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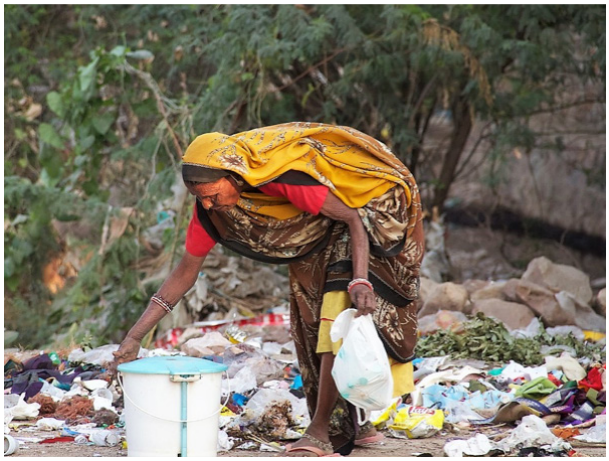
QUICK REFERENCE GUIDE

HEAT AND URBAN ENVIRONMENTAL ISSUES
SOLID WASTE MANAGEMENT

OVERVIEW

The world generates more than two billion metric tons of municipal solid waste annually, and at least 33 percent of that waste is not managed in an environmentally safe manner. The World Bank projects that rapid urbanization, population growth and economic development will increase global waste by 70 percent over the next 30 years—to 3.40 billion metric tons annually (7).



Source: KjellMeek (pixabay.com)

Global average temperatures are also expected to increase significantly by 2050, with particularly large increases in cities and in areas of the world such as sub-Saharan Africa, South and Southeast Asia and the Middle East that are expected to face the greatest increase in solid waste output—in some cases, double to triple the current level (7).

This convergence of higher temperatures and increased solid waste will challenge city officials, particularly to manage the effects on human health, such as an increased risk of water contamination and waterborne diseases (e.g., cholera, dysentery, typhoid), pests, and vector-borne diseases (e.g., malaria, dengue) (3).

Key Impacts

SOLID WASTE MANAGEMENT
Changes to the biological processes at landfill and breakdown of waste
Damage to landfill and waste collection machinery

HUMAN HEALTH
Increased heat risk to landfill workers
Increased risk of vector- and waterborne disease

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This document was prepared under the Adaptation Thought Leadership and Assessments (ATLAS) Task Order No. AID-OAA-I-14-00013 and is meant to provide a brief overview of heat's effect on urban environmental issues. The key resources at the end of the document provide more in-depth analysis. The contents of this report do not necessarily reflect the views of USAID.

HEAT, SOLID WASTE MANAGEMENT AND HEALTH

Increased average temperatures, and in particular extreme heat events, can affect (1) the biological processes of solid waste and the physical operation of landfills, and (2) the health and well-being of solid waste facility workers and populations exposed to solid waste(4, 5, 9).

IMPACTS OF HEAT

Complex chemical and biological processes take place in landfills as various types of waste break down and are broken down by microorganisms. The primary impact of increased temperatures and extreme heat events will be on these chemical and biological processes, changing the way waste breaks down, and increasing the possibility of soil and water contamination. Examples of the potential effects of heat on solid waste management include the following (1, 10):

- The number of cold days decreases and humidity increases (particularly during rainy seasons), which impacts biological processes at landfills (e.g., composting, anaerobic digestion of waste).
- The change in biological processes leads to altered chemical composition of contaminants below the surface, and an increase in contaminated water percolating through the soil (known as leachate).
- Decreased precipitation or increased frequency of drought may impact site stability, change evaporation rates and increase water needed for landfill site operations.
- High temperatures increase the chance of collection vehicles and landfill machinery overheating, and shorten their operating lifespan.

