

ADDRESSING CLIMATE VULNERABILITY IN RURAL KRI

**A Policy Perspective to Prevent
Displacement and Strengthen
Community Resilience**

2026



ADDRESSING CLIMATE VULNERABILITY IN RURAL KRI

**A Policy Perspective to Prevent
Displacement and Strengthen Community
Resilience**

Hasar Organization
2026



Publisher: elbarlament e.V., 2026

Elbestraße 28/29, 12045 Berlin, Germany

Lead Author: Hasar Organization

Editor: Achref Chibani /Parez Dzay

Design: Magma Studio – Mehdi Jeliti

Illustrations and Cover Design: Magma Studio – Mehdi Jeliti

The views presented in this publication do not necessarily reflect the views or positions of elbarlament nor the funding body.

This research paper was prepared within the framework of elbarlament’s project “Women Taking the Lead.”

The Women Taking the Lead programme is implemented by elbarlament as part of the **SPACE Programme**, funded by the German Government and supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

About elbarlament:

Elbarlament is a peacebuilding and democracy support organisation, with a strong focus on empowering women and youth. Its work is focussed on three thematic areas: Inclusive Political Participation; Women, Peace and Security (WPS); and the Gender – Climate – Security nexus. Through its projects elbarlament supports public institutions and civil society actors in designing and implementing initiatives that promote peaceful coexistence, foster democratic norms and practices, and develop integrated solutions to address the impacts of climate change.

For more information, please visit elbarlament’s website:

www.elbarlament.org

© elbarlament e.V.

Table of Contents

Summary	4
Introduction	6
Methodology	8
Literature Review	11
Discussion of Data	13
Analysis and Synthesis	17
Policy and Programming Recommendations	20
Conclusion	25
References	27

Summary

Rural communities in Erbil Governorate are on the front line of Iraq's climate vulnerability, facing recurring droughts, falling groundwater levels, and weak local infrastructure that affect daily life, long-term livelihoods, and migration decisions. These pressures increasingly contribute to displacement risks. This paper examines how climate-driven water scarcity, shaped by infrastructure and energy constraints, affects rural livelihoods, gender roles, and mobility patterns, while identifying practical measures that can help communities remain resilient and adapt locally.

The study uses a mixed-methods approach across nine rural villages in Erbil Governorate, combining a door-to-door household survey in Quba with semi-structured interviews, focus group discussions, site observations, and participatory mapping in eight additional villages. Fieldwork was conducted between 2024 and 2025 and focused on water access and quality, agricultural practices, gendered labor burdens, and migration intentions.

The findings show that climate impacts are filtered through a tightly interconnected water–energy–infrastructure nexus.

Repeated deep re-drilling of wells, open and sometimes contaminated distribution networks, and intermittent electricity all limit water pumping capacity and reduce agricultural productivity and household incomes. In Quba, approximately one quarter of surveyed households reported fully dried plots, while most households lacked efficient irrigation systems and many reported poor groundwater quality. These pressures increase women's unpaid labor related to water collection and household management and contribute to youth-led out-migration from several villages.

At the same time, communities across the surveyed villages have already begun pursuing locally grounded adaptation strategies, including rainwater ponds, wastewater reuse, tree planting, solar-powered pumping, and small-scale solar installations, demonstrating that feasible and community-based adaptation options already exist.

Overall, the findings suggest that strengthening rural resilience and reducing climate-related distress migration will require integrated investments in safe water systems, renewable energy-powered pumping, and climate-smart irrigation practices. Equally important are gender-responsive water governance mechanisms and affordable financing that enable rural households to adopt and sustain these adaptation measures.

Progress can be monitored through practical indicators such as daily water availability, groundwater trends, adoption of efficient irrigation systems, and women's participation in water-related decision-making.



01



INTRODUCTION

Introduction

Rural communities in Erbil Governorate face a growing climate and infrastructure crisis. Recurrent droughts, declining flows in the Tigris and Euphrates rivers, rising temperatures, and aging water infrastructure have increasingly undermined agricultural production and household well-being.



