

Anticipated impacts of the 2024–2025 winter season in Gaza

CRISIS OVERVIEW

The 2024–2025 winter season (November–March) comes at a time when Israeli air strikes and ground invasion have displaced at least 90% (around 1.9 million) of Palestinians in Gaza and damaged or destroyed around 60% of residential buildings, 80% of commercial facilities, and 68% of the road network (OCHA 02/10/2024 a; iDMC 14/05/2024; UNRWA 11/10/2024). Many of the displaced are in tents or temporary shelters that afford little protection against the winter elements, and some are living in the open with no shelter. This increases their susceptibility to the health and safety risks linked to the lower temperatures and heavier rainfall of winter (Palestine Shelter Cluster 28/06/2024; El País 23/09/2024; OCHA 30/09/2024).

Gaza experiences the most precipitation between December–February. Since 2008, variable rainfall has caused severe flooding during winter, a trend expected to continue given the significant infrastructure damage. The increase in rainfall during the season will present a high risk to flood-prone areas, where approximately 850,000 people are in danger of further displacement and exposure to safety hazards and diseases (OCHA 30/09/2024 and 20/09/2024; IFRC 2024).

With infrastructure damage and fuel shortages severely diminishing Gaza's wastewater management capacity, winter rainfall will likely increase exposure to wastewater and further contaminate water sources. This is expected to affect health needs and increase the spread of infectious diseases (Palestine WASH Cluster 10/09/2024; OCHA 16/01/2024; Anera 21/03/2024; Anera accessed 06/10/2024). Compounding this are a surge of hepatitis A cases and the detection of poliovirus, two highly contagious diseases that can spread through contaminated drinking water and wastewater exposure (BBC 26/08/2024; CDC 25/01/2024; Cleveland Clinic accessed 15/10/2024; OCHA 16/01/2024; WHO 11/10/2024).

Winter temperatures in Gaza can drop to as low as 6° C (Palestine Shelter Cluster 28/06/2024; CNN 13/12/2023; IFRC 2024). The colder weather is likely to aggravate overcrowding in available shelters, increasing the risk of the spread of pathogens that cause respiratory infections and other communicable diseases (CNN 13/12/2023; UNICEF 02/2024; ActionAid 22/03/2024; UNRWA 30/07/2024). Colder weather also increases the risk of fire incidents as more activities using firewood, such as cooking, occur inside shelters, often not sufficiently equipped (UNEP 18/06/2024 a; OCHA 08/10/2024 and 18/09/2024). At the same time, severe energy shortages are expected to increase waste burning for heating. This activity releases hazardous substances,

such as dioxins and polycyclic aromatic hydrocarbons, into the atmosphere, heightening the risk of respiratory and cardiovascular diseases (Palestine Shelter Cluster 28/06/2024; OCHA 18/09/2024).

The possible increase in health needs during the winter season comes at a time when Gaza's health system is already heavily depleted, both in terms of human resources and infrastructure. By October 2024, around 19 of the 36 hospitals in Gaza were out of service, while the remaining 17 hospitals were only partially functional (OCHA 22/10/2024; WHO 30/09/2024). The Gaza Health Ministry estimates that Israeli attacks have killed close to 1,000 health workers since October 2023, complicating the winter response when diseases are expected to significantly increase (OCHA 08/10/2024).

About this report

Aim: this report aims to highlight the anticipated humanitarian impact of the coming winter season on the population in Gaza. It particularly focuses on shelter and NFIs, WASH, and health, the sectors anticipated to face the most winter-related impacts.

Methodology: this report is based on a secondary data review of publicly available sources, mostly reports and information from humanitarian organisations working in and on Gaza and media sources. To corroborate some critical pieces of information, ACAPS conducted two key informant interviews: one with a WASH responder and another with a humanitarian organisation's analyst working on Gaza.

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ANTICIPATED SCALE AND ACCESS CONSTRAINTS

A significant increase in humanitarian needs is expected this winter, but the substantive changes and deterioration in the Gaza context since last winter extremely challenge gauging the scale or scope of these needs. While flooding is anticipated, it is difficult to predict its locations or severity based on the previous year's patterns, which have likely changed given the increase in infrastructure damage and accumulation of solid waste and rubble. The Israeli ground offensive has also displaced most Palestinians to areas different from those they resided in last winter. Many have moved to low-lying areas near the coast that are prone to flooding and high tide. Projections on how water might flow, including those using satellite images, still face a high level of uncertainty given both the level of infrastructure damage and limitations in accessing information on sewage systems, water distribution networks, and operation capacity (KII 02/10/2024; KII 20/10/2024; OCHA 20/09/2024; Palestine WASH Cluster 10/09/2024 and 15/09/2024).

