.

4. **Strong institutions and supportive behaviours ensure infrastructure delivers results.** Effective regulation, coordination across agencies, and behavioural interventions are essential to translate investments into improved health and environmental outcomes.

This toolkit accompanies our new synthesis paper "Urban Water and Sanitation Systems: Managing Infrastructure, Institutions and Access". It uses a combination of AI summarising, and writing and editing by the authors, to present practical guidance for policymakers.

1 WaterAid. (2008). Tackling the silent killer: The case for sanitation.

2 UNDP. (2006). Human Development Report: Beyond scarcity: Power, poverty and the global water crisis.

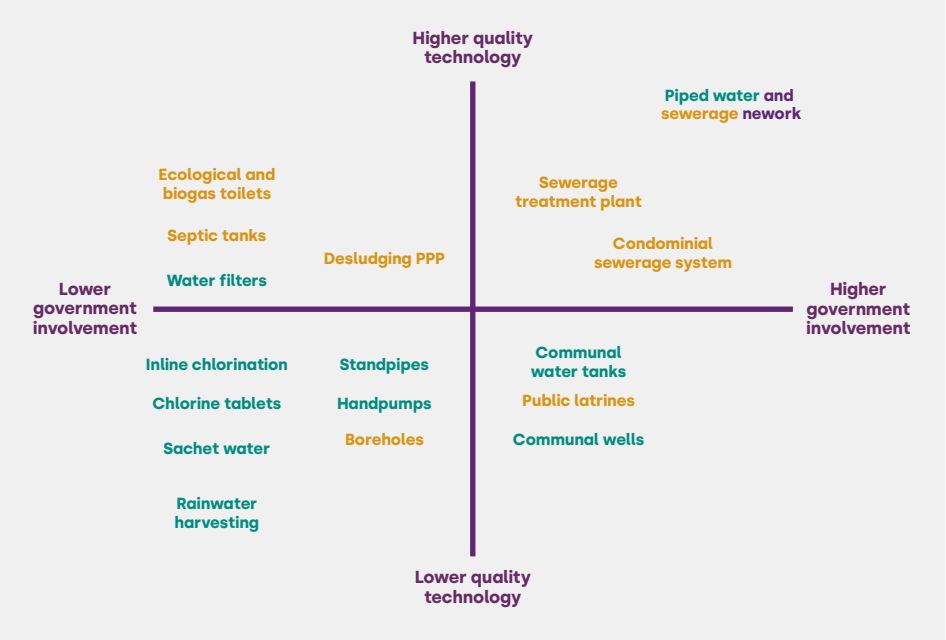
3 World Health Organisation. (2012) "Global costs and benefits of drinking-water supply and sanitation interventions to reach the MDG target and universal coverage".

4 McCulloch, S. E., Schaelling, M. P., Turner, M., & Kitagawa, T. (2025). *Sewers and urbanization in the developing world* (Working Paper No. w33597). National Bureau of Economic Research.

Prioritise water and sanitation technologies that match a city's density and institutional capacity

Cities today have a wide range of technologies available to deliver water and sanitation services, from large-scale piped networks to decentralised systems such as boreholes, water kiosks, septic tanks, and pit latrines. No single technology is universally optimal. The appropriate choice depends on urban density, institutional capacity, and the resources available to build and maintain infrastructure. **Figure 1** illustrates the trade-off between technology quality and the level of government involvement.

Figure 1: WASH technologies and government involvement



Source: authors' own elaboration. Technologies related to the provision of water in blue and sanitation in orange.

In dense cities, networked systems such as piped water and sewerage offer the greatest long-term benefits. By safely transporting water and waste away from densely populated neighbourhoods, these systems reduce disease transmission, limit environmental contamination, and support higher urban population densities. Recent research finds that expanding sewer networks can significantly increase urban density by allowing cities to accommodate more residents safely.[5] However, they require large upfront investment and strong institutions to operate and maintain them effectively.

5 McCulloch, S. E., Schaelling, M. P., Turner, M., & Kitagawa, T. (2025). *Sewers and urbanization in the developing world* (Working Paper No. w33597). National Bureau of Economic Research.

