



POLICY BRIEF

Promoting Safe and Sustainable Groundwater Management in the Nineveh Plain: Policy Recommendations Stemming from a Study in Alqosh district

Iraq is fast moving towards extreme form of water scarcity driven by multitude of pressures such as climate change, water developments in the upstream countries, increasing pollution, rising water demands, and poor water management and governance, which are often limited by a lack of the availability or use to the full value of the scientific data and information. A rapid shift to intensive groundwater exploitation is observed in many parts of the country with the aim to meet the growing demands, amid dwindling water resources. However, a sound knowledge of groundwater availability and quality is lacking, which raises concerns on the long-term sustainability, water security and well-being of the people.

Key Policy Recommendations:

1. Strengthen groundwater monitoring and assessment system.
2. Raise awareness and dialogue on safe and sustainable use of groundwater.
3. Enhance coordination across local to regional authorities to monitor and regulate groundwater use.



Introduction:

Water security is now one of the most pressing challenges for the people of Iraq. The issue is projected to become worse, amid impacts of climate change and rising human demands, pollution and (over) exploitation of water resources in the riparian countries as well as within Iraq. Securing water for the people in the midst of climate and

management crisis is getting more attention in all parts of Iraq including the Northern areas, which were historically known to have better freshwater availability compared to the arid and most downstream southern regions of the country. The Nineveh plain in the North of Iraq is an important area from agriculture, economic and social dimensions. The area also hosts a diverse group of population including minorities and refugees. This



region is also well known as the breadbasket of Iraq, which still provides a considerable portion of Iraq's agricultural produce. However, in the last few years, water security has been at the centre of the sustainability discussions in Iraq including the Nineveh plains. For example, the lack of rains in the recent years created a path of social and economic devastation in agricultural areas as crops failed, causing dread and anxiety in rural communities about the future. The growing water scarcity aggravated by climate change is transforming the region into a water security hotspot with long-term ecological, humanitarian, and economic consequences. In response, people in the Nineveh Plain are exploring and developing multiple sources of water. Increasing dependence and exploitation of groundwater has emerged as an important strategy for public and private sectors, citizens and water using communities. However, the government authorities and water users are becoming increasingly concerned about the long-term water security, amid declining groundwater water tables and river flows. Additionally, they are alarmed by the increasing pollution and resulting health consequences in some areas. There is a lack of information about the groundwater quality in relation to the national and international standards for safe use (e.g., for domestic and irrigation). Lack of proper monitoring and policy actions to regulate groundwater use is another important challenge. Therefore, there is an urgent need to monitoring the groundwater quality and quantity trends and evaluate corresponding policies for their relevance and

effectiveness. This policy brief aims to provide evidence-based information on groundwater challenges, management responses and actionable policy recommendations. The insights are based on the lessons learned from a recent study conducted in the Alqosh district in the Nineveh Plains. Three policy recommendations are suggested to support safe and sustainable groundwater management contributing to the long-term water security and well-being of the diverse communities co-inhabiting in the region. These policy recommendations are also instructive for similar regions in Iraq and beyond.

Methods:

This policy brief is based on the analysis of data collected using quantitative and qualitative methods. Data was collected from about 80 groundwater wells during a field campaign conducted in the summer season (2025). The field information was collected on groundwater situation and some rapid water quality tests were performed covering