CONSEQUENCES FOR HEALTH

Landfills and waste collection operations employ large numbers of people (and in developing countries, waste pickers also informally earn a living in landfills), the vast majority of whom work outside for most or all of the day. Heat directly impacts these workers and their health. Indirectly, higher average temperatures also increase the optimal reproduction period for a host of vermin and pests, which leads to increased frequency of illnesses associated with decomposing waste and these pests. Examples of the potential effects of heat on health issues related to solid waste management include the following (2, 3):

- High temperatures and humidity directly affect landfill site workers and waste pickers by increasing the risk of dehydration, heat exhaustion and stroke.
- There is an increased risk of changes in distribution of vermin and pests (e.g., rats, mosquitoes) and an increased risk of vector- and waterborne diseases (e.g., malaria, dengue, cholera, dysentery, typhoid) coming from landfills, particularly from open and unsanitary landfills.

Heat and Solid Waste Management **HEALTH IMPACTS**
Heightened risk of dehydration and heat exhaustion for landfill workers and waste pickers
Increased risk of vector- and waterborne diseases
Increased number of vermin and pests at landfills and in communities
Increased odor, dust and fire risk from landfill sites

» Uncollected waste from households or community dump sites spoils more quickly, attracting insects and vermin to communities.

» Dryer conditions at landfills cause increased odor and dust from the landfill site, and increase fire risk.

MOST VULNERABLE POPULATIONS AND LOCATIONS

CITY RESIDENTS MOST AT RISK

Water contamination and vector-borne diseases from landfills—particularly open and unsanitary landfills—are a risk for all city residents. However, workers, individuals and communities that are near or come in contact with waste and landfills are the most vulnerable (8, 10).

These groups include:

» Landfill site workers

» Waste pickers

» Informal settlements without solid waste management services

» Residents living near landfills

» Households and communities with infrequent garbage collection or that rely on burning garbage

GEOGRAPHICAL AREAS MOST AT RISK

While increasing temperatures and unsanitary landfills are a problem globally, South and Southeast Asia, sub-Saharan Africa (particularly southwestern and central Africa) and the Middle East and North Africa represent global hot spots due to their increase in extreme heat days as well as expected waste management issues. The fastest growing regions for waste generation are sub-Saharan Africa and South Asia, where total waste generation is expected to at least double by 2050, making up 35 percent of the world's waste. The Middle East and North Africa region is also expected to double waste generation by 2050. This waste generation will largely come from urban areas, which are expected to greatly increase in population in these regions by 2050 as well, exposing an increasing number of residents to extreme heat while putting them in contact with waste management operations (7).

Heat and Solid Waste Management **VULNERABLE GROUPS**	
Populations	Landfill site workers and waste pickers
	Informal settlements
	Residents living near landfills
Geographies	South and Southeast Asia
	Sub-Saharan Africa (particularly southwestern and central Africa)
	Middle East and North Africa

STEPS TO REDUCE RISK

Much of the risk from heat and solid waste management stems from poor or insufficient management practices. Measures to reduce risk typically fall into three categories: (1) improving management of solid waste at the landfill, (2) protecting workers from heat exposure and (3) managing solid waste at the household and community levels (2, 6, 10, 11).

At the landfill

- Install an artificial liner to cover the waste.
- Retrofit existing landfills or create new landfills with a bottom liner to separate the waste and leachate from groundwater.
- Install a leachate collection system as well as a system to treat leachate.
- Construct a stormwater drainage system to collect rainwater that falls on the landfill.
- Ensure machinery is serviced appropriately before a heat event and ensure adequate parts and supplies on hand for maintenance.
- Place fire response on heightened alert.

Protecting workers

- Provide an insulated protective layer and protective accessories for workers to avoid heat stress.
- Ensure adequate drinking water and shade structures for workers and waste pickers.
- Schedule strenuous physical work during cooler hours (early morning and evening), and encourage rest during hotter midday hours.

At the household and community levels

- Discourage or ban household and community waste burning.
- Provide adequate waste collection sites (e.g., household or community garbage cans) and regular waste collection services to prevent community dumping.
- Develop a public awareness campaign about waste disposal and household storage during heat events.

Key Resources

- Waste and Climate Change: Global Trends and Strategy Framework (UNEP, 2010)
- Solid Waste Management – Addressing Climate Change Impacts on Infrastructure: Preparing for Change (USAID, 2012)
- What a Waste 2.0 report and dataset (World Bank Group, 2018)

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