



Factsheet

Accumulation of Solid Waste under Israel's War of Aggression against the Gaza Strip

“The Silent Killer”

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Introduction

Offensives of the Israeli occupying forces (IOF) have affected all components of human life across the Gaza Strip. The ongoing blockade since 2007 and recurrent acts of aggression have destroyed the already degraded baseline environmental conditions.

The IOF have converted the Gaza Strip into an area that is vulnerable to all types of natural and environmental hazards. Repeated aggression has jeopardised all aspects of life in Gaza. Causing air pollution, the accumulation of debris has had the most significant impact on the environment. A major portion of water supply is contaminated and unfit for human consumption. As a result of the Israeli siege, the electricity crisis continues, preventing household access to municipal piped water and disrupting sanitation services.

During its war of aggression against Gaza, systematic large-scale destruction has targeted civilian objects and infrastructure, using various types of internationally prohibited weapons in the context of a genocide.

These crimes have impacted the solid waste management sector. Due to inadequate transportation to dump sites, thousands of tonnes of solid waste have piled up throughout Gaza roads and alleys. Solid waste management machinery and garbage trucks are unable to move under the ongoing Israeli war of aggression. In addition to persistent power and water supply cuts, equipment is already lacking.

Accumulation of solid waste has multiple negative consequences on the short and long runs, including prevalence of diseases, environmental pollution, and threats to public health. All measures need to be taken to prevent the piling up of solid waste. However, against the backdrop of Israel's pursuit to destroy all essentials of life, solid waste turns into a tool of war.

This paper aims to provide an illustration of the environmental and humanitarian disaster created by the accumulation of solid waste. It also proposes actions and recommendations to be fulfilled by the international community and occupying Power.

As the pile of solid waste is associated with the blockade imposed on Gaza since 2007, the analysis begins with addressing solid waste treatment and management prior to the war of aggression.

Solid waste treatment and management before the war of aggression

Concept of solid waste

Solid waste is defined as useless and sometimes hazardous material with low liquid content. Solid wastes include municipal garbage, industrial and commercial waste, sewage sludge, wastes

resulting from agricultural and animal husbandry operations and other connected activities, demolition wastes and mining residues.¹

According to the **Council of Ministers' Decision No. 3 of 2019 concerning the Regulation on Solid Waste Management**, **solid waste** is “any solid waste other than hazardous waste, which is generated by various household, commercial, agricultural, industrial and construction activities, residues resulting from wastewater treatment (sewage sludge), and required to be disposed of.”

As provided by the Regulation, **hazardous waste** involves the residues or ashes of various activities and operations, which retain properties of hazardous material, such as nuclear waste, medical waste, waste originating from the manufacturing of any pharmaceutical preparations and medicines, organic solvents, dyes, paints, pesticides, among others. The Regulation defines **hazardous material** as items with hazardous properties, which cause damage to health and environment, and are classified according to international standards as toxic substances, radioactive and biologically infectious materials, or flammable or explosive solids. Issued by the Council of Ministers, the Regulation on Hazardous Waste Management No. 6 of 2021 views hazardous waste as residues of various activities and associated operations, which maintain the properties of hazardous materials with specific characteristics and classified types, under effective legislation as well as national and international lists.

The Regulation defines **medical waste** as waste generating from the residues or ashes of different medical activities and operations, which preserve the properties of hazardous materials, inside or outside medical establishments, and whether in solid, liquid or gas form.

The Regulation considers that **special waste** requires specific treatment that is different from other types of waste as it presents particular problems for management and final disposal.

Solid waste management bodies

Multiple government bodies are in charge of solid waste management, mainly the Ministry of Local Government (MoLG), including local government units (LGUs) and joint service councils, Palestinian Environment Quality Authority (PEQA), any other responsible body, or authorised agency. In line with operative legislation and Council of Ministers' Decision on the National Strategy for Solid Waste Management, these bodies are government agencies that have competence for supervising solid waste management.

¹ United Nations Economic and Social Commission for Western Asia (ESCWA), <https://www.unescwa.org/sd-glossary/solid-waste>.

The Law No. 1 of 1997 on Palestinian Local Government Units delegates all responsibilities for solid waste management to LGUs, namely, municipalities and village councils. The process is maintained under the supervision of the MoLG.

LGU responsibilities include collection, transfer, hygienic disposal and recycling (if any) of municipal solid waste.

Many LGUs are in place, but some are small and/or do not have adequate capacities to provide for solid waste management. A number of LGUs have been merged to establish joint service councils.

The United Nations Works and Relief Agency (UNRWA) is responsible for solid waste collection and transfer.

