Influence of Community Attitudes and Service Provision on Water Resource Management: A Social-Ecological Analysis

December 2024 | Lebanon

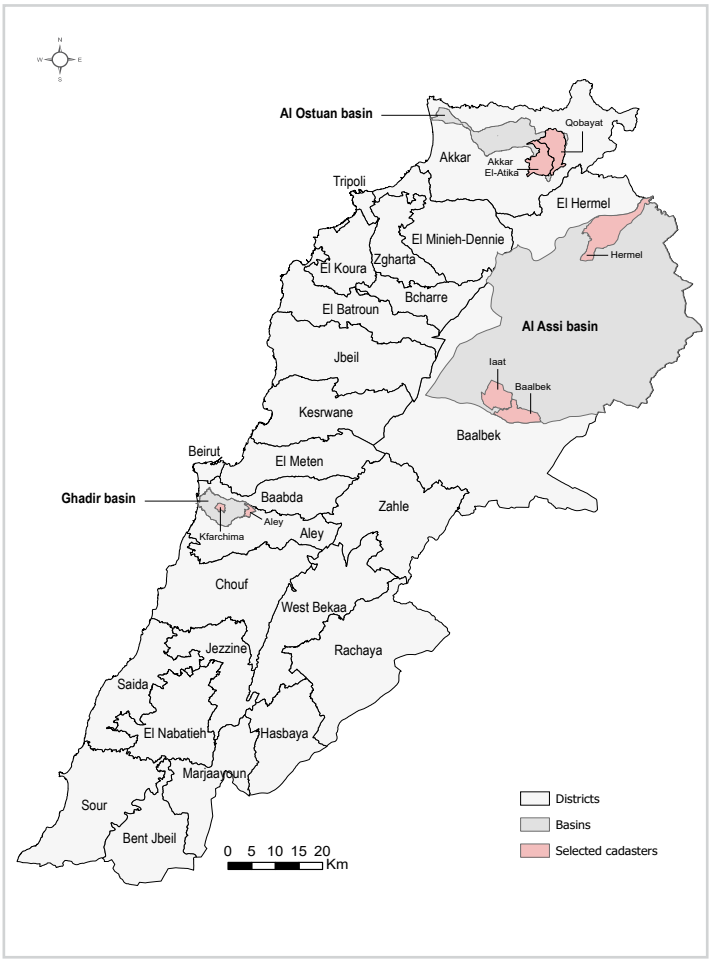
Lebanon faces its fifth year of financial turmoil, with its currency losing over 95% of its value since 2019. Following the official devaluation in February 2023, the exchange rate has shown stability, but the broader economic crisis persists. Nearly 2.8 million people face challenges in accessing safe and sufficient water, a situation worsened by growing poverty and limited access to basic services. Despite investments of over 4 billion USD in the water and wastewater sectors over the past 30 years, the country still grapples with chronic water supply shortages and drought.[1]

The 2022 roadmap for water sector recovery, developed by the Ministry of Energy and Water (MoEW)[2], emphasizes urgent reforms to enhance subscription rates, improve revenue collection, and strengthen institutional capacities. Simultaneously, the EU's Action Plan[3] stresses the importance of public awareness and engagement in water management. However, while institutional capacities, including infrastructure, policies, and human resources, are critical to water governance, perceptions and attitudes of communities remain vital for the acceptance, success, and sustainability of these interventions.

This assessment focuses on three river basins in Lebanon - Al-Assi, Ghadir, and Al-Ostuan - which were chosen due to their diverse geographical, socio-economic, and infrastructural characteristics. These basins face unique challenges in water management, including inconsistent supply, unequal distribution, and varying institutional capacities. The study examines how the interplay between institutional management, community perceptions, environmental behavior and water reliability and equity affects water governance outcomes in these regions. The findings can offer valuable guidance for improving water governance and fostering greater community trust in water services.

IMPACT is a collaborating partner in the HawkaMaa-EU Project*, which supports and enhances water governance and public water and wastewater services for both host and refugee communities in Lebanon.

