UN environment programme

Environmental Impact of the Escalation of Conflict in the Gaza Strip

Second assessment of environmental damage and recommendations for recovery and reconstruction planning

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UNEP is the leading global environmental authority that sets the global environmental agenda. The organisation promotes the coherent implementation of the environmental dimension of sustainable development within the UN system and serves as an authoritative advocate for the global environment. UNEP is keeping the environment under review by providing policy advice, early warning information and promoting international cooperation. It is under this mandate, and at the request of the State of Palestine, that UNEP has undertaken this review of existing information on the current environmental impact of conflict in the Gaza Strip, to inform responses and prepare for subsequent conflict-related environmental impact assessments and recovery plans. UNEP is grateful to UN sister entities and other multilateral partners for substantive support provided during preparation of the current assessment report.

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Executive Summary

The United Nations Environment Programme (UNEP) has issued this report in response to a request from the State of Palestine to assess environmental damage arising from the conflict in the Gaza Strip, pursuant to United Nations Environment Assembly (UNEA) Resolution 6/12 regarding "Environmental assistance and recovery in areas affected by armed conflict". This is the second assessment of environmental damage in the Gaza Strip issued by UNEP since October 2023.

In June 2024, UNEP's first *Preliminary Assessment* found that the conflict had already exerted a profound impact on people and the environment of the Gaza Strip. Fifteen months later, this damage has worsened significantly. The current report covers the period up to 1 September 2025, although some data are available only to mid 2025. At the time of writing, military operations continue, and the damage to people in Gaza and the natural systems on which they depend continues to worsen.

Repairing such extensive damage to land, soil, trees, watercourses and marine ecosystems will be essential for sustainable recovery of the Gaza Strip. Restoration will require a cessation of hostilities. The first phase of recovery will necessarily focus on saving lives, through restoration of essential services (notably freshwater) and removal of debris to facilitate safe movement. After this, careful, science-based and inclusive planning and sustained work towards recovery will be required, led by relevant Palestinian institutions, stakeholders and experts.

For environmental recovery to start, UNEP recommends an inclusive process to define and agree upon a hierarchy of actions. An ecological and environmental health risk screening exercise is therefore proposed to identify priority areas for assessment and management.

Key findings and recommendations relating to environmental recovery in the Gaza Strip are summarised below by issue area.

Water resource systems and wastewater management: The conflict has significantly degraded water infrastructure leading to severely limited, low-quality water supply to the population. This is contributing to numerous adverse health outcomes, including a continuous surge in infectious diseases since the escalation of conflict (World Health Organization [WHO] 2025a; WHO 2025b; WHO 2025c; Paris *et al.* 2025). Groundwater contamination is likely with implications for environmental and human health. There is an 84 per cent reduction in capacity of storage reservoirs and pumping facilities as only 9 of the 54 remain active (with only 3 undamaged) as of April 2025. Remaining desalination supply capacity is estimated to be 31 percent of the October 2023 capacity, with theoretical operational capacity (if energy supply constraints were lifted) estimated as 58 percent. None of Gaza's wastewater treatment facilities are currently operational. Furthermore, heavy destruction of piped systems, and increasing use of cesspits for sanitation, have increased contamination of the aquifer, marine and coastal areas.

Considerable investment will be needed, and priority should be to recover supply systems to ensure Gaza's population has access to recommended water quantity and quality. Humanitarian entities have prepared emergency response plans in the field of water and sanitation, building on experience in the field. Along with water supply, urgent re-installation of sufficient wastewater collection and effective treatment capacity is needed to prevent further human health impacts and prevent future outbreaks of communicable diseases. The restoration of water and sanitation systems also carries important social and developmental benefits, particularly for women and girls. Looking ahead to reconstruction, UNEP provides an assessment of future water needs, building on the Palestinian Water Authority (PWA) 2024 plan. Treated wastewater can be used to support agriculture, benefiting food security while enabling recovery of the aquifer. Forward planning should incorporate provisions for sustainable aquifer utilisation. Spatial plans should include

preservation/installation of groundwater infiltration lagoons and drainage systems to maximise infiltration, supporting aquifer recovery.

Biodiversity, soil and land: Remote sensing assessments indicate that by May 2025, 97.1 per cent of the tree crops in Gaza, 82.4 per cent of annual crops, 95.1 per cent of shrubland and 89 per cent of grass/fallow land had been damaged. Production of food is not possible at scale. Soil has been contaminated by munitions, solid waste and untreated sewage. Degradation of soils through loss of vegetation and compaction by military activity have affected soil structure and reduced the infiltration capacity, increasing runoff and flood risks, and reducing groundwater recharge. Ongoing damage could also be leading to long-term loss of soil that takes decades to recover.

Restoration of tree cover, soil and land will be critical for recovering food security, health and resilience for people in Gaza. During recovery, it will be important to protect people from contamination while recognising the urgent pressure to re-start food production. A large-scale systematic survey of soils will be needed to determine the range of contaminants present. Undamaged (or less damaged) agricultural and vegetated areas, including Wadi Gaza, should be protected in future plans, retaining vegetation and land-use heterogeneity in reconstruction. Human health and employment, including women's employment, and recovery of land and soil should be prioritized in economic and environmental rehabilitation.

Marine and coastal ecosystems: The conflict has all but eliminated Gazan fishing livelihoods. With destruction of institutional capacity, there are no effective controls of contamination in the food chain from fish supply, leading to consumption of poisonous fish. Although quantification of the extent and type of contamination is currently impossible, marine ecosystems have clearly been contaminated with munitions, sewage and solid waste.

The health of the marine environment depends on terrestrial environmental management, especially of pollution control. Restoration of wastewater treatment capacity would prevent sewage pollution into the marine environment. Even secondary-level treated wastewater contains contaminants, including nitrate and phosphate loading that can impact the Mediterranean marine environment and coastal areas. Plans for disposal of debris at sea and land reclamation must be managed with care to protect ecosystems (Cooper *et al.* 2020) and ensure contaminants are removed so they do not enter the food chain. Land reclamation could also impact fish habitats and fish stocks, erosion and deposition along the shoreline and therefore careful assessment and modelling is essential to ensure decision-making is based on an informed evaluation of environmental, social and other relevant trade-offs.

Urban environment and debris: Destruction is extensive with an estimated 78 per cent of the total structures destroyed or damaged (United Nations Satellite Centre 2025). Debris has increased by 57 per cent since the *Preliminary Assessment* and is now 20 times greater than the combined total debris generated by all previous conflicts in Gaza since 2008. According to current estimates, more than 61 million tons of debris will require clearing, sorting and recycling or disposal – some of which is contaminated with asbestos, and industrial chemicals and wastes. Sensitivity is required in the recovery of human remains buried in the debris. Recycling is not only a necessity but a practical imperative in the Gaza context: UNEP estimates that recycling 50 per cent of Gaza's debris—an immensely challenging task—would result in a cost saving of around 20 per cent for the whole debris operations.

Explosions produced significant volumes of dust and contributed to increased cases of respiratory infection with over 37,000 cases reported in June 2025 alone. Unexploded ordnance poses a high risk in densely populated urban areas and need to be safely removed to mitigate risks of future explosion, damage, traumatic injuries and loss of life, as well as environmental impacts if contaminants from munitions are released. A Debris Management Working Group has been established to support risk-managed, efficient and responsive debris interventions across the Gaza Strip.

Rebuilding Gaza's infrastructure should contribute to improving long-term resilience to climate change. Furthermore, urban reconstruction should include public transport systems with provisions for those with impaired mobility including many child amputees.

Solid waste and environmental health: The two constructed solid waste sites in Gaza have been inaccessible to civilians since October 2023. Temporary sites reduce some of the health risks posed

by proliferation of waste dumps but they still lack sanitary controls and are near the population. Limited waste disposal options, including fuel for incineration, have also seen separated medical waste recombined with general waste and sent to temporary dump sites.

A new waste disposal strategy will be needed, to cater both for ongoing disposal of solid waste generated by the population into the future, and gradual disposal of temporary and informal waste sites accumulated during the conflict. The strategy should include sorting and recycling of suitable materials and measures to address hazardous and medical waste. Planning infrastructure for reduced levels of waste into the future could support a wider transition to implement circular economy principles.

Air quality: Limited data is available on air quality, due to minimal air-quality monitoring available in Gaza and the localised and transient nature of conflict-related impacts on air quality. Known challenges during the conflict include pollution from explosions and resultant fires during bombing campaigns, and emissions from explosions of munitions and resultant fires in bombed structures, including industrial facilities, which will also have likely released toxic chemicals into the air. The repetitive nature of these releases will likely have a cumulative impact on the environment, including contaminating soil and water resources as discussed earlier. Such air quality issues will not improve substantially until the conflict ceases. Looking ahead, consideration should be given towards reducing the carbon intensity of reconstruction, including recycling of demolition waste, use of low carbon materials and techniques for carbon capture during manufacturing of construction materials.

Environmental management and governance: While it is not yet possible to assess the full extent of environment damage, due to access and security restrictions, it is clear from the information included in this report that the scale of degradation is immense. Environmental risk management and priority-setting will be essential. UNEP recommends undertaking an early ecological and environmental health risk screening exercise, to identify priority areas for assessment and management.[1] Increased institutional capacity within the Government of the State of Palestine will be needed to coordinate environmental elements of recovery and reconstruction, and monitor implementation and action, while ensuring compliance with Palestinian environmental regulations and international obligations. While building national institutional capacity, recovery planners should also draw on Palestinian technical expertise and knowledge held by individuals and institutions (such as universities, the private sector and non-governmental organisations) with experience in environmental planning, monitoring and management of water resources and wastewater, infrastructure design and construction, and waste and debris management.


Source: UNRWA, 2025

1 A risk assessment is a systematic approach for characterising the potential for harm under a certain set of conditions and timeframe.

About this assessment

The United Nations Environment Programme (UNEP) is the leading global environmental authority that sets the global environmental agenda. The organisation promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations (UN) system and serves as an authoritative advocate for the global environment.

UNEP is keeping the environment under review by providing policy advice, early warning information and promoting international cooperation. It is under this mandate and at the request of the State of Palestine this *Second Assessment of the Environmental Impact of the Escalation of Conflict in the Gaza Strip* (henceforward referred to as the "Second Assessment") has been produced.

Requests from the State of Palestine to the United Nations Environment Programme

Since 2023, the State of Palestine has issued two official requests to UNEP relating to the conflict in the Gaza Strip. In December 2023, UNEP received the first official request to conduct an assessment of the environmental impacts of the ongoing conflict in Gaza. In response to this request, UNEP published a *Preliminary Assessment of the Environmental Impacts of the conflict in Gaza* (henceforward referred to as the "Preliminary Assessment") in June 2024. In June 2025, with the conflict still ongoing, the State of Palestine submitted a second official request for UNEP to update the data and scientific assessment provided in the *Preliminary Assessment*. This request also called for the inclusion of recommendations to support planning for environmental recovery and resilience, consistent with United Nations Environment Assembly (UNEA) Resolution 6/12. The current report responds to that June 2025 request, and covers the period up to 1 September 2025, although some data are available only to June/July 2025 or earlier.

This type of assessment requested by the State of Palestine is a well-established aspect of UNEP's work, pursuant to UNEA resolutions and decisions including 2/15, 3/1 and 6/12. Its objective is to determine, as far as possible given the lack of access and ongoing conflict, the extent of environmental damage in order to inform a science-based approach to resilience, recovery and reconstruction, when conditions allow. Such assessments are essential for minimizing long-term environmental impacts and mitigating the conflict-related harm caused to the greatest extent possible.

International processes relating to the reconstruction of the Gaza Strip

On 4 March 2025, the League of Arab States (LAS) adopted the Cairo Declaration at its Extraordinary Summit (Palestine Summit), which included endorsement of an overarching plan for *Early Recovery, Reconstruction and Development of Gaza* (subsequently referred to as the "Arab-Islamic Plan"). The Arab-Islamic Plan had been submitted to the LAS by the Arab Republic of Egypt, "in full coordination with the State of Palestine and the Arab States on the basis of studies conducted by the World Bank and the United Nations Development Programme."[2] Following endorsement by the LAS, the Arab-Islamic Plan was endorsed by other Member States and international entities. It provides a blueprint for the early recovery and reconstruction of the Gaza Strip. It is hoped that the recommendations in the current report relating to the environment and natural resources will contribute to the further deepening and strengthening of this Arab-Islamic Plan.

On 28 July 2025, the Governments of France and the Kingdom of Saudi Arabia convened a *High-level International Conference for the Peaceful Settlement of the Question of Palestine and the Implementation*

2 Quote is from UN General Assembly document A/79/820-S/2025/151 "Identical letters dated 11 March 2025 from the Permanent Representative of Bahrain to the United Nations addressed to the Secretary-General and the President of the Security Council", 22 April 2025. https://www.un.org/unispal/wp-content/uploads/2025/03/Letter-and-Cairo-Statement-compressed.pdf

of the Two-State Solution. In addressing the opening segment of the conference, the UN Secretary-General reiterated his call for an end to violence, forced displacement and settlement activity, and for concrete steps to bring about the agreed solution of "two States -- Israel and Palestine -- living side-by-side in peace and security, within secure and recognized borders." The Secretary-General further called for "Unified Palestinian governance" and called upon the international community to "continue to support the Palestinian Government in its reform agenda under incredibly challenging circumstances."[3]

The UN system is supporting work by the Government of the State of Palestine to prepare reconstruction plans for the Gaza Strip, building on the extensive remote sensing exercises already conducted, ensuring technical continuity while enabling government ownership and endorsement.

In support of the abovementioned processes, UNEP will continue working with partners, notably the Government of the State of Palestine, the UN system, the European Commission and the World Bank, to ensure that recommendations concerning the environmental dimensions of reconstruction and recovery of the Gaza Strip (including environmental governance) are fully incorporated into action-oriented planning and resource mobilization for Gaza recovery and reconstruction.

Status and structure of the current report

This report summarises what is currently known about the environmental impacts of the ongoing conflict in the Gaza Strip, highlighting environmental issues of serious concern. The material provides a snapshot of a highly dynamic situation, and readers should be aware that, at the time of writing, frequent changes are occurring on the ground.

Readers of this report should note that UNEP's *Preliminary Assessment*, issued in June 2024, included information on "The environment and natural resources in Gaza before the current conflict" (pp.12-17) and summarised impacts relating to water resources, pollution of the marine environment and contamination of land and soil. Gaza's demography and geography are also described as are the longstanding environmental governance challenges. Readers should refer to the *Preliminary Assessment* for a fuller description of the environmental status pre-October 2023.

It should be noted that other UN entities are covering the political, peace and security, and humanitarian aspects of the conflict.[4] These aspects are not covered in the current document, except where data collected by other entities provides evidence or indication of environmental degradation.

Due to security constraints, it has not yet been possible to undertake field-based environmental assessment work in the Gaza Strip. UNEP has maintained contact with officials of the State of Palestine, and has sought access to visit Jerusalem and Ramallah during preparation of the current report. UNEP's requests to the State of Israel for visas for international staff members have not been granted. In July 2025, UNEP staff and officials of the Palestinian Environment Quality Authority discussed technical aspects of environmental degradation and possible recovery steps, and other aspects of the Palestinian environmental agenda, at a meeting in Amman, Hashemite Kingdom of Jordan.

This report is structured around areas of environmental concern, and it necessarily draws on a range of available sources. These include damage assessments undertaken by the UN and multilateral partners – notably the European Union and the World Bank. The report also incorporates analysis of the state of the environment prior to 2023, remote sensing data and information from recognised and peer-reviewed methodologies (e.g. for debris quantification and for understanding the extent of damage to vegetation)

3 Secretary-General's remarks at the Opening Segment of the High-level International Conference for the Peaceful Settlement of the Question of Palestine and the Implementation of the Two-State Solution, 28 July 2025, [bilingual, as delivered] https://www.un.org/sg/en/content/sg/statement/2025-07-28/secretary-generals-remarks-the-opening-segment-of-the-high-level-international-conference-for-the-peaceful-settlement-of-the-question-of-palestine-and-the?_gl=1*hcxflu*_ga*MTQyODM3NTAzMC4xNjUwNTg2M

4 In his August 2025 briefing to the Security Council, Assistant Secretary-General for Political Affairs Mr Miroslav Jenča reiterated the United Nations Secretariat's message that "there is only one path to ending the ongoing violence and humanitarian catastrophe in Gaza — a full and permanent ceasefire. The immediate and unconditional release of all hostages. Life-saving humanitarian aid must flow into Gaza at scale and without obstruction, and civilians must be guaranteed safe, unhindered access to assistance." United Nations Secretariat briefings to the UN Security Council are available at: https://unsco.unmissions.org/security-council-briefings-0. UN humanitarian information is provided by the Office for the Coordination of Humanitarian Affairs.

and observations from UN entities with presence on the ground. The remote sensing methods used by UNEP in this report are specifically designed to identify environmental changes.