In many developing cities, these institutional and financial constraints limit the expansion of networked systems. In developing cities today, only 34% of the population have access to individual piped water connections[6], and in Sub-Saharan Africa, sewerage networks serve only around 16% of urban residents.[7] As a result, many households rely on alternative water sources such as wells and boreholes, and sewage solutions such as septic tanks and pit latrines. These can still provide important health benefits at a much lower cost. In Dakar, for example, the combined capital and operating costs of a piped sewerage system were estimated to be five times higher than those of septic-based faecal sludge management.[8]

Cost-benefit analysis is therefore essential to guide decision-making. It helps weigh financial, institutional, and social trade-offs, considering factors such as maintenance, pricing, retrofitting needs, and service coverage. These trade-offs vary widely across urban contexts and over time, with many cities initially adopt decentralised systems that are cheaper and easier to deploy, while gradually expanding networked infrastructure as density increases and institutions strengthen.

Governments must retain responsibility for access, affordability and service quality, while allowing flexibility in delivery.

Regardless of how services are delivered, water and sanitation services will always require some level of public sector involvement to ensure access to safe and affordable water and sanitation. Two features of the sector explain why public oversight is always necessary:

- Water and sanitation systems generate large public health and environmental benefits beyond those experienced by individual households. Individuals are only willing to pay for the benefits they receive and therefore governments need to subsidise the balance.
- Water and sanitation systems also involve large, fixed infrastructure costs. It is far cheaper for a single provider to build one integrated network, than for multiple competing systems to make these investments in parallel.

6 Banerjee, S., & Morella, E. (2011). Africa's water and sanitation infrastructure: Access, affordability and alternatives. World Bank.

7 World Health Organization & United Nations Children's Fund. (2021). Progress on household drinking water, sanitation and hygiene 2000-2020: Five years into the SDGs.

8 Dodane, P., Mbéguéré, M., Sow, O., & Strande, L. (2012). Capital and operating costs of full-scale fecal sludge management and wastewater treatment systems in Dakar, Senegal. *Environmental Science & Technology.*

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While governments ensure this coordination and access, in many cities, services are delivered through a combination of providers. Public utilities typically manage large-scale infrastructure such as piped water and sewerage networks. Private operators may participate through public–private partnerships that help improve operational efficiency or expand services. In areas that formal networks do not reach, small-scale and informal providers often fill service gaps through water kiosks, boreholes, sachet water markets, or on-site sanitation solutions. Each model has advantages and risks.

Well-managed public utilities can deliver high-quality services at scale, particularly when they operate with managerial autonomy and strong governance. Phnom Penh's public water utility, for example, expanded access from 20% of the city in 1993 to more than 90% by 2008 while maintaining financial sustainability.[9] However, public utilities often face performance issues, risk political interference, and are often used as job-creation programmes rather than optimising efficiency.

Private participation can improve efficiency and innovation, but its success depends on strong regulatory frameworks. Without clear oversight, private operators may prioritise profit over affordability or service expansion. Argentina provides a perfect case – during the 1990s, increased service quality from privatisation resulted in a 26% reduction

9 https://ppp.worldbank.org/public-private-partnership/sites/default/files/2024-08/PhnomPenh_ExemplaryWaterUtilityinAsia_EN.pdf (accessed: 18 January 2026)

in child mortality in the poorest areas.[10] However, as the tariff freeze was lifted following the 2001 economics crisis, a lack of regulation led to large tariff increases, resulting in significant public backlash.[11]

Informal providers often emerge where formal utilities are unable to expand quickly enough. In Ghana, for example, sachet water became the dominant source of drinking water in urban areas, with household reliance rising from 14% in 2010 to 51% by 2017.[12] These providers are often flexible and responsive to local demand, but they frequently operate with limited quality control and can charge higher prices. According to World Bank data, low-income household can spend up to 10 times more on water from water tankers and informal vendors, than if they were connected to a public utility.[13]

Low-income household can spend up to 10 times more on water from water tankers and informal vendors, than if they were connected to a public utility.

For policymakers, the key challenge is not choosing a single provider model, but ensuring that all providers operate within a framework that guarantees service quality, affordability, and accountability. This typically requires:

- **Clear regulatory frameworks for public and private providers.** Regulators need sufficient independence and authority to monitor tariffs, enforce service quality, and set achievable targets for network expansion. Furthermore, adapting standards to local conditions can enable cities to expand safe and affordable services while maintaining appropriate public health protections.

