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Parched and Imperiled: Gaza's Deteriorating Water Security in the Wake of the October 2023 Aggression

Amal Sarsour, Monther Shoblaq, Samer Abuzerr, Nidhi Nagabhatla, Brigitte Herremans, Azzam Abuhabib



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About the authors

Amal Sarsour is an Associate Research Fellow at UNUCRIS Institute on Comparative Regional Integration Studies Belgium, United Nations University (CRIS), 8000 Brugge, Belgium.

Monther Shoblak: Director of the Coastal Municipalities Water Utility “CMWU”- Gaza Strip, OPT.

Samer Abuzerr: Department of Medical Sciences, University College of Science and Technology, Khan Younis, Gaza, Gaza Strip, Palestine.

Nidhi Nagabhatla: Institute on Comparative Regional Integration Studies Belgium, United Nations University (CRIS), 8000 Brugge, Belgium. Faculty of Science, McMaster University, Hamilton, ON L8S 4L8, Canada

Brigitte Herremans: Human Rights Centre of Ghent University, and a guest lecturer in the Middle East at the University of Antwerp.

Azzam Abuhabib: Water & Environmental Department, Faculty of Civil Engineering, Universiti Teknologi Malaysia (UTM), Johor, Malaysia.

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Executive Summary

The Gaza Strip faces an unprecedented water crisis exacerbated by recent and ongoing conflict and military aggression, which commenced on 7 October 2023. This small, arid region on the Mediterranean coast, already suffering from freshwater scarcity, has worsened water insecurity due to pollution, over-extraction of the aquifer, and lack of energy and electricity. The situation is further complicated by a complex interplay of meteorological, political, legal, economic, and geopolitical factors tied to Gaza's regional context. Despite advancements in water and sanitation infrastructure made between January 2006 and October 2023, the ongoing Israeli hostility has led to the systematic targeting and destruction of these facilities. This aggression, linked to Israeli Cabinet decisions to cut water and power supplies, has precipitated a humanitarian crisis. The weaponization of water and its infrastructure has become increasingly evident in recent aggression, with extensive damage to critical infrastructure, exacerbating the already dire conditions for the population. The conflict has resulted in the forced displacement of over 1.9 million Gazans, confining them to extreme, harsh, and inhuman conditions devoid of basic infrastructure and denying their fundamental rights to access water and sanitation services.

This displacement has significantly contributed to the deterioration of the overall situation. IHL regulates hostilities, protecting civilian infrastructure and non-fighting individuals, and prohibits attacking or destroying “objects indispensable to the survival of the civilian population”, including essential human survival items like drinking water and sanitation. During peacetime, additional protections are provided for essential services. In the context of Gaza, Israel, as the occupying power, has a legal obligation under international humanitarian law to maintain order, ensure civilian well-being, uphold public health, and provide essential resources in accordance with human rights standards. This includes preventing the deterioration of the aquifer in Gaza and ensuring sustainable access to quality water. The water crisis in Gaza underscores Israel's responsibilities towards the Palestinian population; notwithstanding, Israel retains control over water governance, thereby limiting external interventions. No legally binding agreements or mandatory actions have been implemented. It highlights the urgent need for full access to water and sanitation services, as emphasized by recent reports from the United Nations and other international organizations. Addressing water insecurity in Gaza requires multifaceted solutions, involving inter-regional cooperation and multi-sectoral policy approaches. Without these measures, the crisis risks further environmental degradation, public health crises, economic instability, and social unrest. The brief addresses a pressing issue, offering insights into the water crisis that has intensified since October 2023, and the document incorporates recent statistics and figures from reputable sources, strengthening its arguments and effectively linking the water crisis to broader issues of conflict, infrastructure damage, and public health with distinct sections that logically progress from introduction to specific impacts and provides recommendations for policymakers and humanitarian organizations.

“Israel must stop using water as a weapon of war. Under Article 7 of the Rome Statute, intentionally depriving the civilian population of conditions of life, calculated to bring about their destruction, is an act of extermination and classified as a crime against humanity”. “Pedro Arrojo-Agudo, United Nations Special Rapporteur on the human rights to safe drinking water and sanitation, (UNOHCHR, GENEVA, 17 November 2023)”

We anticipate this working paper will serve as a valuable resource for understanding the complex water crisis in Gaza. Additionally, our set of narratives and use of recent data makes it a credible document for informing policy decisions and humanitarian efforts for current assessment of needs and gaps and post-conflict response and recovery strategies, more so those that applies to ensuring ‘water security for all’.

Keywords

Water Security, Conflict, International Humanitarian Law, Displacement, Water Governance, Human Rights, Infrastructure Destruction

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Introduction

Gaza Strip is a small Palestinian strip located on the Mediterranean coast in southern Palestine and is an arid region suffering from freshwater scarcity. The strip has witnessed exponential population growth during the last century, which greatly strained the infrastructure in Gaza. Additionally, it is one of the most politically unstable regions in the world, shaped by the ongoing blockade and recurrent military aggression (Farajallah and Farajallah, 2024; Sarsour and Nagabhatla, 2022). These factors have significantly impacted the water and wastewater networks, which could not cope with the increasing demand due to prolonged historic negligence, resulting mainly from recent aggression, which began on 7 October 2023 and continued until 19 January 2025¹. Furthermore, the complete siege that has been imposed on Gaza by Israel following October 7, 2023, including closed crossings and a lack of essential resources like water and electricity, has been a critical factor contributing to the unfolding humanitarian catastrophe (UNFPA, 6 April 2024). Existing settings of conflicts and cascading instability have compounded Gaza's pre-existing vulnerabilities, particularly its acute water insecurity, where the population in the region was already experiencing significant challenges in securing reliable sources of water due to the pollution and over-extraction of the Gaza aquifer, its near depletion, and the degradation of water quality as well as associated lack of energy and electricity massive shortage (Abuzerr et al. 2023; Beiraghdar et al. 2023; Nagheeby et al., 2023).

It is important to note that the water utility, Coastal Municipalities for Water Utility (hereafter: CMWU), is the main official body responsible for providing drinking water and treating sewage for the Gaza Strip's population of over 2 million residents. Notwithstanding the considerable challenges posed by Israeli restrictions, which had a significant impact on the supply of WASH materials, equipment and spare parts, particularly from January 2006 to October 2023, the utility managed to implement projects to overcome the lack of capacity and efficiency. Advancements in water and wastewater infrastructure in Gaza have been notable. It witnessed the implementation of water and wastewater infrastructure and facilities using highly advanced technologies through an investment program, providing \$1 billion to the CMWU and Palestinian Water Authority (PWA), financed by partners in the donor community and UN agencies. As a result, 3 wastewater treatment plants, tens of sewage pumping stations, stormwater infiltration stations, three seawater desalination plants, and brackish water desalination plants, tens of water reservoirs, thousands of kilometers water and sewage pipes of various diameters were developed². The program enabled the Coastal Municipalities Water Utility and its local partners from the local authorities (municipalities) to improve the water quality provided to the Gaza Strip population and safely collect and treat the sewage (Aiash & Mogheir, 2017; Al-Najjar et al., 2021; Rabah et al., 2023).

The above-mentioned developments have emerged through innovative projects and community resilience, aiming to address the region's dire water scarcity and pollution issues. Collaborative humanitarian efforts have aimed to build local capacity for maintenance and repair, emphasizing the need for ethical donation practices and material support rather than solely service provision (Centivany, 2024). Nevertheless, despite the advancements that have been made, the recent Israeli military aggression that commenced October 7th, 2023 along with the subsequent damage to infrastructure, has created substantial challenges in the endeavor to establish sustainable water and wastewater systems in the Gaza Strip. It is of the utmost importance to recognize the necessity of a continued interplay between humanitarian efforts and local resilience to navigate these challenges successfully.