The report also draws on knowledge of how past escalations of the conflict in Gaza have affected the environment, combined with an understanding of the significantly larger scale of the current escalation. Relevant scientific literature has been reviewed, along with evidence of environmental damage arising from other conflicts and disasters. In addition, observations, background material and other inputs from UN colleagues working in and on Gaza have been included in the development of the report. UNEP continues to work closely with sister UN entities to ensure coordinated and consistent understanding the environmental damage, and acknowledges their support.

In this report, to ensure the information is as up-to-date as possible, UNEP has drawn on some previously unpublished material from UN field-based sources. In some limited instances, UNEP has referred to unverified media reports of damage and impacts. Such reports are included only to highlight potential environmental issues that will require more thorough investigation once access is possible to determine the nature and extent of environmental damage and degradation.

At the time of writing, military operations continue, and the harm to people in Gaza and the natural systems on which they depend continues to worsen. UN entities continue to provide updates relating to such damage, and the current report includes links to sources of such information.

Repairing such extensive damage to land, soil, trees, watercourses and marine ecosystems will be essential for sustainable recovery of the Gaza Strip. Restoration will require a cessation of hostilities. The first phase of recovery will necessarily focus on saving lives, through restoration of essential services (notably freshwater) and removal of debris to facilitate safe movement. After this, careful, science-based and inclusive planning and sustained work towards recovery will be required, led by relevant Palestinian institutions, stakeholders and experts. In Section 7, UNEP provides broad considerations for reconstruction and recovery, including an ecological and environmental health risk screening exercise to identify priority areas for assessment and management.


Source: UNRWA, 2025

Section 1: Water resource systems and wastewater management

Gaza's water resources systems play a crucial underpinning role in the maintenance of human life, nature and the economy. Protection and sustainable management of water resources is critical to the achievement of the Sustainable Development Goals (SDGs) including the eradication of poverty (Goal 1), the elimination of hunger (Goal 2), the promotion of health and wellbeing (Goal 3), clean water and sanitation (Goal 6), decent work and economic growth (Goal 8), sustainable cities and communities (Goal 11), climate action (Goal 13) and protection of life on land (Goal 15).

Gaza's natural water resources systems have been significantly over-exploited in recent decades, as they have been the main source of water for both human and agricultural use. Wastewater systems have been crucial in ensuring health and sanitation, mitigating the occurrence of disease outbreaks and reducing the potential for pollution to enter the aquifer and contaminate water, even though treatment infrastructure capacity was insufficient in 2023. The use of water in agriculture has underpinned the significant contribution of local food production to meet the food needs of people and livestock, as well as generating earnings through crop exports. Even with an increasing role for non-conventional water supply (including desalination), and treated wastewater reuse, the health of natural water systems will remain crucial in providing food and water security and environmental health in Gaza.

Status before the escalation of conflict, and the current situation

Status prior to October 2023

Even before the escalation of conflict, natural water resources were stressed and its groundwater highly contaminated (Shomar and Rovira 2023) with 97 per cent of groundwater not meeting World Health Organization (WHO) standards for drinking water (Palestinian Central Bureau of Statistics [PCBS] 2024a). This contamination results from seawater intrusion (due to over-abstraction of the aquifer that results in lowering of the water table and higher-pressure seawater encroaching inland), and nitrate pollution from sewage disposal and agricultural fertiliser being flushed into the aquifer (Palestinian Water Authority [PWA] 2023).

Limited volumes of non-conventional supplies, such as desalination and treated wastewater reuse, and imports from Israel were not sufficient to meet basic human needs (World Bank 2018). The coastal aquifer historically provides the majority of Gaza's water supply, but is heavily over-abstracted, with 189 million cubic meters per year (MCM/year) pumped from the aquifer in 2022, compared to a renewable resource of 55-60 MCM/year.

In 2022 (the final full year of data available prior to the conflict), total water availability within Gaza was 217.5 MCM/year with around 113 MCM/year for the domestic sector (PCBS 2022a). This total of 113 MCM/year (domestic total availability) includes 40 per cent non-revenue water, namely water which is *financially lost* (through theft/unpaid bills) and *physically lost* through leakage.

The pre-escalation water-balance is shown in Table 1. It is noted that total domestic water production *including* non-revenue water (total 113.1 MCM/year equating to 141.1 litres/capita/day) is just below the WHO minimum (150 litres/capita/day). Actual billed water is well below WHO minimums, comprising just 67.9 MCM/year or 84.7 litres/capita/day.

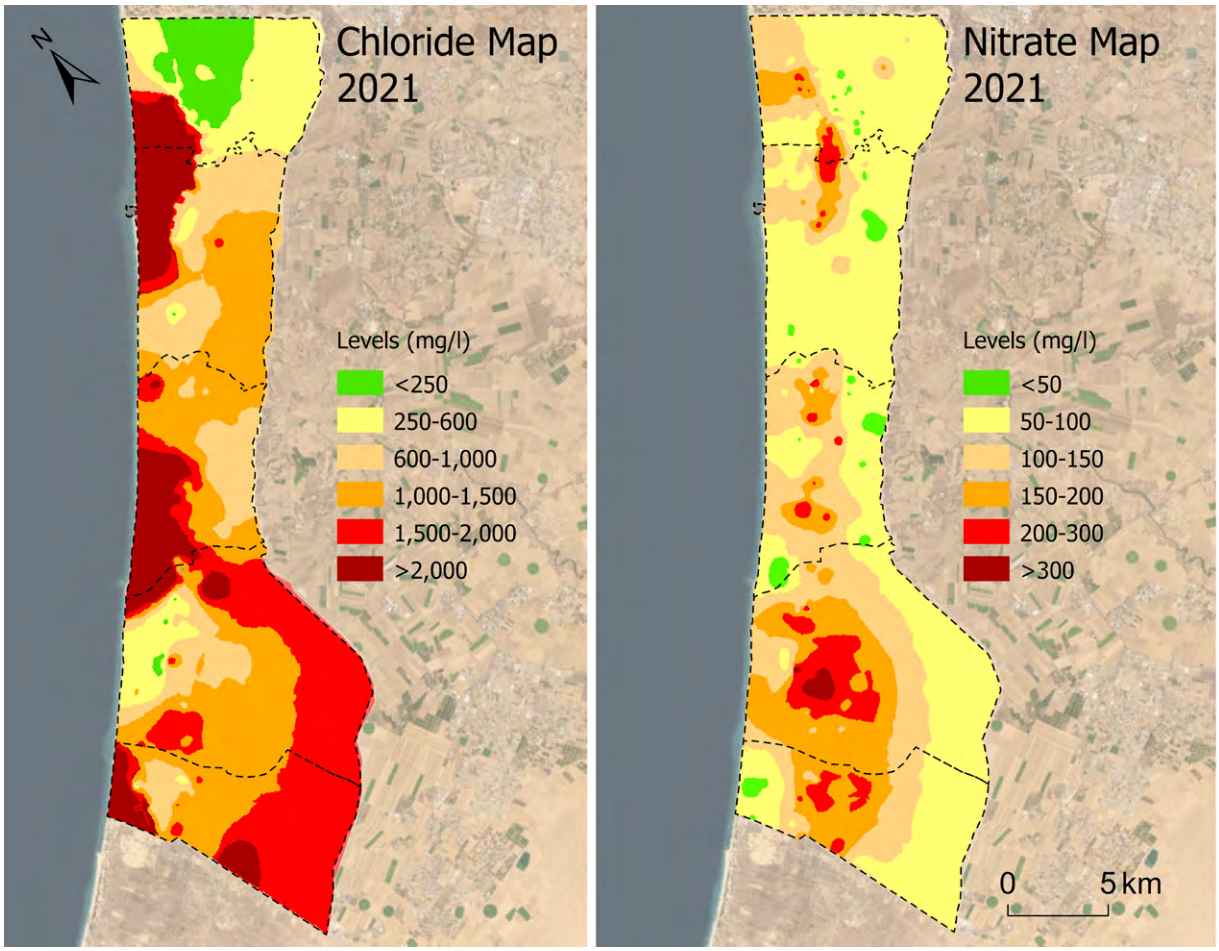
Table 1: Water Balance 2022 (Source: PCBS 2024b)

Population	2,196,407		
	MCM/year	per capita (litre/day)	Percentage of WHO minimum
Non-revenue (leakage) – assumed 15% of total supply	17	21.2	14%
Non-revenue (used unbilled) – assumed 25% of total supply	28.3	35.3	24%
Domestic water use (billed)	67.9	84.7	56%
Total assumed use (billed + unbilled)	96.2	120	80%
Total domestic production (billed + unbilled + leakage)	113.1	141.1	94%
Total domestic need (based on 150l/c/d WHO)	120.5	150.3	
TOTAL WATER	**217.5**		
Groundwater (total)	189.4		
Groundwater (agriculture)	100		
Desalinated drinking	9.6		
Mekorot (supply from Israel)	18.5		

As well as total domestic supply being below WHO minimum levels, the quality of water in 2021 was significantly degraded, with chloride concentrations well above WHO maximum of 250mg/L and nitrate 50mg/L in almost all areas of Gaza (Figure 1).

Source: UNRWA, 2025

Figure 1: Chloride and nitrate values for Gaza, 2021. Only the areas in green are within WHO limits (Source: PWA 2023)



As a means of alleviating high concentrations of chloride, a limited volume of desalinated water was produced within Gaza, to provide either high-quality bottled water, or mixed to reduce chloride concentration (by blending with straight groundwater) for potable uses. This was achieved through three seawater desalination plants (30,000 cubic meters per day (m^3/day) or 11 MCM/year) and 292 public and private groundwater desalination wells (49,000 m^3/day or 17.9 MCM/year).

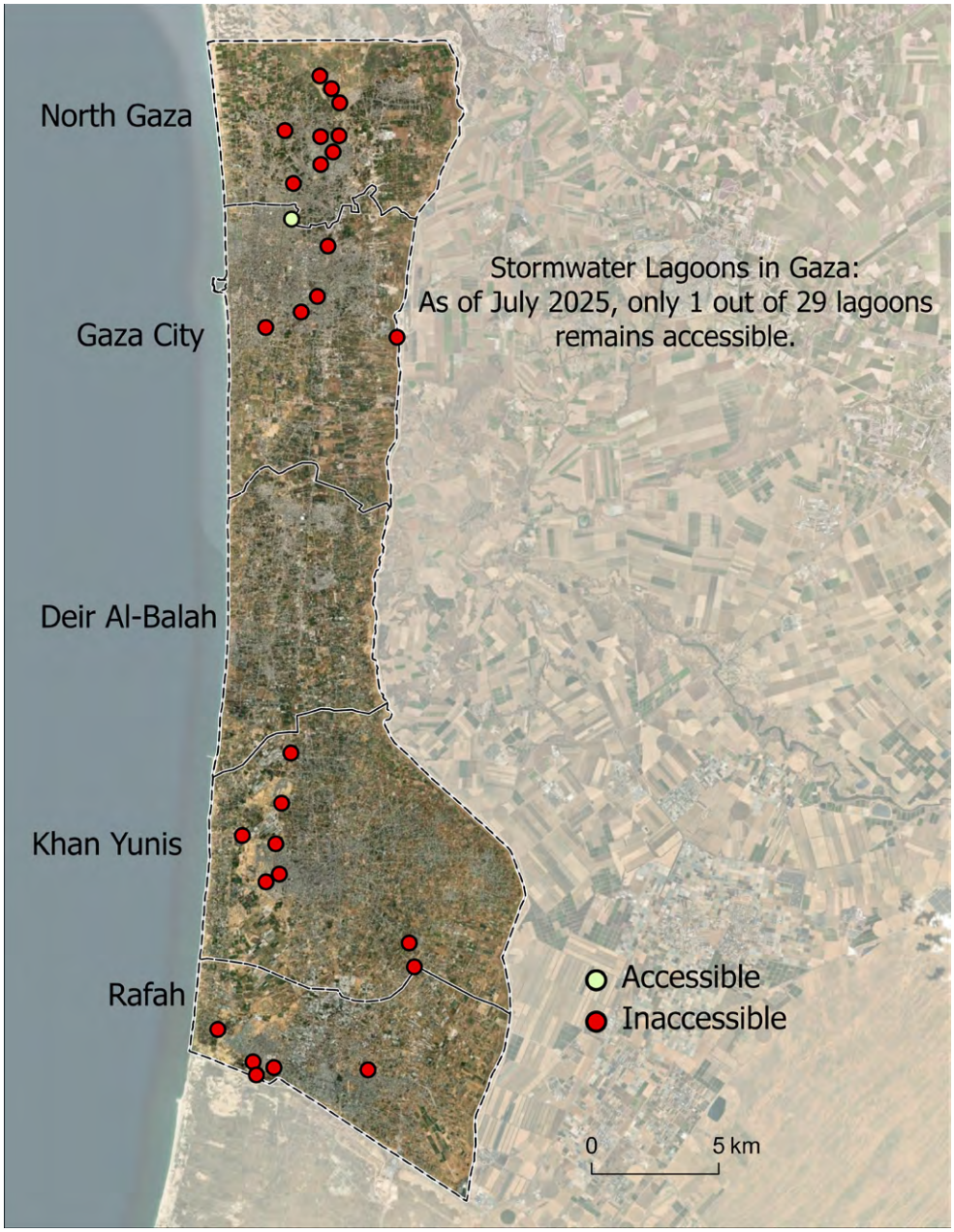
Significant water distribution and treatment infrastructure was built in Gaza for pumping and storage of domestic water, with 54 reservoir and pumping stations active as of 2023, with the oldest constructed in 1972 and significant development in the period since 2011 (Coastal Municipal Water Utility [CMWU] 2025).

Before October 2023, six Waste Water Treatment Plants (WWTPs) existed in Gaza, dating from 1976 to 2020, with older capacity only reaching primary treatment (Sheikh Ejleen and Beit Lahia), and most recently acting as input for some newer facilities (Central Gaza and North Gaza Emergency Sewage Treatment [NGEST]). The total treatment capacity prior to the escalation of the conflict can therefore be regarded as 52 MCM/year. This includes around 13 MCM (36,000 m^3/day) of water in the NGEST program that was designed to be available for agricultural reuse through aquifer recharge (agricultural extractive pumping was on the verge of being established prior to October 2023).

These new facilities (NGEST and Central Gaza were online from 2018 to 2020) helped to limit volumes of wastewater entering the sea (UNEP 2024). Prior to the construction of NGEST, minimally (primary) treated water was regularly discharged into the sea as well as the remaining 25 per cent of wastewater not captured by the sewage system, causing significant marine pollution for Gaza and Israel. This pollution was of sufficient severity to disrupt intake to Israel desalination facilities to the north (Middle East Monitor 2019).

In order to maximise recharge of rainfall into the aquifer, and reduce the impact of stormwater runoff in urban areas, 29 Stormwater infiltration lagoons have been built or upgraded between 1999 and 2021. They have a combined recorded catchment area of 63 km^2 (Gaza Coastal Municipal Water Utility 2025).

Figure 2: Location of stormwater lagoons in Gaza (Data CMWU 2025 and WASH Cluster June 2025)



Impact of the escalated conflict

The conflict has degraded water infrastructure significantly, including wastewater treatment and disposal systems, increasing the risks of groundwater contamination and further limiting the already scarce and low-quality supply of water to the population. This has significant impacts for already degraded ecological health and environmental human health.

Current estimated supply capacity is shown in Table 2, which also shows theoretical extract potential; the difference between supply and potential is related to limited energy supplies preventing full utilisation of the assets, or connectivity and access preventing use.