Similarly, the shelter typography in the run-up to winter has significantly changed compared to last year, likely aggravating humanitarian needs. At the beginning of the 2023–2024 winter season, almost all displaced people took shelter with host families or in UNRWA facilities, hospitals, public buildings, or non-UNRWA schools. This winter, the majority of displaced people will be living in tents and makeshift structures that provide significantly less protection from winter conditions. This is likely to make Palestinians in Gaza considerably more susceptible to the negative health and safety impacts associated with inadequate shelter during the winter season (OCHA 01/11/2023, 04/11/2023, and 02/10/2024; UNRWA 04/10/2024).

The humanitarian response is expected to face significant challenges arising from constraints on the entry of humanitarian aid critical to addressing winter needs. By October 2024, there had been significant shortages in essential materials (e.g. sufficient fuel supplies, winterisation items, toolkits, and spare parts) since the beginning of the conflict, which will particularly affect the health, shelter, and WASH sectors' preparation for the season (UNRWA 21/06/2024; Palestine Shelter Cluster 11/09/2024; NRC 25/09/2024).

With winter approaching, heavy rainfall is expected to significantly impair road conditions, hindering already restricted humanitarian aid delivery. By September, Israeli air strikes and ground invasion had damaged at least 68% of Gaza's road network, with approximately 12,000 metric tons of rubble obstructing roads and drainage systems (OCHA 02/10/2024 b and 23/02/2024; UNRWA 18/09/2024 and 04/10/2024; KII 20/10/2024). The floods that typically follow the increase in seasonal rainfall will render many roads unusable, isolating communities during heavy rains (OCHA 30/09/2024; China Daily HK 27/08/2024). These conditions will further complicate the delivery of essential and critical supplies, such as food, water, and medicine (OCHA 30/09/2024 and 18/09/2024).

The significant and unprecedented loss of lives among responders, especially frontline civil defence, health, and aid workers, is also likely to further complicate the response to the anticipated increased in humanitarian needs during this winter season. By October, more than 300 aid workers had perished in Gaza, with Israeli air strikes and shootings killing the vast majority. This number includes 229 UNRWA staff and 33 Palestinian Red Crescent Society staff and volunteers, including 19 on duty. The Gaza Health Ministry has also reported 986 health worker fatalities, and the Palestinian Civil Defence a total of 85 fatalities and 292 injuries among its staff, with 14 instances occurring while on duty (OCHA 08/10/2024; AWSO accessed 10/10/2024; UNRWA 04/10/2024).

ANTICIPATED IMPACTS

Shelter and NFIs

By winter, at least 90% (1.9 million) of Palestinians in Gaza will be displaced, with the majority living in tents and makeshift shelters. Many have been displaced multiple times, with some being displaced ten times or more since October 2023 (UNRWA 04/10/2024). By September 2024, Israeli air strikes and ground invasion had damaged or destroyed at least 60% of residential buildings, with an estimated 141,000 housing units destroyed and 70,300 severely damaged (Palestine Shelter Cluster 11/09/2024; OCHA 02/10/2024 a).

During winter, tents and makeshift shelters will not provide adequate protection against strong winds, heavy rains, and cold temperatures. Most refugees' makeshift shelters and tents are made of fabric, nylon, and other materials found in the surrounding environment, which do not provide adequate insulation and are susceptible to being inundated by heavy rains and torn by strong winds (AJ 24/12/2023; Anera 18/04/2024; NRC 25/09/2024). With the winter approaching, approximately 74% of the tents will also be unsuitable for use because of wear and tear (NRC 25/09/2024; AA 15/09/2024; OCHA 02/10/2024 a). The makeshift nature of many shelters in Gaza makes them susceptible to recurring damage (Anera 18/04/2024). The lack of proper shelter and heating will worsen the already harsh living conditions displaced people will face this winter (Palestine Shelter Cluster 28/06/2024; OHCHR 03/10/2024).

By 2 October, around 1.34 million people in Gaza were in need of emergency shelter and essential housing items, including around 900,000 people in need of winterisation support. Anticipated shelter winterisation needs include suitable tents, heaters and fuel, and kits containing materials for emergency shelter-building for protection from vertical and horizontal elements (OCHA 02/10/2024 a; Palestine Shelter Cluster 28/06/2024; MEMO 23/09/2024).

Around one million displaced people are also in urgent need of sealing-off kits to prepare for the winter, as many makeshift shelters and tents have deteriorated significantly over the past year (NRC 25/09/2024; AA 15/09/2024; OCHA 02/10/2024 a; Anera 18/04/2024). These kits include tarpaulins, plastic sheets, ropes, and duct tapes. Without them, many displaced people will struggle in weather-proofing their shelters and face increased risks of hypothermia and other serious health issues (NRC 25/09/2024). Winterisation needs also include thermal items for sleeping, such as multipurpose thermal mats, sleeping bags for indoor use, and blankets, as well as winter clothing, including jackets and shoes, thick socks, woollen hats, and underwear (Palestine Shelter Cluster 28/06/2024; MEMO 23/09/2024).