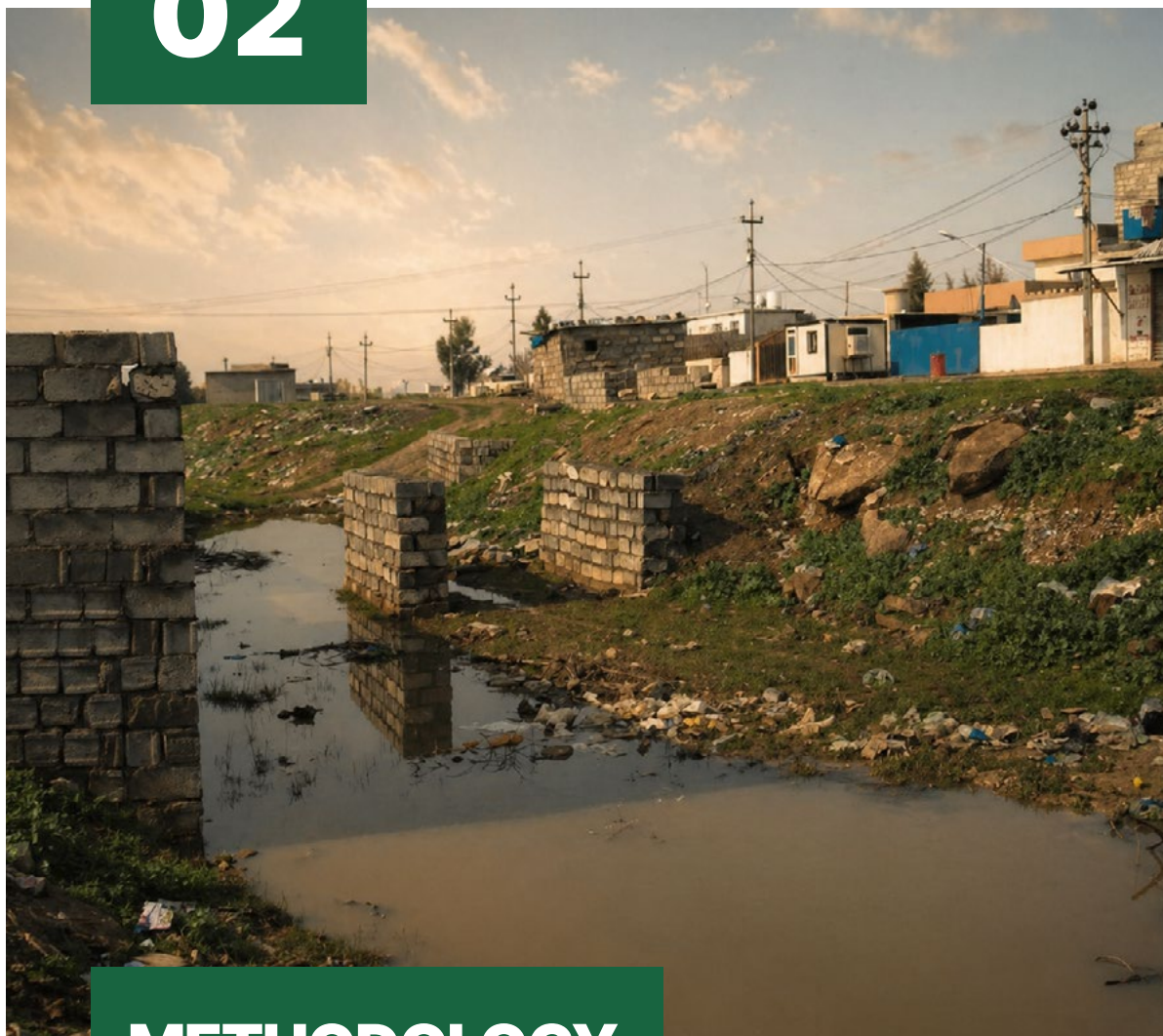
Across the Kurdistan Region of Iraq (KRI), worsening water shortages and declining groundwater levels have placed increasing pressure on rural livelihoods in recent years. Between 2016 and 2023, drought-related conditions displaced more than 130,000 people across Iraq (Humanitarian Practice Network). These pressures have affected agricultural livelihoods first and most severely, forcing many households to adopt coping strategies such as reducing cultivated land, shifting crops, or relying on humanitarian assistance. The impacts have been further intensified by damaged wells, deteriorating irrigation canals, and unreliable electricity supply in the aftermath of conflict.

This paper addresses the following central research question: How does climate-driven water scarcity — mediated by infrastructure and energy constraints — affect rural livelihoods, gender roles, and migration decisions, and what policy interventions can help prevent distress migration and strengthen local resilience?

To answer this question, the study draws on village-level evidence from nine rural communities located across Khabat District, Harir District, Bahrka District, and Dashti Hawler District in Erbil Governorate. Fieldwork conducted between 2024 and 2025 covered the villages of Mala Omer, Kundk, Bar Husht, Saidan, Quba, Kardiz, Kani Bzra, Qurshaghlu, and Dukala, using a mixed-methods approach that combined a household survey in Quba with semi-structured interviews, focus group discussions, and site observations across the surveyed communities.

The study examines how water scarcity, infrastructure conditions, and social norms shape livelihoods, gender dynamics, and migration pressures in rural Erbil. Based on village-level evidence, the paper proposes practical policy recommendations for government institutions, donors, and local communities aimed at strengthening climate resilience and reducing displacement risks.

02



METHODOLOGY

Methodology

This study used a mixed-methods approach informed by sustainable livelihoods, feminist political ecology, and climate mobility frameworks to examine how water scarcity affects livelihoods, gender dynamics, and migration patterns in rural Erbil.



Fieldwork was conducted between 2024 and 2025 across nine rural villages in Erbil Governorate selected to reflect diverse water conditions, agricultural systems, and geographic settings. The villages were grouped administratively as follows:

Khabat District: Mala Omer, Kundk

Harir District: Quba

Bahrka District: Bar Husht, Saidan

Dashti Hawler District: Kardiz, Kani Bzra, Qurshaglu, Dukala

Within this classification, villages such as Bar Husht and Saidan were identified as higher-stress sites based on reported water scarcity, declining agricultural viability, and emerging migration pressures.