Table 2: Estimation of total water supply and remaining theoretical freshwater production capacity in Gaza (Source: Data issued by the Water, Sanitation and Hygiene [WASH] Cluster June 2025)

	M³/day capacity	Theoretical remaining infrastructure production capacity (without connectivity or energy limits)	Data source
Subsidized water project	5,811	5,811	WASH Cluster June 2025
NGO	594	9,406	WASH Cluster June 2025
Desalination	4,500	22,500	WASH Cluster June 2025 (without Rafah UAE plant in Egypt)
Groundwater deal	9,142	9,142	WASH Cluster June 2025
Mekorot	40,000	49,315	CMWU Jan 2025
TOTAL	**60,047**	**96,174**	

Note: The situation relating to water in the Gaza Strip changes frequently. For updates on water data and status, readers should consult: https://response.reliefweb.int/palestine/water-sanitation-and-hygiene

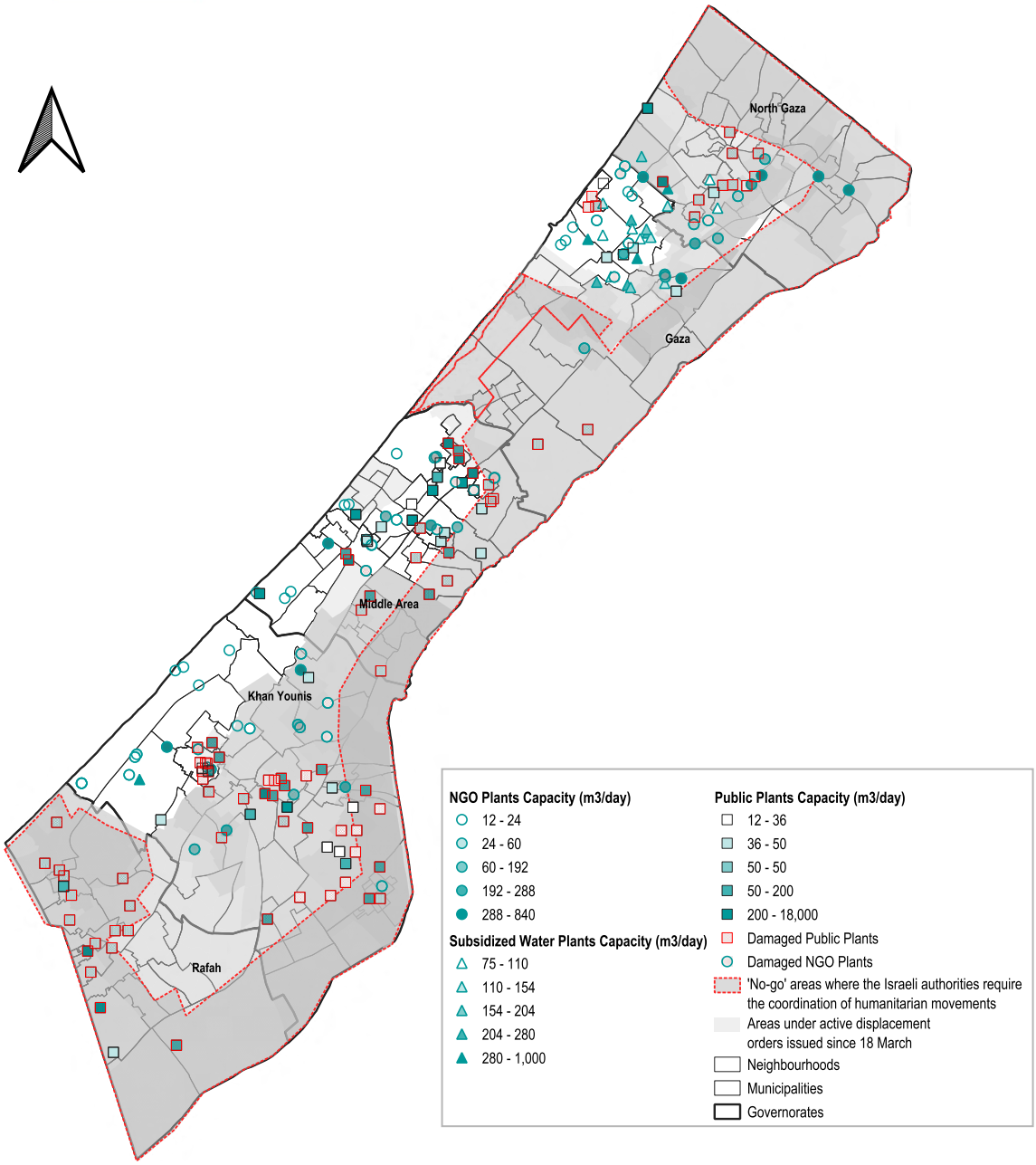
Since October 2023, the Gaza Seawater Desalination plant has been damaged and is not functional, reducing desalination capacity by around a third from 30,000 to 22,500 m³/day (8.2 MCM/year). Actual seawater desalination production is further constrained to around 4,500 m³/day (1.6 MCM/year) due to lack of electricity grid supply and limited fuel for generators (WASH cluster for the State of Palestine 2025).

Of a total of 214 groundwater desalination facilities (public, non-governmental organisation and private) only 84 are still operational (WASH Cluster data, issued June 2025). This gives a total desalinated groundwater supply of 15,547 m³/day (5.67 MCM/year) against a total extant capacity of 24,359 m³/day (8.9 MCM/year) (limited by energy and connectivity). The most recent publicly available figures for Mekorot supplies from Israel are 40,000 m³/day (14.6 MCM/year) (against piped capacity to the Gaza border of 49,315 m³/day or 18 MCM/year). However it is expected that ongoing interruptions of supply and further network damage since the end of the ceasefire in March 2025 mean the actual Mekorot supply is lower than indicated by the most recent data.

The total current maximum supply of freshwater is therefore estimated as 22 MCM/year, with the likelihood that actual supply is even lower.


Source: UNRWA, 2025

Figure 3: Map of active and inactive freshwater production facilities (Source: WASH cluster June 2025. *For updates on water data and status, readers should consult: https://response.reliefweb.int/palestine/water-sanitation-and-hygiene*)



In addition to supplies inside Gaza, around 10,000 m^3/day (3.65 MCM/year) capacity exists in the area adjacent to Gaza in Egypt, from a UAE-funded desalination plant (United Nations Office for the Coordination of Humanitarian Affairs [UNOCHA] 2024a). The piped connection into Gaza has been destroyed and is being repaired at the time of writing.

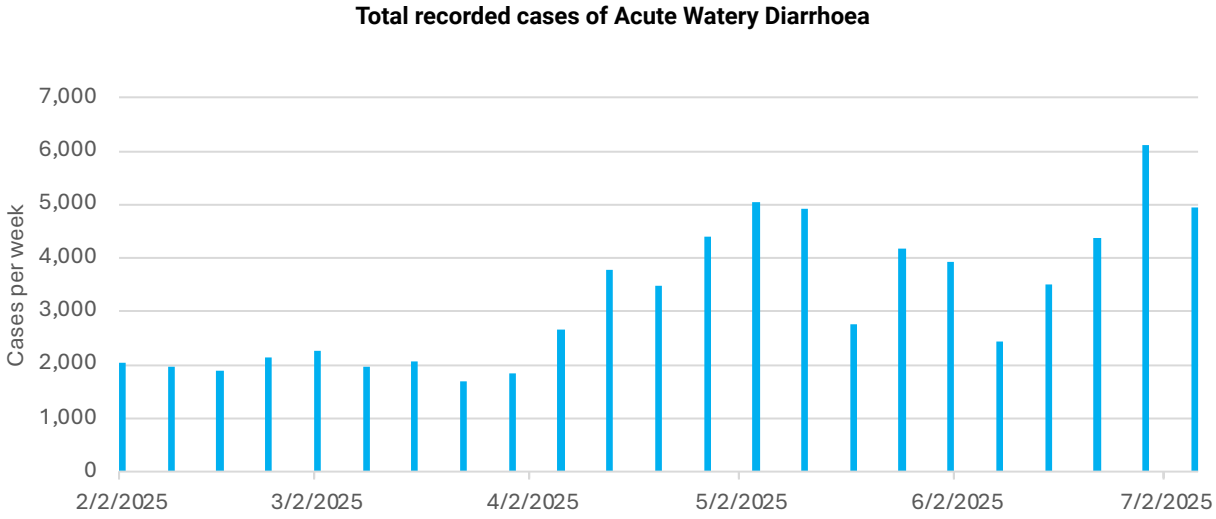
Of 54 storage reservoirs and pumping facilities, only 9 remain active and accessible (with only three of those completely undamaged) as of April 2025 (Gaza Coastal Municipal Water Utility 2025), representing a degradation of at least 84 per cent of pre-October 2023 capacity. Thirteen out of the 28 stormwater harvesting lagoons remain in publicly accessible areas and have limited damage. The remaining lagoons are currently inaccessible, with no information available on their performance for water harvesting. None of Gaza's wastewater treatment facilities are currently operational (Gaza Coastal Municipal Water Utility 2025), meaning that up to 22 MCM/year of available freshwater supply, once used, is discharged into

the terrestrial and marine environment (estimate noting both additional non-freshwater inputs from non-desalinated groundwater pumping and also discounting very limited consumptive/evaporated use).

With the heavy destruction of piped systems, lack of sanitation facilities,[5] and increasing use of cesspits, it is likely that wastewater is seeping into the aquifer, while other quantities will reach the sea through overland runoff.

An almost complete lack of chlorine supplies means there are limited options available to stop contamination of water resources impacting human consumers. Figure 4 shows the cases of acute watery diarrhoea recorded by United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA) health clinics during early 2025, with an increase after March 2025, which could be associated with the degradation in basic water and sanitation (including availability of treatment chemicals) after the end of the ceasefire.

Figure 4: Total cases of Acute Watery Diarrhoea, as recorded by UNRWA health clinics in both under and over 5's (Source: Data UNRWA 2025a)



The lack of safe disposal of wastewater exposes the population to direct contact with accumulated sewage, which has contributed to widespread infectious diseases, including skin diseases such as scabies, further compounded by limited availability of antibiotics for treatment. During 2023-24, major health changes were recorded: cases of acute watery diarrhoea increased 36-fold (412,840 cases vs. 11,562 cases), bloody diarrhoea increased 24-fold (7,504 cases vs. 311 cases), and acute jaundice syndrome, indicative of hepatitis A, increased 384-fold (41,515 cases vs. 108 cases). Children younger than 5 years accounted for 65 percent of acute watery diarrhoea cases in 2025 (Paris *et al* 2025). In its regular updates, the World Health Organisation reports that infectious disease threats persist, driven by overcrowding, poor WASH conditions, and malnutrition-related weakened immunity. In August 2025, acute respiratory infections and acute watery diarrhoea remained the most frequently reported conditions overall, accounting for 58 percent and 41 percent of all reported morbidities, respectively (WHO 2025c). Poliovirus has re-emerged in Gaza during the conflict and remains in circulation. Since 16 July 2024, the Global Polio Laboratory Network notified the detection of six circulating variant poliovirus type 2 isolates in environmental samples from Deir al-Balah and Khan Younis in Gaza, and UNRWA confirmed one polio case presenting with acute flaccid paralysis in its health-care centre (Paris *et al.* 2025). Detection of polio in wastewater poses ongoing risks for re-infection, despite protection of children through a vaccination campaign conducted in late 2024 and early 2025 (WHO 2025d).

5 In February, 2025, the average ratio was 1:360 for people to toilet and 1:2416 for people to showers. Internally displaced people have resorted to open defecation and consumption of contaminated water, further exacerbating disease spread (Paris et al. 2025).


Source: UNRWA, 2025

There are no specific surveys or data directly measuring damage to piped distribution of sewage networks. However, much of this infrastructure follows road routes, and it is possible to use the damage to roads as a proxy for likely pipe network damage. The latest United Nations Satellite Centre (UNOSAT) survey of road damage, for July 2025, shows that at that point, 65 per cent of the road network was damaged or destroyed (UNOSAT 2025), so a similar level of network damage can be assumed.

With the drainage system destroyed, and significant displaced populations located temporary facilities, flooding has become a significant water-related environmental risk in Gaza (Hassoun, Jarrar *et al.* 2025). During the winter of 2024–25 UNOCHA identified 450,000 individuals living in around 100 flood-prone sites, with low tech mitigation and limited planning for flood events (UN News 2024).

Total groundwater abstraction is currently difficult to quantify, due to limited monitoring. Based on the assumption that only 50 per cent of remaining domestic desalination groundwater supplies are operational, and conservatively estimating that agricultural abstraction has declined by at least 80 per cent—given widespread land inaccessibility and agricultural well damage (Food and Agriculture Organization of the United Nations [FAO] 2025)—it is likely that some agricultural wells remain in use, though probably far fewer than before. Under these conditions, total groundwater abstraction is estimated at less than 65 MCM/year. This is only slightly above the long-term sustainable yield of the aquifer. However, because abstraction is now highly concentrated in the coastal zone, localized reductions in pumping especially in the eastern side of Gaza could allow limited recovery in some areas, potentially reducing salinity through dilution and increased groundwater level/pressure.

The changes that have occurred during the escalation suggest that the quantity of groundwater in the aquifer may have increased slightly in the central and north (due to population concentrations in southern Gaza). Simulation modelling on the Gaza aquifer suggests a recovery rate of 35-70 centimetres per year at the current reduced pumping rates (Livshitz *et al.* 2025). At the same time, the lack of sewage treatment, additional contamination by leachate from improper surface waste disposal (discussed later) and flushing of ordinance residue and penetration of deep-level munitions will likely be further degrading water quality across the Gaza Strip.

The flooding of some tunnels below Gaza with seawater was undertaken by the Israel Defence Force (UNEP 2024). There exists debate between experts as to the potential for this flooding to have further impacted the aquifer. Assuming such techniques were only used within areas already contaminated with seawater, some analysts consider it unlikely that there is significant connectivity with other areas of tunnel infrastructure further inland, and therefore limited spread of introduced saltwater (Glausiusz 2024). There is a need to further investigate the extent of the flooding to fully determine its impact on the aquifer.

Implications for recovery and reconstruction

Significant investment will be needed to restore domestic and agricultural supplies, distribution networks and wastewater treatment capacity. Given the critical importance of restoring water and sanitation capacity for human and environmental health, UNEP recommends an urgent focus on these issues, building on the "Interventional Plan" developed by the WASH Cluster in July 2025.[6] Whenever possible, a full and field-based damage and needs assessment should be undertaken, including a groundwater survey. Priorities for restoration of infrastructure should be identified, and strategic plans for water management revised—building on work already undertaken by the Palestinian Water Authority—in recognition of the extent of destruction of water systems in Gaza.

To illustrate the type of planning required for sustainable water resources management in Gaza, including protection and recovery of critical ecosystems, UNEP has developed a water scenario that is outlined in Table 3, Column A below. This is based on remaining infrastructure capacity (June 2025) and future needs, incorporating sustainable extraction from the aquifer and a target of WHO minimum of 150 litres/capital/day domestic supply. Based on a projected 2030 population of 2.7 million in Gaza, Table 3 outlines expected demand, the remaining viable infrastructural capacity and the additional water infrastructure required to meet future requirements.

Table 3 also presents (in Columns B and C) summarised scenarios for the future development of Gaza's water system that were substantially prepared prior to October 2023 but not published by the PWA until late 2024. UNEP recognises that considering the severity of destruction, the goals outlined in Table 3 will not be met during the short-term recovery phase. It is important to note, however, that in planning for recovery, sustainable resource use and reuse should be considered: new systems and infrastructure should avoid entrenching past unsustainable trends.

Source: UNRWA, 2025

6 The Ceasefire Interventional Plan – Gaza WASH Response was drafted "to leverage a potential pause in hostilities to address the urgent, lifesaving needs of the population across all regions of Gaza. This operational plan outlines the humanitarian community's response strategy during such a ceasefire, focusing on the current population distribution in the middle, south, and north regions." The plan is accessible (as of 5 September 2025) at the following link: https://drive.google.com/file/d/1D1kdpbypzfcRk23XZIoP5mHmePDK7UcQ/view

Table 3: Three scenarios of future water resources

	Column A: Reconstruction scenario (UNEP derived) 2030	Column B: Gaza Strip water resources needs identified by PWA (derived from PWA scenario 2030)	Column C: Gaza Strip water resources needs identified by PWA (derived from PWA scenario 2042)
Population projection: *This is a future population for the scenario year for each column*	2,694,752	2,694,752	3,749,670
Per capita supply at tap (l/c/d)	150	88	120
Demand needs (MCM/yr)	147.5	87	164
Non-Revenue Water (NRW) estimation (%)	20%	37%	28%
Supply needs including NRW	184.4	137	228
Industry including NRW	10	6	14
Agriculture	80	88	78
TOTAL NEEDS	**274.4**	**231**	**320**
Extant supply (technically functional)/pre-war baseline			
Mekorot	20	20	20
Desalinated/drinking groundwater (of varying quality)	5.7	89.4	89.4
Seawater desalination (including Rafah Plant)	11.9	7.5	7.5
Estimated agricultural wells	17	100	100
Treated wastewater with reuse potential	0	24.4	24.4
New/reconstructed capacity to meet goals			
New groundwater	27.3		
Recycled water production potential	74	18.5	49.4
Desalination	119.1	37.5	156.5
Total new supply capacity	220.4	56	205.9
Total capacities at end of scenario			
Mekorot	20	20	20
Total net groundwater	50	142.9	48
Seawater desalination	131	45	164
Recycled water (direct)	25	20.8	26.8
Recycled water (recharge)	49	22.1	47
TOTAL ANNUAL SUPPLY	**275.0**	**250.8**	**305.8**

Note: The UNEP derived scenario for 2030 (Column A) is based on remaining infrastructural capacity (June 2025) and future needs incorporating sustainable extraction from the aquifer and a target of WHO minimum of 150 l/c/d domestic supply (Full derivation presented in Annex 2). The other two scenarios (Column B, 2030 and Column C, 2042) are derived from long-term plans by the Palestinian Water Authority, many technical elements of which were developed before the onset of the current conflict or when the full extent of damage was not apparent (PWA 2024).

On a UNEP-derived scenario for 2030 (Column A, Table 3), based on current population projections and WHO-minimum domestic supply, demand per year across sectors is 274.4 MCM/year, including an allowance for some non-revenue water (20 per cent). Total demand needs are 58 MCM higher than in 2022, driven by population growth and increased per-capita supply (to WHO minimum of 150 litres/capital/day) but moderated by reduced agricultural allocations and NRW reductions. Reduced NRW targets should be considered within the context of the significant reconstruction and rehabilitation that will be required to infrastructure across Gaza. Assuming that future agriculture, and potentially some industrial supplies can be comprised of high-quality treated wastewater, this can be supplied through assumed reuse of 50 per cent of domestic supply.

