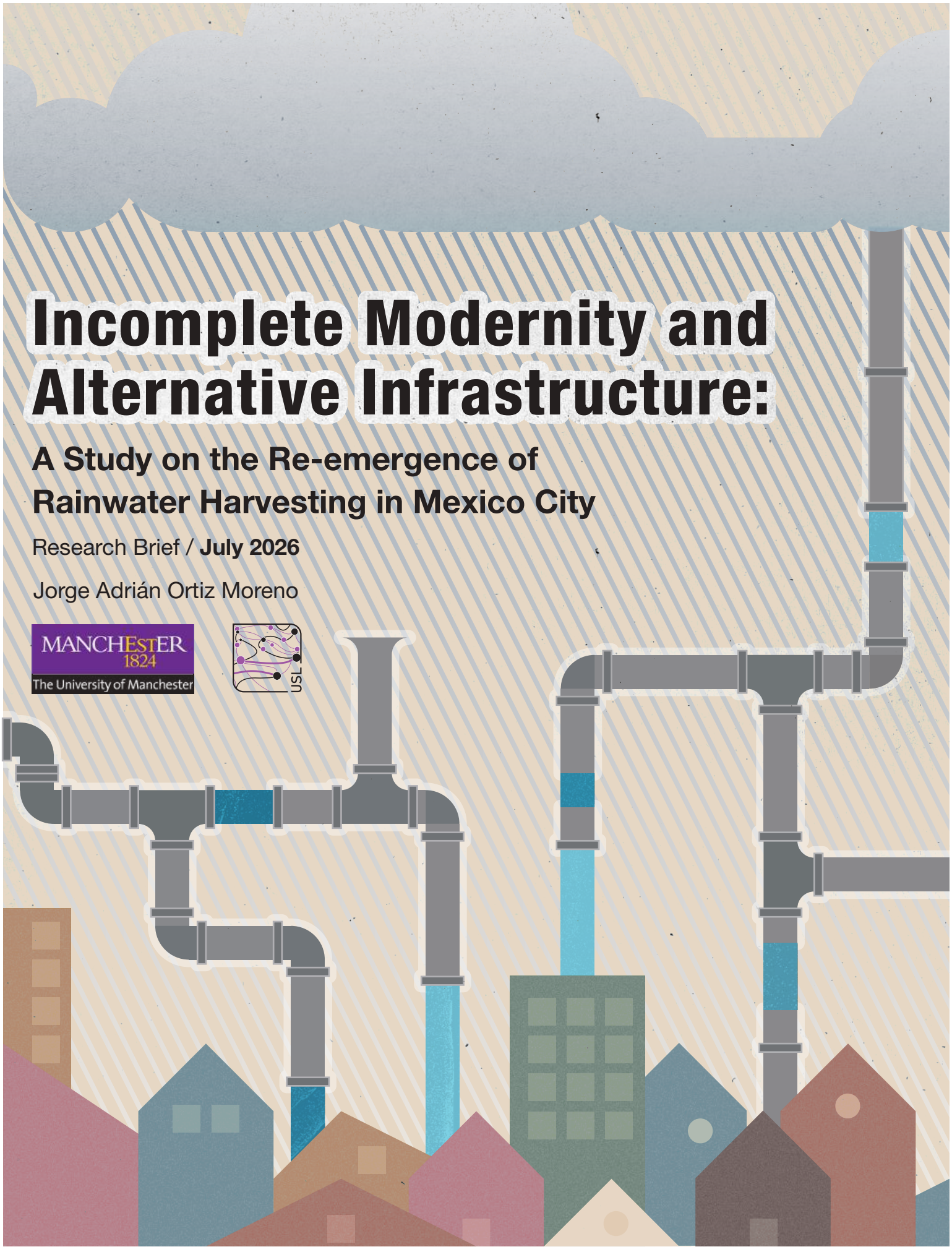
Incomplete Modernity and Alternative Infrastructure:

A Study on the Re-emergence of Rainwater Harvesting in Mexico City

Research Brief / **July 2026**

Jorge Adrián Ortiz Moreno



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Introduction

Today, our cities function through infrastructure networks that provide critical services such as drinking water, electricity, and transportation. However, this was not always the case. These extensive and complex technological systems were incorporated primarily during the second half of the 19th and the first half of the 20th centuries, beginning in Europe and North America and subsequently spreading around the world. Since then, the expansion of infrastructure systems has been commonly interpreted as the materialisation of progress. Therefore, having public services distributed through centrally managed networks became a fundamental characteristic of modern cities[1]. Yet, more than a century later, in vast regions of Latin America, the Caribbean, Africa, and South Asia, it has not been possible to universalise access to these infrastructures or the continuity of their services.

