



Women in Informal Employment:  
Globalizing and Organizing



GT MUDANÇAS  
CLIMÁTICAS

November 2024

# Waste Picker Collectives and Climate Vulnerability in Belo Horizonte

Sonia Dias, Juliana Gonçalves and Tiago Augusto Gonçalves Mello



*Coopesol Leste Cooperative in Belo Horizonte. The infrastructure and location of organized waste pickers' sorting warehouses directly influence their vulnerability to the climate crisis. Photo credit: Lina Mintz, 2023*

## Introduction

The climate emergency is global, but its impacts are felt locally, in cities, towns and villages. Cities not only contribute significantly to climate change but are also strongly affected by it. In this context, these urban settings face a range of physical risks, including heat waves, floods, and the expansion of drought-affected areas, due to climate change.

Workers in informal employment and residents of informal settlements are likely to be among those most affected. WIEGO conducted [research on the impacts of climate change on waste pickers](#) in Brazil, which identified the need to document how climate change affects waste pickers in their workplaces.

Analyzing climate vulnerability in different territories is essential to highlight the geographic areas where impacts are likely to be greatest, and the type of

climate event the region is most likely to be affected by, thus guiding the adaptation intervention required for each territory. By identifying the locations of the sorting warehouses of waste picker cooperatives and other waste picker associations in Belo Horizonte and cross-referencing them with information from the city's vulnerability map, it is possible to assess the situation of the area in which the cooperative is located and better evaluate the city's climate action plans.

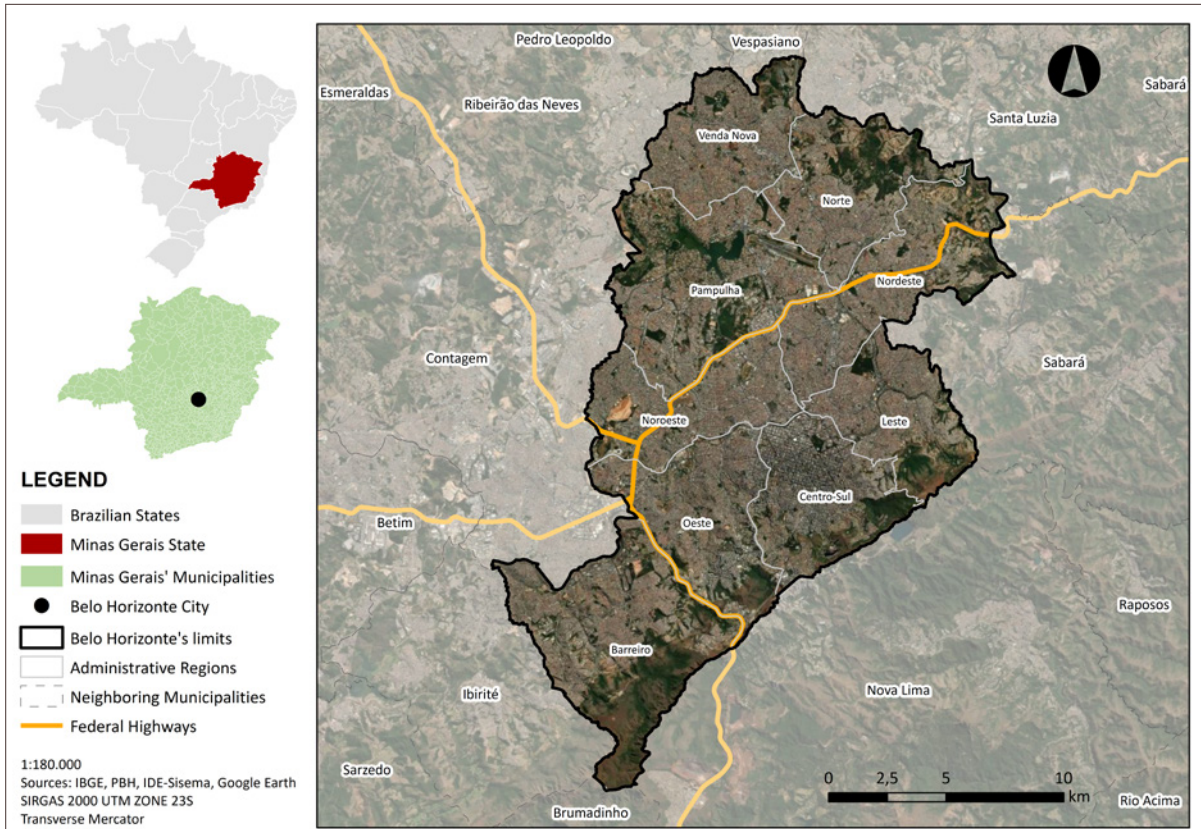
The methodology applied in this study is based on Geographic Information Systems (GIS) tools. The study collected available local data about the climate vulnerability of Belo Horizonte (i.e., vulnerability to floods, heat waves, and dengue fever) and the location of cooperatives and other waste picker associations' sorting warehouses within the city limits.