The research combined quantitative and qualitative methods. Quba was selected as the quantitative anchor site due to its more systematic settlement layout, which enabled the implementation of a structured household survey on water access, irrigation practices, and livelihood conditions. In contrast, the remaining villages relied primarily on qualitative methods to document local experiences, adaptation strategies, and perceptions of environmental change.

Data collection included household and farm visits, semi-structured interviews with farmers, village leaders (mukhtars), school staff, and other residents, as well as community discussions, observation walks, and participatory mapping exercises conducted across all surveyed villages. Separate discussions for women and men were conducted where culturally appropriate. These methods explored water access and quality, agricultural change, migration pressures, gendered labor burdens, decision-making patterns, and local adaptation practices such as solar-powered pumping and small-scale water storage.

Qualitative data was coded thematically around water scarcity, livelihoods, gender dynamics, and migration, while survey findings from Quba supported cross-village comparison and triangulation of evidence through interviews, observations, and community discussions.

All participants provided informed consent prior to participation, and personal information was anonymized during data processing. Gender-sensitive procedures were used to support women's participation, and research activities followed do-no-harm principles to minimize potential risks or coercion.

The study relied on purposive sampling and therefore does not aim to produce statistically representative findings for all rural areas in Erbil Governorate. Some findings were based on participant estimates and may contain minor inaccuracies, while seasonal conditions may also have influenced observations and participant responses during fieldwork.

03



LITERATURE REVIEW

Literature Review

Existing research on climate vulnerability in Iraq highlights worsening water scarcity, declining agricultural productivity, and uneven social impacts shaped by gender and income inequalities (World Bank, 2022; UNDP Iraq, 2022).

Across the Tigris–Euphrates basin, drought, rising temperatures, declining river flows, salinization, and aging irrigation infrastructure have increased pressure on rural livelihoods and accelerated dependence on groundwater (FAO, 2022; WFP & FAO, 2021).

Previous studies also emphasize the interconnected role of water, energy, and infrastructure systems in shaping rural vulnerability. Unreliable electricity supply, rising fuel costs, damaged irrigation networks, and inefficient water distribution systems increase the costs and instability of agricultural production, particularly for small-scale farmers (World Bank, 2022; UNDP Iraq, 2022).

The impacts of climate stress are also strongly gendered. Under conditions of water scarcity, women often assume greater unpaid labor burdens related to water collection, livestock care, and household management, while climate pressures increasingly contribute to migration and displacement among vulnerable rural populations (Ayazi & Elsheikh, 2019; IOM, 2023; NRC, 2023).

However, much of the existing literature relies on national or governorate-level data and provides limited village-level analysis of how water scarcity, infrastructure conditions, gender dynamics, and migration pressures interact in everyday rural life. This study contributes to filling that gap through evidence gathered directly from rural communities across Erbil Governorate.



04



DISCUSSION OF DATA

Discussion of Data

Across the nine surveyed villages in Erbil Governorate, climate impacts emerge through a tightly interconnected water–energy–infrastructure nexus that reshapes livelihoods, gender dynamics, and migration pressures. Quantitative findings from Quba, together with qualitative evidence from the remaining villages, reveal consistent patterns of water insecurity, declining agricultural viability, and uneven adaptive capacity across communities.



Water Access, Quality, and Infrastructure

All surveyed villages reported declining groundwater availability, damaged irrigation infrastructure, and energy constraints affecting water pumping and distribution. Together, these pressures create a reinforcing cycle in which limited water access increases both household vulnerability and agricultural instability.

In Mala Omer (Khabat District), farmers reported that groundwater levels have dropped by approximately 20 meters in recent years, while several wells have become increasingly saline. Residents also described pollution affecting the village's irrigation canal due to household wastewater discharge, creating risks for irrigation systems and fish populations. Community members further reported persistent petroleum odors linked to nearby oil and gas activities. "We cannot breathe freely; the smell from petroleum is everywhere," one farmer explained during a household visit. These conditions have increased reliance on contaminated water sources for both irrigation and fishponds, raising environmental and public health concerns alongside water scarcity.

Kundk faces additional infrastructure constraints, relying on a single shared well while electricity from local generators remains limited to only a few hours per day. Residents reported carefully rationing water under these conditions, while seasonal flooding regularly damages roads and limits physical access to services and markets.

In Bar Hushtr and Saidan (Bahrka District), water stress becomes more severe as wells often require repeated re-drilling to depths of 300–400 meters due to ongoing groundwater depletion. "Our wells keep drying; we drill again and again, now at 350 meters," one resident explained, describing each intervention as only a temporary solution.

Quantitative findings from Quba support these broader patterns. Survey respondents widely reported poor groundwater quality, while open irrigation distribution networks were observed losing water through evaporation and contamination. Across multiple villages,

intermittent electricity supply — sometimes limited to only four to six hours per day — interrupted pumping cycles and reduced the reliability of both household and agricultural water access. Field observations further confirmed that many irrigation systems continue to rely on open ditches rather than closed distribution networks, compounding water loss and contamination risks.

