



## Let the water do the work: Climate adaptation policies and individual welfare

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- This brief discusses the findings of a study on the impacts of a policy delivering one million cisterns to rural households in Brazil, improving access to safe water. The study tracks the economic and health outcomes of 600,000 individuals over 14 years.
- The policy significantly reduced hospitalisations of adults by 10%, particularly for waterborne diseases.
- There is a 12% reduction in conditional cash transfer (CCT) programme dependency ten years after the programme.
- There is a 23% increase in formal employment, with participants moving into higher-paying jobs, and an 8% increase in formal labour income, demonstrating lasting income gains.

Before the programme, 46% of families spent over an hour daily fetching water. Cisterns freed up time, enabling individuals to access jobs that required longer commutes. Improved water quality also reduced illness-related absences from work.

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## Policy motivation

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Adapting to climate change is one of the primary challenges facing society in this century. In turn, water stress is one of the most pressing threats requiring urgent adaptation measures. Over two billion people worldwide lack access to safe drinking water and changing climate conditions are expected to exacerbate this issue, according to the World Health Organization (WHO). Families affected by water scarcity need to travel long distances, often daily, to collect water that is frequently unsafe for consumption. This significant time burden also exposes them to health risks associated with consuming potentially contaminated water.

These challenges may present a major barrier to the economic prosperity of affected families. First, the daily requirement to collect water reduces the time families could devote to productive activities, such as working in the labour market or engaging in home-based production. In addition, the uncertainties associated with unstable access to water may limit individuals' ability to take on jobs that demand consistent time commitments, particularly when attractive employment opportunities are far from home and require long commutes.

Second, limited and unsafe water consumption can lead to adverse health consequences, increasing fatigue and the incidence of illness, both of which harm individual productivity. Thus, in addition to posing a major health issue, the lack of stable access to safe water poses a challenge to the economic welfare of families.

## Policy overview

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The Brazilian federal government launched the First Water Cistern (FWC) programme in 2003 to improve access to safe drinking water in the country's semi-arid region. Since its inception, the programme has built nearly one million cisterns for rural households. The Brazilian semi-arid region is one of the poorest in the country, home to 28 million people whose main economic activities include subsistence agriculture and livestock farming. This predominantly rural area has historically suffered from recurring droughts and is considered one of the six biomes most vulnerable to climate change globally.

Programme participants receive a cistern installed next to their homes, designed to capture rainwater through a gutter system or be filled by water trucks. Each cistern has a capacity sufficient to meet the drinking and cooking needs of a family of five throughout the dry season, which can last several months. Additionally, participants receive basic maintenance training to ensure the cleanliness and safety of the stored water.

**FIGURE 1: Cistern in the semi-arid region**



*Image credit: Brazilian Ministry of Social Development and Assistance, Family and Fight against Hunger (MSD)*

The policy is relatively low-cost, with each cistern costing approximately US 790. Each cistern can be constructed in about two days and was immediately filled by water trucks upon completion, highlighting the scalable potential of this technology. Between 2003 and 2017, nearly 880,000 cisterns were built in the region.

## Research overview

The study gathers identified data on all programme participants. By linking participant data with administrative records, it was possible to identify all individuals residing in each participating household. The study employs a staggered difference-in-differences research design to compare the socioeconomic outcomes of adults in households treated earlier with those in later-treated households over 14 years.

The study exploits individual-level data on hospital admissions, Bolsa Família (Brazil's primary conditional cash transfer programme) paychecks, and formal employment to track individual outcomes. The sample consists of 600,000 individuals living in rural areas of the Brazilian semi-arid region.

## Key findings

Research findings show that the cistern enhanced participants' overall wellbeing by improving health, income, and employment outcomes.

### Cisterns improved overall health

Participants who received a cistern earlier observed a decrease of about 10% relative to the baseline in the probability of being hospitalised. The decrease

was driven by problems related to poor water quality, such as infectious and digestive system diseases. There were no significant effects on unrelated causes (e.g., accidents), confirming that the health benefits stem from improved water access.

## Cisterns reduced dependency on social programs

Comparing early participants to late participants reveals a decrease of approximately 12% in the probability of being enrolled in Bolsa Família, Brazil's primary conditional cash transfer (CCT) programme. Since eligibility for the programme is determined by income thresholds, this finding is interpreted as evidence of poverty reduction.

**TABLE 1: Summary of the main results on the impact of cisterns**

Outcome	Impact	Measure	Mechanism
Health	10% decrease in hospitalisation	Probability of hospitalisation on the Public Health System	Results driven by problems associated with poor water consumption.
Poverty	12% decrease in CCT enrolment	Probability of being enrolled in the Bolsa Família program	General improvement in income, driven by increased employment and higher wages.
Employment	23% increase in employment	Probability of having formal employment	Time savings induced by the cisterns, combined with reduced absenteeism due to improved health, contributed to better labour market outcomes.

## Cisterns increased employment and income

The results show that participants experienced a 23% increase in the probability of having a formal job relative to the baseline average. Additionally, wages increased for those already employed, suggesting that cisterns help individuals access both more and better job opportunities. The effects on employment are driven by jobs requiring longer commutes, often outside the municipality of residence. These effects are particularly strong for time-constrained families,

such as those with children, and individuals with more earning potential, men, and more educated. These findings are consistent with the role of cisterns in reducing the time spent on long daily journeys to fetch water, thereby enabling greater labour market participation.

## Policy implications

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The findings highlight the transformative role of water access in improving economic outcomes and reducing poverty. Expanding similar programmes could yield significant benefits in other water-scarce regions.

- **Poverty reduction and labour market:** Cisterns increase formal employment and wages, reducing reliance on social assistance programs like Bolsa Família. Integrating infrastructure investments with social policies can enhance long-term impacts.
- **Time allocation and economic integration:** The strongest employment effects are seen in time-constrained households. Cisterns free up time for workers to access better jobs outside their municipalities. Complementary transportation investments could further enhance labour mobility.
- **Climate resilience:** Given the region's climate vulnerability, scaling up rainwater harvesting programs could increase resilience. Cisterns are a cost-effective rural development tool with a relatively low cost (~USD 790 per unit).

The study emphasises the multidimensional benefits of water infrastructure beyond health, supporting its expansion as a sustainable poverty reduction strategy.