## Context

According to the Köppen-Geiger classification, Belo Horizonte has temperate climate, with concentrated rainfall in the summer and a dry season in the winter. The maximum and

minimum temperatures observed in the city do not vary greatly among seasons, although summer days are generally hot and winter days generally cold.



*Belo Horizonte is the capital of the state of Minas Gerais and an important commercial centre. With 2.3 million inhabitants, the city represents 11% of the state's population and is Brazil's sixth largest city by population (IBGE 2022). The city is divided into nine administrative regions: North, Pampulha, Venda Nova, Northeast, East, West, Northwest, Centre-South and Barreiro.*



*The work of waste pickers in sorting warehouses needs to be considered in climate action plans and cities' adaptation strategies. Photo credit: Sonia Dias*

## Climate Vulnerability and Waste Picker Cooperatives and Other Associations

Climate vulnerability maps are visual tools that represent the areas that are most susceptible to the impacts of climate change, such as floods, heat waves, droughts, vector-borne diseases and other climate-related phenomena. These maps are based on the analysis of geospatial and socioeconomic data, enabling the identification of regions that face greater risks due to their location, infrastructure, socioeconomic conditions and historical exposure to adverse climate events (O'Brien et al. 2013). By highlighting the vulnerability of different territories, these maps help to create adaptation strategies that aim to protect communities and promote public policies to achieve this.

The Climate Impact Lab<sup>1</sup> foresees substantial increase in the number of days per year where temperatures reach or exceed 32°C by 2090. Currently, many regions experience up to 12 such days per year, but this number is expected to increase to 30 days by the end of the century due to climate change. In addition, historical trends reveal an increasing frequency and severity of floods, driven by rising sea levels and more intense rainfall. Projections indicate that, as global temperatures continue to rise, floods will become increasingly frequent and destructive, causing more extensive damage to infrastructure, more displacement of communities, and significant economic losses.

Linking climate vulnerability mapping to the locations of waste picker cooperatives' sorting warehouses is essential, as waste pickers often operate in areas susceptible to extreme weather events, which can directly impact their activities, as identified by WIEGO research (Dias et al. 2023). With

this information, we are able to identify the areas of the city most exposed to these risks and develop adaptation strategies to mitigate their impacts, since the work of waste pickers in vulnerable areas may face further challenges.

“Adaptation to climate change is related to the process of adjusting natural and human systems to current and future climate behavior. In human systems, adaptation seeks to reduce and prevent potential harm; or to explore beneficial opportunities arising from such change. In natural systems, human intervention seeks to support the adjustment of these systems to the current and future climate and its effects” (IPCC 2014).

The climate vulnerability map is the final product of a field of study that is expanding in the urban context. This type of analysis considers a large and diverse amount of data in its preparation, including information regarding climate (rainfall rates, air temperature, relative humidity index, etc.), geography (land relief, slopes, the presence of vegetation, etc.), socioeconomic factors (income, population density, etc.), and government action (infrastructure, plans and policies, etc.). The index is prepared by the overlapping of spatial data, resulting in a map indicating critical points of socio-environmental risks in a given territory.

