

# Water Resources Management in the Kurdistan Region of Iraq

A POLICY REPORT  
by Alessandro Tinti  
2017

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## **LIST OF ACRONYMS**

CSO – Central Statistical Organization of Iraq

FAO – Food and Agriculture Organization of the United Nations

GAP – South-Eastern Anatolia Project (Güneydoğu Anadolu Projesi)

GOI – Government of Iraq IAE – Environmental Impact Assessment

IDP – Internally Displaced Person

IOC – International Oil Company

KRG – Kurdistan Regional Government

KRI – Kurdistan Region of Iraq

KRSO – Kurdistan Region Statistics Office

MRN – Ministry of Natural Resources

MoAWR – Ministry of Agriculture and Water Resources

MoMT – Ministry of Municipalities and Tourism

MoP – Ministry of Planning

UNDP – United Nations Development Programme

UNESCO – United Nations Educational, Scientific and Cultural Organization

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## FOREWORD

As one of the founders of AUIS, it is a pleasure to see good quality work on the environmental issues that are affecting the Kurdish region of Iraq and the region in general be published by IRIS.

The issues addressed in this paper are generally focused on the KRG and while the recommendations carried within are good they are by no means complete. While the paper mentions that there is a need to take into account the complex political issues associated with basin wide management and international laws and agreements that are needed to avert dislocation from climate change effects and increase population, it rightly focuses on what municipalities and government officials can do locally to reduce the potential problems.

Obviously the complexities associated with reaching a basin wide agreement is way beyond the scope of work on this paper but this issue must be addressed in the near future given the referendum on independence that the KRG has recently voted on. Water sharing and management between KRG and Baghdad will be one of the most troublesome aspect and not Kirkuk or any of the disputed areas that all are referring to.



Azzam Alwash,  
Goldman Prize Laureate, 2013  
Member of the Board of Trustees, American University of Iraq, Sulaimani

## EXECUTIVE SUMMARY

Watered by the major tributaries of the Tigris River, the northeastern highlands of the Kurdistan Region of Iraq (KRI) enjoy higher rates of precipitation compared to the alluvial plain stretching across central and southern Iraq and the western desert lying south of the Euphrates River.

Unfortunately, despite this relative wealth and diversification of water resources, exogenous and endogenous drivers of change are severely endangering water security in the KRI. The intensified water shortages caused not only by lowered reserves and reduced water quality, but also over-consumption and bureaucratic mismanagement, have prompted the Kurdistan Regional Government (KRG) to devise a long-term comprehensive planning process to ensure self-sufficiency and sustainable development.

Although federal interdependencies recommend a common-pool approach for the integrated management of water resources in the country, both legal and hydrogeological features suggest that a regional assessment of KRG's water policies is critical at this time.

While water crises are commonly framed as natural hazards or the result of suboptimal economic outcomes, they are quite often the consequence of short-sighted political decisions. From this perspective, the Institute of Regional and International Studies (IRIS) engaged with government officials, environmental activists, and international experts in the water sector to identify pressing issues and priority areas.

The purpose of this report is twofold: (1) to illustrate the main challenges to water planning and management in the KRI; and (2) to summarize policy measures and best practices to be implemented based on a functional need assessment of the KRG water sector.

Overall, findings suggest a multi-pronged approach: improve data collection and management, integrate water administrations at the regional level, shift policy attention from the supply side to the demand side, and promote – in cooperation with the Government of Iraq (GOI) – a basin-wide initiative in the transboundary Tigris-Euphrates river system.