- **Mechanisms to integrate informal providers where formal networks are absent.** Rather than attempting to eliminate them, governments can improve service delivery by bringing these providers into the formal regulatory system. For example, in Ho Chi Minh City, authorities issued multi-year service contracts to informal water providers, allowing them to operate legally while the public utility gradually expanded its network.[14] In Durban, municipal recognition of pit latrine emptiers improved sanitation services in informal settlements by enabling better oversight and coordination.[15]

Cities that combine strong public oversight with flexible delivery arrangements are often better able to expand water and sanitation services, particularly in rapidly growing urban areas.

10 Galiani, S., Gertler, P., & Schargrodsky, E. (2005). Water for life: The impact of the privatization of water services on child mortality. *Journal of Political Economy*, 113(1), 83–120.

11 Marin, P. (2009). Public-private partnerships for urban water utilities: A review of experiences in developing countries. *Trends and Policy Options*, No. 8. Washington, D.C.: World Bank Group.

12 Moulds, S., Chan, A. C. H., Tetteh, J. D., Bixby, H., Owusu, G., Agyei-Mensah, S., et al. (2022). Sachet water in Ghana: A spatiotemporal analysis of the recent upward trend in consumption and its relationship with changing household characteristics, 2010–2017. PLoS ONE, 17(5), e0265167.

13 Banerjee, S., & Morella, E. (2011). Africa's water and sanitation infrastructure: Access, affordability and alternatives. World Bank.

14 World Bank. (2006). Vietnam urban water supply and sanitation sector review. Washington DC: World Bank.

15 Mitchell, C., Ross, K., & Cotton, A. (2016). Managing sanitation services in informal settlements: The role of manual pit emptiers. *Water Policy*, 18(2), 388–403.

Financing requires funding infrastructure, connections and maintenance together

Water and sanitation systems involve large upfront investments and long asset lifetimes. Providing universal access to water and sanitation by 2030 is estimated to cost over USD 1 trillion—about 1.21% of global GDP.[16] Financing is needed across three areas: (i) large-scale trunk infrastructure, (ii) household connections, and (iii) ongoing operations, maintenance, and expansion.

Financing major infrastructure includes treatment plants, trunk pipelines, reservoirs, and sewerage networks. These require substantial capital investments that often exceed the fiscal capacity of municipal governments. They also generate large public health and environmental benefits beyond individual households. For this reason, infrastructure investments are typically financed through a combination of national government funding, concessional loans, and development finance. For example, in 1996, the city of Salvador, Brazil, launched an eight-year program to expand sewerage access from 26% to 80% of the population, at a cost of $440 million—$246 million of which was funded through a concessional loan from the Inter-American Development Bank (IADB).[17]

However, even when networks exist, many households remain unconnected due to the **"last mile problem"**: the reluctance or inability of poorer households to pay for network connections. In Lusaka, Zambia, in 2005, approximately 80% of inhabitants live in areas close to utility networks, but the majority are not actually connected to these.[18] To address this gap, many utilities have incentivised household uptake through subsidies, fines, or flexible payment options such as micro-loans.

Even when networks exist, many households remain unconnected due to the "last mile problem".

- **Subsidies** aim to reduce installation, connection, or service costs for low-income households, helping to promote rapid and inclusive infrastructure uptake. Targeted subsidies, based on willingness-to-pay surveys, or **cross-subsidization** schemes, where wealthier users pay more to offset costs for poorer households, can enhance both efficiency and equity. Subsidised last-mile connections typically require an additional allocation of public funds.

- **Fines** penalise property owners or households that fail to connect to existing water and sanitation infrastructure or engage in illegal behaviors like unauthorized connections or sewage dumping. They clearly signal socially desirable behavior, at the same time as generating revenue, and thus improve cost recovery.

16 OECD (2022), Financing a Water Secure Future, OECD Studies on Water, OECD Publishing, Paris

17 Hall, D. and Lobina, E. (2008) "Sewerage Works: Public Investment in Sewers Saves Lives", UNISON and Public Services International Research Unit

18 Ashraf, N., Glaeser, E., & Ponzetto, G. (2016). Infrastructure, incentives, and institutions. *American Economic Review*, 106(5), 77–82.

However, fines require strong administrative and enforcement capacity, and may be less effective in lower income settings where people cannot afford to pay.

- **Small-scale loans and payment plans** enable households to spread out large one-time connection fees through microcredit or installment schemes. This can significantly boost uptake, especially where piped water is ultimately cheaper than informal alternatives. In Indonesia, for example, financing water connections through microcredit helped the utility increase its customer base by 40% between 2003 and 2005.[19] Effective implementation depends on financial institutions' capacity to manage non-income-generating loans and the availability of supportive awareness campaigns.