Livelihoods and Agricultural Systems

Water scarcity has directly reduced agricultural production and household incomes across the surveyed villages, forcing many households to adopt short-term coping strategies or reduce their dependence on farming altogether.

Survey findings from Quba show that approximately one quarter of households reported fully dried agricultural plots, while 57% reported not using efficient irrigation systems such as drip irrigation. Similar patterns emerged in other villages, where unreliable water access and short pumping windows disrupted planting cycles and reduced agricultural productivity.

In villages such as Qurshaghlu and Dukala (Dashti Hawler District), residents described shrinking cultivated areas and declining green cover linked to worsening water scarcity. Participants in Qurshaghlu additionally reported poor drinking water quality and increasingly bitter groundwater, while repeated crop failures pushed some households toward lower-return livestock production or day labor opportunities in nearby towns.

Households without the financial resources to purchase diesel generators, deepen wells, or upgrade irrigation infrastructure were particularly vulnerable. In several villages, residents reported leaving agricultural land fallow as water access became increasingly unreliable. Kardiz and Kani Bzra showed similar trends, where irregular water access forced farmers to rely on less water-intensive crops while still reporting yield reductions

of approximately 30–50% during severe drought years.

Community discussions consistently emphasized that improved irrigation systems, water storage, and more reliable energy access could help stabilize agricultural production. However, the high upfront costs associated with these interventions remain beyond the reach of many rural households.

Gendered Impacts

Water scarcity has increased unpaid labor burdens for women across the surveyed villages, reshaping household responsibilities and limiting opportunities for education, income generation, and participation in local decision-making processes.

Women across multiple villages reported spending an additional two to four hours per day collecting water from distant or unreliable sources, managing household water shortages, and assuming greater responsibility for livestock care when agricultural production declined or men sought off-farm employment. In Bar Hushtr and Saidan, women described how these pressures reduced time available for children's education, paid work, and participation in community meetings, where decisions related to wells, pumps, and irrigation systems were often dominated by men.

Open water access points, including irrigation ditches and shared taps, also raised safety concerns, particularly after dark when water collection frequently peaks. Despite these challenges, residents reported that few infrastructure improvements had considered women's mobility patterns, safety concerns, or daily water collection responsibilities.

Interviews in Mala Omer and Quba further highlighted how water scarcity often reinforces existing gender norms. Men were typically responsible for technical repairs and infrastructure maintenance,

while women absorbed much of the daily burden associated with water management and household adaptation. Women participating in focus group discussions expressed interest in greater inclusion within local water governance and community decision-making, although many also identified persistent cultural barriers to participation.

Migration Dynamics

Environmental stress has increasingly turned migration into a common coping strategy across several surveyed villages, particularly among younger residents facing declining agricultural viability and limited economic opportunities.

In higher-stress sites such as Bar Hushtr, Saidan, and parts of Harir District, households described a recurring pattern in which young men initially leave for temporary construction or service-sector jobs in Erbil city. When local conditions fail to improve, these temporary movements often evolve into seasonal labor migration and, in some cases, permanent relocation as farming becomes less economically sustainable.

“If the well works and crops grow, the young stay; otherwise, they go find work,” a mukhtar in Saidan explained during a community meeting.

At the same time, not all households possess the financial means to migrate. Several participants described situations in which poorer households lacked the resources necessary to deepen wells, invest in solar-powered pumps, or relocate to urban areas. These households often relied on reduced food consumption, informal support networks, or humanitarian assistance while attempting to remain in place despite worsening environmental conditions.

Across multiple villages, residents directly linked migration intentions to water reliability and local adaptation capacity. Communities where residents discussed potential investments in solar-powered pumping, water storage, or irrigation improvements generally reported lower intentions to leave. These findings suggest that targeted investments in water infrastructure, renewable energy, and locally grounded adaptation measures could play a significant role in reducing climate-related distress migration and strengthening long-term rural resilience.

05



ANALYSIS AND SYNTHESIS

Analysis and Synthesis

Patterns Across the Research Question

Findings from the nine surveyed villages strongly support the paper's central argument that climate-driven water scarcity, mediated through infrastructure and energy constraints, reshapes rural livelihoods, gender relations, and migration decisions in interconnected ways. Quantitative findings from Quba, combined with qualitative evidence from the remaining villages, demonstrate that environmental stress does not operate through water scarcity alone. Rather, vulnerability emerges through the interaction between declining groundwater availability, damaged infrastructure, unreliable electricity supply, and unequal social and economic capacities to adapt.

Across the surveyed communities, declining groundwater levels and unstable pumping capacity directly reduced agricultural productivity and household income generation. In villages such as Bar Hushtr, Saidan, and Kardiz, repeated deep re-drilling of wells to depths of 300–400 meters has become increasingly common as groundwater tables continue to fall. At the same time, intermittent electricity supply frequently interrupts pumping cycles, limiting irrigation reliability and increasing production costs for already vulnerable farming households.

The findings from Quba further reinforce these patterns. Approximately one quarter of surveyed households reported fully dried agricultural plots, while most households lacked efficient irrigation systems and reported declining groundwater quality. Open irrigation canals and deteriorating

distribution systems contributed to water loss through evaporation and contamination, further reducing the efficiency and sustainability of agricultural production.