However, it is imperative to acknowledge that these initiatives were executed by local water utilities in collaboration with international organizations to foster the advancement of the water sector, notwithstanding the challenges that have been delineated. This is of paramount importance to avoid any misinterpretation. This does not exonerate the occupation state of Israel of its primary responsibility for the exacerbation of the water situation and the increase in challenges. The burden of responsibility for the challenges posed by Israel as an occupying state, and for its failure to provide essential services, lies with the state itself. Israel is bound by legal obligations to maintain public health and provide essential resources. Conversely, the external interventions in this regard have been constrained by Israel's governance of water resources. The absence of legally binding accords to address the water crisis in Gaza is further indicative of this. In order to address the issue of water insecurity in Gaza, it is necessary to implement solutions involving inter-regional cooperation and multi-sectoral policy approaches.

¹ This policy brief was prepared to cover the exacerbation in water insecurity crisis in Gaza following 7 October 2023 and continued until the onset of the ceasefire on 19 January 2025 before the ceasefire has been breached on the evening of 17 March 2025, where Israel unilaterally ended the ceasefire that it agreed upon with Hamas to take place on 19 January.

² Monther Shoblak, Director of the Coastal Municipalities Water Utility "CMWU"- Gaza strip, OPT

Nevertheless, despite the advancements that have been made, the recent Israeli military aggression that commenced following Oct 7, 2023, along with the subsequent damage to infrastructure, has created substantial challenges in the endeavor to establish sustainable water and wastewater systems in the Gaza Strip. It is of the utmost importance to recognize the necessity of a continued interplay between humanitarian efforts and local resilience to navigate these challenges successfully. It is of the utmost importance to recognize the necessity of a continued interplay between humanitarian efforts and local resilience to navigate these challenges successfully. In this regard, consideration should be given to the accountability of Israel as an occupying state in regard to any deliberate actions that impede or restrict access to water for the civilian population in Gaza. Such actions may be considered a violation of IHL in accordance with Geneva Convention IV Article 54.

As we reflect on the complex interplay of political, economic, and social factors that shape the multifaceted challenge of Gaza's water insecurity, recent research explanations, including the study on water, sanitation, and hygiene insecurity among internally displaced populations, the conflict-driven displacement has exacerbated the already precarious conditions for water access (Abuzerr et al., 2024). Also, Oxfam's recently published report emphasizes the weaponization of water in the ongoing conflict, underscoring the urgent necessity for full access to water services to prevent further deterioration of the humanitarian situation (Abdul Samad, Butcher, Khalidi, 2024)

Considering the factors mentioned earlier, water insecurity in Gaza represents a complex challenge that requires local authorities, international organizations, and humanitarian agencies to guarantee the population's access to safe and reliable water sources.

This paper seeks to explore the key factors contributing to Gaza's challenging water security situation, including the political dynamics and the broader human rights violations affecting the water sector. It also explores the challenges local authorities, international organizations, and humanitarian agencies face in addressing these issues and ensuring that the population's fundamental water rights are upheld, particularly in the wake of the October 2023 aggression, with discussion of the denial of access to critical resources like water, particularly as a punitive measure, and its violation of human rights and its contrariness to IHL and human rights.

1. The Importance of Water Security in Conflict Zones

Box 1.

"Global attention to water security has emerged in the 21st century." UN-Water defines it as: "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development; for ensuring protection against water-borne pollution and water-related disasters; and for preserving ecosystems in a climate of peace and political stability". The aim of water security is to make the most of water's benefits for humans and ecosystems. The second aim is to limit the risks of destructive impacts of water to an acceptable level (Sadoff, et al., 2020)

Water is an essential resource for life, and its availability has consistently been a determining factor in the survival and prosperity of nation-states and their inhabitants.

However, in recent years, there has been a notable increase in the number of threats to freshwater security. The ramifications of a prospective water crisis for states, societies, and international systems will likely be far-reaching and profound. The disruption of water supplies and contamination are responsible for many adverse effects, including death, injury, and forced migration. Furthermore, they pose a significant risk of further destabilization in areas characterized by conflict and drought. It can be reasonably argued that water security is a prerequisite for national, regional, and global stability. While the precise nature of these developments in specific locations remains uncertain, it is becoming increasingly evident that states that control freshwater sources will gain considerable influence over those that do not (Mishra, 2023).

It is undeniable that water is a fundamental necessity for human life. The absence, deprivation, or contamination of water has significant and sometimes fatal consequences for those directly or indirectly affected by such actions. Water has distinctive 'security' and 'weapon' capabilities. These two capabilities, which focus on the 'control' of water, are vital in the context of the approach and in maintaining the balance in legal provisions that specifically protect water. The control or denial of water resources in inhabited areas can be a significant instrument of asymmetrical warfare, particularly regarding the fundamental

necessity of life. Such actions, including denial, forced obstruction, destruction, or dispersion of water resources, have immediate and far-reaching consequences for human security (Arrojo-Agudo, 2022; Martinez-Cruz et al., 2024).

Conflict further weakens the already fragile governance systems responsible for managing water resources sustainably. In such contexts, the inability to effectively protect and distribute water aggravates existing vulnerabilities, turning water scarcity into a trigger for further violence and societal breakdown. Consequently, addressing water security in conflict zones requires a multifaceted approach that incorporates advanced methods and models to assess dynamic water environments and identify risks and response strategies. Research and policy must prioritize sustainable governance frameworks to ensure water resources are safeguarded and effectively managed, even amid the complexities of conflict (Schillinger et al., 2020).

“Water has become not just a necessity for survival but a weapon of control, amplifying human suffering and destabilizing societies in conflict-affected areas” (Nagheeby et al., 2023)

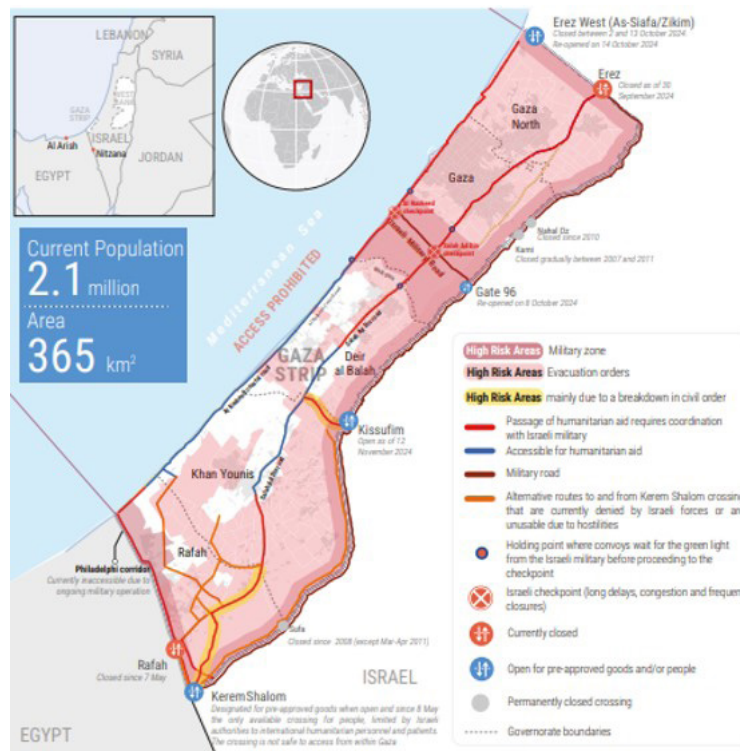


Figure 1: Gaza Overview: Humanitarian Access

Source: OCHA, Reported impact snapshot, Gaza Strip, 2 January 2025

1.1 History of Water Insecurity in Gaza: Causes and Impacts

The Gaza Strip, a narrow coastal strip along the Mediterranean in southern Palestine, spans approximately 365 square kilometers. Despite its limited size, it is home to 2.23 million residents, making it one of the most densely populated areas in the world, with a population density of around 6,300 people per square kilometer (Dardona et al., 2024; PCBS, 2024). Israel occupied the Gaza Strip in 1967 and remains an occupying power, although it unilaterally withdrew from the Strip in 2005, the Israel's military continued to retain effective control of Gaza's borders, airspace, and coastline (Amnesty, 2024; Gross, 2023; Jaber & Bantekas, 2023). The extreme population density, combined with the occupation power not meeting its international obligations³, blockade, and political, economic, and environmental challenges, has made Gaza one of the most impoverished and