In many cities across the world, especially in regions historically oppressed by colonialism, what predominates is rather an incomplete modernity[2] characterised by unfinished, fragmented or chronically deteriorating infrastructure networks. Even drinking water services, recognised as a human right by the United Nations[3], remain limited, intermittent, and unaffordable for large populations[4]. This research explores how urban infrastructures are reconfigured by incorporating new practices and technologies in contexts where universal and reliable access to potable water for domestic use has not been achieved. In particular, the thesis analyses the case of Mexico City, where rainwater harvesting has re-emerged as an alternative infrastructure to address the supply gaps and deficits of the local water network.

Today, Mexico City is experiencing a differentiated crisis; while some neighbourhoods subsist on barely 20 litres of water per person per day, in affluent areas consumption can be virtually unlimited[5]. According to recent studies, around 30% of the population does not receive a continuous and quality supply[6], and nearly 150,000 residents live under conditions of severe water scarcity[7]. Most of the latter without access to the water network and relying on tanker truck deliveries, whether they are private or subsidised by government agencies.

In this context, over the last 20 years, rainwater harvesting facilities have been promoted as an alternative to expand access to water in places where supply is limited or restricted. Between 2019 and 2024, for example, the government of Mexico City implemented a social program (called *Cosecha de Lluvia*) through which more than 70,000 rainwater harvesting systems were installed in homes and schools located in areas with high levels of water scarcity and social marginalisation[8].

Based on primary and secondary research conducted between 2019 and 2024, the findings show that rainwater harvesting has been implemented primarily as an ameliorative measure to address the shortcomings of an infrastructure network that institutionally excludes marginalised populations. In particular, the design and implementation of innovative rainwater harvesting systems tailored to the needs of populations with insufficient access to water services has been key to making this infrastructure an institutionalised practice, supported by local policy and legislation.

While these advances are not enough to transform the power structures that produce and reproduce unequal access to water in Mexico City, rainwater harvesting has proven to strengthen the autonomy of people facing insufficient access to the service by reducing the time, effort and stress associated with obtaining water under materially disadvantaged conditions.

Methods

Based on the conditions described, the study was formulated to respond to the following research question:

How is alternative infrastructure incorporated into cities of the Global South where modern networks do not provide universal and reliable water supply services?

And the following specific questions:

Why has the Mexico City water network failed to provide universal and reliable domestic services, and how has this situation created an opportunity for alternative arrangements?

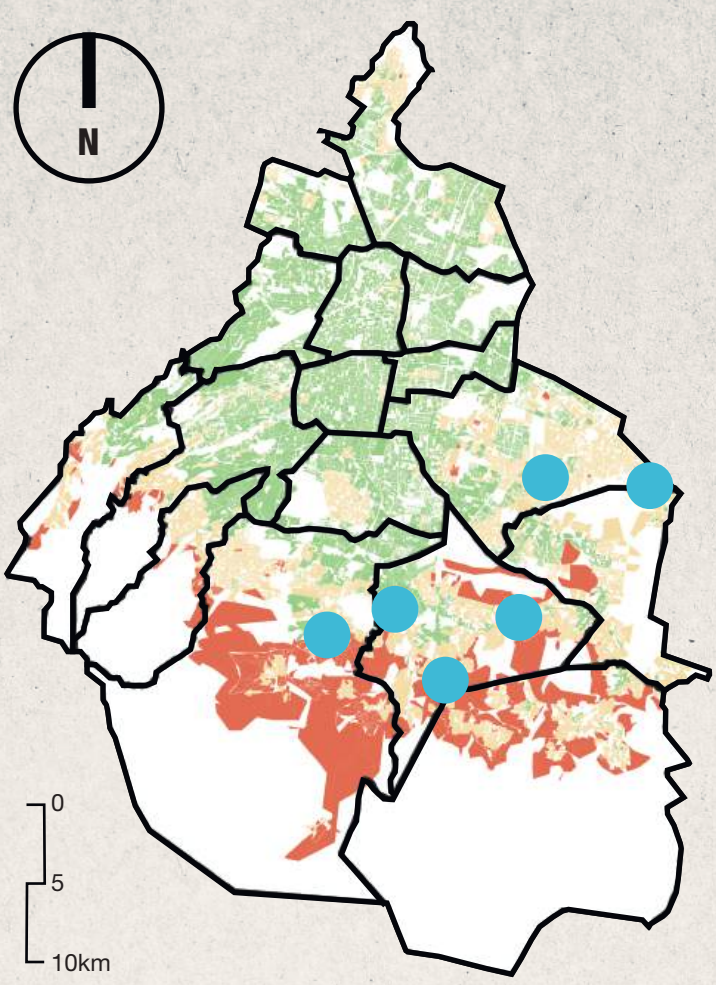
How have rainwater harvesting facilities emerged as an alternative configuration, and what socio-technical complexities arise in situating them as an additional water supply in Mexico City?

