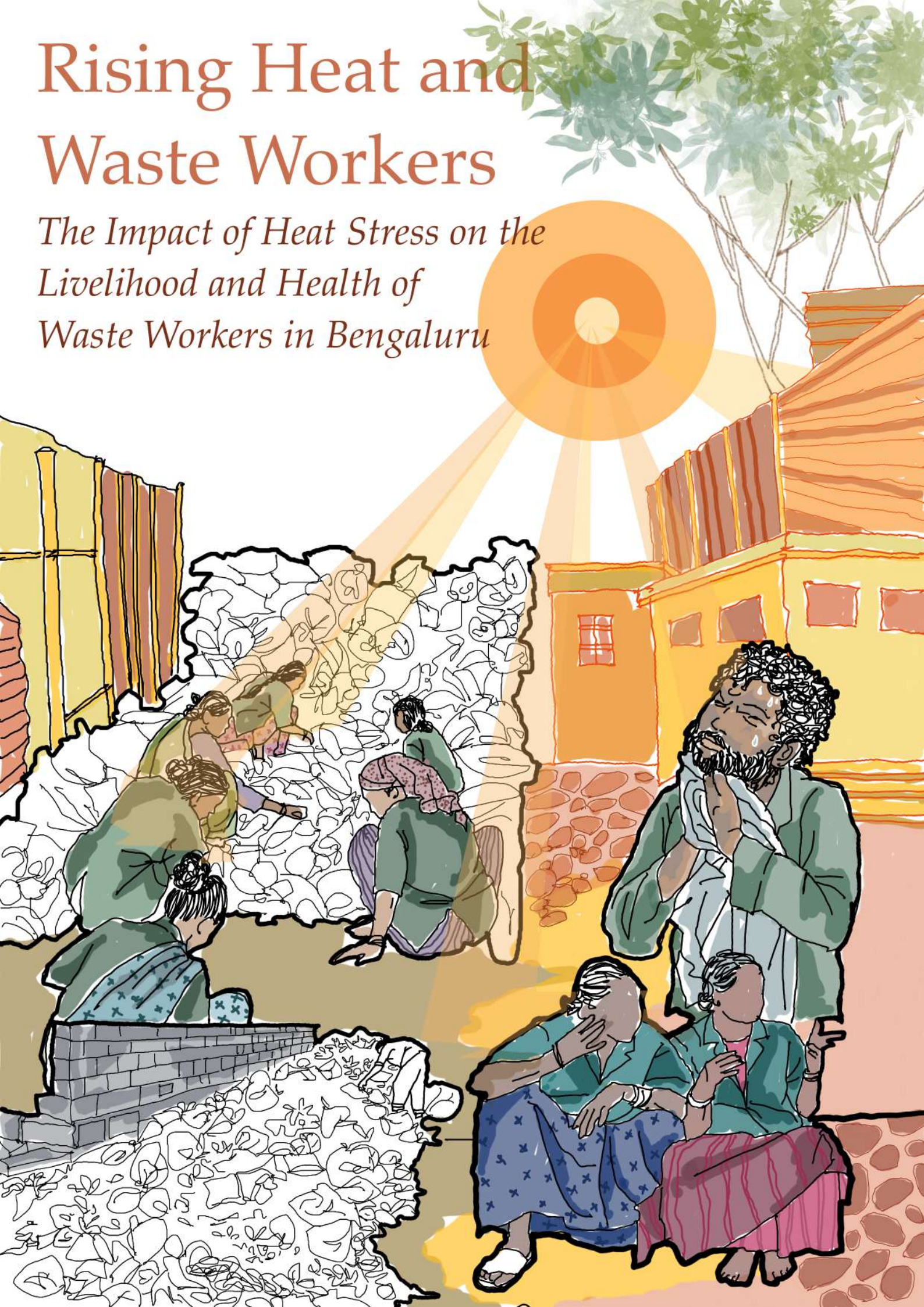
Rising Heat and Waste Workers

The Impact of Heat Stress on the Livelihood and Health of Waste Workers in Bengaluru



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A Report by Hasiru Dala and HeatWatch

About Hasiru Dala and HeatWatch

Hasiru Dala

Hasiru Dala (meaning Green Force in Kannada) is a social impact organization that has worked with waste pickers and other waste workers for more than a decade in varied capacities to ensure a life with dignity. It works towards ensuring that its members receive continuous access to livelihood security and social protection measures provided by the state and other relevant institutions. Its interventions also include enhancing the educational opportunities for the children of waste pickers, focusing on access to public housing for waste pickers, both locals and migrants, and providing health benefits to the waste workers.

HeatWatch

HeatWatch is a non-profit organization advancing public health, labor rights, and climate justice by addressing the escalating threat of extreme heat through both immediate interventions and long-term structural change. Over the past two years, we have engaged more than 500 outdoor workers across Telangana, Karnataka, Haryana, Odisha, and Maharashtra. Our programs include participatory research, occupational heat safety training, and policy development, all grounded in the lived realities of vulnerable workers. By collaborating with healthcare professionals and centering community-led solutions, we aim to strengthen frontline resilience while advocating for systemic reforms that embed equity and social justice into climate adaptation efforts.

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We are also grateful to members of the Thyajya Shramika Sangha (TSS) Union members - Kumuda, Sathya, Mansoor, Indumathi, and Sagaya Mary who gave us insights from their years of experience of working in Bengaluru's waste management ecosystem and acting as a bridge to facilitate discussions with the workers working in respective DWCCs.

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Lastly, we are deeply thankful to the Australian Consulate-General in Bengaluru's Direct Aid Programme for their generous financial support, without which this project would not have been possible.

Foreword by Uma Mahadevan, IAS

Bengaluru, once celebrated for its temperate climate, now finds itself at the frontline of the climate crisis. The rising frequency and intensity of extreme heat events is not only an environmental challenge but also a pressing public health and labour rights concern. This crisis is acutely felt by the city's most essential yet often invisible workforce: its waste workers.

The findings presented in this report by Hasiru Dala and HeatWatch are both timely and vital. They highlight how pourakarmikas, Dry Waste Collection Centre workers, and free-roaming waste pickers who provide indispensable environmental services are exposed to rising temperatures. Their daily labour sustains the city's sanitation and recycling systems, reduces greenhouse gas emissions, and protects public health. Their working conditions require basic infrastructure: access to water, sanitation, shade, cooling, and protective equipment.

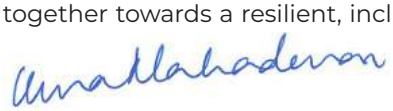
As someone who has witnessed how rural public libraries can transform into vibrant knowledge centres, I am reminded that infrastructure is not merely about buildings and resources, it is about creating spaces where dignity, learning, and equity thrive. In that same spirit, this report centres the lived reality of Bengaluru's waste workers, whose labour under extreme heat often goes unseen, yet remains essential to public health and civic life.

Their stories recorded here through data and first hand testimony highlight an urgent need for compassion, recognition, and institutional support. These workers represent the informal strength of our city's foundation. Just as we ensured that rural children could borrow a book or learn online, we must now ensure that our waste workforce has the tools, protection, and dignity they deserve.

The report offers concrete and actionable steps: improved working infrastructure, health and safety protections, social support systems and participatory planning mechanisms that treat workers not as service providers, but as equal stakeholders in our city's well-being. As we strengthen Bengaluru's climate action plans, it is imperative that the lived realities of informal and outdoor workers are placed at the centre. This study provides actionable recommendations: from upgrading workplace infrastructure to ensuring health protections and extending social security coverage. It also calls for participatory planning, ensuring that workers themselves are recognised as key stakeholders in shaping climate adaptation.

I commend Hasiru Dala and HeatWatch for this important work. By amplifying the voices of waste workers and grounding climate response in equity and justice, this report provides a roadmap for building a city that not only adapts to rising heat but also protects and uplifts its most vulnerable communities.

Let this be a call to action for policymakers, municipal authorities, civil society, and citizens to work together towards a resilient, inclusive, and compassionate Bengaluru



(Uma Mahadevan, IAS)
Additional Chief Secretary and
Development Commissioner

Message from Hasiru Dala

Every city's story is composed not just of its infrastructure and innovations, but also of the resilience and perseverance of its essential workers. For over a decade, Hasiru Dala has worked to re-centre the lives and leadership of waste pickers in Bengaluru's environmental future. The impact of rising heat, once marginal, has now become a defining crisis for those who shoulder our city's burdens. This report, developed with HeatWatch and grounded in participatory research, connects abstract climate data with the urgent, embodied realities faced by waste workers every day. As you turn these pages, you encounter the voices of waste pickers, pourakarmikas, and DWCC workers. Their stories mirror a phenomenon we first documented in field notes and later in a blog - Disportinate impact of heat stress on Waste Pickers, insightfully written by Geetanjali Sharma and Roy Anto, which exposed "invisible" suffering largely absent from policy debate. Through such documentation, Hasiru Dala's climate work has found clarity: advocating not only for recognition but also for lived justice. Our journey has been shaped by daily dialogues with waste workers, listening, learning, and sharing their frustration over systemic neglect. These interactions deepened our conviction that heat is more than a statistic; it is a test of our city's conscience and a measure of whether we can transition from acknowledging essential workers to dignifying them through change. This report is therefore both documentation and reflection, born from direct experience of the vulnerabilities and resilience of waste worker communities.

Hasiru Dala's climate leadership extends beyond advocacy: we pioneered quantification of waste pickers' climate impact, proving decentralised DWCC operations reduced 1,743 tonnes of GHG emissions annually, charting a roadmap for circular economies. We also led the Nagara Pravaha study, advancing inclusive, community-driven climate adaptation in vulnerable neighbourhoods, while pilots on green roofing and flood resilience improved thermal comfort and disaster preparedness in waste picker communities. Our recognition of waste pickers' climate stewardship has been acknowledged in the media, most recently when Karnataka's waste pickers were honoured for their contributions to climate action in 2025.

This document highlights the disproportionate exposure, health risks, and economic strain waste workers endure in a warming city. By centering their perspectives, it underscores the urgency of integrating their needs into climate planning and urban development. What sets this report apart is not just its analysis or policy recommendations, but its insistence on a participatory ethic: waste workers are not research subjects but co-authors shaping solutions for their futures. If you are reading this, you are likely a policy champion, activist, city official, academic, or citizen. What you will find here is more than statistics or testimonies; this is a roadmap for transformative action. I urge you to actively absorb these findings, share them, and let them inform your advocacy, policies, and practices. Let us move beyond sympathy toward solidarity, whether by subscribing to our updates, supporting campaigns, or amplifying these voices in every room where decisions for Bengaluru's climate future are made. I write with honesty and pride in the worker-centred approach that defines Hasiru Dala's climate work. The tone here, direct, urgent, and hope, is for a movement for safe workplaces. I invite you to join us in reimagining climate justice for Bengaluru, beginning with those who sustain it every day.

Chinmayi Naik
Executive Director,
Hasiru Dala

Message from Heat Watch

As the climate emergency deepens, its impacts are no longer distant or abstract. For millions of workers in India, extreme heat has become a daily occupational hazard, eroding health, safety, and dignity in ways that are poorly understood and rarely documented. Heatwaves are now the deadliest environmental disaster of our time, yet in India, the toll of heat remains absent from public records, invisible in official statistics, and disconnected from urgent protections that workers need.

HeatWatch works with communities across India to investigate heat as a public health and occupational crisis, linking climate impacts to social justice, dignity of labour, and the right to health. Through awareness building, training, participatory research, and advocacy, we amplify the voices of those on the frontlines whose lived experiences have been missing from policy conversations. Our work has already documented uncounted heatstroke deaths and revealed the realities faced by construction workers, textile workers, and gig workers. With this newest report, and in collaboration with Hasiru Dala, we turn to Bengaluru's waste workers, a community whose essential role in maintaining public health remains deeply undervalued and under-protected.

This report addresses a glaring research gap by centering waste workers' own words and experiences with rising heat. Drawing on focus group discussions, awareness sessions, and a survey of 150+ workers including pourakarmikas, free-roaming waste pickers, and workers in Dry Waste Collection Centres (DWCCs), it details how occupational heat exposure shapes health and human rights outcomes. Our findings are clear: excessive heat compounds the precarity of waste work, causing illness, diminishing earnings and increasing expenses.

The study identifies immediate as well as long-term interventions. Workers have called for urgent upgrades that provide safe drinking water, shaded spaces, and protective gear as a baseline right. These short-term improvements can ease the daily burden and reduce immediate risks. However, effective adaptation cannot stop there. Structural changes in housing, workplaces, and urban infrastructure are essential. They require policy reforms that are grounded in workers' realities and ensure their direct representation in governance processes. Crucially, this research is made possible by the leadership of community-based organisations such as Hasiru Dala, who have long defended the rights and dignity of waste workers. Supporting such organisations is essential to ensuring that community-led solutions are implemented rather than promised on paper. To confront the escalating heat crisis, we need responses that span waste management, health systems, housing, and urban design.

This report is both documentation and testimony, a call to recognise waste workers not only as labourers but as vital providers of public health and climate services, and to guarantee them the protections they deserve in the face of a rapidly-warming world.

Apekshita Varshney,
Founder,
HeatWatch

Executive Summary

Rising heat is not just an environmental crisis, but a labour and public health emergency. Addressing it requires centering the needs and voices of informal workers in climate response, bridging gaps between policy and lived reality, and acknowledging the essential environmental services waste workers provide every day.

This report by Hasiru Dala and HeatWatch examines the growing threat of **extreme heat in Bengaluru and its disproportionate impact on waste workers** - including pourakarmikas, DWCC workers, and informal free-roaming waste pickers. It combines survey data from 154 waste workers, five focus group discussions, three targeted awareness sessions led by a medical practitioner, and interviews with union representatives to understand the lived experiences of workers exposed daily to rising temperatures. The report focuses on **how heat affects their health, income, and ability to work** and provides worker-centered recommendations to build heat resilience and provide immediate relief. It adds to existing literature on the disproportionate impact of heat on vulnerable groups by highlighting disaggregated data across worker categories which are essential for strategic and effective interventions.

Study Findings: The study reveals how rising temperatures in Bengaluru are severely affecting waste workers in terms of heat exposure and vulnerability, income and productivity losses and health challenges.

- **Significant Impact of Heat on Work:** An overwhelming majority of surveyed waste workers reported heat significantly impacting their work at **92%**. Around 88% of female workers and 70% male workers reported increased difficulty in working during summer months.
- **High Heat Exposure:** Over 73% of waste workers continue working during peak heat hours (11 am–3 pm).
- **Lack of Resting Spaces:** More than 65% of waste workers reported lack of access to rest areas during work, an essential requirement to cope and manage heat stress during work.
- **Income Loss:** Over 40% of workers reported reduced income during summers due to increased work difficulty and changes in working hours.
- **Health Challenges:** Over 70% workers reported experiencing heat muscle cramps, over 60% workers reported experiencing heat exhaustion along with other symptoms like headaches, dizziness, burning eyes, dehydration, skin rashes and from kidney stones and heatstrokes in severe cases.
- **Access to essential workplace amenities is severely lacking:**
  - » Nearly half of DWCCs lack water, toilets or power supply.
  - » Shade, cooling, and rest infrastructure are missing.
  - » PPE is inconsistently accessible or unusable due to discomfort

- Coping strategies are informal, minimal and self-funded, including taking shade under trees, skipping meals, or buying energy drinks.

Policy Gaps:

- Existing Heat Action Plans at the city and state level (BCAP, Karnataka HAP) recognise heat risk but lack targeted, enforceable, and budgeted measures for informal workers.
- Climate and disaster plans (NAPCC, NPCCHH, KSAPCC, NDMA) underplay occupational risks faced by outdoor workers like waste pickers.
- Data on worker categories, heat exposure, and health outcomes is not disaggregated, making targeted action difficult.

Recommendations for Immediate Action and Policy:

Workers' requirements reflect both immediate and structural needs: access to basic amenities such as toilets with running water, drinking water, cooling infrastructure, health insurance and pensions. Longer-term, they called for formal recognition and integration of informal waste work, improved working conditions that assist in adapting to heat during summer months, and improved housing.

The study recommends that municipal authorities and relevant departments take urgent steps to improve heat resilience for this essential workforce.

- All waste workers should be provided access to free or subsidised drinking water and toilets as a basic and essential requirement.
- Upgrade and retrofit existing workplace structures such as DWCCs with ventilation, electricity, and alternatives to tin-roofing to improve working conditions. Ensure DWCC provision in wards lacking proper infrastructure.
- Expand infrastructure accessibility for different waste and sanitation workers: We recommend utilising DWCCs as a space for all waste and sanitation workers as a space of rest and access to basic amenities like water and toilets.
- ESIC coverage and access should be broadened and facilitated to include more informal workers, ensuring they can access empanelled clinics for affordable healthcare, especially for heat-related symptoms.
- Integrate heat-related first aid and awareness training into occupational safety programmes and distribute breathable, heat-appropriate protective gear for occupational safety and health of waste workers.
- Cross-sectoral coordination, participatory planning, and recognition of workers' expertise in climate adaptation frameworks. Waste workers should be represented in official and civil society initiatives around emerging climate and heat-related initiatives.

In summary, Bengaluru's waste workers face disproportionate exposure to rising heat, compounded by socio-economic conditions, informal work status, and inadequate workplace infrastructure. **Meaningful climate adaptation for the city must integrate worker voices, ensure immediate access to basic amenities and health protections, and recognise the essential environmental service that waste workers provide to the city. The rising heat is not just an environmental crisis, but a labour and public health emergency.**

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Abbreviations

AIW – Alliance of Indian Waste Pickers

BBMP – Bruhat Bengaluru Mahanagara Palike

DDMA – District Disaster Management Authority

DWCC – Dry Waste Collection Centre

ECBC – Energy Conservation Building Code

FGD – Focus Group Discussion

GHG – Greenhouse Gas

HAP – Heat Action Plan

HRS – Heat Related Symptoms

IHIP – Integrated Health Information Platform

IMD – India Meteorological Department

KSDMA – Karnataka State Disaster Management Authority

KSAPCC – Karnataka State Action Plan on Climate Change

KSNDMC – Karnataka State Natural Disaster Monitoring Centre

MNREGA – Mahatma Gandhi National Rural Employment Guarantee Act

MoU – Memorandum of Understanding

NAPCC – National Action Plan on Climate Change

NCDC – National Centre for Disease Control

NDMA – National Disaster Management Authority

NPCCHH – National Programme on Climate Change and Human Health

ORS – Oral Rehydration Solution

PDS – Public Distribution System

PPE – Personal Protective Equipment

RO – Resource Organisation

SDG – Sustainable Development Goal

SWM – Solid Waste Management

SWMRT – Solid Waste Management Round Table

TSS – Thyajya Shramika Sangha

ULBs – Urban Local Bodies

UNDRR – United Nations Office for Disaster Risk Reduction

WIEGO – Women in Informal Employment: Globalizing and Organizing

1. Introduction

1. Introduction

1.1 Context-Setting: Rising Heat in Bengaluru

Bengaluru, once known for its moderate, pleasant climate, is now facing significant changes in its weather patterns. Recent years have witnessed rising average temperatures and erratic rainfall. These changes are not just climatic or environmental concerns, they have direct consequences for the city's essential workforce: especially outdoor workers like waste workers, street vendors, construction workers, platform-delivery workers, among others who are at the forefront of urban resilience.

Outdoor and informal workers form the backbone of Bengaluru's urban economy, yet they remain among the most vulnerable to climate risks. A study in southern India comparing workers in indoor formal sector occupations with outdoor informal sector workers found that the latter were twice as likely to report heat related illness and 11 times more likely to report productivity losses due to heat (Venugopal et al 2021). The Climate Hazards and Vulnerability Atlas of India developed by the IMD also acknowledged that most victims of heatwaves were outdoor workers, stating that their occupational profile includes agricultural labourers, coastal community dwellers, and those engaged in other outdoor occupations. This underscores the heightened vulnerability of outdoor and informal workers, who face extreme weather with limited access to essentials like clean water, sanitation, shade, and cooling—making them more prone to heat-related illness. Workers are also disproportionately affected by the impacts of extreme heat due to personal risk factors (e.g. age, living in poorly ventilated or cooled housing), occupational risk factors (e.g. working outdoors) and societal risk factors (e.g. urban planning) (Pillai and Dalal, 2023).

This is particularly exacerbated in urban areas like Bengaluru due to the effects of unplanned development, decreasing green and blue spaces (gardens, parks, forests and lakes), urban heat island effect and overall climate change. The Bengaluru Climate Action and Resilience Plan (BCAP, 2023) highlights that the city's average annual temperature has risen—at a rate of about 0.23 °C per decade—and that it now records roughly 60 heatwave or extreme heatwave days annually (1975–2022), marking a notable increase in frequency and intensity of rising heat over the past decade (BCAP, 2023). According to the India Meteorological Department (IMD), **Bengaluru recorded 35.9°C on February 17, 2025, its hottest February day in two decades.** (ToI 2025). This spike is part of a larger trend of rising temperatures and earlier summer onset, with the city's average temperature increasing by 2.7°C over the past year (Indian Express 2025).

Rapid and unchecked urbanisation has also driven up temperatures in Bengaluru: built-up area rose by over 50% (1973–2022) while green cover fell 26% (Ramachandra et al., 2023). This loss of ecological buffers not only intensifies heat but also reduces the city's capacity to absorb and manage rainfall, compounding the risks of both heat and flooding (Hussain et al., 2024). These losses disproportionately affect low-income communities, as they are often concentrated in the most densely built, least vegetated parts of the city where open spaces are scarce. Multiple studies show greener neighborhoods in Bengaluru are significantly cooler; local parks and tree-rich areas can lower temperatures by 2–3°C compared to crowded, built-up zones (Shah et al., 2021). On the other hand, numerical climate modelling confirms that during heatwaves, urban surfaces where there is reduced vegetation and increased built-up coverage, or where low-income communities tend to live, absorb more heat than even rural areas (Garuma, 2022).

Such changes in Bengaluru's urban landscape not only pose environmental but also social and

occupational hazards, especially for vulnerable urban outdoor workers. **Waste workers, for example, are especially exposed to rising heat levels but rarely feature in climate adaptation policies, despite their critical role in public health.** Their limited access to cooling spaces like parks, often due to social stigma or restrictions, further compounds their vulnerability (Ravi, 2024). Addressing these risks requires urgent, coordinated action: restoring green cover, improving urban planning, strengthening waste and water management infrastructure, and ensuring occupational health protections for those most exposed. However, **to implement grounded interventions, understanding outdoor workers' working conditions is essential for developing targeted, inclusive heat adaptation strategies. Our study therefore focuses on documenting the heat-related impacts on waste workers' work and health, highlighting the urgent need for interventions that prioritize worker well-being and climate protections.**

1.2 Who are Waste Workers?

To assess heat's impact on workers, it's essential to first understand who waste workers are, what do they do, and how they are categorized. In the sanitation sector, they are broadly divided into two groups: liquid waste and solid waste management (SWM) workers (Government of India, 2024). Our study focuses on solid waste management workers, specifically those handling dry (inorganic) waste collection, segregation, and recycling.

Workers Engaging with Solid Waste

Waste workers who work with solid waste work with a spectrum of dry, wet (organic), sanitary and hazardous waste items. The SWM value chain involves waste collection at the city level, either through the formal municipal waste collection system or by informal waste collectors, such as free-roaming waste pickers (ibid). Broadly, these workers engage in a range of activities including street sweeping, waste collection, recovery, sorting, and resale of valuable waste items like recyclable and reusable materials. Together, these workers represent a network of waste workers that labour to clean public spaces as well as collect and/or recover waste items to be and resold as valuable recyclable and reusable material.

1.2.1 Nature of Work: Waste Workers

Waste workers who engage with solid waste at large and dry (inorganic) waste specifically operate across a range of formal, semi-formal, and informal arrangements, working at various scales and sites. The study engaged with three key categories of waste workers involved in the city's solid waste management, represented below.

A) Pourakarmikas

Pourakarmikas are municipally employed or contracted civic workers and refers "to street sweepers who collect street sweeping waste and carry out cleaning of public places" (BBMP, 2020). Majority of the pourakarmikas are contractual employees hired by the municipal body, the Bruhat Bengaluru Mahanagara Palike (BBMP), Greater Bengaluru Municipal Corporation, or a contractor. On 1st May 2025, on the occasion of International Labour Day, the BBMP regularised the services of around 12,600 pourakarmikas and absorbed them as "D" group employees. that refer to employees that are engaged in manual and supporting work like drivers, peons, sweepers, etc., and who now have greater social security entitlements (Deccan Herald, 2025).

B) DWCC Workers

Dry Waste Collection Centre (DWCCs) are decentralised ward-level waste aggregation and recovery centres run by a waste-picker entrepreneur, called a 'DWCC operator'. The DWCC work involves collection of dry waste from households, small commercial establishments, and streets in dry waste collection vehicles. The DWCC model was introduced in Bengaluru in 2011, following a directive from BBMP, which issued a public notice inviting NGOs and informal waste traders to manage these centres. In 2017, the first tripartite Memorandum of Understanding (MoU) was signed between the BBMP, waste pickers, and Resource Organisations or (ROs) composed of NGOs or waste picker organisations such as Hasiru Dala. This enabled waste pickers to operate and manage their own DWCCs as official DWCC operators, with support from these organisations. Until 2024, 37 DWCC centres were run by waste pickers and Self-Help Groups supported by Hasiru Dala as the RO.

Following is the spectrum of waste workers engaged in the DWCCs:

DWCC Operator

The DWCC operator is responsible for the overall management and functioning of the centre. While the initial infrastructure is provided by the Bruhat Bengaluru Mahanagara Palike (BBMP), the operator oversees day-to-day operations, staff coordination, and waste management processes within the amenity.

DWCC Sorters

Sorters are engaged in the manual segregation of collected dry waste into distinct material categories such as plastic, paper, glass, and metal. Given that a significant portion of incoming waste is unsegregated, sorters perform both primary and secondary segregation. This involves separating recyclable materials (e.g., metal, plastic, cloth), non-recyclable materials (e.g., low-value multi layered plastics), and rejected waste (e.g., contaminated, hazardous, or sanitary waste).plastics), and rejecting waste (e.g., mixed, contaminated, hazardous, or sanitary waste).

DWCC Driver

DWCC drivers are employed by the operator to carry out door-to-door collection of dry waste from households and small commercial establishments. They are responsible not only for driving the waste collection vehicle but also for working alongside the cleaner and helper to collect and organise waste into appropriate compartments during the collection route..

DWCC Cleaner / Helper

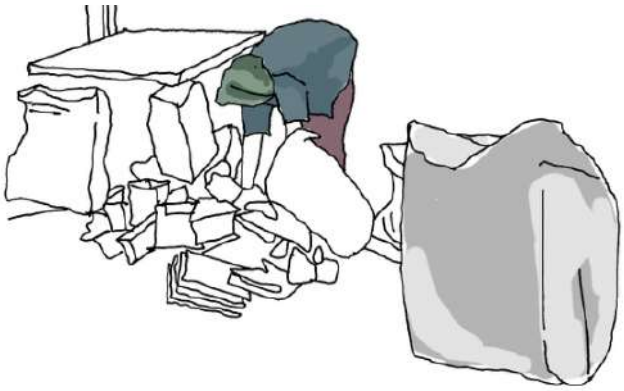
Cleaners and helpers are key support staff employed by the DWCC Operator. Their responsibilities include assisting in waste collection, aiding in segregation activities, and ensuring cleanliness and maintenance of the collection vehicle and the DWCC premises after daily operations.

