

Water Crisis in Al-Hasakeh

Assessment of Roles, Challenges, and Opportunities

A Policy Paper

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September 2024

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The Justice for Life is a Syrian non-governmental and non-profit organization that has been active in northeastern Syria since 2015. It has been registered in Germany since 2019 and in France since 2023. JFL's mission is to collaboratively promote human rights, dialogue, and freedoms in Syria through documentation, advocacy, access efforts, and capacity building for communities and organizations. JFL operates on two strategic tracks, which are reviewed and adjusted every three years. These tracks focus on enhancing justice and defending human rights in Syria, and advocating for the right of Syrians to participate in political and civil life.

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Introduction

The city of Al-Hasakah, located at the confluence of the Jaghjagh and Khabur rivers, is facing an unprecedented and ongoing water crisis, with all its attendant environmental, economic, and social repercussions. This crisis has coincided with water scarcity and years of conflict, threatening the most basic aspects of daily life and the prospects for a decent living. Despite hydrogeographic studies indicating that the governorate is rich in natural water resources, including both surface and groundwater, due to its location in the heart of the Tigris and Khabur basin, they also point out that climate change, lack of rainfall, and geopolitical factors (both external and internal), before and after the armed conflict in 2011, have played a significant role in transforming the problem of water scarcity into a real crisis, portending environmental, health, and social disasters.

The crisis in northeastern Syria is primarily attributed to what is known in academic studies and human rights organizations as «water conflict,» particularly concerning freshwater resources. This conflict involves the control of water resources and associated facilities, using them as a strategic tool “Water as a Weapon” to demonstrate power and influence among conflicting parties and states¹. States vary in their methods of employing this type of violence internally and externally, whether directly or indirectly. Academic studies distinguish between two types of violence in this context: accelerated violence, associated with urban conflicts and the destruction of cities “Urban Warfare and Urbicide² and slow violence³, which is closely linked to infrastructural violence⁴. Prominent practices include targeting water infrastructure, repeatedly cutting off water supplies from rivers, tributaries, and valleys by upstream states under the pretext of implementing development projects or building temporary dams and discharging untreated wastewater into rivers and their tributaries near borders, among others. These practices converge in the case of northeastern Syria, as this research paper shall illustrate, becoming a daily reality with implications for the future of the region, which has been shaped by conflicts in an unclear manner.

In the context of the ongoing armed conflict and continuous military operations conducted by conflicting parties in northeastern Syria, civilian infrastructure and facilities have been directly targeted alongside military sites. This targeting has included water, energy, and oil facilities essential for the daily lives of local residents. According to reports from multiple human rights and humanitarian organizations, including Human Rights Watch in February 2024⁵, these actions have significantly impacted the lives and survival of the population. The situation has been exacerbated by successive waves of internal displacement. According to the same report, the population of Al-Hasakah governorate swelled from less than half a million to nearly two million by the end of 2019. Displaced individuals currently reside in various temporary accommodations, including homes, schools, and damaged buildings in urban and rural areas, as well as informal camps. This surge has led to an unprecedented increase in demand for water resources. Consequently, the frequent shutdowns of the Allouk station since 2019, which is the main water source for most residents and displaced people in Al-Hasakah city, its suburbs, and surrounding camps, were the breaking point, causing an unbearable deficit. These water challenges have affected all aspects of life, causing widespread negative impacts on both local residents and displaced individuals. This includes partial paralysis of water-related economic activities, especially in the agricultural and livestock sectors, which are the main sources of income for the region's population. Additionally, it has led to the depletion and pollution of natural resources and the deterioration of conflict-ridden fragile infrastructure and built environments. In this context of diverse and concurrent challenges, emergency solutions and alternative systems have emerged, aiming to cover the minimum water deficit and secure the basic daily water needs. These solutions primarily focus on transporting water via tankers (both public and private) from various and newly developed sources, such as wells and local and neighboring springs, which are relatively distant from direct conflict zones. They also include establishing projects to draw water from diverse sources, whether from rivers (with the Euphrates water diversion project being one of the most recent)

¹Gleick PH. Water as a weapon and casualty of armed conflict: A review of recent water-related violence in Iraq, Syria, and Yemen. *WIREs Water*. 2019; 6:e1351. <https://doi.org/10.1002/wat2.1351>

²Abujidi, N. (2014). in *Palestine: spaces of oppression and resilience*: London : Routledge.

Amin, A. (2014). *Lively Infrastructure*. *Theory, culture & society*, 31(7-8), 137-161. doi:10.1177/0263276414548490

Campbell, D., Graham, S., & Monk, D. B. (2007). Introduction to *Urbicide: The Killing of Cities?* *Theory & event*, 10(2), N_A.

Graham, S. (2003). *Lessons in Urbicide*. *New Left Review*.

³Nixon, R. (2011). *Slow Violence and the Environmentalism of the Poor*: Harvard University Press.

⁴Otsuki, K. (2024). *Infrastructural violence and its temporalities*. In O. Coutard & D. Florentin (Eds.), *Handbook of Infrastructures and Cities*. Cheltenham, UK: Edward Elgar Publishing.

⁵<https://www.hrw.org/ar/news/2024/02/09/turkiyes-strikes-wreak-havoc-northeast-syria>

or from stations relying on drilling local wells. However, unplanned drilling and excessive, unregulated exploitation of wells have led to a severe decrease in the level and quality of groundwater, an increase in salt concentration, and the drying up and filling of some wells. Moreover, most of the water transported from wells and springs, which are contaminated by untreated wastewater, lacks safety and quality standards, reaching the area's residents and causing severe health effects and the spread of various diseases and epidemics. These solutions fail to meet the minimum water needs and severely lack extensive and in-depth hydrogeological studies, integrated urban planning that includes infrastructure, economic feasibility studies and risk assessment, and sustainable thinking that goes beyond emergency solutions. Consequently, the factors causing the water crisis to intersect with the limited scope of emergency solutions, portending humanitarian and environmental disasters that are indifferent to political borders.

In light of current developments and the need to adopt a sustainable approach, this paper aims to analyze the dimensions of the water scarcity problem and urgent solutions in the city of Al-Hasakah. The research paper is based on the perspectives of representatives from various segments of civil and local society, as well as representatives from relevant administrations. It also relies on comparing these views with diverse media and academic reports and sources. This paper provides a comprehensive analysis of the multiple and interconnected effects of the water crisis, focusing on its natural, geopolitical, environmental, health, urban, technical, structural, economic, and social implications, as well as other relevant aspects. The paper builds on the results of this analysis to present a set of recommendations and proposed solutions to address the water crisis in Al-Hasakah city. These recommendations aim to improve water resource management and enhance long-term sustainability, taking into account local conditions and current challenges. It also highlights the importance of cooperation between various stakeholders to achieve tangible and effective results in addressing this vital crisis.

Relevance & Significance

The interventions addressing the water crisis in Al-Hasakah city rely on inconsistent and sporadic emergency solutions, with a lack of integrated, sustainable medium or long-term solutions. According to a joint report prepared by the organization “Syrians for Truth and Justice” in collaboration with civil and humanitarian organizations working in the field of human rights in the Syrian context⁶, the main reasons for the exacerbation of the water scarcity problem to the point of complete deficit in northeastern Syria are the unlawful practices of using water as a weapon by conflicting parties that violate international laws and norms, both local and international, intervening in the Syrian conflict, thus depriving the region’s residents, whether local community members or displaced persons, of their most basic rights to access water. This deprivation in the region coincided with increased pollution and health deterioration outcomes resulting from poor sanitation and waste management in the area, as well as the discharge of wastewater and solid waste, and oil leaks into waterways (rivers, streams, and seasonal rain valleys) both internally and externally. This, in turn, was affected by the water deficit, frequent water shortages and interruptions, and the deterioration of water and sewage networks, if existent, in many areas. Consequently, most water bodies have turned into polluted swamps and hotbeds for the outbreak of various diseases (such as cholera) and noxious odors emanating from polluted water bodies. The repercussions of water scarcity and pollution have, as such, extended to cause severe disruptions and significant effects on the agriculture and livestock sectors, which have been the backbone of food security and the main source of income for the population in the region for decades.

However, reducing the solution to the water crisis to a mere political resolution is problematic in itself. The roots of the water scarcity crisis in the region extend to the period before the events of 2011 and the subsequent military operations. It is crucial to examine this crisis in the context of a complex set of interrelated factors, including the notable climate change, especially during recent years of conflict, and the marginalization strategies adopted by successive governments, both Turkish and Syrian, in dealing with the northeastern region of Syria. These strategies aimed to impose power, security, and economic control over the region’s natural resources, in addition to various social engineering practices targeting its ethnic components, particularly the Kurds. These practices fall within the framework of what is known in development and conflict studies as infrastructural power⁷. This form of power manifests in governments implementing specific infrastructure projects, considered essential for the life and development of communities, with the aim of tightening control over entire regions, especially those geographically distant from the center of governance and whose social components may pose a potential challenge to state sovereignty. Consequently, these practices allow governments to control the level of investment and development in line with their primary political, security, and economic objectives. In the case of northeastern Syria, the control and targeting of water resources, water infrastructure, agricultural sectors, agro-industry, and associated facilities such as gas, oil, and electricity fall under the most important practices of infrastructural power exercised by governments before and after the conflict. Since the 1960s, successive Syrian governments have applied domination strategies through various projects focusing on water resources, particularly groundwater, and their potential in achieving self-sufficiency in food security. This was primarily done through the development of the agricultural sector and livestock breeding, to produce main crops such as wheat, grains, cotton, animal products, and animal feed that supply the industries built upon them in the center and export them whether as crops or products. Consequently, the region transformed into what is called Syria’s “food/breadbasket”. These development projects included the construction of dams, desalination and power plants, the establishment of villages to house farmers, facilitation of agricultural loans, development of skills related to these projects, and other forms of support in geographic areas strategically aligned with the government’s security and economic objectives⁸.

⁶<https://stj-sy.org/ar/مراسلة-مشتركة-إلى-الإجراءات-الخاصة-في/>

⁷Mann, M. (1984). The autonomous power of the state : its origins, mechanisms and results. *European Journal of Sociology / Archives Européennes de Sociologie / Europäisches Archiv für Soziologie*, 25(2), 185-213. Retrieved from <http://www.jstor.org/stable/23999270>

Mann, M. (2008). Infrastructural Power Revisited. *Studies in comparative international development*, 43(3-4), 355-365. doi:10.1007/s12116-008-9027-7

However, the developmental aspect of these projects did not encompass all other sectors and infrastructure that directly or indirectly contribute to the sustainability of water resources, maintenance of environmental balance, and protection of the area from pollution. The agricultural sector in Syria consumes approximately 90% of water usage⁹, which is considered scarce in the northeastern regions of the country. These areas often face severe drought periods, as occurred in 2007-2008, leading to dire consequences for water resources, particularly groundwater, and related economic activities. For instance, there was a lack of focus on establishing and developing safe methods, rules, and frameworks for rainwater harvesting, rationalizing water use in irrigation, safe disposal of agricultural and wastewater from both civil communities and industrial and health facilities, or solid waste recycling. This negatively impacted groundwater levels, quality, and the pollution rate seeping into it from the soil. Socially and economically, the geographical site selection for many projects, such as the creation of Assad Lake, led to the (forced) evacuation of entire areas from their inhabitants under the banner of development and modernization. Residents were relocated to other areas and villages far from their original regions without adequate compensation, and their new residential areas failed to fulfill the promised modernization expectations. The infrastructure and civil facilities in their new areas were not sufficiently developed, especially in the education and health sectors, and loans and projects were associated with discriminatory policies between different ethnic components. Furthermore, the state's centralization of agricultural industry development and related decisions and policies limited the completion of the investment cycle and investment thinking in the region. This restricted the area's ability to grow and develop in the agricultural sector and confined individuals within the economically struggling agricultural class. These practices led to the creation of a phenomenon referred to in literature as "uneven geographical development"¹⁰ between the periphery and the center. This is a state of geographical imbalance in the region manifested in resource exploitation, limited and directed development policies, weak infrastructure and civil facilities, inadequate state-provided services, and unmet needs across various aspects of life. It also led to social and economic fractures, in addition to overlapping and diverse waves of rural-urban migration in search of better conditions and opportunities¹¹.