Map 1. Research Coverage Area:



Key Messages

- Trust in public institutions and fairness of water distribution plays an important role in shaping community behaviours. Higher levels of trust are associated with increased participation in sustainable practices, such as water conservation and pollution reduction.
- Reliable and equitable water distribution significantly increases community trust in institutions, with improvements in water quality, supply consistency, and equitable access linked to higher trust levels.
- Perceptions of unfair water distribution and institutional inefficiency were commonly reported, with concerns about inequity leading to lower trust in institutions and reduced engagement in environmental behaviours.
- Enhancements in water reliability alleviate operational pressures on water management by reducing service disruptions and maintenance challenges.

* HawkaMaa-EU was the WASH assistance to support water governance and public water and wastewater services in Lebanon for host and refugee communities implemented by 5 agencies: ACTED, WW-GVC, SI (Solidarites Internationales), ACF (Action Against Hunger) and LebRelief and supported by Impact, Lewap, CNRS, LCPS, Nahnoo, and the NDU.

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Methodology Overview

The assessment methodology was built upon the Social-Ecological System (SES) model that explores the interactions between water resources and human societies. It aimed to assess the extent to which communities' attitudes, institutional capacities and service provision influence water management, and to highlight the interconnectedness of governance structures, service availability and household perceptions to inform key stakeholders' targeted advocacy initiatives.

The study employed a mixed-methods approach, integrating both quantitative and qualitative data collection methods between August and September 2024. The primary population of interest consisted of Lebanese residents living within the three river basins: Al-Assi, Al-Ostuan, and Ghadir.

A total of 550 structured face-to-face surveys were conducted across selected municipalities within the three river basins. These areas were chosen for their high population density, diverse land usage (urban, commercial, industrial, and agricultural), and varied levels of water service coverage. The surveys provided a quantitative foundation for understanding household-level attitudes, perceptions, and behaviours related to water access and management.

In addition, 20 key informant interviews were conducted, 8 of which were held in Al Ostuan, 5 in Ghadir and 7 in Al Assi. Key informants included public servants at a municipality (n=11), public servants at a Water Establishment (n=2), and members of a community (n=7) that worked in areas related to water management.

The study also incorporated secondary data sources, including river basin datasets and community perception surveys focusing on environmental behaviours and institutional trust. These data were integrated into a Structural Equation Modelling (SEM) approach to explore the relationships between key variables. The SEM was refined to assess interactions within the basins, providing insights into the connections between water reliability and equity, management practices, community trust, and environmental behaviours. The project's limitations are detailed on the last page.

Introduction

This report presents findings from a Structural Equation Model (SEM) designed to examine the relationships between four latent variables central to water resource governance:

- **Environmental Behaviour (EVB):** Reflects community actions supporting sustainability, environmental knowledge and conservation motives.
- **Community Trust (CMT):** Represents confidence in institutions managing water resources and perceptions of fairness in water services.
- **Management (MNG):** Captures governance quality, operational efficiency, and institutional capacity.
- **Water Reliability and Equity (WRE):** Reflects water resources, quality, and coverage of demand.

By modelling these variables, the SEM approach offers a structured evaluation of how community perceptions, institutional capacities, and service delivery interconnect to shape water management outcomes. The analysis explores how the availability and reliability of services influence household behaviours and perceptions, validating and refining hypotheses about the interplay between social and environmental systems.

Through this methodology, this situation overview examines how social factors - such as trust in institutions and individual behaviours - are linked to ecological behaviours, including resource conservation and environmental protection. Hypotheses about these interrelationships were tested against real data, including household-level survey and secondary data sources, to improve our understanding of how social and ecological systems function together.

Through the SEM, we aimed to understand how social factors (such as people's behaviour or trust in institutions) were linked to ecological behaviours (like environmental protection or resource use). We made hypotheses about how these factors might influence each other and tested if these predictions were correct based on real data. This process helped us improve and adjust our understanding of how social and ecological systems worked, allowing us to refine ideas and theories in both social and environmental research.