The majority of Palestinians in Gaza are likely to have increased shelter and NFI needs this winter, but those with the highest needs are likely to be:

- individuals without shelter, who require winter tents, emergency kits, clothing, thermal sleeping items, heaters, and fuel
- people in makeshift shelters, who need sealing-off kits and winter clothing
- residents of substandard tents and emergency shelters, who also need winter clothing and thermal items (Palestine Shelter Cluster 28/06/2024; UN 12/08/2024; OCHA 21/08/2024).

The severe restrictions on importing essential materials imposed by Israeli authorities have caused an extreme shortage of critical shelter materials and NFIs (UNRWA 04/10/2024; Palestine Shelter Cluster 11/09/2024; KII 20/10/2024). In September, humanitarian responders stated that with the current rate of aid allowed to cross into Gaza, it would take around two years to get the material needed to address shelter and NFI needs for this coming winter (NRC 25/09/2024). These severe shortages will likely result in an ineffective emergency response to people in need during the season (UNRWA 04/10/2024; Palestine Shelter Cluster 11/09/2024; Palestine Shelter Cluster 28/06/2024).

WASH

Increased flooding resulting in health and safety concerns

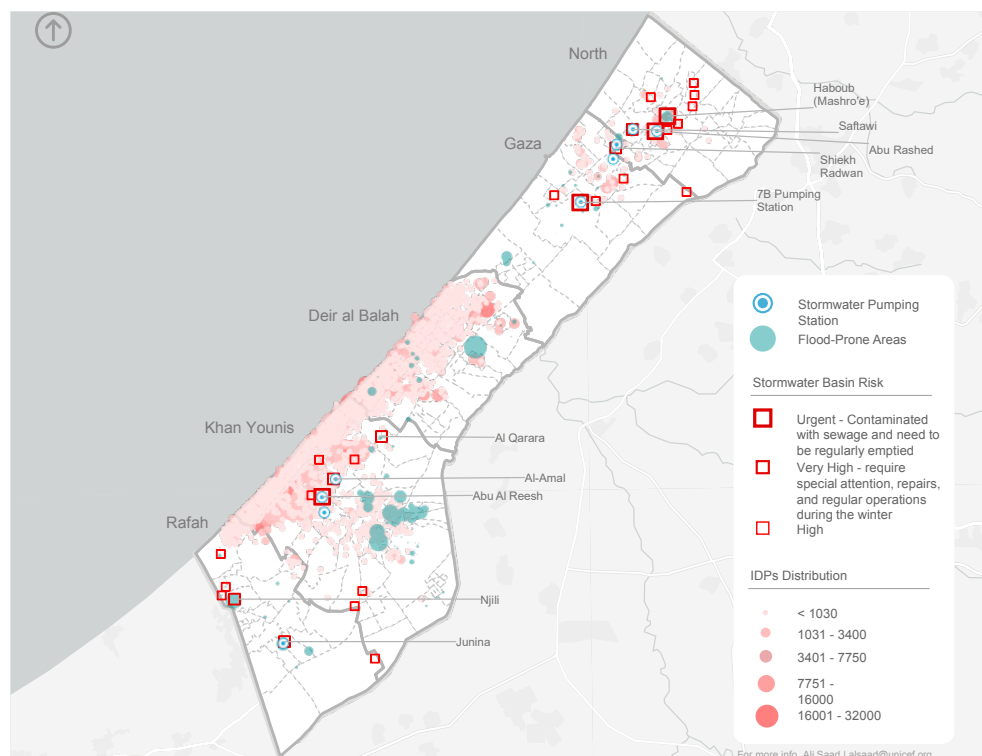
Flooding is anticipated across different areas in the Gaza Strip as a result of heavy winter rainfall, extensive infrastructure damage, and clogged sewage systems. The conflict has destroyed drainage networks and storm water basins, while the remaining infrastructure requires fuel for operation, access to which is severely restricted by the Israeli authorities (Palestine WASH Cluster 10/09/2024 and 18/08/2024; OCHA 16/01/2024 and 11/01/2024; KII 20/10/2024). There were already 180 locations at high risk of flooding in Gaza before October 2023; extensive conflict-related damage to basic infrastructure has likely increased this number (OCHA 20/09/2024; Palestine WASH Cluster 18/08/2024). By winter, an estimated 850,000 people would be living in around 49 flood-prone neighbourhoods (OCHA 30/09/2024).

The WASH Cluster has categorised flooding-prone stormwater basins across Gaza as at urgent, very high, or high risk. Based on the mapping, the areas at urgent or high risk of flooding this winter are:

- North governorate: Abu Rashed, Haboub, and Saftawi
- Gaza City: Shiekh Radwan Pond and the nearby 7B pumping station
- Khan Younis governorate: Abu Al Reesh, Al Amal, and Al Qarara
- Rafah governorate: Njili and Junina (Palestine WASH Cluster 10/09/2024).