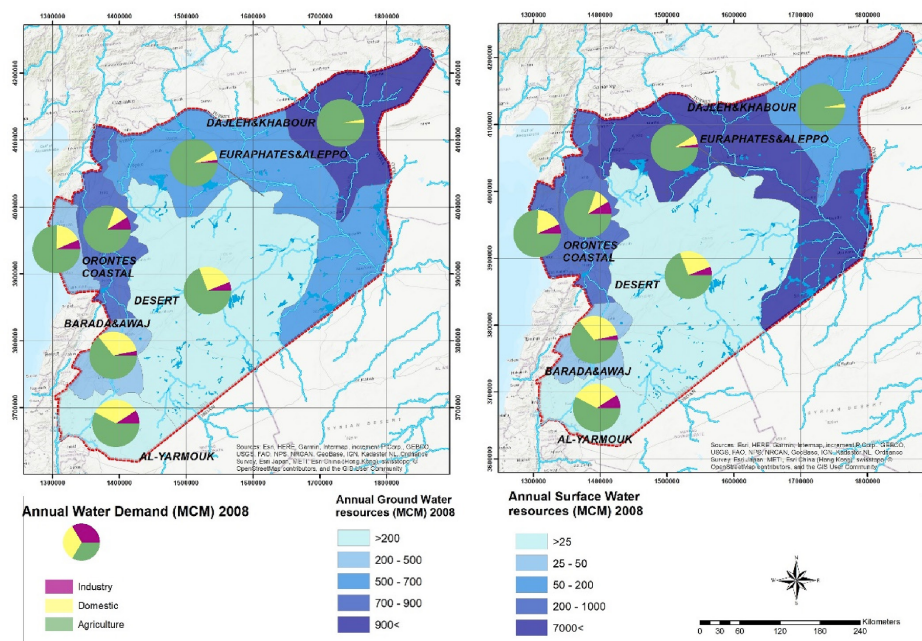


Figure 1: Water needs by sector and distribution of surface water concentration (on the right) and groundwater (on the left) in Syrian geography (Mourad & Berndtsson, 2012 in Baba, Karem & Yazdani, 2021).

⁹Mourad, K. and Berndtsson, R. (2012) Water Status in the Syrian Water Basins. *Open Journal of Modern Hydrology*, 2, 15-20. doi: 10.4236/ojmh.2012.21003.

¹⁰Harvey, D. (2005). *Spaces of neoliberalization: towards a theory of uneven geographical development* (Vol. 8). Franz Steiner Verlag.

Hudson, R. (2007). Regions and regional uneven development forever? Some reflective comments upon theory and practice. *Regional studies*, 41(9), 1149-1160.

¹¹Turner, E. J. *Water and the Capitalist Resource Frontier*.

Consequently, it is not surprising that the region suffers from threats and impacts of various geopolitical fluctuations, having linked the foundations of daily life and growth opportunities to a sector that primarily depends on water coming from another country. Despite the existence of Protocol No. (30069) signed in July 1987 between the Syrian and Turkish governments regarding the sharing of border waters¹², the Turkish government has not hesitated to exploit its position as an upstream country. Turkey has used the waters of the Euphrates and Tigris rivers, along with their permanent and seasonal tributaries originating from its territory, as a strategic weapon and tool to impose its control and influence the region's development. It has justified these actions by claiming to protect its national security from "Kurdish rebels" concentrated in the border areas. These practices predated the events of 2011 and continued thereafter, escalating to levels of violence that surpass the frequent water cuts to target the region's limited infrastructure. Therefore, the targeting of the Allouk station and the repeated interruption of its water supply and power sources that ensure its operation have led to a severe water deficit in the region that is difficult to overcome. In the absence of an international political solution, which does not appear to be on the horizon in the near future, local administration institutions, humanitarian organizations, and civil society organizations resort to short-term emergency solutions to address the humanitarian catastrophe resulting from water scarcity. These solutions include transporting water by tankers from wells and surface water sources, transporting water from desalination plants that directly rely on rivers, or drilling new wells. However, the health, economic, and environmental implications of these solutions, as previously mentioned, transform water into a scarce and increasingly expensive economic commodity. Furthermore, the fragility of deteriorating infrastructure, geopolitical pressures, changes in donor policies, the administration's economic inability to meet needs, and the resulting social impacts are all factors that portend interconnected crises and humanitarian and environmental disasters that do not recognize borders.

Therefore, the relevance of this research paper stems from its role as part of a broader project led by the Justice for Life organization, which aims to support human rights and projects that enhance security and stability in the region. The paper's main purpose is based on the Human Rights Council resolution (15/9)¹³ regarding rights related to water and environmental security, considering them as fundamental and pivotal structures for achieving a decent and humane standard of living, associated with an acceptable level of physical and mental health and human dignity. These rights are considered among the most basic, non-discriminatory human rights, ensuring equal access to sufficient and affordable clean water, and providing safe sanitation services in accordance with the United Nations General Assembly resolution (64/292)¹⁴. The practical significance of the paper derives from its ability to present a draft roadmap for the relevant authorities and their civil partners to resolve the crisis in Al-Hasakah city. This paper distinguishes itself by being based on ideas and suggestions from residents of Al-Hasakah city, representatives of various segments of its civil and local community, and representatives from different administrations. It aims to establish a local framework for the problems, understand the effectiveness of various responses and challenges, and develop multi-stage and multi-topic recommendations, as well as practical /technical solutions.

In addition, this type of recommendation, based on dialogue and focus group sessions, contributes to opening channels of communication between participants. It also strengthens their role in thinking and proposing solutions and ideas based on local context and capacities, through peaceful and creative ways to express difficulties and provide practical solutions. This process also contributes to raising social responsibility and collective awareness among different groups. This is achieved through the exchange of opinions and ideas from multiple perspectives - administrative, financial, practical, and gender-related - which helps in considering various aspects of the crisis. Consequently, serious engagement with the outcomes of these dialogue sessions contributes to building bridges between different communities and reducing tension and congestion. It also reduces the resort to extremism and armament to obtain the minimum requirements of life, which are clean water and safe communities. Therefore, the recommendations on which the paper is based respond to the needs of the region and the population to mitigate the effects of the current complex crisis. They also propose more sustainable medium and long-term solutions, stemming from the local context and taking into account changing geopolitical factors. These recommendations align with the trend towards the early recovery phase, which is now attracting the attention of the international community.

¹²<https://treaties.un.org/doc/Publication/UNTS/Volume%201724/v1724.pdf>

¹³<https://documents.un.org/doc/undoc/gen/g10/166/31/pdf/g1016631.pdf>

¹⁴<https://documents.un.org/doc/undoc/gen/n09/479/33/pdf/n0947933.pdf>

Objectives

Given the increasing water challenges in Al-Hasakah city and their multidimensional humanitarian and environmental impacts on local residents and displaced persons, as well as on the local and regional geographical scale, this paper aims to:

•Analyze the water crisis and its effects in the local context through:

- Examining the natural factors causing water scarcity in the region.
- Evaluating geopolitical factors and internal and external strategies in employing water as a control tool before and after 2011, which led to the transformation of the water problem into an acute shortage.
- Assessing the crisis implications related to damages to infrastructure and civil facilities.

•Evaluate the efficiency of emergency solutions to address the water crisis:

- Categorizing these solutions and assessing their sustainability.
- Identifying water sources used in these solutions, evaluating their quality, and monitoring mechanisms.
- Analyzing the environmental impacts of these solutions.
- Identifying financial, administrative, and social obstacles hindering the effectiveness of these solutions.

•Review the implications of the water crisis on economic and living aspects:

- Identifying causes of pollution, disease spread, and health consequences resulting from the water crisis.
- Analyzing its direct and indirect effects on economic and social life in Al-Hasakah city and the surrounding formal and informal camps.

•Formulate recommendations and propose short, medium, and long-term solutions:

- Emphasizing the importance of political solutions and approaches to prevent the exploitation of water resources and food security as control tools.
- Proposing frameworks to organize and improve the effectiveness of urgent solutions, ensure their quality, and limit their impact on groundwater reserves.
- Providing an outline for a comprehensive research study including in-depth hydrogeological studies, economic and developmental feasibility studies, and environmental risk assessments.
- Identifying necessary steps to develop local infrastructure and enhance human capacities in the region, considering the dynamic changes of the conflict.

Data Sources

To prepare this research paper and formulate recommendations, the following data analysis was relied upon:

1-Primary Data: This data was collected through three direct physical dialogue sessions held in July 2024 in Al-Hasakah city. Discussion axes were designed in the form of semi-structured group interviews (focus groups), with open-ended questions within a specific framework for each axis. This methodology allowed for maintaining a flexible structure for the sessions, permitting question reformulation and follow-up questions suitable for various participant categories. This flexibility resulted in obtaining diverse qualitative answers, leading to clarification of different perspectives on the water crisis and encouraging the sharing of diverse ideas and solutions. Twenty-four individuals participated in the three sessions (an average of 8 people per session), and discussions were conducted in Arabic.

Participant data confidentiality was maintained, with their consent obtained for audio recording for internal use, photography, and data utilization. The sessions were facilitated by a team from the Justice for Life organization, who are members of the local community in northeastern Syria. Participants were diverse, including administrative and technical representatives from committees affiliated with the Autonomous Administration in the Water Directorate, representatives from the local community (including notables, tribal sheikhs, and citizens from the city's residents), as well as representatives from civil society (from local organizations operating in the area). Gender balance was considered in all sessions. Each session lasted approximately 4 hours, during which participants presented their observations, opinions, knowledge, and visions on the topic openly. Several main axes were focused on, which will be detailed later in the results section.

2-Secondary Sources: These included a diverse range of reports related to the water problem in Al-Hasakah city, issued by international and local human rights and humanitarian organizations and observatories, including the Justice for Life organization. Published journalistic materials about this crisis were also utilized.

3-Academic Sources: Focus was placed on specialized studies and publications in the fields of water security, the use of water as a tool in conflicts, structural violence in war and conflict contexts, as well as issues of uneven geographical development and their implications.