C) Waste pickers

Waste pickers make up the majority of informal and cooperative waste sector workers. They are self-employed or own-account free-roaming workers who make a livelihood reclaiming value from waste generated on a daily basis in the city. According to Solid Waste Management Rules 2016, waste picker means a person or groups of persons informally engaged in collection and recovery of reusable and recyclable solid waste from the source of waste generation the streets, bins, material recovery amenities, processing and waste disposal amenities for sale to recyclers directly or through intermediaries to earn their livelihood (Government of India, 2016).

In the context of Bengaluru, due to advocacy efforts of concerned groups including the Alliance of Indian Waste Pickers (AIW) and Solid Waste Management Round Table (SWRMT), the Lok Adalat (public citizen's forum within the Karnataka High Court) directed the urban local body to register and enumerate waste pickers (International Alliance of Waste Pickers). Initiated in 2011-12, Bengaluru became one the first cities in India where Occupational Identity Cards were issued directly by a municipal body to waste pickers and informal waste workers thereby recognising and legitimising their work within the city.

In this report, we have referred to waste pickers as free-roaming waste pickers to highlight the own-account self-employed nature of their work. Within these however, we see three broad categories:



Free-Roaming Waste Pickers on Foot

Free-roaming waste picking on foot is predominantly done by regional women but also men who have engaged in waste picking generationally. They engage in waste picking and collection on foot from streets, black spots, commercial shops etc. They often segregate the waste themselves, with the help of family members at home and/or other workers in small scrap shops.

Free-Roaming Waste Pickers on Vehicles

Free-roaming waste pickers on vehicles are often male waste pickers who are self-employed or employed to work by a contractor or *thekedar* who aggregates the collected waste they collect and sort. In Bengaluru, most of the free-roaming waste pickers on vehicles operate in informal settlements or goddowns and engage in waste collection in the surrounding areas.

Godown Sorters

Godown sorters operate with free-roaming waste pickers on vehicles and engage in segregation of collected waste by waste pickers on vehicles. They are also employed by or work under a contractor or *thekedar* in informal settlements and godowns. For them, their worksite and residence often are the same.

1.3 Waste Workers and Climate Change

1.3.1 Contribution to Climate Change Mitigation

Waste workers are vital to urban economies and ecological systems. By collecting recyclables, managing waste in public spaces, and feeding recycling industries, they provide essential environmental services. Their efforts reduce demand for raw materials, conserve energy, and help lower air and water pollution.

Studies highlight their significant impact: **waste pickers collect an estimated 58% of plastics, playing a critical role in preventing plastic pollution and supporting circular economies** (Cook & Velis, 2021). Beyond waste recovery, their work enhances land use, prevents urban flooding, facilitates water flow, energy systems such as biogas and reduces greenhouse gas emissions through early waste removal and informal recycling processes (Green Partners & WIEGO, 2019). In doing so, waste workers not only sustain their own livelihood but also contribute meaningfully to public health, environmental sustainability, and the urban economy. In Bengaluru, a 2022–23 study by Hasiru Dala found that seven DWCCs in the city helped reduce greenhouse gas emissions by 1,743 tonnes annually (Anto et al 2023). Earlier, a 2014 paper by Hasiru Dala, Solid Waste Management Round Table (SWMRT) and Jain College (Pinky Chandran et al, 2014) estimated that **BBMP saves approximately 23 crores per annum due to the work of around 4175 waste pickers in the city.**

These studies establish that by collecting and segregating the recyclable materials from dry waste, pourakarmikas, DWCC workers and waste pickers help in preventing the volumes of waste that goes to landfills, contribute to extending the life cycle of materials by propelling recycling, reduce the emission of methane and GHG emissions as well as contribute to lowering municipal budgets and costs. Waste workers' contribution to climate mitigation and the circular economy is therefore substantial and crucial.

1.3.2 Climate and Social Vulnerability

While rightfully recognised for their work towards a greener economy, it is essential to acknowledge that waste workers' remain systemically vulnerable, especially to emerging risks and hazards brought by climate change. Waste workers by nature of their working and living conditions are also disproportionately exposed to the outdoors, increasing their exposure and vulnerability to heat stress.

A 2023 WEIGO study showcased that waste workers have also identified climate-change induced hazards like heat waves and extreme rising temperatures as a key issue, with 98% citing climate change as a key concern for their lives and work. (Dias et al, 2023). While the study included several climate change induced hazards like flash floods, mudslides, infectious diseases, **heat waves were highlighted as one of the key issues facing the waste pickers.** The study showed that **heat waves adversely impact waste workers' health, well-being and productivity, and decrease their earnings (ibid). Many waste pickers reported dehydration, heatstroke and fatigue due to increased temperatures, and not only during extreme heat waves.**

The disproportionate exposure and vulnerability of waste workers in Bangalore has been highlighted in 2024 report titled *'Heat in Bangalore: Systems Research and Engagement for Climate Action in Marappanapalya Ward.'* The authors developed a **qualitative heat vulnerability index** intersecting two attributes – (1) the influence of a community group on the context and (2) influence of heat

stress on the given group. **The Heat Impact Matrix in the report showcased the high level of vulnerability pourakarmikas face while interacting with 4 intersecting systems of infrastructure, health, built environment and economy.** While the report primarily focused on pourakarmikas as high-priority stakeholders vulnerable to heat stress, similar risks affect other waste workers such as DWCC workers and waste pickers who might face greater vulnerability due to their semi-formal or informal employment conditions. In 2024, Hasiru Dala researchers documented early insights on heat-related impacts like dehydration and dizziness among DWCC workers and pourakarmikas through a blog (Geetanjali and Roy, 2024). The write-up provided the initial insights that helped shape this larger study and highlighted the need to recognise and document the disproportionate vulnerability to rising heat faced by waste workers in Bengaluru.

Social Identity and vulnerability

Waste workers' vulnerability to climate change induced hazards like heat stress is further compounded by their pre-existing socio-economic realities and historical marginalisation. It has been established that informal waste recycling is characterised by ignorance, non-recognition, and social exclusion (Chandran and Arora et al, 2017). Globally, waste picking and waste work is largely carried out by people who hail from economically disadvantaged and socially marginalised backgrounds, including oppressed castes, urban poor, homeless, religious and ethnic minorities, and Indigenous communities (International Alliance of Waste Pickers 2024). WIEGO has also argued how policy and investment responses to climate change often negatively impact the lives and livelihoods of workers in informal employment. According to a 2020 statistical profile of the informal sector **in India by WIEGO, in India, an estimated 2.2 million people are engaged in waste picking out of which the majority that is 76.2% are informally employed (Raveendran & Vanek, 2020). The majority of these workers come from historically-marginalized, socio-culturally oppressed caste, tribal, and religious minority groups.** This lack of formal employment leaves most without access to basic social protections such as health insurance, income security, or safe working conditions and makes them highly vulnerable to exploitation, stigma, harassment, and daily health risks.

A majority of waste pickers and waste workers in Bengaluru are women who belong to communities that come under Scheduled Caste (SC) and Scheduled Tribe (ST) categories. Hasiru Dala's internal dataset shows that **women waste workers constitute around 61% of the total workforce in the informal waste sector.** When it comes to socio-cultural background, SCs and STs together constitute more than approximately 68% of the overall workers in the waste sector. This highlights how caste and gender continues to shape waste work in India today, reflecting deep-rooted structural vulnerabilities.

Many waste workers living in Bengaluru for generations had initially migrated from Northern Karnataka and neighbouring states like Tamil Nadu, Andhra Pradesh, Telangana, and Maharashtra. Drawn to Bengaluru in search of livelihood, they often enter waste work due to lack of alternatives. It is important to know that due to historical marginalization, a substantial portion of waste workers engage in waste work generationally with limited access to quality education which constrains their employment opportunities. As climate emergencies exacerbate inequality, waste workers remain on the frontlines, with minimal protection.

1.4 Policy Review and Landscape

Given the heightened vulnerabilities and marginalization faced by waste workers and the severe impact of heat on them as outdoor workers it is critical to assess how Heat Action Plans (HAPs) and climate policies address their needs. This section reviews relevant policy frameworks to evaluate whether they meaningfully identify and outline provisions to protect vulnerable groups like waste workers from rising heat stress in Bengaluru. Our overall analysis reveals a lack of disaggregated data and targeted interventions for vulnerable groups like outdoor and informal workers such as waste workers, weak implementation, monitoring, and funding mechanisms, and an absence of recognition of structural and social protection measures.

1.4.1 Karnataka Heat Action Plan

The 2024-25 Karnataka Heat Action Plan acknowledges the vulnerability of specific regions such as North Interior Karnataka and outlines taluk-level thresholds based on temperature analysis. However, this quantitative lens isn't matched by disaggregated socio-demographic data. The UN Office for Disaster Risk Reduction stresses the need for data disaggregated by age, gender, occupation, and socio-economic status for inclusive development of heat-health warning systems (HHWS) (UNDRR, 2023). Karnataka HAP vaguely lists “vulnerable populations” such as elderly people, pregnant women, and outdoor workers, but fails to identify, measure or monitor specific vulnerabilities of informal sector workers and marginal urban communities.

The plan reflects a top-down structure. Though the Karnataka State Natural Disaster Monitoring Centre (KSNDMC)'s contributes granular weather forecasts, **the institutional mechanisms do not adequately devolve power or resources to urban local bodies (ULBs) or Panchayati Raj institutions** (Reddy

& Prabhu, 2016) which limits local-level implementation and community-level responsiveness. HAP recommendations such as awareness campaigns, water kiosks, and colour-coded alerts although welcome and important are insufficient for long-term resilience. Structural measures such as revised urban planning regulations and codes, cool roofing mandates, expanded tree canopy coverage, investment in heat-resilient public infrastructure and social protection systems are missing and lack statutory enforcement or budgetary allocation.

As a result, waste workers, and other outdoor workers who face prolonged exposure to extreme heat without access to shade, hydration, rest breaks, or protective equipment, remain largely invisible in the Karnataka HAP. Without integrating their lived realities and ensuring occupational safety standards, the plan risks reinforcing existing inequities.

Although the "Energy Conservation Building Code (ECBC)", a code that sets minimum energy efficiency standards to to reduce energy consumption, cut emissions, and promote sustainable building practices, has been mentioned, active steps **towards retrofitting or enforcing passive cooling norms in affordable housing, especially for low-income communities that bear the brunt of extreme heat, are missing.** The plan also lacks a monitoring and evaluation (M&E) framework, to document and track resilience or vulnerability indicators or incorporate feedback from citizens. **While Karnataka's HAP proposes "annual improvisation," it lacks institutional clarity on the actors responsible for collecting, verifying , and acting on data related to heat-related mortality, productivity loss, or infrastructure breakdown.**

The plan does emphasize robust interdepartmental coordination, establishing a state-level steering committee comprising key stakeholders such as KSNDMC, Karnataka State Disaster Management Authority (KSDMA), District Disaster Management Authority (DDMA), the Health Department, Urban Local Bodies, the Forest Department, and others to ensure synchronized planning and response. It also outlines clearly defined roles and responsibilities for each department, facilitating convergence across forecasting, early warning dissemination, public health preparedness, and infrastructure readiness. For example, KSNDMC and IMD are tasked with issuing timely forecasts, while health and municipal authorities ensure the dissemination of alerts and the establishment of cooling and hydration amenities.

Actions are categorized into short-, medium-, and long-term objectives, each requiring collaborative input, for instance, the provision of shaded workspaces and water by MNREGA and WCD in the short term, and coordinated studies on heat-health linkages by Health, Environment, and Energy departments in the long term. The plan also integrates a shared Early Warning System (EWS) that serves as the operational backbone for inter-agency coordination, ensuring that all relevant departments act promptly during heatwave alerts. **Yet, without financial allocations, implementation remains aspirational. The absence of a clear funding roadmap raises concerns about the feasibility of even well-intended actions, limiting the plan's potential to respond effectively to rising heat risks.**

1.4.2. Bangalore Climate Action and Resilience Plan (BCAP)

The Bengaluru Climate Action and Resilience Plan (BCAP), released in 2023, outlines an ambitious vision to achieve net-zero emissions by 2050. Prepared by the Bruhat Bengaluru Mahanagara Palike (BBMP) with C40 Cities and WRI India, **the plan identifies extreme heat as one of the city's three most pressing climate hazards, alongside floods and air pollution.**

The Bengaluru Climate Action and Resilience Plan (BCAP) uses robust spatial risk mapping to prioritize action in peripheral zones such as Yelahanka, Mahadevapura, RR Nagar, and Bommanhalli, which face high risks from urban heat, flooding, and air pollution. The plan recognizes the heightened vulnerability of low-income and marginalized groups, including pourakarmikas and waste workers and suggests formalizing pourakarmikas and ragpickers through legal status and licensing, aiming to ensure social equity and job security. It also recommends establishing mustering centres with essential amenities in every ward to improve working conditions and public health for these workers. However there are gaps and concerns over implementation strategies to achieve these suggested actions such as the eligibility criteria for formalisation as well as the protection of existing informal waste workers and waste pickers (Geetanjali and Roy, 2024). Additionally, it proposes measures like subsidized reversible ceiling fans, green roofs on new buildings, and a transition to 68% non-fossil fuel energy by 2030.

BCAP's governance vision is highly participatory, mandating local climate plans, ward-level committees with representation for vulnerable groups, and collaborative platforms for spatial data and action monitoring. While risk mapping and solution suggestions are robust, there is limited detail on specific, enforceable timelines for several adaptation strategies at the ward level. It also falls short in specifically analyzing and addressing occupational heat risks for outdoor workers, tailored health protections and enforceable labour standards. Most urban heat actions are broad in scope—expanded green cover, public asset retrofits, energy efficiency—but lack detailed, occupational health interventions. While the Monitoring and Evaluation framework supports learning and accountability, translation to ground-level implementation and true inclusivity depends on concrete mandates and sustained political will. The BCAP is strong on mapping, vision, and inclusive intent but weaker on targeted, actionable solutions for the most at-risk workers.

Comparison with other city-level heat action plans: Delhi's Heat Action Plan (HAP) provides a well-structured, multi-phase approach with early warning alerts, clearly-defined departmental roles, medical preparedness, and annual review mechanisms. However, it still falls short of translating its institutional design into enforceable, equity-focused measures for those most exposed to rising temperatures. The HAP's collaboration with IMD and DDMA allows for tiered alerts and improved forecasting, and its medical protocols including dedicated cooling wards and Rapid Medical Response Teams that are among the best developed in India. Yet, despite identifying hotspots and at-risk groups such as waste workers, daily labourers, slum residents, and women, it lacks binding policies for rest breaks, shaded spaces, mobile cooling stations, and formal social protection for these communities.

In this regard, Delhi mirrors Bengaluru, where **the Bangalore Climate Action and Resilience Plan (BCAP) acknowledges rising temperatures and proposes formalising waste work, licensing informal waste workers, and providing basic muster stations, but similarly treats these measures as advisory, without enforceable monitoring or accountability.** In contrast, Ahmedabad's Climate Change and Environment Action Plan (2022), developed by the Vasudha Foundation and SHAKTI, explicitly recognises "heat stress" as a key sectoral challenge. According to a study, around 1190 deaths have been avoided since Ahmedabad's first Heat Action Plan, in 2013, through targeted interventions including cool roofs, water stations, and IMD-linked alerts (Hess et al., 2018). 74% of Karnataka's workforce is employed in the informal sector, many of whom are daily-wage, outdoor labourers (Ranganath, 2019). By ignoring occupational heat stress, the BCAP overlooks those most exposed.

1.4.3 National Action Plan on Climate Change (NAPCC)

Launched in 2008, the NAPCC outlines eight national missions focusing on climate change mitigation and adaptation. While the NAPCC emphasizes protecting vulnerable populations through inclusive and sustainable development strategies, it does not explicitly address issues related to heat stress, occupational safety, or social protection for workers, particularly those in the informal sector *(India: National Action Plan on Climate Change (NAPCC), 2012).* This omission has been a point of concern among labour rights groups. In May 2024, the National Alliance of People's Movements (NAPM) criticised the exclusion of outdoor and informal workers from climate change and heat action policies. Policies like the NAPCC and various heat action plans fail to incorporate social protection measures such as paid sick leave, health insurance for heat-related illnesses, and income support, despite the growing threat that extreme heat poses to the health and livelihoods of workers, especially those in the informal sector.

1.4.4 Karnataka State Action Plan on Climate Change (KSAPCC)

The Karnataka State Action Plan on Climate Change (KSAPCC) recognizes rising temperatures and intensifying heatwave patterns as pressing climate threats. Its climate profiles and vulnerability assessments underscore how increased thermal stress impacts agriculture, livestock, and water resources across rural Karnataka. It proposes resilient crops and water harvesting but lacks a clear focus on heat as an occupational or public health issue for vulnerable groups like waste workers.

At the policy level, KSAPCC provides a strong analytical foundation for climate impacts across agriculture and water resources, highlighting increasing surface temperatures and altered rainfall patterns. But the Plan falls short in offering targeted measures for outdoor workers exposed to heat stress. This overlooks how rising temperatures reduce productivity, harm health, and deepen inequalities. This gap sidelines marginalised workers like waste workers, who, without dedicated policies such as including occupational health protocols, provision of cooling spaces, access to hydration, and mandatory rest breaks will face deepening structural inequities.

Finally, the Plan lacks a multi-sectoral implementation mechanism that links climate policy with public health, urban planning, and social security. The absence of robust institutional arrangements to operationalize heat action for waste workers and other vulnerable populations means that even well-intentioned strategies risk being ineffectual.

1.4.5 National Programme on Climate Change and Human Health (NPCCHH)

Initiated in 2019 by the Ministry of Health and Family Welfare, the NPCCHH aims to build health system resilience to climate-sensitive diseases, including heat-related illnesses. Its digital tool, the Integrated Health Information Platform (IHIP), tracks climate-linked health outcomes like extreme heat.However, its effectiveness in addressing heat-related challenges, particularly for vulnerable populations like informal workers, faces several limitations. The IHIP is not publicly accessible which raises questions on transparency and accountability in India's response to extreme heat. Currently, heatstroke-related illnesses and deaths remain vastly underreported, particularly affecting informal workers such as waste pickers, sanitation workers, and daily wage labourers. **Making IHIP data open and disaggregated by geography, occupation, and gender would allow researchers, civil society, and state institutions to design more targeted interventions, such as worker-specific advisories.** In 2023, the National Centre for Disease Control (NCDC) issued advisories under the NPCCHH to integrate heat surveillance into IHIP, yet the implementation across states remains uneven and opaque (The Hindu, 2023).

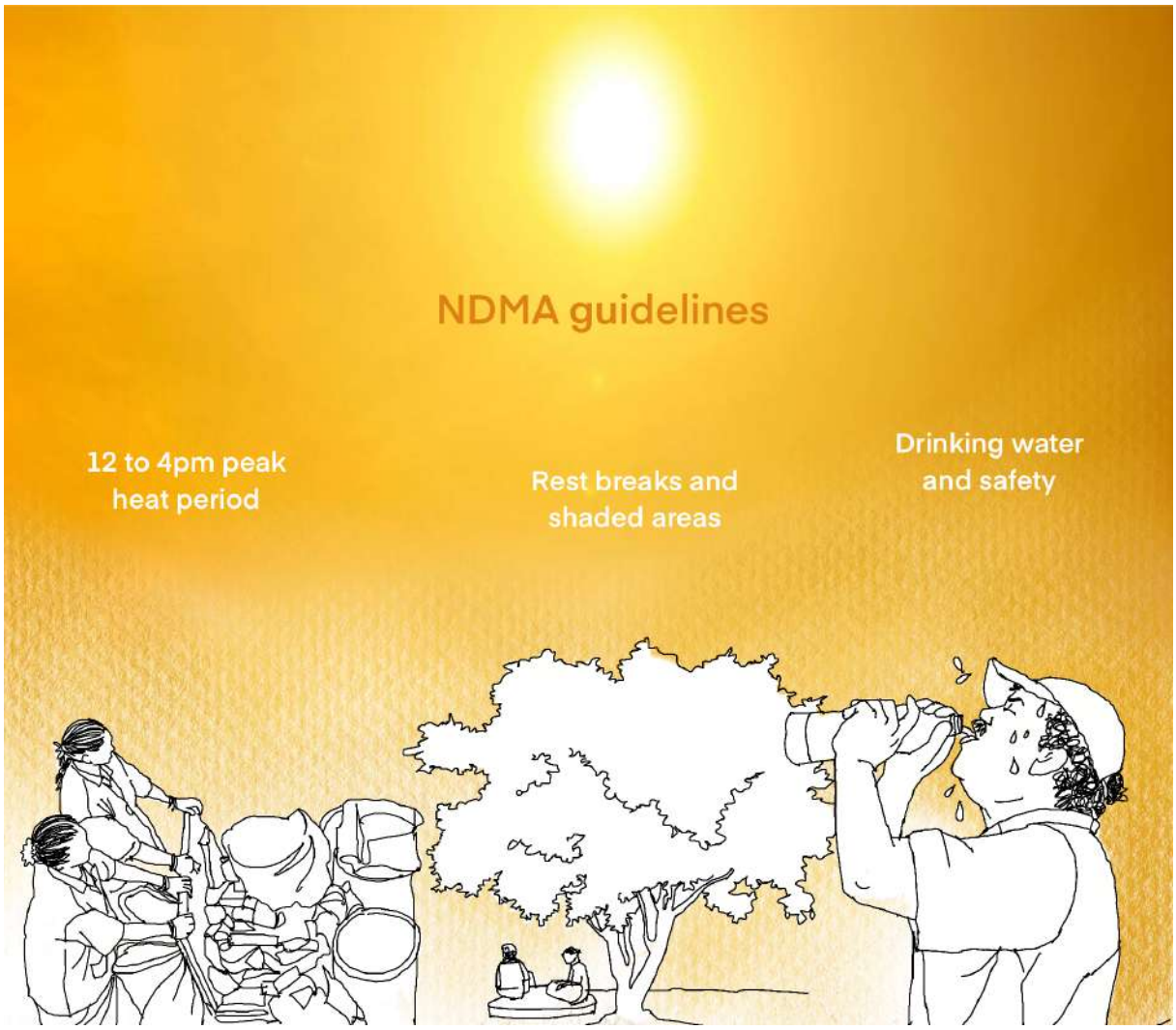
1.4.6 National Disaster Management Authority (NDMA) Guidelines

On June 12, 2025, the National Disaster Management Authority (NDMA) issued an advisory addressing the impact of heatwaves on India's informal urban workforce, which constitutes over 80% of the labour force. The NDMA urged that sanitation staff, street vendors, construction labourers, and women gig workers be included in municipal Heat Action Plans, with dedicated budgets and updated worker databases developed in consultation with relevant stakeholders.

To reduce heat-related health risks, it recommended avoiding the peak heat period between 12 p.m. and 4 p.m., and providing rest breaks, drinking water, and shaded areas. Special attention was advised for the safety of women workers.

The advisory also encouraged the development of climate-responsive infrastructure in work zones and proposed social protection measures, including heat-specific insurance, wage compensation, and unemployment aid for those affected by climate disruptions (The Indian Express, 2025).

While this marks progress in recognising the vulnerability of informal workforce to extreme heat, the guidelines need to be implemented in tandem and incorporated into localised HAPs for effective implementation. Furthermore it needs to address challenges such as lost wages due to paused work. Gaps remain, including the lack of enforceable safety norms and insufficient provisions for specific needs of different informal workers', including women.



2. Study Design

Vinod Sebastian for Saamuhika Shakti

2. Study Design

2.1 Objectives of the Study

This study focuses on three categories of waste workers - pourakarmikas, DWCC workers, and free-roaming waste pickers, whose nature of work exposes them to varying levels of heat-related risk:

The study is guided by the following specific objectives:

- **To document the health impacts of heat stress on informal waste workers**, such as dehydration, fatigue, dizziness, and more severe manifestations such as heat cramps, exhaustion, or heat stroke.
- **To explore differential impact of heat by exploring how different work environments (open streets, sorting sheds, or mobile waste collection) shape both the nature and intensity of heat exposure** across all three worker categories.
- **To identify the coping strategies that waste workers** currently use to prevent and manage heat-related risks, including clothing, hydration, and food practices.
- **To assess awareness levels and access to institutional or community-based heat resilience resources**, such as water stations, shaded rest areas, early warning systems, or first-aid measures.
- **To suggest recommendations for the development of inclusive heat adaptation and occupational safety policies** that account for the specific needs of informal waste workers in Bengaluru.

2.2 Research Design and Methodology

The study adopted a **mixed-methods participatory research approach** to document and analyse the impact of extreme heat on informal waste workers in Bengaluru. The methodology engaged waste workers in problem identification, voicing demands, and proposing recommendations, evolving throughout the project based on ongoing feedback and practical insights.

2.2.1 Study Process and Phases

There were four broad phases in the project -
1. Internal consultations with Hasiru Dala team,
2. Focus group discussions with different worker groups,
3. Awareness and training sessions of heat stress management
4. Quantitative survey on the impact of heat on work and health

1. Internal Consultations with Hasiru Dala Staff and Team for Study Scope Design:

Before data collection, the research team consulted **Hasiru Dala's team** across different verticals including **Housing (Hasiru Mane), Health, Livelihoods (DWCC), Social Security, Namma Jagguli and Buguri teams to understand an map community profiles, assess feasibility and risk, and align with existing community initiatives.** These consultations provided us insights into the workers' working, living conditions and health impacts, helped frame the project's scope and approach and informed us about Hasiru Dala's previous initiatives such as health and housing pilots aimed at mitigating and adapting to the impacts of heat.

Key insights included details on food, nutrition and eating habits such as workers skipping meals during working hours,leading to gastrointestinal issues. Second, lack of workplace amenities such as insufficient access to water, toilets and electricity exacerbates health challenges for workers. In addition to poor conditions in cramped, hot or outdoor worksites, waste workers often return to poorly ventilated homes. Hasiru Dala's Housing team highlighted previous collaborative pilot

projects undertaken to improve roofing solutions (Hasiru Mane Project, 2020) in a few Bengaluru communities that have shown improvements in indoor temperatures. **Due to project limitations, we focused only on working conditions and the health impacts of heat on waste workers, not on living conditions or housing typologies which is a key factor in contributing to the level of heat adaptation and response communities have.** However, further research and practice should prioritise both housing and living conditions when examining how climate change impacts workers.

The internal consultations were followed by a preliminary meeting with a few waste workers to explain the objectives of the project and to receive feedback on the proposed methods and engagement practices. Together, these initial steps ensured that the methodology was rooted in local realities and respectful of the workers' experience, knowledge, and agency.