The SEM model identified four primary relationships that form the basis of this report:

- **Water Management directly influences Community Trust.**
- **Water Reliability and Equity directly influence Water Management.**
- **Water Reliability and Equity directly influence Community Trust.**
- **Community Trust is positively correlated with Environmental Behaviour.**

The report is structured into three sections:

1. The first section examines the impact of water management on community trust.
2. The second section explores the relationship between community trust and environmental behaviours.
3. The third section investigates the influence of water reliability and equity on water management.

This structure allows for a comprehensive analysis of the complex interactions between water management practices, community perceptions, and environmental behaviours, offering insights for improving water resource governance.

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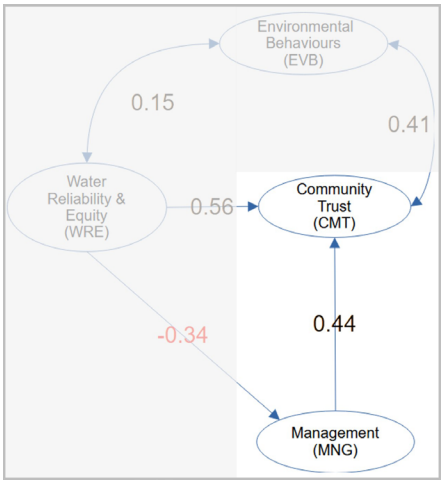
Impact of water management on community trust

Water management in Lebanon impacts community trust, with institutional efficiency, fairness, and responsiveness playing central roles in this dynamic. Regional water institutions, responsible for regulatory oversight, infrastructure maintenance, and operational coordination, face significant challenges in ensuring equitable water access. These challenges often influence public perceptions and, consequently, the level of trust communities place in these institutions. This section explores the direct influence of water management on community trust, as established in the SEM, while integrating insights from household surveys and key informant interviews.

Diagram 1. Relationship between MNG and CMT, as identified in the SEM model



The SEM model demonstrates that **water management (MNG) has a statistically significant positive effect on community trust (CMT),** with a path coefficient of 0.44 ($p < 0.05$). This suggests that improvements in management practices—measured through operational efficiency, staff capacity, and robust regulatory processes—lead to moderate increases in public trust. Trust, in this context, is driven by perceptions of the fairness of water fees, institutional competence in resolving water issues, and satisfaction with water services.

The relationship between management and community trust can be further explored through findings from the quantitative assessment. While the household-level survey reflects perceptions rather than direct evaluations of management practices, these perceptions are strongly linked to institutional trust and satisfaction with water services.

- Among households that perceived public institutions as capable of addressing water-related challenges (29%, n=150), 80% believed their community received equitable amounts and high-quality of water.
- In contrast, among households with negative perceptions of institutional capacity (50%, n=262), only 57% believed in equitable water distribution.

A similar pattern emerged concerning perceptions of subscription fees. Households with positive evaluations of institutional capacity (29%, n=150), were significantly more likely to view subscription fees as adequate (67% rating as adequate or very adequate), compared to just 8% among households with negative perceptions (50%, n=262).

These findings suggest that **trust in water management is closely tied to perceptions of institutional effectiveness and fairness.** Communities that perceive management positively tend to report higher levels of trust, which may encourage greater satisfaction with and cooperation around water services.

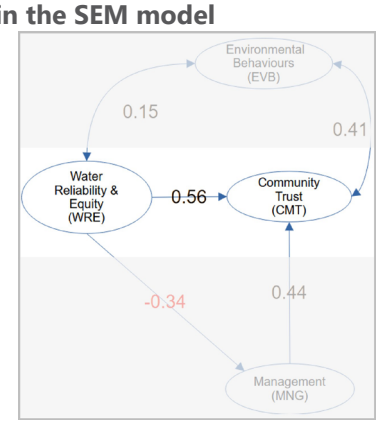
Key informant interviews provided additional insights into this relationship. Across all river basins, 10 out of 20 key informants highlighted community perceptions of unfair water distribution, while 11 informants, particularly from Al Ostuan and Al Assi, reported perceptions of water insufficiency. These concerns were often linked to negative views of water management. Challenges included shortages of essential equipment (16 mentions), insufficient human resources (9 mentions), lack of fuel and electricity to operate water stations (14 mentions), and perceptions of ineffective administrative management (9 mentions). These challenges may contribute to broader public perceptions of inefficiency or inequity in service provision.