In Deir Al Balah governorate, the local emergency committee has urged **residents near Wadi Al Salqa and Sahn Al Baraka** to evacuate before rainfall begins, as flooding in these areas poses a significant risk to life (OCHA 20/09/2024).

Map 1. Stormwater basins and flood-prone areas in Gaza in the upcoming winter season



Source: Palestine WASH Cluster (10/09/2024)

Winter flooding could have significant effects and result in casualties, including injuries and drowning, particularly in low-lying areas. Floods increase the risk of waterborne and vector-borne diseases by contaminating water supplies and creating stagnant pools that serve as breeding grounds for mosquitoes, which can transmit diseases such as West Nile fever. Current mitigation measures are inadequate to address the health risks associated with heavy rains and floods (Palestine Health Cluster/Palestine WASH Cluster 25/09/2024; OCHA 30/09/2024 and 15/10/2024). Some of the measures needed to reduce the impact of anticipated floods include cleaning storm water channels and procuring dewatering pumps, rehabilitating drainage systems and installing temporary ones, identifying flood-prone areas, and developing community messages to raise awareness about flood (OCHA 18/09/2024, 30/09/2024, and 15/10/2024; Palestine Health Cluster/Palestine WASH Cluster 25/09/2024).

Increased exposure to wastewater and accompanying health hazards

The spread of sewage and untreated water is expected to increase during the winter season because of the significant reduction in wastewater treatment capacity, damage to Gaza's water and wastewater network systems, and damage to drainage networks (Anera 21/03/2024; Anera accessed 06/10/2024; KII 02/10/2024). By October 2024, the Israeli military had damaged or destroyed all wastewater management sites in Gaza (UNICEF 01/09/2017; PCBS 07/10/2024; AP 09/10/2024; UNEP 18/06/2024 a). Fuel shortages and power outages are also hindering wastewater treatment and management, leading to the release of untreated sewage and contaminating beaches, coastal waters, soils, and, potentially, groundwater. This increases the likelihood of rainwater mixing with sewage, which in turn would increase the potential of wastewater overflowing to roads (Informed Comment 16/02/2024; UNEP 18/06/2024 a and 18/06/2024 b; OCHA 20/09/2024). Approximately 70% of water supplied through networks is lost as a result of damage from conflict, with insecurity and spare part import restrictions by the Israeli authorities hindering repairs. At the same time, many displaced people connect their pipes to rainwater drainage systems for sewage disposal, increasing the mixing of sewage with rainwater (OCHA 20/09/2024; BBC 26/08/2024).

This coming winter season, there is an increased risk of exposure to wastewater from overflowing sewage ponds and stormwater ponds that are contaminated with sewage given the deterioration of infrastructure and rainfall increase during the season. Some areas are at risk of overflowing during the upcoming winter, including the following:

- **The Sheikh Radwan Pond** reached critical wastewater levels in September according to the municipality of Gaza. It accumulated over 450,000m³ of its 500,000m³ capacity, increasing its risk of overflowing from the anticipated winter rains (Municipality of Gaza 09/09/2024; OCHA 20/09/2024; KII 20/10/2024). The municipality faces challenges in draining the pond because of damage to its drainage lines and facilities, including severely damaged generators and electrical panels. Over 1,500m of the drainage line to the sea is destroyed, with 1,100m completely unusable (Municipality of Gaza 09/09/2024; OCHA 20/09/2024).

- **Al Manara, areas of Al Zeitoun near the 7B pumping station, and Port Said Street** are at risk of flooding if the Sheikh Radwan Pond overflows. Polluted water is likely to inundate streets and homes, and flooding will hinder movement and emergency interventions, according to the municipality assessment (Municipality of Gaza 09/09/2024).
- **Sewage ponds in Al Muhararat, Khan Younis city, in southern Gaza** are at risk of overflowing. In September, the Khan Younis municipality urged residents near rainwater collection ponds and temporary sewage treatment basins in Al Muhararat and low-lying areas to evacuate given the risk of the ponds overflowing during the winter season (OCHA 20/09/2024; Khan Younis Municipality Facebook 16/09/2024; Al Watan Voice 16/09/2024).

Increased wastewater exposure will pose significant public health risks during the winter season, both immediately and in the long term. Damage rendering infrastructure unable to safely handle hazardous material from wastewater leads to the risk of exposure to harmful pathogens, microplastics, and hazardous chemicals. These pathogens can also spread through physical contact and re-enter the environment, perpetuating the cycle of contamination (Razum et al. 01/05/2024; GWH 04/2024; UNEP 18/06/2024 a and 18/06/2024 b; OCHA 20/09/2024; KII 02/10/2024). This raises concerns over the spread of diseases, such as meningitis, jaundice, impetigo, chickenpox, diarrhoea, hepatitis, and other communicable diseases (Palestine Health Cluster 06/11/2023; OCHA 12/12/2023; UNEP 18/06/2024 b; GWH 04/2024). Diarrhoea can also lead to malnutrition, increasing susceptibility to waterborne and other infectious diseases (GWH 04/2024; UNEP 18/06/2024 a and 18/06/2024 b; OCHA 20/09/2024).