Over the past few years, UNRWA has been crippled by financial difficulties. Oftentimes, these strains have resulted in the temporary discontinuation of solid waste service and piling up of solid waste.

Solid and hazardous waste management in Gaza prior to the war of aggression

With a total area of 365 square kilometres, the Gaza Strip has an estimated population of some 2.23 million. Gaza generates nearly 2,000 tonnes of solid waste per day, or around 60,000 tonnes a month. This involves solid waste in excess of 700,000 tonnes per annum, originating from household, commercial, agricultural, industrial and construction activities as well as sewage sludge.

According to Engineer Abdul Rahim Abu al-Qumbuz, Executive Director of the Joint Service Council for Solid Waste Management in the Gaza and Northern Gaza governorates, “the Gaza Strip, home to some 2.2 million citizens, generates almost 1,800 tonnes of solid waste per day.”

Analysis shows that solid waste piles in dump sites contain organic material (58 percent), plastic (15 percent), paper and cardboard (14 percent), metals (1.5 percent), and glass (0.5 percent). The rest comprises other components, such as sand, construction and agricultural waste, etc. Solid waste piles up in major dump sites in huge quantities across northern, central and south Gaza.²

In regard to solid waste management, 1 percent of total solid waste is recycled. Of all other solid wastes generated by the Gaza Strip, plastic is estimated at 1,595 tonnes per day, representing 17 percent of total solid waste production. While paper and cardboard comprise 11 percent, metals,

² Maan Development Centre, *Solid Waste in Gaza: An imminent threat to citizens and income sustaining others*, available at: <https://www.maan-ctr.org/magazine/article/3492/> (in Arabic).

glass and sand account for 22 percent of all solid waste. Fifty percent of solid waste contained degradable organic waste, such as food leftovers and combustion residues.³

Dump sites... An environmental disaster

There are 10 central, temporary and random dump sites across the Gaza Strip. The Johur ad-Dik and Al-Fukhari dump sites, in eastern and southern Gaza Strip respectively, are the largest in terms of area and daily rate of dumping. According to Abu al-Qumbuz, the Johur ad-Dik landfill contains piles of solid waste, reaching some 4 million tonnes since 1986. In Northern Gaza, solid waste is accumulated in three random dump sites, namely, Jabalya landfill east of the wastewater treatment plant, Beit Lahiya landfill west of the An-Nada Towers, and another in close proximity to the Perimeter Fence in Beit Hanun, containing more than 100,000 tonnes of piled solid waste.⁴

Municipalities play a key role in solid waste management, collecting 85 percent of solid waste. Compared to 5 percent collected and transferred by private sector firms, the UNRWA is in charge of collecting and transferring 10 percent of solid waste. Of note, the UNRWA serves refugee camps only. Municipalities collect and transfer some 1,500 tonnes of waste on a daily basis.⁵

The Environment Law No. 7 of 1999 and PEQA Instructions of 2004 place several conditions for solid waste treatment and management: (1) PEQA approval will be obtained for the establishment of transfer stations or waste landfills; (2) A separate hole, large enough to be used for at least 10 years, will be allocated to dump a particular category of waste, ensuring sustainable management; (3) The waste collection site will be far from residential areas and insulated to protect groundwater; (4) An upwind system will be in place to treat landfill leachate.

According to Ahmed Hilles, an environmental expert, problems associated with the management and safe disposal of solid waste, which comprises 50 percent of all waste, is one of the most important and complicated challenges in the environmental reality of Gaza. Statistics demonstrate that huge quantities of waste are produced every day. This is compounded by the complete absence of waste landfill development as well as health and environmental conditions to protect citizens from relevant risks.

The statement made by Hilles is supported by a report of the Al Mezan Centre for Human Rights. Clearly, solid waste risks are further exacerbated in Gaza due to the mismanagement of waste landfills, transfer stations, or collection points. Environmental and health hazards involve the

³ Ibid.

⁴ Ibid.

⁵ UNRWA, *Annual Operational Report*, 2020

danger of fire, air pollution, risks to soil and agriculture, and health crises among both the local population and persons employed in this sector.⁶

The Al Mezan Centre for Human Rights attributes the deteriorating situation of solid waste management and consequent environmental and health impacts of waste landfills in Gaza to Israel's practices. In addition to hindering the development of existing dump sites, the Israeli occupying authorities have obstructed the establishment of waste landfills in border areas away from residential communities. Along this vein, Israel has prevented the expansion of the Johur ad-Dik waste landfill.⁷

Data from several reports highlight the adverse consequences of dump sites on the already degraded environment, negatively impacting life processes, especially population health. The environment is important as a key vital sector, which directly affects people's lives, particularly in connection with health.