# POLICY RECOMMENDATIONS

## MONITORING INFORMATION SYSTEM

- Implement and improve **hydrogeological data collection and analysis procedures** in line with international standards
- Develop a **monitoring** framework of **surface** and **groundwater** resources based on a **geo-referenced central database and dissemination units**
- **Train specialized personnel** to survey and map hydrogeological resources in the KRI

## INSTITUTIONAL CAPACITY BUILDING

- Institutionalize **coordination** mechanisms for **data exchange** and **water use** between **KRG ministries and levels of government**
- **Centralize water planning and management** in a dedicated Ministry of Water Resources

## GROUNDWATER OVER-EXTRACTION

- Monitor **groundwater withdrawals** and enforce strict **regulation on wells drilling**
- Introduce **metering** and **water pricing** to limit wasteful overconsumption
- Incentivize the **adoption of water saving measures** and **advanced irrigation systems**
- Invest in **small-scale decentralized projects** to **increase water supply** and **recharge groundwater**

## WATER QUALITY

- Promote **awareness** campaigns on **water consumption**
- **Maintain, repair, and expand water distribution networks**, especially in rural areas
- Establish **wastewater treatment plants** and **sewerage systems**
- Implement **landfill and waste management** processes
- Monitor **soil and water pollution** levels

## TRANSBOUNDARY COOPERATION

- **Jointly with the Government of Iraq**, engage in **multilateral negotiations with neighboring countries** to achieve an equitable **water sharing** agreement in the Tigris-Euphrates basin
- Promote a **common-pool approach** for the integrated management of water resources at the regional and federal level

## BACKGROUND

Despite a semi-arid climate and significant variations among the three governorates under KRG administration, the KRI has a relatively large amount of both surface and groundwater, benefiting from the tributaries of the Tigris River, its plentiful natural springs, and perhaps most importantly, its sizeable precipitation, with annual rainfall rates between 300 and 1000 mm, well above the national average of 216 mm (FAO 2003; UNDP 2010). If Iraq is confronting the existential threat of spreading desertification, overall the fertile valleys of KRI have been less impacted than other parts of the country.

According to government statistics, 95% of urban households and 62% of rural households have access to improved water sources (MoP 2013: 22). A country-wide survey of domestic water usage shows that half (50.4%) of respondents living in northern Iraq do not experience supply problems, while only 4.5% and 5.9% of respondents in central and southern regions, respectively, gave the same answer (CSO 2016: 78). Generally speaking, the survey highlights a less acute perception of water scarcity in the north. Moreover, only a minority (albeit a substantial 41.2%) agrees that there is a need to improve hygienic conditions and sanitation, in contrast to the national figure (70.9%) (CSO 2016: 96).

However, water availability, access, and sanitation in the region are below international standards. Furthermore, water resources are increasingly under stress due to both climate change and bureaucratic mismanagement.

Since 2007, Iraq has been suffering from recurrent droughts, worsening desertification, and deteriorating standards of living in large parts of the country. In the KRI, reduced rainfall and snowfall have rapidly resulted in declining water levels, including in springs and shallow wells, particularly in the driest districts of Erbil and

Dohuk governorates (UNDP 2010). Officials from both the UN and the Ministry of Agriculture and Water Resources (MoAWR) report that groundwater levels have dropped by about 30-40 meters over the last ten years. Such a dramatic figure reveals the exposure of the KRI to environmental vulnerability and the need to immediately put mitigation measures in place.

Yet mismanagement may be an even more serious threat than climate change. Water shortages are frequently the result of misallocation or neglect. Scarcities are indeed produced or exacerbated by a combination of political and socio-economic factors, which include: (1) insufficient environmental regulation and a lack of law enforcement; (2) aging and poorly maintained distribution networks; (3) inadequate sanitation infrastructures (in particular wastewater treatment and sewerage systems); and (4) limited ecological awareness.

Despite recent improvements to the water network's infrastructure, the quality of services remains poor (World Bank 2015: 103) in terms of the continuity of services, water pressure, and access to clean water (cf. MoP 2012: 30). Quite tellingly, the Ministry of Municipalities and Tourism (MoMT) estimates that losses account for approximately 50-60% of distributed drinking water due to leakages or illegal private connections to the public grid. Reportedly, only central neighborhoods in Erbil are served with water 24 hours a day, although disruptions and water rationing are common everywhere in the region, especially during the dry season. Most dams, mains, field drains, and pumping stations are in need of maintenance or repair. The marginalization of rural areas is an additional concern.