Remaining (fresh) supplies could be comprised of just under 25 MCM/year groundwater re-exploitation (beyond currently extant infrastructure), 122 MCM/year new desalination capacity and a potential 20 MCM/year from Mekorot). Should water supplies from sources outside Gaza not be considered viable in future, these could be substituted by additional desalination capacity, noting the resultant reduced diversity (and therefore potential reduced resilience) of supplies and the need for energy sources for desalination. Full explanation of the derivations of each element of the scenario is given in Annex 2.

Compared with official PWA plans for 2030 and 2042, the UNEP scenario is based on advancing the elimination of groundwater over-abstraction. The PWA plans, which were partly drawn up before the current conflict, account for a gradual increase in desalination and treated wastewater reuse capacity. The PWA narrative recognises the need for re-evaluation of the technical plans, considering destruction that has occurred since 2023. It is therefore suggested in the present context of major infrastructural rehabilitation and reconstruction, that forward planning for reconstruction targets sustainable aquifer utilisation and does not re-embrace over-abstraction, even in the medium term, as part of official planning.

Along with water supply, sufficient wastewater collection and treatment capacity should be installed comparable to the projected future total use of domestic and industrial water. Apart from the long-term need for effective sanitation and treatment infrastructure, there is also an urgent need for emergency investment in sanitation and hygiene infrastructure, coupled rapid redevelopment and rehabilitation of permanent systems (Abuzerr and Zinszer 2025). Although Gaza was cholera-free before the current conflict, and the risk of introduction has remained low due to highly restricted population movement between Gaza and other areas, the near-collapse of sanitation infrastructure creates a very real danger of cholera entry and rapid spread (WHO 2025a) especially during a possible influx of international support during the reconstruction phase.

In this regard, lessons could be drawn from the cholera outbreak in Haiti in 2010 (Lantagne *et al.* 2014), which demonstrated that just one dormant case brought in through international staff could precipitate a major outbreak. A further example relates to Yemen, where a wartime and post-war cholera outbreak was compounded by degraded water and sanitation infrastructure (Al Iriani *et al.* 2023). Consideration could be given to implementing vaccination efforts and quarantining staff prior to their entry to Gaza. This would not however stop the entry of dormant carriers, so additional measures might be necessary. The urgent restoration (re-installation) of water and sanitation systems also carries important social and developmental benefits, particularly for women and girls, by enabling greater participation in education and the workplace. In displacement sites and damaged neighbourhoods, women and adolescent girls face heightened risks due to lack of safe, private and accessible WASH facilities and menstrual health and hygiene (MHH) supplies and disposal systems. Reconstruction should adopt WASH minimum standards (privacy, dignity, lighting, locks, distance and inclusivity) and ensure MHH packages (materials, information and disposal bins) and female friendly, accessible facilities are available in schools, health centres and public spaces. Monitoring should track time spent collecting water, safety incidents near facilities and MHH access (UN Women 2024).

Given Gaza's limited natural resources and supply options, and the urgent need to eliminate over-extraction, present and future water supply will depend on the rapid and sustainable development of non-conventional resources (Al-Najar *et al.* 2021). This should include expanding desalination capacity and building infrastructure to treat and enable safe reuse of treated wastewater within agriculture.

Options include tertiary groundwater 'polishing' to allow relatively unrestricted agricultural use (as per NGEST) or secondary treatment with sufficient capacity for use on restricted crops, particularly tree crops. It will be necessary to ensure that such secondary treated water use does not pollute the underlying aquifer, and this may require restrictions on the location for which such wastewater can be deployed. In all cases, significant additional investment will be required in distribution systems to convey wastewater to agriculture, and accompanying investment in agriculture to enable safe consumption of the resource, and appropriate techniques and technologies to use secondary-treated wastewater. Planning for treatment and reuse infrastructure together is a requirement of the most recent PWA National Reuse Strategy (PWA 2024) and will be required in Gaza planning to be compliant with PWA national strategy.

Failure to both mobilize treated wastewater supply and the agricultural capacity to use it will either force a return to over-abstraction of groundwater to meet agricultural needs or require additional desalination capacity, which is uneconomical for all but the highest-value crops. Without investment in reuse mechanisms, the benefit of wastewater treatment will be lost –both as a resource for agriculture and as an opportunity to support sustained economic recovery (Mizyed 2025). Moreover, channelling treated wastewater into productive use is essential to prevent secondary pollution of marine and terrestrial environments.

Treatment of wastewater, will offer an important potential productive resource to agriculture, thereby benefiting food security. It will also have compounding benefits for water resource systems and the natural environment. Effective collection and treatment will ensure that untreated wastewater does not pose a pollution threat to the aquifer. Effective treatment should also ensure that the marine environment is not contaminated, in line with fundamental environmental protection and the requirements of the 1978 Barcelona convention (UN 1978). Minimising pollution from sewage further benefits to the marine ecosystem and marine-derived nutrition, as well as eliminating the risk of transboundary pollution spills.

Surveys need to be undertaken as soon as possible on the current state of the aquifer, including noting (and ideally maintaining) any recovery in the aquifer that has occurred due to reduced pumping since October 2023 but also potential for increased contamination. Surveys are needed on the aquifer level, water quality and seawater intrusion, which will inform future water use including abstraction location and suitability of different regions of the aquifer for future use, based on water quality and treatment needs.

Planning and reconstruction efforts in Gaza should prioritize the preservation of groundwater infiltration lagoons (Figure 2) and the installation of drainage systems to maximize natural aquifer recharge. The impact of major urban redevelopment, especially above sensitive aquifer recharge areas, should account for the groundwater system, including allowing for continued infiltration (including through permeable surfaces) and guarding against pollutants entering the aquifer during reconstruction or subsequent urban or industrial activities. It is important for reconstruction planners to engage with the PWA over the latest water plans for Gaza and the current thinking on reducing abstraction from groundwater, and how this can be accelerated within a reconstruction context. This is especially valuable in terms of future growth beyond 2030, and the potential for treated wastewater to be used to reverse historic aquifer decline through artificial recharge for storage.


Source: UNRWA, 2025

Section 2: Biodiversity, soil and land

The natural landscapes of Gaza, including its non-urbanised areas, and their land and soil resources, play a crucial role in food security, nutrition, economic contributions and local livelihoods. These areas support other environmental services such as habitat provision, water replenishment and areas for recreation. All these benefits support lives and livelihoods, and will be crucial for securing future nutrition, physical and mental health, employment and environmental sustainability. These resources are directly connected to several SDGs, including the eradication of poverty (Goal 1), the elimination of hunger (Goal 2), the promotion of health and wellbeing (Goal 3), climate action (Goal 13) and protection of life on land (Goal 15).

As of 2022, agricultural production within the Gaza Strip met approximately 44 per cent of local food needs. The remaining 56 per cent was covered by imports from the West Bank, and from Egypt, Israel and other international sources (Reuters 2022; Agflow 2023; PCBS 2023a; Yin *et al.* 2025), including significant dependence on food aid.[7] Israeli restrictions on access to areas within 300 metres of the Gaza side of the perimeter fence with Israel prevented or discouraged agricultural activities in these areas of Gaza, which increased reliance on food aid (UNOCHA 2022).

Agricultural production contributed 55 per cent of Gaza's exports (PCBS 2023a). The Gazan agricultural system is highly fragmented, 24,745 separate agricultural holdings existed as of 2021, the majority on areas of less than three dunams — roughly equivalent to 0.1 hectares or approximately 0.25 acres (PCBS 2023a).

As of 2022, the agriculture sector contributed approximately 11 per cent to Gaza's GDP, and in 2021 it accounted for 6 per cent of total employment. Within this, the male agricultural workforce stood at approximately 6.7 per cent of the total workforce—however this exhibits seasonal shifts—while female employment in the sector was only 1.1 per cent with less variability throughout the year (PCBS 2022a; PCBS 2022b). The disproportionately high GDP contribution compared to labour force participation also indicates that it is one of the more economically productive parts of the Gazan economy.

Open land also plays a crucial role in supporting Gaza's biodiversity and ecological health, which in turn is important for food productivity of cultivated areas.[8] Two hundred and fifty species of bird were observed in Gaza, accounting for 45.4 per cent of observed bird species in Palestine (Abd Rabou *et al.* 2013), 21 species of reptiles and amphibians (Abdel Fattah *et al.* 2007a), 1,216 species of plant (Ali-Shatayeh *et al.* 2022) and at least 15 species of mammals (Abdel Fattah *et al.* 2007b).

Open land is also important for aquifer recharge. Natural recharge of the aquifer is understood to be 55–60 MCM/year (PWA 2024). This long-term safe yield depends on rainwater infiltrating soils to recharge the aquifer. Such infiltration requires permeable open land—or in urban areas artificial soakaways or infiltration pools—with sufficient soil health to allow percolation. When land is damaged, degraded, compacted or sealed, infiltration is reduced, leading to greater surface runoff to the sea and diminished aquifer recharge.

7 Reliance on external humanitarian supplies, including food has been a consistent feature of Gaza for decades, with up to 80% of the population dependent on humanitarian assistance in some years (World Bank 2015; UNRWA 2019; OCHA 2021

8 For example, pollinators are critical for food production and human livelihoods. See "Global Action on Pollination Services for Sustainable Agriculture", FAO, https://www.fao.org/pollination/en.

Status before the escalation of conflict, and the current situation

Status prior to October 2023

Thirty-two per cent of Gaza's land was used for agriculture (Yin *et al.* 2025), with around 33.4 per cent classified as built up/urban area reported in 2021 (UN Habitat 2023). The most recent agricultural census (PCBS 2023b) reporting 2021 data includes:

- *Vegetable crops:* production area 17,880 dunams producing 148,250 tons
- *Field crops:* production area 29,291 dunams producing 33,492 tons
- *Tree crops:* production area 32,238 dunams producing 29,206 tons
- *Honey:* 141.2 tons
- *Poultry production:* 23,704 tons of meat and 8,141 tons of eggs
- *Goats:* 606 holdings for goats primary/only for meat, 363 primarily/only for milk
- *Sheep:* 42,194 head primarily/only for meat, 14,983 primarily/only for milk
- *Cattle:* 14,578 head

The agricultural sector used around 100 MCM of water per year, primarily groundwater of generally poor quality (nigh nitrate, high salinity). The North Gaza Emergency Sewage Treatment (NGEST) program was being prepared to provide 35,600 m^3/day (13 MCM/year) (EcoConServe 2019) of high-quality water per year, treated to unrestricted tertiary standards for use in agriculture (including use on vegetable crops).

Impact of the escalated conflict

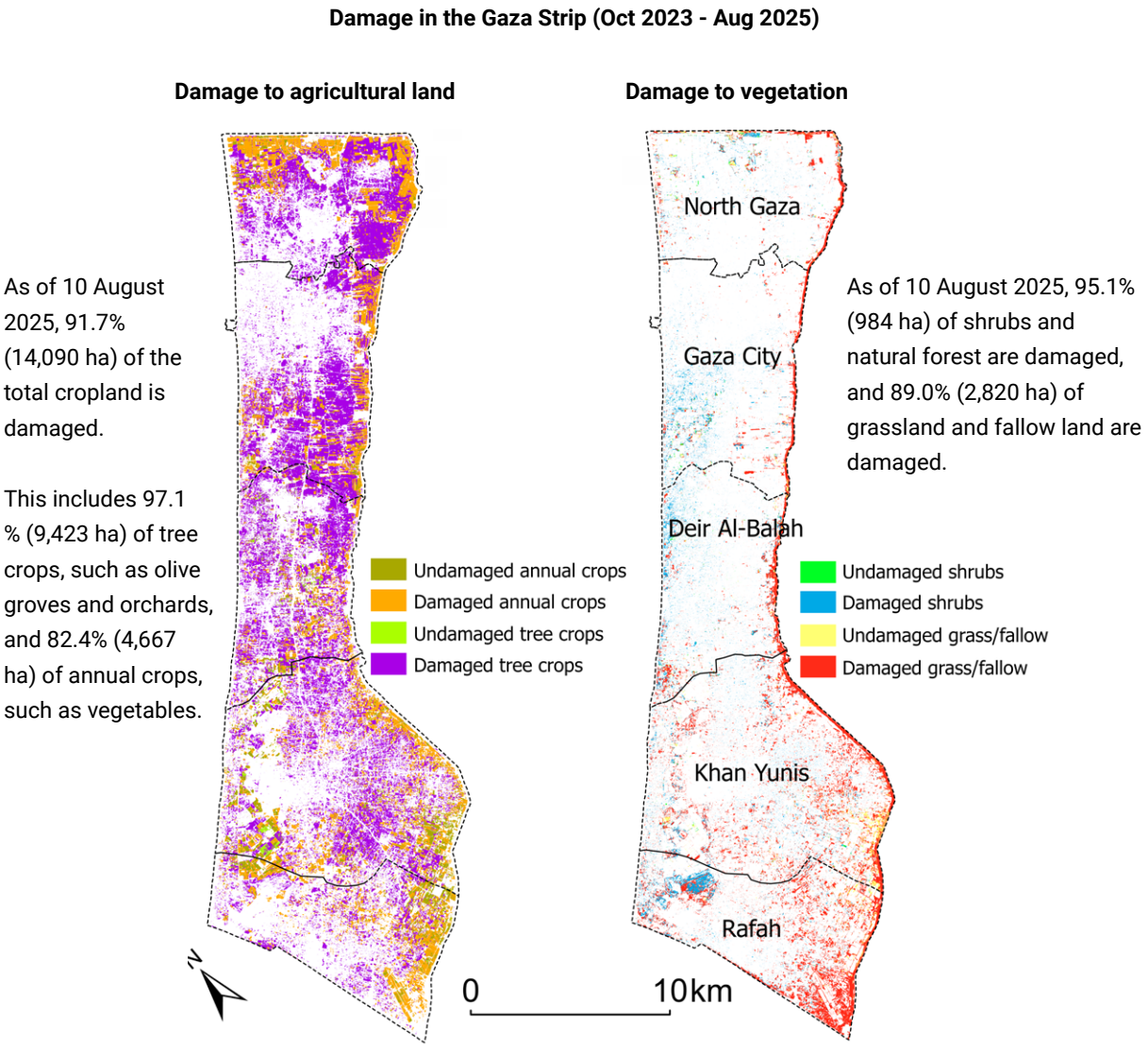
Throughout the conflict, the agricultural sector has experienced substantial damage. As of September 2024, 64–70 per cent of tree crops in Gaza were assessed to have been damaged by the conflict (Yin *et al.* 2025), and 65 per cent of greenhouses damaged or destroyed (UNEP 2024). By May 2025, the damage had increased further with damage calculated as: 97.1 per cent of tree crops, 82.4 per cent of annual crops, 95.1 per cent of shrubland and 89 per cent of grass/fallow land (Figure 5). As the conflict has progressed, less undamaged areas remain and this may account for the apparent slowing in the rate of damage (Figure 5).

The assessment of damage provided in the current report has been made using a method developed by He Yin at Kent State University (Yin *et al.* 2025). The assessment is based on Planet Scope (3 m resolution) and Planet Sky Sat (50 cm resolution) imagery, by comparing a pre-war assessment of the Gaza landscape, with observations from satellite passes in the period since October 2023. These assessments are corrected for growing season (i.e. compared against the state of vegetation from the appropriate season in the pre-war assessment). The full methodology used by He Yin including correction functions is described in full by Yin *et al.* 2025. It is used here given UNEP's environmental focus, due to the higher resolution and ability to disaggregate between different vegetation types.[9] The discrepancies between the Yin assessments and those undertaken by UNOSAT are relatively small. Both assessments indicate that the damage to vegetation and agricultural systems is extremely widespread.


Source: UNRWA, 2025

9 UNOSAT reported that 86.1% (12,962 ha) of cropland was damaged as of 28 July 2025. Using the methods published in Science of Remote Sensing (Yin et al. 2025), Yin estimated that 91.7% of cropland was damaged as of 10 August 2025, based on 3-m PlanetScope imagery. This estimate is slightly higher than UNOSAT's estimate (86.1%) derived from 10-m Sentinel-2 imagery. Several factors may have contributed to the small discrepancy. First, the coarser resolution of Sentinel-2 imagery could have led to an underestimation of fine-scale damages. Second, UNOSAT grouped tree crops with other trees and shrubs, whereas Yin analysis focused specifically on tree crops. Finally, UNOSAT's area estimates appear to rely on pixel-counting, while the Yin study employed a sampling-based approach that explicitly corrected for map errors. (Olofsson et al. 2014; Stehman and Foody 2019).

Figure 5: Damage to trees and croplands in Gaza as of 10 August 2025 showing a) annual and tree crops and b) shrub and grassland/fallow areas (Source: Analysis conducted based on methodology of Yin *et al.* 2025)



Source: Analysis of 3 m PlanetScope imagery © 2025 Planet Labs PBC, conducted by Dr. He Yin, Kent State University, based on research published in Science of Remote Sensing (DOI: 10.1016/j.srs.2025.100199).