The choice of policy instrument often depends on institutional capacity: strong executive institutions may be better suited to implementing subsidies, while strong judicial institutions may more effectively enforce penalties. In contexts with limited institutional strength, a mixed approach that combines both incentives and penalties may offer the most effective solution.[20]

Once infrastructure is built, and households are connected, utilities must generate sufficient revenue to recover initial investments, operate systems, repair infrastructure, and expand services to new areas. These costs are typically covered through user fees and property taxes.

- **User fees** are the most direct way to fund the ongoing costs of water and sanitation services. The tariffs need to balance cost recovery with residents' willingness and ability to pay. Two-part tariffs are regarded as the most efficient pricing model. They combine a fixed fee to recover infrastructure investment with a per-unit charge equal to the ongoing cost of supply. This aligns usage prices with the actual cost of delivery, avoiding both overuse and underuse. Other structures might be considered for ease of administration or to promote cross-subsidisation between high- and low-income households. Furthermore, where the willingness to pay for sanitation alone is low compared to water, bundling water and sanitation into a single user fee can be an effective way to fund both services.

  Collecting these fees can be challenging. In African cities, annual losses from revenue collection inefficiencies in water and sanitation utility operators have been estimated at $500m.[21] Improving compliance rates requires reliable and high-quality service delivery, use of pre-paid meters, easy payment options and credible enforcement.

19 USAID. (2006). Micro-credit finance of water connections to new PDAM customers: Assessment study. *USAID Environmental Services Program*, DAI Project Number: 5300201.

20 Ashraf, Nava, Edward L. Glaeser, and Giacomo A. M. Ponzetto. 2016. "Infrastructure, Incentives, and Institutions." *American Economic Review* 106 (5): 77–82.

21 Banerjee, S., & Morella, E. (2011). Africa's water and sanitation infrastructure: Access, affordability and alternatives. World Bank.

- **Property taxes** offer an alternative funding source for recovering both capital investment and ongoing costs of water and sanitation infrastructure. As property values rise due to improved WASH services, these taxes become self-financing. For example, in 19th century Chicago, land prices more than doubled after gaining sewer access.[22] The resulting higher tax revenues can then be reinvested into network expansion. Property taxes can be easier to administer and may face less resistance than introducing new fees. They can also encourage last mile connections, as people want to connect if they are already paying for the service through property tax. However, property taxes require clear land demarcation and effective tax collection systems, which may be absent lower income cities. They also don't provide a visible link between the service and payments, limiting the utilities ability to use price to influence water consumption behaviour.

The final key to the financial sustainability of water and sanitation services is to **reduce operational costs**. Two main areas to target are overstaffing and system leakage:

- **Overstaffing**, particularly in public utilities, costs African providers up to $400 million annually.[23] Reforming recruitment and staff practices in cities like Dakar, Ouagadougou, and Kampala reduced staff per 1,000 connections by two-thirds without compromising service quality.[24] Limiting new hires and focusing on staff training can also improve efficiency.

- **System leakages**, whether from theft or technical issues, contribute significantly to operational costs. Addressing these leaks is crucial for reducing costs, conserving water, and improving service delivery in the face of climate change.

For policymakers, the key challenge is therefore not only mobilising funds for infrastructure construction, but ensuring that financing arrangements support the entire lifecycle of water and sanitation systems. Cities that align capital investment, household connection policies, and sustainable revenue streams are better able to expand access while maintaining reliable services.

22 Coury, M., Kitagawa, T., Shertzer, A., and Turner, M. (2024) " The Value of Piped Water and Sewers: Evidence from 19th Century Chicago" *The Review of Economics and Statistics 1–47.*

23 Banerjee, S. and Morella, E. (2011) "Africa's Water and Sanitation Infrastructure: Access, Affordability and Alternatives", World Bank.

24 Heymans, C., Eberhard, R., Ehrhardt, D., & Riley, S. (2016). Providing water to poor people in African cities effectively: Lessons from utility reforms. World Bank.

Behaviour and institutions ensure infrastructure delivers results

Water and sanitation infrastructure alone does not guarantee improved services. Even where networks and facilities exist, outcomes depend on how systems are used, regulated, and coordinated across institutions. Behavioural responses, regulatory frameworks, and the alignment of responsibilities across government agencies all influence whether investments translate into better health and environmental outcomes.