³ The statement "the occupation power not meeting its international obligations" is a reference to the legal consequences arising from Israel's policies and practices in the Occupied Palestinian Territory, including East Jerusalem, as examined in the International Court of Justice (ICJ) advisory opinion of July 19, 2024. The ICJ's opinion, specifically in paragraphs 124-133, details how Israel's prolonged occupation and related actions violate international law, including obligations related to self-determination, the prohibition of acquiring territory by force, and international humanitarian law. Source: <https://www.icj-cij.org/case/186>

deprived coastal regions in the world. Chief among these challenges is water insecurity, which is deeply intertwined with political blockades, recurrent conflicts, and aggression. These factors have exacerbated economic hardships and have led to widespread water scarcity and poor water quality, which, in turn, have undermined food security and public health (Buheji & Hasan, 2024).

Water scarcity remains Gaza's most pressing environmental issue. The region receives limited and irregular rainfall, ranging from just 300 mm/year in the north to 100 mm/year in the south. Extended periods of drought and excessive groundwater abstraction have severely diminished the natural recharge of the coastal aquifer, the sole natural source of fresh water for Gaza. Over-extraction has led to a dramatic decline in the water table, saline intrusion, and a steady degradation of water quality, exacerbating agricultural and economic challenges. These compounding issues have made Gaza's water supply increasingly precarious over time (Muratoglu, Wassar, 2024).

“The water crisis in Gaza is emblematic of the intersection between environmental degradation and geopolitical conflict, where resource scarcity becomes a tool for control and a driver of human vulnerability”. (Lossow and Shatat, 2020)

However, it would be erroneous to attribute the water insecurity experienced in Gaza exclusively to local environmental conditions. Instead, it is shaped by a complex interplay of meteorological, political, legal, economic, and geopolitical factors tied to Gaza's regional context and the broader Middle East. Where, the root cause of Palestine's water crisis is not a lack of investment but the political reality that Israel, as an occupying power, manages water in a way that denies Palestinians fair access (Marianne Dhenin, 2024), and the governance of water resources in Gaza is impeded by the significant influence exercised by Israel over Gaza's water resources and regulatory frameworks, frequently impeding access to what would be considered Gaza's rightful share of water resources. This is in direct violation of the ICJ's statement that ‘the occupation power not meeting its international obligations’ (Von Lossow & Shatat, 2020; Buheji & Al-Muhannadi, 2023; ICRC, 26-07-2024⁴). For instance, Israel controls the aquifer's upstream portions, while granting the Palestinian Authority (PA) sole responsibility for the downstream Gaza portions. Notably, the 1995 Interim Agreement on the West Bank and the Gaza Strip (Oslo II) did not accord Israeli-Palestinian coordination over either of the transboundary riparian resources (the Jordan River and the Coastal Aquifer) in which Israel controls upstream portions. There are no mechanisms by which the PA can limit Israeli extractions from the Coastal Aquifer, even though these extraction levels impact the downstream Gaza sections of the aquifer. For Gazans, relying exclusively on the PA's portion of the coastal aquifer is insufficient to satisfy even the most basic needs of the population (Ravey, et al., 2022). A recent study comments on the overexploitation of water resources by Israeli settlements before the unilateral withdrawal in 2005 is a factor that has also contributed to the exploitation (dos Santos & Nasser, 2024; Obermaier, 2024).

In light of the aforementioned historical water scarcity experienced in the Gaza Strip, the Palestinian Water Authority (PWA) had previously estimated, prior to the hostilities that commenced on 8 October 2023, that the Gaza Strip required 152 million cubic meters (MCM) of water per annum to meet its population's needs. However, the region's sustainable water supply capacity was constrained to a mere 100 MCM per year, which fell significantly short of meeting demand. This situation was further exacerbated because less than 10% of Gaza's population had access to water that met acceptable bacteriological quality standards. The water and wastewater infrastructure damage further obstructed access to clean water for the population, undermining efforts to develop and improve these essential systems. These long-standing challenges have intensified the suffering of Gaza's residents and undermined substantial investments to address the region's critical water needs (Alnajar, et al., 2023; Salem, 2023).

Noting these points, we can say that addressing water insecurity in Gaza requires recognizing it as a result of multifaceted and interconnected challenges. Israel is manipulating the region's water. This is the biggest challenge. It is clear that Israel, as the occupying power, is not meeting its international law obligations. The Supreme Court's advisory opinion makes this abundantly clear. Israel is in clear violation of its international law obligations as an occupying power. It is imperative that sustainable solutions go beyond technical fixes. Inter-regional cooperation is the only way to force Israel as the occupying power to commit to its role and stop depriving Palestinians of adequate access to clean water. Multi-sectoral policy approaches must be adopted to consider the crisis's environmental, political and social dimensions. It is clear that without such measures, Gaza is

⁴ “What does the law say about the responsibilities of the Occupying Power in the occupied Palestinian territory?”, July 26, 2024, <https://www.icrc.org/en/document/ihl-occupying-power-responsibilities-occupied-palestinian-territories>

at risk of continuing cycles of environmental degradation, public health crises, economic instability and social unrest. This will undoubtedly jeopardise the welfare of its residents (Abdul Samad, Butcher, Khalidi, 2024; Buheji, A Hasan, 2024; Human Rights Watch; December 2024; Rantissi et al., 2024; Shorrab et al., 2023)

1.2 Israel's Intrusion in Gaza's Water Sector: Prior to October 7, 2023

The Palestinian water crisis exemplifies and exceeds global challenges in enforcing water rights, particularly in conflict-affected regions. While 71% of the world population has access to safely managed water services, only 59% of Palestinians have similar access. This disparity is particularly acute in Gaza, where just 11% of the population has basic water access, compared to 95% in the West Bank (UN, 2020). The political landscape in the Occupied Palestinian Territories (oPt), including Gaza, diverges from the conventional definition of occupation where the current water crisis in Palestine exemplifies the profound impact of political conflict on water rights and access. Since the occupation began, Palestine has faced severe consequences, including resources scarcity, contamination, rapid population growth and limited job opportunities. These factors have created significant environmental hazards, with water scarcity and declining water quality posing major challenges to Palestine's economic development (Muratoglu & Wassar, 2024). The Oslo Accords envisioned a phased transition to Palestinian self-governance, laying the groundwork for an independent, sovereign Palestinian state with laws and a constitution that would ensure democratic rights and human equality on par with universal standards (Saul, 2021; Soleimani, 2020; Stensland, 2023;). Currently, territorial sovereignty rendered impossible by Israel's occupation that is labelled as illegal by the International Court of Justice (2024). The occupation is characterized by policies favoring Israeli settlers, often through confiscation of natural resources and land dispossession. This was also the case when Israel had settlements in the Gaza Strip, up until 2005⁵ (dos Santos & Nasser, 2024; Obermaier, 2024). This has resulted in the mismanagement of Palestinian natural resources and land use planning. One direct outcome is the degradation of groundwater quality and salinity, exacerbated by Israeli control over key water infrastructure, such as starter technique wells and the Yarkon-Taninim desalination system (Gazzini, 2022; Sands, 2023; Seliktar, 2021).

"Israel has violated all the rules of war in the Gaza Strip, the world must not become numb. All wars have rules. All those rules have been broken in Gaza" (Lazzarini, 2024).