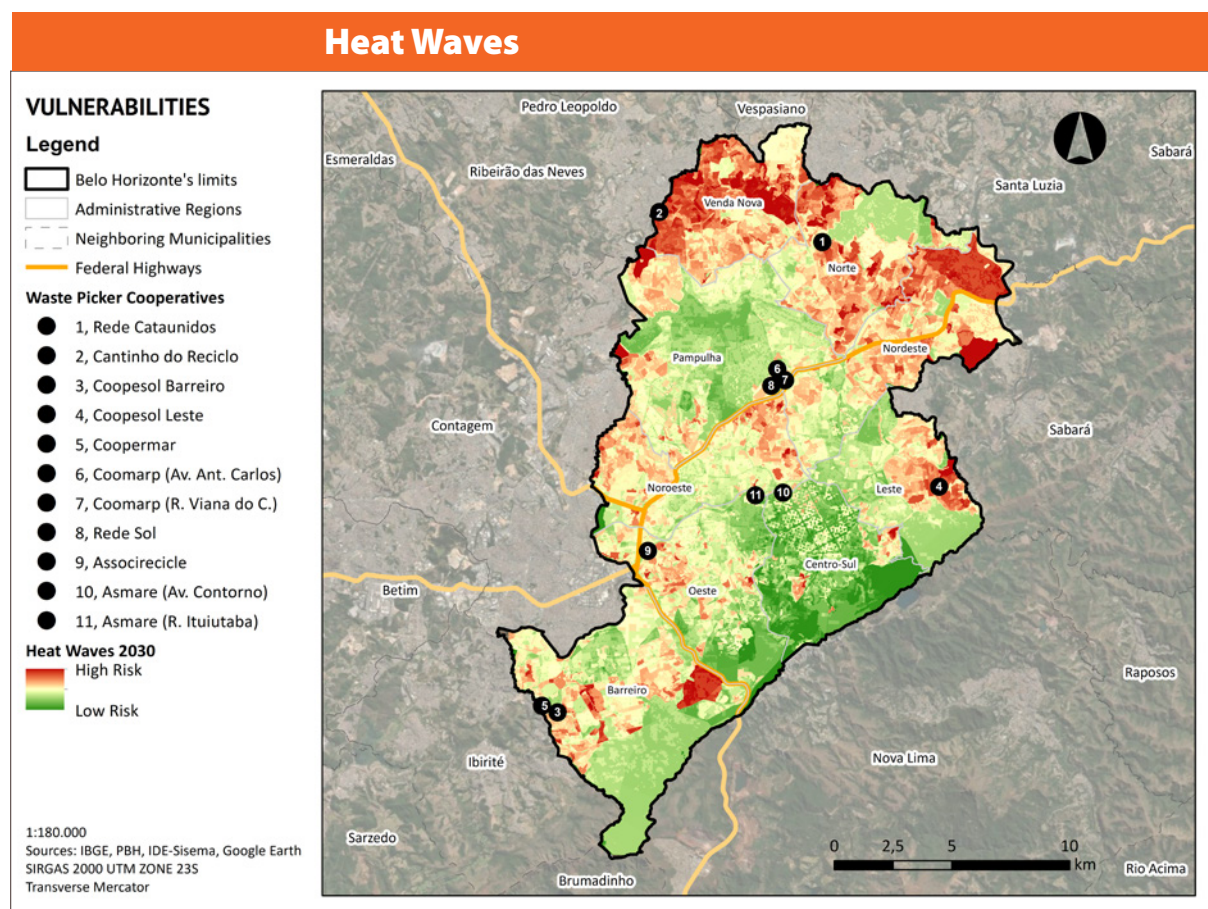
<sup>1</sup> The Climate Impact Lab is a non-profit organization whose mission is to measure and communicate the impacts of climate change to inform decision-making.



In Belo Horizonte, the study was carried out by WayCarbon, a local company involved in this work, within the scope of the ICLEI South America Climate Action Plan project.

The analysis resulted in four themed maps: Floods, Heat Waves, Landslides and Dengue. In this case study, we focus on the following themed maps: Floods, Heat Waves and Dengue.