Conflict-related tree loss in Gaza, while primarily driven by military actions, has also been affected by acute fuel shortages. Satellite imagery confirms that civilians—facing severe fuel and energy scarcity—have resorted to cutting down trees to use as firewood for heating and cooking (Pearce 2025). As noted in the Preliminary Assessment report (UNEP 2024), damage and destruction of trees and agricultural land also damages and destroys soil structure. Given the long duration of this conflict, combined with the number and extent of weapons used, the resulting damage could also be leading to permanent loss of soil material and irreparable ecological consequences, further exacerbating Gaza's vulnerability to climate change (Abuawad *et al.* 2025; Dardona *et al.* 2025; Hassoun, Al-Muhannadi *et al.* 2025; Hassoun, Jarrar *et al.* 2025).

Palestinian access to agricultural land has been substantially restricted during the conflict. According to the most recent UNOSAT assessment (August 2025) only 8.6 percent (1,301 ha) of cropland in the Gaza Strip is still accessible, but only 1.5 percent (232 ha) is accessible and not damaged. Another 12.4 percent of cropland (1,858 ha) is not damaged but is currently not accessible.[10] Military activity has caused significant damage to agriculture and ecosystems—including contamination soil, plants and the food chain (Pearce 2025; Yin *et al.* 2025).

10 UNOSAT Cropland assessment, United Nations Satellite Centre (UNOSAT) oPt Geospatial Support, presentation to United Nations, August 2025.

Soil health and contamination issues

Soils are likely to be significantly contaminated with chemicals and heavy metals from munitions, based on trends from past conflicts (Al-Najar *et al.* 2015), although no official estimates exist of the likely total tonnage of munitions dropped, and therefore no estimation of tons of potential chemical contamination is currently possible.

The intensity and duration of the conflict exceed any previous action in Gaza, so the impacts will also be expected to go beyond anything previously witnessed in this context. Challenges experienced in past conflicts are likely to be repeated and magnified. This includes spills of hydrocarbons and chemicals from damaged infrastructure and industrial facilities that will likely have caused pollution to soils, based on damage in previous conflicts (UNEP 2009), as will have unexploded ordinance and wind-blown contamination of dust (see section 4). This will pose risks for potential contamination within harvested crops and with it the health of the general population (Abuawad 2025) and potentially threaten the safety of agricultural workers regularly exposed to contaminants in soil. Such contamination can persist, with evidence from Europe suggesting the impact of heavy bombardment can be seen in soils over a century later (Williams and Rintoul-Hynes 2022).

The likely destruction of many records including land holdings poses significant challenge in determining and asserting rights to land ownership and use (FAO 2024a), which may affect farmers seeking to re-establish food production especially in areas of high damage.

Degradation of soils through loss of vegetation and compaction by military activity are likely to have reduced the infiltration capacity of Gaza's soils. Vibration from uneven surfaces could further enhance compaction (effects of heavy vehicles) throughout the soil layers (Vennik 2025). This action will likely reduce the short-medium term health of the soil, result in less groundwater recharge and consequentially, greater risk of surface flooding, as well as removal of soil material through surface flow of runoff.

Production of food in any notable quantity is currently not possible in Gaza, and people are reliant on food aid. At the time of writing, more than 500,000 people—nearly a quarter of Gaza's population—are enduring famine conditions, while the remaining population is facing emergency levels of hunger (World Food Programme 2025). The destruction of soil and the agricultural system could, in the medium and long-term, contribute to reduced nutrition for people living within Gaza, continued reliance on centralized food aid (where available), and increased susceptibility of the population to disease as consequence of malnutrition (Keusch 2003; Lal 2024).

Given the significant loss of open, natural and agricultural land, indigenous plant and animal species will have been impacted. The reliance on remote sensing to assess damage is limited without ground truthing to accurately capture the impact on biodiversity. Preliminary assessments of habitat loss suggest that some species in Gaza may have lost nearly all of their habitats, while others have experienced habitat losses of up to 80 percent (Ward *et al.* 2025). Global evidence suggests that where habitats are greatly fragmented and/or reduced in area, species can become increasingly vulnerable (Crooks *et al.* 2017). However, limited access and data gaps mean these figures remain preliminary and require further verification.

Implications for recovery and reconstruction

Given the importance of land resources in facilitating agriculture's major role in meeting food needs in Gaza, as well as its disproportionate economic contribution, the sector should be prioritized in economic and environmental rehabilitation. Failure to do so would threaten long-term food security, impacting long-term food prices (beyond the immediate impact of the conflict) and the overall export and internal economic prospects. Even within the highly damaged context of land and soil, there remains potential for rehabilitation of agricultural areas. Figure 5 shows that, as of 10 August 2025, small but significant areas of remaining undamaged or less damaged agricultural land and trees remain including in pockets towards the centre and west of the Gaza Strip. These remaining areas should be protected and recognised in future spatial plans, with a view to potentially maintaining some of the land-use heterogeneity within both medium and longer-term reconstruction of Gaza.

Land uses before the escalation of conflict should be accounted for during planning for recovery and

reconstruction. Rehabilitation of light or moderately damaged areas would be easier and more productive in terms of soil health, than rehabilitating heavily damaged areas, especially in the short term. Converting previously urbanised or industrialised land into productive agricultural areas could prove complex and costly. Re-zoning and complete relocation of agriculture areas would also threaten the already eroded tenure of farmers, while disregarding historic land use that carries cultural significance. Long-term planning without due regard for land, soil and agricultural resources risks further impeding long-term food security and the sustainability of the agricultural economy. Given the small but steady role of women within agriculture (who unlike the male agricultural workforce do not vary involvement in agriculture by season), there is also a gender component for agricultural recovery. Women's participation in Gaza's agriculture should be prioritized through targeted cash for work and voucher support for women-led producer groups; gender responsive extension and risk communication for soil contamination; and joint titling/tenure support and documentation services for female headed households to mitigate destruction of land records *(*FAO 2024c*)*. Deployment of urban agricultural systems such as vertical hydroponic systems (which are used elsewhere in the region, including in refugee camps) could also be considered. These systems could reduce the risks of transfer of heavy metals or contaminants into food systems, while helping to restore food security (World Bank 2021).

Failure to stabilise soils and start rehabilitation risks continued deterioration and loss of soil resources (Kallio 2015), impeding long-term sectoral productivity and food security. For heavily damaged, contaminated and/or degraded areas, balance needs to be struck between managing risks of contamination and Unexploded Ordnance (UXO), supporting the urgent food security needs of the Gazan population, halting further decline of soil material. In the context of recovery planning, temporary housing and infrastructure should be located with care to avoid degrading remaining agricultural land and potential, in both existing viable land and those areas planned for future agricultural rehabilitation.

In the medium to long-term, agricultural rehabilitation also provides an economically productive use for treated wastewater. This will require treatment to sufficient tertiary treatment standards to allow near unrestricted reuse in agriculture. Alternatively secondary treatment could be deployed in some crops, although significant attention would be needed to ensure that such irrigation does not damage or degrade the underlying aquifer, and does not occur near sensitive recharge sites. Either tertiary or secondary reuse for agriculture will promote agricultural growth, climate resilience (especially considering increasing evapotranspirative demands), but also require significant planning and investment in treatment and distribution infrastructure and agricultural techniques and planning to ensure it is safely and effectively used (Mishra *et al.* 2023).

With unknown degrees of chemical and munition pollution in the terrestrial landscape, there is potential for contamination in crops planted and harvested across Gaza. Although soil testing has not been possible in Gaza since October 2023, experience of post-conflict testing may be instructive. Following the 2008–2009 escalation of conflict in Gaza, UNEP soil surveys in areas impacted by sewage spills revealed various heavy metal contaminations. These included lead, cadmium, chromium, copper, cobalt, nickel, mercury and zinc (UNEP 2009). It is likely that similar trends will be evident and exacerbated by the length of the conflict but also with additional chemicals that may have been used during the conflict.

It is almost certain that such contamination is already in the food chain and will continue, potentially impacting human health (UNOCHA 2024b). An urgent and large-scale systematic survey of soils will be needed to determine the range of contaminants present. Such a survey would focus on areas of high-concentrations of toxic substances that should be prioritized for cleanup. It will be important to identify locations in which, due to the expected scale of contamination, cultivation should be restricted (or even stopped) until this work is complete.

While there has undoubtedly been significant harm to wildlife and biodiversity in Gaza, it is likely that natural recolonization of many species can occur after the conflict. This is due to many species being indigenous to both Gaza and southern Israel, and some land animals previously able to cross the border of their own accord (Rabou 2011). This will however depend on the protection of remaining habitat at an early stage in reconstruction and rehabilitation, and the planning for, and active development of appropriate natura and

agricultural habitats to support and even enhance the diversity of flora and fauna in Gaza.

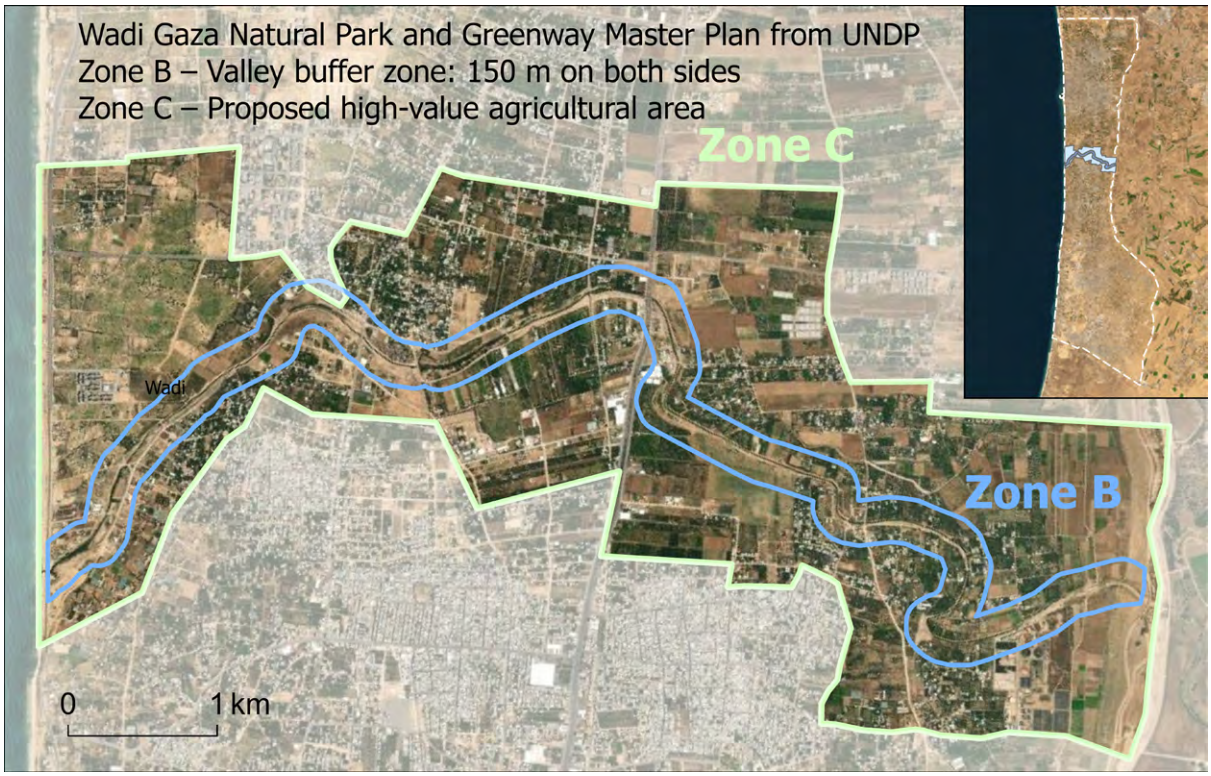
Wadi Gaza

Gaza contains a regionally important ecological site, Wadi Gaza, that supports significant biodiversity within Gaza and also supports species migration between Africa and Asia, providing significant ecosystem services for Gaza and the wider Eastern Mediterranean region. This Wadi's flow originates near Hebron in the West Bank, crosses Israel, entering Gaza east of Bureij at 30 m above sea level, meandering across central Gaza, north of Nuseirat Camp and being joined by six minor tributaries on its length in Gaza before entering the sea. Its total drainage area is 3,500 km^2 (Zaineldeen and Aish 2012).

Established as a nature reserve in 2000, the area was submitted by the State of Palestine to UNESCO in 2012 for tentative listing as a World Heritage Site (UNESCO 2012). It is the only major natural site in Gaza, with a diversity of flora and fauna,and its mouth, where both fresh and saline water meet, provides a unique habitat in the region (UNESCO 2012). It hosts 120 animal species including the endemic Palestine Sunbird, and 250 plant species (UNDP 2022). It serves as an important resting point on bird migration routes. While many of these species are not endangered, Wadi Gaza plays an important role in the regional and global ecosystem that supports their movements (UNESCO 2012).

Due to the restricted land availability in Gaza, Wadi Gaza has suffered significantly from pressures including encroachment, pollution and dumping. This is illustrated by the boundaries of the declared protected area being revised just one year after their listing in 2000, due to pressure by the public and local municipalities reducing the area of protection (MedWetCoast 2002) (Figure 8). The future protection of the Wadi will be vital for ecosystem functioning within Gaza, the health and sustainability of migratory bird populations, and the public physical and mental health, education and welfare of the Gazan population through the existence of wild and open public space.

Figure 6: Map of Wadi Gaza, and protected site boundaries based on Natural Park Proposal (Source: MedWestCoast 2002 and UNDP 2022)



Status before the escalation of conflict, and the current situation

Status prior to October 2023

Wadi Gaza has suffered from significant degradation and pollution including dumping of solid waste and sewage, and reduction of the estimated historic discharge of around 20 MCM/yr (concentrated in winter months) to minimal flows through abstractions (Zaineldeen and Aish 2012). The area originally designated as "protected" in 2000 has been reduced in size by urban and agricultural development, with an impact on ecosystems (MedWetCoast 2002).

Between 2017 and 2022, UNDP developed a comprehensive US$ 50 million master plan for Wadi Gaza and its surroundings, aiming to rehabilitate the degraded environment and provide an important environmental resource for both the natural environment and the human population. This included maintaining a protected zone within the course of the Wadi, a zone 150 m on either side of the wadi with limited development, as well as a more extensive 2 km zone with limited development that would help protected the Wadi Environment (UNDP 2022).

Alongside this Wadi Gaza development plan, the Central Gaza Wastewater Treatment Plant was designed to discharge up to 60,000 m^3/day (22 MCM/year) into the Wadi, and in so doing eliminate major wastewater inflows, improving water quality and providing a reliable source of water for the environmental system. It is noted that the planned Treated Wastewater (TWW) flows are similar in total volume to the historic natural flows, albeit distributed throughout the year rather than being concentrated in winter months. The TWW supply is however also planned for long-term agricultural reuse, and this relies on reduction of salinity of the resultant wastewater. When this occurs, a new strategy for Wadi Gaza would need to be found.

Impact of the escalated conflict

At the time of writing, it is difficult to directly assess the impact of the conflict on Wadi Gaza. The significant degradation of sewage infrastructure has likely increased untreated inflows into the Wadi, as well as preventing the initiation of TWW flows to rehabilitate the Wadi. The destruction of vegetation and land cover will also have impacted the Wadi, with significant tree cover damage recorded. There are also suggestions of pollution by munitions, unexploded ordinance (Pearce 2025).

Implications for recovery and reconstruction

Priorities within reconstruction planning should include maintaining the Wadi itself as an environmental and hydrological resource, and the Wadi corridor as a wider area for environmentally sensitive development and recreation (including potentially limiting building height to minimize threats to migrating birds) (UNDP 2022). The preservation of the Wadi as a functioning hydro-ecological ecosystem will play an important role in flood and water resources management and in supporting regional species migration within the Eastern Mediterranean.

In the longer-term, flow restoration will depend on improvements in TWW quality—particularly reductions in salinity—to enable safe agricultural reuse. A potential interim approach could include long-term controlled use of treated wastewater to sustain Wadi flows, with partial abstraction of water for onward conveyance to agriculture, prior to discharge in the sea.

Any plans to reclaim land from the sea off the coast of Gaza should be advanced with great care, to prevent negative impacts on estuarine habitats and ecosystems (Cooper *et al* 2020). Lessons can be learned from coastal land reclamation in other contexts (Healy and Hickey 2002; Wu *et al.* 2018). Environmental impacts should be considered carefully in planning for any coastal land reclamation projects: such projects can change wave patterns, tides, currents and energy fluxes (erosion and deposition).

Source: UNRWA, 2025

Section 3: Marine ecosystems

A healthy marine environment and coastline is critically important for the food security, nutrition, environmental resilience, health and livelihoods of people living in Gaza. The 40 km coastline provides access for the population to the Mediterranean coast, including for fishing and resultant nutrition provision, and will be critical in future plans for trade, maritime transport and desalination. The coastal environment represents a significant open space with potential for recreation, in an otherwise highly developed and densely populated area.