Results

Based on the in-depth discussions conducted in the three focus group sessions, which aimed, as previously mentioned, to highlight the perspectives of the local community and local actors directly affected by the crisis, and following a comprehensive review of relevant reports, academic studies, and media publications, we have arrived at the following findings:

First: Identifying and Understanding the Water Crisis and Its Implications within the Local Context

Natural Factors, Climate Changes, and Food Resources:

- 1-**The water deficit in the city of Al-Hasakah cannot be separated from climatic factors, the nature of agricultural production, and the industries that relied on it, despite the city's geographical location on the banks of the Khabur and Jaghjagh rivers, and the designation of the city as the «Food/Breadbasket» in media platforms and social media pages. However, participants from various categories view this designation as inadequate, as it describes the entire Jazira region and the Tigris and Khabur basin, of which Al-Hasakah city is considered the poorest agriculturally in the region. Currently, it has transformed into what resembles an «empty basket».
- 2-**Local experts attribute these results to factors associated with climate change. They point to the region's history and stability in terms of annual rainfall, which used to range between 200-300 mm, sufficient for rain-fed agriculture and replenishing non-renewable groundwater resources¹⁵. However, these rates have significantly decreased with changes and disruptions in rainfall patterns, dropping to less than 100 mm. This decline has led farmers to excessively use well water for irrigation, especially for cotton crops, resulting in the depletion of groundwater resources.
- 3-**In 2023, the governorate recorded precipitation rates 60% lower than the average documented in the previous three years, confirming the Global Drought Observatory warnings issued in 2021. This is considered one of the most severe droughts waves the region has experienced in 70 years, coinciding with unprecedented high temperatures¹⁶, which, as participants confirmed, increased the demand for water. Numerous international studies indicate that climate change will exacerbate the severity and frequency of drought events and alter rainfall patterns, with diverse impacts. These climatic changes are causing severe environmental effects and herald an impending wave of desertification¹⁷.
- 4-**Despite the generally low precipitation rates, the occurrence of frequent severe rainfall events is expected in the region. Al-Hasakah Governorate has experienced significant impacts from recurrent floods during the rainy seasons of the Khabur River, locally known as «Al-Tawaf,» with the most recent occurrence in 2024¹⁸. Consequently, participants expressed the need to develop and implement diverse rainwater harvesting techniques, which are currently uncommon in the region (except for simple household tanks). These techniques are viewed as a potential opportunity to contribute to mitigating the water scarcity problem.
- 5-**The severe water crisis, drought waves, and military campaigns have significantly impacted the agricultural sector, related industries, and livestock farming. The proportion of cultivated land decreased to only 54% and livestock farming to 39% in 2022 compared to 2008. Economic burdens, such as increased prices of seeds, fodder, energy, and other essential components for operating these sectors, have risen, accompanied by displacement and migration phenomena¹⁹. Participants observe that the water crisis has severely affected wheat cultivation, which previously had surplus production for export, and has driven people to consume imported corn. Cotton, one of the most important crops contributing to economic activity, requires large quantities of water and incurs high costs for fertilizers and pest control. Many farmers have found it difficult to cultivate cotton after the exacerbation of the water deficit due to the cutting off of the Euphrates River water and economic repercussions, which, according to one expert, has led to a disruption in the agricultural cycle. The country has transformed from a cotton exporter to an importer of used clothing.

¹⁵<https://water.fanack.com/ar/syria/water-resources/>

¹⁶GDO Analytical Report: Drought in Syria and Iraq – April 2021- <https://reliefweb.int/report/iraq/gdo-analytical-report-drought-syria-and-iraq-april-2021>

¹⁷Mourad, K. and Berndtsson, R. 2011. 'Potential water saving from rainwater harvesting in Syria'. Vatten67:113-117.

¹⁸<https://tishreen.news.sy/?p=894338>

¹⁹Water crises and its repercussions- <https://hdcorganisation.com/wp-content/uploads/2024/01/Water-crises-EN.pdf>

One participant expressed the dire situation by stating, “If it weren’t for secondhand clothing stores, half the population would be naked.” This situation has resulted in the complete deterioration of the agriculture-dependent economy and the closure of some facilities.

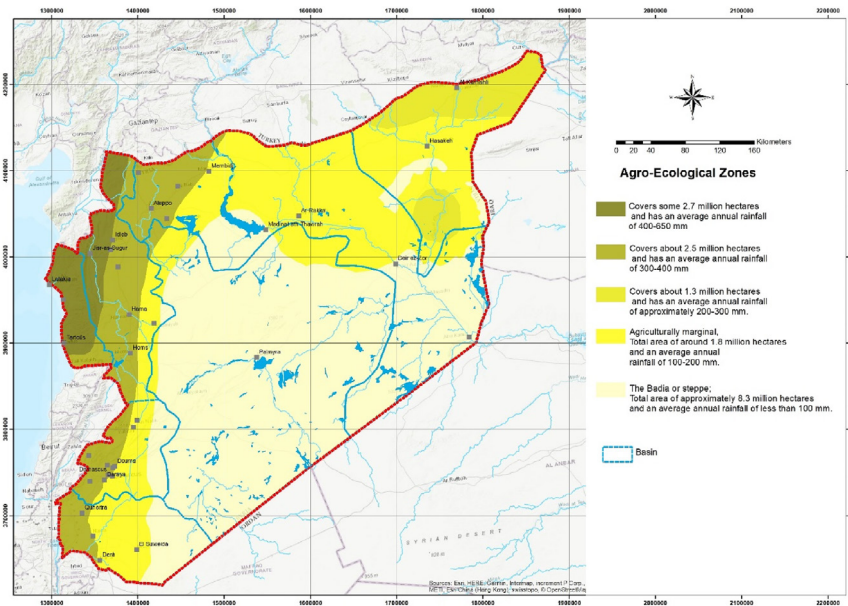


Figure 2: Distribution of Agricultural Lands and Average Rainfall in Syria (FAO, 2019 in Baba, Karem & Yazdani, 2021)

“Water Security” as a Political Leverage and Tool for Control and Dominance:

“Water security” is considered one of the most pressing concerns dominating discussions among humanitarian organizations and intermediary governments between disputing nations. These dialogues are regarded as powerful tools for maintaining peace and resolving conflicts related to the equitable distribution of transboundary water resources. However, in the Syrian case, political and military objectives, coupled with shifts in regional power dynamics, hinder the creation of suitable conditions for bringing parties together at the negotiating table. Such dialogue could potentially develop existing legal frameworks to neutralize water as a contentious issue, agree on fair distribution, and establish methods for implementing these frameworks.

1-According to session participants, although the water problem was severely exacerbated after the attack on the Allouk station, the water crisis in the region stems from escalating external and internal policies. The results have manifested in a complete inability to secure political and practical solutions. Participants emphasized that water distribution is contingent on fluctuating decisions issued by Turkey, the upstream state, where protocols—most notably the 1987 protocol²⁰—and laws remain subject to political fluctuations in the region and are used as leverage on international alliances.

2-Furthermore, Turkish development projects have significantly impacted the water flow levels and continuity in both Syria and Iraq. Opinions align with the Fanack Water Resources Studies report²¹, which considers the Southeastern Anatolia Project, known as “GAP” (Güneydogu Anadolu Projesi), announced by Turkey in 1977, and the construction of the Atatürk Dam, as among the most prominent projects that have greatly affected water flow from Turkish territories. This project is still being implemented by the Turkish government, including the construction of 22 dams on the two rivers in addition to 19 hydroelectric power stations. The project aims to reclaim agricultural land in southern Turkey and transform it into the largest source of agricultural products in the region²². Reports estimate that these practices will lead to a 50% reduction in water levels in the Tigris River and a 70% reduction in the Euphrates River upon completion of the dams and stations²³.

²⁰The 1987 protocol with Syria regarding matters of economic cooperation between the Syrian Arab Republic and the Republic of Turkey, which guarantees a minimum flow of Euphrates River water at the border of 500 m³/second.

²¹<https://water.fanack.com/ar/syria/shared-water-resources-syria/>

²²Salameh, Elias, Nadhir Al-Ansari, E. Salameh, and N. Al-Ansari. “Deficient Developmental Planning Leading to Water Conflicts across Political Borders: The Way Forward Open Access.” *Engineering* (03/25 2021): 158-72.

²³<https://sitainstitute.com/?p=13910>



Figure 3: Locations of Built and Under-Construction Dams on the Tigris and Euphrates Rivers in the Southeastern Anatolia Project (GAP) in Turkish Territory (Salameh & Al-Ansari, 2021)

3-Participants observe that the rate of water pumping from Turkey is affected by security tensions, particularly those related to the Kurdish issue in the northern border regions. The Turkish government cuts off water to pressure supporters of the Kurdistan Workers' Party (PKK) both within and outside its territories. The use of water as a weapon, under the pretext of combating terrorism and protecting Turkish security and stability, coincides with threats of war. According to researcher Alaa Diab, this occurred in the years 1989, 1992, 1993, and 1998²⁴.

4-Participants noted that strategies for dams' construction and water flow restrictions were not limited to the Euphrates and Tigris rivers alone. These practices extended to include the cutting off of small adjacent waterways, which feed multiple tributaries,

including the Khabur and Jaghjagh rivers, as well as groundwater reservoir in the region. Excessive well drilling was also observed along the banks of these rivers near the Syrian border. Furthermore, these practices expanded to include various violations by pro-Turkish government entities within Turkish-controlled areas of Syrian territory. These violations included the construction of earthen dams impeding water flow to the Khabur River, according to the 2023 Taa'zor report²⁵.

5-Regarding internal policies, participants confirmed that the Syrian government's policies over the years have had a diverse developmental nature. The Al-Jazeera region was previously considered, due to its abundance of water, agricultural land, and livestock, a source of wheat, cotton, vegetables, fruits, and other crops, in addition to animal products and primary animal feed that supplies other industries such as biscuit and pasta factories. According to the participants' opinions, since the 1950s, various projects have been directed to serve the government's interests in developing the agricultural sector and demographic change. As one participant stated, since the 1980s, water projects have been introduced to support the agricultural sector, whether supported by the Baath government or private projects. For example, the Al-Manajir station was established near Ras al-Ain. However, participants described these projects as "political," "superficial," and "ineffective," as their geographical distribution "only served certain areas," and they were established to strengthen or neutralize a specific ethnic component compared to others. The "Euphrates Dam," "Assad Lake," "Arab Belt Project," and "Al-Shaddadi Project" were among the most important examples mentioned by different participants. One participant expressed that the unfair distribution included, for example, diverting Euphrates water in 2004 to irrigate southern regions exclusively.

²⁴Alaa Diab's response to Raji Saad's article. September 18, 2020. Published on the "Sergile" website.

²⁵ <https://hevesti.org/ar/weaponizing-water-resources-in-syria/>

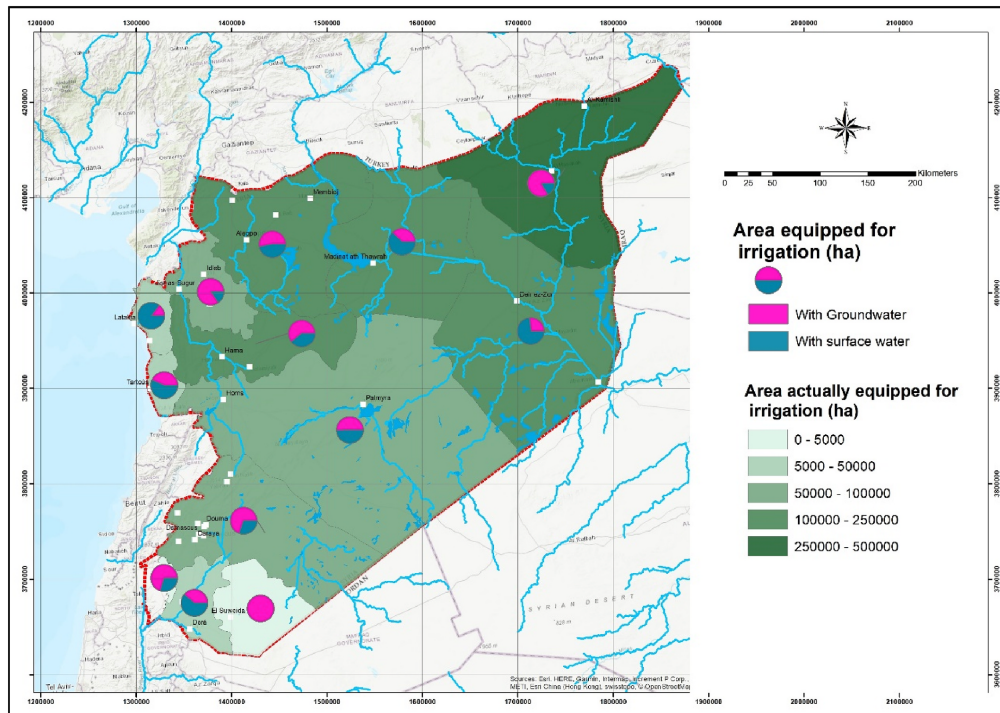


Figure 4: Distribution of irrigated agricultural lands and the proportions of surface and groundwater use in irrigation in Syria (FAO, 2012 in Baba, Karem & Yazdani, 2021)

6-The participants expressed their discontent with these projects, which failed to prioritize water security or maintain infrastructure that ensures efficient water usage, safe irrigation drainage, or proper treatment of sewage and wastewater from industrial or health facilities. These untreated waters are either discharged into rivers and their tributaries, as previously mentioned, or absorbed into the soil, causing increased salinity and contamination of various surface and groundwater resources. The region also lacks sustainable plans for conserving its limited water resources²⁶.