The fact that solid waste contains liquid content, namely leachate, can contaminate groundwater if it seeps underground. Most dangerously, insect infestation puts at risk public health and provides a fertile ground for the transmission of skin diseases and parasites. Of note, anaerobic oxidation of organic materials in garbage leads to the rise of flammable hydrogen sulphide and methane gas, expanding the scale of combustion. Gasses cause chest disorders, heart attacks and asthma.⁸

Accumulation of solid waste after the war of aggression

Since the beginning of the aggression against the Gaza Strip on 7 October 2023, the IOF have used many weapons. During the first few weeks of the war, the IOF dropped over 45,000 bombs on Gaza. Comparative to the area of Gaza, these are far more powerful than all three atomic bombs which were dropped on Hiroshima in 1945.⁹

The UNRWA announced that more than 330,000 tonnes of solid waste piled up throughout the Gaza Strip, posing disastrous environmental and health risks. Due to harsh security conditions, trash accumulates around shelters, schools, and hospitals. While the IOF target any moving objects in Gaza, fuel needed to operate garbage trucks is lacking. These trucks have also been destroyed in the course of Israeli bombardment.¹⁰

⁶ Al Mezan Centre for Human Rights, *Dump sites in the Gaza Strip: Environmental and health impacts*, September 2022 (in Arabic).

⁷ Ibid.

⁸ Ibid.

⁹ Euro-Med Human Rights Monitor, *Israel hits Gaza Strip with the equivalent of two nuclear bombs*, available at: <https://euromedmonitor.org/en/article/5908/Israel-hits-Gaza-Strip-with-the-equivalent-of-two-nuclear-bombs>.

¹⁰ UN News. *Heavy environmental toll of Gaza war and long, painful recovery*, 19 June 2024, available at: <https://news.un.org/ar/story/2024/06/1131871> (in Arabic).

In a press conference held on 19 April 2024, Stéphane Dujarric, Spokesperson for the Secretary General of the United Nations, said that the collection and disposal of solid waste has been gravely damaged by the destruction of waste management facilities and medical waste disposal centres. Ongoing hostilities in Gaza, the destruction of roads, and the prevalence of unexploded ordnance (UXO) continue to pose significant risks for humanitarian workers. Piles of solid waste accumulate on a daily basis due to the destruction of access roads and more than 100 solid waste collection vehicles.¹¹

In the Gaza Strip, solid waste is a horrible mountain that builds up day by day. A population of 2.23 million live in an area no greater than 369 square kilometres, making the Gaza Strip one of the most densely populated stretches of land in the world. In this context, a report of the Institute for Palestinian Studies indicated that, prior to the war, Gaza used to generate some 1,770 tonnes of domestic solid waste per day. This is not merely statistics; it also reflects a reality that is magnified over time, particularly under a 17-year-long blockade, isolation, and hardship.

This situation has further deteriorated with the displacement of most residents of Northern Gaza to Khan Yunis and Rafah, where the population has increased to nearly 1.5 million. In both areas, the situation has become catastrophic owing to the destruction of infrastructure and piling of solid waste around residents. For example, in Khan Yunis, the tragedy was deepened over the first months of the war as quantities of solid waste jumped from 250 to 350 tonnes per day. This drastic rise and increasing pressure of solid waste have significantly impacted the performance of solid waste collection teams in southern Gaza. In addition to direct threats of the Israeli bombardment and incursion, short fuel and destroyed roads have brought solid waste transportation to a halt. Solid waste collection vehicles and containers have been damaged, making the treatment of this sizeable amounts of solid waste difficult. Capacities to dispose of solid waste are also lacking.

Causes of accumulating solid waste under the war of aggression

There are multiple sources and causes of solid waste under the ongoing aggression:

- Piles of solid waste and debris have generated from destroyed buildings and structures. Across the Gaza Strip, debris totalled 37 million tonnes due to Israel's destruction of structures and buildings. The IOF have destroyed more than 31,000 buildings and caused extensive damage to some 17,000 buildings and medium damage to over 41,000 others. While 294,000 sustained partial damage, at least 86,000 housing units are estimated to have been completely destroyed. Combined, these represent nearly 70 percent of housing units in the Gaza Strip. Furthermore, the IOF has wreaked havoc on schools, universities, hospitals, mosques, churches, government premises, and thousands of economic

¹¹ Office for the Coordination of Humanitarian Affairs (OCHA). *Hostilities in the Gaza Strip and Israel | Flash Update #155, 19 April 2024*, available at: <https://www.ochaopt.org/content/hostilities-gaza-strip-and-israel-flash-update-155>.