How is rainwater harvesting altering or reinforcing power relations behind the unequal distribution of water in Mexico City?

To answer these questions, primary research (interviews and observations) and secondary research (documentary research) were conducted from a qualitative perspective. A total of 65 participants were interviewed, from civil society, academia, government, and the private sector, as well as individuals who have adopted rainwater harvesting systems in their homes (see table below).

Additionally, six field visits were conducted in neighbourhoods where rainwater harvesting facilities have been implemented (see image below), and a documentary collection was compiled, including more than 80 media articles. The data were interpreted through thematic analysis, which involved fragmenting and classifying the texts obtained from transcribing the interviews to identify the main themes that respond to the research questions.

Hereunder, the different profiles of the people interviewed are shown, as well as the approximate locations of the field visits. In addition to the political divisions, the map shows an estimate of the degree of water precarity throughout Mexico City. Green areas are estimated to have low precarity, beige areas medium precarity, and red areas high precarity[7].



Number of interviews	Profile of the people interviewed[1]
6	Lecturers/Researchers
7	Government Officials
4	Staff from the Mexico City Rainwater Harvesting Program
1	Former Congressmen
1	Leaders of Professional Associations
3	Executives/Managers of NGOs
3	Supervisors of Rainwater Harvesting Installations
3	Managers of Rainwater Harvesting Design and Installation Companies
4	Heads of Urbanism Firms
1	Managers of Water Technology Corporations
5	Rainwater Harvesting Entrepreneurs
17	Beneficiaries of the Mexico City Rainwater Harvesting Programme
1	Beneficiaries of Municipal Rainwater Harvesting Programmes
3	Beneficiaries of Philanthropic Rainwater Harvesting Projects
8	Self-funded Rainwater Harvesting Adopters

As a result, the thesis comprises three empirical chapters that address each specific research question and synthesise the analysed data. These are described below.

[1] In addition, two pilot interviews were conducted involving a university professor and an architecture and design specialist.

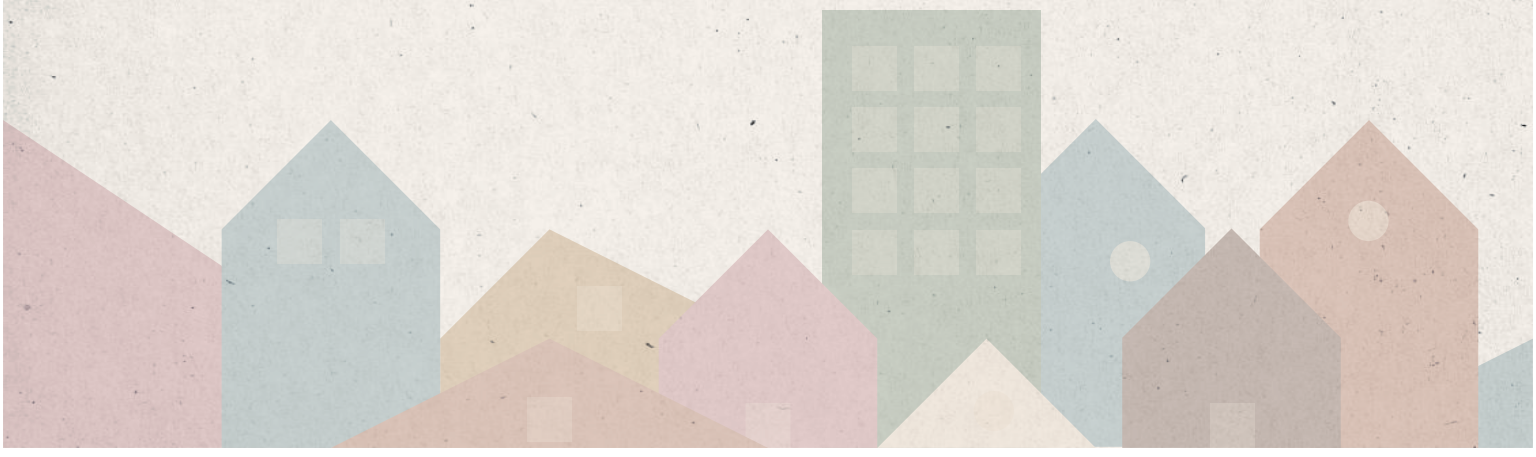
Growing challenges, historical inequalities: The roots of incomplete modernity in Mexico City