7-According to various press reports and literature, corroborated by participants, these diverse policies, encroachments, and military campaigns have resulted in the “killing of the Khabur River,” as stated in a 2021 report by the PAX organization²⁷. The Khabur River is considered the “master of rivers” for the region, extending 402 km within Syrian territory and serving as one of the most important sources of agricultural irrigation in the Al-Jazeera area, with an estimated irrigated area of 150,000 hectares from its waters. Since the early 1990s, the river has experienced a decline in its level (except during periods of floods and rainfall), leading to what one participant described as the “strangulation of the Khabur River.” In recent years, the river has suffered from relative drought due to conflicts and dam construction during various military campaigns. Additionally, the discharge of sewage and industrial wastewater into its course (both in Turkish and Syrian territories) has led to the formation of polluted swamps. The river has transformed into a pollution source, with its impact extending to the surrounding agricultural lands, causing the spread of diseases due to stagnant water.

8-Participants expressed concern about the state of the Jaghjagh River, which is similar to the condition of the Khabur River. The Jaghjagh River extends for 100 km within Syrian territory, and its waters used to irrigate more than 50,000 hectares of agricultural land. However, the interruption of water flow, coupled with the discharge of sewage, chemical waste, and solid waste into its course²⁸, has also transformed it into a major source of foul odors and diseases.

²⁶Baba, Alper, Ruwad A. L. Karem, and Hamidreza Yazdani. “Groundwater Resources and Quality in Syria.” *Groundwater for Sustainable Development* 14 (2021/08/01/ 2021): 100617. <https://doi.org/https://doi.org/10.1016/j.gsd.2021.100617>.

<https://www.sciencedirect.com/science/article/pii/S2352801X21000746>.

²⁷<https://paxforpeace.nl/news/killing-the-khabur-how-turkish-backed-armed-groups-blocked-northeast-syrias-water-lifeline/?highlight=Khabur>

²⁸<https://npasyria.com/191008/>

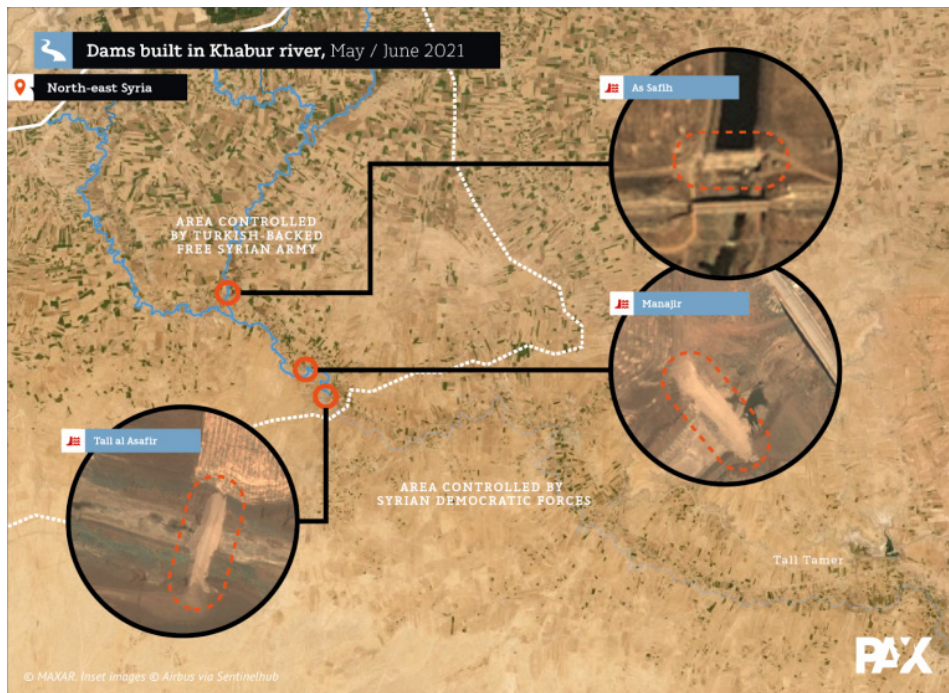


Figure 5: The status of the three earthen dams constructed on the Khabur River in 2021 by the «Syrian National Army» near the villages of «Al-Safth,» «Al-Manajir,» and «Tal Al-Asafir,» south of Ras Al-Ain/Sere Kaniye (PAX, 2021).

9-The participants observe that following the events of 2011 and the withdrawal of Syrian government institutions from areas with a high concentration of Kurds, a series of military campaigns ensued until 2024. During this period, direct and indirect destruction affected water facilities, infrastructure, power generation stations, oil installations, and other civilian facilities that support the daily lives and livelihoods of the region's inhabitants. Attacks on water stations in the area began in 2012, with the Al-Manajir station being vandalized and ceasing operations since then. This was exacerbated by repeated attacks by the Islamic State/ISIS on the Ras al-Ain area in 2014 and 2015, followed by Turkish army-affiliated factions stealing its pumps in 2021, preventing the possibility of maintenance and reactivation.

10-The reasons for controlling water and using it as a weapon in the region have accumulated and intensified. Attention has turned to the Allouk station, which, according to participants' opinions, represented an emergency solution to the recurring water crisis and became the primary source of water supply for approximately one million people in northeastern Syria, including displaced persons in camps. Various opinions agreed that the station's frequent interruptions due to political differences between the controlling forces in the region and the disruption of energy sources it has relied on since 2019, including the years of the COVID-19 pandemic, have caused a severe water crisis. Despite the station's partial return to operation, it functions in a limited capacity. To date, various forces and international and local humanitarian organizations, despite their diverse efforts in providing emergency solutions, have been unable to find more sustainable alternative solutions to secure water supplies.

Second: Evaluating the Effectiveness of Emergency Solutions and Alternative Projects to Address the Water Problem

Emergency Solutions, Alternative Projects, and Accumulated Challenges:

The participants unanimously agreed that the current effective temporary solutions following the frequent interruptions of water supplies from the Allouk station are limited to the use of water tankers extracting water from wells and springs. However, these measures do not adequately meet the needs and portend future challenges and potential environmental impacts. The participants also expressed concerns about the various emergency initiatives implemented by the Autonomous Administration, humanitarian organizations, and civil society institutions, which aim to ensure water supplies for the city of Al-Hasaka. The following is a summary of the proposed solutions and commitments:

Water Tankers:

1. Participants indicated that mineral water is considered expensive, making it inaccessible to a wide segment of citizens. As a result, water tankers have become «the best of the worst,» as one participant put it, serving as the primary source for meeting water needs in the region, regardless of quality or water source. The distribution of this water is handled by multiple entities, including local authorities under the Autonomous Administration, non-governmental organizations, and private tanker owners. According to statements from water management representatives, the Autonomous Administration owns approximately 40 tankers, whose water undergoes monitoring and sterilization processes. As for the number of private tankers, it is variable (600-800 tankers) and cannot be determined precisely.
2. The quality of water delivered to the city via tankers varies according to participants' opinions. The quality of well water differs from one location to another. Water from desalination plants, according to representatives of the Water Department, undergoes analysis and monitoring, which is not necessarily the case for private wells. These private wells suffer from high salinity and pollution due to excessive exploitation of groundwater and the lack of safe drainage processes for irrigation and wastewater, which infiltrate and contaminate the groundwater. This water, if polluted and non-compliant with quality and safety standards, may pose a risk to human health and the environment. Consequently, well water requires basic rules, technical expertise, and human resources including laboratories, equipment, and experts to analyze well water and ensure accurate quality control processes. Despite collaboration between organizations and local administration institutions in establishing desalination plants (in Al-Shaddadi, Al-Hol, etc.), they still lack the financial and human resources to establish, manage, and maintain sufficient desalination plants proportionate to the number of beneficiaries.
3. Despite relying on chlorine as the primary water disinfectant in specified proportions, some tanker owners object to its use due to the corrosion it causes in the tanks used for water transportation. Additionally, some residents refuse to purchase water because of the noticeable chlorine odor and taste in the water.
4. Participants unanimously agree that tanker operators need to conduct three to four water transportation trips to ensure profitability and business continuity, taking into account maintenance costs and reduced fuel allocations due to rising fuel prices (about 600 Syrian pounds per liter). Consequently, they may be compelled to increase water prices or sell their tankers. According to the participants, to improve operational efficiency and increase profit margins, tanker operators resort to extracting water from nearby sources, such as local springs and wells. Additionally, they modify distribution routes to include areas with high purchasing power, where residents can afford increases in water prices.
5. These factors lead to a more rapid depletion of wells compared to others, resulting in a decrease in their water levels. Consequently, the recurrence of drought periods, water-cutting practices, and excessive exploitation, coupled with the wells' inability to regenerate in accordance with their lifecycles, may lead to what can be described as "well depletion" or "well death," causing permanent cessation of operation.
6. The opinions of participants and reports from various media sources varied regarding the determination of a unified water price. While humanitarian organizations distribute water free of charge, particularly in official camps such as Al-Hol camp, the cost of purchasing water in the region varies based on the source of the tanker and water, as well as the reduction in fuel allocations and rising prices (with the minimum price of a liter of diesel ranging from 525-600 Syrian pounds). The cost of a 1,000-liter tank ranges from 20,000 Syrian pounds (the official price set by the Water Department) to 45,000 in neighborhoods within the security square affiliated with the Syrian government²⁹, and up to 70,000 Syrian pounds according to participant statements. The tank lasts between a few days to two weeks, depending on the number of family members and the extent of consumption rationalization, which has increased with the aforementioned heat waves. Participants describe these prices as "significantly high" given the difficult economic situation, with monthly water needs ranging between 300,000-500,000 Syrian pounds, equivalent to half the monthly income of a working individual.

²⁹The term "security square" refers to the area where state security institutions are located in the city of Al-Hasakah. It is situated within the city's neighborhoods and enjoys special security protection.