enterprises. According to the World Bank, more than half of Gaza's roads have been damaged. It should also be noted that the Gaza Strip continues to be challenged by a large amount of the debris of buildings and structures destroyed by the IOF during the 2014 aggression.¹²

- Toxic and hazardous wastes have originated from the use of white phosphorus and UXOs. The International Committee of the Red Cross defines UXOs as remnants of war, including weapons that did not explode when activated, that are left behind in the aftermath of an armed conflict, such as bombs, missiles, artillery shells, and hand grenades. When they explode, these munitions kill and injure thousands of people around the world every year. According to Charles (Mungo) Birch, Chief of the Mine Action Programme in the State of Palestine, while there are no mine fields in the Gaza Strip, it might take years and billions of dollars to safely remove large amounts of UXOs. Although it is impossible to identify the exact number of UXOs located in Gaza, the removal of debris, including of destroyed buildings, is expected to take 14 years under specific circumstances.¹³ In addition to time and cost, other challenges include how to safely unearth these munitions. According to the United Nations Mine Action Service (UNMAS), UXOs are deep in the ground and, in the case of Gaza, under more than 23 million tonnes of debris as estimated by the UNRWA. This carries the risk that UXOs explode later, posing an obstacle to the reconstruction of the devastated Gaza Strip.¹⁴
- In the Gaza Strip, large scale infrastructure destruction and fuel shortages have disrupted all wastewater treatment plants and systems, including six stations. While some 65 wastewater pumps have been out of service, almost 70 kilometres of sewage networks have been destroyed. As a result, approximately 130,000 cubic metres of untreated wastewater are disposed of and discharged into the sea or Wadi Gaza. A large portion of wastewater leaks into the streets and sometimes into houses due to the destruction of or blockages in piped sewage systems. Wastewater has accumulated around the tents of displaced people, providing a breeding ground for the spread of pandemics and diseases.¹⁵
- Solid waste collection vehicles have been out of operation due to fuel shortages, pile up of garbage in designated dump sites, and targeting of every moving vehicle by IOF warplanes. This has caused grave damage to the solid waste collection service across the Gaza Strip, declining from 98 percent before the Israeli aggression to 20 percent during the war. Hence, the current situation produces a looming environmental and health catastrophe due to

¹² Palestinian Central Bureau of Statistics (PCBS). *H.E. Dr. Awad, highlights the Forty-Eighth Annual Commemoration of Land Day in Statistical Figures*, 28 March 2024, available at: <https://www.pcbs.gov.ps/postar.aspx?lang=ar&ItemID=4726> (in Arabic).

¹³ Nirvana as-Said, *Unexploded ordnance: Timed bombs after the war in Gaza*, 3 April 2024, available at: <https://www.bbc.com/arabic/articles/c5177v8pv1go>.

¹⁴ Ibid.

¹⁵ PCBS and PEQA, *Press Release on World Environment Day, 05/06/2024: The Israeli occupation aggression made Gaza Strip an inviable environment*, available at: <https://www.pcbs.gov.ps/post.aspx?lang=en&ItemID=5765>.

considerable solid waste piles on the streets and in shelters. Not to mention the spread of insects and rodents, malodorous smell affects air quality and increases the risk of the spread of diseases and pandemics among Palestinian citizens. According to 2022 statistics, some 2.23 million Palestinians in the Gaza Strip generated as much as 1,800 tonnes of solid waste per day.¹⁶

Catastrophic consequences of solid and hazardous waste

1. With the accumulating waste, insects and rodents have spread, increasing the risk of diseases and health hazards. The decomposition of waste produces harmful gas emissions, as methane and carbon dioxide, polluting the air, causing unpleasant odours, and threatening respiratory health. This is not all. Playing with accumulation waste transmits several serious diseases to children. Multiple cases of respiratory tract problems have been reported, particularly among children and older persons.¹⁷
2. Since the war began in October 2023, the accumulation of overwhelming quantities of solid waste on the streets across the Gaza Strip has become a real tragedy. There is no choice but to burn this waste in order to mitigate the damage it causes. Still, waste burning is another tragedy. Involving contaminating components of plastic, petrochemicals and complex industrial chemicals, the process produces huge amounts of carcinogenic toxins and toxic gasses, such as dioxins, carbon monoxide, carbon and nitrogen oxides and others that kill people without realising.¹⁸
3. The fact that solid waste contains liquid content, namely leachate, can contaminate groundwater if it seeps underground. Most dangerously, insect infestation puts at risk public health and provides a fertile ground for the transmission of skin diseases and parasites.
4. Anaerobic oxidation of organic materials in garbage leads to the rise of flammable hydrogen sulphide and methane gas, expanding the scale of combustion. Accordingly, gasses cause chest disorders, heart attacks, and asthma.
5. Immeasurable environmental pollution has been caused by the disruption of all wastewater treatment plants and systems, including six stations. While some 65 wastewater pumps have been out of service, approximately 130,000 cubic metres of untreated wastewater leaks into the sea, groundwater, soil, and air. Besides shelters, where more than 1 million displaced persons have sought refuge, streets and alleys have turned into swamps, posing serious health and environmental hazards.¹⁹