Status before the escalation of conflict, and the current situation

Status prior to October 2023

The marine environment has suffered significant environmental decline due to pollution and restrictions (Abualhin and El-Khuzundar 2022; Abdullah *et al.* 2025). This includes regular historic discharges of untreated sewage into the sea, averaging around 108,000 m^3 in the period to 2020 (Efron *et al.* 2019). This pollutes the Gaza marine environment, its beaches and aquatic life, and impacts coastal environmental quality in Egypt and Israel (UNEP 2020).

Despite heavy restrictions imposed by marine military exclusion zones prior to the escalation of the conflict, Gaza's fishing sector remained a vital source of food and livelihoods. In 2020 and 2021, over 4,500 tons of fish were landed each year (PCBS 2022a). The sector employed approximately 4,200 registered fishers operating roughly 1,500 boats, with more than 6,000 people directly dependent on the fishing sector for their livelihoods (FAO 2024b). The fish catch has been an essential local source of protein for the Gazan population. However, restrictions on the zone in which fishers can operate have contributed to localized overfishing and high competition for limited stocks. To diversify and expand production, FAO supported the installation of marine cage fish farms in 2021, located four miles off the Gaza coast (FAO 2021). Since 2014, two main terrestrial fish farms were established in Gaza, including some along the coast, drawing on seawater extracted from near-shore wells (Hussein and Zaquoot 2023a).

Impact of the escalated conflict

With significant attrition of institutional and scientific capacity in Gaza, as well as military restrictions on marine activity including that required for environmental monitoring, even a partial assessment of the impact of the escalated conflict on the marine environment is impossible at the time of writing. The following analysis is based on narrative evidence gathered by UN agencies within Gaza, remote sensing images, understandings of the historic trajectories of the marine environment and likely implications based on available data on the conflict.

The most recent estimate of fish catch is equivalent to around 130 tons per year (t/year), with just 47 boats active, operating in a very limited area close to the shore (UNifeed 2025). The conflict has all but eliminated the livelihoods of Gazan fishers. Furthermore, the destruction of institutional capacity, associated lack of regulation, and high demand for limited fish stocks mean that poisonous fish, including Rabbit Fish that contain venomous spines and are banned from human consumption in Gaza, are entering the food chain (WHO 2025b). Analysis of Google Earth images for the two major sites of on-shore aquaculture operating as of 2023 (Hussein and Zaquoot 2023b), suggests that one of these has been destroyed or heavily damaged (as of 2025), while the other (near Rafah) is likely undamaged (as of mid-2024), but surrounded by displaced person facilities, with ponds empty (Google Earth 2025).

With significant destruction of water and sanitation infrastructure (as described in Section 1) there is potential for a greater proportion of wastewater to enter the sea untreated. At the same time, one can assume that the reduced availability of water

means less sewage is produced. The destruction of conveyance networks also means that a greater proportion of sewage remains in cesspits or discharged into open ground (UNOCHA 2024c; Pearce 2025), in both cases posing a risk to groundwater rather than the marine environment. It is possible therefore that the marine impact of sewage discharge has decreased since the escalation of the conflict, albeit at the expense of significant environmental and humanitarian costs elsewhere in Gaza, however this needs to be confirmed.

The recovery of the marine environment will improve both food security and economic outcomes. It requires management of terrestrial sources of pollution as well as land use.

Implications for recovery and reconstruction

The future of the marine environment will be heavily influenced by environmental management on land. Failure to reconstruct water treatment systems will result in significant volumes of sewage once again polluting the marine environment. Even secondary-level treated wastewater still contains contaminants, including nitrate and phosphate loading that can impact the marine environment (Rajapriyan and Kumar 2018) and as such will need to be disposed of with care, or preferably appropriately reused in agriculture, including through treatment to tertiary level.

Any proposals for coastal land reclamation (e.g. Gazze Destek Organization 2025) could impact the morphology of the Gaza coastline, and with it the currents and energy fluxes along the shore, as well as the projected impact of climate-change induced sea level rise. This will have the potential to impact fish habitats and available stocks for fishing. There may also be a potential for changes in patterns of erosion and deposition along the shoreline, changing the nature and availability of beaches in Gaza (Subraelu *et al.* 2022). Given the prevalence of beaches along much of the Gazan coastline, careful assessment and modelling of the impact of coastal land reclamation on beach areas (on both updrift and downdrift sides) should be investigated as part of planning, and appropriate mitigation and trade-offs evaluated.


Source: UNRWA, 2025

Section 4: Urban environment, debris quantity and management

Gaza is one of the most densely populated areas on earth, with 6,102 individuals/km² (PCBS 2023). In October 2023, there were an estimated 245,781 structures in the Gaza Strip[11], providing homes, and industrial and commercial facilities, education and healthcare. Other significant structures and infrastructure existed to support food production (including energy generation and transmission). In combination, these structures formed the built environment of Gaza, covering slightly over one-third of the Gaza Strip's total land area (UN-Habitat 2023) maintaining a critical support system for the population and economy.

Status before the escalation of conflict, and the current situation

Status prior to October 2023

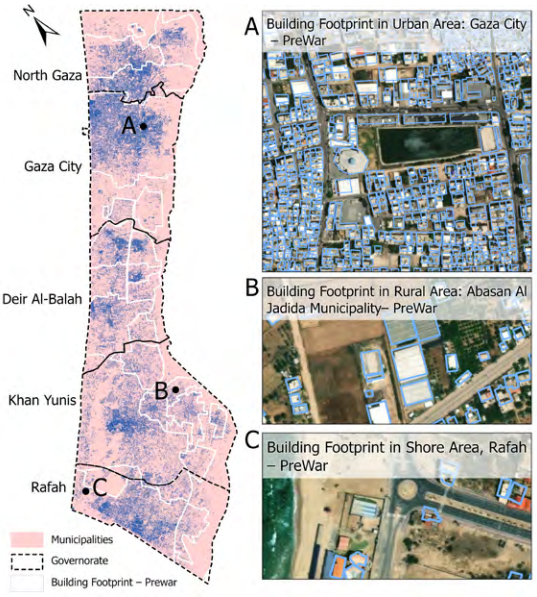
Gaza's urban environment was diverse, ranging from dense high-rise dwellings to lower-rise buildings, historic structures including religious buildings and cemeteries, developed refugee camps and industrial facilities (Figure 9). As well as agricultural areas, primarily on the eastern side of Gaza, there were also interspersed agricultural and productive tree stands within otherwise developed areas in the west and south, producing an important mixed urban-agricultural environment.

The coastline, and especially the undeveloped beachfront, also represents an important open space within the patchwork of urban development. This area has served in the recent and distant past as open and publicly-accessible land: should it be closed off, an important public common would be lost, and with it physical and psychological health eroded.

Due to the limited land area within Gaza, and limited and unreliable energy systems, a rapid growth in solar facilities has occurred since 2010, with a vast majority of the 8,760 solar generation sites (as of 2019) (Fischhendler *et al.* 2021) located on urban and industrial rooftops.

11 Using data from UN-Habitat

Figure 7: Snapshots of building footprint in the Gaza Strip before the escalation of the conflict in 2023 (Source: UN-Habitat 2025)



Impact of the escalated conflict

The conflict has resulted in widespread destruction of the built environment, creating immense challenges for housing, infrastructure recovery and Gaza's population. Destruction is extensive and ongoing at the time of writing. Of the total structures in Gaza as of July 2025, 102,067 (41 per cent) are destroyed, 59,316 (25 per cent) are severely or moderately damaged and 31,648 (13 per cent) possibly damaged. This corresponds to around 78 per cent of the total structures in the Gaza Strip and a total of 282,904 estimated damaged housing units (UNOSAT 2025). With only 52,969 of Gaza's structures likely remaining intact (~22 per cent), most of the populations' housing and infrastructure has been destroyed or damaged. The level of destruction has resulted in an unprecedented quantity of debris. Based on calculations of building footprint and height before October 2023, combined with mapping of destroyed or damaged structures, UNEP and partners estimated that more than 61 million tons of debris (Figure 8) will require clearing, sorting and recycling or disposal. This represents a 57 per cent increase in debris since UNEP's first *Preliminary Assessment* in June 2024, reflecting the growing scale and intensifying severity of the destruction. Furthermore, the quantity of debris from the current conflict is 20 times greater than the combined total generated by all previous conflicts in Gaza since 2008. Its density is equally striking, equivalent to over 169 kilograms of debris for each square meter in the Gaza Strip. The growth rate of debris is shown in Figure 9.

Figure 8: Preliminary estimates of debris quantities and distribution across the Gaza Strip

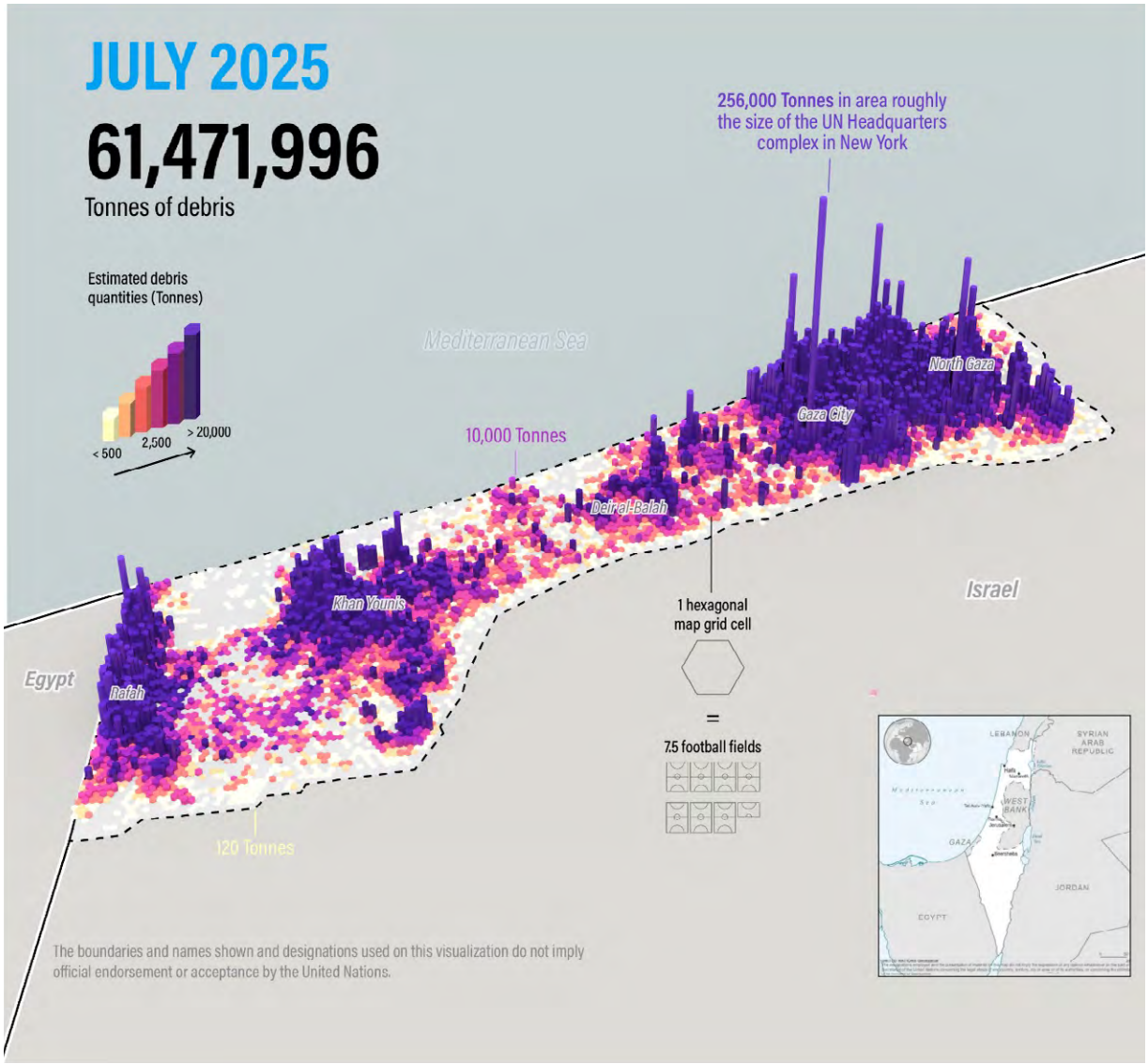
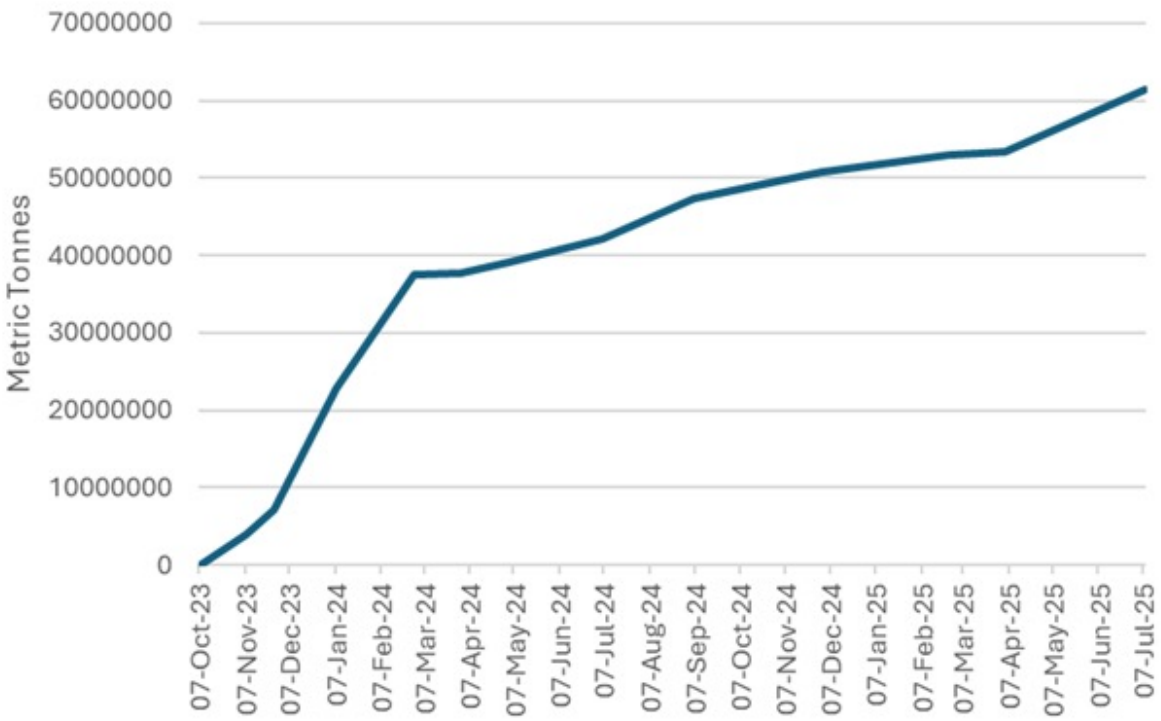


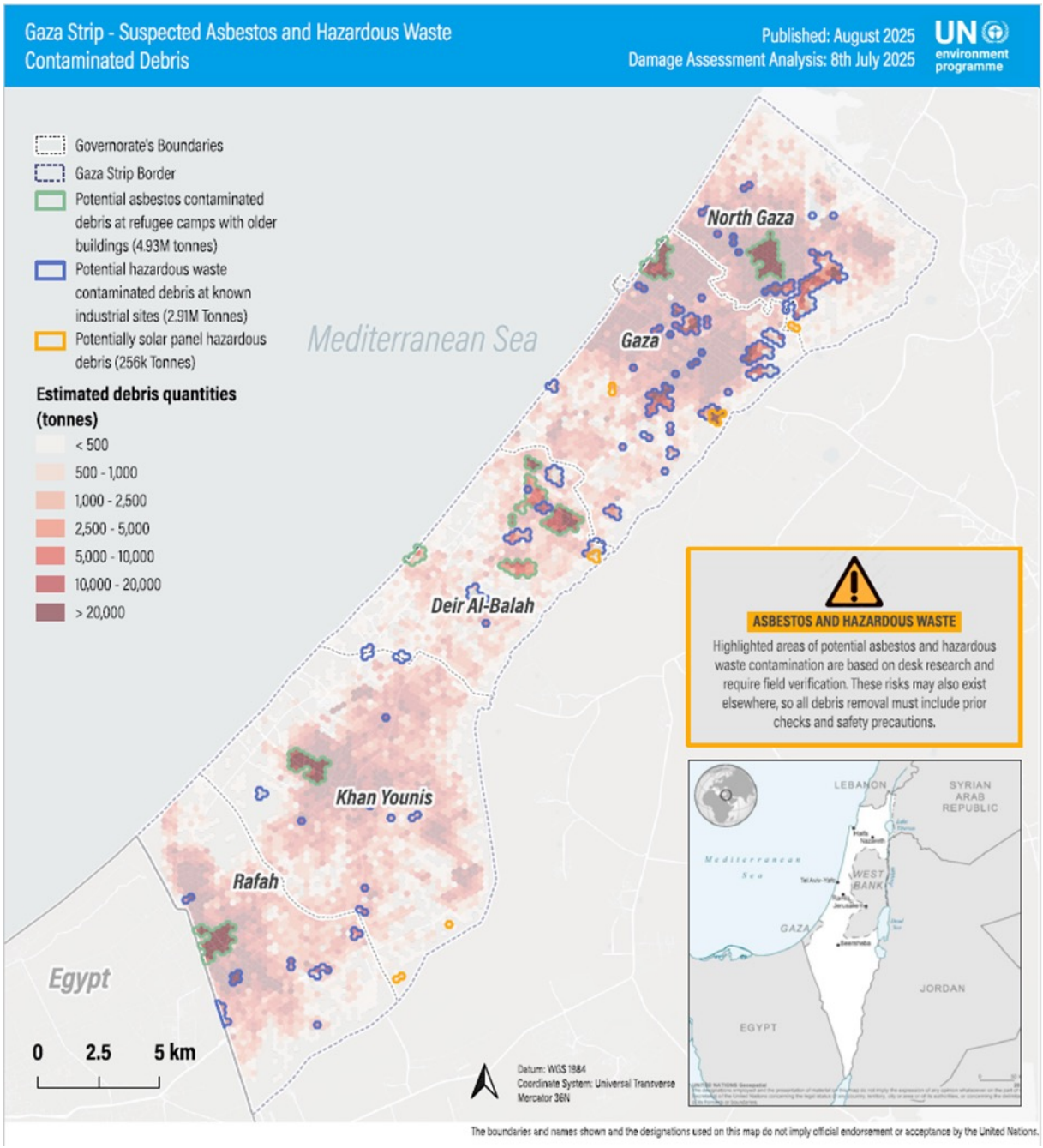
Figure 9: **Generation of debris in the Gaza Strip from October 2023 – July 2025**



Most of the debris—approximately 80–90 per cent—consists of inert construction materials (primarily concrete, bricks, stones and tiles) that can be recovered with relative efficiency. Nevertheless, three potential 'hot spots' require detailed surveys and specialized management: (i) Gaza's eight refugee camps, where the older building stock increases the likelihood of asbestos-containing materials such as roofing sheets; (ii) industrial areas, where chemicals and other hazardous substances may be present; and (iii) large-scale photovoltaic installations, where damage may result in the release of heavy metals. It is important to note that these risks may also occur outside these hot spots; consequently, all debris clearance operations should be preceded by careful screening and implemented with health and safety precautions.