These environmental and infrastructural pressures have pushed many households toward short-term coping strategies, including reducing cultivated land, shifting toward less water-intensive crops, relying on day labor, or leaving agricultural land fallow altogether. Households with greater financial resources were generally better positioned to deepen wells, purchase generators, or invest in alternative pumping systems, while poorer households faced increasing difficulty maintaining agricultural livelihoods under worsening environmental conditions.

Gender, Adaptation, and Unequal Burdens

The findings also demonstrate that climate vulnerability is experienced unevenly within households and communities. Across the surveyed villages, women consistently carried disproportionate unpaid labor burdens associated with water scarcity and household adaptation.

Women reported spending additional hours each day collecting water, managing water shortages within households, and assuming increased responsibility for livestock care and household management when agricultural production declined or male household members migrated temporarily for work. In villages such as Bar Hushtr, Saidan, Mala Omer, and Quba, participants described how these pressures reduced opportunities for women's paid employment, education, and participation in community-level decision-making processes.

At the same time, women often remained excluded from formal decisions regarding wells, irrigation systems, and local infrastructure management. Although women participating in focus group discussions expressed interest in more

inclusive water governance structures, many identified persistent social and cultural barriers that limited their participation.

These findings support broader feminist political ecology approaches that emphasize how environmental stress interacts with existing gender inequalities, often increasing women's unpaid labor responsibilities while simultaneously limiting their influence over adaptation planning and resource governance.

Migration as a Climate Adaptation Response

The research further demonstrates that migration increasingly functions as both a coping mechanism and an adaptation strategy under conditions of prolonged environmental stress. Across several villages, residents described a recurring sequence in which declining agricultural viability first encouraged temporary labor migration and later contributed to more permanent forms of displacement.

In higher-stress villages such as Bar Hushtr and Saidan, younger residents frequently sought temporary construction or service-sector employment in Erbil city when agricultural income became unreliable. Where local environmental and economic conditions failed to improve, temporary migration often evolved into seasonal migration patterns and eventually permanent relocation.

Importantly, the findings also reveal unequal mobility capacities across households. Migration itself requires financial resources, social connections, and access to urban opportunities that many poorer households lack. Several participants described situations in which households remained trapped in deteriorating environmental conditions because they lacked the means either to adapt locally or to relocate elsewhere.

At the same time, communities that reported stronger local adaptation efforts — including solar-powered pumping systems, rainwater storage, irrigation improvements, and local environmental initiatives — generally expressed lower intentions to migrate. This suggests that investments in decentralized water infrastructure, renewable energy access, and locally grounded adaptation strategies may significantly reduce climate-related distress migration by improving the viability of rural livelihoods.