The relationship between management and community trust appears to be reciprocal. While effective management can build trust, negative perceptions of institutional performance can erode it, potentially leading to reduced public cooperation. This dynamic highlights the importance of addressing management-related challenges and improving public perceptions of fairness and competence in water governance.

Impact of water equity on community trust

The SEM indicated also that the **community trust (CMT) is positively influenced (0.56) by water reliability and equity (WRE)**.

Diagram 2. Relationship between WRE and CMT, as identified in the SEM model



This relationship suggests that improvements in the equitable distribution and reliability of water services are directly associated with increased public trust in the institutions responsible for managing these resources.

When water systems are perceived as consistent and equally accessible, communities are more likely to view managing institutions as trustworthy and capable.

Household survey data further illustrate this relationship. As presented in the table below, trust levels were significantly higher among households satisfied with the frequency and reliability of their water supply compared to those dissatisfied.

Table 1. Households (HHs) level of trust in public institutions addressing water-related issues, by satisfaction with water supply frequency and quality

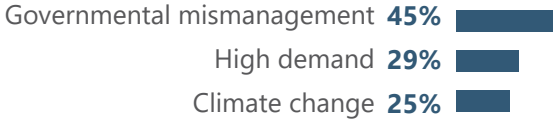
Level of trust in public institutions solving water related issues	HHs satisfied with water frequency and supply n=139	HHs not satisied with water frequency and supply n=336
Not trustworthy	20%	63%
Trustworthy	61%	17%
Level of trust in public institutions solving water related issues	**HHs rating quality of their water as high n=202**	**HHs rating quality of their water as poor n=108**
Not trustworthy	23%	81%
Trustworthy	54%	5%

The results suggest that visible improvements in service quality, such as consistent water supply and good water quality, act as significant drivers of institutional trust.

The connection between water equity, management, and trust is further reflected in household-reported reasons for insufficient water supply and perceived unfair distribution.

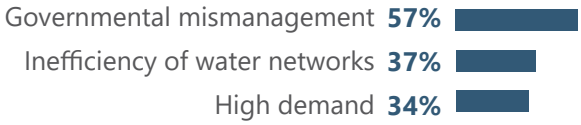
One-third (33%) of households reported experiencing insufficient water supply to meet their needs at least once a month, and 49% experiencing it occasionally. Among the top reasons cited for this insufficiency was perceived governmental mismanagement, reflecting concerns over institutional inefficiencies in water resource management.

Top 3 reported reasons behind water insufficiency, among HHs reporting insufficient water supply (n=430):



Perceptions of fairness in water distribution were similarly limited, with 29% of households stating it was unlikely or very unlikely that everyone in their community received equal amounts and quality of water. Again, one of the most frequently cited reasons for this was perceived governmental mismanagement.

Top 3 reported reasons for perceived unfair distribution of water supply among households indicating inequity (n=161):



The findings show that improvements in water reliability and equity are closely associated with higher levels of community trust. Consistent water supply and good water quality are perceived as indicators of institutional competence and fairness. However, persistent concerns about insufficient water supply and unfair distribution, often attributed to governmental mismanagement, highlight the importance of addressing systemic inefficiencies to foster trust and improve water governance outcomes.