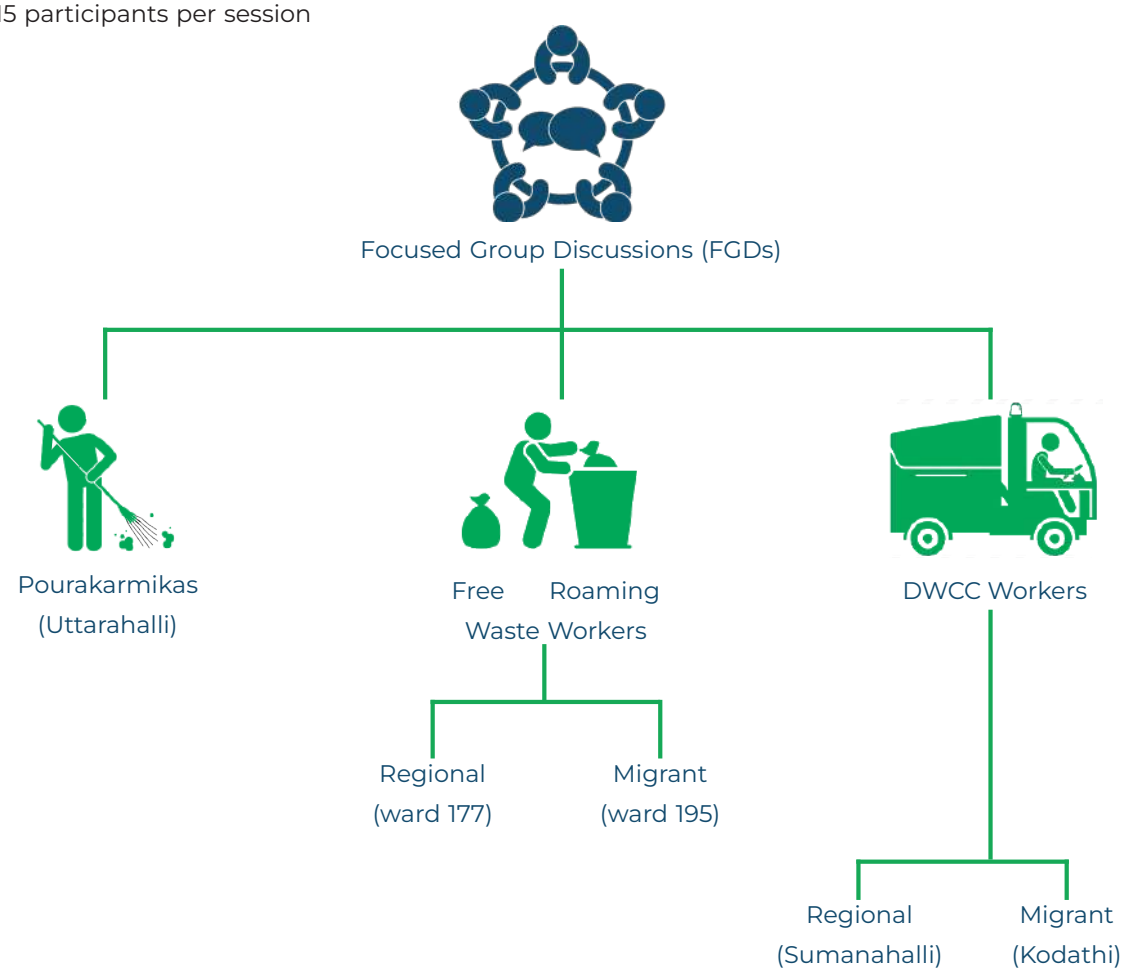
Study Sites and Sample Finalisation:

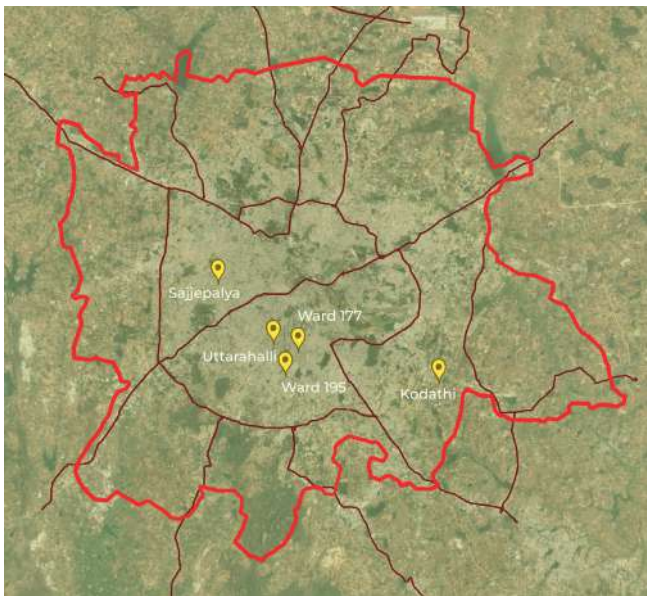
After consulting Hasiru Dala's Social Security Team, the final locations for the study were finalized on the basis of different worker categories, observations around exposure to heat as well as the willingness and interest of the community members to participate in our study.

Participants were selected through **purposive sampling**, facilitated by Hasiru Dala's long-standing relations with the community, and **ensured representation** across working group and worksite types. The sample included free-roaming waste pickers (both migrant and regional workers), Dry Waste Collection Centre (DWCC) workers (both migrant and regional workers) and pourakarmikas (municipal sanitation workers, mostly regional workers).

2. Focus Group Discussions with Different Worker Groups:

In the first phase of data collection, five FGDs were conducted, one in each locality, ranging from 10-15 participants per session





The locations for the five Focus-Group Discussions were:

1. DWCC Workers - Regional (Ward 177)
2. DWCC Workers - Migrants (Ward 195)
3. Free Roaming Waste Pickers - Regional (Summanhalli)
4. Free Roaming Waste Pickers - Migrants (Kodathi)
5. Pourakarmikas - Uttarahalli

We used a participatory, semi-structured format for the FGDs with each FGD lasting approximately 1 to 1.5 hours. We explored three core themes: heat's impact on work, health, and coping strategies. Sessions included an interactive body mapping to help participants identify and visually articulate how their bodies respond to excessive heat during work. This exercise facilitated both individual and group understanding of heat-related health risks. Insights from the FGDs were thematically coded to identify key patterns and location-specific issues.

3. Awareness Sessions on Heat-Stress Management:

Three participatory, rights-based heat health training sessions were co-developed by HeatWatch and Hasiru Dala for different waste worker groups in Bengaluru. Facilitated by a community medicine practitioner, Dr Archana S, the sessions used storytelling, case studies, and interactive activities to build awareness and practical coping strategies for heat-related health challenges.

4. Survey:

The final phase involved a structured survey administered to 154 **waste workers across three working groups and various work sites.** Using a combination of **purposive and convenience sampling**, the survey aimed to quantify patterns of working conditions, heat exposure, rest availability, income changes, and self-reported health symptoms among **154 waste workers**. The survey target had to be readjusted due to rains, flooding and relief work in sites of enquiry. The 43 survey questions aimed to supplement qualitative insights emerging from the focus group discussions (FGDs) and training and awareness sessions. By doing this, the survey sought to generate baseline data on heat impacts on health, productivity, income, and access to services. The survey was deployed separately in Kannada and Hindi and was enumerated by Research Consultants and Research Interns onboarded for the project.

Note on Ethical Considerations

Informed consent was obtained at every stage of data collection. Researchers ensured that participants fully understood the purpose of the study, the voluntary nature of their participation, and their right to withdraw or not answer at any point without any adverse consequences. To maintain confidentiality, no identifying personal information was recorded or disclosed in any part of the documentation or analysis. Anonymity was preserved in all notes and transcripts. Additionally, considering the study's focus on communities vulnerable to heat stress, special attention was given to the physical comfort and safety of participants. Focus Group Discussions (FGDs) and awareness sessions were organized in accessible, and shaded locations to avoid exposure to extreme heat during peak afternoon hours.

3. Awareness Session on Heat Stress Management for Waste Workers

3. Awareness Session on Heat Stress Management for Waste Workers

3.1 Introduction

The curriculum, developed by HeatWatch and adapted with Hasiru Dala's feedback for greater relevance and interactivity, was delivered by Dr. Archana S, a community medicine practitioner affiliated with St. John's Medical College Hospital, Bengaluru to ensure scientific accuracy and contextual relevance. It aimed to equip waste workers with foundational knowledge, practical response skills, and a collective framework for navigating heat-related occupational health challenges.

3.2 Purpose and Approach

The primary objective of the session was to increase identification capacity and recognition of heat stress and other heat-related illnesses as a serious occupational health issue among waste workers, and to foster agency through basic first-aid training, symptom recognition, and low-cost coping strategies. A secondary goal was to enable workers to articulate connections between daily discomfort and broader systemic neglect—such as inadequate rest areas, lack of potable drinking water, and absence of protective infrastructure or gear.

The session used a participatory and rights-based framework that foregrounded workers' experiences. The session was conducted in participants' native language (Kannada or Hindi, with team members offering Bengali translation) and participants shared their personal experiences of heat exposure, thereby allowing the facilitators to build technical knowledge on a foundation of lived realities. The format allowed for peer exchange, reflection, and clarification, rather than unidirectional instruction.

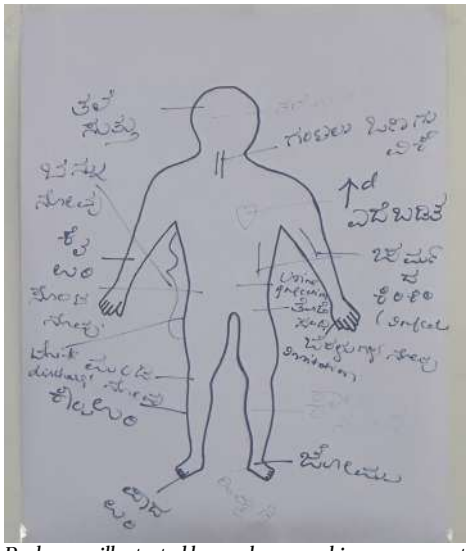
3.3 Participant Profile and Facilitation

The session brought together 15 to 25 participants representing three major waste worker categories in Bengaluru: DWCC workers, pourakarmikas, and free-roaming informal waste pickers. The session took place in an informal, accessible venue.

Researcher noting areas where participant experiences pain while working in extreme heat

3.4 Curriculum and Pedagogical Structure

The session was structured around **five core segments,** each reinforcing a different aspect of heat stress management. Although time-bound, the curriculum maintained a balance between biomedical information and contextual storytelling. The initial segment used ice-breakers and shared anecdotes to build trust and encourage dialogue. Participants recounted their own experiences of working during peak heat, which normalised discussion of health challenges typically ignored in public discourse.



Body map illustrated by workers, marking areas most affected by extreme heat

Case studies were presented to ground technical learning in local experience. These case studies were developed from the preliminary insights we observed from the focus group discussions. One case study, for example, detailing the story of Prabha, a DWCC worker suffering from kidney stones due to dehydration and lack of sanitation access, illustrated the intersection of heat stress, gender, and inadequate infrastructure. Another, that of Radha[1] a contract pourakarmika with chronic fatigue and exposure-related illnesses, highlighted how lack of formal benefits, delayed wages, and the absence of protective gear increase vulnerability to heat-related complications.

Following this, **a participatory body-mapping exercise** was conducted to help workers identify where and how they experience symptoms of heat stress. This visual method allowed immediate engagement and categorisation of symptoms into dehydration, heat exhaustion, and heat stroke. Symptoms such as dizziness, confusion, nausea, muscle cramps, and fainting were discussed in terms of severity and appropriate responses. The session also clarified when and how to seek emergency assistance, especially in suspected cases of heat stroke. The final component of the session involved **small-group simulations of real-life scenarios** requiring immediate response. These drills reinforced simple, actionable steps such as relocating an affected person to shade, using damp cloths to cool the body, administering oral rehydration solutions, and calling emergency services. Participants responded actively, demonstrating that practical role-play improved retention and confidence in handling emergencies.

3.5 Outcomes and Reflections

The session contributed to a measurable increase in awareness about the early signs of heat-related illnesses and when to treat them as emergencies. Participants reported a better understanding of the difference between manageable symptoms like dehydration and life-threatening conditions like heat stroke. Many also identified behaviours they could change immediately, such as increasing water intake, recognising fatigue as a warning sign, and checking on coworkers during peak heat hours.

Importantly, the session created space for structural critique. Workers reflected on the absence of drinking water, toilets, shaded rest areas, and protective clothing at their workplaces. Several identified the need for institutional—government and private—-recognition of heat stress as an occupational hazard and expressed interest in collective bargaining for improved safety measures.

Rather than individualising responsibility, the session encouraged a shift toward peer support and advocacy. It positioned heat resilience not only as a matter of personal behaviour but also as a question of workplace rights, infrastructure, and policy.

1 Pseudonym used to protect the identity of the participant


waste workers
training
heat combat
discussion
body mapping
FGDs

4. Focus Group Discussions (FGDs)

4.1 FGD 1: DWCC Sorters
(Regional Workers, Predominantly Women)
Location: Ward 177 DWCC in JP Nagar

Nature of Work

- Tasks are physically intensive and repetitive, involving manual sorting, stacking, and management of waste materials.
- The workplace is semi-enclosed without mechanical ventilation or cooling systems. Work is also carried out in the open—sometimes under the shade of a tree or ad-hoc provisions like tarapulin sheets, often without any protection from the sun.
- Work hours are long, typically from 9 AM to 7 PM, without any scheduled breaks during peak heat hours. While short water and lunch breaks are integrated into routines, workers still experience cumulative fatigue caused by high ambient temperatures, and prolonged exposure to sun working outdoors.
- Incomes range from Rs 550 to Rs 600 a day.

Impact of heat on productivity and health

- Workers shared a noticeable decline in productivity from sorting approximately 70-75 kilograms per person per day in winter to around 50 kilograms in peak heat conditions. ***"March, April and May–these three months-very difficult to withstand heat-it's unbearable"***
- Common symptoms: Dizziness, loss of appetite, headaches, and nausea were experienced by workers. Workers shared that sorting in such conditions often leads to vomiting and severe fatigue by midday, particularly when appetite loss results in insufficient caloric intake during work hours. ***"Heat has made our work more difficult, extreme heat makes us more thirsty, we drink a lot of water, so we don't feel hungry and led to vomits"***
- Serious health issues such as kidney stones were reported by workers allegedly due to sustained dehydration. Access to functional sanitation remains inadequate, with no running water in the amenity's toilet, forcing workers to rely on stored water provided by the operator. These constraints reduce the quantity of water intake further, compounding the risks of heat-related illness.
- Most rely on local pharmacies for self-medication, pointing to a gap in occupational health coverage and primary healthcare access.

Coping and Institutional Gaps

- Makeshift approaches: Male workers occasionally erect tarpaulin sheets to create shaded workspaces, workers consume more water or take brief rests in shaded corners of the amenity.
- Absence of formal guidelines or adequate employer-provided support structures to address heat exposure.
- Protective equipment is either unavailable or unsuitable for the climate. Workers noted that cotton gloves and aprons, though distributed, are often set aside

Researchers and FGD participants at Ward 177 DWCC

due to the discomfort in hot weather, triggering rashes and breathlessness.***"The public and community will never realize the importance of our work, never treat us like humans, unlike the other workers groups like construction etc."***

- Undervaluation and invisibility: Workers expressed that they are not accorded the same respect or visibility as other informal labourers, such as those in construction.
- Additional costs arise due to increased spending on cool drinks, electricity, and even medical debt
- Despite the risks, none of the workers reported leaving their jobs due to heat.

4.2 FGD 2: Free-Roaming Waste Pickers On Vehicles (Migrant Workers, Mixed Gender)

Location: Kodathi

Nature of work

- The waste pickers in Kodathi, primarily migrants, collect waste via vehicles and work in highly informal and unregulated conditions, with long, erratic hours for men, ranging from 5 AM to 7 PM, based on availability and access to valuable waste.
- Women juggle sorting collected waste with unpaid domestic responsibilities, some engage in sorting independently as unpaid family workers while some work under informal employer arrangements.
- Income ranges from ₹500 - ₹1,000 per day, insufficient due to rising costs.
- Workers take a break for an hour or two usually between 12 and 1 PM for lunch (coinciding with peak heat). A worker said, ***"Work is not something to be ashamed about",*** a sentiment that underlines pride and dignity while engaging in waste work.

Impact of heat on work

- Workers reported that heat exposure has worsened, with summer beginning earlier in the season (March), and becoming more intense around midday. Waste pickers are doubly exposed: to ambient heat and to the heat generated from the waste itself, especially while sorting. ***"Kachre ka bhi bhaap" (Even garbage emits heat)"***
- Lunch often coincides with peak heat, but breaks are also dictated by need and workload. Male waste pickers rest under trees or in shade during peak heat on their waste picking routes, but share that ***"Zyada jhaad nahi hai" (There isn't enough shade)***
- Women face compounded heat exposure both indoors and outdoors, first during domestic chores (cooking with gas or chulhas) and then while sorting waste ***"Sarr dhakk ke kapade dhote hain" (Covering the head while washing clothes) "Tabiyat kharab hoti hai" (Our health worsens)***

Impact of heat on health

- Frequent health complaints: Headaches, burning eyes, fainting, dehydration, and gastric issues. Chronic back and knee pain are prevalent due to physically strenuous work.
- Health-seeking behaviour is constrained. Women waste workers often avoid hospitals. Private clinics are preferred despite the cost, particularly for children.
- Children's comfort is a major concern: some are sent to neighbours' homes with

Researchers and FGD participants at Kodathi

fans for relief also showcasing shared community understanding and avenues for coping with heat.

- Water access is limited. One family claimed to spend ₹10,000/month on water for 25 people and another ₹3,000 additionally in summer for extra water needs. Notably, bathing frequency has increased to twice a day, reflecting the intense discomfort, but also increasing water costs.
- Fans, once optional, are now indispensable. Fridges are also being seen as necessary. ***"Pankha chalega bhi toh garam hawa" (Even if the fan works, it blows hot air), hinting towards poor ventilation and impact of heat indoors in their homes.***

"We adjust" - a quiet refrain repeated often, reflecting adaptation out of necessity, not choice.

4.3 FGD 3: Pourakarmikas
(Regional Workers, Predominantly Women)
Location: Uttarahalli

Work conditions and daily routines

- Strict schedules: two shifts daily (6–10:30 AM, 11–2 PM) with only brief water breaks, group sweeping in teams of 3–4.
- Attendance is closely monitored and recorded three times daily through biometric.
- Very limited rest or flexibility, even during festivals—no formal adjustment of workload in heat. Their weekly time off includes a half-day on Wednesdays and Sundays.
- Many commute long distances (often 15 kilometers or more) from neighborhoods such as Hosakerehalli, Guballala, Gowripalya, Talaghattapura, Ittamadu, and KR Market, adding further strain to their daily routines.
- Incomes range from Rs 17,000 to Rs 19,000 a month but there are no provisions for provident fund or pensions, particularly critical for ageing workers with no alternative skills. Many lack permanent employment status.

Impact of heat on health and work

- Workers complained of high prevalence of headaches, dehydration, fatigue, urinary tract infections, skin rashes, and eye strain.
- Health coverage is mostly ineffective; schemes like ESIC and Ayushman Bharat are underutilized due to distance, bureaucracy experienced at listed clinics, and time-consuming nature of seeking care.
- Economic vulnerability is substantial: ***"In summer, expenses go up by ₹2,000, mostly on self hydration or children's demands for cool drinks."***

Coping, Infrastructure, and Support Gaps:

- Workers lack basic amenities such as dedicated drinking water stations, safe toilets, and private changing areas which add to discomfort during menstruation.
- Workers hydrate as much as possible, and rely on local cooling foods (ragi ganji, buttermilk).
- The PPE shirt is widely used and considered comfortable, but other protective equipment such as gloves and masks remains largely unused due to lack of comfort and habit.
- At work and at home, adaptation is severely limited due to lack of cooling.
- Workers' demand for shelters during rains and extreme heat, indicating the broader absence of climate-resilient infrastructure.

Researchers and FGD participants at Uttarahalli

4.4 FGD 4 : DWCC Workers (Migrants, all male)

Location: Ward 195 DWCC

Worker Demographics and Roles

- Most of the DWCC workers were male migrant workers from Barpeta and Guwahati in Assam. The exact number of workers remains unclear—flagged as a data gap. Workers are mainly split between DWCC sorters and DWCC drivers/helpers.
- Workers reported working long hours: early start (as early as 5:30 AM) and finishing work around 5 to 7 pm in the evening with peak periods sometimes requiring work until 10–11 PM. ***"Sometimes we leave at 5, sometimes at 6 or 7 in the evening." During peak periods, shifts can continue until 10–11 PM."***
- Heavy workloads fluctuate with seasonal festivals and waste types.
- Breaks are spread out throughout the day. Workers take a 5-10 minute tea break between 9:30 and 10:00 AM, lunch breaks and another tea break in the evening around 4:30 PM. Those working overtime until 11:00 PM are granted a 10-minute dinner break at 8:30 PM.
- Workers lack basic amenities: The DWCC shed is made of a tin roof sheet which traps heat with no electricity supply that adds to poor ventilation and discomfort during work. The DWCC has no on-site toilets (workers walk to a remote common room nearby for bathroom breaks).

Impact of Heat On Work and Health

- Rising temperatures have made sorting significantly harder. A worker noted, ***"It's become hotter, and sorting waste has become difficult because the waste heats up inside the bags, and steam builds up from the garbage."***
- Accumulated waste emits heat and foul odors as food residue in plastic packaging decomposes. One worker explained: ***"When garbage is piled up in one place, steam and a foul smell come out while sorting it."***
- Workers report physical discomfort, especially chest and body pain during heavy lifting. One worker explained, ***"When we work in the heat and lift heavy loads, our chest hurts, and the rest of the body aches too."***
- Workers also complain of burning sensations in the nose, frequent headaches, digestive problems due to irregular or skipped meals and skin-related issues.***"Due to working in extreme heat, we develop skin problems like burning, boils, and prickly heat,"*** one worker reported. Prickly heat, rashes, and peeling skin often affect areas like knees, elbows, back, and intimate regions due to sweat and friction from damp clothing. Loaders and helpers face additional symptoms, including burning urination (linked to dehydration), dizziness, weakness, loose motions, fevers, and muscle pain in legs, arms and lower back.

Coping, healthcare and suggestions

- Employers provide two water cans in summer, one in winter. But, water is consumed reactively rather than proactively—only when workers feel exhausted. Drivers , meanwhile, cope by carrying water on duty—***"We carry a 5-litre can of water with us,"*** one noted—and seek shade during the hottest part of the day: ***"When it gets too sunny, we have to rest under a tree for at least an hour."***
- **Workers also reported consuming** commercial energy drinks like "Sting" to sustain energy during long shifts. One worker noted that although such drinks provide a "sudden burst of energy," they recognise an immediate crash in energy levels afterwards.
- **Most use private clinics** because public hospitals are far and require documentation. As one worker put it:

"The government hospital is far from where we stay, so we go to private clinics." Most possess **Ayushman cards and ration cards**, but these are registered in their domicile states.

Researchers and FGD participants at Ward 195 DWCC

Worker Suggestions for Improvement

Workers urgently need electricity to power basic ventilation systems. Portable fans are preferred over head umbrellas or caps, which tend to fall off during loading and unloading tasks. Many also expressed a desire to replace the current tin-roof structure with a cement roof to reduce internal heat buildup and create a more tolerable working environment.

4.5 FGD 5 : Free-Roaming Waste Pickers On Foot (Regional Workers, Predominantly Women)

Location: Summanahalli

Nature of work

- Workers comprise primarily women free-roaming waste pickers on foot whose work starts early by 6:00 AM, waste is collected until around 12:00 PM, followed by an hour of sorting and a break from 1:00 PM to 2:00 PM.
- Waste pickers operate as own-account workers collecting, sorting and selling recyclable valuable waste and do not have formal employment relationships or contracts.
- They earn on the amount of waste sold, per kilogram, sometimes as low as ₹5-10 per kg. The payment varies based on the type of material collected: plastic fetches ₹10/kg, carton waste (locally known as rattu) is valued at ₹7/kg, and dense black plastic (gatti) earns ₹5/kg.
- This nature of the piece-rate system offers no job security, wage stability, or protection against income loss during extreme weather events.

Impact of heat on health and work

- Common problems include body pain, cramps, dizziness, headaches, and poor sleep. Mental distress due to financial pressure and body fatigue is also evident.
- Summer months further reduce their productivity from 15-20 kg to around 10 kg per day,
- Workers reportedly prefer private clinics as public healthcare is inaccessible or unavailable. Most were reportedly unaware of government health schemes or cards other than Aadhaar.

Coping Strategies and Challenges

- **Workers attempt to shift working hours to early mornings to avoid peak heat, however early waste collection (4 am or earlier) leads to risks of suspicion and harassment from the public and police as well as increased safety risks for women.**
- Workers take some protective measures like wearing full-sleeve clothing and covering their heads. Access to drinking water is unreliable, often dependent on shops, homes, or bakeries during work. Potable water is expensive and hard to access during summers.
- Workers requested assistance in transport via vehicles for travel to and from waste collection areas, drinking water tanks, and adjusted work timings to cope better with.

5. Survey Findings: Profile of the Workers

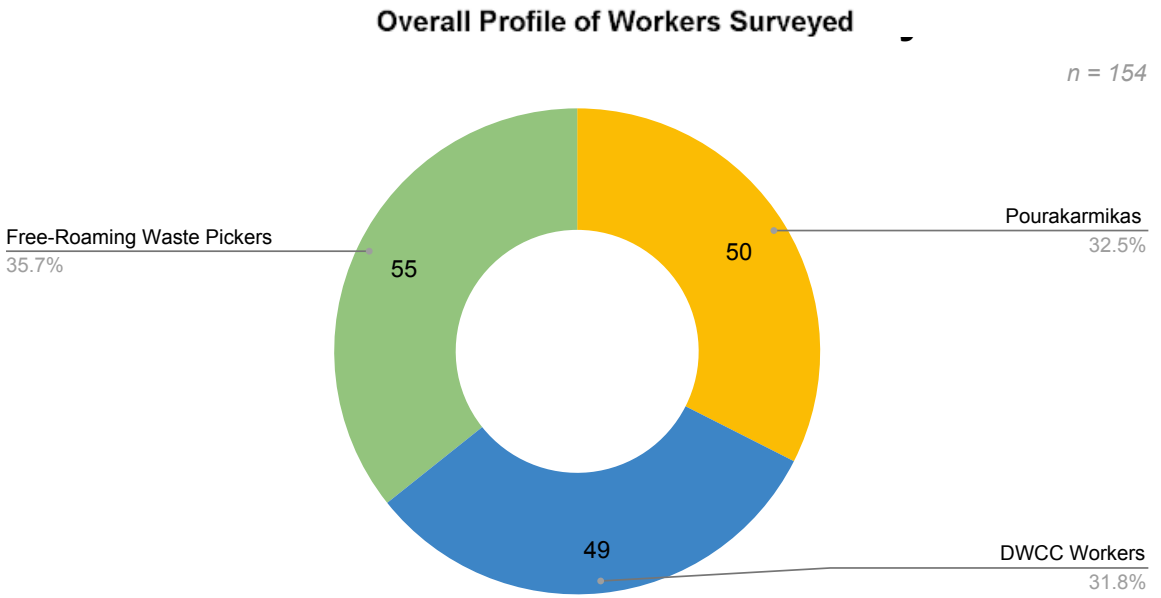
Vinod Sebastian for Saamuhika Shakti

5. Survey Findings: Profile of the Workers

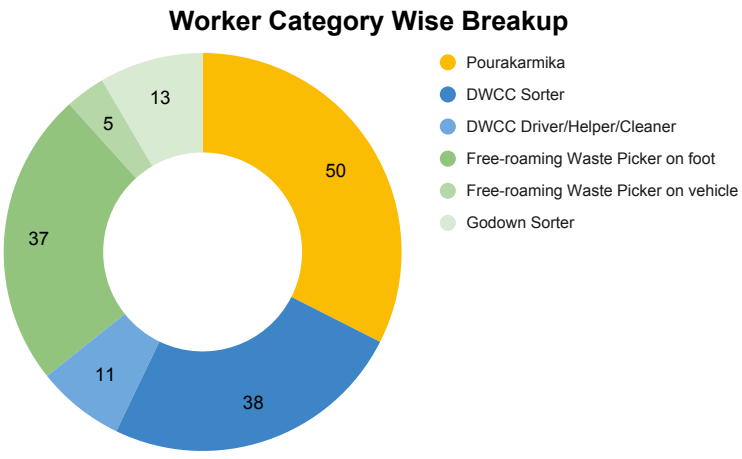
The 43-question structured survey was co-developed by the study team based on insights from HeatWatch's previous health perception survey questionnaire and based on consultations with the Hasiru Dala team and focus group discussions (FGDs) with waste workers. It was designed to capture a broad yet optional range of themes on how heat affects their work and health. The pre-selected options for each question were similarly informed by these early FGDs. The survey was conducted by the project's Research Consultant and Research Intern between April and June 2025.