Household behaviour plays an important role in determining the effectiveness of sanitation systems. This behaviour is influenced by peoples understanding of the benefits of WASH, how to interact with the infrastructure. Behavioural interventions targeting households are an important compliment, helping to:

- **Raise awareness of the public benefits of WASH to increase adoption and usage.** Even beyond financial constraints, many households don't connect to the infrastructure as they don't see the link to broader benefits, for example lower disease incidence in the community.
- **Reduce harmful actions** such as open defecation or littering. In many cities, indiscriminate dumping of waste in open gutters or drains frequently leads to blockages of rudimentary sewer systems and is one of the reasons behind chronic flooding.
- **Incentivise sustainable usage of water and sanitation services.** This is particularly important in regions where climate change is increasing pressure on water systems and is creating a need to manage consumption in times of crisis.

Two key levers to achieve this include:

- **Information campaigns to raise awareness.** In Mozambique, informing households about flood risks reduced waste dumping in drains by 8–15%.[25] In South Africa, a randomised education campaign raised WASH payments by 25% for three months.[26] Successful education and awareness-raising initiatives have tended to be tailored towards residents' priorities, well-focused, and crucially, large-scale.
- **Leveraging cultural norms and social interactions.** Campaigns that appeal to shared values, like civic pride or religious principles, or that make use of social comparisons can shift behaviours. For example, In Singapore and South Korea, public health campaigns successfully

25 Leeffers, S. (2023) " It Will Rain: The Effect of Information on Flood Preparedness in Urban Mozambique"

26 Andrea Szabó, Gergely Ujhelyi, Reducing nonpayment for public utilities: Experimental evidence from South Africa, *Journal of Development Economics*, Volume 117, 2015, Pages 20-31

linked sanitation to national identity.[27] In Jordan, religious messages about the sanctity of water led to a 17% drop in water use among women and increased donations to conservation efforts.[28] In Cape Town's, a "City Water Map" displaying household usage data during the drought encouraged households to conserve water.[29]

Institutional coordination is equally important. Water and sanitation systems often involve multiple actors across national governments, municipalities, utilities, and private providers. When responsibilities are fragmented or poorly defined, infrastructure expansion, regulation, and service delivery can become difficult to coordinate. Clear mandates and effective regulatory frameworks are therefore essential to ensure services are delivered reliably and affordably. National water and sanitation policies can be a useful way to provide a high-level basis for legislation, strategic planning, and mapping of the roles of different institutions. Such initiatives can help to diagnose gaps in governance, clarify and often strengthen the role of sub-national governments, and promote inter-institutional coordination.

Finally, water and sanitation policies should be closely linked to broader urban policy decisions. Land tenure rules, housing regulations, and urban planning frameworks often determine whether households can legally connect to networks. In many cities, residents without formal land titles are excluded from utility connections. For example, in Kampala, formal documentation requirements have prevented many households in informal settlements from obtaining water connections.[30] Allowing alternative forms of documentation or working with local intermediaries can help overcome these barriers.

Land tenure rules, housing regulations, and urban planning frameworks often determine whether households can legally connect to networks.

Poor coordination can also lead to missed opportunities or unintended harms, while integrated planning can deliver cost-effective solutions. For instance, Indore's Slum Network Project significantly improved water quality citywide by upgrading wastewater systems - an intervention made effective through interlinked planning.[31]

Expanding infrastructure must therefore go hand in hand with strengthening institutions and addressing behavioural constraints. This includes changing behaviour, coordinating responsibilities across government agencies, and integrating water and sanitation planning with broader urban development policies. Cities that align infrastructure investments with effective institutions and user behaviour are more likely to achieve sustained improvements in water and sanitation services.

27 Black, M., & Fawcett, B. (2008). *The Last Taboo: Opening the Door on the Global Sanitation Crisis.* Earthscan.

28 Buccione, G. (2023). "Religious Messaging and Adaptation to WaterScarcity: Evidence from Jordan"

29 https://theconversation.com/cape-towns-map-of-water-usage-has-residents-seeingred 90188#:~:text=How%20the%20Map%20works,litres%20in%20the%20previous%20month. (accessed: 18 January 2026)