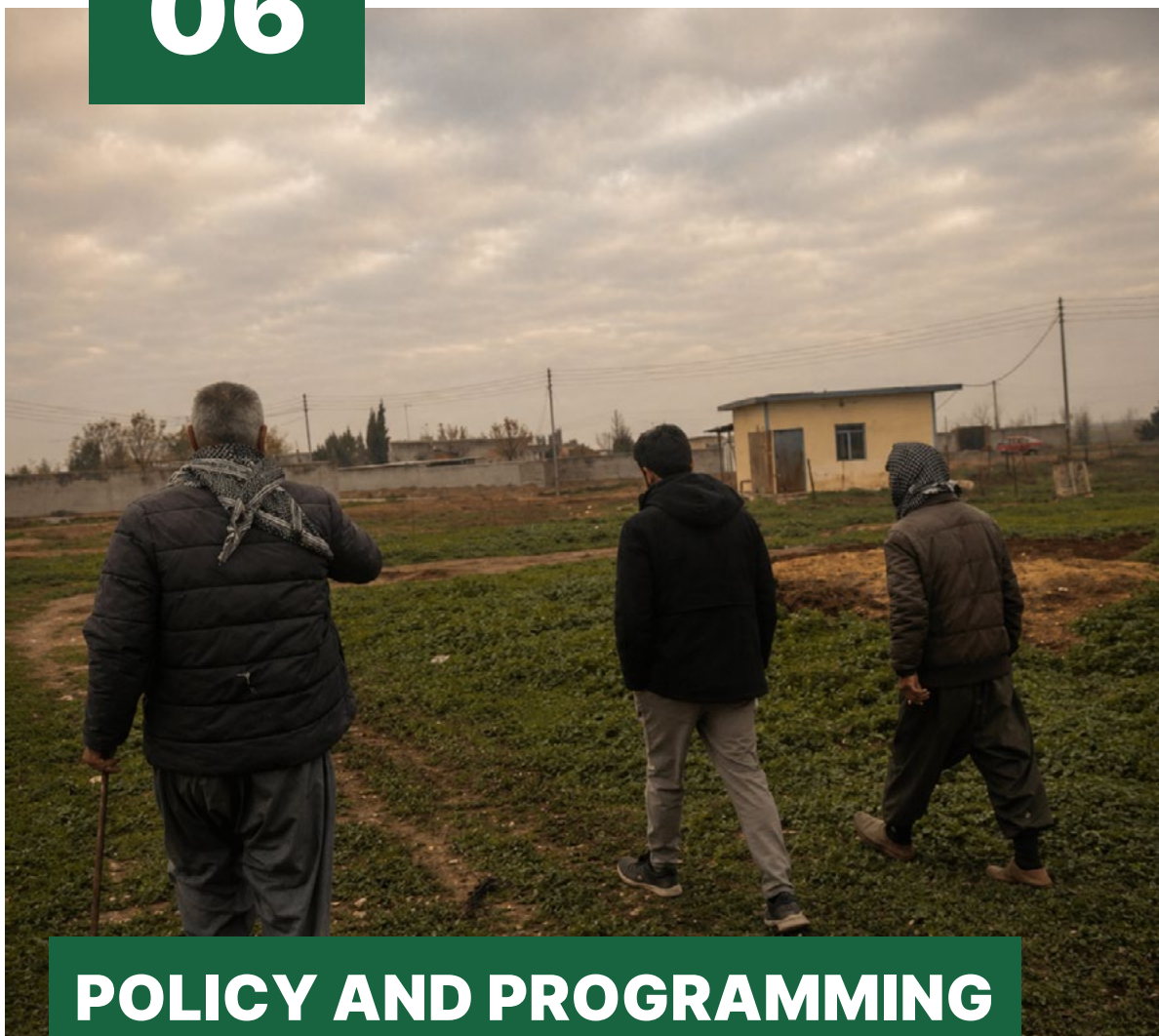
Core Analytical Contribution

Overall, the findings point to the existence of a closely interconnected water–energy–infrastructure nexus shaping climate vulnerability across rural Erbil Governorate. Water scarcity alone does not fully explain livelihood decline or migration pressures. Instead, vulnerability emerges through the combined effects of declining groundwater, damaged infrastructure, unreliable electricity, rising adaptation costs, and unequal social capacities to respond.

This integrated perspective helps explain why some households and communities remain more resilient than others despite facing similar environmental pressures. Communities with better access to functioning infrastructure, renewable energy systems, local adaptation initiatives, and social support networks were generally better able to sustain agricultural production and reduce migration pressures. In contrast, communities facing deeper infrastructure deficits and weaker adaptive capacity experienced more severe livelihood disruption and stronger migration pressures.

By grounding these findings in village-level evidence, the study contributes a localized understanding of how climate vulnerability, infrastructure systems, gender dynamics, and migration interact in everyday rural life across the Kurdistan Region of Iraq.

06



POLICY AND PROGRAMMING RECOMMENDATIONS

Policy and Programming Recommendations



Findings from the surveyed villages point toward several practical policy interventions capable of addressing the interconnected water–energy–infrastructure nexus driving rural vulnerability, livelihood decline, and climate-related migration pressures across Erbil Governorate. The evidence suggests that strengthening resilience will require integrated investments in decentralized water systems, renewable energy-powered pumping, climate-smart agricultural practices, and more inclusive local governance mechanisms.

Importantly, many of these interventions are already being discussed or tested at the community level through local initiatives such as rainwater harvesting, wastewater reuse, tree planting, solar-powered pumping, and small-scale renewable energy installations. Scaling and institutionalizing these locally grounded adaptation efforts could provide a realistic pathway toward reducing environmental vulnerability and displacement pressures across rural communities.

Decentralized Safe Water System

Across the surveyed villages, damaged irrigation infrastructure, open distribution networks, and contaminated water systems contributed significantly to water loss, declining water quality, and growing public health concerns. These challenges were particularly visible in villages such as Mala Omer, where residents reported irrigation canal contamination linked to wastewater discharge and nearby oil and gas activities, as well as in Quba, where many surveyed households reported poor groundwater quality.

A key policy priority should therefore focus on rehabilitating and modernizing rural water infrastructure through decentralized and locally manageable systems. This includes replacing open irrigation channels with closed distribution networks, rehabilitating damaged pipes, improving local water storage capacity, and introducing affordable household-level filtration systems where contamination risks are high.

Pilot interventions could initially target higher-stress communities such as Quba, Bar Hushtr, and Kundk, where water insecurity and infrastructure degradation were particularly severe. Community-based water mapping and participatory planning mechanisms should also be integrated into infrastructure rehabilitation efforts to ensure that distribution systems reflect actual household usage patterns and local accessibility needs.

Strengthening decentralized water systems would likely improve daily water reliability, reduce contamination risks, lower water losses through evaporation, and reduce the economic pressure associated with repeated well deepening and emergency coping strategies.

Renewable Energy-Powered Pumping and Affordable Finance

Energy insecurity emerged as a major factor limiting water access and agricultural stability across nearly all surveyed villages. Intermittent electricity supply and rising fuel costs frequently disrupted pumping cycles, reduced irrigation reliability, and increased agricultural production costs for rural households.

The findings suggest that expanding access to renewable energy-powered pumping systems could significantly improve both water reliability and agricultural resilience. Solar-powered pumping systems were consistently identified by residents as one of the most desirable adaptation measures, particularly in villages facing severe electricity shortages or heavy dependence on diesel generators.