Furthermore, over-exploitation and misuse critically affect the regional water balance. The daily consumption per capita in urban areas

reached 375-400 liters in 2011 (MoP 2012: 16), which is considerably higher than the worldwide average for middle-income countries, which stands at 162 liters (World Bank 2015: 105). Moreover, the unauthorized drilling of wells in concert with traditional irrigation methods pose the risk of depleting underground aquifers.

Two other factors should be taken into consideration. First, the KRG is not currently adapting its policies to demographic pressures and urbanization. Population growth and higher urban consumption lead to additional water demand, which appears to exceed the current institutional and infrastructural capacity in the region (cf. Heshmati 2009: 107-108). The influx of Syrian refugees and internally displaced persons (IDPs) places further strain on social services and public utilities in the host communities. According to UNDP, the provision of humanitarian assistance to refugees and IDPs increased the domestic water demand by nearly 15% in 2015, with the largest impact observed in Duhok and Erbil (UNDP 2015: 5).

Second, upstream water use and damming in neighbouring countries have markedly reduced the volume of water entering the region through international waterways. According to UN estimates, “the expected loss in the average water discharged to the two main sources of surface water in Iraq – Tigris and Euphrates – will

decrease in the year 2025 to about 50-80% of the water discharged in 2009” (UNDP 2010: 11). Without an agreement governing and empowering water cooperation in the transboundary basin, hydraulic projects underway in upstream countries raise important concerns for downstream communities in Iraq.

The KRG recognizes water security as a priority. For example, the Socio-Economic Infrastructure Needs Assessment (SEINA) – undertaken by the Ministry of Planning (MoP) in collaboration with UNDP – has devoted about one-third of total investments for the 2013-2020 period to water, sanitation, and environment (MoP 2012). They specifically recommended water conservation measures (such as tariffs and metering programs) to tackle over-consumption and the establishment of sewage treatment plants.

However, regional institutions have been slow to implement water policies and invest in infrastructure. Given that the aforementioned adverse trends are likely to worsen in the short and medium terms, the KRG needs to take a more resolute lead in designing adaptive strategies to a dynamic situation.

Consequently, this report focuses on five major issues with the aim of suggesting sustainable pathways to reform the water sector.



Photo: Nabil Musa

# MONITORING INFORMATION SYSTEM

## POLICY RECOMMENDATIONS

- Implement and improve hydrogeological data collection and analysis procedures in line with international standards
- Develop a monitoring framework of surface and groundwater resources based on a geo-referenced central database and dissemination units
- Train specialized personnel to survey and map hydrogeological resources in the KRI

The lack of systematic data collection is a major weakness for water management in the region. Indeed, limited and inaccurate information translates into operational and managerial issues, affecting decision-making over the entire water cycle.

Because there are few gauging stations and observation wells monitoring surface and groundwater levels, there are no precise estimates of hydrogeological resources in the KRI. In particular, knowledge of the storage capacity of deep aquifers is not available.

In fact, insufficient background information undermines the adoption of well-informed decisions and, consequently, the efficient allocation of water supply among users. For instance, MoAWR reported 39208 wells in 2011 (Heshmati 2009: 48; UNDP 2015: 59), with half of them unauthorized, although a clear-cut distinction between legal and illegal ones is actually blurred. According to the General Directorate of Water Resources, the total number of wells has peaked at around 44,000-46,000.

These figures highlight the alarming and unrestricted over-reliance on groundwater, particularly for agricultural and industrial usages, which is reducing the underground water table to critically low levels. However, the ministerial inventory does not even include reliable data on groundwater withdrawals, thus preventing the enforcement of an effective regulatory framework.

Developing a central database to be updated and refined on a regular basis is a fundamental requirement for policy-making and research in the water sector. As part of an overall reform strategy, the KRG has initiated a program to centralize data currently siloed in different ministries, departments, and levels of government. Such long overdue efforts to support and improve water management should be identified as an essential strategic goal.