Figure 2 illustrates key events in the region's water governance history, shedding light on over seven decades of conflict over shared water resources. Palestinians have been denied meaningful access to the Jordan River since 1967, triggering chronic water insecurity in the oPt. The 1993 Oslo Accords aimed to address water allocation by assigning specific quantities to Israel, the West Bank, and Gaza. However, these agreements largely treated water as a quantitative issue and overlooked critical environmental and socioeconomic challenges. This approach resulted in asymmetrical access to water resources, perpetuating water disparities, inadequate infrastructure, and inefficient management systems. Critics argue that the accords failed to address environmental sustainability and social equity, thereby exacerbating economic injustice and disparities in water access between Israel and Palestine (Casas, et al., 2020; Brooks, et al., 2019; Sarsour & Nagabhatle, 2022; Lazarou, 2016).

⁵ Despite the unilateral withdrawal of Israeli settlements from the Gaza Strip in 2005, the region continues to be affected by the legacy of resource exploitation and water scarcity. From the mid-1970s until 2005, Israeli settlements were located in the Strip, with an average population of just under 8,000. The exploitation of natural resources was a critical factor in the establishment and maintenance of these settlements, with the presence of Israeli settlements in the Gaza Strip primarily facilitated using hydro-hegemony and resource control. The Strip was considered a valuable asset due to its strategic position over the coastal aquifer, which constitutes Israel's primary groundwater source. Additionally, the Strip was considered an area where development could be pursued with relative ease due to a surplus of water. Consequently, Israeli settlements in Gaza often had preferential access to water resources, facilitated by infrastructure that diverted water from local aquifers to serve the settlements. This control led to severe restrictions on Palestinian access to water. Concurrently, there was over-extraction of water from the Coastal Aquifer by the settlements, which is the primary water source for Palestinians in the Gaza Strip. This was exacerbated by implementing agricultural practices associated with the settlements, leading to the depletion of water resources in Gaza. This has had a significant impact on the already precarious water situation for the Palestinian population and has contributed to environmental degradation, including issues such as groundwater salinization, which has further compromised water quality in the Gaza Strip (dos Santos and Nasser, 2024; Obermaier).

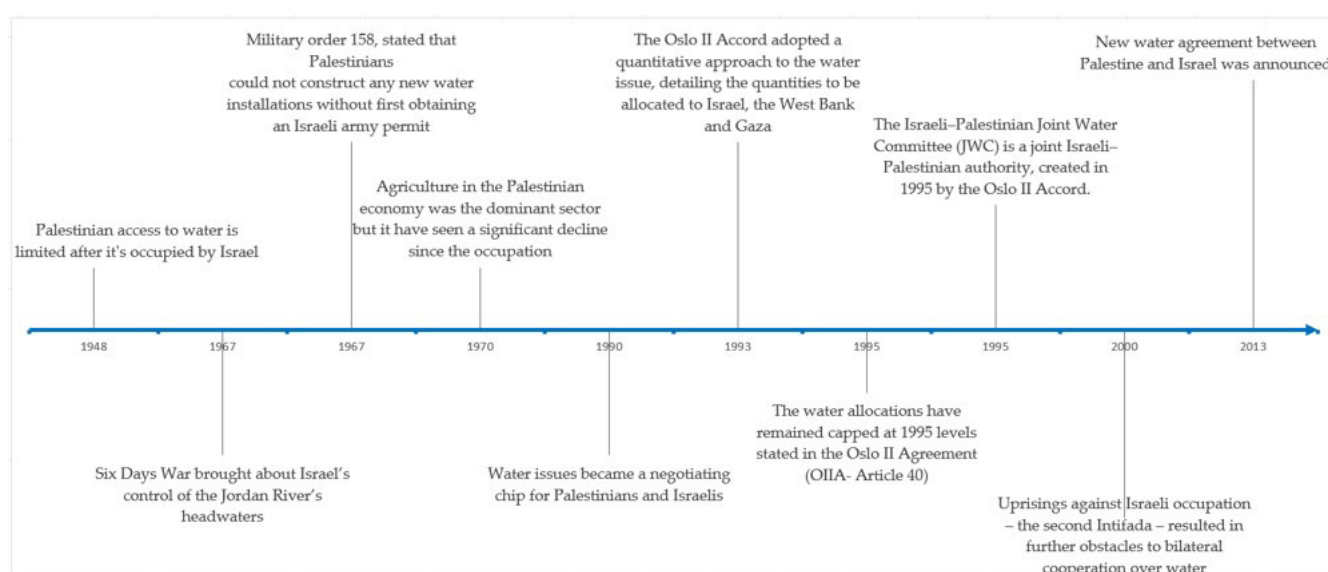


Figure 2: Timeline of Palestinian Israeli water conflict and agreements.

Source: Sarsour and Nagabhatla 2022

Furthermore, the region's capacity to replenish exploited resources or absorb the impacts of pollution has been exceeded; soil resources, including sand and gravel, were being extracted unsustainably, while groundwater – Palestinians' sole source of potable water – is over-pumped, poorly managed, and contaminated due to the environmental degradation in the Gaza Strip stemming from overexploitation, pollution, and unsustainable use of natural resources by settlements until 2005. This degradation negatively affects livelihoods and poses serious health risks, especially in urban and coastal areas of Gaza. Toxins, heavy metals, and pathogens are prevalent, and the agricultural regions in southern Israel, downwind of emissions from Gaza, are also adversely impacted. The coastal dunes stretching from southern Gaza to northern Sinai have suffered from desertification, leaving the aquifer exposed to contamination and severely degrading water quality. Consequently, the marine ecosystem, extending beyond the 36-nautical-mile median line, is now contaminated with nitrates, chlorides, and turbidity from silt. The over pumping and pollution of groundwater have rendered the aquifer unsuitable for human consumption. Water from unsanitary wells, while used domestically and for agriculture, remains unsafe for drinking, recreational activities, and wildlife (Abualhin & El-Khuzundar, 2022; Al-Najjar, et al., 2021; Buheji & Al-Muhannadi, 2023; Dardona et al., 2024; El Baba et al., 2022; Sarsour & Nagabhatla, 2022). The prolonged political instability in Gaza, exacerbated by the escalation of Israeli military aggression following Hamas' assault on October 7, 2023, has led to a devastating humanitarian crisis. On October 9, Israel intensified its 16-year blockade of Gaza by imposing a "total siege," systematically depriving the population of essential resources such as food, water, and electricity triggering acute food insecurity and alarming levels of starvation among Gaza's population (Abdul Samad, et al., 2024).

1.3 Impact of the October 2023 Aggression on Gaza's Water Insecurity

The October 2023 aggression has severely exacerbated water insecurity in Gaza, compounding the hardships faced by its 2.23 million residents. A recent report by the UN Special Committee revealed that since the beginning of the aggression, Israeli officials have publicly supported policies that strip Palestinians of the very necessities required to sustain life — food, water, and fuel. These statements along with the systematic and unlawful interference of humanitarian aid make clear Israel's intent to instrumentalize life-saving supplies for political and military gains. Furthermore, the UN Special Committee finds Israel's warfare methods in Gaza consistent with genocide, including use of starvation as weapon of war (UNOHCHR, nov 2024).

Notwithstanding advancements that have been made to WASH facilities, the recent Israeli hostility and the systematic targeting and destruction of water and wastewater facilities in Gaza, linked to Israeli Cabinet decisions to cut water and power supplies, have precipitated a humanitarian crisis. The Israeli military aggression has resulted in extensive damage to critical infrastructure, thereby exacerbating the already dire conditions for the population (Abdul Samad, et al., 2024; Human Rights Watch, 2023).

Extensive damage to infrastructure, including water treatment facilities, pipelines, and electricity networks, has disrupted water supply systems and desalination plants. The exacerbation of a 16 year blockade with imposing total siege enforced on Gaza by Israel, including closed crossings and lack of essential resources like water and electricity, have been critical factors contributing to the unfolding humanitarian catastrophe (UNFPA, 2024). Moreover, restrictions on importing essential repair materials have further hindered efforts to restore these vital systems, leaving the population with diminished access to potable water and compromised public health and sanitation conditions (Dardona et al., 2024; Hassoun et al., 2024; Shorrab et al., 2024).