Policy interventions should therefore prioritize subsidized solar-powered pumping systems for vulnerable rural households and community water systems, combined with affordable financing mechanisms such as low-

interest microloans, revolving community funds, or installment-based repayment schemes linked to agricultural income cycles.

Pilot projects could initially focus on villages such as Kundk, where households rely heavily on a single shared well, and Quba, where households experiencing dried agricultural plots face particularly high livelihood pressures. Existing small-scale solar initiatives in schools and community facilities could also be expanded into larger communal pumping systems capable of supporting irrigation and household water supply simultaneously.

Strengthening renewable energy access would not only improve water pumping reliability but also reduce long-term fuel costs, stabilize agricultural production, and lower the economic pressures that contribute to climate-related migration.

Targeted Support for Highly Vulnerable and Low-Income Households

The findings demonstrate that the households most severely affected by climate stress are often those with the fewest financial resources to adapt locally or migrate elsewhere. Across several surveyed villages, poorer households reported being unable to afford well deepening, solar-powered pumps, irrigation upgrades, or relocation costs, leaving them trapped under worsening environmental and economic conditions.

Policy and donor programming should therefore prioritize targeted support mechanisms for highly vulnerable rural households facing combined environmental and economic insecurity. Adaptation measures should not rely solely on household purchasing power or private investment capacity, as this risks reinforcing existing inequalities and

excluding the populations most exposed to climate-related vulnerability.

Priority interventions could include subsidized irrigation and solar technologies for low-income households, community-based adaptation grants, emergency livelihood support, cash assistance during drought periods, and publicly funded communal water infrastructure accessible to households unable to invest individually.

Social protection mechanisms should also be integrated into climate adaptation programming, particularly in villages experiencing severe groundwater depletion and declining agricultural viability. Without targeted inclusion measures, climate adaptation interventions may disproportionately benefit households already possessing greater financial and technical capacity, while leaving poorer households increasingly trapped in deteriorating environmental conditions.

Strengthening resilience therefore requires not only technological adaptation, but also equitable access to adaptation resources and long-term livelihood protection for the most vulnerable rural populations.

Gender-Responsive Water Governance

The findings demonstrate that women disproportionately absorb the daily burdens associated with water scarcity while often remaining excluded from local infrastructure and water management decisions. Women across multiple villages reported increased unpaid labor burdens, reduced access to income opportunities, and safety concerns linked to water collection responsibilities.

Policy responses should therefore incorporate gender-responsive governance mechanisms into all water and infrastructure interventions. Village-

level water committees should include meaningful participation by women and actively incorporate women's experiences, mobility patterns, safety concerns, and household responsibilities into planning and decision-making processes.

Capacity-building programs focused on infrastructure maintenance, local governance, and climate adaptation planning could further strengthen women's participation within community-level resilience initiatives. Partnerships between local authorities, civil society organizations, and women's groups may also help reduce cultural barriers limiting women's involvement in public decision-making.

Improving women's participation in water governance is likely to strengthen the effectiveness, accessibility, and long-term sustainability of local adaptation measures while also reducing gendered vulnerability under conditions of environmental stress.

Climate-Smart Irrigation and Agricultural Practices

Agricultural vulnerability across the surveyed villages was closely linked to inefficient irrigation systems, declining groundwater quality, and increasing salinization pressures. In Quba, most surveyed households reported lacking efficient irrigation systems, while farmers in Kardiz, Kani Bzra, and other villages described major yield reductions during drought years.

Expanding climate-smart agricultural practices therefore represents another critical policy priority. Provincial agricultural offices, donor agencies, and local organizations should support training programs focused on efficient irrigation systems such as drip irrigation, drought-resistant crop varieties, soil rehabilitation techniques, composting,

rainwater harvesting, and sustainable land management practices.

Local adaptation initiatives already observed in several villages - including tree planting, small-scale composting, and water-saving agricultural experimentation - provide important foundations that can be expanded through technical support, demonstration projects, and subsidized agricultural inputs.

Integrating climate-smart agricultural practices with renewable energy-powered pumping and improved water infrastructure would help reduce groundwater pressure, improve water efficiency, stabilize agricultural production, and strengthen long-term livelihood resilience across vulnerable rural communities.

power meets smart use. Farmers in Kardiz and Kani Bzra already experiment to scale these to rebuild productivity without chasing groundwater deeper.

07



CONCLUSION

Conclusion

Rural communities across Erbil Governorate are facing a deepening climate and infrastructure crisis in which water scarcity, shaped by energy shortages and deteriorating infrastructure systems, increasingly threatens livelihoods, intensifies gender inequalities, and contributes to growing migration pressures.



Evidence gathered across the nine surveyed villages demonstrates that climate vulnerability in rural Erbil does not emerge through environmental stress alone. Rather, vulnerability is produced through the interaction between declining groundwater availability, damaged irrigation systems, unreliable electricity supply, rising adaptation costs, and unequal social and economic capacities to respond.