7. The participants highlighted significant challenges in coordinating the distribution process of water tankers and their access to various areas. These challenges stem from poor coordination between local administration, organizations, and private entities, as well as the prevalence of corruption and favoritism. This situation may lead to inefficient distribution and inequality in accessing water resources.

a. Regarding the water tankers dispatched by the municipality and water department, they are distributed according to specific priorities. The distribution begins with local councils, followed by public institutions such as clubs, orphanages, and hospitals. Next in line are essential services like bakeries, and finally, residential areas. Additionally, tankers are allocated for emergency needs (such as fire extinguishing) and general requirements (such as garden irrigation).

b. As for marginalized areas and popular neighborhoods, such as Al-Tala'i and Al-Kalasa, they face additional challenges in accessing water. Due to economic difficulties, residents of these areas rely heavily on humanitarian organizations (such as UNICEF, Ashna, Solidarity, and ACTED) to meet their basic needs for water, purification materials, and disinfection supplies. However, these organizations face difficulties in meeting the increasing demand for water, as their work is affected by political fluctuations and annual funding cycles that vary according to donor policies and new crises.

c. Organizations provide treated water to official camps, such as Al-Hol camp, and distribute rations to everyone, including camp management, according to Sphere standards. However, estimates suggest that the number of displaced people in these camps exceeds the officially reported figures. This situation creates social tensions, as some participants view the provision of water to all camp residents, including families affiliated with extremist organizations, as placing additional pressure on limited water resources and leading to price increases for other citizens.

d. Regarding shelter centers and informal camps, there is no established mechanism for water provision. Most residents of these areas are compelled to purchase very limited quantities of water from “any available source,” which may raise concerns about the quality and safety of this water, as well as personal hygiene practices.

e. It is worth noting that areas facing security challenges experience additional difficulties in obtaining water supplies, as tanker owners are reluctant to service these areas due to the surrounding security risks.

8. The participants further note that the absence of an effective monitoring system and complaint mechanism reduces the ability to ensure water quality, regulate prices, and prevent unfair practices. It is also observed that residents are hesitant to file complaints against tanker operators for fear of “non-return” and future disruptions in water supply.

Water Drilling and Water Supply Projects:

1. There was widespread consensus that the establishment of the Allouk station, comprising 33 wells, was a temporary solution to address the water crisis resulting from the declining water level of the Khabur River, its drought, and the pollution of water drawn from the dam. The station was expected to operate for two years, pending the implementation of a project to transfer water from the Tigris River, which was part of a joint initiative between the Syrian and Turkish governments. The foundation stone for this project was laid in the Al-Zibria area in 2011, in collaboration with the Iraqi government and under Russian sponsorship³⁰. However, work on this project was suspended due to the escalation of armed conflict, leading to complete reliance on the Allouk station as the main water source for Al-Hasakah. The station faced multiple operational challenges, including frequent maintenance needs and a lack of expertise and necessary materials. As a result, the operational capacity of the wells decreased by half. Nevertheless, the station managed to meet basic needs under the prevailing circumstances. However, the failure to neutralize the Allouk station from the ongoing conflict has turned it into a pressure tool used by various conflicting parties, negatively impacting citizens.

2. Participants believe that well-drilling projects to supply water stations, such as Al-Hamma and Sanjaq Saadoun, lack comprehensive hydrogeological and environmental assessment studies. These studies are essential for understanding the distribution and movement of groundwater in soil and rocks within the Earth's crust (typically in aquifers), evaluating environmental impacts on groundwater reserves, soil quality, and vegetation cover, and ensuring sustainable management of water resources.

³⁰<https://al-akhbar.com/Syria/34115>

Excessive groundwater extraction has led to a noticeable decrease in water levels in neighboring wells, negatively affecting groundwater and causing springs to dry up. For example, in the Shmouka area, a significant decrease in well productivity was observed, with the time required to fill a 30-barrel tank increasing from 15 minutes to 45 minutes. Furthermore, the continuous depletion of wells has resulted in increased salt concentration in the water, rendering it unfit for human consumption. This issue is particularly concerning given that many organizations and private tanker owners rely on these sources to provide water to camps and marginalized, impoverished areas.

3. The participants raised serious concerns about the wells' ability to recover, with estimates suggesting that a well needs at least five years to fully regain its productivity. This apprehension stems from the absence of a systematic strategy for managing the use of wells, whether private or public, for filling water tankers. They also emphasized the importance of implementing preventive measures to avoid complete depletion of wells, which could potentially lead to the need for permanent closure.

4. According to an expert assessment, the majority of currently proposed projects are considered "modest solutions" that do not meet basic water needs even if fully implemented. For instance, the Sanjaq Saadoun project, even if completed in its entirety, barely meets the needs of a single "neighborhood."

5. Regarding the project to extend the water pipeline from the Euphrates River to the Al-Aziziyah station³¹, which was announced by the Autonomous Administration in 2021 and became operational in mid-July 2024, despite high expectations associated with it,

its direct service scope is limited to only five areas (Ghweiran, Al-Mufti, Al-Aziziyah, Al-Salihiyah, Al-Tala'i). Water is provided to each area at a rate of once every five days, with plans to distribute water to other neighborhoods via tankers or through cooperative projects with humanitarian organizations. These projects include establishing networks to connect water tanks and installing pumps to deliver water to other neighborhoods (such as the anticipated ACTED project that will connect water supplies between the Ghweiran neighborhood and the Military neighborhood). However, frequent unauthorized interventions on water lines, in addition to power outages, cause recurrent disruptions in water supplies to the station, negatively affecting the regularity of water access to the targeted neighborhoods.

6. According to the participants' opinions, current projects lack clear and integrated infrastructure plans, particularly regarding the planning and implementation of water transmission lines in a manner that protects them from encroachments, in order to avoid repeating the problems faced by previous lines. The process of water extraction and extending supply lines and channels over long distances, reaching up to 160 km, makes them vulnerable to unauthorized interventions, such as the establishment of unauthorized branch lines or damage caused by military operations. As a result, disruptions in water supply occur, along with frequent outages and depletion of human resources tasked with removing these encroachments.

7. Moreover, there is a notable lack of comprehensive economic and technical feasibility studies for these projects, taking into account the hardly available financial and human resources. This deficiency leads to obstacles in completing projects, maintaining them, and ensuring their long-term success. The majority of these projects require extensive maintenance of facilities and infrastructure, including pumping and desalination stations, as well as water networks and pipelines that have deteriorated due to conflicts and extended periods of inactivity. However, the relevant institutions and organizations lack the necessary human resources and equipment, such as water leak detection devices, sensors, filters, and materials required for efficient periodic maintenance.

8. The participants expressed their concerns regarding financial and administrative corruption that may affect the implementation of these projects. They emphasized the necessity of ensuring equity in resource distribution and reducing manipulation in areas where water lines pass through. Furthermore, they stressed the importance of maintaining transparency and accountability in project management to mitigate the risks associated with corrupt practices and ensure the effective utilization of available resources for the benefit of the community.

³¹<https://hawarnews.com/ar/الحسكة-بالأرقام-والتفاصيل>

Third: Examining the Impacts of the Water Crisis on Health, Economic, and Living Conditions

Pollution

Participants discussed the increase in water pollution as a result of ongoing conflict and military operations, as well as the targeting of infrastructure. The main causes of pollution can be summarized as follows:

1. The participants highlighted that the issue of sewage and water networks has persisted for an extended period. The infrastructure, if existent, suffers from obsolescence and deterioration, and is continuously subjected to damage and theft. When pressure on these networks increases, coupled with the rise in calcification and salt content in the water, it results in the overflow of contaminated water into the streets. This leads to its infiltration into shallow groundwater and adjacent wells, as is the case in the Tel Hajar and Al-Salihiya areas.
2. Regarding river water pollution, it results from the discharge of untreated sewage directly into rivers, whether from within Syrian territories or beyond, as confirmed by the participants. This includes the absence of appropriate sanitary infrastructure, facilities, and frameworks necessary for safe sewage disposal processes, including medical centers. Consequently, contaminated water seeps into groundwater, which is subsequently extracted and utilized.
3. According to participant opinions, security and military operations have significantly exacerbated the situation. These operations have caused damage and collapse of water networks in numerous areas. Such operations included direct confrontations, tunnel digging, use of explosives, and aerial bombardment that the region was subjected to during years of direct conflict, particularly against the Islamic State/ISIS organization. This was followed by Turkish attacks, especially at the beginning of 2022, as reported by multiple international and local organizations concerned with monitoring human rights violations³².
4. The impacts of the attacks were not limited to water networks alone. Repeated bombardment of infrastructure and oil facilities has caused severe damage to oil transport pipelines in the border areas of the northeastern part of the country³³. As a result, oil has leaked into rivers, leading to the spread of oil pollution across the governorates of Deir ez-Zor and Al-Hasakah, reaching tributaries of the Khabur River such as the Al-Rad River³⁴, and the Jaghjagh River³⁵, and extending to the Southern Dam near Al-Shaddadi, which is used for agriculture. This pollution poses a serious threat to public health, agriculture, livestock, and fish stocks, in addition to numerous other severe environmental consequences.



Figure 6: Pollution in the Jaghjagh River due to oil derivative leakage resulting from repeated Turkish bombardment on northeastern Syria (January 29, 2024 - North Press)

³²The Syrian Observatory for Human Rights, the Violations Documentation Center for Justice and Respect for Human Rights and the Rule of Law, and Human Rights Watch

³³<https://npasyria.com/179626/>

³⁴<https://asharq.com/reports/79521/تسرب-نفطي-في-نهر-شمال-شرق-سوريا-ومسؤولون-يلومون-تركيا/>

³⁵<https://www.syriaahr.com/700930/السبب-تداعيات-القصف-الجوي-التركي-تسرب->



Figure 7: - Pollution of the Jaghjagh River in Al-Hasakah with Solid Waste - North Press Agency Syria - August 11, 2024

5. In the absence of effective strategies for solid and medical waste management and recycling, Hasakah Governorate and its surrounding areas have witnessed a concerning transformation in river courses and seasonal rain valleys. According to participant opinions and reports from relevant organizations, these natural areas have become sites for solid waste accumulation. For instance, the course of the Jaghjagh River has turned into a polluted swamp, with solid waste accumulating in its vicinity. This pollution has extended to negatively impact adjacent agricultural lands, and the crops cultivated therein, as reported in a study published by the World Health Organization in 2022.

Spread of Epidemics and Diseases:

Based on the preceding information, it can be inferred that the spread of epidemics and diseases is anticipated under the current circumstances. The participants' opinions align with the World Health Organization (WHO) report (2022) regarding the impact of water scarcity on public health and personal hygiene practices in Al-Hasakah Governorate and areas of northeastern Syria. The following is a detailed breakdown of the key points:

1. The scarcity and contamination of water resources, both surface and groundwater, pose significant health risks due to various factors including untreated sewage, accumulation of oil and solid waste, and insufficient monitoring of water tanker quality. These risks encompass the spread of waterborne diseases, particularly among children, such as cholera, diarrhea, hepatitis, skin diseases, and parasitic infections (like lice and scabies). The severity of these issues is exacerbated in impoverished areas and camps unable to secure their basic water needs.
2. The participants in the sessions emphasized the decline in personal hygiene levels associated with water usage. They also noted an increase in the incidence of kidney diseases and the formation of kidney stones, as well as a rise in cancer cases.
3. Due to the high incidence of water-related diseases, medical personnel are facing increasing challenges. This situation places additional strain on the newly established medical centers in the region, which lack specialized physicians, and on the already deteriorating healthcare system in northeastern Syria.
4. The participants emphasized that the difficulty in accessing safe water, and its high costs have caused significant psychological stress among the region's residents, especially among marginalized groups and displaced persons. Elevated levels of stress and anxiety were observed, particularly in areas suffering from severe water shortages. Women and children were especially affected by these pressures, as they often bear the responsibility of providing water for the family. The participants warned that the continuation of these conditions could lead to more severe psychological consequences in the long term, including the potential for depression, burnouts and chronic fatigue.