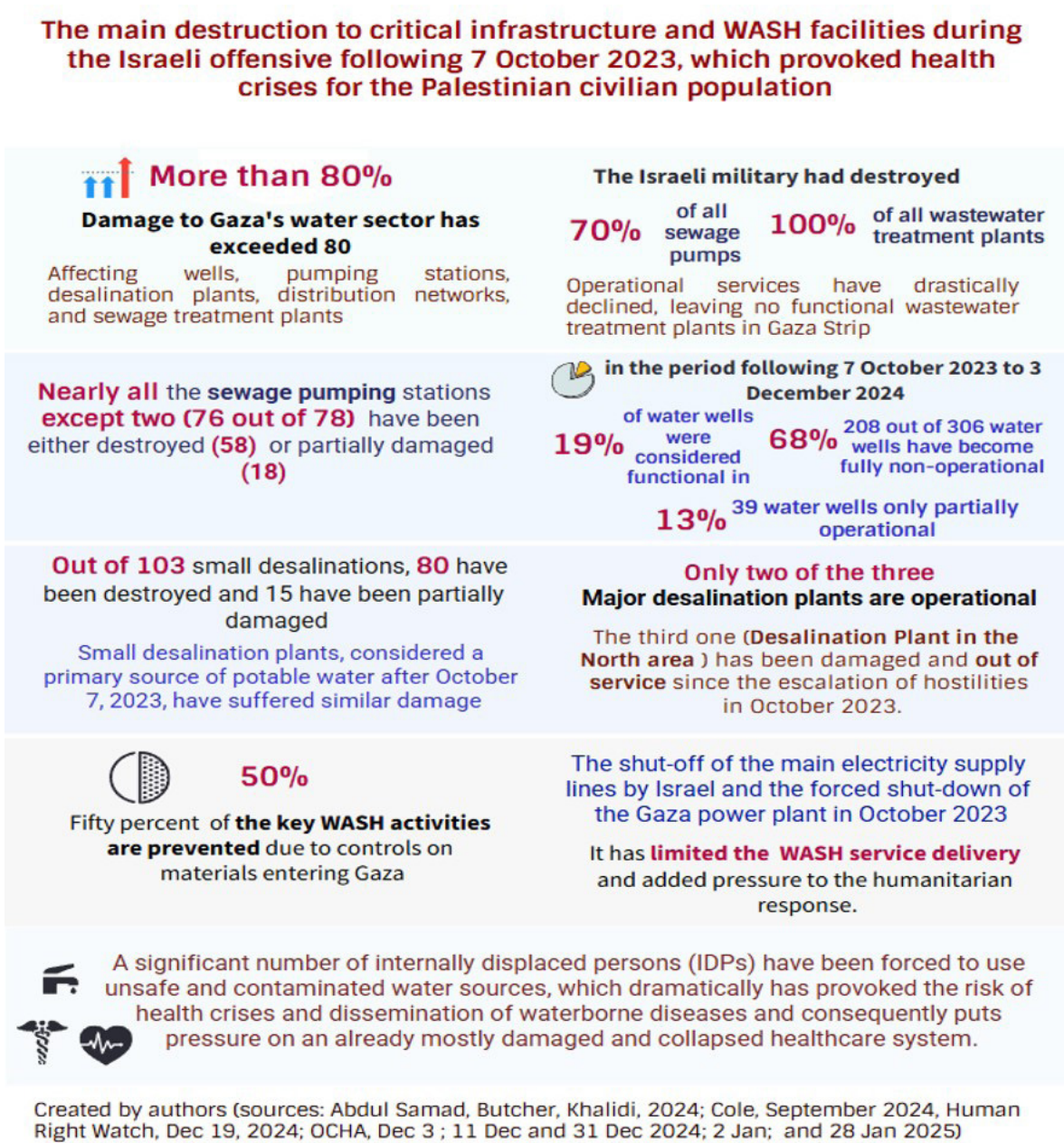


Figure 3: The main destruction to critical infrastructure and WASH facilities during the Israeli offensive following 7 October 2023, which provoked health crises for the Palestinian civilian population.

Source: Created by authors⁶

6 Sources: Abdul Samad, Butcher, Khalidi, 2024; Cole, September 2024, Human Right Watch, Dec 19, 2024; OCHA, Dec 3, 2024; 11 Dec 2024; 31 Dec 2024; 2 January 2025; 28 January 2025

The weaponization of water and its infrastructure has become increasingly evident in recent aggression (Nagheeby et al., 2024), and this was supported by Oxfam's recently published report which emphasizes the weaponization of water in the ongoing conflict, underscoring the urgent necessity for full access to water services to prevent further deterioration of the humanitarian situation (Abdul Samad, et al., 2024). Also, a UN expert warned that Israel must stop using water as a weapon of war, that "every hour that passes with Israel preventing the provision of safe drinking water in the Gaza strip, in brazen breach of international law, puts Gazans at risk of dying of thirst and diseases related to the lack of safe drinking water", as said by Pedro Arrojo-Agudo, the UN Special Rapporteur on the human rights to safe drinking water and sanitation (UNOHCRS, 2023).

"Since October 2023, Israeli authorities have deliberately obstructed Palestinians' access to the adequate amount of water required for survival in the Gaza Strip" (Human Rights Watch, 2024).

WASH service providers, including public utilities, community-led initiatives, humanitarian actors, and households, struggle to meet the overwhelming demand. With 84.6 percent of critical Gaza's Water, sanitation, and hygiene (WASH) infrastructure being destroyed, operational services have drastically declined, leaving no functional wastewater treatment plants. The shutdown of the Gaza Power Plant and electricity cut-off forces WASH partners and service providers to rely on backup generators and fuel, limiting service delivery and adding pressure to the humanitarian response. The limited available resources have been repeatedly damaged, requiring services to be continuously repaired or depleted. The destruction of critical infrastructure, including water treatment plants and distribution networks, has severely hampered the ability to provide safe and adequate water for the population. Community-led initiatives, sustained community engagement, and self-support mechanisms at the household level are nearly exhausted. Fifty percent of the key WASH activities are prevented due to controls on materials entering Gaza (OCHA, 2024).

Figure 3 summarizes the main destruction to critical infrastructure and WASH facilities during the Israeli offensive following 7 October 2023, which provoked health crises for the Palestinian civilian population. The repeated and continuous massive displacement of the population by the Israeli military action towards the Gaza Strip has resulted in a catastrophic situation where approximately 80 percent of the Gaza Strip has been under active Israeli-issued evacuation orders from October 2023 until December 2024 (OCHA, 2024). This has resulted in the displacement of at least 1.9 million individuals, representing approximately 90% of the Gaza Strip's population. Many individuals have been displaced on multiple occasions, with some experiencing up to ten relocations. These individuals have been compelled to reside in rudimentary, scattered tents, predominantly in the Al Mawasi region. Even before the onset of hostilities, the area in question was characterized by a paucity of sophisticated infrastructure. It is widely acknowledged that the area is best suited to agricultural and recreational activities. The region is sparsely populated and relies on agricultural wells that are only partially operational, with percolation pits used for the disposal of sewage.⁷

The overcrowded and unsanitary conditions in southern Gaza, lacking safe water and adequate sanitation, have contributed to the emergence and spread of waterborne diseases. Since the commencement of the Israeli offensive, the water allocation for Gaza's population throughout the 15 months has decreased to 4.74 liters/person/day, representing a 94% reduction from the pre-aggression average of 82.7 liters/person/day. This is considerably below the World Health Organization's (WHO's) minimum standard of 15 liters/person/day for emergency survival (Abdul Samad, et al., 2024). The United Nations Office for the Coordination of Humanitarian Affairs in the Occupied Palestinian Territories (OCHA) recent report demonstrated that 62% (1.4 million) of people following October 7 2023, receive less than the recommended 6 liters/person/day for drinking and cooking, while 47% of people receive less than the minimum recommended 15 liters/person/day for drinking, cooking, and basic hygiene (OCHA, 2025). As summarized in Figure (4), even prior to this crisis, the Gazan population was experiencing significant difficulties in accessing an adequate and secure supply of potable water, driven by a lack of surface water sources and asymmetric control of water resources by Israel (Perlman, et al., 2025). The health implications of this crisis are dire, with an increase in waterborne diseases and a severe lack of basic hygiene conditions.