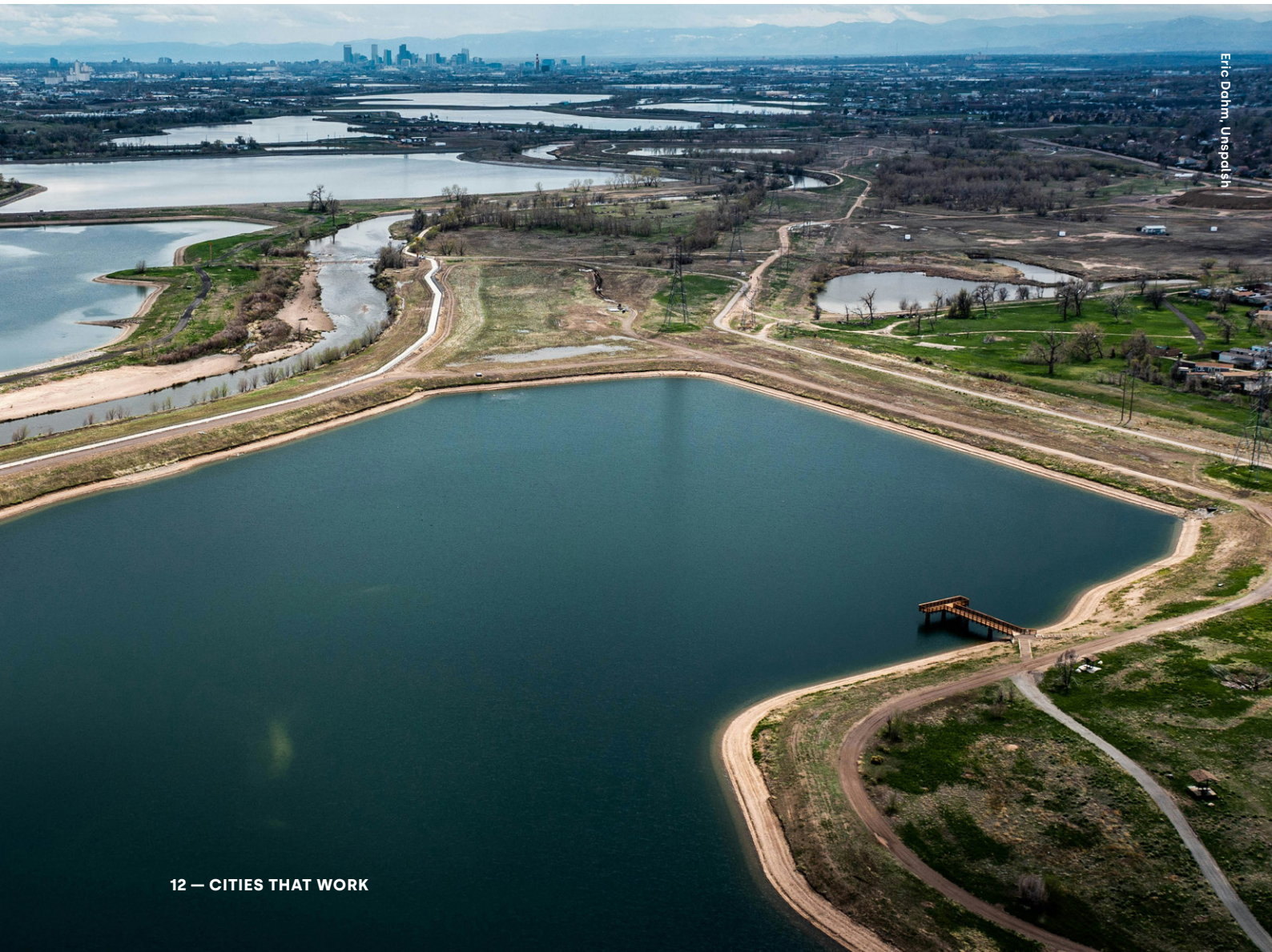
30 Baptista, I. (2013). *The Different Approaches to Faecal Sludge Management in Kampala, Uganda.* Environment and Urbanization.

31 World Bank. (2004). Scaling-up urban environmental sanitation: The case of the slum networking project in Indore. Washington DC: World Bank.

Conclusion

Water and sanitation systems are central to the functioning of modern cities. By reducing the spread of disease, improving environmental conditions, and supporting higher population densities, effective WASH systems enable cities to remain healthy, productive, and resilient as they grow. Yet expanding these services in rapidly urbanising contexts presents complex challenges. Infrastructure investments alone are rarely sufficient. Policymakers must consider how technology choices, service delivery models, financing arrangements, and institutional conditions interact to shape the performance of water and sanitation systems over time.