There is currently a shortage of chlorine and water testing kits, which are essential to preventing waterborne diseases as the winter season approaches. Monitoring water quality is becoming increasingly difficult given the lack of essential testing kits and treatment chemicals, access to which has been severely restricted by the Israeli authorities. According to the WASH Cluster, no chlorine had entered Gaza by August since January, resulting in a severe shortage amid hepatitis A and polio outbreaks. With the possible increase in waterborne diseases during the winter months, it may become increasingly difficult to monitor and address health outbreaks (Anera 21/03/2024; Palestine WASH Cluster 18/08/2024; GWH 04/2024; ActionAid 22/03/2024).

Increased exposure to solid waste and accompanying flooding and health hazards

During the winter season, rainfall and strong winds increase the chance of solid waste moving away from its original location or intended storage place, particularly in uncontrolled dumping sites. This constitutes a health threat for the people living in the surrounding areas. There has been a proliferation of uncontrolled dumping sites since October 2023 because of the emergence of new IDP camps and limited access to managed landfills resulting from the Israeli military operation. Between 1,100–2,000 tons of solid waste is generated daily in Gaza, with significant amounts accumulating in the streets (PAX 18/07/2024; UNEP 18/06/2024 a;

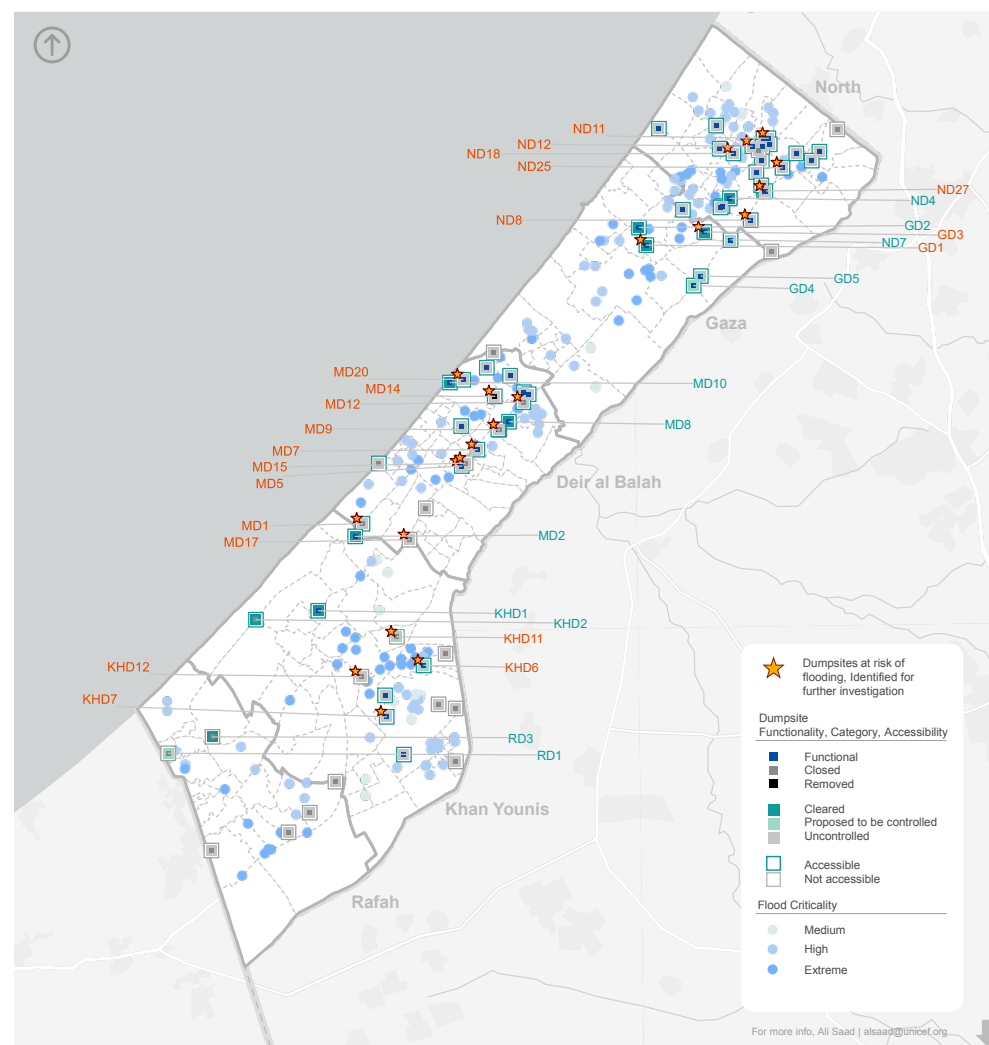
OCHA 20/07/2020). Solid waste in uncontrolled sites can also obstruct the natural flow of water, aggravating the potential for flooding in Gaza (Palestine WASH Cluster 15/09/2024).