5.In light of the deteriorating economic conditions, solid waste has become a commodity traded among waste dealers, locally known as “Hawaj.” Participants expressed concern about the spread of the phenomenon of searching through garbage without protective measures, especially by children. These containers hold various types of waste, including war remnants such as unexploded ordnance, posing serious health risks. A report by the Enab Baladi platform³⁶ confirmed the occurrence of dangerous incidents, including a child being injured by an explosion caused by a bomb fuse while searching through garbage, as well as other injuries resulting from viral skin diseases and illnesses caused by inhaling fermentation gases and exposure to contaminated materials. These and other health issues arise from rummaging through waste containers.

Social and Economic Implications:

1.As previously mentioned, participants emphasized the pivotal role of foreign and domestic policies and conflicts in exacerbating the water crisis and transforming it into a comprehensive deficit. Their views align with what is known in literature as uneven geographical development and infrastructural violence. The inadequacy of infrastructure projects, which were aimed at development, improvement, and modernization, along with military campaigns and partial or complete destruction during years of conflict, have led to severe deterioration and the creation of economically and socially fragile geographical areas. This has resulted in successive waves of forced and voluntary displacement of the workforce, especially in the agricultural sector, as well as the aggravation of social, health, and economic crises during periods of conflict, in addition to other direct and indirect factors. Consequently, these deteriorated and unstable geographical areas have become a market for Turkish agricultural products, primarily dependent on Turkey for their food and water security, making them vulnerable to crises and economic collapse at any moment.

2.Participants pointed to the noticeable deterioration in economic conditions, citing rising prices, increased unemployment rates, and decreased purchasing power. The water crisis has significantly affected agricultural sectors and related industries, which are a main source of income for individuals in the region. Employees in various institutions have also been affected by these conditions, suffering from reduced salaries and delays in their scheduled disbursement.

3.Based on the analysis of participants’ opinions, current economic challenges are clearly evident. Individuals not only face the financial burden of purchasing water, which can consume up to half of their income as previously mentioned, but they must also deal with additional requirements to ensure water accessibility and, if possible, sanitize it before use. Some of the most prominent challenges include:

a.Boiling water is considered one of the most effective methods for water sterilization. However, this process poses a significant financial challenge due to the notable increase in fuel prices, if available, and frequent power outages. Regarding gas cylinders, they are limited in availability, and their price has risen to 125,000 Syrian pounds. The situation is further complicated by the lack of viable alternatives for sustainable energy use, attributed to the general rise in prices, imposed economic restrictions, and severe shortages of essential materials in the region.

b.Concerning water purification systems, participants noted a significant increase in demand for purchasing and installing water filters. This trend is attributed to the continued reliance of residents on unreliable water sources, such as tankers and personal wells dug in homes and private farms. Despite the high cost of these filters, ranging from 75-110 US dollars (approximately 15,000 SYP per USD) depending on the filtration stages and country of origin, they have become a basic necessity. This is due to the deterioration of available water quality, characterized by high calcium content, yellow color, and sometimes foul odors, as well as increased rates of water pollution-related diseases. It is worth noting that these filters require periodic maintenance every 6-8 months, at an estimated cost of about 20 dollars per person.

c.Buildings with upper floors face challenges in obtaining adequate water supplies. To address this issue, residents resort to using electric pumps to ensure water reaches the upper floors and elevated areas. However, this solution incurs additional operational costs and can lead to tensions between neighbors due to water monopolization and energy consumption.

³⁶<https://www.enabbaladi.net/681902/ال-ومخلفات-عرضة-للأمراض-وأطفال-نباشون>

d. Furthermore, the Autonomous Administration raised water and sanitation fees in the city from 2,000 to 10,000 Syrian pounds at the end of May 2024, according to a report published by Enab Baladi newspaper. This increase, which represents a fivefold increase in previous fees, comes amid difficult economic conditions and scarcity of water resources.

4. The participants emphasized that public awareness and social responsibility regarding water conservation remain insufficient, despite the scarcity of water resources. There is a continued excessive use of water in activities such as car washing and crop irrigation. One participant reported that accessing water and cleaning shared facilities have become sources of tension between households, due to some families' inability to secure the necessary water for these purposes.

5. The absence of social responsibility is evident in the context of acute water scarcity, pervasive poverty, and inequitable distribution of water resources among different regions. Some participants reported that the water crisis has driven many individuals to encroach upon newly established supply lines, resulting from a loss of trust and uncertainty regarding water access in their marginalized areas.

6. Despite individual initiatives by some notables and wealthy individuals to provide water in the early stages of the crisis, such as drilling charitable wells for the community, providing free water tankers, or allowing the sharing of their private water wells, these efforts, while important, do not constitute a sufficient or sustainable solution to the current problem.

7. Participants also discussed the issue of access to clean water as disproportionately affecting vulnerable and marginalized groups in society. Women, children, the elderly, and people with disabilities face additional difficulties in obtaining water, exacerbating existing social disparities despite individual initiatives to support them. It was also noted that this problem exacerbates gender inequality, as women and girls often bear the greatest burden in fetching water, limiting their time available for education, work, and other activities.

8. Some citizens resort to alternative solutions by creating local water tanks known as "samanjat." These tanks are used to store water or collect rainwater for sharing. However, it should be noted that these tanks may be susceptible to algae and lichen growth, necessitating regular maintenance and chemical treatment, which poses an additional financial burden on individuals.

9. Participants indicate that the indirect effects of the water crisis are exacerbated by the severity of poverty and deteriorating economic conditions in the marginalized areas of Al-Hasakah city. These areas suffer from regular water supply interruptions since the shutdown of the Alouk station, in addition to a lack of basic services such as sidewalks, parks, schools, and waste collection services, compared to other neighborhoods that enjoy full services. Participants expressed concern about the widening social and economic gaps resulting from the lack of equitable resource distribution and balanced development among different areas of the city, with no effective strategies to stimulate economic and social growth in these regions. One participant drew attention to the worsening phenomenon of "scavenging" in waste³⁷, especially among children and displaced persons in the poor areas of Al-Hasakah and neighboring camps. They compete to collect food remnants and sellable materials, exposing them to health risks and dangers from war (explosive) remnants. These harsh conditions may lead to the exploitation of children and their potential future recruitment into radical groups for meager sums.

³⁷<https://www.enabbaladi.net/681902/ال-ومخلفات-عرضة-للأمراض-وأطفال-نباشون-عرضة-للأمراض-ومخلفات-ال>

Recommendations:

Based on the series of in-depth discussions about the water crisis, and analysis of reports from humanitarian organizations, media sources, and academic institutions, a set of strategic recommendations has been developed. These recommendations are categorized into the following levels:

At the Political and International Level:

- 1. Neutralizing water resources from political conflicts and ensuring equitable access:** Working to ensure the immediate and sustainable operation of vital water infrastructure, with a particular focus on facilities such as the Allouk water station. This operation must be free from any political interference or exploitation by any party to the conflict. The primary objective is to guarantee fair and continuous access to safe and clean water for all communities in the region, regardless of their political, ethnic, or religious affiliations. This requires close coordination among all concerned parties, including local authorities and international organizations, to establish effective mechanisms for protecting water resources and ensuring their equitable distribution. A transparent monitoring system must also be established to ensure adherence to these principles and to quickly identify any violations.
- 2. Creating an Independent Monitoring Mechanism:** Establish a neutral and independent body to oversee shared transboundary water resources between Syria, Turkey, and Iraq. This body should have broad powers to monitor water usage and ensure equitable distribution. The mechanism should work to ensure strict compliance with international water agreements and treaties, and facilitate ongoing, constructive dialogue between the concerned states. The primary objective of this body is to achieve fair and sustainable use of shared water resources, taking into account the needs of each country while preserving the environment. Additionally, this body should be empowered to make binding recommendations for resolving water-related disputes and promoting regional cooperation in water resource management.
- 3. Creating a regional framework for water governance that includes all stakeholders and addresses both short-term crisis management and long-term sustainability goals.** This framework should be flexible and adaptable to climate and political changes, ensuring fair representation for all affected groups. It should also include clear mechanisms for participatory decision-making, precise allocation of responsibilities, and the establishment of an effective monitoring and evaluation system. Additionally, this framework should focus on building local capacity in water resource management and enhancing community awareness about the importance of water conservation. Finally, it should incorporate strategies for mobilizing the necessary financial resources to implement vital water projects in the long term.
- 4. Implementing a system of sanctions and penalties:** Establishing a strict legal framework to impose sanctions on parties that violate agreements related to water resource management or use water as a weapon in conflicts. These sanctions should include substantial financial penalties, restrictions on access to international funding, and trade limitations. The objective is to create a strong deterrent against the illicit use of water resources and ensure compliance with international standards in water management. These sanctions should be graduated and proportionate to the scale of the violation, with a clear mechanism for appeal and review to ensure fairness and transparency in their application.
- 5. Enhancing and supporting initiatives aimed at reviving dialogues at local, regional, and international levels, which include all segments and components of society without discrimination.** These dialogues contribute to identifying common goals that serve the interests of citizens as partners in natural resources and national wealth. They also assist in developing a comprehensive strategy for environmental and economic recovery and promoting stability.

At the level of Emergency Responses and Solutions:

At the current stage, it is not possible to move away from emergency solutions. However, some steps can be taken to improve them as follows:

- 1.** It is essential to conduct thorough hydrogeological and environmental studies before drilling new wells to avoid negative impacts on groundwater and the environment. A detailed study of the area's hydrogeological characteristics should be carried out, including identifying locations and quantities of groundwater, water renewal rates, and water quality in various rock layers. This assessment will help determine the most suitable locations for drilling new wells and estimate sustainable quantities that can be extracted without harming water resources in the long term. It will also contribute to developing effective strategies for managing and protecting groundwater from depletion and pollution.
- 2.** Develop a comprehensive and well-structured plan for the sustainable and efficient utilization of existing wells, taking into account the necessity for regular rest periods. These periods are crucial for the wells' recovery and ensuring their long-term productivity. The plan should include precise scheduling for each well's usage, determination of optimal extraction rates, and implementation of periodic maintenance programs to ensure the wells' operational efficiency. Additionally, it is essential to conduct regular hydrogeological studies to assess groundwater conditions and adjust the plan accordingly.
- 3.** Conduct comprehensive and detailed economic and feasibility studies to determine the true and accurate cost of water extraction and distribution operations from wells, taking into account all influencing factors such as infrastructure costs, maintenance, operation, human resources, and energy used. These studies will help in developing realistic and effective financial plans to ensure the long-term sustainability of water projects.
- 4.** The proposed projects currently under consideration must be thoroughly reviewed and comprehensively developed to effectively meet the actual needs of the population. This necessitates an in-depth study of the current situation, listening to the opinions of the local community, accurately assessing available local resources, taking into account the surrounding environmental and economic challenges, and ensuring the long-term sustainability of these projects. It is also essential to coordinate efforts among various stakeholders, including local authorities, humanitarian organizations, and civil society institutions, to ensure the integration of plans and avoid duplication of work.
- 5.** To overcome challenges related to water retrieval and infrastructure maintenance, an integrated strategy encompassing several aspects can be implemented. Firstly, it is essential to develop a monitoring system and establish a security plan to protect water lines from encroachments and attacks, in collaboration with local authorities and beneficiary communities. This can be achieved through the development of simple, smart mobile applications for early detection of encroachments and leaks, as well as identifying their geographical locations and causes, if known. Based on this, mobile maintenance teams equipped with the necessary tools can be trained and deployed for rapid response to any malfunctions.
- 6.** Creating a joint funding pool between the Autonomous Administration and humanitarian organizations to ensure project sustainability.
- 7.** Setting clear standards for contractors' selection, focusing on experience, good reputation, and community endorsement. Implementing strict penalties for cases of corruption and manipulation in projects. Applying a rigorous quality control system for implementation, including regular and independent inspections. Additionally, involving the local community in monitoring project implementation to ensure transparency. Finally, enforcing severe sanctions on cases of corruption and manipulation in projects to guarantee integrity and effectiveness in the execution of these initiatives.
- 8.** Intensively focusing on improving the quality of water tankers, which are currently considered the most widespread and effective solution under the challenging conditions faced by the region. This vital matter requires the application of stringent and highly precise standards regarding monitoring and sterilization, to ensure the highest levels of quality and safety for transported water. These standards should include conducting regular and intensive periodic examinations, utilizing the latest available technologies and scientific methods, to ensure that the water is completely free from any type of contaminants or harmful substances that may pose a risk to beneficiaries' health.