5.1 Primary work

We surveyed and classified workers by worksite and nature of work. While not representative, the sample aimed to include diverse waste worker categories across Bengaluru. The survey included roughly equal numbers across three main groups: 35.7% (55) free-roaming waste pickers, 32.7% (50) pourakarmikas, and 32% (49) DWCC workers.



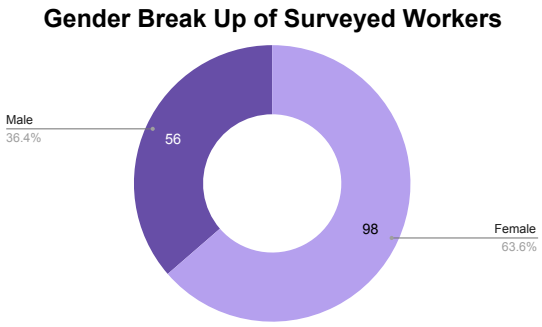
Further breakdown shows pourakarmikas as the largest group at 32.5% (50), followed by DWCC sorters at 24.7% (38) and free-roaming waste pickers on foot at 24% (37). Smaller shares included godown sorters at 8.4% (13), DWCC drivers/helpers/cleaners at 7.1% (11), and free-roaming waste pickers using vehicles at 3.3% (5). A detailed description about each worker category and their nature of work is given in Section 1.2.1 of this report.



5.2 Gender break-up

The gender distribution highlights a significant predominance of female workers within the surveyed waste workforce, with women making up two-thirds (98 out of 154) or 63.6% of the sample.

Male workers comprise 36.4% of the sample, representing a smaller yet still significant portion. Their participation in the waste sector reflects gendered roles, evident in the worker-category breakdown.



Worker-category wise breakdown: Women form the majority among pourakarmikas, DWCC sorters and free-roaming waste pickers on foot. Pourakarmikas (32.5%), were 46 females and 4 males, followed by DWCC sorters (24.7%) with 22 females and 16 males and free-roaming waste pickers on foot (24%) with 28 females, 9 males. Godown sorters at 8.4% had 2 females and 11 males, DWCC drivers, helpers, cleaners at 7.1%, all of whom were male, and free-roaming waste pickers using vehicles 3.3%, where all 5 were males.

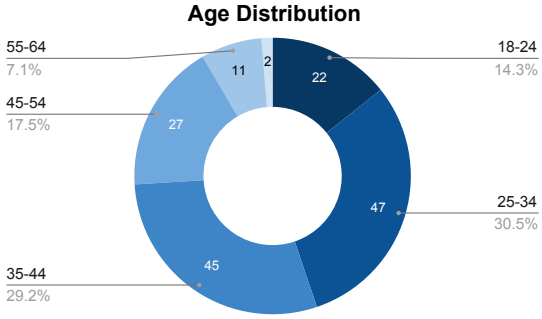
This shows that men dominate roles involving vehicles, machinery, and larger waste volumes—like godown sorting, driving, and mechanized collection—while women are concentrated in the least mechanized waste work, highlighting clear gendered divisions in the sector.

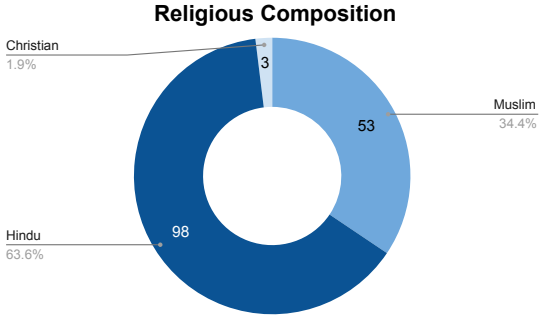
5.3. Age Distribution

The surveyed waste workforce is predominantly composed of working-age adults, with nearly 60% between 25 and 44 years. The largest segment is 25–34 (30.5%), followed by those aged 35–44 (29.2%). Workers aged 45–54 make up 17.5%, while only 14.3% are between 18–24 suggesting limited recent entry of younger workers. Older individuals—aged 55–64 (7.1%) and 65+ (1.3%)—form a small fraction, reflecting the physically demanding nature of the work. These trends highlight the central role of younger and middle-aged adults in sustaining waste services and underscore the need for targeted policies on occupational health, safety, and career progression within this demographic.

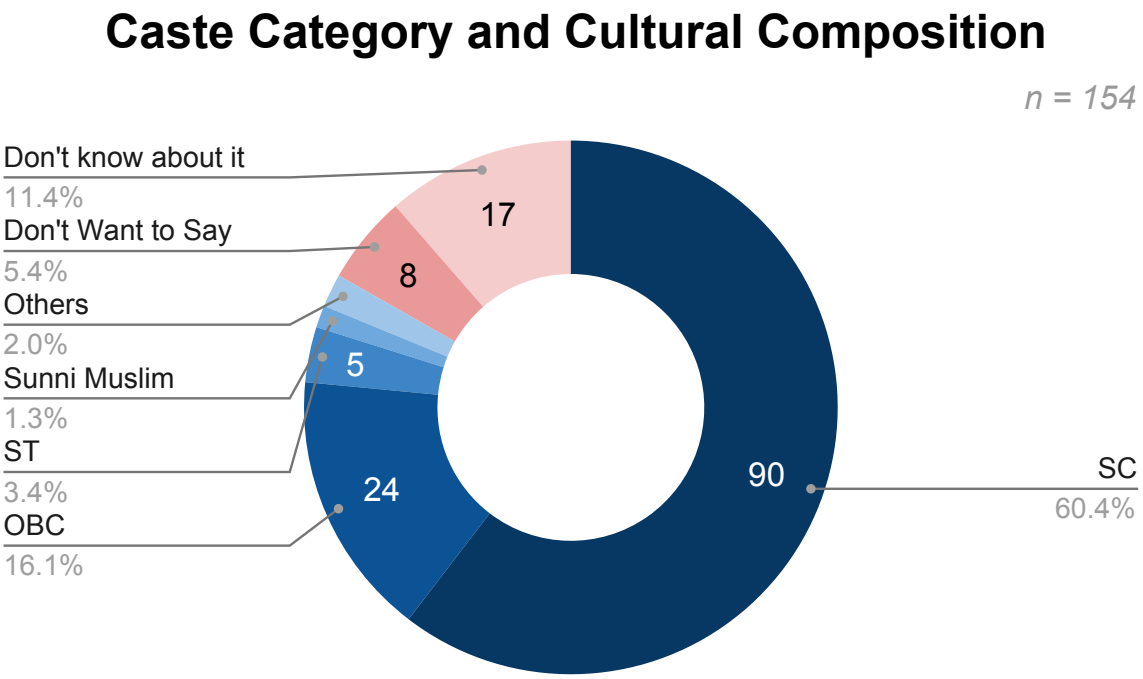
5.4. Religion

The religious composition of surveyed waste and sanitation workers reveals a predominantly Hindu workforce (63.6%), with Muslims forming the second-largest group (34.4%). Christians constitute only 1.9%. This distribution highlights the sector's socio-cultural composition and its importance as a livelihood source for Hindu and Muslim communities. Recognising this diversity is essential for designing inclusive policies, respectful workspaces, and community-oriented programmes that consider religious and cultural practices.





5.5. Caste Category and Cultural Composition



The caste category distribution illustrates an overrepresentation **of workers from Scheduled Caste (SC) communities making up 60.4% of the sample.** This trend reflects the long-standing association between caste and sanitation work in India, where **SC communities have been historically forced to shoulder a significant share of waste work responsibilities. Other Backward Classes (OBC) comprise 16.1%** of the sample, indicating some diversification within the workforce, followed by 3.4% from ST communities and 1.3% identifying as Sunni Muslims.

Meanwhile, 5.4% of our respondents preferred not to disclose their caste and 11.4% of respondents shared they were unaware about their caste category. The data clearly highlight the **persistence of caste dynamics** in the waste sector, reinforcing the urgent need for affirmative action policies, stigma reduction, and improved working conditions for SC workers.

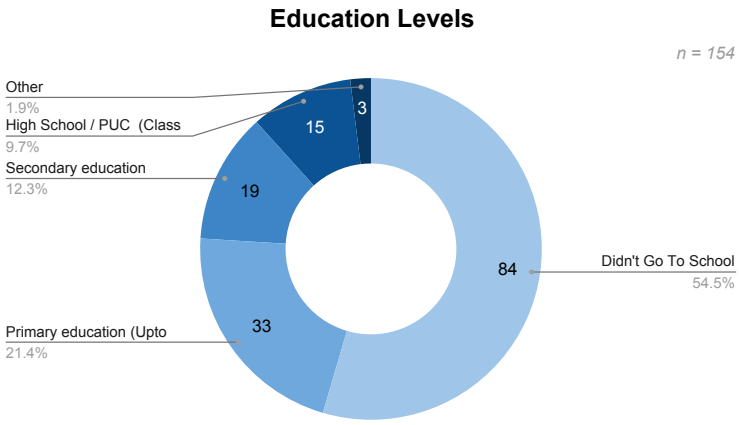
5.6. Domicile

Waste workers surveyed represented a predominance of intra-state regional workers from Karnataka with around 38% workers representing inter-state migrant workers. 72% (111) respondents were from Karnataka, followed by 14% from Assam (21 respondents) and 11% from West Bengal (17 respondents). A small number of respondents came from Uttar Pradesh (2 respondents, ~1%), while migrants from Delhi, Meghalaya, and Tamil Nadu contributed one response (about 0.6% each). All 50 pourakarmikas surveyed (100%) were from Karnataka. Of the 49 DWCC workers surveyed, 41% were from Karnataka (20 respondents), followed by 35% from Assam (17), 22% from West Bengal (11), and 2% from Tamil Nadu (1).

This shows that while Karnataka had the largest share, Assam and West Bengal together formed more than half the sample. Among the 54 free-roaming waste pickers surveyed, 76% were from Karnataka (41 respondents), followed by 11% from West Bengal (6), 7% from Assam (4), 4% from Uttar Pradesh (2), and 2% from Meghalaya (1). This shows a strong concentration of respondents in Karnataka, with smaller shares from other states.

5.7. Education

A significant **54.5% had never attended school,** highlighting the link between educational exclusion and waste work. Another 21.4% had only primary education (class 5 or below), followed by 12.3% with secondary education (class 6–8). Just 9.7% had reached high school or pre-university levels (class 9–12), and 1.9% fell into the "other" category, suggesting non-traditional educational paths. This data reflects **a workforce largely deprived of formal education**, limiting their social and economic mobility, access to training, and increasing occupational health and safety risks on the job. It emphasizes the **urgent need for targeted educational interventions** that focus on literacy, vocational training, and skill development as well as investments in education of future generations to uplift and enable long-term economic and social empowerment of waste workers.

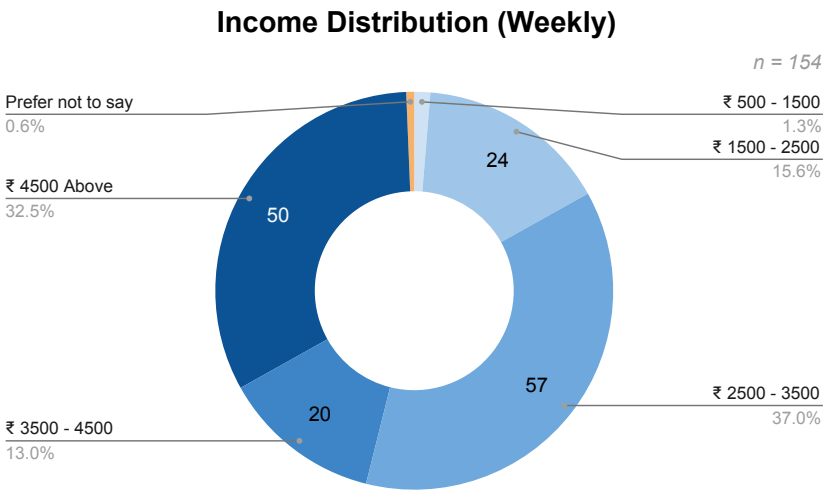


5.8. Location of Work

Surveyed workers reported **diverse work locations**, with the largest shares from **Ward 177** (23 workers, ~15%), **Ward 184** (17, ~11%), and **Ward 194** (12, ~8%). Smaller but notable groups worked at **DWCC offices in wards 192 and 195** (11 workers each, ~7% each). Other locations—including areas like Begur Kopa Road, Shakambari Nagara, Vishwa Priya Layout, and parts of Nagarabhavi—each had between 2–7 workers (ranging from ~1–5%). Additionally, many other wards like and neighbourhoods were represented by single respondents (~0.6% each), highlighting the wide geographic spread of work sites across the city.

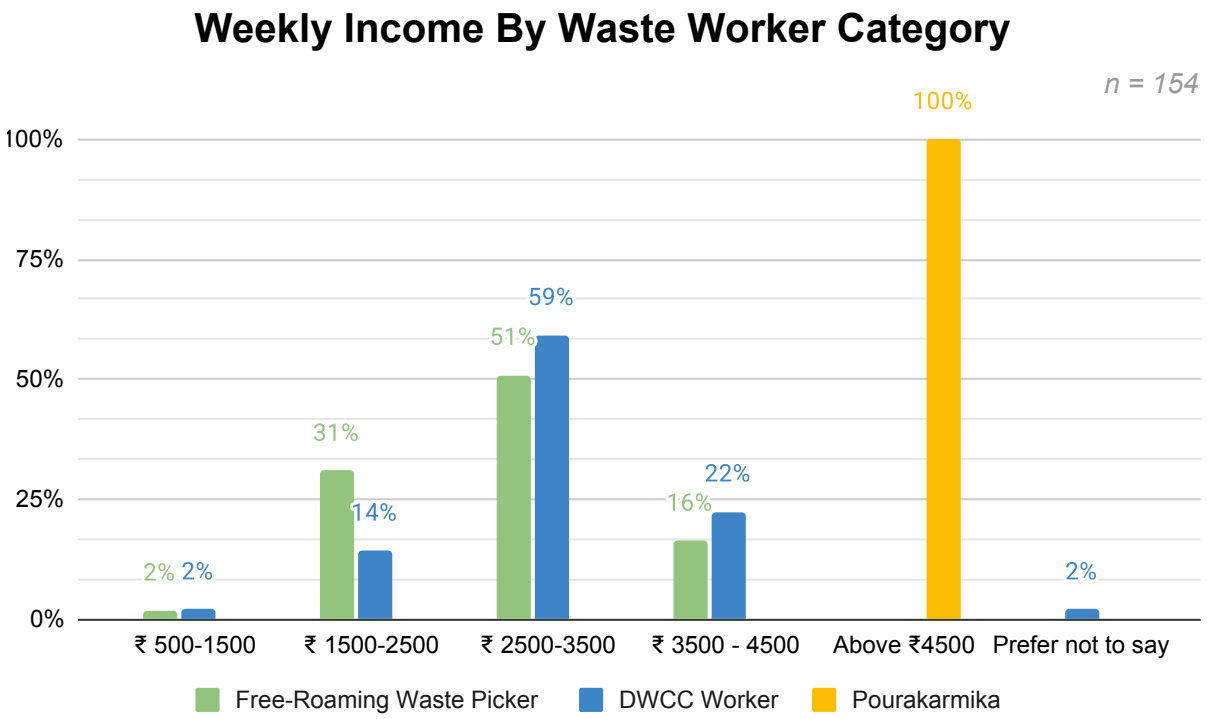
5.9. Individual weekly income

We asked workers their weekly incomes instead of monthly incomes because **most workers are paid on a weekly-basis.**



The largest share of surveyed workers **(37%) earn between ₹2,500-3,500 per week,** followed by 32.5% of workers who earn above **₹4,500.** Meanwhile, 15.6% of the workers fall in the Rs. 1,500-2,500 range, and 13% earn Rs. 3,500-4,500 per week. Only 1.3% report earning Rs. 500-1,500 per week, highlighting the presence of a small but highly vulnerable group. The "prefer not to say" category is negligible (0.6%), suggesting overall transparency about income levels. This data reflects a workforce with **varied income levels, pointing to a mix of formal and informal roles** and underscoring the need for fair wage policies and improved income stability across the sector.

5.9.1 Weekly income by worker category



- All surveyed pourakarmikas reported earning above ₹4,500 per week, translating to monthly incomes of ₹18,000 or more. In contrast, none of the free-roaming waste pickers or DWCC workers reported earnings in this range.

- A substantial ~84% of free-roaming waste pickers and 75.5% of DWCC workers earn less than ₹3,500 per week.
  - » Most free-roaming waste pickers (~50%) and DWCC workers (~60%) fall within the ₹2,500-₹3,500 weekly range, or ₹10,000–₹14,000 per month.
  - » More than a quarter (~30%) of free-roaming waste pickers earn ₹1500-2500 / week and only about 16% earn between ₹3500-4500 / week.
  - » Almost a quarter (~22%) of DWCC workers earn between ₹3500-4500 / week and only 2% responded to earning ₹1500-2500 / week .

- The income disparity is visible between municipally-contracted pourakarmikas (where all workers earn above ₹4500 / week) and self-employed or informally employed free-roaming waste pickers and DWCC workers (where none earn above ₹4500 / week and majority earn less than ₹3500 / week).

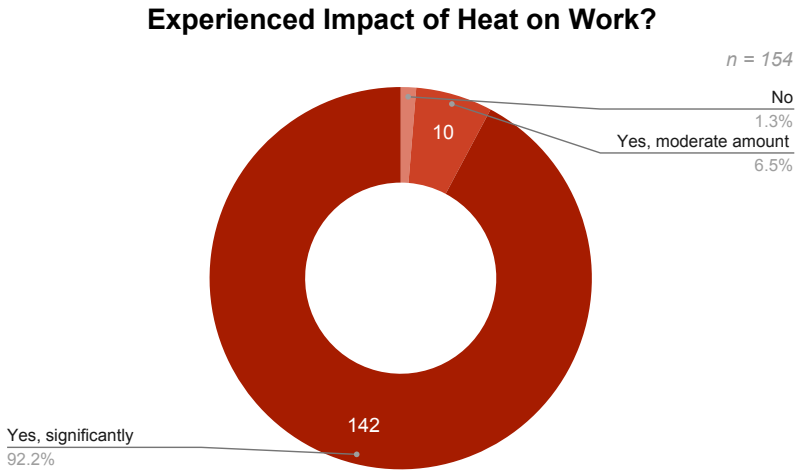
6. Impact of Heat on Work

Vinod Sebastian for Saamuhika Shakti

6. Impact of Heat on Work

Note: The questions in this section were optional, and as a result, the number of respondents varies across different indicators. All findings should be interpreted in light of these differing baselines, which are mentioned in each response.

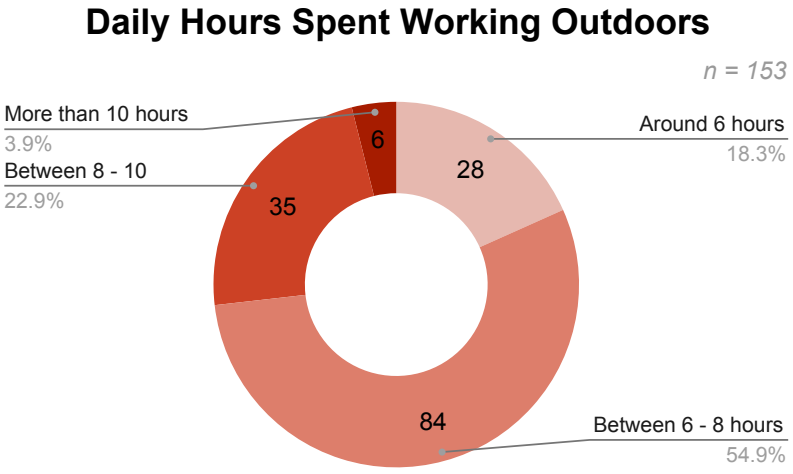
6.1 Do waste workers feel an impact of heat on work?



92.2% waste workers,142 out of 154, reported **experiencing a significant increase** in the impact of heat on their work. Another **6.5% noticed a moderate increase**, while only a small fraction, **1.3% felt there had been no change**. This **strong consensus** reflects the growing challenges posed by rising temperatures and extreme heat conditions.

6.2. Outdoor Work Hours from March to June:

A significant majority, over 81% of waste workers spend more than 6 hours per day working outdoors during the peak summer months.



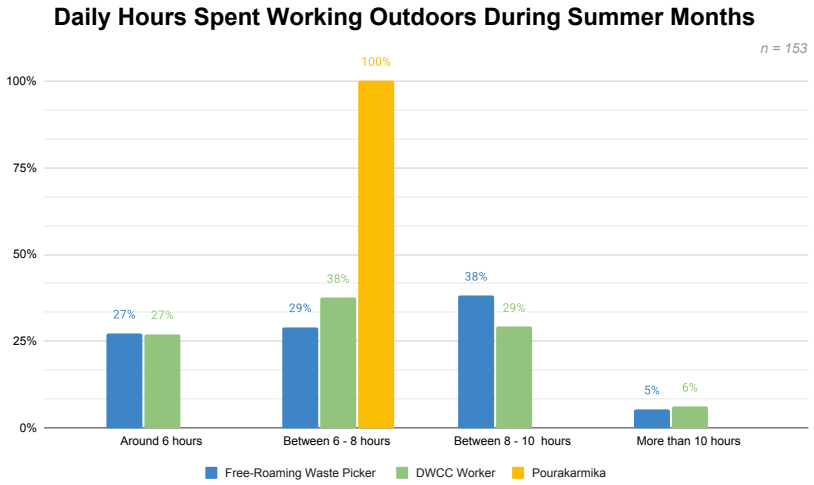
Over half, 54.9%, reported working between 6–8 hours outdoors daily. Nearly a quarter, 23.0%, work 8–10 hours per day outdoors. 3.9% endure more than 10 hours of outdoor work each day. This points to sustained heat exposure. Only 17.8% manage to keep their outdoor work to around 6 hours per day.

6.2.1 Waste worker category - wise breakdown:

Free-roaming waste pickers spent the highest average time outdoors (8.05 hours), followed by DWCC sorters (7.51 hours) and then pourakarmikas (7 hours). The following observations were noted:

- **Pourakarmikas:** All pourakarmikas, responded to working between 6 to 8 hours only, displaying consistency in working hours.
- **DWCC Workers:** Almost half, i.e 18 out of 48 of the surveyed DWCC Workers spend between 6-8 hours (~48%) working outdoors, followed by ~29% who work between 8-10 hours and ~27% who work around 6 hours.

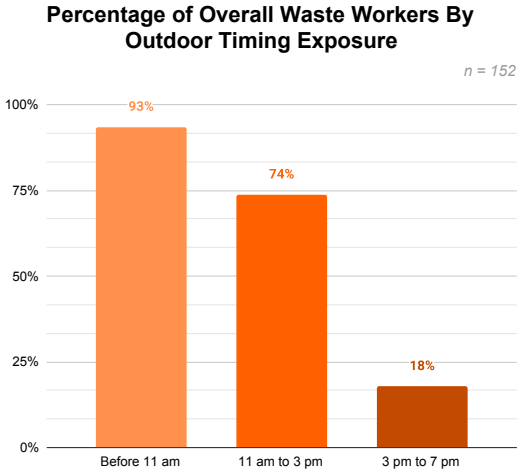
- **Free-Roaming Waste Pickers:** Within free-roaming waste pickers, more than a quarter i.e. 21 out of 55 spend 8-10 hours (~ 38%) outside, followed by 16 and 15 workers starting working between 6-8 hours (~29%) and around 6 hours (~27%) respectively and ~5% working beyond 10 hours.



» Within these free-roaming workers, waste pickers on vehicles spend a greater proportion of time working outdoors (8-10 hours) when compared to free-roaming waste pickers on foot.

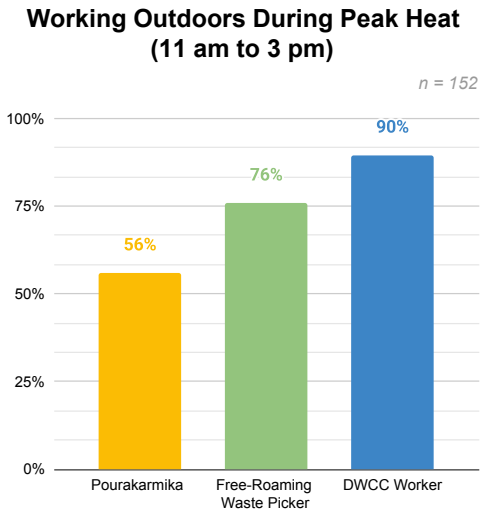
» A small but highly vulnerable section of 8% of waste pickers on foot spend more than 10 hours outdoors.

6.3. Outdoor work timings



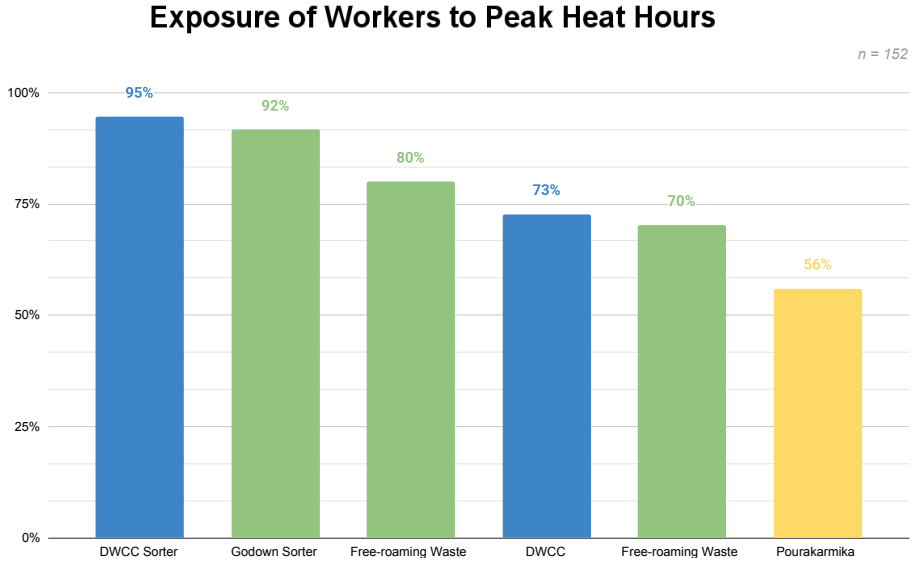
In addition to stating overall working hours, **we asked workers to specify the timings during which they were outdoors.** An overwhelming majority – about 93% are outdoors before 11 am, indicating that most workers start their day early. Almost **74% reported being outside between 11 am and 3 pm**, which is typically the hottest part of the day. A smaller group, roughly **17.7%**, continue working outdoors between 3 pm and 7 pm. This pattern shows that while early morning is the most common work period, **a significant number of workers are exposed to extreme heat during midday hours,** which raises concerns about their health.