¹⁶ Joint Service Council of Solid Waste Management in Gaza and Northern Gaza governorates, Solid Waste in Gaza: An imminent threat to citizens and income sustaining others, available at: <https://www.maan-ctr.org/magazine/article/3492/> (in Arabic).

¹⁷ Institute for Palestinian Studies, *The catastrophe of solid and medical waste in the Gaza Strip*, 25 April 2024.

¹⁸ PCBS and PEQA, *Press Release on World Environment Day, 05/06/2024: The Israeli occupation aggression made Gaza Strip an inviable environment*, available at: <https://www.pcbs.gov.ps/post.aspx?lang=en&ItemID=5765>.

¹⁹ PCBS, <https://www.pcbs.gov.ps/default.aspx>.

6. The spread of insects and pests causes disease outbreaks, posing an additional threat to public health and agriculture.
7. Foul odours and harmful gas emissions affect air quality and cause health problems to citizens.
8. UXOs put at risk the lives of the population as they contaminate the surrounding environment. The IOF have used unfamiliar weapons with an impact extending beyond human exposure limits and causing long-term damage to the environment. These include phosphorus bombs, dense inert metal explosives (DIME), thermobaric and vacuum bombs, and ammunitions containing depleted uranium.

Based on the test results of samples from victims, the Ministry of Health (MoH) confirmed the existence of heavy toxins, such as uranium, in quantities that were far in excess of the normal rate. Reports released by Italian researchers in cooperation with the MoH highlighted foetal toxicity and malformations as well as cases of infertility in men and women because Israel has used internationally prohibited weapons during wars on Gaza.²⁰

The effects of weapons, particularly phosphorus bombs, extend humans to the environment by:

- Polluting and deteriorating air quality as intense heat of over 850 Celsius is released upon combustion. Also, according to the World Health Organisation, sulphur dioxide and phosphorus oxide emissions directly impact human health and cause further health and chest diseases.
- Contaminating water as burnt phosphorus falls and melts in water.
- Contaminating and degrading soil quality, making the land useless for agriculture, due to the phosphorus acid which forms by interaction between phosphorus and water in the soil.
- Damaging and declining growth of plants due to increased amount of phosphorus in the soil.
- Destroying and reducing the productivity of agricultural land.

Recommendations

Notwithstanding the UN Security Council Resolution 2735 on an immediate ceasefire, the occupying Power has continued its war of aggression and genocide for 10th month in a row, creating an unliveable environment as a result of large-scale destruction. Against this backdrop, the Independent Commission for Human Rights (ICHR) stresses the following:

- The international community, humanitarian organisation and human rights actors should intervene urgently and immediately and exert pressure on the occupying Power to bring an end to this aggression in consistence with the UN Resolution 2735.

²⁰ Institute for Palestinian Studies, *The catastrophe of solid and medical waste in the Gaza Strip*, 25 April 2024.

- The international community and High Contracting Parties to the four Geneva Conventions of 1949 should fulfil their legal and moral obligations, put pressure on the occupying Power, and take action to protect civilian lives, avoid targeting civilian property, and prevent the use of toxic gasses and materials, such as white phosphorus.
- The international community should bear its responsibilities and take necessary action to facilitate the entry of waste treatment equipment, trucks and machinery, and permit the establishment of new solid waste management projects.
- The Israeli occupying authorities should be held accountable for crimes that affect the Palestinian environment and water.
- Pressure should be placed on Israel to put an end to the blockade, open all Gaza crossing points immediately, and provide access to all emergency supplies needed by health and environmental facilities with a view to reducing existing environmental and health risks.
- The international community should oblige Israel to allow all health and environmental experts to access the Gaza Strip and detect the environmental and health catastrophes caused by the Israeli war of aggression to the essential components of the environment. Restrictions placed by Israel on the entry of relevant international organisations and delegations into Gaza will be brought to an end.