The findings show that repeated groundwater depletion, costly re-drilling of wells, inefficient irrigation systems, and unstable pumping capacity have significantly reduced agricultural productivity and household resilience across the surveyed communities. Quantitative findings from Quba, including reports of dried agricultural plots, poor groundwater quality, and limited use of efficient irrigation systems, reinforce broader patterns identified through interviews, focus group discussions, and site observations across the remaining villages.

At the same time, the study demonstrates that climate impacts are experienced unevenly within rural communities. Women disproportionately absorb the unpaid labor burdens associated with water scarcity while often remaining excluded from infrastructure and resource governance decisions. Similarly, poorer households frequently face the highest levels of environmental vulnerability while possessing the fewest financial resources to adapt locally or migrate elsewhere. In several villages, households described being unable to afford well deepening, solar-powered pumps, irrigation upgrades, or relocation costs, leaving them trapped under increasingly difficult environmental and economic conditions.

The findings strongly support the analytical frameworks guiding the study. Sustainable livelihoods approaches help explain how water reliability connects directly to agricultural production, household income, and long-term community stability. Feminist political ecology highlights how environmental stress interacts with existing gender inequalities, increasing women's labor burdens while limiting participation in decision-making processes. Climate mobility perspectives further demonstrate that migration often emerges not as a free choice, but as a coping strategy shaped by unequal access to resources, infrastructure, and adaptation opportunities.

Importantly, the research also demonstrates that rural communities are not passive victims of climate stress. Across the surveyed villages, residents identified and, in some cases, already implemented locally grounded adaptation measures including rainwater harvesting, tree planting, wastewater reuse, solar-powered pumping, small-scale renewable energy systems, and climate-smart agricultural experimentation. These initiatives demonstrate that feasible adaptation pathways already exist at the local level, although their expansion remains constrained by limited financial resources, weak infrastructure investment, and uneven institutional support.

The study therefore highlights the importance of integrated policy responses that combine decentralized water infrastructure, renewable energy access, climate-smart agricultural practices, gender-responsive governance, and targeted support for highly vulnerable households. Without such interventions, ongoing environmental decline and infrastructure deterioration may further intensify livelihood insecurity and climate-related migration pressures across rural areas of Erbil Governorate.

At the same time, the evidence suggests that the current trajectory is not irreversible. Investments in locally grounded adaptation, equitable access to infrastructure, and community-based resilience strategies can help reduce vulnerability, strengthen agricultural sustainability, and improve the long-term viability of rural livelihoods. By grounding these findings in village-level evidence, this paper contributes a localized understanding of how climate vulnerability, infrastructure systems, gender dynamics, and migration pressures interact in everyday rural life across the Kurdistan Region of Iraq.

References

Ayazi, H., & Elsheikh, E. (2019). *Climate refugees: The climate crisis and rights denied*. Berkeley, CA: Othering & Belonging Institute, University of California, Berkeley.

Department of Political and Peacebuilding Affairs (DPPA). (2022). *The interlinkages between climate, peace and security in Iraq*. New York, NY: United Nations.

Food and Agriculture Organization of the United Nations (FAO). (2021, June). *GIEWS Update: The Republic of Iraq Drought affected rainfed areas in northern parts of the country*. Rome: FAO.

Food and Agriculture Organization of the United Nations (FAO). (2022). *Iraq: DIEM Data in Emergencies Monitoring brief (Round 8)*. Rome: FAO.

International Organization for Migration (IOM). (2023, October). *Drivers of climate-induced displacement in Iraq: Climate vulnerability assessment*. Baghdad: IOM Iraq Displacement Tracking Matrix (DTM).

Norwegian Refugee Council (NRC). (2022). *A dry horizon: Iraq's interlinked drought and climate crises*. Oslo: NRC.

Norwegian Refugee Council (NRC). (2023, November). *Inadequate and inequitable: Water scarcity and displacement in Iraq*. Oslo: NRC.

United Nations Development Programme (UNDP) Iraq. (2022). *Climate change and development in Iraq*. Baghdad: UNDP.

United Nations Development Programme (UNDP) Iraq. (2022). *Catalytic climate action in Iraq*. Baghdad: UNDP.

United Nations Framework Convention on Climate Change (UNFCCC). (2021). *Republic of Iraq: Updated Nationally Determined Contribution (NDC)*. Bonn: UNFCCC Secretariat.

United Nations Framework Convention on Climate Change (UNFCCC). (2021). *Nationally determined contributions under the Paris Agreement: Synthesis report by the secretariat (FCCC/PA/CMA/2021/8/Rev.1)*. Bonn: UNFCCC Secretariat.

World Bank. (2022, November). *Iraq Country Climate and Development Report (CCDR)*. Washington, DC: World Bank.

World Food Programme (WFP) & Food and Agriculture Organization of the United Nations (FAO). (2021, March–April). *Agricultural value chain study in Iraq: Dates, grapes, tomatoes and wheat*. Rome: WFP and FAO.

Humanitarian Practice Network. (2023). *Extreme heat, drought and displacement in Iraq*. ODI Humanitarian Practice Network.

For more information, please contact :

elbarlament e.V.
Elbestraße 28/29
12045 Berlin, Germany
info@elbarlament.org