Based on mapping by the WASH Cluster, controlled and uncontrolled dump sites at risk of flooding this winter season include:

- North governorate: the eastern side of the main temporary site, Al Mansheia, Hamoda, and the market land (Beit Lahya); Al Wadi (Jabalia); Al Wadi (Beit Hanoun)
- Gaza City: Old Feras Market; Khayal Land
- Deir Al Balah governorate: Al Berka 1 (Deir Al Balah municipality); Al Musadar and Wadi Al Romisa (Al Musadar); Al Seka (Al Maghazi); Abu Midin and Hospital Area and Awawda Area (Al Bureij); Street No. 86 (Wadi Al Salqa); Al Musdar and Street No. 4 (Al Nuseirat)
- Khan Younis governorate: Al Trans (Abasan Al Jadeeda); Wadi Saber (Abasan Al Kabira); Ibn Al Nafees, Al Thaqafi Centre (Bani Suhila) (Palestine WASH Cluster 15/09/2024).

Unmanaged solid waste could increase the spread of diseases this winter season in Gaza. Solid waste attracts disease-carrying vectors, such as flies and rodents, increasing the probability of diseases spreading as flood carries it around. Potential diseases include gastrointestinal infections and cholera. The hazardous substances in solid waste can also cause respiratory problems when they come into contact with people (Palestine Health Cluster 25/09/2024; Palestine WASH Cluster 15/09/2024; UNEP 18/06/2024 a; UNFPA et al. 29/11/2023; PAX 18/07/2024). At the same time, these hazardous substances create a liquid mixture called leachate that, if not managed properly, can travel and seep into the soil and aquifer, especially during rainfall. This chemical can find its way later into food and water sources, exposing people to health hazards (UNEP 18/06/2024 a; PAX 18/07/2024).

Map 2. Dump sites in Gaza at risk of flooding in the upcoming winter season



Source: Palestine WASH Cluster (15/09/2024)

Health

Increased infectious disease transmission

Cold weather during winter is expected to increase cases of infectious diseases, especially respiratory tract infections. During cold weather spells, overcrowding increases as people tend to gather closely in shelters with less-than-ideal ventilation, heightening the risk of pathogen transmission (CNN 13/12/2024; UNICEF 02/2024; ActionAid 22/03/2024; Anera 21/03/2024; UNRWA 30/07/2024).

Even before the onset of winter, polio has already been detected, and there has been a surge in hepatitis A cases. Both diseases, which primarily spread through contaminated food and water, are expected to further spike this winter given the increase in water source contamination and exposure to wastewater. Nearly 40,000 hepatitis A cases were reported between October 2023 and July 2024, compared to just 85 cases from October 2022 to July 2023 (OCHA 16/01/2024; UNRWA 30/07/2024; BBC 26/08/2024; KII 02/10/2024). Polio, which was detected in Gaza in June 2024, is a highly contagious viral disease that can cause fever and vomiting. It can also attack the nervous system, leading to meningitis and paralysis within hours (WHO 23/07/2024; UNICEF 19/07/2024; El País 23/08/2024; Cleveland Clinic accessed 15/10/2024). Following the virus detection, the Palestinian Ministry of Health and multiple UN agencies launched a two-round vaccine campaign in early September targeting an estimated 95% of eligible children. For a polio vaccination campaign to be successful in interrupting transmission, a minimum of two doses is required for at least 90% of the children in the area. The second round took place in mid-October, but the last phase of this round, which was supposed to take place on 23 October 2024 and aimed at vaccinating around 129,000 children across northern Gaza, has been postponed as a result of the lack of a humanitarian pause and Israel military intensifying its operations and issuing mass displacement orders in northern Gaza (WHO 11/10/2024, 04/09/2024, and 23/10/2024; Reuters 14/10/2024)..

Despite these significant health threats, there is currently a critical shortage of essential health and hygiene supplies in Gaza. These supplies include chlorine, soap, shampoo, and detergents to help reduce the transmission of some communal diseases, such as diarrhoea, respiratory infections, and skin conditions. By October 2024, shampoo, detergent, and washing-up liquids were no longer available in the market. The shortages in hygiene items disproportionately affect people whose immune system is more susceptible to being compromised, such as children, pregnant women, and those with weakened immune systems (Palestine WASH Cluster/Palestine Health Cluster 16/09/2024; Palestine Health Cluster 13/09/2024 and 16/09/2024; UN 16/09/2024).