9. Creating a support system for poor and marginalized families to ensure their access to water at reasonable prices. This system may include providing direct subsidies for water purchases or offering special vouchers that can be used with water tanker owners. Additionally, an emergency fund can be established to assist families facing severe financial difficulties in obtaining water.
10. Implementing an ascending pricing system, where basic water quantities are priced at very low rates, with prices gradually increasing for higher consumption levels. These measures would help ensure water access for all segments of society while maintaining the sustainability of water resources.
11. Supporting private tank truck owners through:
 - a. Stabilizing their fuel allocations and providing financial assistance to cover the costs of malfunctions resulting from frequent transportation operations and the use of disinfection materials. This support will contribute to the continuity of tanker operations and ensure regular water supply for the residents of the area.
 - b. Providing a comprehensive package of financial and technical support for private tank owners, including microloans with favorable terms, as well as offering professional consultations to assist them in developing comprehensive feasibility studies and realistic business plans. These plans will take into account potential risks in this sector, such as military campaigns, fuel price fluctuations, and periodic vehicle maintenance.
 - c. Creating a specialized training program for private tanker owners, focusing on improving operational efficiency and reducing fuel consumption, as well as training them on best practices in safe and hygienic water transportation and distribution. This program will help enhance the level of service provided and reduce long-term operational costs.
12. Improving the management and distribution of water tankers more effectively among the administration, organizations, and private entities, with a focus on increasing the number of available tankers and enhancing their distribution scheduling to cover all areas regularly and equitably. This includes:
 - a. Creating a centralized system to coordinate water distribution among local administration, organizations, and private entities. This system will enhance communication between all relevant parties and ensure more efficient allocation of limited water resources. It will also help identify the actual needs of each area and better direct efforts. This includes coordinating efforts between different organizations to avoid duplication of work and to exchange expertise and resources. Additionally, a joint working group can be established, bringing together local administration and humanitarian organizations to develop long-term strategies for improving access to water.
 - b. Establishing transparent mechanisms for monitoring the distribution process and combating corruption and favoritism. This includes creating an independent committee to monitor water distribution and quality across all regions. Additionally, developing an electronic platform to provide public access to information regarding distribution schedules and allocated quantities for each area, which sends notifications to independent committees and subscribers via social media. Furthermore, developing a smart mobile application to help track tanker movements transparently. These measures will aid in building trust between citizens and local authorities and ensuring equitable distribution.
 - c. Develop an emergency plan for water provision to areas facing security challenges. This plan should include the establishment of secure distribution points and the utilization of alternative transportation methods such as temporary pipelines or unmanned aerial vehicles (UAVs) to deliver water to hard-to-reach areas. Additionally, coordination with security agencies is essential to ensure the safety of water distribution teams.
 - d. Create a comprehensive system for quality monitoring and anonymous complaint reception. This system can be implemented through several key steps. First, establish an independent water quality monitoring team that conducts random and regular checks on water samples transported in tankers. Second, develop an electronic complaint system that protects the identity of complainants, allowing residents to report any issues related to water quality or distribution services without fear of consequences. Third, set up an emergency hotline to receive urgent reports of water-related problems and respond to them quickly. Additionally, publish periodic reports to the public that include quality test results and actions taken to address complaints, thereby enhancing transparency and trust between citizens, relevant institutions, and organizations.
 - e. Establish mechanisms to regulate water prices and prevent exploitation, while ensuring service continuity and quality.
13. Conduct periodic assessments of the effectiveness of these various measures and modify them as needed based on contextual changes.

At the planning, structural, and executive levels:

1. Implementation of integrated urban planning strategies for effective water resource management is a fundamental aspect of sustainable urban development. This comprehensive approach encompasses several key aspects: designing advanced sanitation systems that reduce water waste and promote reuse, creating urban green spaces that serve as natural buffer zones for rainwater absorption and groundwater recharge, integrating rainwater harvesting techniques into the design of buildings and urban infrastructure, and developing water distribution networks in a well-planned manner to minimize leaks and improve distribution efficiency. Through the application of these integrated strategies, water resource management in urban areas can be significantly improved, leading to more sustainable water use and a tangible enhancement in the quality of life for residents.

2. Development of a comprehensive plan for rehabilitating water infrastructure: Formulating an integrated strategy for the restoration and modernization of water and sanitation networks in the region, with a focus on reducing losses and increasing distribution efficiency. This plan should include the creation of an interactive information database that incorporates accurate updates on damage locations through smartphone applications, a precise assessment of current damages caused by wars and aging infrastructure, identification of urgent priorities, and allocation of necessary resources for rapid and effective implementation.
3. Developing a comprehensive strategy for rehabilitating water infrastructure facilities, such as desalination plants, and improving their energy efficiency. A decentralized approach to planning and geographical distribution is proposed to enhance the resilience of these facilities in the face of security challenges and to maintain operational continuity in the event of damage to some sites. Moreover, the integration of renewable energy sources, such as solar power, as a partial or complete alternative contributes to ensuring the sustainability of these projects, albeit to a limited extent, during periods of disruption or when main power sources are compromised.
4. Adopting plans to integrate and develop sustainable renewable energy applications, particularly solar energy, which is considered a promising solution in contexts of chronic conflicts and water scarcity³⁸. In this fragile environment and the inability to generate hydroelectric power, solar energy represents a reliable, sustainable, and clean source of energy. Solar energy powers water pumps, medical facilities, educational centers, and other essential services. Decentralized solar energy systems, such as home solar panels, provide electricity to displaced communities and areas where electrical grid infrastructure has deteriorated due to armed conflict and military campaigns. They also help provide reliable lighting at night in public spaces, camps, and conflict-affected areas. Joint solar energy projects between conflicting communities can serve as a platform for cooperation and trust-building, paving the way for building community trust bridges. Consequently, they help improve living conditions, enhance security, reduce violence within local communities, and promote resilience, cohesion, and stability in the region.
5. Developing Effective Strategies for Rainwater and Flood Harvesting: Establishing an Integrated System for Collecting and Storing Rainwater on Urban and Rural Scales. This system encompasses domestic use (installation of water collection systems on building rooftops), creation of medium and large-scale rainwater catchments, construction of underground reservoirs, and development of groundwater recharge areas. The approach relies on local expertise and low-cost technologies that are compatible with and derived from the local context.
6. Implementation of water desalination programs: Investing in environmentally friendly decentralized water desalination technologies to increase freshwater supplies. The focus should be on utilizing renewable energy in desalination processes to ensure their sustainability and cost-effectiveness. Additionally, the possibility of establishing small-scale decentralized desalination plants distributed across the areas of greatest need and less vulnerable to military attacks should be explored to ensure equitable and regular distribution of water resources.
7. Implementation and Development of Wastewater Treatment and Safe Disposal Programs: Execute strategic projects to improve and expand wastewater treatment plants in the region, while promoting the adoption of decentralized water treatment systems that rely on Nature-Based Solutions (NBS)³⁹. Develop and employ locally-appropriate and environmentally sustainable technologies. These programs should also include training local personnel and equipping them with the necessary skills to operate and maintain these facilities, ensuring their long-term sustainability.
8. Enhancing sustainable water management programs and training: Implement initiatives to rationalize water consumption and improve efficiency across all sectors, particularly agriculture and industry. This includes applying modern irrigation techniques, reusing treated water, and encouraging the adoption of sustainable agricultural practices that conserve water resources and reduce environmental pollution.
9. Regarding temporary solutions, prefabricated modular solutions can be utilized, such as emergency-ready sewage tanks, which are characterized by an operational lifespan ranging from two to five years.⁴⁰

³⁸ Al-Ghussain, L., Abujubbeh, M., Ahmad, A D., Abubaker, A M., Taylan, O., Fahrioglu, M., & Akafuah, N K. (2020, September 18). 100% Renewable Energy Grid for Rural Electrification of Remote Areas: A Case Study in Jordan. *Multidisciplinary Digital Publishing Institute*, 13(18), 4908–4908. <https://doi.org/10.3390/en13184908>

Griffiths, S. (2013, June 1). Strategic considerations for deployment of solar photovoltaics in the Middle East and North Africa. *Elsevier BV*, 2(1), 125–131. <https://doi.org/10.1016/j.esr.2012.11.001>

³⁹ https://sswm.info/sites/default/files/reference_attachments/DEWATS_Guidebook_small.pdf

⁴⁰ <https://sanihub.info/resource/the-septic-bag-kit-safely-managed-sanitation-in-early-stages-of-emergency-relief/>

10.Improving Sanitation Infrastructure: Develop and upgrade sewage networks in urban and rural areas, focusing on regions most affected by sanitation issues. This work should include repairing old networks and expanding coverage to underserved areas. It is crucial to pay special attention to improving water supply and sanitation in slums and marginalized areas. Safe and clean public water points should be established in areas lacking water networks, and local community initiatives for water management and facility maintenance should be supported. These measures will help reduce disparities in access to clean water and improve living conditions in the most vulnerable areas, contributing to social justice and enhancing public health in the community as a whole.

11.Improving water supplies in displacement camps is considered a fundamental element to ensure safe and healthy living conditions. This requires the development and implementation of comprehensive strategies that include establishing appropriate and scalable water infrastructure, including water distribution points, rainwater collection and harvesting points, and sanitation facilities. It is crucial to pay special attention to the efficiency of sanitation systems and safe water drainage, with the aim of minimizing environmental damage and groundwater contamination.

On the Health and Wellbeing Levels:

1.Enhancing Water Quality Monitoring Programs: Establish a comprehensive network for water quality monitoring throughout the region, focusing on areas most affected by pollution. These programs should include regular testing of surface water, groundwater, and drinking water in homes and public facilities. Additionally, develop a smartphone application that allows citizens to report suspected pollution incidents and receive updates on water quality in their areas.

2.Enhancing Prevention Programs for Water-Related Diseases and Epidemics: It is essential to develop a comprehensive strategy for the prevention of waterborne diseases such as cholera and typhoid. This strategy includes establishing an early warning system for disease outbreak detection, implementing large-scale vaccination campaigns, and distributing water purification supplies and personal hygiene tools to households in high-risk areas. Community health workers should also be trained to quickly diagnose and treat waterborne diseases. Additionally, it is important to implement intensive health awareness programs on the importance of handwashing, household water purification, and safe food handling to reduce disease spread. These comprehensive measures will help strengthen community resilience against water-related epidemics and improve overall public health in the Al-Hasakah region.

3.Development of a Solid and Medical Waste Management System: It is essential to establish a comprehensive solid and medical waste management program in the Al-Hasakah region, focusing on protecting water resources from pollution. This program includes the creation of modern solid waste treatment facilities, including sorting and recycling stations to reduce the amount of waste reaching landfills. It also involves developing a specialized system for collecting and treating medical waste from hospitals and health centers, using safe disposal techniques to prevent contamination of water sources. Additionally, awareness programs should be implemented for the community and healthcare workers on the importance of proper waste segregation and safe disposal. Finally, a monitoring and inspection system should be established to ensure compliance with waste management regulations, especially concerning hazardous and medical waste. These measures will significantly help reduce water source pollution resulting from poor waste management, thereby improving water quality and protecting public health in the Al-Hasakah region.