While a number of environmental, technical, administrative, and governance challenges limit the capacity of the Secretariat of Comprehensive Water Management (SEGIAGUA) to meet the city's demand, the fact that significant segments of the population lack adequate access to drinking water services reflects the stark structural inequalities that persist in the capital. Existing literature and the evidence gathered through this research confirm how populations from lower socioeconomic backgrounds experience the greatest water scarcity due to their institutional exclusion from the infrastructure network and its services.

Approximately half of the Mexico City metropolitan area has been informally urbanized[9] over the last century, creating a gap in access to public services, as government agencies are prohibited from building permanent infrastructure in informal settlements until they are regularised, which can take decades. This segregation has created both an economic opportunity for private agents and a secondary responsibility for the authorities, who assume the role of providing water where access to public infrastructure is limited or restricted.

As long as this incomplete modernity persists, relegating populations from lower socioeconomic backgrounds to the margins of infrastructure networks and services, alternatives that allow them to meet their extraordinary water demands will remain necessary. As suggested in the field of political ecology[10], understanding this incompleteness requires asking, 'Who gains and who pays?' for the current infrastructure systems, as well as 'Who benefits from and who suffers (and in what way) from them?'

Populations from higher socioeconomic backgrounds, who can access formal housing in areas with better access to state infrastructure, have greater influence and priority in the provision of public services, while large underserved populations are forced to cope with scarcity through alternative infrastructure and services, such as water trucks or rainwater harvesting systems.



A step in a different direction: The recent emergence of rainwater harvesting in Mexico City

In less than twenty years, rainwater harvesting has gone from a suggestion discussed in specialised forums to a practice promoted in the capital's legislation and policy. While this alternative has gained relevance as a result of the global environmental movement, this chapter explains how the push for rainwater harvesting in the capital has emerged from a set of narratives, actors, policies, regulations, initiatives, and technologies aimed at addressing the water crisis. In this context, the local development of rainwater harvesting models and components specifically designed to meet the demand of homes structurally excluded from networked water services stands out. In other words, this alternative is interpreted as an innovation that responds to a social need.

The launch of *Cosecha de Lluvia*, the city's rainwater harvesting programme created in 2019, followed a decade of technological experimentation and social learning, reflecting the consolidation of this alternative as infrastructure that enables the use of a resource that would otherwise be wasted. However, as with other decentralised technologies, the main challenge lies in ensuring its long-term adoption. In other words, guaranteeing that the installed systems will continue to function properly over time. Overall, the case study illustrates an emerging process of social and technological transition, which has already triggered a growing market of companies and professionals who design, produce, and install rainwater harvesting systems for various kinds of buildings.

Although rainwater harvesting is not the solution to the water crisis in Mexico City, it represents an alternative that can be implemented to move towards a more sustainable, resilient and equitable vision of water management in the city.