Although most displaced Palestinians are at risk of infectious diseases this winter because of overcrowded living conditions and exposure to poor sanitation, the spread of infectious diseases disproportionately affects women and girls. Reports indicate that approximately 25% of women have experienced skin infections, twice the rate observed among men. Women also account for two-thirds of the cases related to hepatitis A and gastrointestinal diseases. This disproportionate impact is largely attributed to women being more likely to take the primary role of caregiver, often exposing them to infections while caring for sick family members (OCHA 20/09/2024).

Increased exposure to health hazards linked to heat-generating activities

During winter, more activities occur inside shelters, including heat-generating activities such as cooking and heating, increasing the potential of shelter fires and putting the safety of people at risk (Palestine Shelter Cluster 28/06/2024; OCHA 18/09/2024). Shelter fires can lead to death and property loss and cause skin burns, smoke inhalation, and exposure to toxins (Palestine Shelter Cluster 10/10/2023; OCHA 08/10/2024).

This winter, the burning of wood and waste in the open and inside shelters for heating and cooking is also expected to increase given the severe shortages in fuel and electricity resulting from the restrictions imposed by the Israeli authorities. Firewood is in extreme shortage in Gaza, with most being sourced from the remains of damaged buildings, furniture, and wooden electric poles. This is forcing people to burn waste containing plastic and hazardous materials, such as batteries. Waste incineration leads to the release of these hazardous substances, including dioxins and polycyclic aromatic hydrocarbons, polluting the air and raising the risk of respiratory, cardiovascular, and cancerous diseases (UNEP 18/06/2024 a; OCHA 08/10/2024 and 18/09/2024; The Guardian 04/10/2024; KII 20/10/2024). Children, the elderly, and people with pre-existing health conditions are more vulnerable to wood and waste burning as they are more prone to the impact of toxic fumes (Dardona et al. 21/09/2024).

AGGRAVATING FACTORS

Israeli authorities' restrictions on fuel imports to Gaza

The Israeli authorities continue to severely restrict fuel imports to Gaza, significantly limiting humanitarian operations, especially those led by local organisations, with the impacts likely to increase during the winter months (UN 25/07/2024; UNDP 14/10/2024; WFP 12/10/2024; OCHA 15/10/2024 a; OHCHR 20/10/2024). The fuel constraints are hindering WASH sector preparations for winter, including the removal of accumulated waste, maintenance work on wastewater networks, and the procurement of flood mitigation equipment (UN 16/10/2024; OCHA 15/10/2024b). The lack of fuel is also affecting the health sector, with hospitals running critically low on supply and operating at reduced capacity. Without fuel to power backup generators, hospitals cannot run essential medical equipment and services, including ambulances, impeding their ability to meet the anticipated increase in health needs during winter (UN 16/10/2024 and 25/07/2024; OCHA 15/10/2024 b).

Fuel shortages are leading people to exhaust their coping mechanisms and options. This situation is expected to worsen as the demand for fuel increases during the winter months. Limited fuel availability and the electricity blackout are forcing people to use firewood and waste as the main sources of cooking energy, especially in northern Gaza, where the lack of cooking gas had persisted for 12 months by October 2024 (OCHA 15/10/2024 a and 02/10/2024; UN 01/10/2024). Firewood in Gaza is increasingly becoming scarce, with most being sourced from the remains of damaged buildings, furniture, and wooden electric poles (UNEP 18/06/2024 a; OCHA 08/10/2024 and 18/09/2024; KII 20/10/2024). This is creating a dire situation, with some unable to even boil contaminated water to make it safe for drinking, exposing themselves to potential health hazards (GWH 04/2024; MEE 15/10/2024; NPR 10/10/2024). Those relying on pre-conflict-procured solar technology will face reduced solar radiation during winter, dropping to 2.63kWh/m² from 8.4 kWh/m². This poses significant challenges in northern Gaza, where dependence on solar energy is higher given severe Israeli restrictions on fuel imports to northern Gaza (MEMO 25/09/2024; Al Shabaka 29/03/2023; IFRC 2024; KII 20/10/2024).

Existing high food insecurity and malnutrition levels

Food insecurity and malnutrition will increase the vulnerability of the people in Gaza to the cold weather and diseases the winter season is expected to bring. Severely malnourished children are of particular concern, as their immune system is weakened, and they are more susceptible to hypothermia (IPC 17/10/2024; WHO accessed 28/10/2024; The Guardian 16/01/2024). Malnutrition levels are expected to stay high, with over 96% of women and children ages

6–23 months currently unable to meet their nutritional needs. Hunger-related deaths are likely still occurring through early October. Global acute malnutrition is at critical levels at some areas and projected to get worse, with an estimated 60,000 cases of acute malnutrition among children ages 6–59 months expected between September 2024 and August 2025 (IPC 17/10/2024; FEWS NET 18/10/2024).