Source: UNRWA, 2025

Figure 10: Distribution of debris across the Gaza Strip, highlighting asbestos, hazardous waste and likely heavy metal contamination from utility-scale photovoltaic installations



Note that these are preliminary estimates and subject to field verification (UNEP 2025). Both initial explosions and disturbance and transport of debris post conflict will produce and re-mobilise air pollutants and dust. Dust is estimated to have contributed to increased cases of respiratory infection within Gaza (Reliefweb 2025), with over 37,000 cases reported in June 2025 alone as recorded in Health Centres and Shelters in Gaza, Middle and Khan Yunis areas (UNRWA 2025a). The explosive destruction of structures, as well as explosive impacts in soils have raised concerns around release of mould and fungal spores. Previous studies have shown a link between fungus within the soil and patterns of infection on both military and civilian personnel (Roberds et al. 2024).

In refugee camps, debris is estimated at around 4.93 million tons, of which a small fraction—in the order of one per cent (roughly 50,000 tons)—may consist of asbestos containing materials, although the actual proportion can only be confirmed through field surveys and sampling. Nevertheless, the potential dispersal of this carcinogenic material within the wider debris matrix, and the health risks linked to its handling and disposal, make careful identification and separation essential. An additional 2.91 million tons of debris in industrial areas are potentially contaminated with chemicals and other hazardous materials, also requiring thorough sorting and safe disposal before the residual bulk debris can be recycled or disposed. Surveys following the 2008 conflict in Gaza revealed that combustion of toxic materials produced ash and other burnt substances contaminated with Polycyclic Aromatic Hydrocarbons (PAH) and Polychlorinated bipheyls (PCB), with recommendations for the use of personal protective equipment during cleanup of these areas (UNEP 2009). Similar but more widespread trends in contamination can be expected following the present conflict (UNEP 2024).

Analysis also suggests that at least 256,000 tons of debris may be contaminated with heavy metals from utility-scale photovoltaic sites. This value will likely grow if it becomes possible to account for rooftop solar facilities in urban locations in future assessments. Rooftop solar installations pose a separate and more localised risk – mainly from small-scale panels and battery storage in residential and commercial buildings. Although the concentration of contamination is lower than in utility-scale facilities, it will still need to be managed alongside other potential household-level hazardous materials.


Source: UNRWA, 2025

As well as the destruction caused by bombing and artillery fire, the United Nations Mine Action Service (UNMAS) estimate that around five to ten per cent of munitions fail to explode (UN News 2025a), which results in a significant risk within both debris masses and the general environment. Explosive ordinance embedded in debris and the wider environment pose both immediate and long-term risk, including of accidental future explosions, traumatic injuries and loss of life if unaddressed. Over time, they may also cause significant further environmental degradation if hazardous materials contained within them escape into the environment (Chendorain *et al.* 2005).

Gaza's debris-dominated landscape is also contributing to its public health crisis, as concerns grow that it is serving as a breeding ground for lice, fleas and sandflies that spread diseases such as leishmaniasis among displaced people living nearby (Gaza Debris Management Working Group [DWG] 2025). In addition, more than 10,000 people are believed to remain buried under the debris, underscoring the need for special debris management procedures to ensure the safe and dignified recovery of human remains (UNOCHA 2025).

Implications for recovery and reconstruction

The unprecedented scale of debris in Gaza makes its clearance and management a foundational priority for enabling humanitarian access, relief delivery and recovery, and requires dedicated planning and resources. To coordinate efforts, a multi-agency Gaza Debris Management Working Group (DWG) has been established to support risk-managed, efficient and responsive debris interventions across Gaza. To promote a coherent approach, the DWG has developed a 'Debris Management Framework' that is endorsed by the Palestinian Ministry of Public Works and Housing to guide interventions, setting out core principles and minimum requirements for safe, structured and sustainable operations.

Central to the framework is the waste management hierarchy, which emphasizes circularity and recycling – turning debris into reconstruction materials to the extent possible. Recycling is not only a necessity but a practical imperative in the Gaza context: disposing of all debris would require an estimated 727 hectares of land, an unviable option in Gaza's densely populated and land-constrained context, where landfill capacity was already overstretched before the conflict.

Recycling also helps address severe shortages of construction materials in Gaza, provides livelihoods and job creation opportunities, reduces costs and carbon emissions, and safeguards the environment by reducing quarrying of new construction materials while also easing land take for disposal. UNEP estimates that recycling 50 per cent of Gaza's debris would result in a cost saving of around 20 per cent for the whole debris operations with the value of the resulting recycled debris materials contributing to this saving. For context, current projections indicate that debris operations would cost approximately US$ 966 million if 50 per cent of the debris is recycled, compared to about US$ 1.2 billion if all debris were to be disposed of without recycling.

Given the critical role of recycling in sustainably managing Gaza's debris, all actors are strongly encouraged to observe the DWG's guidance and standard operating procedures, which cover inter alia issues ranging from debris recycling, asbestos handling, health and safety, explosive ordnance and the recovery of human remains. Furthermore, UNEP and UNDP have commissioned a programmatic-level Environmental and Social Impact Assessment (ESIA) under their ongoing emergency debris management pilot project in Gaza, which provides detailed environmental management plans including on site requirements to support timely and safe operations.

A critical element of the recycling process is careful sorting, especially of debris contaminated with asbestos or industrial waste. Preventing hazardous materials from entering the crushing process is essential, as this would spread contamination and create serious public health risks. Even inert debris can generate dust during clearance and processing, which may affect respiratory health and requires precautions to protect recovery teams (Abdelnour and Roy 2025). To minimize these risks, dust suppression measures and adequate resourcing with personal protective equipment must be prioritized. While processing sites should be located away from residential areas to the extent feasible, Gaza's severe displacement and limited land make adequate distancing extremely challenging. Risk communication should be gender tailored (channels used by women, accessible formats), and site selection should pass protection and safety screenings (distance from shelters, lighting, safe access).

A large proportion of Gaza's cultural heritage sites has also been damaged by the conflict, with 110 sites verified as affected (UNESCO 2025). Debris from these sites should be recovered and stored with due care and consideration, to enable the use of the original building elements within potential reconstruction of these structures, either on site, or in appropriate new locations. Debris removal in these areas should therefore be sensitive to any remaining extant elements, or to the existence of restorable elements within the debris that could be part of longer-term restoration initiatives (DWG 2025).

For the disposal of residual, non-recyclable debris, permanent sites for debris disposal should be established with appropriate safeguards to protect human health and the environment. Hazardous waste including asbestos and industrial waste needs to be properly disposed of in accordance with international regulations and standards, including the Basel Convention of which the State of Palestine, the State of Israel and the Arab Republic of Egypt are all signatories.

It should be noted that the Oslo II Accords mandate transfer of hazardous waste to Israel, pending establishment of Palestinian disposal facilities (Oslo II Agreement 1995); such facilities therefore need to be established, or other arrangements made for transfer and external management. The Barcelona Convention (of which the Arab Republic of Egypt and the State of Israel are signatories) does not explicitly prohibit disposal of hazardous wastes at sea but requires permissions where such wastes will impact marine activity and marine life. Given the limited area for Gazan fishing, it is likely that any attempt to dispose of hazardous waste in the marine environment would have an impact on the marine environment and fish stocks, and would run against pollution control policies being espoused by the Palestinian government.

Reconstruction provides an opportunity to rebuild Gaza's infrastructure while improving resilience to climate change. Regional climate forecasts predict more extremes of heat, as well as greater potential for flash flooding (Red Cross Climate Centre 2021; Ali *et al.* 2022), and the need to continue to manage low temperatures during the winter months. The design of the entire built environment should incorporate climate-resilient infrastructure thinking. 'Green Building' approaches should be adopted that deploy both modern and traditional design and construction techniques to support managing heat and cold (Katkhuda 2025). This could include passive cooling incorporated within major public buildings such as schools and hospitals, and development of cooling centres and emergency preparedness protocols to support people during periods of extreme heat (UNEP 2023). These techniques will also help reduce the future energy intensity required for cooling and heating the urban areas. Sufficient drainage infrastructure will also be needed to manage extreme rainfall events, and minimize the risk of flooding, while also providing opportunities to harvest runoff for aquifer recharge.

Green space, including open recreational space or urban agricultural areas, will also help manage urban temperatures and reduce the extent of the urban heat island effect (UNEP 2021). This is important for both high-density population, as exists in Gaza, but also for a primarily young population where recreational space will optimise recovery and future health following a sustained period of deprivation.

Global Sea level rise of between 0.07 m and 0.44 m by 2050 (depending on emissions pathways) (World Bank Climate Knowledge Portal 2021) and up to 1.55 m by 2100: will also threaten the coastal environment. Given the potential lifetime of reconstructed urban infrastructure, redevelopment of Gaza should account for these long-term trends. Protection of the beach environment should be included in planning, given its importance as a public and environmental resource.

In the immediate recovery phase, to support humanitarian efforts and remaining livelihood capacities, essential transport links should be restored. Future planning for longer-term resilience should also account for public transport needs, especially on reducing private car use given the density of development in Gaza. Care should be taken that public transport planning refers to maximum recommended accessibility requirements to disincentivise private vehicle use and avoid congestion and pollution. Encouraging this behaviour includes meeting a 500–1,000 m distance from homes and workplaces to public transport facilities (including metro systems, buses etc.) (UN Habitat 2018).

While this public transport target might be accomplished through careful location of bus and light rail routes in the northern part of Gaza, additional

infrastructure will be required in the south, for example loop rail lines or increased parallel bus routes. This is because the width of the territory means that services, for example running along a coastal and/or inland axis, will be too far to serve populations in the middle of any planned conurbation. Additional parallel provision may be needed to ensure that all areas have equality of access. Sufficient route frequency and hours of system operation would ensure that public transport is viable and accessible for the majority of the population including those travelling in the evening and early in the morning.

Effective public transport is especially important for those with both domestic and work responsibilities, and for access to educational facilities, thereby impacting opportunities for women and children, and those with mobility constraints. The latter point is especially relevant for Gaza, which has the largest cohort of child amputees in modern history (UNOCHA 2024d). Adopting principles of the 'Livable City' will encompass transport, basic public services and recreation being easily accessible for all residents, as well as including urban climate resilience considerations (Dietrich 2022).

Construction of a significant informal underground tunnel infrastructure poses a significant future environmental risk and a challenge to future sustainable urban redevelopment. The unplanned and unmapped nature of these tunnels, and the absence of any design and engineering standards mean that there is an unquantified risk of movement and instability on the land above (Dudek *et al.* 2020).

Historically, injuries and deaths have been reported from collapse and explosions (United Nations Children's Fund [UNICEF] 2013). This may be magnified in the event of considerable urban redevelopment including major planned and high-rise structures. Localized collapse or wider sub-surface movement could threaten new construction and the sustainability of a rebuilt urban environment. Furthermore, human, munition and chemical remains within the tunnel network may pose a risk of future surface and subsurface pollution. Remedial steps could be considered, potentially including structural backfilling and permanently sealing off such infrastructure across Gaza to reduce these risks.

Source: UNRWA, 2025

Section 5: Solid waste and environmental health

Effective infrastructures to process and dispose of disposal of municipal solid waste are essential to prevent the accumulation of materials that could threaten human and environmental health. Waste buildup creates hygiene hazards, promoting the decay of organic material, and attracting pests and increasing the potential for spread of disease. Additionally, rainfall can flush surface contamination into the soil and groundwater, causing wider environmental pollution and health risks (WHO 2024).

Status before the escalation of conflict, and the current situation

Status prior to October 2023

There were two technically-equipped solid waste landfill sites in Gaza, both located on the eastern edge. These were crucial for the safe disposal of solid waste in sanitary facilities that minimize both pollution to the environment (including groundwater) and remove waste from proximity to the majority of the Gazan population. Some recycling was occurring, with 1,696 truckloads of recovered materials being exported from Gaza to Egypt in 2022 (three times higher than in 2021). Of these exports, 87.5 per cent were iron scrap, 11.5 per cent were scrap batteries, and 1 per cent carried scrap copper and aluminium (UNOCHA 2023).

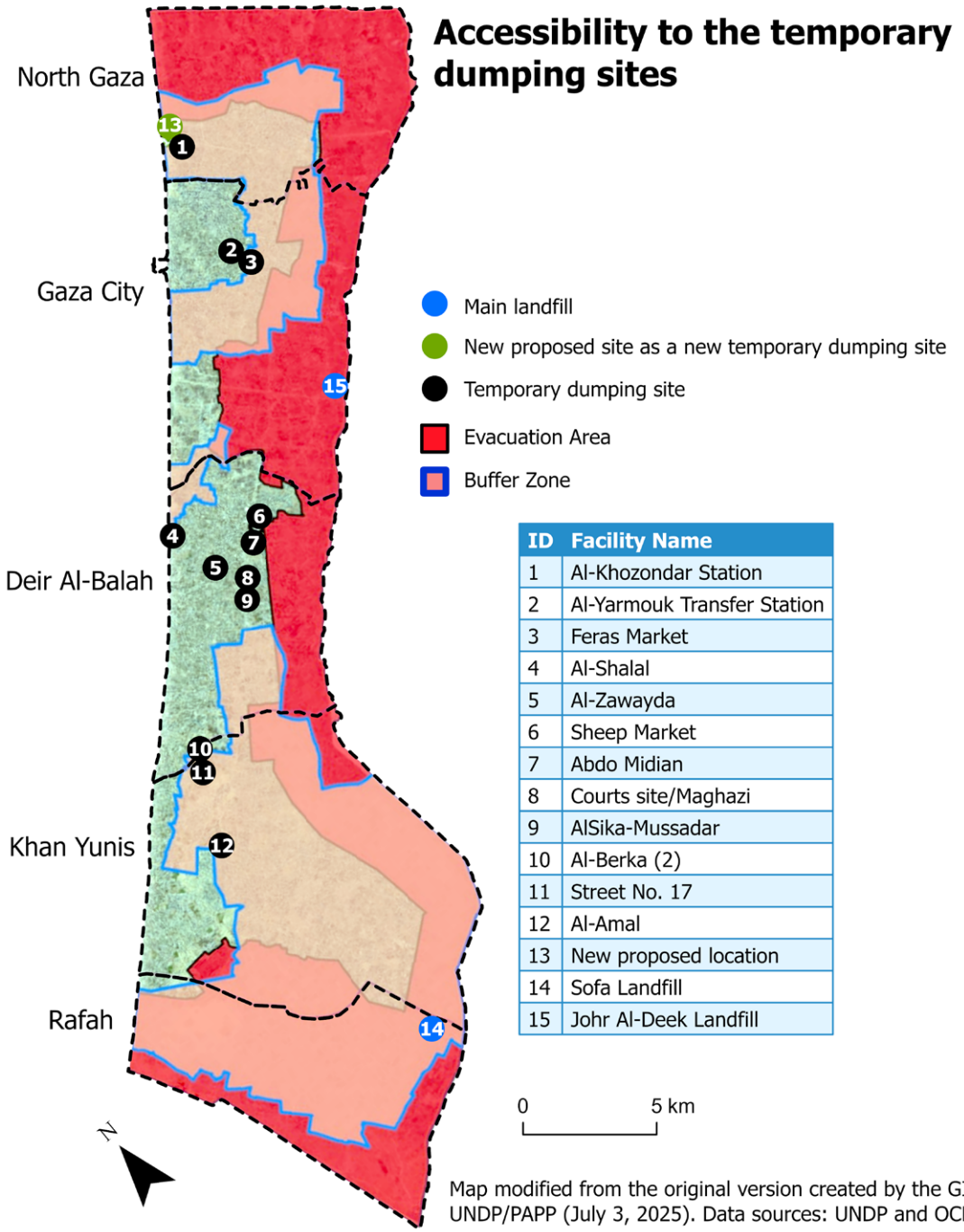
Impact of the escalated conflict

Since October 2023, both landfill sites have been off limits to civilians, since they are located within areas that have been closed by the Israeli armed forces. Furthermore, movement of the population, and destruction of vehicles and equipment have meant that for significant periods of time there was limited organized sold waste collection. The result of this was emergence of over 200 random and informal dump sites early in the conflict, which lacked any sealing or sanitary controls (Pax for Peace 2024). These have now been either cleared or temporarily covered by soil, with 12 temporary collection and dump sites established in strategic locations, and one further site currently proposed (Figure 11) (UNDP Programme of Assistance to the Palestinian People [UNDP/PAPP] 2025). While these temporary dump sites are established, their capacity is limited. For example, in mid-August UNRWA was able to clear just 390 tons of solid waste from shelters serving 130,000 people – just a fraction of the total (UNRWA 2025b).