6.3.1 Peak-heat exposure: Waste worker category - wise breakup



Between the three worker categories, **89% of DWCC workers, 76% of free-roaming waste pickers and 56% of pourakarmikas** are exposed to heat during 11 am to 3 pm

6.3.2 Peak-heat exposure: nature of worker - wise breakdown



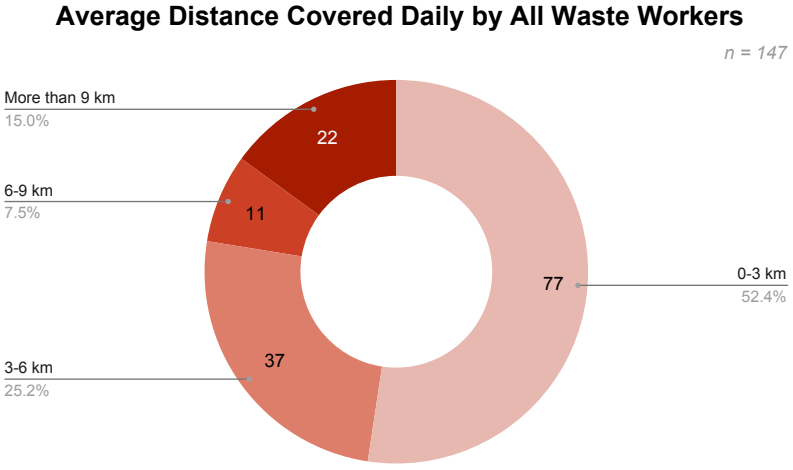
More than half of all waste workers are exposed to extreme heat hours from 11 am to 3 pm due to the nature of their work.

A key finding is that **waste sorters in both DWCCs and godowns had the highest exposure to peak heat hours,** with 95% and 92% respectively working between 11 am and 3 pm. This may be due to their working conditions where unlike municipally-engaged pourakarmikas and own-account free-roaming waste pickers on foot or vehicles, sorters are not mobile workers and often sit in one place and segregate waste for prolonged hours.

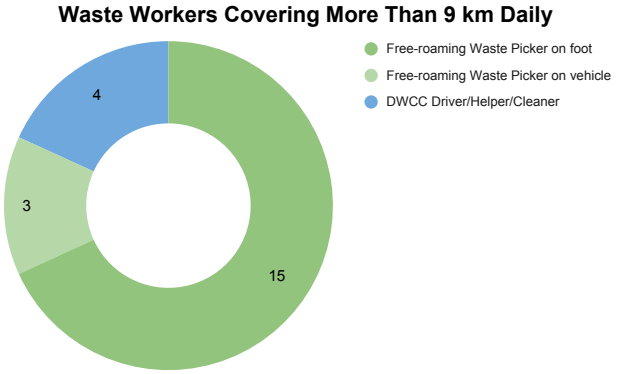
Exposure to peak heat during work hours indicates poor and inadequate infrastructure at the workplace. Sorters are also predominantly employees which means they do not have decision-making power over pausing or readjusting their work hours compared to free-roaming waste pickers who are own-account workers and have more agency over their working hours and often start earlier in the day to avoid exposure to peak heat hours. However, sorters' working conditions may differ between different worksites. Other waste workers also remain vulnerable to heat exposure: **80% of free-roaming waste pickers on vehicles, ~73% of DWCC drivers/helpers/ cleaners, ~70% of free-roaming waste pickers on foot and 56% of pourakarmikas** also reported being exposed to peak heat between 11 am to 3 pm.

6.4 Average distance covered by waste workers daily

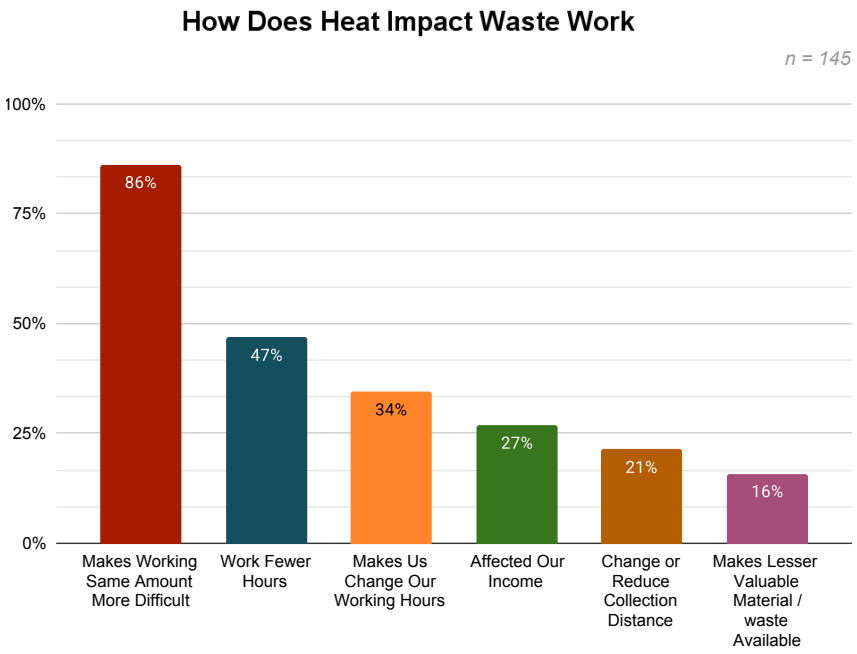
The majority of waste workers - **just over half (52.4%) - cover up to 3 kilometers during their workday. About a quarter of the workers (25.2%) reported walking between 3 and 6 kilometers,** A smaller group (7.5%) covered between 6 and 9 kilometers. 15% workers surveyed said they **cover more than 9 kilometers.**The fact that nearly one in six workers covers more than 9 kilometers daily is particularly striking and underscores the demanding nature of their work.



Out of 22 people who responded to covering a distance of more than 9 km daily, 15 were free-roaming waste pickers on foot, and 4 were DWCC driver/cleaner/helper and 3 were free-roaming waste pickers on vehicles. The greatest daily average distance covered was for DWCC driver helper, cleaner (7.22 km), followed by free-roaming waste pickers on foot (6.97 km). Pourakarmikas travelled an average of 2.97 km daily.



6.5 Nature of impact of heat on work



- **Working the same amount is now more difficult: 86%**

86.21% of waste workers (125/145) said that the same amount of work now takes more time and effort due to heat. This was highest among free-roaming waste pickers on foot where 94% (35/37) said this. Among Pourakarmikas, 88% (44/50) said that their work has become more tiring. Among DWCC workers, this was echoed by 82% (9/11) of drivers/cleaners/helpers,66% (25/38) of DWCC sorters, around 75% of godown sorters (9/12) and 60% of free-roaming waste pickers on vehicles (3 / 5).

- **Reduced working hours: 47%**

Overall, ~47% (68/145) of waste workers said that heat makes them work fewer hours compared to cooler months. This was highest among free-roaming waste pickers with ~ 80% (43/54) reporting the same, followed by almost half or ~49% of DWCC workers. Only 2% of pourakarmikas reported working reduced hours, highlighting fixed regularised hours. A further breakdown shows that 91% godown sorters (91%), 80% free-roaming waste pickers on vehicle (80%) and 75% free-roaming waste pickers on foot reported that heat makes them work reduced hours.

- **Changing working hours: 34%**

Overall, around 34.4% (50/145) said they have changed their working hours to cope with heat This includes 63% of free-roaming waste pickers and 32.6% of DWCC workers.The reporting was highest amongst free-roaming waste pickers on vehicles where all 5/5 of the respondents shared that they change their working hours during summers. 62% of free-roaming waste pickers on foot and 50% of godown sorters also reported changing working hours. However, this was relatively low amongst DWCC workers with only 36% of DWCC drivers/helpers/cleaners and 31% of DWCC sorters reporting the same. None of the pourakarmikas reported changing work hours.

- **Affected incomes: 27%**

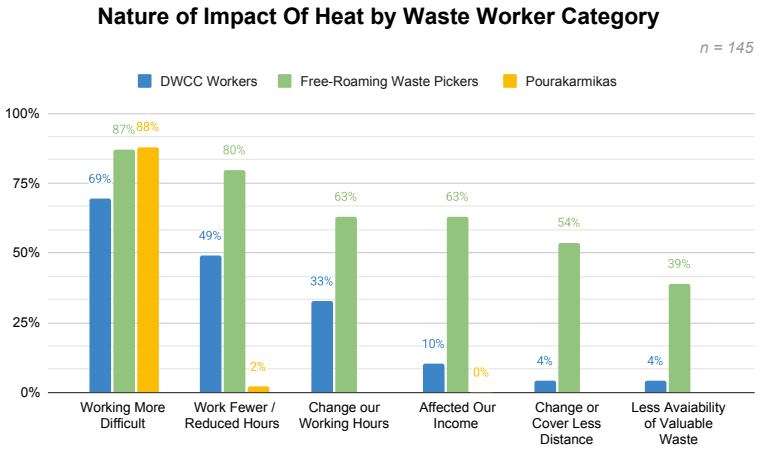
More than a quarter, or 26.9% (39/145) said their income has been affected because of heat. Overall more than 62% of free-roaming waste pickers shared affected incomes during summer along with 10.2% of DWCC workers. None of the pourakarmikas reported any changes in their incomes. Within free-roaming waste pickers, impact on income was highest free-roaming waste pickers on foot, where ~73% (27/37) reported income loss, followed by around 41% (4/12) of godown sorters and 40% of free-roaming waste pickers on vehicles. About 10% DWCC sorters and 9% DWCC drivers/helpers/ cleaners reported income loss.

- **Changing waste collection routes: 21%**

Around 21.3% (31/145) mentioned changes in their collection routes or covering less distance during heat. This was highest among free-roaming waste pickers with more than half or 53.7% (29/54) reporting this. 67.5% waste pickers on foot and 80% of waste pickers on vehicles also reported changing collection routes. Around 18% of DWCC drivers reported changing routes. None of the pourakarmikas who are assigned designated routes reported changing waste collection routes.

- **Lower availability of valuable material: 16%**

Overall, 15.8% (23/145) said there has been a drop in the availability of valuable materials for resale. 60% free-roaming waste pickers on vehicles reported lower availability of valuable material during summer, followed by 40.5% (15/37) free-roaming waste pickers on foot and 25% of godown sorters. 5% of DWCC sorters also reported the same

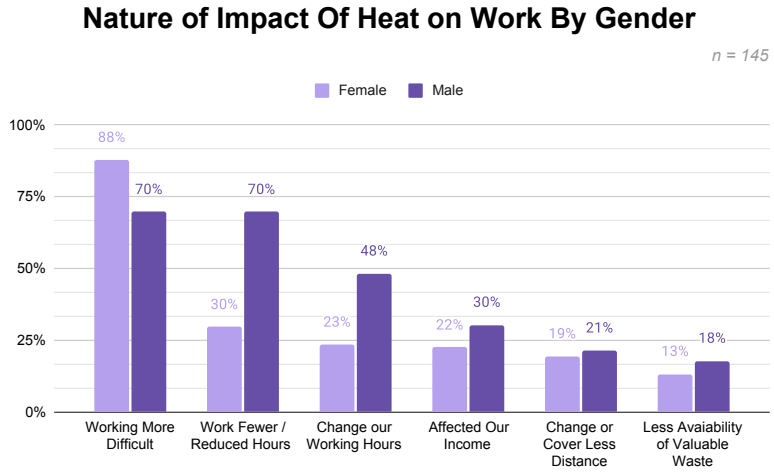


Among the three worker categories, pourakarmikas mostly reported that heat made the same amount of work feel more tiring and difficult (88%). However, very few reported being able to adapt their work patterns: just 2% reduced working hours, and none reported changing their work timings, income loss, or changes in collection routes or material availability. Their fixed duty hours, designated routes, and more formal employment structure meant they experienced heat stress but had limited flexibility to adjust their workday.

DWCC workers also shared that heat made work more exhausting and difficult, with around 87% reporting this impact. Compared to pourakarmikas, more DWCC workers were able to adapt by reducing working hours (49%) and changing work timings (33%). Few workers reported income losses (10%) or changing collection distance and fewer valuable materials (around 4% each). Within this group, drivers and helpers had slightly higher flexibility to adjust than sorters, but overall, site-based work still constrained adaptation.

By contrast, free-roaming waste pickers were both the most affected by heat and the most likely to adjust their work. Around 87% found work more tiring (94% of those on foot), and large majorities reduced working hours (80%) and shifted work timings to cooler hours (63%). 63% also reported significant income losses: 73% of those on foot, and around 40% of those on vehicles and godown sorters. In addition, over half changed their collection routes and many noticed a drop in available

valuable material, especially those on vehicles (60%). While their informal and mobile work structure allowed them to adapt their schedules and routes, it also made them far more vulnerable to income instability and material scarcity during heatwaves.

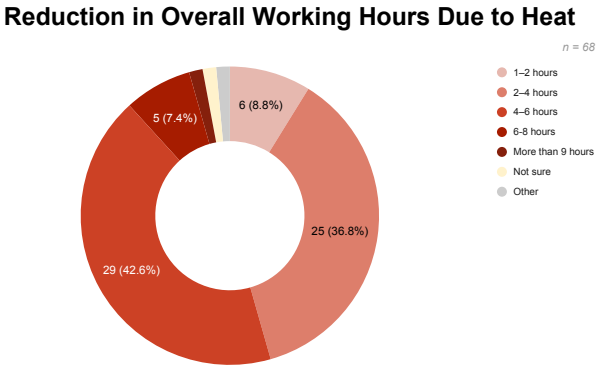


Across all categories, both female and male waste workers reported that heat made work more tiring and difficult, though this was especially pronounced among women: nearly 88% of women compared to around 70% of men shared that the same amount of work now feels harder under heat stress. However, **men were more likely to adapt their workday** by changing or reducing hours: around 70% of men reduced working hours versus only about 30% of women, and nearly half (48%) of men changed work timings compared to just 23% of women.

Men were also slightly more likely to report direct economic impacts: 30% said their income was affected compared to 22% of women, and a higher share noted a drop in the availability of valuable recyclable materials (18% of men vs. 13% of women). **Both groups had similar proportions reporting changes in distance or collection routes, though men again reported slightly higher numbers (21% vs. 19%).**

Overall, while heat made work harder for everyone, the data suggest that **men had more flexibility to adapt**—by adjusting hours or routes—whereas women, who often face more rigid work conditions or social constraints, were less able to change schedules or reduce working hours despite feeling the impact more sharply.

6.6 Reduction in working hours:



For different kinds of impact on work, we also asked workers to share details about the extent of impact. In this section we detail the responses from waste workers in terms of the number of working hours reduced during heat months.

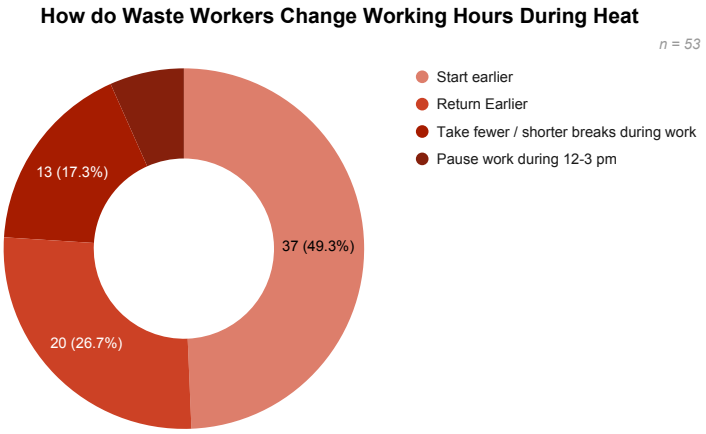
Out of the total surveyed workers, 68 waste workers shared the amount of reduction in working hours due to heat. Within these, most of the workers, 42.6% (29) experienced a reduction between 4 -6 hours per week. 36.8% (25) workers reported a reduction of 2-4 hours. 8.8% (6) workers said their hours decreased by one to two hours. A smaller number faced even greater reductions, with 7.4% (5) workers losing six to eight hours and 1 worker reporting a decrease of more than 9 hours per week. Two workers also reported not being sure about their reduction in overall working hours.

6.6.1 By Waste Worker Category:

- Sorters: 20 out of 30 or ~66.7% sorters (both in DWCCs and goddowns) surveyed shared a reduction in working hours by more than 4 hours.
- Free-roaming waste pickers on foot: 12 out 27 or ~44% indicated a reduction of more than 4 hours.
- Pourakarmikas: In contrast, only 1 pourakarmika shared a reduction in working hours suggesting they may have less flexibility to adjust their schedules in response to heat stress.

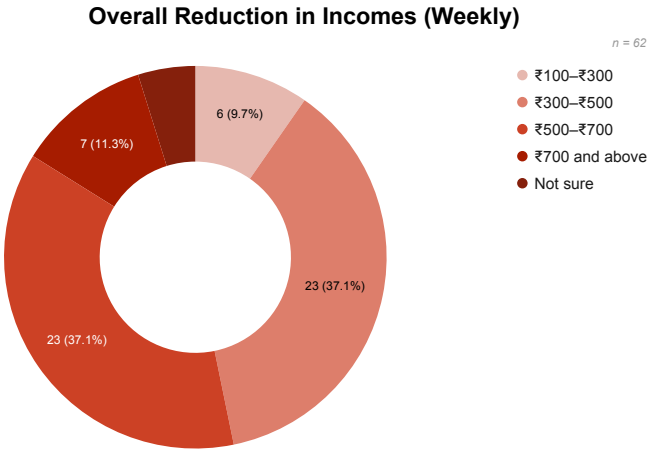
6.7 Nature of change in working hours during summer

Out of the total surveyed workers, 53 waste workers shared the nature of change in working hours due to heat. The most common adjustment was starting work earlier in the day, as reported by 48.1% (37) workers. 26% (20 workers) said they either returned home earlier and 19.5% or 13 workers said they took fewer or shorter breaks during their shifts. Only 6.5 % or 5 workers mentioned that they paused



work during the hottest hours between 12-3 pm. Among those who started work earlier, 26 were men and 11 were women. This hints that men may be more likely to start work earlier than women suggested lesser household and domestic burden as well as greater safety in public spaces. 2 men reported pausing work between 12-3 pm as compared to 3 women. Among those who started work earlier, the majority of them, i.e. 75% (28/37) of respondents were sorters (19 at DWCC and at godowns). 7/37 were free-roaming waste pickers and 2 were DWCC driver/helper/cleaners hinting greater flexibility in working hours. Very few waste workers are able to pause work between 12 pm to 3 pm. Only 5 workers shared pausing work between 12-3 pm, out of which 4 were free-roaming waste pickers on foot and 2 were DWCC drivers and helpers. In terms of returning earlier from work, all of the 15 free-roaming waste pickers returned earlier from waste collection work during summers. None of the pourakarmikas shared a change in working hours, reflecting lack of flexibility in their working routines during summers.

6.8 Impact of heat on income

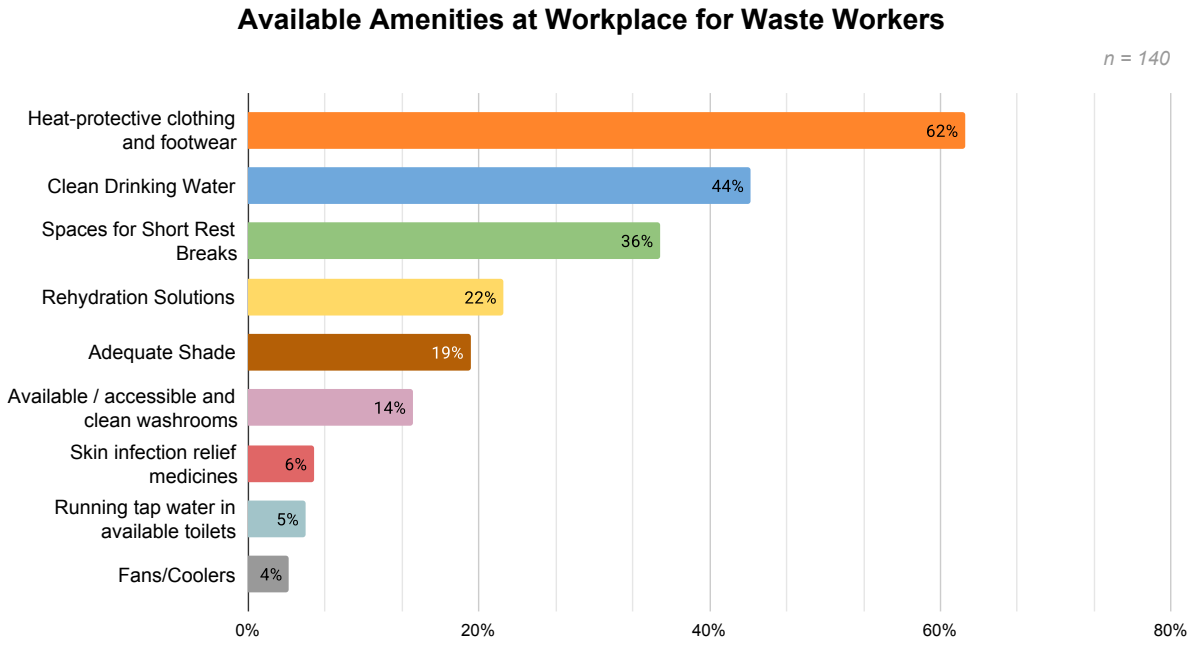


Out of the total waste workers surveyed, 62 out of 154, that is, 40.2% waste workers shared their overall reduction in weekly incomes. The largest groups reported a weekly income reduction of ₹300–₹500 (37%)and ₹500–₹700 (37%). A smaller proportion experienced a loss of ₹100–₹300 (9.7%), while 11.3% reported losing ₹700 or more per week. Three respondents were unsure about the amount of reduction.

Free-roaming waste pickers faced the maximum weekly reduction in income (₹504.34), followed by DWCC Sorters (₹500). pourakarmikas didn't experience much reduction in income. Only 1 pourakarmika reported having reduced income by ₹200.

When these reductions are compared to the average weekly income of ₹3,500, the weighted average weekly loss is approximately ₹458, which amounts to a 14.1% decrease in weekly earnings during the hottest months. This is a significant cut, especially for workers in the informal sector who already operate on tight margins. Over a typical month, this could translate to a loss of around ₹2,000, given the average monthly income of ₹14,000.

6.9 Available amenities during work



We asked waste workers about existing workplace amenities available to them including, cooling amenities, protective gear, among others. Overall, **90% or 139/154 of surveyed waste workers shared about their workplace amenities.** The survey showed that access to basic amenities was limited. Differences were observed across gender and worker categories.

1. Heat-protective clothing: 62%

Access to heat-protective clothing and footwear such as PPE, caps or towels, was the most commonly available amenity for waste workers. It was reported by 62% (87/139) of all waste workers. A higher number of pourakarmikas (92%) reported access compared to 49% of DWCC workers and 31.4% of free-roaming waste pickers. Amongst them, 81% of DWCC drivers had access to it compared to only 40% of DWCC sorters. 40% of free-roaming waste pickers on foot, and only 15% of godown sorters had access to heat-protective clothing and footwear. In terms of gender-breakdown, more women (69.4 percent) reported access than men (33.9 percent).

2.Clean drinking water: 44%

Access to clean drinking water was the second highest available amenity for waste workers, however the proportion was less than half with only ~44% (61/139) waste workers reporting access. It is important to note that access to clean drinking water is often arranged and paid for by the workers or operators themselves.Overall, more than half of free-roaming waste pickers (53%) and DWCC workers (57%) reported access to clean drinking water. Only 2% of pourakarmikas reported access to clean drinking water. This was highest among free-roaming waste pickers on foot where 70%

reported access to drinking water, often taken from nearby shops and public spaces. 68% of DWCC sorters, 45% of DWCC drivers reported access. A smaller portion, 20% of free-roaming waste pickers on vehicles and 15% of godown sorters had access to water. In terms of gender, a greater proportion of men at 51.8% and 32.7% of women reported access to clean drinking water.

3.Spaces for short rest breaks: 36%

Access to rest spaces for waste workers includes suitable areas at worksites like DWCCs, designated break spots such as mustering points or suvidha cabins, and public spaces used for short breaks. Overall, only 35% (50/139) of waste workers had access to spaces for short breaks. This was highest among pourakarmikas with 78% reporting available rest spaces like mustering points, less than a quarter or 20.4% of DWCC workers and a miniscule 1% of free-roaming waste pickers reporting access. Among DWCC workers, drivers/helpers had a greater access to spaces for rest with 45% reporting it compared to only 13% of DWCC sorters sharing the same. Only 2% of free-roaming waste pickers on foot reported this with none of the godown sorters and free-roaming waste pickers on vehicles reporting it. In terms of gender, a higher percentage of women (40.8%) had access compared to men (17.8%).

4. Rehydration Solutions: 22%

Access to rehydration solutions is one of the key adaptation measures for workers to cope with rising heat and protect themselves from heat-related illnesses. Only 22.3% (21/139) of waste workers said they had access to rehydration solutions like lemon water, ORS, buttermilk or locally-available drinks like ragi ganji. This was highest amongst DWCC workers with 53% of workers saying they had access to rehydration indicating provision of the same by the DWCC operator or employer. A significantly low proportion, 9.2% of free-roaming waste pickers had access, while none of the pourakarmikas reported rehydration solution access. Among DWCC workers, 81% of DWCC drivers/helpers/cleaners had access compared to 44% of DWCC sorters. Among free-roaming waste pickers, none of the waste pickers on foot had access to rehydration solutions as compared to 30% of godown sorters and 20% of waste-pickers in vehicles. In terms of gender, a relatively higher but overall low percentage of men (26%) had access compared to women (16%).

5. Adequate shade: 19%

Access to adequate shade included both available shade through trees, public parks, surrounding built-environment and infrastructural measures undertaken by workers to protect themselves from excessive sunlight at work. Overall, only 19.4% (27/139) of waste workers reported access to adequate shade. Although substantially low, the number was highest in terms of proportion for 22% of pourakarmikas, 18% of DWCC workers and only 12% of free-roaming waste pickers. Within DWCC workers, the number was higher for DWCC sorters at 21% as compared to 9% of DWCC drivers/helpers/cleaners. Within free-roaming waste pickers, the number was highest among waste pickers on vehicles (40%), followed by godown sorters (15%), and only 8% waste-pickers on foot. In terms of gender, a relatively higher but overall low percentage of women (20.4%) had access to adequate shade as compared to men (12.5%).

6. Clean washrooms: 14%

Overall, only 14.3% (20/139) of waste workers reported access to clean washrooms. DWCC workers reported the highest access to washrooms, with 38.7% saying they had access, compared to just 1.8% of free-roaming waste pickers. No pourakarmikas reported having access to washrooms.Among DWCC workers, 45.4% DWCC drivers/helpers/cleaners and 36% of DWCC sorters had access. Only 7.6% of godown sorters reported access, hinting low availability of adequate washrooms in their

settlements. None of the free-roaming waste pickers on foot or vehicle reported access. In terms of gender, men reported significantly greater access to clean and available washrooms at 21% compared to just 8% of women highlighting gendered barriers to access.