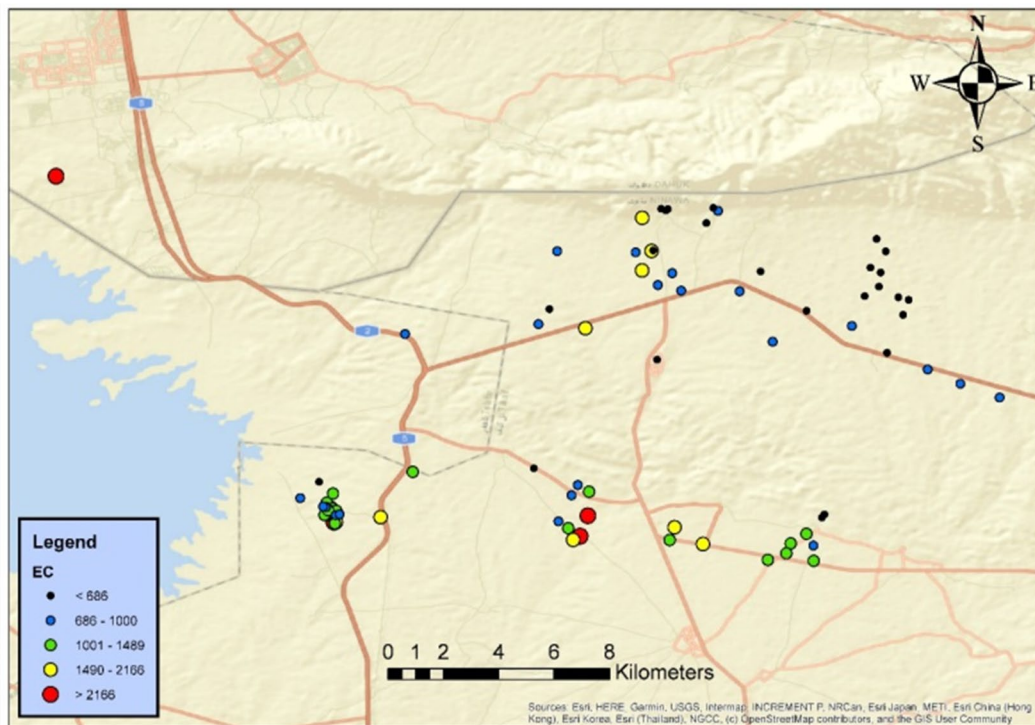
parameters such as Electrical Conductivity (EC), Temperature, basic well information (e.g., diameter & depth; production of wells) and management and governance issues (e.g., permits, access and water sharing arrangements). Groundwater samples were collected and analysed by a well-established water quality testing lab in Erbil city. The analysis covered multiple dimensions and included several parameters: chemical (e.g. EC; cations; anions); biological (e.g. E-Coli bacteria); and heavy metals (e.g. Nitrate and Sulphate). Additionally, meetings, interviews, workshop and focused group discussions were held with local authorities and groundwater well owners and users in the region. The local knowledge and information collected from these activities were triangulated with the field data and lab reports.

Strengthen groundwater monitoring and assessment system

A well-established and effectively functioning groundwater monitoring and assessment programme provides sound scientific evidence to support informed management and governance decisions. The work conducted under the Nineveh project revealed significant gaps in groundwater monitoring and assessment. There is no regular monitoring of groundwater tables, quality or other relevant data. The Groundwater Directorate of Nineveh and Department of Water and Agriculture are the two main government organizations and

Department of Water and Agriculture are the two main government organizations dealing with groundwater. Other key stakeholders include, but not limited to, Municipalities, private sector (e.g., industry and well drillers) and individual users (e.g., domestic, livestock and agriculture). These actors lack sufficient information, capacity and resources to set up a comprehensive programme.

For example, the discussions with government authorities indicate that they do not have sufficient budget and scientific capacity to carry out groundwater monitoring and assessments activities. Thus, they mainly focus on implementing the groundwater regulations policy instruments such as issuing groundwater use permits. The private sector (e.g., well drillers) mainly depends on experience and local knowledge for their business activities, which result in both success and failure in delivering safe and sustainable groundwater well fields. In general, the groundwater users speculate on the expectation of economic life of the abstraction infrastructure amid declining groundwater tables caused by increasing abstractions from a growing number of wells.



The groundwater salinity results, measured in terms of EC, are shown in this policy brief, as an example to highlight variable quality across the studied wells. These results confirm freshwater availability in most cases but also identify some cases of brackish water. Most of the other water quality parameters show similar pattern of variations indicating the importance of assessing the quality of each well. These findings clearly suggest the need of setting up a comprehensive monitoring and assessment programme. Allocation of sufficient government funding and encouraging investment by the private sector and communities (in kind and/or cash) are important enabling factors for developing and implementing groundwater monitoring programmes. Strong collaboration between government agencies and communities (e.g., Groundwater Directorate of Nineveh, Department of Agriculture and Water, Municipality of Alqosh, Groundwater users, Community Based Organization, SCOs, and Non-Government

Organizations, NGOs) is highly recommended to ensure a well coordinate approach that promote joint ownership and integrated use of scientific and local knowledges. The regular monitoring and assessment with involving multiple actors can support informed policies and strategies on groundwater regulation, safe and sustainable use. Moreover, in absence of water quality information, the impacts on environment (e.g., soil quality), agricultural productivity, livestock and human health are not well understood. In some areas, communities are highly concerned about poor quality of their groundwater resource and consequent health and socio-economic impacts caused by its use. The limited information collected through the field surveys and discussion with key actors in the region indicate variations in aquifer depths, hydro-geological conditions and water quality. For example, the high variation and localized pockets of both fresh and brackish/polluted water were confirmed by the results of the recent groundwater survey and discussions with the communities. The survey also confirms majority of the wells having good quality water meeting the Iraqi standards for drinking and irrigation use. A small but considerable number of wells indicated higher E-Coli concentrations compared to the standards for safe use. Most of these wells were located near the waste sites resulting from livestock and human waste streams.