In this respect, the nearly-finalized “Advanced Survey of Hydrogeological Resources in Iraq” (ASHRI) – carried out by UNESCO and a consortium of international consultants with the financial support of the European Union – could be the cornerstone for setting up standard procedures for data collection and analysis. Indeed, water authorities in Baghdad and Erbil may take advantage of ASHRI hydrogeological database and planning tools to survey, map, and monitor groundwater resources, thus filling in the existing gaps.

Without a centralized information system, any attempt to release a comprehensive water policy would be short-sighted at best. At the operational level the KRG should train and task specialized personnel to continuously upgrade and update a geo-referenced database of water bodies. It is notable that there is still no Geographic Information System (GIS) section in the MoAWR.

# INSTITUTIONAL CAPACITY BUILDING

## POLICY RECOMMENDATIONS

- Institutionalize coordination mechanisms for data exchange and water use between KRG ministries and other levels of government
- Centralize water planning and management in a dedicated Ministry of Water Resources

The establishment of an information system implies defining specific administrative functions and mandates. In this regard, the KRG institutional and policy framework for managing water resources lacks coordination mechanisms. Whereas MoP is responsible for planning and overseeing the regional development strategies, the water sector falls under the direct authority of MoAWR and MoMT. Thus it is clear that policies of other ministries may have an indirect impact on water resources management.

For example, the hydropower generation from the Dukan and Darbandikhan dams accounts for a large share of electricity production in the KRI, while at the same time electricity is needed to distribute water and operate wells. Likewise, upstream activities (i.e. exploration and production) in the oil and gas industry usually require water injection to fully exploit the potential of oilfields, to the extent that in certain areas 3-4 barrels of water are necessary to produce one barrel of oil.

The so-called water-energy nexus emphasizes how water is an essential input for multiple users and sectors. Accordingly, following the unsuccessful proposal to establish a national water council, the KRG created a high-level

regional water committee, convened by the Council of Ministries and comprising one representative (typically a general director) from each ministry. An inter-ministerial agreement is indeed an essential asset of water governance, whereby the committee reviews the water demands of various sectors in line with overall programs.

Nevertheless, inter-ministerial procedures of coordination (such as mechanisms of data exchange) are hardly formalized, let alone implemented, leaving the matter to the discretion of high officials in most cases. For instance, none of the MoAWR staff attends meetings between the Ministry of Natural Resources (MNR) and operators in the oil and gas industry. Even if international oil companies (IOCs) comply with a MoAWR procedure to gain permission for drilling wells and using water, currently IOCs are not asked to deliver data on deep water at their disposal. In fact, the technological expertise of IOCs might provide an added value to explore and map underground aquifers, a burdensome task assigned to regional authorities who must manage high associated costs.

Lack of communication and decentralized information processes are observed not only between different ministries, but also between departments and offices within the same ministry. At the end of the policy chain, these information and institutional asymmetries contribute to a sub-optimal distribution of water between household, agriculture, and industrial uses.

Therefore, the integration and centralization of water management institutions is highly recommended as a way forward to achieve a more balanced allocation of increasingly limited resources.

# GROUNDWATER OVER-EXTRACTION

## POLICY RECOMMENDATIONS

- Monitor groundwater withdrawals and enforce strict regulation on wells drilling
- Introduce metering and water pricing to limit wasteful overconsumption
- Incentivize the adoption of water-saving measures and advanced irrigation systems
- Invest in small-scale decentralized projects to increase water supply and recharge groundwater

Among MoAWR's several missions is the protection of groundwater resources and the development of surface water supplies for irrigation and water harvesting projects. Nonetheless, as mentioned above, the extraction of groundwater for agricultural purposes is growing at an unsustainable rate, meaning that withdrawals exceed the natural recharge rate of underground aquifers.

Despite declining production, the agricultural sector still siphons off large amounts of freshwater for farming and animal husbandry. Old irrigation systems lead to over-extraction of groundwater, both in the northern mountainous areas due to insufficient rainwater storage and in the southern plains where reduced precipitation affects rain-fed agriculture. Besides lowering the water table, over-pumping also results in increased soil salinity in the long term.