7. Skin-infection relief medicines: 6%

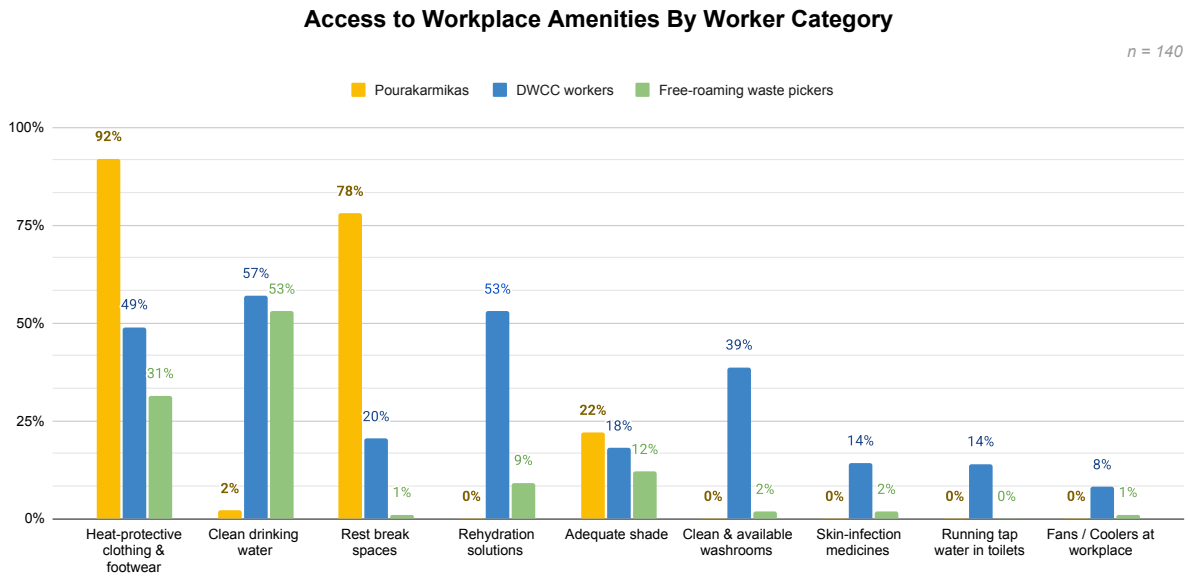
Skin infections during heat were a major concern raised in our FGDs, which led us to specifically ask waste workers about the availability of relief and remedy medicines at their workplaces.Overall, only 5.7% of waste workers reported having access to skin-infection relief medicines. 14.2% of DWCC workers, 1.8% of free-roaming waste pickers and none of the pourakarmikas reported access to skin-infection relief medicines. Among DWCC workers, 18% of drivers/cleaners/helpers and 13.1% of DWCC sorters reported access to these, along with 20% of overall free-roaming waste pickers on vehicles. 7.1% of men and 4% of women reported access.

8. Running Tap Water in Available Toilets: 5%

We included a separate question on access to running tap water in toilets because workers highlighted it as a key issue during our FGD. Only 5% (7/139) of waste workers reported access to running tap water in toilets. This included 14% of DWCC workers—mainly sorters (18.4%)—while none of the free-roaming waste pickers, pourakarmikas, or DWCC drivers/helpers reported access. Just 10% of men and only 1% of women had access, showing stark gender disparities.

9. Access to fans/coolers at workplace: 3%

Access to fans or coolers is one of the most basic necessities to prevent heat-related exhaustion. In our survey, it was reported as one of the least available amenities for waste workers with only 3% reporting having access to the same. A miniscule percentage of 8.1% of DWCC workers, 1% of free-roaming waste pickers and none of the pourakarmikas reported access to any cooling amenities. Among DWCC workers, 9% of DWCC drivers/helpers/cleaners and 7.8% of DWCC sorters reported access to fans. 7% of overall godown sorters shared having access to it. Only 5% of men and 2% of women had access to fans and coolers.



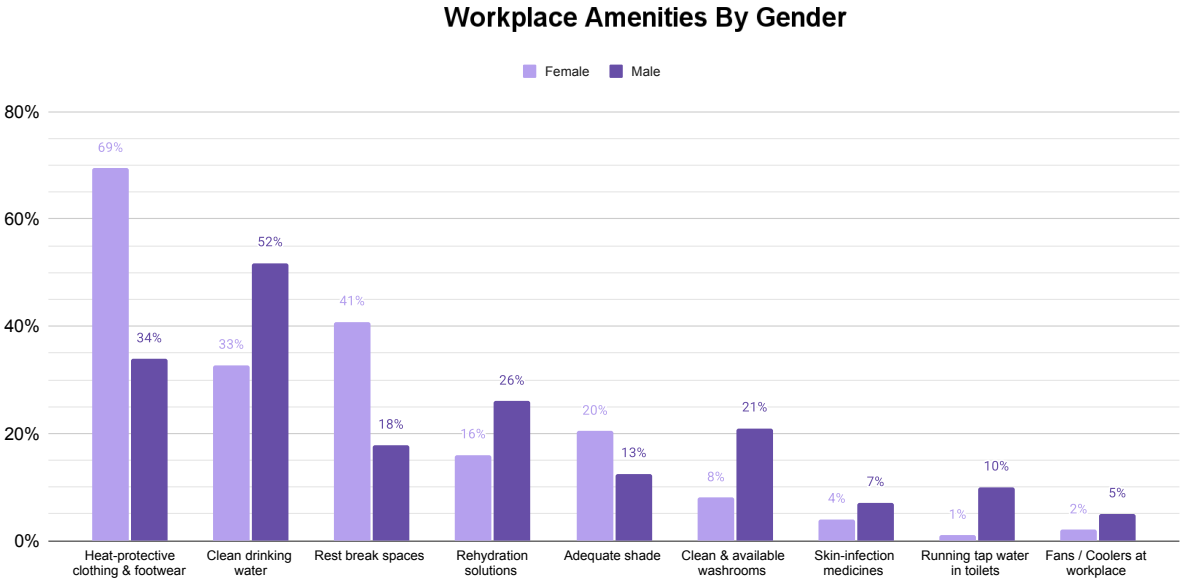
Overall all the workers reported minimal access to basic amenities like fans at the workplace, running tap water in toilets and skin-infection medicines. Among the three worker categories, pourakarmikas had the best access to heat-protective clothing (92%) and designated rest spaces (78%), thanks to formal employment and worksite infrastructure like mustering points. However, they had very limited or no access to drinking water during work (2%), rehydration solutions, sanitation amenities,

and cooling amenities, leaving them vulnerable to heat stress despite some protective gear.

DWCC workers reported comparatively better access to basic infrastructure—such as clean drinking water (57%), heat-protective clothing (49%), and washrooms (39%)—often with the support of DWCC operators. They also had the highest access to rehydration solutions (53%) among all groups. Within this category, drivers and helpers consistently had better access than sorters, though overall access to rest spaces (20%) and shade (18%) remained limited.

In contrast, free-roaming waste pickers were the most exposed and underserved. They had the lowest access to nearly every amenity, especially access to rest areas (1%), sanitation (1-2%), and rehydration support (9%). While a little over half managed to access drinking water (53%)—mainly through personal effort and public sources—their work's informal and mobile nature left them most vulnerable to heat-related risks.

Overall, the findings highlight stark differences in workplace protections and adaptation measures across worker groups, with the most informal workers facing the greatest gaps.



Female waste workers generally reported better access to heat-protective clothing (69.4%) and spaces for short rest breaks (40.8%) than men. This may reflect workplace norms or employer provision focused on women-dominated roles, such as pourakarmikas and DWCC sorters.

However, men reported higher access to most critical heat adaptation and hygiene amenities: clean drinking water (51.8% vs. 32.7% for women), rehydration solutions (26% vs. 16%), clean and available washrooms (21% vs. 8%), and running tap water in toilets (10% vs. just 1%). Men also had slightly betteraccess to shade and skin-infection relief medicines.

Overall, the data suggests a gendered pattern of inequality: while women had relatively better access to protective clothing and rest areas, they faced significant barriers in accessing sanitation, hydration, and medical support—amenities that are essential for coping with heat stress and maintaining dignity at work. These gaps underline how gender intersects with occupational vulnerability in the informal waste sector.

7. Impact of Heat on Health

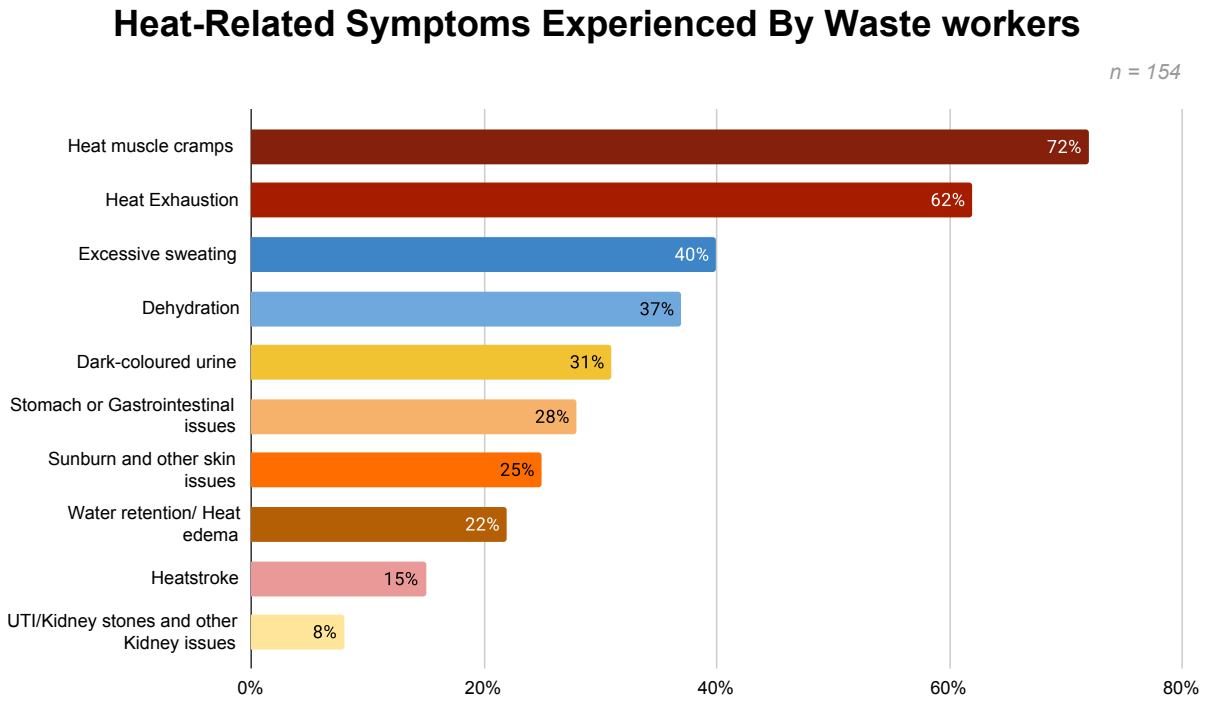
Vinod Sebastian for Saamuhika Shakti

7. Impact of Heat on Health

Questions on heat-related health symptoms were were self-identified and self-reported by workers, which may have led to underreporting due to limited awareness or reluctance to share. To improve clarity during enumeration, we distinguished overlapping symptoms—like dehydration and dark urine—to consolidate responses from workers.

Note: The questions in this section were optional, and as a result, the number of respondents varies across different indicators. All findings should be interpreted in light of these differing baselines, which are mentioned in each response.

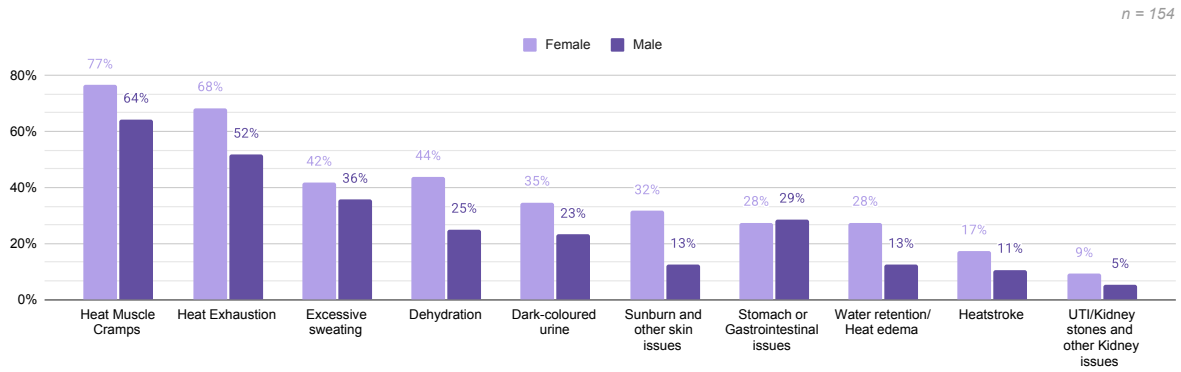
7.1 Heat-related symptoms due to prolonged exposure



Heat-related muscle cramps emerged as the most commonly reported symptom, affecting 72.1% of respondents, followed by heat exhaustion, reported by 62.3%. Other frequently mentioned symptoms included excessive sweating (39.6%) and dehydration (37%). Less common but notable symptoms included dark-coloured urine (30.5%) and gastrointestinal issues (27.5%). Sunburn was reported by 24.7%, while heat edema or water retention affected 22.1% of respondents. 14.9% reported experiencing heatstroke, a serious emergency condition. Urinary tract infections (UTIs) and kidney issues were the least reported, at 7.8%.

Gender-wise breakdown of heat-related symptoms: Among the 154 waste workers surveyed, 36.4% were male and 63.6% were female. When looking at the percentage of each gender reporting specific heat-related symptoms, the following patterns emerge:

Heat-Related Symptoms Experienced by Gender



Heat-related symptoms were widely reported, with women consistently reporting higher prevalence across most indicators. The most common symptoms among both men and women were heat muscle cramps (64% men, 77% women), heat exhaustion (52% men, 68% women), and excessive sweating (36% men, 42% women).

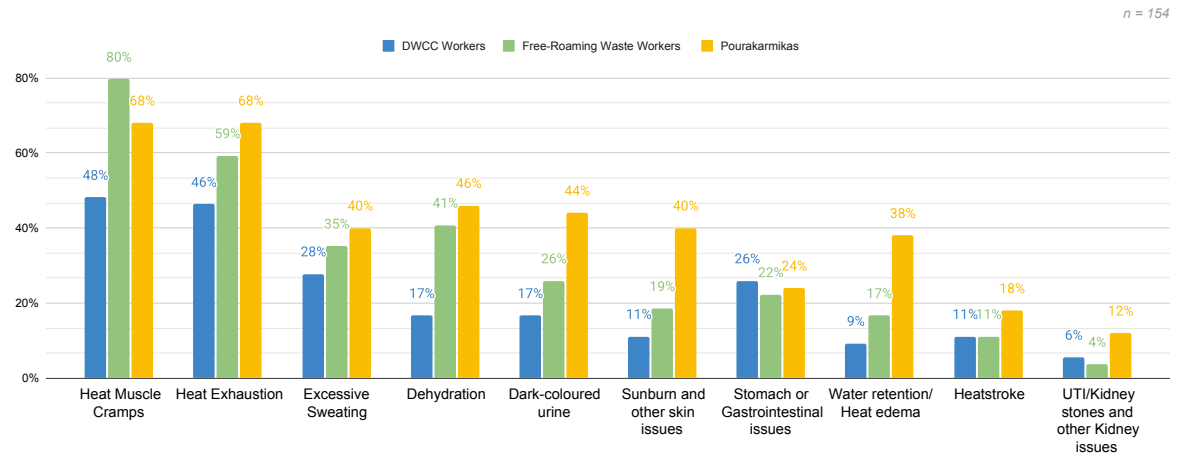
Women consistently reported higher prevalence across most symptoms. Excessive sweating was noted by 41.8% of women compared to 35.7% of men. Dehydration was reported by 43.9% of women and 25% of men, while dark-coloured urine affected 34.7% of women versus 23.2% of men. Skin issues like sunburn were significantly more common among women (31.6%) than men (12.5%).

Stomach or gastrointestinal issues were fairly common among both groups—reported by around 28.6% of men and 27.6% of women. Heat edema was reported by 27.6% of women and 12.5% of men, while kidney-related concerns (including UTIs and stones) were more frequently reported by women (9.2%) than men (5.4%). Heatstroke, while less widespread, was still present—affecting 17.3% of women and 10.7% of men reporting it.

Overall, women reported a higher incidence of nearly all symptoms reflecting a strong gendered dimension in both the experience and reporting of heat-related symptoms.

Across all worker groups, heat-related symptoms were commonly reported, though the severity and frequency varied. Free-roaming waste pickers are most affected by heat cramps (~80%,) followed by pourakarmikas at 68% and DWCC workers at 48.15%. Heat exhaustion showed a similar trend, most prevalent among Pourakarmikas (68%) and free-roaming workers (59.3%).

Heat-Related Symptoms Experienced By Worker Category



Pourakarmikas reported the highest rates of dehydration (46%), dark-coloured urine (44%), skin issues (40%), and heat edema (38%), suggesting greater sustained exposure to heat and limited recovery time. They also had the highest reporting of heatstroke (18%) and kidney-related issues (12%). Free-roaming waste pickers showed high rates of dehydration (40.7%) and moderate reporting of other symptoms, but had relatively lower reporting of severe conditions like kidney issues (3.7%).

DWCC workers generally reported the lowest incidence across most symptoms, particularly severe ones, with only 16.7% reporting dehydration or dark urine, and less than 10% for skin issues, heat edema, or kidney problems. These trends suggest that occupational setting and exposure patterns play a differential role in shaping vulnerability to heat stress.

7.2 Impact on Reproductive and Urological Health:

On menstrual cramps: 43%

Around half of 83 female workers, 43% (36) reported that working in extreme heat made menstrual cramps or related symptoms worse. Amongst these, highest were pourakarmikas (16), followed by 12 DWCC workers and 8 free-roaming waste pickers .

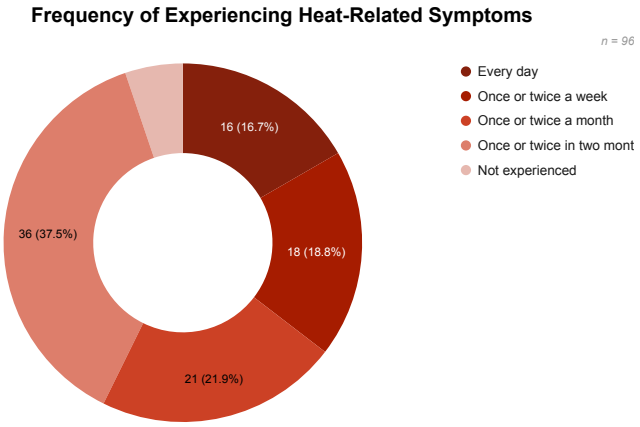
On increased discharge: 20.2%

Among the 79 female respondents across various worker categories, around 20.2% (16) reported experiencing increased white discharge, itching, irritation, or burning sensation. Among these, 6 were pourakarmikas, 5 were DWCC workers and 5 were free-roaming waste pickers.

On UTIs: 11.3%

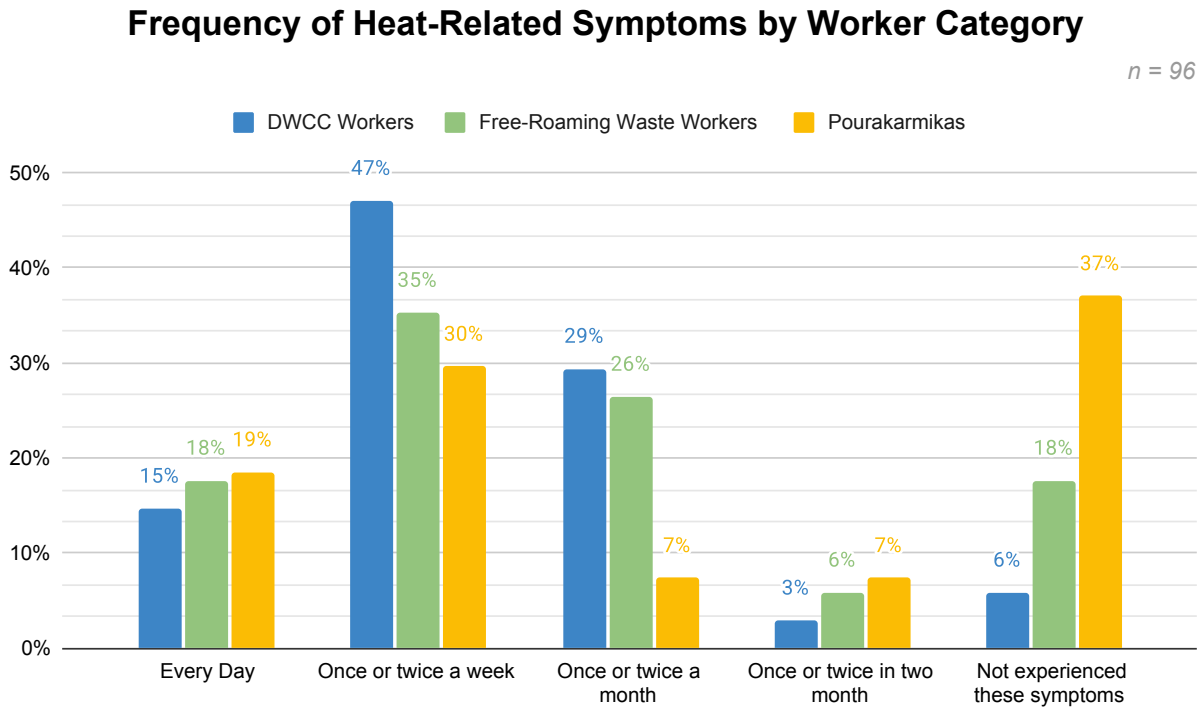
Out of 88 female respondents, only 11.3% (10) workers reported experiencing UTI symptoms. Among these, 5 were DWCC workers, 4 were free-roaming waste pickers and 1 was a pourakarmika.

7.3 Frequency of Heat-Related Symptoms

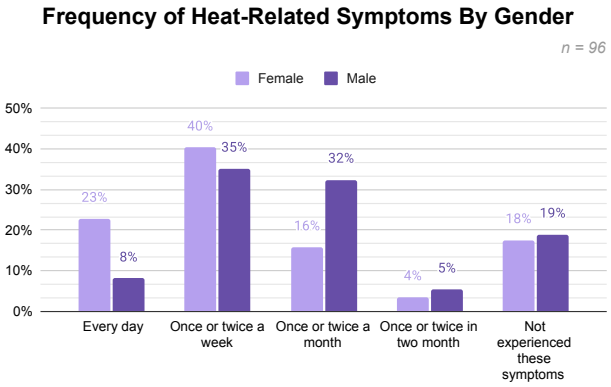


Around 96 respondents reported experiencing symptoms related to heat illnesses. 16.7% respondents experienced symptoms everyday, while 37.5% said they experienced these symptoms weekly. 21.9% respondents reported monthly symptoms and another 5.2% reported experiencing these symptoms once in two months.

By Worker Category: The frequency of reported symptoms varied notably across worker categories. Among DWCC workers, nearly half (47.06%) experienced symptoms once or twice a week, while 29.41% faced them once or twice a month, and 14.71% reported experiencing them daily. Only a small share reported rare (2.94%) or no symptoms (5.88%). For free-roaming waste pickers, 35.29% experienced symptoms weekly, 26.47% monthly and 17.65% experienced symptoms daily. Notably, 17.65% had not experienced these symptoms at all. Pourakarmikas showed the highest proportion (37.04%) reporting no symptoms, while 29.63% weekly and 18.52% experienced them daily. Monthly and bi-monthly experiences were much lower among pourakarmikas at 7.41% each.

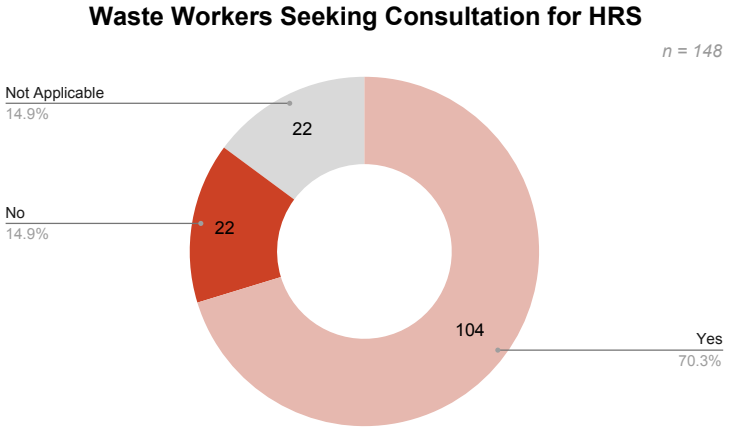


By Gender: The frequency of symptoms varied by gender. Female respondents reported higher daily incidence (22.81%) compared to males (8.11%), and a greater proportion also experienced symptoms weekly (40.35% vs. 35.14%). In contrast, male respondents more commonly reported experiencing symptoms monthly (32.43% vs. 15.79%). The proportion of those who had not experienced any symptoms was relatively similar across genders—17.54% for women and 18.92% for men.



7.4 Access to healthcare

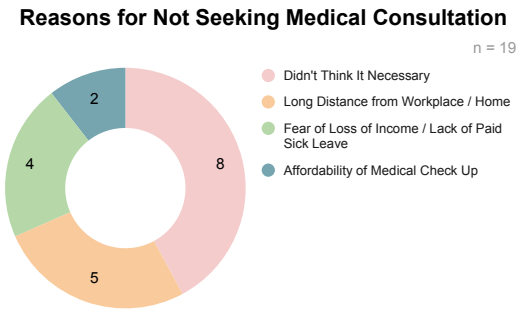
Out of 148 respondents, about 71% of workers reported accessing healthcare and receiving a medical diagnosis for heat-related symptoms, 14.9% reported no and 14.9% reported not-applicable.



By worker category, the highest healthcare seeking behaviour for HRSs was displayed by DWCC workers (73.4%), followed by free-roaming waste pickers (67.27%) and pourakarmikas (62%). This suggests that while most symptomatic workers seek and receive a diagnosis, there are still some gaps in access or reporting.

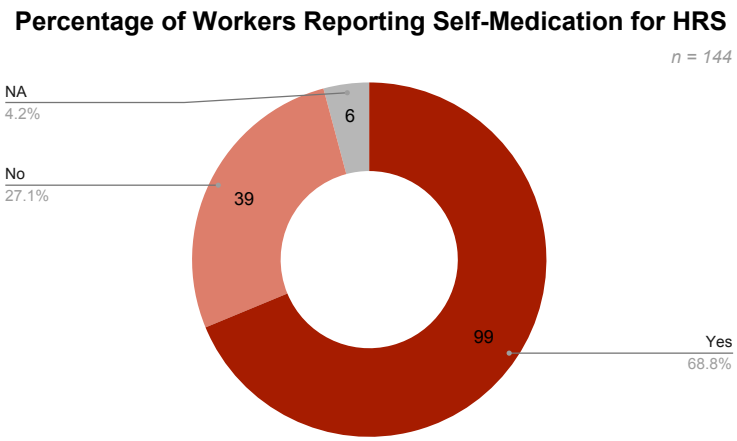
7.4.1 Reasons for Not Seeking Healthcare for HRSs

Out of the 22 respondents who said they haven't received a medical diagnosis, the most common reason—cited by 8 individuals—was that they did not consider medical consultation necessary. Five respondents pointed to the long distance from their workplace or home as a barrier, while four cited fear of income loss. Two individuals mentioned lack of affordability as the reason.