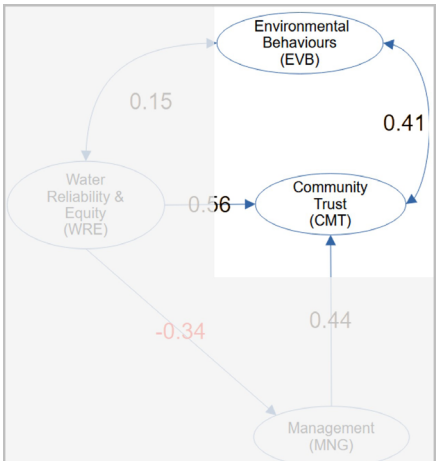
Relation between community trust and environmental behaviours

Community trust and environmental behaviors, including engagement in sustainability practices such as water conservation and waste management, are closely linked. Confidence in institutions responsible for managing critical resources, such as water, increases when communities are willing to adopt environmentally responsible behaviors. This relationship is based on the perception that fair and reliable management fosters a shared sense of accountability and reinforces the belief that individual actions contribute to collective environmental goals. Household decisions - such as saving water or managing waste - are influenced not only by socioeconomic and cultural contexts but also by perceptions of institutional effectiveness and fairness.

Communities with higher trust levels are more likely to align with environmental policies, participate in community-based environmental actions, and adhere to guidelines promoting sustainability. Conversely, low trust often mirror scepticism about institutional priorities, undermining individual motivation to adopt environmental behaviors.

The SEM analysis confirms a moderate positive correlation between community trust (CMT) and environmental behaviour (EVB), with a path coefficient of 0.41 ($p < 0.05$).

Diagram 3. Relationship between EVB and CMT, as identified in the SEM model



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This indicates that higher levels of trust in institutions are associated with increased engagement in environmentally responsible actions, such as water conservation and pollution mitigation.

Household survey data further illustrate this relationship. Trust in institutional fairness was closely linked to specific environmental behaviours. For example, households perceiving equitable water distribution were more likely to take actions aimed at combating water pollution.

Household methods to combat water pollution, by perceptions of equitable water distribution:

Methods to Combat Water Pollution	HHs reporting lack of trust in equitable water distribution n=146	HHs reporting trust in equitable water distribution n=332
Nothing	45%	23%
Filters	21%	41%
Water testing	14%	29%

Households that trusted public institutions were also more likely to demonstrate higher awareness of environmental challenges. For instance, 91% of 153 households expressing trust in public institutions acknowledged the impact of climate change within their river basins, compared to 77% of 262 households with low trust levels.

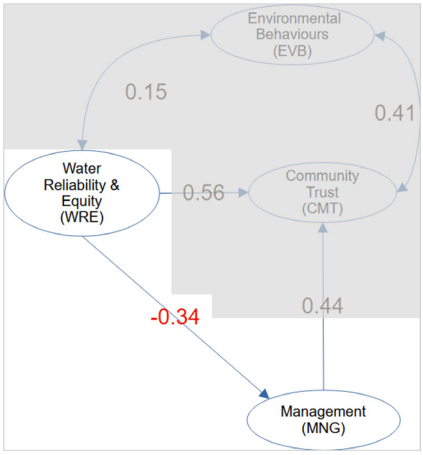
However, mistrust and perceived mismanagement can act as barriers to engagement. Twenty-eight per-cent (28%) of households identified governmental mismanagement as the primary cause of water pollution, and 70% of households reported perceiving no local efforts to address water pollution. Such perceptions may reduce the motivation to engage in sustainable practices, especially when communities perceive a lack of governmental prioritization of such practices.

The findings underscore the mutual influence between community trust and environmentally responsible behaviours. Trust in institutions is associated with greater engagement in sustainable practices, while distrust or perceptions of mismanagement appear to reduce the likelihood of such engagement. These dynamics highlight the connection between institutional performance and individual motivation for environmental action.

Impact of water reliability and equity on institutional water management

Water reliability and equity (WRE) are components of water resource management, encompassing in the model factors such as water use (demand and deficit/ excess), water quality, and infrastructure performance (e.g., wastewater services and water supply coverage). These aspects directly influence institutional management (MNG), which includes operational maintenance, regulatory processes, and staff capacity. The SEM model identifies a significant negative relationship between WRE and MNG, with a path coefficient of -0.34 ($p < 0.05$). This finding aligns with earlier results, showing how improvements in WRE not only foster community trust but also reduce operational pressures on institutional management.

Diagram 4. Relationship between WRE and MNG, as identified in the SEM model



The analysis indicates that as water reliability and equity improve, the demands on management decrease.