Cities that have successfully expanded access to safe and affordable WASH services have typically taken a pragmatic and coordinated approach. They match technologies to local conditions, maintain strong public oversight while allowing flexibility in service delivery, ensure that financing covers the full lifecycle of infrastructure, and support these investments with effective institutions and behavioural change. By aligning these elements, governments can extend reliable water and sanitation services to growing urban populations while maintaining financial sustainability and protecting public health.



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Further reading

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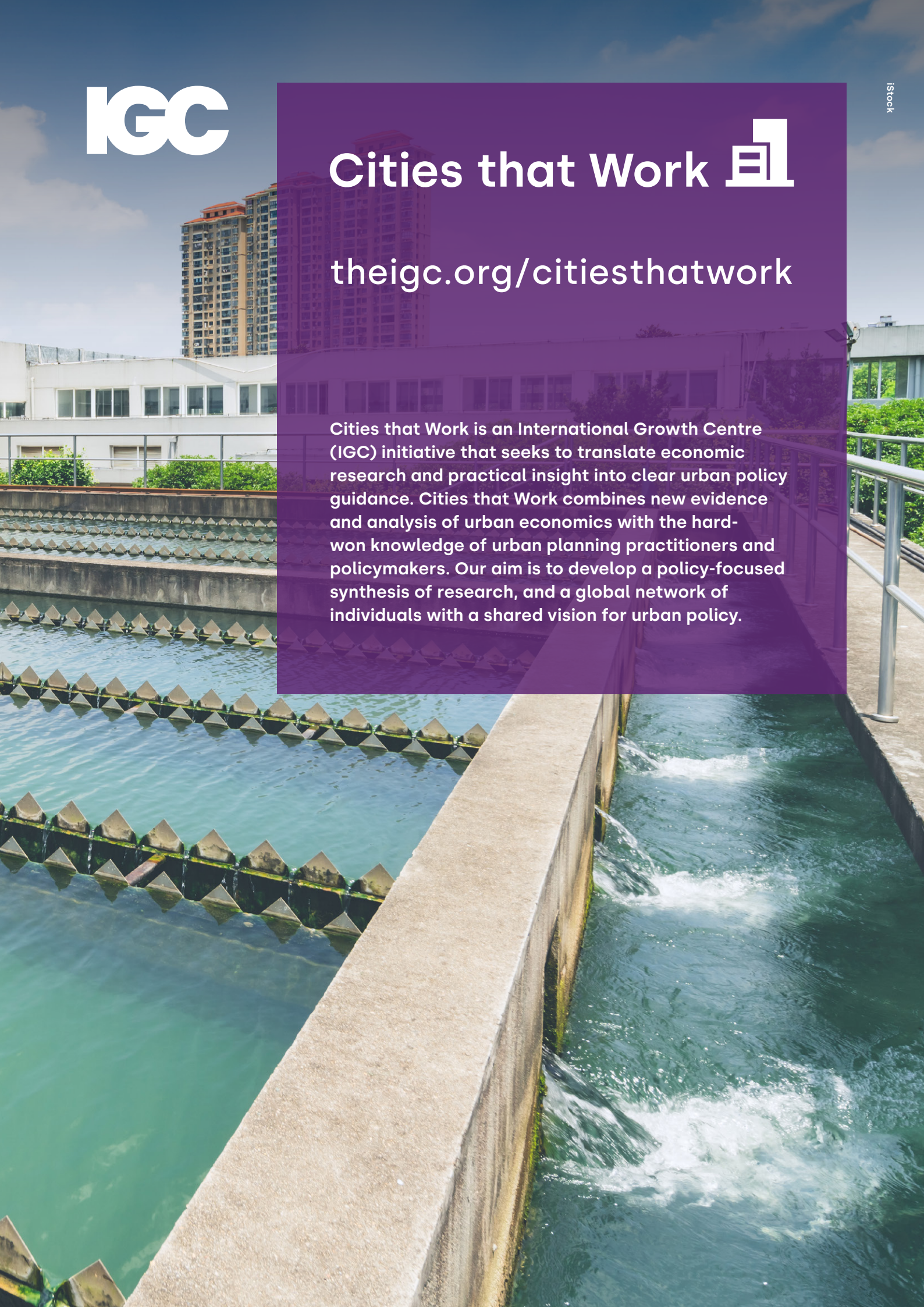

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