Raise awareness and dialogue on safe and sustainable use of groundwater

Owing to the variable quality of groundwater in the Nineveh Plain, its use may or may not be safe for a specific location and purpose. Although most wells demonstrate good water quality for domestic and irrigation use, some wells do require treatment before safe domestic use. Similarly, the use of wells with high salinity level (e.g., brackish water) may cause environmental issues in the long-term, with risks of reducing soil productivity and crop yields. Therefore, analysing groundwater quality in view of standards for safe use (e.g., drinking and irrigation purposes) is essential to avoid negative impacts on health, economy and environment. Moreover, absence or poor availability of sound scientific data and lack of

communication across stakeholders further limit safe and sustainable use of groundwater resources. Raising awareness of relevant stakeholders (e.g., Groundwater Directorate of Nineveh; Department of Agriculture and Water, District and Local Government Authorities including Municipalities, Local Well Drillers, Community Organizations and Beneficiaries such as domestic users, livestock herders and farmers) on groundwater quantity and safe yield are pivotal to design suitable groundwater governance policies supporting equitable, safe and sustainable use. Lack of knowledge and awareness on groundwater quantity and quality alongside of limited coordination need urgent attention. Efforts to overcome these obstacles can result in multiple benefits. For example, the groundwater quality assessment carried out under the Nineveh project were shared among the key stakeholders to support raise awareness and informed decision making. While groundwater quality was found good in most cases, the analysis also led to identification of a few wells where water quality standards were not met. This evidence based and location specific information helped authorities to pay special attention to the water quality hotspots and advise continued use or closure of wells posing risks. Discussions and exchange of information between researchers, public authorities and users, conducted under this study, were found very helpful in enhancing understanding and informed decision making. The individual meetings between project partners and local authorities as well as workshops with them and other stakeholders (e.g., groundwater users) were found very helpful to foster knowledge exchange, awareness raising and stimulating interest in groundwater assessment and sustainable management. Therefore, key stakeholders (e.g., academia, government agencies, local authorities, industry, users, CSO and NGOs) are advised to do coordinated efforts and investments in awareness raising, capacity development and promoting science-policy-practice dialogue. Found very helpful in enhancing understanding and informed decision making.



The individual meetings between project partners and local authorities as well as workshops with them and other stakeholders (e.g., groundwater users) were found very helpful to foster knowledge exchange, awareness raising and stimulating interest in groundwater assessment and sustainable management. Therefore, key stakeholders (e.g., academia, government agencies, local authorities, industry, users, CSO and NGOs) are advised to do coordinated efforts and investments in awareness raising, capacity development and promoting science-policy-practice dialogue.

Enhance coordination across local to regional authorities to monitor and regulate groundwater use

A good coordination among local and regional authorities can facilitate a coherent understanding of relevant policies and their smooth implementation. The administrative structure in the Nineveh plain is complex due to lack of clarity for some local areas in terms of which policies and



regulations should be applicable (e.g., Central, Regional and/or Local Government). Therefore, an enhanced coordination between different government units such as at local, governorate, regional and national levels is recommended. This is extremely important to improve equitable, safe and sustainable groundwater exploitation in the region. For example, clarity on who is responsible for issuing permits and what procedures should be followed by different users would greatly help users to follow the legitimate and efficient ways of accessing their rights to use groundwater. Creating culture of sharing data and information about groundwater across different units of the government and other stakeholders could enhance trust and strengthen coordination.



Authors and Contact:

Nabaz Ibraheem Mohammed¹ Ali Abduljabbar Yousif¹, James Haido¹, Ilyas Masih², Sundus Al-Ogaidi² and Wim Douven²

1. University of Duhok, Zakho Street 38 AJ Duhok Kurdistan Region· 1006, Iraq
2. IHE Delft Institute for Water Education, Westvest 7, 2611 AX, Delft, the Netherlands

For more information or questions, please contact Dr. Nabaz Ibraheem Mohammed (nabaz.mohammed@uod.ac); Dr. Ilyas Masih (i.masih@un-ihe.org)

Acknowledgement

This policy brief is based on Water-Nineveh project (grant agreement number 112205), which received funding from IHE Delft's Water and Development Partnership Programme (WDPP) funded by the Ministry of Foreign Affairs of the Netherlands.