⁷ UNRWA Situation Report #151 on the Humanitarian Crisis in the Gaza Strip and the West Bank, including East Jerusalem, Thursday, December 12, 2024. All information updated for 4 – 10 December 2024, valid as of 10 December 2024 at 22:30 ; Days 425- 431 of Hostilities. <https://www.unrwa.org/resources/reports/unrwa-situation-report-151-situation-gaza-strip-and-west-bank-including-east-jerusalem>

“By destroying vital water, sanitation, and food systems, and contaminating the environment in Gaza, Israel has created a lethal mix of crises that will inflict severe harm on generations to come,” (The UN Special Committee to investigate Israeli practices, 2024).

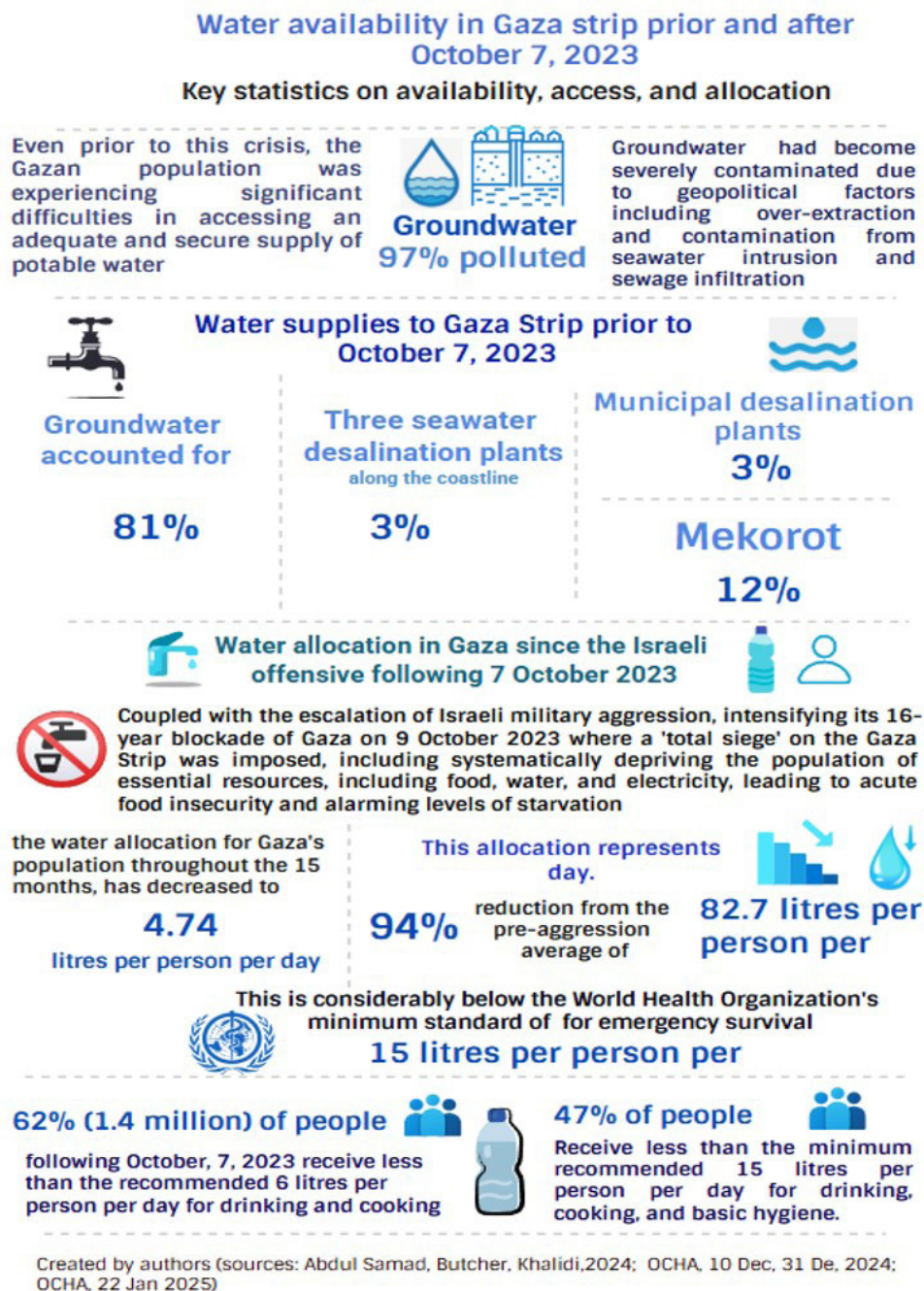


Figure 4: Water availability in Gaza Strip prior to and after October 7, 2023 (Authors graphic)
Source: Abdul Samad, et al., 2024; OCHA, 2024; De, 2024; OCHA, 2025

Box 2. What is International Humanitarian Law (IHL)

International humanitarian law is a set of rules that seek, for humanitarian reasons, to limit the effects of armed conflict on people, including civilians, persons who are not or no longer participating in the conflict, and even those who still are, such as combatants. It protects persons who are not or are no longer participating in hostilities and restricts the means and methods of warfare (UNOHCHR, 2011). IHL, or the law of armed conflict, applies in military occupation and armed conflict situations. It imposes significant obligations on occupying powers to protect the fundamental needs of the occupied population (ICRC, 2024). In the context of the water crisis in Gaza, IHL plays a crucial role in ensuring that the occupying power, in this case, Israel, fulfills its obligations to provide for the basic needs of the civilian population, including access to water. It enshrines the obligation of humane treatment toward all parties to a conflict, a principle codified in the Fourth Geneva Convention. Water resources are afforded special protection under IHL, recognizing their vital importance for civilian survival during conflicts (Tignino & Kebebew, 2023a; Tignino & Kebebew, 2023b).

2. International Humanitarian Law (IHL) Framework and Water Security in Conflict

In 1967, the United Nations Security Council, in regard to the territories occupied by Israel after the Six-Day War, had already considered that “essential and inalienable human rights should be respected even during the vicissitudes of war.”⁸ In Gaza, violations of IHL have, since October 7, 2023, gained widespread international attention, mainly due to the targeting of civilians, who are distinct from combatants engaged in hostilities. Prior to the most recent Israeli military escalation against Gaza, concerns were raised about the consistent failure to uphold obligations under IHL, with warnings about the escalation of conflict in various parts of the Gaza Strip (Abdul Samad, et al., 2024, Human Rights Watch, 2024; Kihara-Hunt, 2024; UNOHCHR, 2024).

“Water can be the object of negotiations and become a vehicle for cooperation and peace, or it may be one of the causes of armed conflicts” (Mara Tignino, Member IIHL, 2024).