In the coming winter months, projections indicate that the population facing Catastrophe (IPC Phase 5) food insecurity may nearly triple and reach 345,000, accounting for almost 16% of the population of Gaza. Until April 2025, almost two million Palestinians (more than 90% of the population) are expected to experience acute food insecurity (IPC Phase 3 or worse). Areas such as Rafah and the northern governorates are expected to face more severe food insecurity given the intensity of Israeli military offensives and restrictions on humanitarian access. Until October 2024, approximately 1.84 million people were experiencing acute food insecurity (IPC Phase 3 or worse). The figure includes nearly 133,000 people facing catastrophic food insecurity (IPC Phase 5) and 664,000 facing emergency food insecurity levels (IPC Phase 4) (IPC 17/10/2024; FEWS NET 18/10/2024).

To mitigate the impact of malnutrition in the coming winter months, prevention services and treatment interventions are needed. These include providing blanket supplementary feeding with fortified high-calorie foods, improving the coverage of feeding programmes for infants and young children, and improving the inpatient and outpatient management of acute malnutrition, the promotion of breastfeeding practices and care for non-breastfed infants, and micronutrient supplement provision for breastfeeding women (IPC 17/10/2024; OCHA 16/10/2024).

Existing water scarcity

Water scarcity is anticipated to worsen during the winter with the expected increase in water source contamination. The significant reduction in wastewater treatment capacity, damage to the water network system, and damage to drainage networks will increase the mixing of rainwater with sewage, which, in turn, will contaminate water wells and other water sources (HRW 16/11/2023; Anera 21/03/2024; Palestine Health Cluster 16/09/2024; UN 16/09/2024). Since October 2023, daily water availability in Gaza has fluctuated between 3–15L per person (PCBS 22/03/2024; KII 02/10/2024; CSIS 12/01/2024). In September, according to a rapid WASH assessment conducted by the WASH cluster, more than 64% of assessed households reported receiving less than 6L per person per day of drinking and cooking water (SoP WASH Cluster 09/2024; KII 20/10/2024). This is significantly below the 15L needed under emergency conditions and far from the 100L WHO recommendation for daily consumption per person (Anera 21/03/2024; Oxfam 10/09/2024; UNICEF 20/12/2023; MSF 08/02/2024). The main driver is the plummeting of water production in Gaza to about 25% of pre-October 2023 levels because

of Israeli restrictions on fuel and infrastructure damage (OCHA 20/09/2024; UNICEF 20/09/2024; UNEP 18/06/2024 a; Razum et al. 01/05/2024). This is significantly below the 15L needed under emergency conditions and far from the 100L WHO recommendation for daily consumption per person (Anera 21/03/2024; Oxfam 10/09/2024; UNICEF 20/12/2023; MSF 08/02/2024).

Water scarcity is likely to compound the impact of the anticipated deterioration in sanitation this winter, increasing the health risks associated with waterborne diseases and poor hygiene (UNICEF 22/03/2024). The lack of sufficient clean water will complicate safe food preparation and basic personal hygiene, increasing the risk of communicable diseases such as diarrhoea, respiratory infections, and skin conditions such as scabies (Anera 21/03/2024; Palestine Health Cluster 16/09/2024; UN 16/09/2024). Women face additional challenges because of a systemic shortage of menstrual supplies, leaving them with few hygienic options for managing periods (Anera 21/03/2024).

Forced displacement and evacuation orders

Repeated forced displacement as a result of evacuation orders and active conflict is likely to diminish the capacity of responders and communities to respond to seasonal winter needs. The mass movement of populations disrupts humanitarian operations, forcing a constant readjustment of plans and exhausting resources in re-establishing response programmes (UNRWA 04/10/2024; Anera 18/04/2024; Palestine Health Cluster 25/09/2024; UNICEF 16/08/2024; KII 02/10/2024). Each displacement also further complicates efforts to locate and access people in need, reducing the efficiency of interventions and impeding access to affected populations (AFSC et al. 22/08/2024; OCHA 21/08/2024; UNICEF 16/08/2024; KII 02/10/2024).

Widespread and repeated displacement contributes to significant overcrowding in the remaining accessible areas that are prone to flooding during winter. By 15 October 2024, approximately 84% of Gaza was under evacuation orders. This has led to severe overcrowding, with the average 1.5m² of space occupied by each displaced person falling less than half the minimum emergency standard of 3.5m² per person (OCHA 02/10/2024 a; UNHCR accessed 24/10/2024). The majority of displaced Palestinians have been forced to move into overcrowded areas in winter in Deir Al Balah and western Khan Younis, particularly Al Mawasi. These are low-lying areas near the coast that are at risk of flooding and high tide (OCHA 20/09/2024; OCHA 09/08/2024 and 22/07/2024; KII 20/10/2024).