According to ministerial sources, over 70% of farmers rely on shallow wells, in an environment in which regulation of groundwater exploitation is vague and largely unenforced. Indeed, monitoring is based on a few observation wells, while information on a larger scale (i.e. catchment basin

scale) is not available. Therefore, the implementation of metering systems and the introduction of progressive tariffs going towards cost coverage ought to be mandatory measures to reduce waste and mismanagement. Furthermore, ineffective control is coupled with an information gap, which leads to situations where users are usually unaware of the existence of regulation. As MoP acknowledged, "there is a general neglect or avoidance of Environmental Impact Assessments (IAEs) for most public and private projects" (MoP 2012: 31). Accountability and transparency are necessary to educate users and better communicate regulations.

A modified water law, currently stalled in the Kurdistan Parliament, would reportedly remedy some of these limitations, although the on-going suspension of parliamentary activities has halted the legislative process. However, drawing attention to the consumption side by imposing sanctions would be ineffective without significant investments in water-saving technologies and trainings in advanced irrigation methods. Traditionally, farmers in the KRI use water-intensive flood irrigation, while drip and sprinkler methods are uncommon due to high initial costs and expensive maintenance. However, switching to the latter would substantially boost water usage efficiency and crop productivity, and should therefore be encouraged with trainings and financial aid. Moving subsidies from wheat production to irrigation and water harvesting systems, for instance, would prioritize a policy shift towards sustainable and resource-efficient management.

Such interventions have already been taken into consideration by KRG officials but cannot be further delayed. In particular, stricter requirements should be given for licensing the

drilling of wells. For instance, along with the submission of IAEs, industrial users should also produce a numerical model to prove the sustainability of the well. At the same time, identifying conservation and recharge areas should be pursued to replenish underground aquifers and shallow wells.

On the supply side, in 2014 MoAWR's General Directorate of Dams and Reservoirs completed a master plan to significantly increase water storage and power capacity by building up to 11 multipurpose large dams. The financial crisis has prevented funding this large-scale infrastructural scheme to date, although MoAWR is attempting to finalize public-private partnerships to bring forward minor projects. Nevertheless, it is questionable whether the construction of large dams is an appropriate solution to actual and potential water crises in the KRI. Aside from potentially negative environmental and socio-economic repercussions, these prohibitively expensive large-scale infrastructure projects would not adequately tackle or solve shortages in the region, which are caused by over-consumption and poor management rather than scarcity per se. On the contrary, small-scale decentralized projects (such as rain harvesting ponds, micro and submerged dams, water recycling plants) are cost-effective and high-reward alternatives that can be undertaken even during a time of fiscal austerity.

## WATER QUALITY

### POLICY RECOMMENDATIONS

- Promote awareness campaigns on **water consumption**
- Maintain, repair, and expand **water distribution networks**, especially in rural areas
- Establish **wastewater treatment plants and sewerage systems**
- Implement **landfill and waste management processes**
- Monitor **soil and water pollution levels**

The KRG should prioritize and capitalize on demand-side management practices. In addition to water pricing systems and irrigation charges, awareness campaigns and educational programs should be promoted to incentivize citizens to embrace water conservation practices. Indeed, especially in urban areas, the misuse of water is a major source of waste and pollution.

Moreover, the problem of sewerage must become a high priority. In the KRI, not a single drop of sewage water has been purified to date. In fact, there are no sewage and wastewater treatment plants in the semi-autonomous region. With the exception of leaky and incomplete sewage collectors, municipal and industrial untreated wastewater is released into waterways, seriously contaminating soil, water, and eventually the food chain. As water reserves dwindle, deteriorating quality due to pollution further reduces available supplies.

Exposure to heavy pollutants is a devastating threat to human health, which should compel the KRG to invest in infrastructure and to set strict guidelines based on scientific evidence. For instance, faced with soaring waterborne diseases and cancer cases, the Ministry of Health verified

high pollution levels and toxic chemicals in Lake Darbandikhan, which receives large amounts of industrial waste from the Sulaymaniyah area through the Tanjaro River (Othman 2017).