Furthermore, since the end of the ceasefire in March 2025, limited fuel has hampered the use of waste collection vehicles, compounding the problem of inability to replace vehicles lost or damaged in military activities (UNDP 2024).

Source: UNRWA, 2025

Figure 11: Location of permanent and temporary dump sites in the Gaza Strip (Source: UNDP/PAPP 2025)



ID	Facility Name
1	Al-Khozondar Station
2	Al-Yarmouk Transfer Station
3	Feras Market
4	Al-Shalal
5	Al-Zawayda
6	Sheep Market
7	Abdo Midian
8	Courts site/Maghazi
9	AlSika-Mussadar
10	Al-Berka (2)
11	Street No. 17
12	Al-Amal
13	New proposed location
14	Sofa Landfill
15	Johr Al-Deek Landfill

Map modified from the original version created by the GIS Team, UNDP/PAPP (July 3, 2025). Data sources: UNDP and OCHA

The current 12 temporary dump sites in Gaza are located close to the population, in a context in which waste collection has almost collapsed and people are living in highly constrained areas. Many communities are consequently living alongside and amidst rotting waste (UNDP 2024).

The limited waste disposal options, including fuel for incineration, have also seen separated medical waste recombined with general waste and sent to temporary dump sites. These conditions are conducive to the outbreak of disease and create pathways for significant bioaccumulation of contamination within the environment and food chain (Corte Pause *et al.* 2024). Remaining livestock, faced with limited available fodder, have been observed feeding from dump sites, exposing them to a multitude of contaminations. The lack of sealing of these dumping sites also presents a risk of airborne particles, and leachate entering soils and groundwater, creating new pathways for environmental contamination (UNDP/PAPP 2024).


Source: UNRWA, 2025

Implications for recovery and reconstruction

A full survey of temporary and persistent ad-hoc dump sites as well as dormant landfill sites will be needed at the start of the recovery process. This includes comprehensive mapping of locations and estimation of accumulated waste volumes, including uncollected waste in areas inhabited by displaced people. With the existing sanitary landfill sites having limited capacity prior to the conflict (UNDP 2024), a new waste collection, management and disposal strategy will be needed including landfill sites and other systems. This will have to cater for the urgent collection and management of uncollected waste in the community that has accumulated, as well as collection and disposal of solid waste generated by the population into the future, and eventual disposal of temporary and informal dumpsites established during the conflict.

Waste disposal should also consider adopting sorting and recycling of suitable materials either inside or outside Gaza. A suite of measures could be deployed to reduce the amount of currently accumulated materials to landfill and to initiate infrastructure for reduced levels of waste into the future: for example, consideration of Anaerobic Digestion for food/organic wastes to generate biogas (potentially alongside sewage biogas) and support to establish innovative measures to clean and reprocess waste streams for use in recovery efforts, such as the recovery/reuse of metal tins or the reprocessing of plastic materials. Such an approach is consistent with the recommendations of the 2020 UNEP State of Environment Report (UNEP 2020). These efforts could also support a wider transition to implement circular economy principles with a reconstructed Gaza.


Source: UNRWA, 2025

Section 6: Air quality

Air quality has important implications for human health. Globally, airborne pollutants are responsible for about one third of deaths from stroke, chronic respiratory disease and lung cancer, as well as one quarter of deaths from heart attack. Air pollution comes from many sources, including vehicle emissions, industrial furnaces and fires. Fires and explosions that occur in conflict situations produce a range of air pollutants that affect human health (UNEP 2024).

Status before the escalation of conflict, and the current situation

There is limited data available within Gaza on air quality both before and during the conflict. Part of this lack of information is connected to the limited air-quality monitoring available in Gaza, and part due to the localised and transient nature of air quality impacts. Known challenges during the conflict include pollution from explosions and resultant fires during bombing campaigns. With limited electricity provision and supply of cooking gas, people have relied for cooking and heat on solid fuels. This includes the burning of waste plastic (UN News 2025b) that is known from studies in other areas of the world to contribute to multiple health issues including respiratory and neurological and skin conditions (Pathak *et al.* 2023). Shortage of fuel has also led to the burning of trees for cooking fuel (Pearce 2025), further reducing tree cover (and their contribution to air quality) in Gaza.

A recent study has combined remote sensing, machine learning and predictive modelling to assess air pollution in Gaza (Abulibdeh 2025). This study notes distinct spikes in pollution including sulphur dioxide associated with major destruction of fuel or industrial facilities and Ultraviolet Aerosol (UVAI) as an indicator of smoke and dust suspended in the air. The use of generators to compensate for power shortages are associated with increased CO_2 concentration, along with burning solid materials for cooking. Increased methane emissions are observed in association with degradation of waste and wastewater disposal systems

Emissions from explosions of munitions and resultant fires in bombed structures, including industrial facilities, will also have likely released toxic chemicals into the air with impacts on human and environmental life. The repetitive nature of these releases will likely have a cumulative impact on the environment, including contaminating soil and water resources as discussed earlier.

Source: UNRWA, 2025

One study pre-published in 2025 has attempted to quantify the total carbon emissions of the conflict in Gaza, which range from pre-conflict military investment to emissions from conflict actions including munitions and fires, and the likely carbon intensity of reconstruction (Neimark *et al.* 2025).

Consideration should be given towards reducing the carbon intensity of reconstruction, where possible. This may include the recycling of construction materials, and use of low carbon materials, as well as techniques for carbon capture during manufacturing of construction materials, either in Gaza or at source for imported materials.


Source: UNRWA, 2025

Section 7: Further considerations for recovery and reconstruction

While it is not yet possible to assess the full extent of environment damage, due to access restrictions, it is clear from the information included in this report that the scale of degradation is immense. With the conflict ongoing at the time of writing, pollution of air, water and soil continues, and the few remaining vegetated areas are at risk of destruction.

Recovery of the environment and natural resources in the wake of this conflict will require carefully sequenced planning. Some interventions, such as the early reconstruction of water supply and sanitation systems, and efforts to manage solid waste and minimize pollutant remobilization during debris clearance, would have an immediate positive impact on the population – helping to minimize health outbreaks and pollution risks. Other interventions, such as the testing and removal of contaminated soil, should be carried out at an early stage to reduce the likelihood that contaminants enter food systems. UNEP recommends undertaking an early ecological and environmental health risk screening exercise, to identify priority areas for assessment and management. A range of stakeholders and domain knowledge holders should participate in this exercise.

Longer-term reconstruction planning processes should include science-based assessments and incorporate adaptation best practices, to enhance the resilience of Palestinian communities to the rapidly changing Mediterranean climate. A list of recommended actions is provided in Annex 1. Managing recovery and reconstruction will be highly challenging, given the scale and scope of the emergency affecting communities living in the Gaza Strip. Processes outlined in the first section of this report provide a solid basis for coordination of international assistance. Supported by international partners, Palestinian entities and experts must play the leading role in the environmental recovery of Gaza.

Given the importance of natural resources and ecosystems for all aspects of life in Gaza, environmental protection should be integrated fully into planning by different sectors and actors. Strong inter-sectoral coordination and cooperation, including between different ministries, could help to ensure environmental and natural resource dimensions are integrated into recovery planning. Investment will be needed in building the planning and monitoring capacity of the Environment Quality Authority (EQA), including investment in recruiting and training sufficient high-quality staff, obtaining equipment and laboratory space (both temporary and permanent) to assess and monitor pollution, and infrastructure for data gathering, storage and dissemination.

Lastly, planning for the environmental recovery of Gaza should also include, where possible, the inputs of Palestinian environmental specialists, including scientists. Before the escalation of the conflict, there was a significant body of expertise in environmental management in Gaza including individuals experienced in environmental planning, monitoring and management of water resources, wastewater, solid waste and debris management and infrastructure design and construction. There were also significant university and laboratory facilities to support soil and water quality monitoring and testing, as well as testing to ensure compliance with construction material standards. While there have almost certainly been major losses in physical infrastructure, and some losses in human expertise, it will be critically important to draw on the remaining capacity for monitoring, planning and reconstruction. Investing in such Palestinian capacity would enhance prospects for recovery and increase environmental quality and management, with multiple benefits.

Annex 1: Prioritised environmental actions during relief, short-medium term recovery and longer-term planning and reconstruction actions

Within existing planning frameworks

- UNEP recommends undertaking an early ecological and environmental health risk screening exercise, to identify priority areas for assessment and management.[12] A range of stakeholders and domain knowledge holders should participate in this exercise.

Urgent action during relief phase

- Prioritise early reconstruction of water supply and sanitation systems to minimize health outbreaks and pollution risks, building on planning exercises undertaken by the WASH Cluster.
- Undertake emergency debris clearance to facilitate access for humanitarian aid delivery and critical infrastructure essential for life saving-efforts, public safety, temporary shelter and early community recovery.
- Identify and establish suitable sites for temporary storage, recycling and disposal of debris including hazardous waste arising from the debris management works.
- Minimize pollutant remobilization during debris clearance, ensure sorting and safe disposal of debris and hazardous contaminants (including asbestos, industrial waste and heavy metals.
- Carry out environmental impact assessments for debris recycling and disposal sites, ensure sufficient distance from population centres to the extent practical under the critical humanitarian circumstances and that contaminated material are managed in accordance with international obligations.
- Secure and rehabilitate remaining variable agricultural land, devise and deliver systematic survey of agricultural land to inform wider decontamination process.
- Clean up temporary solid waste dump sites to eliminate human and environmental health risks and transfer waste to new or existing sanitary landfills.
- Protect Wadi Gaza, beaches and other environmentally sensitive areas from inappropriate activities including debris dumping, waste disposal and informal construction.
- Ensure that temporary housing and relief facilities do not cause undue additional pollution to land or groundwater that would further inhibit long-term rehabilitation.

Short-medium term recovery actions

- Prioritize most heavily contaminated rural land areas for cleaning and decontamination to reduce contamination in food chain.
- Monitor food and water quality for pollution and contamination to inform restrictions and remedial actions.
- Plan for decontamination of remaining agricultural land.
- Manage safe disposal of treated wastewater including minimising impact on the marine environment prior to longer-term wastewater strategy.

12 A risk assessment is a systematic approach for characterising the potential for harm under a certain set of conditions and timeframe.

- Identify and protect historic sites and debris during clearance actions.
- Develop debris and waste management strategies and management action plans.
- Implement large-scale debris recovery and recycling programme promoting circularity and minimizing the environmental impacts of disposal and reducing the burden on quarries for extraction of construction materials.

Priority considerations in medium and long-term reconstruction planning

- In conjunction with the Environment Quality Authority, protect, maintain and restore the Wadi Gaza environment as a functioning hydro-ecological system including maintaining its tidal mouth from inappropriate development on or near the Wadi and its surroundings as a regionally important environmental resource and local open space. This should include limited high-rise buildings close to the Wadi that could impact migrating birds, and the potential for transit of treated wastewater prior to reuse as a means of restoring Wadi flow.
- In conjunction with the Palestinian Water Authority, plan for future sustainable water utilization (including through desalination) that does not over-exploit the aquifer, and that allows for gradual long-term aquifer recovery of quality and quantity of water.
- In collaboration with the Ministry of Public Works and Housing and the Environment Quality Authority, ensure that debris operations are aligned with Palestinian Government recovery strategies and plans and in compliance with relevant national legislation, codes and standards as well as international best practice.
- Install comprehensive water distribution networks from local and transboundary production sources, with low leakage rates and appropriate operation and maintenance systems.
- Plan for collection, conveyance of wastewater and high-quality (tertiary) treatment. Install appropriate infrastructure and agricultural capacity building (in conjunction with Ministry of Agriculture) to permit reuse of treated wastewater to maximise agro-economic benefit and minimise terrestrial and marine pollution.
- Incorporate green areas (including where possible existing urban and peri-urban agricultural land) and green building design and sustainable transport into urban reconstruction plans to reduce heat, pollution and enhance climate resilience.
- Protect water infiltration basins from inappropriate urban development, and ensure drainage infrastructure allows stormwater collection to recharge the aquifer.
- Utilize local expertise and capacity in reconstruction, recovery and environmental planning, including through governmental and private-sector capacity building, and adhere to appropriate national environmental standards.
- Carry out extensive studies on the coastal environment on the impact of any reclamation of land from the sea (including through debris disposal), impact on Wadi Gaza, beach health and amenity value, and coastal climate resilience and impact on neighbours.
- Develop long-term solid waste disposal system and infrastructure including collection systems, sanitary landfill facilities, appropriate measures for medical and hazardous waste, strategies and infrastructure to recycle and reuse materials to minimise landfill requirements.
- Prioritise the rehabilitation of existing agricultural areas over the conversion of previously urban or industrial sites to agricultural land (that may be necessary if spatial planning is adopted that disregards historic uses).
- Stabilise and infill subterranean tunnels that threaten stability above ground and lead to long-term pollution and safety risks.
- Consider construction strategies to minimise carbon emissions including through material choice (recycling) and construction techniques.

Annex 2: Explanation of water scenario for 2030

Derivation of water scenario for 2030 presented in Table 3

	Post-war reconstruction scenario (UNEP derived) 2030	Derivation
Population projection	2,694,752	Based on projection by PWA 2024 (which itself has extrapolated PCBS projections to 2026). This does NOT account for currently unknown medium-term impact of the escalated conflict on population
Per capita supply at tap (l/c/d)	150	This is the WHO minimum recommended water supply by WHO
Demand needs (MCM/year)	147.5	This is the population multiplied by 150litres/capita/day, converted into MCM/year
NRW estimation (%)	20%	This is an assumed non-revenue water
Supply needs including NRW	184.4	This is the total supply whereby 20% losses will allow demands to be met
Industry including NRW	10	This is assumption for industrial use, based on an average of future PWA scenarios, assuming major industrial reconstruction by 2030
Agriculture	80	This is an assumption based on future PWA scenarios and likely widescale re-investment in agriculture and lower future water needs based on higher-quality water inputs.
TOTAL needs	**274.4**	
Extant supply (technically functional)/pre-war baseline		
Mekorot	20	Based on pre-water installed capacity to the border, requiring new connections within Gaza
Desalinated/drinking groundwater (of varying quality)	5.7	Based on undamaged capacity (not subject to energy limitations)
Seawater desalination (including Rafah Plant)	11.9	Based on undamaged capacity (not subject to energy limitations)
Estimated agricultural wells	17	Estimated remaining agricultural wells based on FAO 2025
Treated wastewater with reuse potential	0	
New/reconstructed capacity to meet goals		
New groundwater	27.3	Potential new/reconstructed capacity required to increase total groundwater to 50 MCM/year (just below sustainable yield)
Recycled water production potential	74	Based on total supply for reuse of 50% of domestic supply (excluding NRW).
Desalination	119.1	Remaining capacity required to bridge the gap between demand and supply from other sources. This new capacity assumes existing small desalination plans remain in use. In reality it may be prudent to replace their capacity as an as part of this major new desalination infrastructure
Total new supply capacity	220.4	
Total capacities at end of scenario		
Mekorot	20	Continuation of pre-October 2023 Mekorot supply
Total net groundwater	50	Groundwater offtake just below the sustainable yield
Seawater desalination	131	Total installed desalination capacity
Recycled water (direct)	25	Tertiary level wastewater used directly by agriculture
Recycled water (recharge)	49	Wastewater re-injected into aquifer for further cleaning and later use by agriculture, extending the principles deployed in NGEST facility
TOTAL annual supply	**275.0**	**Total annual supply for Gaza in 2030 (against a demand of 274.4)**

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