2.1 Key Principles and Provisions

Article 54 of Additional Protocol I to the Geneva Conventions establishes a general obligation to protect objects indispensable to the survival of the civilian population during armed conflict. Paragraph 2 of this article specifically prohibits attacking, destroying, removing, or rendering useless objects like drinking water installations and irrigation works, particularly when the intent is to deprive the civilian population or the opposing party of their sustenance value. This principle is considered part of customary international law and has been reaffirmed by the ICJ in its advisory opinion on Israeli practices in occupied Palestinian territories. The focus on protecting water resources should be maintained, preventing any reinterpretation or limitations on this obligation.⁹

The relationship between water and armed conflicts can be seen from many perspectives, and it should be analyzed from different angles: water can be the object of negotiations and become a vehicle for cooperation and peace, or it may be one of the causes of armed conflicts. In times of armed conflicts, water is both a means of survival for the civilians and used by the belligerents as a method or means of warfare (Tignino, 2024). Such conflicts can disrupt water systems in diverse ways, with negative consequences reaching from basic service provision to development efforts (Schillinger et al., 2020). While there is no single comprehensive treaty on water in armed conflict, IHL and other international laws provide a framework of rules that comprehensively protect water sources and installations during hostilities (Abdul Samad, et al., 2024; UNOHCHR, 2024). The rules include:

- Protect civilians and their water access during international and non-international armed conflicts.
- Parties to a conflict must refrain from attacking water installations or sources, which would constitute denying water as a method of warfare.
- Obligated to protect water infrastructure and provide water for humanitarian purposes. “This includes protecting water ecosystems and preventing pollution.”

⁸ GA Res. 237, ¶ 2, preamble ¶ 2, UN Doc. A237/1967, (June 14, 1967); see also GA Res. 2252 (ES-V), UN Doc. A2252/ESV, (July 4, 1967), which refers to this resolution.

⁹ Legal Consequences arising from the Policies and Practices of Israel in the Occupied Palestinian Territory, including East Jerusalem (Paras. 124-133), source: <https://www.icj-cij.org/case/186>

In the context of military occupation, IHL recognizes military occupation as a temporary situation where an occupying power has specific legal responsibilities (Arai, 2024; Gross, 2024; Jaber & Bantekas, 2023; Kihara-Hunt, 2024; Soni, 2023). These include:

- Maintaining order in the occupied territory
- Ensuring the well-being of the civilian population
- Upholding public health standards
- Providing access to essential resources, including water

While occupations are not meant to last indefinitely, the occupying power must fulfill these obligations as long as the occupation continues. This protects the fundamental rights and needs of civilians living under occupation (Arai, 2024; Gross, 2024; Jaber & Bantekas, 2023). In the case of Gaza, Israel, as the occupying power, has a legal duty under IHL to prevent the deterioration of the aquifer, the primary water source for Gazans, and obligations to ensure access to clean water and maintain public health infrastructure. This responsibility persists despite the complex political situation and ongoing conflict. The principle behind these obligations is to safeguard the human rights of the occupied population, even in challenging circumstances. This includes ensuring that civilians have access to the resources necessary for survival and maintaining an essential quality of life (Arai, 2024; Gross, 2024; Jaber & Bantekas, 2023; Human Rights Watch, 2024; Kihara-Hunt, 2024). Despite the potential for international organizations or independent commissions to provide support, Israel has maintained control over water governance within its existing frameworks, limiting external interventions. No binding agreements or mandatory actions, such as comprehensive desalination efforts or cooperative initiatives, have been implemented to effectively address Gaza's escalating water crisis (Abdul Samad, et al., 2024).

2.2 IHL Violations vis-a vis Water Access in Gaza

The occupying power must respect human rights and meet the humanitarian needs of the population in compliance with IHL and the Fourth Geneva Convention (see ICJ's Advisory Opinion on Wall (2004), paras. 104-113, 130 and HRC, A/HRC/40/CRP.2, paras. 80-83). The historical and continuing use of the population as a means to further military objectives and the state-building processes transforms the usual standards used to determine responsibility for the provision of drinking water into legal obligations to provide access to this basic necessity (Dannenbaum and Dill, 2024; Mahomed, 2024; PCHR, August 2024). Therefore, the denial of access to clean drinking water is insufficiently examined within the contours of a sole environmental injustice paradigm (UNOCHR, 2024; Zeitoun et al., 2024); hence, denying access to critical resources like water, particularly as a punitive measure during armed conflicts, is contrary to IHL and human rights (General Comment No. 15, paras. 21 and 31).¹⁰

IHL imposes stringent obligations on occupying powers concerning the welfare of civilians in the occupied territory. Israel, as the occupying power in Gaza, is legally bound to ensure the welfare of civilians and must prioritize their access to fundamental necessities, including safe drinking water and sanitation facilities (Geneva Convention IV Article 55). The systemic IHL violations in Gaza have perpetuated a military occupation that exerts extraordinary control over Palestinians' lives, with the water crisis epitomizing decades of policies designed to fracture ecological and social resilience. Israel's 16-year blockade intensified after October 2023, has weaponized resource deprivation—cutting access to water, fuel, and electricity—while indiscriminate attacks destroyed 68% of Gaza's water and sewage infrastructure. Gaza's 2.3 million Palestinians, confined to an ecologically fragile 365 km² territory, now face catastrophic water scarcity (Abdul Samad, et al., 2024; Kihara-Hunt, 2025; UNOCHR, 2024). Using starvation as a method of warfare by destroying and rendering useless OIS is a war crime. Starvation includes water deprivation as well (A/CONF.183/9, July 17, 1998).¹¹

Additional Protocol I of the Geneva Conventions (Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts), is a key international treaty that strengthens the protection of civilians during armed conflict. It sets out obligations regarding the conduct of hostilities and the treatment of individuals not or no longer participating in the conflict. It is also considered to be a primary instrument of international humanitarian law (IHL) and a significant part of customary international law.¹²

¹⁰ General Comment No. 15: The Right to Water (Arts. 11 and 12 of the Covenant): <https://www.refworld.org/legal/general/cescr/2003/en/39347>.

¹¹ Rome Statute of the International Criminal Court (Rome Statute), A/CONF.183/9, July 17, 1998, entered into force July 1, 2002, art. 8(2)(b)(xxv).

¹² Protocol additional to the Geneva Conventions of 12 August 1949, and relating to the protection of victims of international armed conflicts (Protocol I), source: <https://treaties.un.org/pages/showdetails.aspx?objid=08000002800f3586>

IHL also prohibits warring parties from attacking, destroying, removing, or rendering useless objects indispensable to the civilian population's survival (OIS), including water and sanitation infrastructure (Human Rights Watch, 2024). The situation has worsened since the October 2023 aggression, leading to widespread destruction of water infrastructure and forced displacement of millions of people. Any deliberate actions that impede or restrict access to water for the civilian population in Gaza can be considered a violation of IHL (Geneva Convention IV Article 54¹³). Despite efforts by the Gaza Water Utility to improve water and sanitation facilities between 2006 and 2023, recent military actions have systematically targeted and destroyed these advancements. Several legal provisions are relevant in addressing these violations. Article 54(1) of Protocol I Additional to the Geneva Conventions, Article 23(b) of the Hague Convention (1907¹⁴), and the Restatement (Third) of the Law of the United States (701) all provide frameworks for the protection of essential infrastructure, including water resources. IHL mandates the protection of critical civilian infrastructure in conflict zones, emphasizing the importance of safeguarding systems necessary for the survival and well-being of the population. Specifically, the protection of water, sanitation, electricity, and other essential services must be prioritized to maintain social order and ensure the security of civilians.

The concept of protection in IHL extends beyond mere life-saving measures during hostilities. It encompasses the safeguarding of vital infrastructure that sustains the functioning of society. Protocol I contains two provisions specific to the natural environment. Article 35 and 55 both protect the natural environment against "widespread, long-term and severe damage". Reprisals against the environment are also prohibited by article 55. Where additional specific rules on means and methods were also introduced, including Art. 35 (3) AP I, which prohibits means of warfare that 'cause widespread, long-term and severe damage to the natural environment', a provision reaffirmed in Art. 55 AP I, which prohibits reprisals against the natural environment, and an entreaty to parties to take care to protect the natural environment in the conduct of hostilities¹⁵.

In Gaza, ensuring access to water and sanitation services is a core component of this IHL requires that parties to the conflict distinguish between military objectives and civilian targets, prohibiting the deliberate destruction of civilian infrastructure protection (IRRC, 2024; Tignino & Kebebew, 2023b). The failure to protect such essential services constitutes a violation of international obligations and further exacerbates the humanitarian crisis in Gaza (Human Rights Watch, 2024).