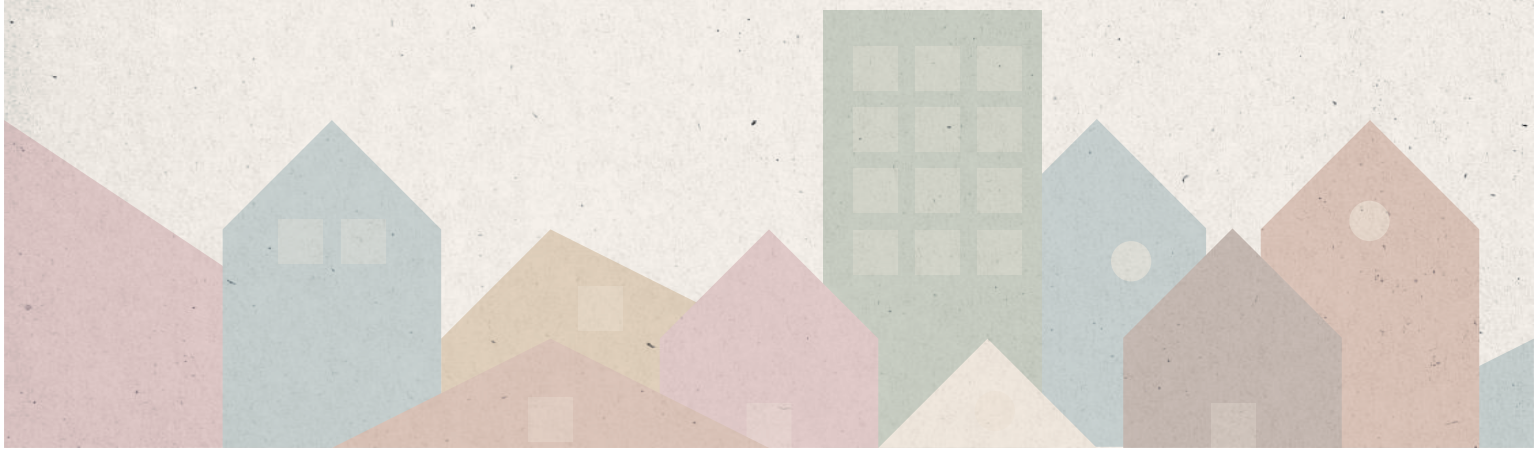
Is anything changing?: Adoption of rainwater harvesting and power relations

Considering the arguments presented in the previous chapters, one might assume that institutionalising the installation of rainwater harvesting systems would naturally contribute to reducing inequalities in access to water. However, this depends on how the initiatives are implemented.

The implementation of Cosecha de Lluvia has shown that populations experiencing the most severe water scarcity, mostly residents of informal settlements, are generally excluded from access to this alternative for the same reasons that restrict their access to the water network. If interventions promoting rainwater harvesting are designed incorporating discriminatory rationales, they can also contribute to reproducing inequalities in access to water. Conversely, when this infrastructure reaches the most marginalised households, it can become a valuable tool for mitigating water scarcity, at least during the rainy season. For users of this alternative, adopting a rainwater harvesting system can help strengthen their autonomy for a significant part of the year by reducing their dependence on authorities, intermediaries, and other actors who control water distribution in areas where access to the network is limited or restricted.

Regarding the city's water crisis, rainwater harvesting plays an ambivalent role. On the one hand, at an individual level, it provides a new water source that complements or partially replaces water deliveries by tanker trucks and/or the local water network, thus reducing the daily burden on those suffering from water scarcity. However, collectively, it also serves as a ameliorative measure that mitigates political tension between citizens and their authorities, contributing to some extent to postponing more substantial measures by the state. Those who benefit from the unequal distribution of water resources also benefit from the widespread installation of rainwater harvesting infrastructure, as it symbolically reduces the pressure on the water resources to which they have priority access.

Certainly, rainwater harvesting is an alternative that does not dismantle the structural inequalities that restrict access to water for populations in lower socioeconomic strata. However, it can help reduce the time and effort spent obtaining water under disadvantageous conditions.



Conclusions

The case of Mexico City illustrates how alternative infrastructures and services emerge where water networks do not provide universal and reliable services – that is, where the promise of urban modernity has not been fulfilled.

Today, rainwater harvesting is more than an experiment, and its consolidation as an additional infrastructure for water supply can be seen not only in the number of systems installed throughout the city but also in how this alternative has permeated the city's institutions. While it does not solve the water crisis, it is a critical measure for improving the lives of those who face water scarcity daily. It also represents a small step in the transition towards new water management models aligned with the social and ecological challenges of this century.

Overall, this thesis examined a process of technological and social change from which lessons can be drawn to help close gaps in access to essential infrastructure and services, both in Mexico City and in other cities and regions with similar water challenges.

Download the full thesis here.

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