For example, improvements in water use variables, such as balancing demand with supply or addressing deficits, may reduce disruptions requiring management intervention. Similarly, better infrastructure performance - such as improved wastewater services or expanded water supply coverage - could decrease operational challenges by ensuring more consistent service delivery. Water quality improvements also contribute by reducing issues that require frequent maintenance. These dynamics suggest that strengthened WRE variables create conditions that reduce the intensity of management demands.

The negative correlation does not imply a reduced need for management but rather suggests that the scope and focus of management activities may shift in contexts with improved water systems. With fewer immediate challenges to address, resources could potentially be reallocated toward maintaining or further improving system performance. However, the SEM model captures the direct relationship between WRE and MNG and does not provide insights into broader changes in resource allocation or management strategies.

Conclusions

The findings of this study highlight the interconnected relationships between water reliability and equity (WRE), institutional management (MNG), community trust (CMT), and environmental behaviour (EVB) in assessed river basins. The Structural Equation Model (SEM) analysis provides evidence of how these factors influence each other, offering insights into key dynamics affecting water systems.

Water reliability and equity positively influence community trust, with consistent supply, equitable distribution, and higher water quality being significant drivers of public confidence in institutions. At the same time, WRE is

associated with reduced operational demand on management, suggesting that improved water systems can alleviate some pressures on institutional capacities. Community trust, in turn, has a positive correlation with environmental behaviours, with higher trust levels linked to greater engagement in practices such as water conservation and pollution mitigation. Conversely, perceptions of mismanagement or inequities act as barriers to both trust and environmental action.

These relationships highlight areas for further consideration in efforts to improve water resource management in Lebanon. Based on the findings, several evidence-informed summary points were developed, that could support promoting positive environmental behaviours and improving perceptions of water governance in Lebanon, including:

- **Transparent Communication on Water Distribution:** Clear and open communication to citizens about water distribution processes could improve perceptions of reliability and equity (WRE) while fostering stronger trust within the community (CMT).
- **Establishing Community Feedback Mechanisms:** Developing platforms within water establishments, municipalities, and response actors for communities to report issues and share feedback could enhance perceptions of fairness and responsiveness, which are essential for building trust (CMT).
- **Promoting individual action:** Raising awareness about water-saving practices and efficient resource use could help reduce operational pressures, contributing to improved water reliability and reduced management intensity (MNG).

Limitations

- Data collection was conducted prior to the escalation of the war in mid-September 2024. This timing may have influenced certain research areas, particularly those related to household expenditure, water usage, coping mechanisms, and issues with water quality and supply. Additionally, the conflict may have impacted infrastructure and introduced new variables, such as the presence of internally displaced persons, that were not captured in the study.
- Access to the areas of Baalbek and Hermel was restricted by local and non state actors and was stopped due to the escalation. This limitation reduced the overall sample size and may have affected the geographic representativeness of the findings.
- The model would have benefited from a larger sample size, which could have enabled analysis at the river basin level. A larger and more diverse dataset would improve representativeness and provide more accurate estimates of variance across different basins.

Endnotes

[1] Climate change and environmental program (2020). AUB Lebanon. G. Gharios and N. Farajalla. Access here.

[2] Ministry of Energy and Water (MoEW) 2022. Roadmap for Water Sector Recovery. Access here.

[2] Action Document for EU Response to the Syrian Crisis: support to Wastewater and Water Public Services to Syrian refugees and host communities in Lebanon. Access here.

The following secondary data sources were used in the structural equation modeling: Al- Assi River Basin Management Plan (Published by ACTED), Al- Ostuan River Basin Management Plan (Published by ACTED), Ghadir River Basin Management Plan (Published by ACTED), National Water Sector Strategy 2020-2035 (Report published by Lebanese Ministry of Energy and Water in 2020), Community Perception Research (CPR) Studies.

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ABOUT IMPACT

IMPACT Initiatives is a Geneva based think-and-do-tank, created in 2010. IMPACT is a member of the ACTED Group.

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