On Agricultural level:

1. Promoting water-efficient irrigation methods and selecting suitable crops for arid climates to reduce agricultural water consumption. This includes developing and implementing drip irrigation and precision sprinkler irrigation techniques, which minimize water loss through evaporation and ensure direct water delivery to plant roots. Additionally, farmers should be encouraged to cultivate drought-adapted crops that require less water for growth and production. Furthermore, training programs for farmers should be implemented, focusing on best practices in water management and sustainable agriculture techniques in arid regions.
2. These programs should also include training agricultural personnel on how to utilize modern technology such as soil moisture sensors and smartphone applications to accurately monitor crop water requirements. Additionally, the adoption of organic farming methods that enhance soil water retention capacity and reduce the need for frequent irrigation should be encouraged.
3. Enhancing Traditional Local Water Conservation Practices: It is essential to revive and develop traditional local water conservation practices that have been used in the region for centuries. This includes restoring and improving traditional irrigation systems such as “qanats” and “aflaj” that help distribute water efficiently, promoting the use of traditional rainwater harvesting techniques such as “matfiyat” and earthen dams for storing rainwater, as well as reviving traditional agricultural practices adapted to arid environments, such as intercropping and crop rotation. It is crucial to integrate these traditional practices with modern technologies to maximize water use efficiency, while organizing workshops and training courses to transfer this traditional knowledge to new generations and ensure its continuity.
4. Implementation of Safe Irrigation Water Disposal Practices: Develop and enforce stringent guidelines for the safe disposal of used irrigation water to prevent contamination of groundwater and surface water sources. This includes establishing appropriate drainage systems to collect excess irrigation water, and implementing natural treatment techniques such as constructed wetlands to purify water before reuse or release into the environment. Farmers should also be trained in responsible use of fertilizers and pesticides to reduce agricultural runoff pollution. Additionally, a monitoring system should be established to regularly check the quality of agricultural wastewater and ensure compliance with environmental standards.

At the Economic Level and Human Resource Development:

The water crisis can be viewed as an opportunity to stimulate economic growth through:

1. Adopting climate-smart agricultural practices, as defined by the Food and Agriculture Organization (FAO), is an approach to developing the necessary measures to transform and redirect agricultural systems and livestock breeding to effectively support and ensure food security in the face of climate change, including efficient and smart management of water resources⁴¹. Thus, in the context of conflict and deficit faced by the city of Al-Hasakah, these practices present opportunities to address food security shortfalls resulting from water scarcity and reinvest in agriculture and livestock breeding based on current conditions, following steps aimed at sustainability. Therefore, it is beneficial to educate and train workers in the fields of smart agriculture, learn from different contexts and geographies, and develop these practices to align with the local context
2. Developing specialized training programs in water resource management within the context of conflict and water scarcity, thereby enhancing the skills of the local workforce and increasing its resilience and employability.
3. Enhancing investment in water infrastructure: Encouraging local and international investments in water infrastructure projects, including water treatment plants and distribution networks. This can be achieved through the establishment of a dedicated investment fund for water projects and offering tax incentives to companies investing in this sector. Additionally, there should be a focus on developing innovative technologies for water desalination and reuse, contributing to the creation of new job opportunities and boosting the local economy.
4. Enhancing partnerships between local, humanitarian, and private sectors: Establishing mechanisms for cooperation between local authorities, humanitarian organizations, and private entities to finance and implement various projects that help address water deficits. These partnerships, in light of the trend towards early recovery,

⁴¹<https://www.fao.org/climate-smart-agriculture-sourcebook/ar/>

can assist in securing the necessary funding to advance the restoration and modernization of water facilities and infrastructure. They also aid in developing and engaging local expertise essential for improving, maintaining, and ensuring the continued operation of water infrastructure. Consequently, this contributes to creating new job opportunities and stimulating local economic growth.

5. Encouraging Small Water and Sanitation Projects: Support and finance small and medium-sized enterprises focusing on innovative solutions for water and sanitation issues. These projects may include the production of water-saving devices, maintenance services for domestic water systems (such as tanks and filters) and sanitation, development of low-cost rainwater harvesting systems, production of locally-made water filters, and provision of greywater recycling services for homes and small farms. Local authorities and civil organizations can support these initiatives through competitions and incentive awards, providing training and support for economic feasibility studies and market research, as well as offering soft loans and incentives for entrepreneurs in this field, contributing to job creation and boosting the local economy. Furthermore, specialized business incubators in water technologies and training centers in environmental entrepreneurship can be established to equip participants with the necessary skills to manage these small projects, support startups, and accelerate their growth. This initiative will help stimulate innovation in the water sector, enhance environmental awareness, and develop innovative and local solutions to water problems, contributing to long-term environmental and economic sustainability.

6. Encouraging Small and Micro Agricultural Projects: Support the establishment and development of small and micro agricultural projects that focus on sustainable practices and efficient water use. These projects may include hydroponics, vertical farming, and the production of high-value crops that require less water, as well as the development of small and medium-scale irrigation systems. Providing training and financial support to the owners of these projects, with a focus on precision irrigation techniques and efficient water management, and encouraging cooperation between these small projects to exchange resources and expertise, contributes to strengthening the local economy and improving food security while conserving water resources.

7. Encouraging Small-Scale Agro-Industries: Support the establishment and development of small-scale agro-industries that rely on local resources and employ water-efficient technologies. These industries may include fruit and vegetable dehydration, herb and spice production, and small-scale dairy product manufacturing. Such projects contribute to diversifying and supporting the local economy, creating job opportunities, and enhancing food security while conserving water resources. It is essential to provide training and technical support to farmers to develop their skills in agricultural product manufacturing and marketing, with a focus on utilizing environmentally friendly and water-efficient technologies in manufacturing processes.

8. Encourage local companies to adopt environmentally friendly practices in their waste management, while providing incentives for institutions that adhere to high standards in environmental conservation and water resource protection.

9. Development of Training and Educational Programs: Create specialized training programs in water resource management and modern irrigation techniques. These programs will help build the capacity of local populations and provide them with the necessary skills to participate in future water projects.

10. Although the phenomenon of waste collectors (scavengers) emerged in the context of economic repercussions and extreme poverty in the region, it is considered an important indicator of the development of local practices in the field of waste recycling and achieving economic benefits. Therefore, it necessitates conducting a comprehensive analytical study of this phenomenon, addressing recycling processes and the associated value chain, as well as its economic cycle. Developing and organizing this phenomenon presents a strategic opportunity to adopt innovative and sustainable local solutions that have proven effective in other geographies in the field of solid waste management and recycling. Consequently, relevant authorities must establish frameworks, measures, and strict controls to ensure safety and social protection, including providing personal protective equipment, setting a minimum age for workers, and protecting them from exploitation. Thus, these practices can be developed into an integrated series of small projects, including waste sorting, selling, and transportation, resulting in tangible economic and environmental benefits for the entire community. Moreover, partnerships can be established between local, humanitarian, and private entities to develop the necessary infrastructure to support this emerging sector, contributing to job creation and stimulating local economic growth.

At The Social Level:

- 1.** Promoting and encouraging local and community initiatives from within and outside to assist marginalized and vulnerable groups in accessing clean and safe water, especially the elderly, orphans, and individuals with special needs.
- 2.** Establishing local committees for water resource management, responsible for equitable water distribution and ensuring access for all community members, with priority given to the most vulnerable families.
- 3.** Encouraging community volunteerism in projects for maintenance and cleaning of local water sources, thereby enhancing a sense of ownership and shared responsibility towards this vital resource. Implementing regular river and stream cleaning campaigns with local community participation and organizing community awareness campaigns on the importance of water conservation and consumption rationalization.
- 4.** Developing comprehensive corporate social responsibility programs focusing on solid waste management and water resource protection. This includes launching initiatives to reduce plastic use and promote recycling, contributing to the reduction of water source pollution. Additionally, developing effective systems for collecting and treating solid waste to prevent its leakage into water sources.
- 5.** Implementation of Community Awareness Programs: Launch comprehensive awareness campaigns on the importance of water conservation and consumption rationalization. These campaigns can include community workshops, informational materials, and school programs to promote a culture of responsible water consumption and reduce pollution risks while protecting the environment. Additionally, competitions and awards for innovative water conservation projects can be organized, including interactive workshops on water conservation methods, sanitation, and solid and health waste management, which encourage active participation from the local community.
- 6.** Integration of Marginalized Groups: It is essential to develop special programs to ensure the participation of marginalized groups in water resource management and decision-making. This includes women, ethnic and religious minorities, people with special needs, and displaced persons. This goal can be achieved by establishing diverse community committees for water management with fair representation for all groups. Moreover, professional and technical training in water management should be provided to marginalized groups, increasing their employment opportunities in this sector. It is also important to allocate a percentage of water projects to directly meet the needs of marginalized communities and establish mechanisms for regular consultation with them to ensure that water policies consider their specific needs. These measures will help promote social justice and ensure that all segments of society benefit from water resource management efforts.
- 7.** Training Camps' Residents in Water Resource Management and Hygiene Practices: Establish water management committees within camps to ensure fair and effective distribution. These measures will significantly contribute to improving the living conditions of displaced persons, reducing the risks of waterborne diseases, and alleviating pressure on local water resources, leading to an overall improvement in the humanitarian situation in the region.

At the level of scientific research and evaluation studies:

- 1.** Encouraging partnerships between local universities, research hubs and international research institutions to exchange knowledge and expertise in water and food security in conflict and crisis contexts. These partnerships should be adopted within early recovery plans, with financial resources allocated to fund research projects related to innovative solutions for water problems in the region. Additionally, establishing specialized local research centers for water and environmental studies, and encouraging students to engage in these fields through scholarships and training opportunities.
- 2.** Organizing local and international conferences and workshops to present diverse ideas and challenges, exchange research findings, and facilitate collaboration between researchers from around the world. This focus on research and development will help in finding innovative and sustainable solutions to water challenges, contribute to building local capacities in water resource management, enhance long-term sustainability, and support economic and social development in the region.

3.Enhancing support for hydrogeological research and risk assessment studies: Given the risks facing groundwater levels in the region from depletion and contamination, conducting comprehensive hydrogeological assessment and risk evaluation studies is crucial for understanding the best ways to utilize groundwater resources and identify potential threats. This includes analyzing groundwater quality, assessing aquifer recharge rates, and identifying vulnerabilities in water systems. Additionally, the use of modern technologies such as remote sensing and geographic information systems for accurate mapping of water resources is essential for developing an effective and sustainable plan for groundwater extraction and its impact on broader geographical scales, affirming the principle of no harm. It is important to develop local early warning systems to monitor changes in groundwater levels and quality. This information will be critical in developing effective water management strategies, optimally locating new wells, and developing plans to mitigate the effects of drought and floods. It will also help guide land use policies and development project planning to ensure long-term sustainability of water resources in the region.

4.Supporting scientific research and field studies that combine traditional knowledge with modern scientific techniques to develop sustainable solutions suitable for local conditions. This approach aims to leverage local expertise accumulated over generations in water resource management, integrating it with the latest scientific technologies. These studies may include documenting traditional practices in water harvesting, ancient irrigation methods, and locally developed water conservation techniques. In parallel, modern technologies such as remote sensing, advanced data analysis, and ecosystem modeling are used to evaluate the effectiveness of these traditional practices and improve them. This integration of traditional knowledge and modern sciences can lead to the development of innovative and sustainable solutions that are more acceptable and effective in the local context, enhancing sustainable management of water resources and improving adaptation to climate changes.