IHL prohibits attacking objects essential for civilian survival, including water infrastructure. As the occupying power, Israel has legal obligations to maintain public health and provide essential resources. However, Israel's control over water governance has limited external interventions, and no legally binding agreements have been implemented to address Gaza's water crisis. Addressing water insecurity in Gaza requires solutions involving inter-regional cooperation and multi-sectoral policy approaches. Without such measures, the region faces risks of environmental degradation, public health crises, economic instability, and social unrest. The situation underscores the urgent need for international intervention to uphold the fundamental human right to clean water and adequate sanitation for Gaza's residents (Abdul Samad, et al., 2024; Human Rights Watch, 2024; PCHR, 2024; Zeitoun et al., 2024)

3. Policy Support for Addressing Water Insecurity in Gaza

The humanitarian water crisis in Gaza has reached catastrophic proportions, exacerbated by the ongoing aggression that began after 7 October, resulting in the widespread and disproportionate destruction of civilian infrastructure, which is essential for the provision of basic lifesaving water and sanitation services. The imposition of a 'total siege' on Gaza, encompassing restrictions on piped water and electricity, fuel deliveries, and the entry of water and sanitation supplies, materials, equipment, tools, and spare parts, has further compounded the crisis. This is exacerbated by the destruction of key roads and infrastructure and the pervasive insecurity that has engendered widespread fear and anxiety among the civilian population. The water insecurity in Gaza represents a complex challenge that requires local authorities, international organizations, and humanitarian agencies to guarantee the population's access to safe and reliable water sources. To address this critical situation, a seven-point strategic and multi-faceted approach can include:

13 <https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/article-54>

14 <https://ihl-databases.icrc.org/en/ihl-treaties/hague-conv-iv-1907>

15 Protocol Additional to the Geneva Conventions of 12 August 1949 and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977, (Additional Protocol I), Articles 35: <https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/article-35?activeTab=> and 55: <https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/article-55>.

1. Immediately end the use of cuts and denial of essential services such as water, electricity, and fuel as a means of political pressure, community control, and collective punishment of civilians.
2. It is imperative that international organizations and donors acknowledge the risks and repercussions of restrictions on the entry of WASH materials, which have a detrimental effect on response timeframes. In order to enhance water production and distribution, as well as sewage and solid waste management, it is essential to provide greater support for importing appropriate equipment and materials to Gaza.
3. Emphasis on the restoration of damaged water and sanitation infrastructure as nearly two-thirds of all water and sanitation infrastructure are damaged, rebuilding efforts must be prioritized to ensure access to safe water in the near and far future.
4. International support to enforce humanitarian law, which prohibits the destruction of essential civilian infrastructure, including water facilities.
5. Create a comprehensive public health strategy to address the alarming rise in waterborne diseases, focusing on vulnerable populations, especially children under five.
6. Developing long-term solutions to address Gaza's chronic water scarcity, including sustainable coastal aquifer management and boosting investments in desalination technologies.
7. Collaborative efforts between local authorities, international organizations, and humanitarian agencies are essential to implement effective and sustainable solutions.

Addressing these critical areas makes it possible to mitigate the immediate health crisis and work towards long-term water security in Gaza, ultimately safeguarding the fundamental human right to clean water and adequate healthcare for all residents. Specifically, in terms of policy direction, we outline three key aspects:

Strengthening International Monitoring and Accountability

Establish a robust international mechanism to monitor Gaza's water access and infrastructure protection. This could involve a combination of UN agencies, independent human rights organizations, and humanitarian groups. The mechanism should ensure that parties to the conflict adhere to IHL provisions for protecting civilian infrastructure, including water and sanitation systems. Additionally, this monitoring should assess the impact of water insecurity on the civilian population and hold those responsible for violations of IHL accountable.

Coordinated Humanitarian Support for Water Infrastructure and water-health Nexus

Increase humanitarian support to repair, maintain, and expand the water infrastructure in Gaza. This includes providing immediate assistance for restoring damaged water treatment plants, pipelines, and sanitation systems and long-term investments in sustainable water management. International donors and organizations should prioritize funding for water projects, particularly those that provide clean drinking water and promote sanitation, to prevent the spread of waterborne diseases.

Facilitating Diplomatic Efforts for Water Cooperation

Promote dialogue and negotiation between Israel, the Palestinian Authority, and relevant international stakeholders to ensure equitable access to shared water resources. Diplomatic efforts should be focused on establishing frameworks for cooperation on water security that respect the rights of Palestinians in Gaza while addressing the broader geopolitical context. This could include agreements on water allocation, joint management of shared aquifers, and the establishment of desalination plants, ensuring that water is used as a tool for peace rather than a weapon of conflict.

Concluding Notes

Water insecurity has been a pressing humanitarian issue in the Gaza Strip for decades, influenced by a complex interplay of meteorological, political, legal, economic, and geopolitical factors. The root cause of the crisis is not a lack of investment but rather the political reality that Israel's influence over Gaza's water resources and regulatory frameworks impedes access to what would be considered Gaza's rightful share of water resources. The recurrence of aggression and the destruction of WASH facilities are also impeding progress and improvements to water security in Gaza.

Despite the advancements made to WASH facilities from January 2006 to October 2023 to address water insecurity, the recent Israeli hostility and military aggression, which commenced 7 October 2023 and persisted until 19 January 2025, have had a significant impact on the Gaza population. The imposition of a comprehensive siege on Gaza by Israel since October 7, 2023, exacerbated 16 years of blockade, including closed crossings and a lack of essential resources like water and electricity, has precipitated a humanitarian crisis and exacerbated water insecurity.

The situation of water insecurity in Gaza has reached a critical point, exacerbating the already dire humanitarian crisis and violating fundamental human rights. The repeated and ongoing massive population displacement caused by the Israeli military campaign against the Gaza Strip, which has displaced at least 1.9 million people, approximately 90% of the population of the Gaza Strip, has created a catastrophic situation. The overcrowded and unsanitary conditions in southern Gaza, the lack of safe water, and adequate sanitation contribute to the emergence and spread of waterborne diseases.

The weaponization of water and its infrastructure has become increasingly evident in recent aggression. This was supported by different international organizations such as Oxfam's recently published report, which emphasized the weaponization of water in the ongoing conflict, underscoring the urgent necessity for full access to water services to prevent further deterioration of the humanitarian situation.

IHL calls for the protection of essential infrastructure, including water systems, which is paramount to ensure the survival and dignity of civilians in conflict zones. In Gaza, Israel has a legal duty under IHL to prevent the deterioration of the aquifer, the primary water source for Gazans, and obligations to ensure access to clean water and maintain public health infrastructure. Violations of IHL have been central to the maintenance of military occupation, which has allowed extraordinary control over the lives and futures of Palestinians in Gaza.

To mitigate the impact of water insecurity and contribute to Gaza's long-term stability, multifaceted solutions that involve inter-regional cooperation and multi-sectoral policy approaches must be implemented. These solutions must encompass both the immediate provision of humanitarian relief and the establishment of long-lasting political and legal frameworks that uphold the rights of Palestinians to essential services and ensure the equitable distribution of water resources.

Way Forward

This work is the result of a collaborative effort involving the study of various scholars, reports, international humanitarian organizations, press releases, human rights reports and IHL, and makes a valuable contribution to our understanding of the key factors that contribute to Gaza's challenging water security situation. These factors include political dynamics and broader human rights violations that affect the water sector. The work also explores the challenges that local authorities, international organisations and humanitarian agencies face in addressing these issues and ensuring that the population's fundamental water rights are upheld, particularly in the wake of the aggression in October 2023. It discusses the denial of access to critical resources such as water as a punitive measure and how this violates human rights and contravenes IHL and human rights.

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