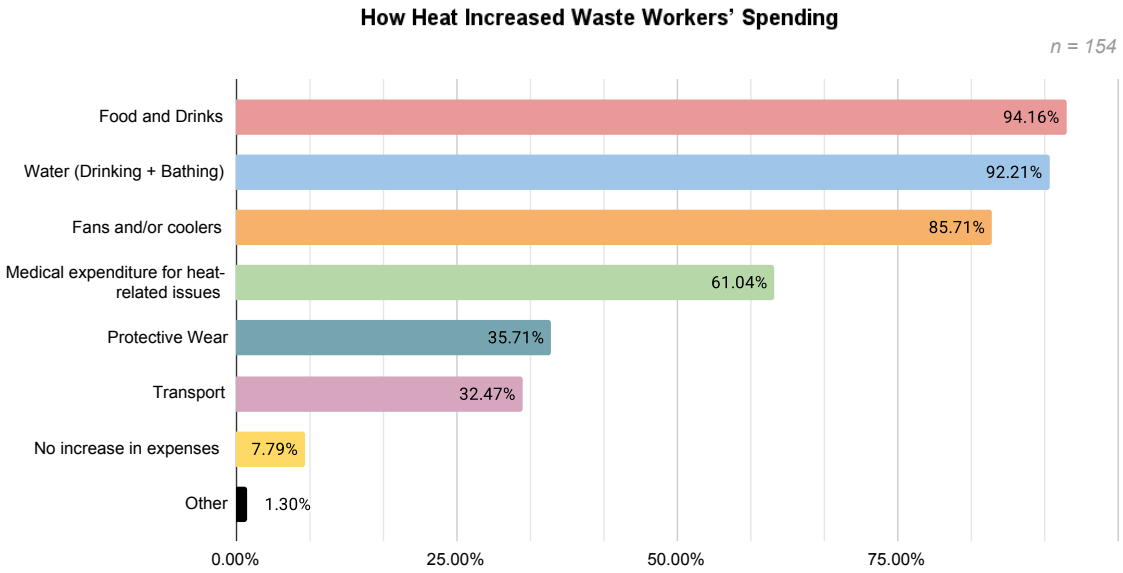
Among people who responded that distance from home was the reason for not getting a medical diagnosis, 3 were free-roaming waste pickers on foot. Among those who described fear of loss of income as the reason, 3 were DWCC sorters and 1 was a free roaming waste picker on foot. 8 people also responded that they didn't think consultation was necessary. 4 of them belonged to free-roaming waste pickers (on foot /vehicle) and 2 belonged to DWCC sorters category. 2 belonged to the free-roaming waste picker (vehicle) category.

7.4.2 Self-medicating for heat-related symptoms



Out of 144 respondents, around 69% of workers who experienced symptoms reported self-medication and buying medicines from a local pharmacist without a doctor's prescription, while 31% reported not buying medicines without a prescription. Around 4.2% of workers reported not applicable.

7.5 Impact of extreme heat on regular expenses especially in the months of March and April

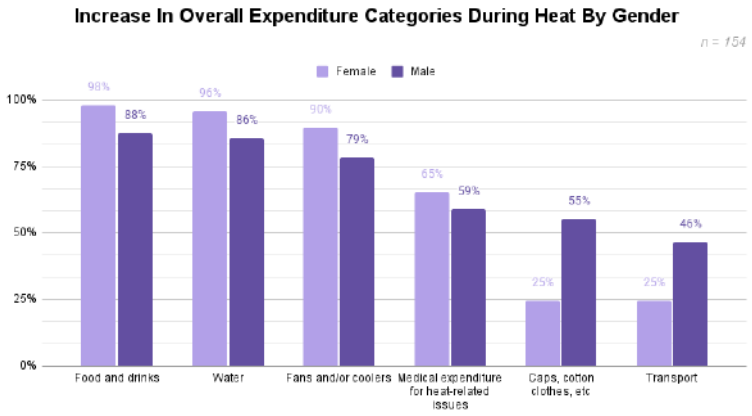


Across all respondents, the most commonly reported heat-related expenses were for food and drinks (94.16%) and water for drinking and bathing (92.21%), followed by fans and coolers (85.71%).

Medical expenses due to heat were reported by 61.04% of workers, while protective wear (35.71%) and transport (32.47%) were less frequently cited. Only 7.79% reported no increase in expenses, and 1.30% mentioned other types of spending.

This indicates that nearly all workers are incurring additional daily costs to cope with heat, primarily through essentials like hydration, food, and cooling.

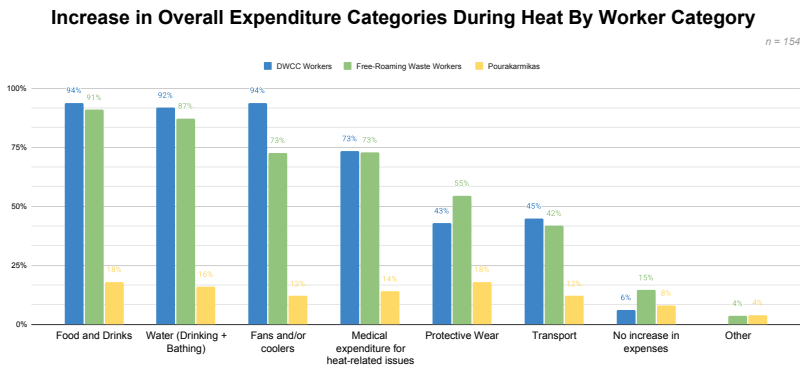
Gender-Wise: We asked workers to share the increase in overall expenses by category during heat. In terms of gender, we see that a large share of both men and women reported increased spending on food and drinks (87.5% of men, 97.95% of women) and water (85.71% of men, 95.91% of women). Women also reported higher spending on fans or coolers (89.79%) compared to men (78.57%).



Men were more likely than women to spend on transport (46.4% vs. 24.5%) and protective items like caps and cotton clothes (55.35% vs. 24.5%). In contrast, medical expenses for heat-related illnesses were more frequently reported by women (65.3%) than men (58.9%).

These patterns suggest women bear a higher burden of daily consumable and medical expenses, while men may prioritize mobility and protective gear.

Worker-Category Wise: In terms of occupational category, a large share of both DWCC workers and free-roaming waste workers reported increased spending on food and drinks (93.9% and 90.9% respectively) and water (91.8% and 87.3%). DWCC workers also reported the highest spending on fans or coolers (93.9%), followed by free-roaming workers (72.7%), while only 12% of pourakarmikas reported such expenses.

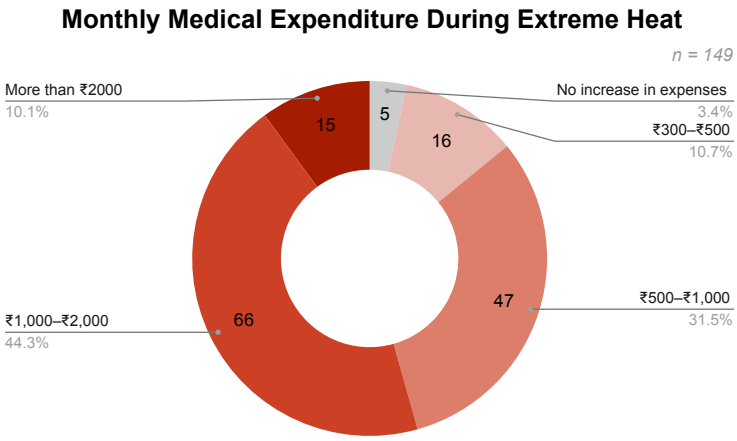


Free-roaming workers were slightly more likely than DWCC workers to spend on transport (58.2% vs. 44.9%) and protective wear (54.5% vs. 42.9%). In contrast, pourakarmikas consistently reported much lower increases in expenditure across all categories—only 18% on food and protective wear, 16% on water, and 14% on medical expenses.

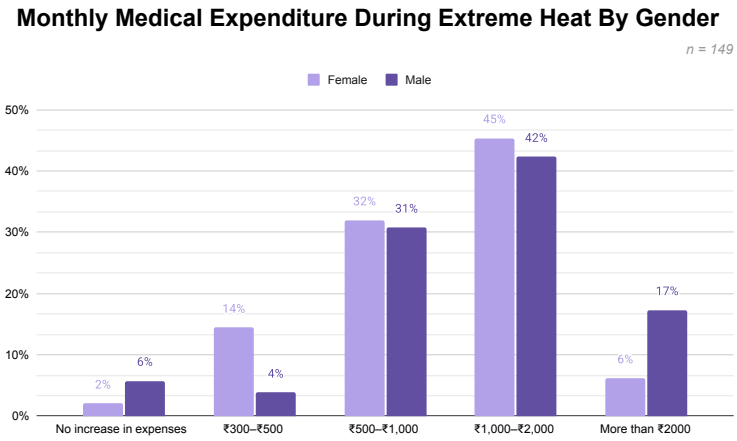
These patterns suggest that informal workers like DWCC and free-roaming workers bear a higher financial burden during periods of extreme heat, particularly on essential consumables, cooling solutions, and health-related costs, whereas pourakarmikas may have relatively more institutional support or fixed routines that buffer such expenses.

7.6 Monthly medical expenditure during extreme heat medical expenses

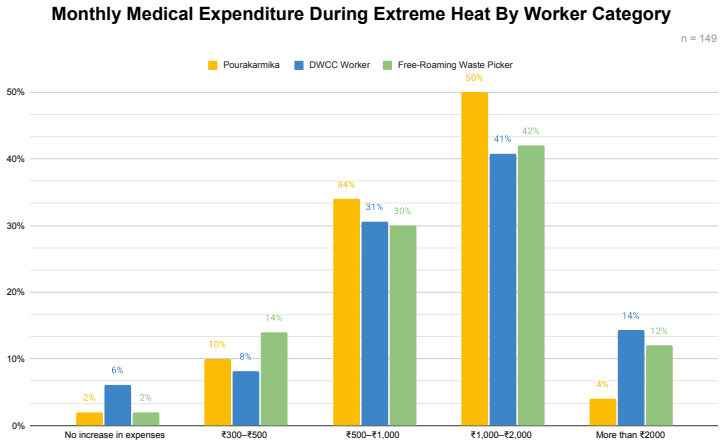
Heat-related medical expenses posed a significant financial strain on many waste workers. While only 3.4% reported no additional medical costs, a majority spent substantial amounts. Almost half, that is 44.3% incurred between ₹1,000–₹2,000 monthly, and another 31.5% reported spending between ₹500–₹1,000 monthly. Only 10.7% had smaller increases (₹300–₹500), and 10.1% reported expenses exceeding ₹2,000. Based on these figures, the average monthly increase in medical expenses due to heat is approximately ₹1,195, underscoring the severe health and financial impacts of extreme heat on workers.



Gender-Wise: Among 149 respondents (52 men, 97 women), the average monthly medical expense on heat-related illnesses was ₹1,196. The weighted average increase in monthly expenses was ₹1,313.46 for men and ₹1,132.47 for women. In our survey, almost half of the workers in both men (42%) and women (45%) reported a monthly increase between ₹1,000–₹2,000. Around 31% of men and 32% of women reported an increase between ₹500–₹1,000. A small share—17.31% of men but only 6.19% of women—experienced increases of over ₹2,000. Very few reported no increase (5.77% of men, 2.06% of women).

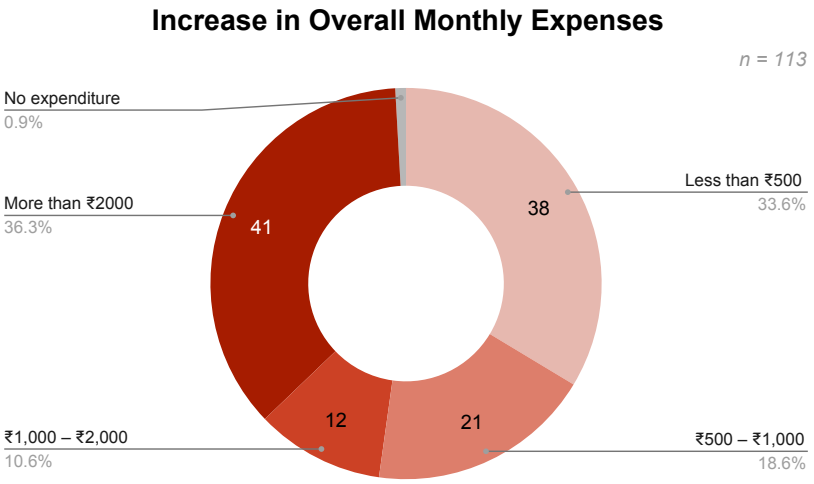


By worker category: the average monthly increase in medical expenses due to heat was highest for DWCC workers at ₹1,231.63, followed by free-roaming waste pickers at ₹1,211.00, and pourakarmikas at ₹1,145.00. In our survey, 50% of pourakarmikas, 41% of DWCC workers, and 42% of free-roaming waste pickers reported a monthly increase between ₹1,000–₹2,000. Around 30–34% across all categories reported increases between ₹500–₹1,000. Notably, 14.29% of DWCC workers and 12% of free-roaming waste pickers experienced increases of over ₹2,000, compared to only 4% of pourakarmikas. Very few workers in any category reported no increase in expenses.

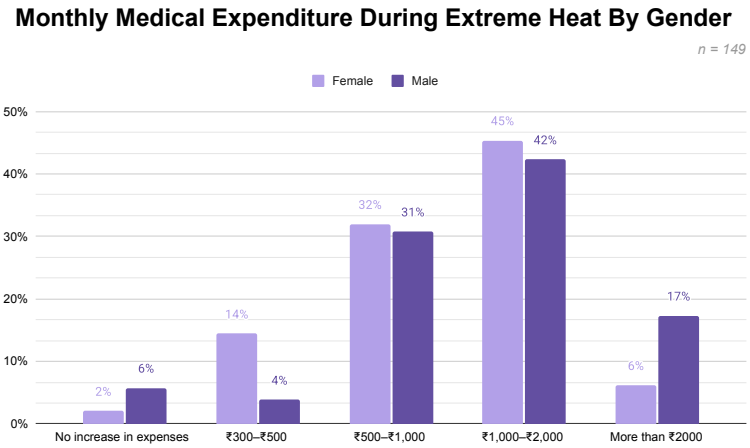


7.7 Increase in Overall Monthly Expenses During Summer

A majority of waste workers (36.3%) reported spending over ₹2,000 in additional monthly expenses due to heat, while 33.6% reported increases below ₹500. Around 28% reported intermediate expenses between ₹500 and ₹2,000. Only one respondent reported no additional expenditure. Based on reported ranges, the average increase in monthly expenses due to heat is approximately ₹1,290, indicating a significant financial burden for most workers.



Gender-Wise: Among 113 respondents (72 women and 41 men), the average monthly increase in expenses due to heat-related issues was ₹1,707.32 for men and ₹1,052.08 for women, with an overall average of ₹1,289.82.

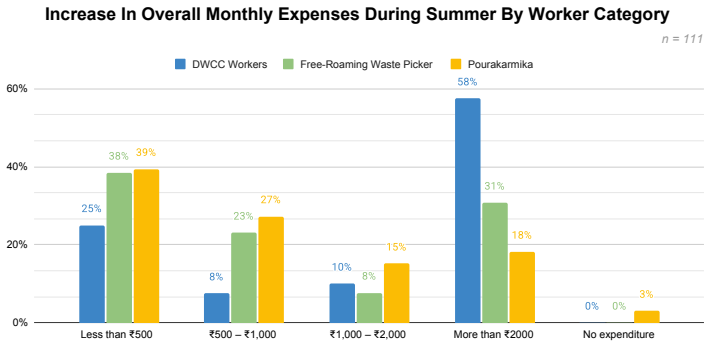


A majority of men (56.10%) reported spending more than ₹2,000 per month, compared to 25% of women. In contrast, 41.67% of women reported spending less than ₹500, nearly double the share of men (19.51%) in that bracket. Moderate increases between ₹500–₹1,000 were reported by 20.83% of women and 14.63% of men, while around 10–11% of both groups reported expenses in the ₹1,000–₹2,000 range. A small share of women (1.39%) reported no expenditure at all. These figures highlight that while men were more likely to face very high expenses, women experienced broader but generally lower levels of cost increases.

Among the 111 respondents who reported medical expenses related to heat, DWCC workers had the highest average monthly expenditure at ₹1,706.25, followed by free-roaming waste pickers at ₹1,153.85, and pourakarmikas at ₹984.85.

Over half of DWCC workers (57.5%) reported spending more than ₹2,000 per month, compared to 30.77% of free-roaming waste pickers and 18.18% of pourakarmikas. A significant share of pourakarmikas (39.39%) and free-roaming waste pickers (38.46%) spent less than ₹500, while only 25% of DWCC workers fell in that lowest bracket. Additionally, 3.03% of pourakarmikas reported no medical expenditure related to heat.

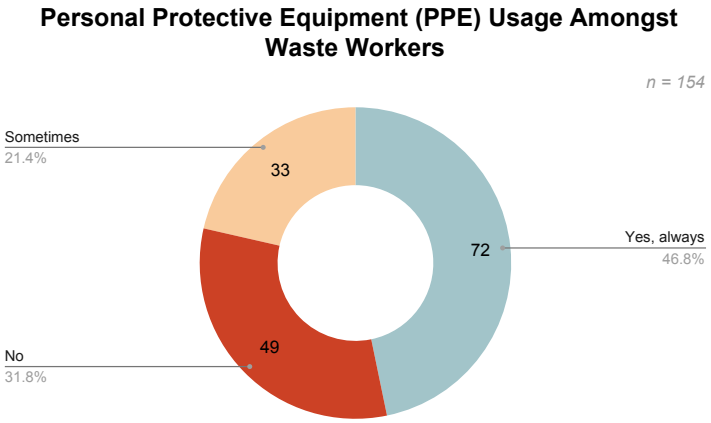
These findings indicate that DWCC workers face a disproportionately high financial burden in managing heat-related health issues.

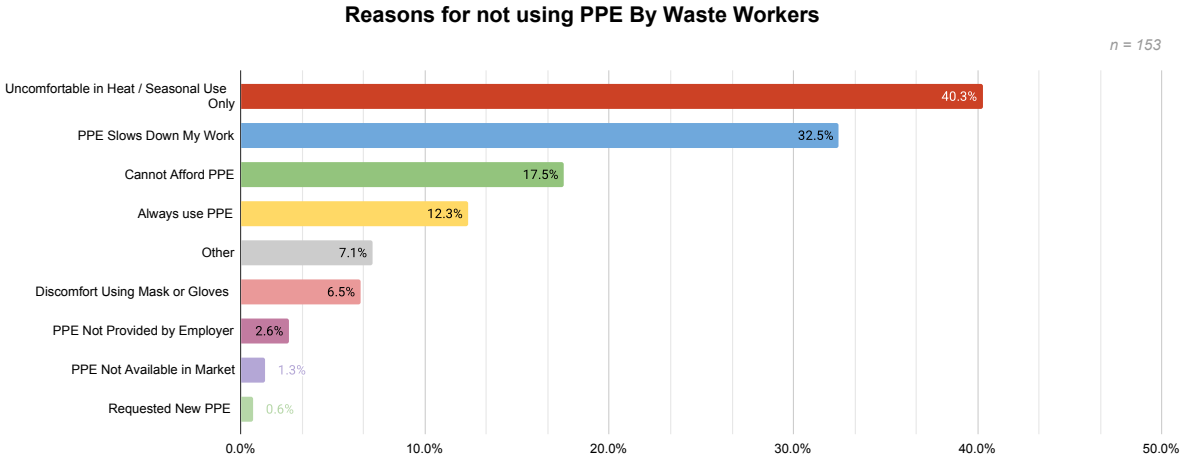


It is worth noting, that although a higher percentage of women reported increased expenses in almost every category (like food and drinks, water, medical expenses, etc), men have reported higher average overall spending. What this might mean is that while women report spending across a wider range of categories, their expenses may be smaller in value. In contrast, men - though reporting spending in fewer categories - may be incurring higher costs per item, such as coolers or transport, leading to a greater overall increase in average expenses.

7.8 PPE Usage and Challenges in Utilisation

A significant proportion, 46.8%, reported always using personal protective equipment, which is a positive indication of awareness, availability of PPE and compliance with safety protocols. 31.8% of respondents admitted to not using PPE at all, highlighting a gap in safety equipment and practices that could pose occupational safety and health risksAround 21.4% of respondents use PPE only sometimes, suggesting the need for more training and awareness regarding PPE usage. This distribution indicates that nearly half of the surveyed waste workers demonstrated occupational safety practices. For universal adoption of PPE, improvements in comfort, materials, and design must go hand-in-hand with greater awareness, stricter enforcement, and easier access to ensure consistent and widespread use.



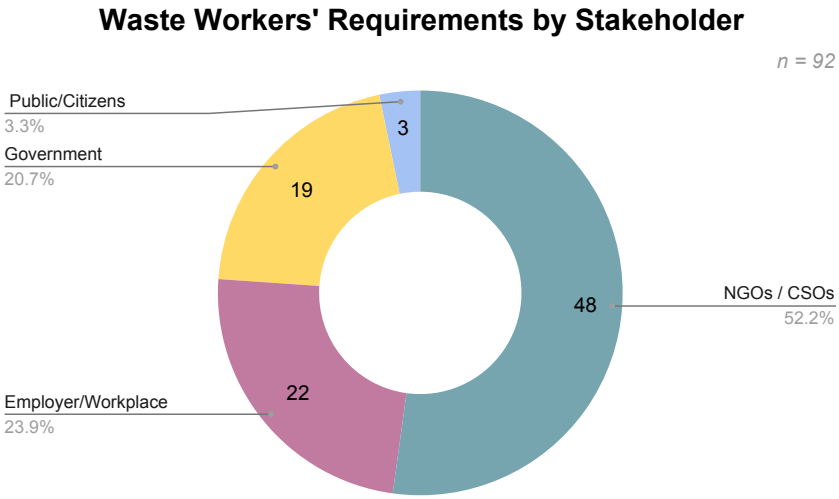


The most common challenge with PPE use was difficulty adjusting to it (54.5%), followed by discomfort during heat or seasonal use (40.3%) and PPE slowing down work (32.5%). Financial barriers were also noted, with 17.5% unable to afford PPE. Only 12.3% reported always using PPE. A smaller share cited discomfort using masks or gloves (6.5%), lack of provision by employers (2.6%), unavailability in the market (1.3%), or having requested new PPE (0.6%).

8. Waste Worker Requirements

8. Waste worker requirements

8.1 Stakeholder-Specific Requirements of Waste Workers



Out of 92 respondents who shared stakeholder-specific demands, over half of the respondents 52.2% identified NGOs and CSOs civil society organisations as stakeholders to assist in fulfilling their requirements. highlighting the critical role of civil society in supporting workers. Employers are the second-most mentioned group shared by 23.%, with requirements centered around workplace improvements such as access to fans, toilets, and rest areas. The government accounted for 20.7% of the responses, indicating a significant yet secondary expectation for structural support and public services. The data underscores a strong reliance on civil society actors to support workers over formal institutional support, reflecting systemic gaps in state and employer accountability.

8.2. Most Preferred: Short-Term and Long Term Requirements

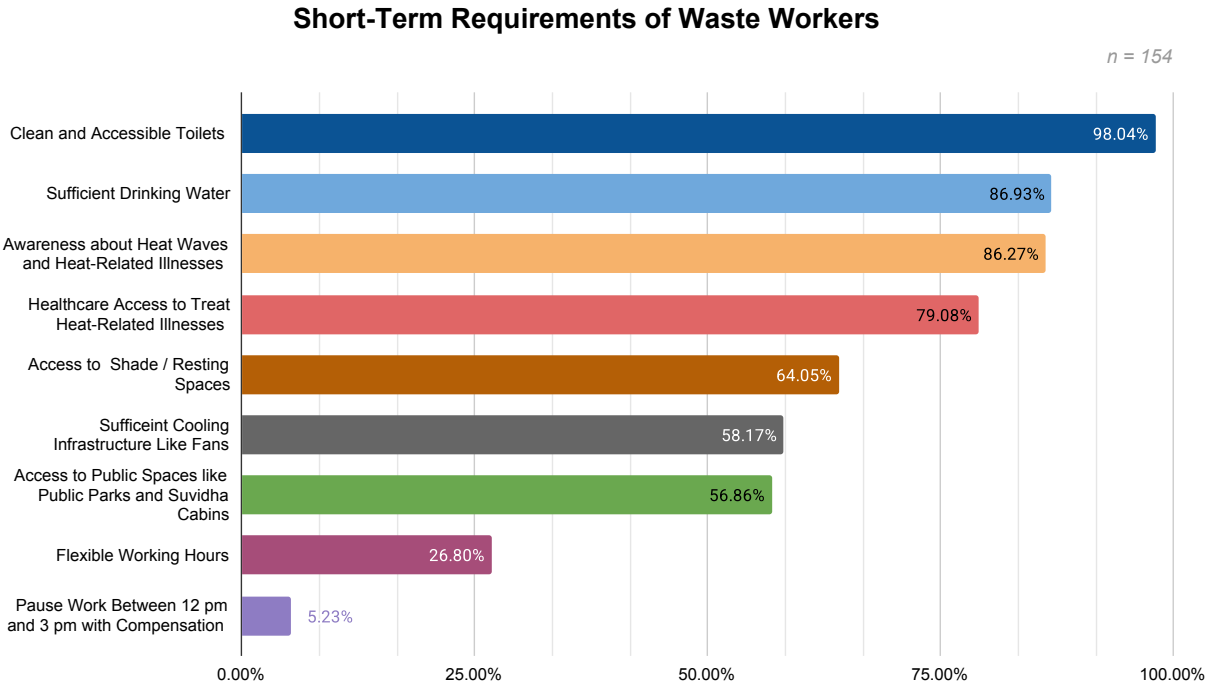
Alongside stakeholder-specific demands, we asked surveyed waste workers to identify the most urgently needed short- and long-term solutions. These options were shaped by our FGDs and literature review to reflect both lived realities and recommendations from academic and policy sources.

8.2.1 Short-Term Requirements of Waste Workers Surveyed

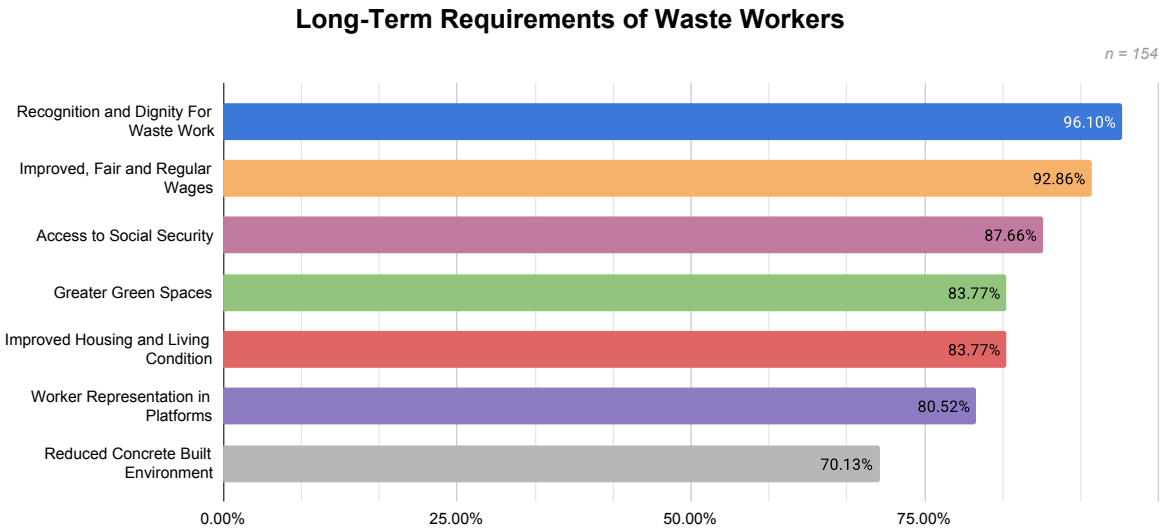
The graph on short-term demands highlights immediate needs of informal waste workers during extreme heat.

The most widely demanded measures were clean and accessible toilets (98.04%), sufficient drinking water (86.93%), awareness about heat-related illnesses (86.27%), and healthcare access for treatment (79.08%).

Workers also emphasized the need for shade or resting spaces (64.05%), cooling infrastructure like fans (58.17%), and access to public spaces (56.86%). Fewer workers highlighted flexible working hours (26.80%) or paid breaks between 12–3 pm (5.23%), suggesting practical constraints as well as preferences of workers in current work arrangements.