Over the years, negligence has prompted dangerous degradation of the ecosystem, disrupting traditional livelihoods in rural areas and poisoning the water supply. This situation is exacerbated by the use of fertilizers and pesticides, poor regulation of industrial activities, and the lack of landfills and waste management. As in the Tanjaro area, there is evidence throughout the region of leachate seeping out of dumpsites and discharging into rivers and farmland. Hence, strong government intervention is required to convert open dumps into controlled landfills, monitor pollution levels, implement waste and leachate treatment, establish recycling programs, and provide compensation to affected communities.

Oversight of practices in the oil and gas sector should be particularly strengthened. Balancing hydrocarbon exploitation and environmental sustainability is imperative. Whereas the MNR reassures that IOCs meet environmental and safety international standards, private service companies (from small-size distillation units to medium-size refineries) running midstream and downstream activities often operate without oversight. Field visits and in-depth interviews revealed that the refining processes do not comply with basic safety standards in most cases. Indeed, it is not unusual to find oil spills leaking into irrigation canals and agricultural land around the projects run by these companies.

## TRANSBOUNDARY COOPERATION

### POLICY RECOMMENDATIONS

- Jointly with the GOI, engage in multilateral negotiations with neighboring countries to achieve an equitable water sharing agreement in the Tigris-Euphrates basin
- Promote a common-pool approach for the integrated management of water resources at the regional and federal level

With 60.8% of its total renewable water resources originating from outside its territory (FAO 2014), Iraq's downstream position in the Tigris-Euphrates river system makes the country vulnerable to upstream reductions of water inflows. Because waterways do not conform to political boundaries, the optimal allocation and utilization of water resources in a transboundary hydrogeological basin would require cooperation among riparian countries. However, recent history demonstrates the absence of coordination over shared rivers and the non-compliance of upstream countries with international treaties, namely the UN Convention on the Law of the Non-navigational Uses of International Watercourse. Indeed, unilateral hydraulic projects in Turkey and Iran display no consideration for downstream actors. Such development plans have a detrimental impact on water supply in Iraq. Due to river damming and increased withdrawals, Euphrates and Tigris inflows have significantly decreased in less than a decade, and this downward trend is expected to worsen upon the completion of damming projects currently underway.

Water security in the KRI is particularly affected by the Iranian construction of several dams on the tributaries of the Tigris River and the diversion of the Sirwan River, which enters the

region in the Halabja Governorate and feeds Lake Darbandikhan. The full completion of these projects will cause a massive water loss to the extent that the Darbandikhan Dam would no longer be able to provide hydroelectric power and irrigation (ICSSI 2016). Surface water depletion would also be likely to aggravate groundwater exploitation and displace local communities. The drastic cut of the Little Zab and Alwand rivers inflows by Iranian authorities, however temporarily, in late June showed the dire humanitarian, environmental, and economic effects of externally induced water shortages. By the same token, the steady advancement of the huge South-Eastern Anatolia Project (GAP) in Turkey will indirectly affect the regional water balance since looming under-supply in the rest of Iraq will undoubtedly lead to GOI demands for the KRG to release more water.

Against this gloomy backdrop, both Baghdad and Erbil have expressed concern about water policies of neighboring countries. Despite technical consultations, diplomatic efforts have fallen short of solving water disputes. It is worth

mentioning that these might place further strain on federal relations. For instance, following the abovementioned Iranian restrictions, the KRG ended up channelling less water to central and southern Iraq.

Therefore, central and regional institutions have a mutual interest in resuming a dialogue with riparian countries to achieve an equitable distribution of water resources. Specifically, the KRG should adopt a proactive approach to promote a basin-wide negotiation to be held under international oversight. Initiating a multilateral political process is indeed an essential prerequisite to reduce information asymmetries between parties and to pave the way to an inclusive water-sharing agreement.

At the same time, effective cooperation with GOI is central to implement a common-pool approach to water issues at the federal scale. From this perspective, for example, a joint GOI-KRG crisis group should be tasked to develop emergency preparedness and response plans.

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## A policy report

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