8.2.2 Long-Term Requirement of Waste Workers Surveyed



The long-term demands center around structural and systemic improvements.

Waste workers highlighted the need for recognition and dignity (96.1%), fair wages (92.86%), and access to social security and health insurance (87.66%) as their top priorities. They also stressed the importance of improved housing with greenery and basic services (83.77%), more green spaces in the city (83.77%), and being involved in government planning (80.52%).

Reducing heat from concrete infrastructure was also a significant concern (70.13%).These responses show that beyond immediate relief, waste workers aspire for sustainable livelihoods, social inclusion, and infrastructural equity. Addressing these demands would promote climate justice and secure the long-term wellbeing of a workforce vital to urban sanitation systems.

Interview with Union Representatives from Thyajya Shramika Sangha(TSS)


Kumuda
CCRA

9. Interview with Union Representatives from Thyajya Shramika Sangha(TSS),

The Union of Waste Pickers in Karnataka

In addition to detailing the requirements and emerging challenges faced by waste workers through the survey, we interviewed two members of the Thyajya Shramika Sangha (TSS), the union of waste pickers in Karnataka that was recently registered in 2024. Indumathi and Kumuda were formerly informal waste workers who are currently working as DWCC Operators in Bengaluru.

Union leaders Indumathi and Kumuda echoed the challenges highlighted in our survey among waste workers. **Both spoke of extreme heat exposure inside DWCCs, which our study also shows:** long hours under tin sheds without adequate ventilation or cooling make work almost unbearable, especially in summer months. Indumathi highlighted a key concern intersecting with waste and heat. **“Plastic itself emits too much heat,”** which created additional difficulties while engaging with and segregating waste during summers.

Both also shared the **persistence of health challenges** and shared that many waste workers faced kidney stones, “around 40-50%” according to Indumathi’s long-term experience in the sector working with different waste workers. “I also had twice the kidney stones myself,” Indumathi shared. Along with this, skin allergies, and fever were persistence during summer months — matching our survey where many workers reported heat-related illnesses and dehydration.

Kumuda shared that the **poor design of the centres forces workers to cope by moving operations outdoors under tree shade**, using ad-hoc installed tarpaulins as **makeshift shelters,** matching survey data showing over 60% of workers are exposed outdoors during the hottest hours (11 am–3 pm). Both highlighted the lack of running water in toilets and no power connections, which parallels our finding that **nearly half of surveyed DWCCs lack reliable access to water and electricity**

In coping, both operators and workers have improvised solutions that mirror coping strategies we saw in the data. **Indumathi explained how piece work systems help workers rest during peak heat whose houses are nearby, while still maintaining or even increasing income** — from about ₹500 to ₹800–900 daily. Kumuda noted employers sometimes buy juice, buttermilk, and cold drinks to keep workers hydrated, and flexible breaks are allowed, especially for women during menstruation or for pregnant workers. Yet, as our survey showed, **these coping strategies are limited and rely heavily on individual operators’ initiative rather than systemic support.**

Their suggestions strongly reinforce gaps identified in the study: the need for better infrastructure, including exhaust fans, running water, power supply, Aqua Guard systems for cold water, and larger, well-ventilated centres to withstand both heat and rain. **“What will help for heat is not just fans and coolers but also exit fans that can take out the heat from centres”,** highlighting experiencing suffocation and indoor heat in DWCCs. To enable access to clean drinking water, Indumathi suggested providing aqua guard filters that can reduce overall extra expenditure incurred on buying drinking water during summer. “Purchasing extra water in the summers is also an additional cost to the

centre" shared Indumathi.

Both leaders emphasized the importance of protective measures like thin cotton uniforms, hats or head caps, cooling vests, and proper shaded areas for. Indumathi also highlighted how certain heat-related protective gear is not suitable for waste work. For instance, sunglasses are not useful because "small waste will not be seen properly; can get confused, " shared Indumathi.

They also advocated for social protection measures our survey flagged as missing: living incomes over minimum wages, pensions, housing rights, identity cards, and formal recognition of waste work as essential urban service. The union is currently also focusing on increasing membership of free-roaming waste pickers and getting informal workers access to occupational identity cards, Indumathi shared.

Finally, the leaders shared **the challenges negotiating with stakeholders like the government such as the urban local body, the BBMP**, which help explain why these gaps persist despite clear needs. Echoing survey responses about limited worker participation in decision-making, Indumathi described how BBMP does not consult operators directly. The union has made representation and submitted official letters to the body but haven't heard back from them. Kumuda shared how electricity has remained a persistent challenge and that previous requests to BBMP and AEE — for power, running water, and identity cards — remain unresolved. Both described the strain of non-renewal of DWCC MoUs for the past 1.5 years which increases the economic and operational burden on operators. In addition to the government they highlighted that while some ROs support them as workers, others focus more on waste material over labour concerns.

Together, these interviews highlight how lived realities reinforce and deepen what the survey surfaced: that while workers and operators have created localised coping strategies, structural gaps in infrastructure, formal recognition, and responsive governance continue to put them at risk — especially in a context of rising heat and climate vulnerability.

10. Analysis and Discussions

The survey of 154 waste workers in Bengaluru (98 women and 56 men) revealed a complex interplay of heat-related health, economic and occupational challenges. The findings highlight not only the significant health impacts on waste workers but also the cascading effects on their financial stability, social mobility, and access to healthcare. We surveyed three broad categories of pourakarmikas, free-roaming waste pickers (on foot, in vehicles, and godown sorters), and DWCC workers (DWCC sorters and DWCC drivers, cleaners, helpers) to highlight differing impacts across worker groups.

Gendered and Caste Based Dimensions of Waste Workers: The sample included 35.7% free-roaming waste pickers, 32.5% pourakarmikas, and 31.8% DWCC workers. Women comprised 63.6% of respondents, showing the sector's gendered nature—especially roles involving manual segregation and street sweeping. Women predominate as pourakarmikas, DWCC sorters, and waste pickers on foot; men dominate among DWCC drivers/helpers and pickers on vehicles. Thus, women occupy more physically taxing, repetitive, and less mechanized roles, while men control motorized or semi-mechanized posts, underscoring profound gendered labor dynamics. In terms of caste, 60.4% of respondents identified as Scheduled Caste, 16.1% as Other Backward Classes, 3.4% as Scheduled Tribes, 11.4% didn't know their caste, and 5.4% declined to disclose. This reflects entrenched caste-based segregation: sanitation work in India is overwhelmingly caste-assigned.

Heat Exposure and Vulnerability: Most workers (93%) start before 11 am, some as early as 6–7 am. However, 74% continue working through 11 am–3 pm—the hottest period. DWCC and godown sorters are most affected with over 90% working outdoors at peak heat, versus 76% of free-roaming pickers, and 56% of pourakarmikas. On-foot pickers and DWCC drivers/helpers, who walk 6–9km/day, suffer compounded heat exposure.

Income and Exposure Inequities in Waste Work:

There is a **stark income disparity between formal and informal waste workers.** All pourakarmikas report earning above ₹4,500 per week, while none of the informal workers—particularly free-roaming waste pickers and DWCC workers—reach this threshold. In fact, the majority earn less than ₹3,500 per week.

At the same time, **those earning the least are exposed to the highest levels of physical exertion and exposure risk.** Free-roaming waste pickers work the longest hours outdoors—an average of 8.05 hours per day—compared to 7.51 hours for DWCC workers and 7 hours for pourakarmikas. They also walk nearly 7 km daily in the course of their work, far exceeding the 2.97 km covered by pourakarmikas on fixed routes.

This imbalance underscores how informality within the waste sector magnifies vulnerability: the most precariously employed workers are not only underpaid but also face greater physical and climatic burdens, especially during peak summer months.

Heat Impact on Work:

Heat heavily affects work: **92.2% report significant or increased impact, and 86% say the same work is now harder and slower due to heat.** This reduces productivity and earnings and complicates collection patterns. The ways workers cope vary:

Free-roaming waste pickers were most flexible: 80% reduced working hours, 63% changed work

timings to cooler hours, and over half (54%) changed collection routes to avoid heat or fatigue. Their informal and self-directed work made adaptation possible, but at the cost of reduced income.
DWCC workers had moderate flexibility: ~49% reduced working hours, and ~32.6% changed timings, with drivers and helpers having more scope to adjust than sorters bound to site-based work.

Pourakarmikas had almost no flexibility due to fixed municipal shifts: only 2% reported reducing working hours, and none reported changing their work timings.

Men show more adaptive coping (70% reduced hours, 48% changed timings) than women (30% reduced hours and 23% changed work timings), reflecting women's double burden: fixed work schedules and domestic duties limit their ability to adapt even when they feel the heat more intensely.

Adjusting work hours during peak heat is rarely feasible: fixed shifts for pourakarmikas (monitored by biometric attendance), and strict targets for DWCC workers, limit break-taking. Very few can pause work during the hottest hours (12–3pm); only five workers, mostly foot-based pickers and a couple of DWCC drivers/helpers, managed it at all. Men can shift their hours more than women (48% vs 23%).

Personal Protective Equipment (PPE) Use and Barriers:
Use of PPE reflected both worker category and gender dynamics. Pourakarmikas had the highest PPE use due to formal provision, while free-roaming waste pickers had the lowest. Only 9.8% reported regular, issue-free use. Barriers include heat-induced discomfort (35.3%), difficulty adjusting (32%), and affordability (18.3%). Women report greater access to PPE, but men more often cite discomfort.

Access to Heat-Related Amenities

Access to heat-protective infrastructure varies greatly. **Pourakarmikas** mainly have cotton PPE shirts (92%) but almost no drinking water (2%), rehydration, sanitation, or cooling amenities. While they have better access to rest spaces (78%), these are minimal defences against heat stress.

DWCC workers reported comparatively better access to basic infrastructure—such as clean washrooms, running tap water, and occasional fans or coolers—often provided by DWCC operators. They also had the highest access to rehydration solutions among all groups. Within this category, drivers and helpers consistently had better access than sorters, though overall access to rest spaces and shade remained limited. In contrast, only about half of DWCC workers reported access to protective clothing (49%),

Free-roaming waste pickers, especially those on foot, had the lowest access to nearly every amenity. This included protective clothing, rest areas, sanitation, and rehydration support. While a little over half managed to access drinking water—mainly through personal effort and public sources—their work's informal and mobile nature left them most vulnerable to heat-related risks.

Overall, access to basic amenities remains limited. Only 39.6% of respondents had access to clean drinking water. Clean washrooms are even rarer (13%) and sharply gender-skewed: 8.1% for women, 21.4% for men. Amenities like fans or running tap water are scarce (under 6%), often limited to DWCC sorters.

Gendered patterns were equally sharp: While women had relatively better access to PPE shirts and rest spaces (often due to being concentrated in roles like pourakarmikas and DWCC sorters where they are provided PPE shirts), men had relatively higher access to clean drinking water, washrooms, running water in toilets, and rehydration solutions. These differences highlight how structural gender

and occupational hierarchies intersect to shape everyday vulnerability.

Health impacts and access to healthcare:

Heat-related symptoms are widespread: muscle cramps (72%) and exhaustion (62.3%) are most common, plus dehydration (37%), dark urine (31%), skin issues (25%), stomach problems (28%), edema (22%), heatstroke (15%), and kidney problems (8%). Women report a higher prevalence of nearly all these, except gastrointestinal complaints, where men slightly lead. Notably, 43% of women had worse menstrual cramps during heat, highest among DWCC sorters (80%).

By worker category, free-roaming waste pickers on foot, who walk long distances (over 7 km daily), report the highest levels of heat cramps (about 80%). Dehydration was highest among pourakarmikas (46%) followed by free-roaming waste workers at 41%. DWCC sorters, who often sit for extended hours to sort waste, show relatively low dehydration (17%) but report higher gastrointestinal issues (26%), more than pourakarmikas (24%) or free-roaming waste pickers (22%). Interestingly, pourakarmikas, despite having the least exposure to peak heat hours (12–3 pm), report the highest instances of water retention/edema (38%) and heatstroke (18%). This may be linked to better symptom recognition and articulation due to higher education levels (46% received education, as compared to 38% in free-roaming waste pickers on foot, and 31% in godown sorters).

Healthcare access is uneven. While 71% of workers reported getting medical diagnoses for heat illnesses, this figure was much higher among DWCC workers (73.4%), followed by free-roaming waste pickers (67.27%) and pourakarmikas (62%). Barriers include not seeing care as necessary, distance to clinics (especially for foot-based pickers), cost, and fear of income loss (for both free-roaming waste workers and DWCC workers). Self-medication is rampant: 69% reported buying medicine without a doctor's prescription.

Heat and Economic Burden:

Income loss and reduced productivity: Heat also reduced earnings, especially for the most informal waste workers. Free-roaming waste pickers experienced the highest average weekly income loss of about ₹504 (approximately 14% of income). DWCC sorters also reported losses around ₹500 per week, while pourakarmikas' incomes remained largely stable due to fixed wages. Extreme heat is pushing already marginalised waste workers—who do not earn a living wage—into deeper financial distress. Average weekly income losses translated to about ₹2,000 per month.

Over half of pickers (54%) altered routes to adapt, and many saw drops in access to valuable material, most keenly among vehicle-based (60%) and on-foot pickers (40.5%). Extreme heat also impacted waste sorters productivity as highlighted in our focus-group discussion by workers who went from sorting 15-20 kg per day, they are able to sort around 10 kg per day in summers.

Increased household and medical expenses: Household expenses also jumped, compounding lost income: 94% of workers reported higher costs for food and water, and around 86% for fans or coolers. Women also faced higher increases in medical expenses (65%) compared to men (58%), pointing to a slightly heavier financial burden.

Medical expenses specifically for heat-related illnesses averaged ₹1,196 per month, with men spending slightly more than women (₹1,313 vs ₹1,132). Total overall monthly expense increased by an average of ₹1,317—highest among DWCC sorters (₹1,815) and male waste workers (₹1,695). The lowest expenditure was among free-roaming waste pickers on foot (₹734) and women in general.

This could reflect their limited financial capacity due to lower and more irregular earnings, and in the case of women, potentially constrained financial autonomy.

What is needed by waste workers:

Short-term requirements focused on basic essentials: clean and accessible toilets (98.04%), sufficient drinking water (86.93%), awareness about heat-related illnesses (86.27%), healthcare access for treatment (79.08%), need for shade or resting spaces (64.05%), cooling infrastructure like fans (58.17%), and access to public spaces (56.86%). Women especially emphasized safe toilets and menstrual health support. Surprisingly, only eight respondents asked for breaks during working hours between 12pm and 3pm with compensation reflecting how inflexible or insecure many of their jobs are but about 41 demanded more flexible schedules.

Long-term requirements reflected deeper structural needs: The need for recognition and dignity (96.1%), fair wages (92.86%), and access to social security and health insurance (87.66%) as top priorities. Workers also demanded involvement in planning and decision-making reflecting a clear need for participatory governance. They also stressed the importance of improved housing with greenery and basic services (83.77%), more green spaces in the city (83.77%), and being involved in government planning (80.52%). Free-roaming waste pickers stressed better pricing for recyclables; pourakarmikas advocated for permanent employment. Women highlighted sanitation and reproductive health support, while men pointed to shade infrastructure and equipment.

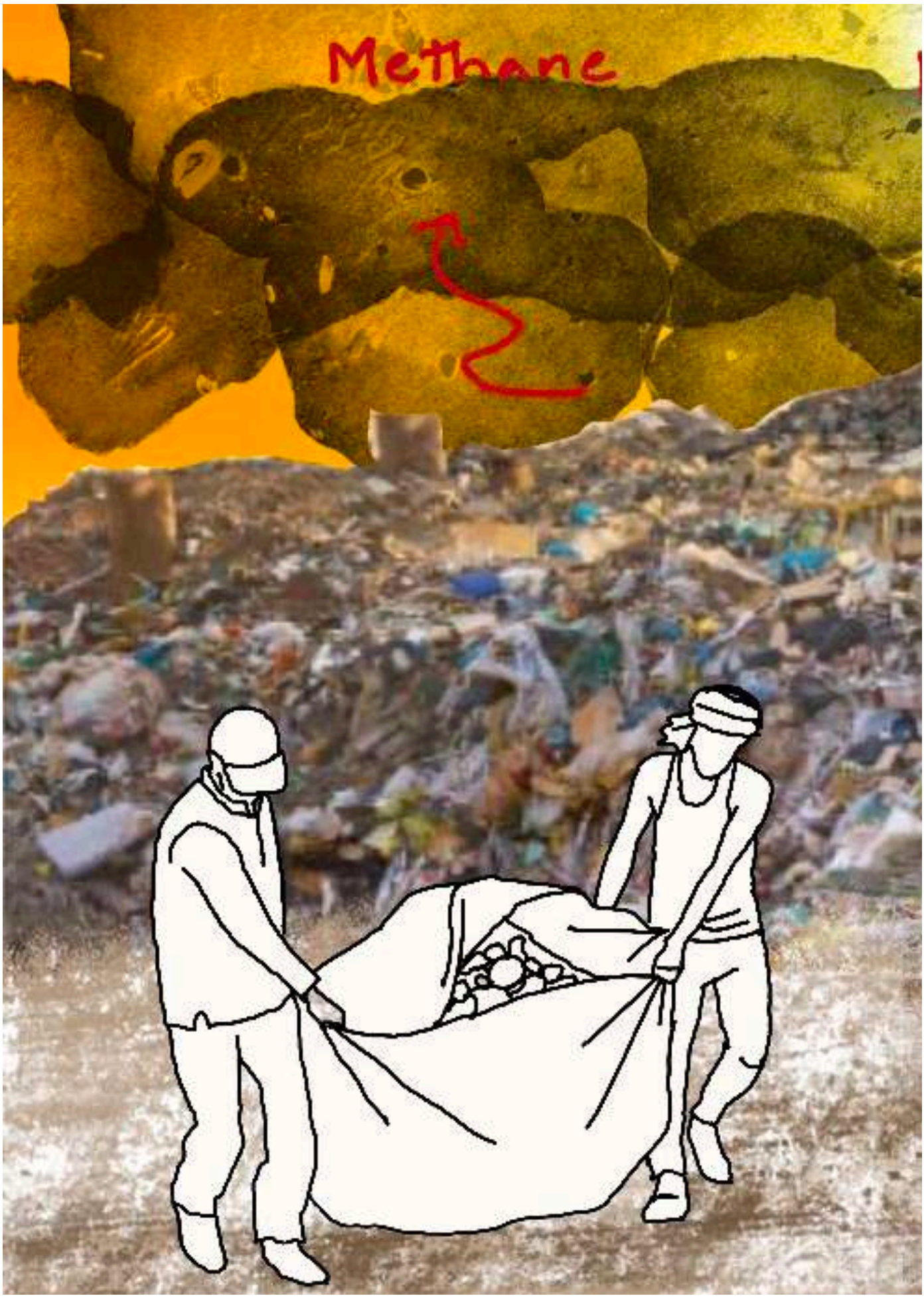
Summary Pointers:

Worker category-wise:

- *Free-roaming waste pickers:* Most vulnerable among all waste worker categories. They face the highest heat exposure, walk the longest distances, and show the most flexibility in adjusting work hours. However, they also face the greatest risk of income loss and have the least access to basic amenities.
- *DWCC workers:* Relatively better access to some amenities, relatively moderate income loss, yet vulnerable with the highest peak heat exposure especially among sorters, predominantly women.
- *Pourakarmikas:* Comparatively least income loss due to fixed wages, relatively best access to rest spaces/PPE—but limited flexibility and very low access to water and rehydration during work, leading to high daily heat symptoms.

Gender-wise:

- *Women:* Reported stronger and more intense heat impacts and higher prevalence of health issues; have worse access to critical amenities like drinking water and washrooms; less flexibility to adjust work schedules.
- *Men:* Displayed greater ability to adjust hours/routes, slightly higher heat-related spending; better access to clean drinking water, washrooms, and rehydration solutions.


Methane


Carbon
Dioxide

11. Main Recommendations: Work-place Amenities and Health

This study identified several challenges related to heat and impact on waste workers, spanning workplace amenities, occupational safety and health concerns. Our recommendations focus on immediate practical interventions, such as upgrading existing infrastructure and enabling greater access to basic services as a baseline requirement to address heat-related challenges that arise for waste workers. Focusing on actionable, short-term improvements can help alleviate the immediate difficulties faced by various categories of waste workers. However, effective adaptation and mitigation of heat-related challenges is not possible without built-environment and structural changes at both workplaces and homes. These are long-term solutions that require governance and policy-level reforms, and must be grounded in diverse occupational realities and include worker representation to ensure efficacy. At the outset, the government and civil society must recognise the vital public health and climate services waste workers provide and ensure they have better access to basic amenities and healthcare, given their heightened vulnerability to rising heat.

On Workplace amenities and Basic Provisions:

One of the key findings from our study was the lack of adequate workplace amenities, which posed significant challenges to waste workers in Bengaluru.

- **Cooling and WASH amenities:** Only 3% of waste workers reported access to cooling amenities like fans, 5% reported access to running water in toilets and 14% had access to toilets during work.
- **Water Access and Expenditure:** Clean drinking water was available to around 45% of waste workers. During summer months, over 90% of waste workers reported increased spending on food and drinks and on water. Access to drinking water was the second highest requirement shared by 87% of workers.
- **Lack of Rest Spaces:** Our survey shows that more than 65% of waste workers reported lack of access to rest areas during work - an essential requirement to cope and manage heat during work. Existing places for rest such as Suvidha Cabins were reportedly inaccessible to pourakarmikas and were not used by DWCC workers and free-roaming waste pickers.
- **Heat Exposure:** The majority of waste workers surveyed work between 6 to 10 hours daily with a significant majority of waste workers at 74% continuing working between 11 am and 3 pm—the peak heat period resulting in high heat exposure and risk.
- **Working Hours:** Only 34.4% reported changing their working hours to cope with extreme heat. Additionally only 5% of workers preferred pausing work during 12 - 3 pm as a short-term solution to cope with heat, suggesting that standard advisories such as halting work during peak heat hours may not align with worker preferences. Many workers instead prefer to complete their shift early and return home. Therefore, priority should be on improving workplace conditions rather than merely adjusting working hours.

11.1 Recommendations for Immediate Action:

1. Improving Infrastructure and Amenity Access:

- Improve infrastructure: DWCCs across wards should be upgraded with access to basic amenities, such as electricity for cooling amenities and toilets with running water, which were identified as a top requirement by more than half of the surveyed workers. Additionally DWCC infrastructure should be set up in wards which currently do not have it.
- **Utilising DWCCs as a space for all waste and sanitation workers:** In the absence of uniform

coverage of existing amenities, we recommend expanding access to DWCCs and utilising it as a space of rest and as a shared community space for all waste workers including DWCC workers, pourakarmikas, and free-roaming waste pickers during summers.

- **Increased Frequency of Breaks:** Waste workers should be enabled to work in cooler periods and provide frequent breaks in shaded or cool environments to minimize heat illnesses such as heatstroke, muscle cramps, dehydration, and kidney-related issues.
- **Practitioners and Waste Workers Collaboration:** Practitioners should be invited to consult with waste workers in the following action areas related to their workplace such as:
  - » Recommend roofing solutions and structural improvements to enhance ventilation and reduce heat-trapping especially in worksites.
  - » Explore solar roofing options that can be scaled up and implemented by local governance bodies. Solar installations like in Hasiru Dala's Machohalli Material Recovery Facility (MRF) assist in regular supply ensuring consistency and functionality for cooling at the workplace.
  - » Upgrade Suvidha cabins for pourakarmikas to ensure adequate ventilation, improved cooling infrastructure (such as fans), and reliable access to clean drinking water so that workers have safe and comfortable spaces for relief during periods of extreme heat.

2. Expanding access to public spaces and water for waste workers:

- **Public parks should be accessible to all waste workers** including pourakarmikas, DWCC workers and free-roaming waste workers for rest and cooling off with no restrictions or harassment.
- **Provisioning of drinking water and access to toilets:** Access to drinking water and adequate toilets was one of the key requirements for waste workers. They should be provided with free drinking water and toilet amenities in public spaces, especially during summers.

3. Occupational Safety and Health:

- PPE Availability: PPE was the highest available workplace provision reported by 62% respondents, however only around half of the waste workers reported utilizing them consistently during work. Many of them cited discomfort and trouble adjusting to it as the major reason.
- In this context, improved and worker-friendly design of PPEs that provide better comfort and usability in heat should be made available, in the context of occupations like waste work.
- We recommend that the government and practice organisations support scaling improved PPE designs for wider distribution, especially among informal workers such as free-roaming waste pickers.

4. Access to Primary Healthcare Centres (PHC): To address heat-related health issues, access to primary health care must be enhanced:

- **Allow walk-ins:** PHCs should allow workers to receive healthcare without prior appointments, especially during heatwaves.
- **Mobile clinics:** Deploy mobile health units in areas with high waste worker density for onsite screening, first aid, and early treatment of heat-induced symptoms.
- **Conducting health camps:** Organise periodic health camps at waste worker sites and community hubs to provide timely screening and treatment for heat-related symptoms.

5. ESIC coverage: Expanding Employee State Insurance Corporation (ESIC) coverage is crucial.

- **Extension of ESIC:** Broaden ESIC to include more informal workers, ensuring they can access empanelled clinics for affordable healthcare.
- **Promotion and facilitation:** Increase dissemination of and provide enrollment support, especially for women and those in non-traditional waste sectors.

6. Awareness and information: Promoting heat and health awareness is essential for early identification and management of heat impacts.

- Information demand: In the survey, 86.2% of workers identified awareness of heat-related illnesses as their top short-term demand, reflecting a strong need for clear, actionable information.
- Employer and government responsibility: All employers and government departments should actively disseminate heat-health messages tailored to all worker groups.

7. Rehydration is a vital defense against heat stress:

- Oral rehydration solution (ORS): Research indicates that ORS is more effective than water or other drinks in reducing fatigue and preventing heat-related industrial accidents in high-temperature environments. Regular access to ORS or electrolyte-rich fluids should be provided, especially during peak summer months.

Prioritising these health interventions: safer work timings, accessible healthcare, robust insurance coverage, targeted awareness, and effective rehydration can protect workers from both immediate and long-term health effects of heat exposure.

11.2 Policy - Level Recommendations:

- **Need for Disaggregated Data:** Climate-related and heat specific policies lack disaggregated data and differential vulnerability recognition based on occupational categories, social identity like caste and gender, and informal working conditions. Understanding the different working conditions and lived experiences of worker groups is essential to identify and implement effective heat adaptation policies, especially to prioritise those most vulnerable.
- **Contextualised Provisions for Informal Workers:** Guidelines and provisions outlined in relevant HAPs for heat resilience are generalised and often put the responsibility on individuals for self-protection. In the context of informal working groups, it is crucial for policies to respond contextually in a localised manner to worker requirements prioritising health and livelihood needs of workers.
- **Worker Representation in Policy Platforms:** One of the ways to ensure contextually grounded policy is to prioritize worker and marginalized groups' representation in policy platforms such as climate action cells and other government forums that foregrounds, and is inclusive of, their knowledge and requirements.
- **Strengthened Implementation Framework:** Any effective heat intervention requires dedicated and sustained funding mechanisms, administrative and implementation framework, and efficient coordination and communication across government departments to ensure policies translate into action.
- **Embedding HAPs in broader Climate Policies:** By ensuring embedding heat-action plans in broader climate policies and climate action plans, we can ensure frontline workers benefit from coordinated policy measures that address both their chronic, everyday risks and acute disasters resulting in more targeted protections, improved access to relief mechanisms and stronger institutional support for their health and livelihoods. This integrated approach is necessary to ensure no vulnerable group is left behind climate adaptation and urban resilience initiatives.

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HEAT WATCH

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Hasiru Dala