**A limitation of this study is that it does not perform an analysis at the building level, that is, it does not focus exclusively on the workspaces of waste pickers. Instead, it adopts a broader approach, considering the city as a whole and the impact of the aforementioned risks on the regions where these buildings are located. This perspective may limit the depth of the discussion on the infrastructure of sorting warehouses, but it enables analysis of the areas where they are located. Therefore, the study remains relevant, since waste picker cooperatives and other associations play a central role in addressing socio-environmental and climate issues.**



Heat waves are prolonged periods of abnormally elevated temperatures, usually accompanied by low humidity. The analysis considers data on air temperature and extreme weather events, such as the maximum number of consecutive dry days and heat waves. In addition, it associates information on vulnerable social groups, such as children, older people, and low-income families; and fragile territories,





understood as areas that are densely populated, impermeable and devoid of vegetation. The Northeast and Venda Nova regions stand out as the most exposed, vulnerable and climate-threatened areas. On the other hand, the Pampulha and Centre-South regions are less affected, due to the presence of wooded areas, better urban infrastructure and more concentration of income.

**Although the cooperatives and other associations' sorting warehouses are located in the territories, we cannot affirm that they – including those in less vulnerable areas – are appropriately prepared to deal with heat waves or whether their adapted facilities may actually worsen the situation.**

## Floods

### VULNERABILITIES



#### Legend

-  Belo Horizonte's limits
-  Administrative Regions
-  Neighboring Municipalities
-  Federal Highways

#### Waste Picker Cooperatives

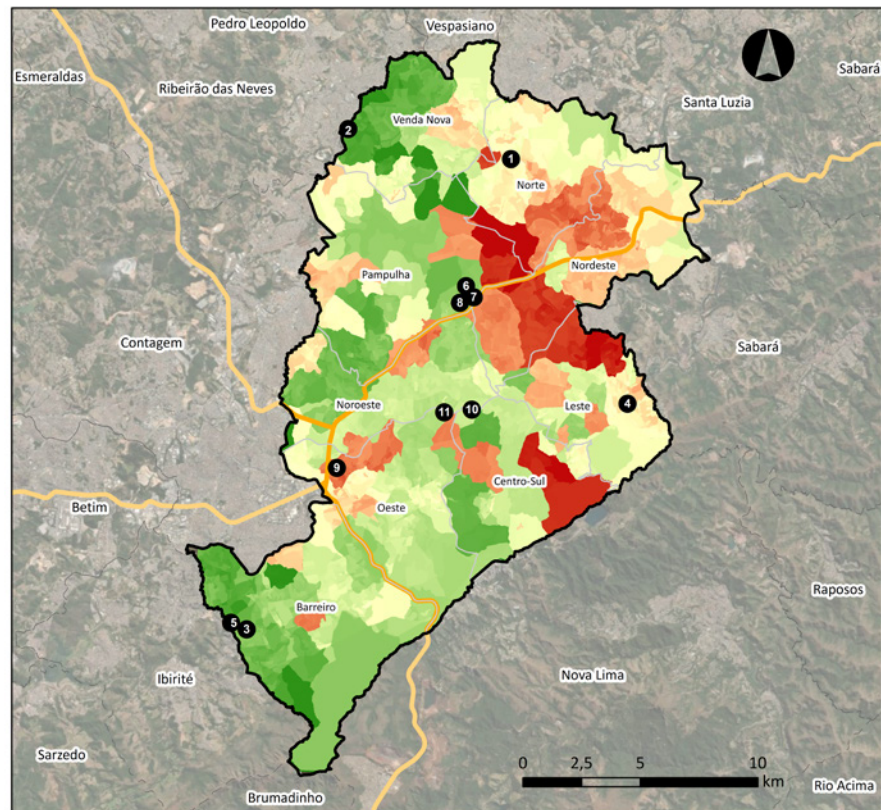
-  1, Rede Cataunidos
-  2, Cantinho do Reciclo
-  3, Coopesol Barreiro
-  4, Coopesol Leste
-  5, Coopermar
-  6, Coomarp (Av. Ant. Carlos)
-  7, Coomarp (R. Viana do C.)
-  8, Rede Sol
-  9, Associrecycle
-  10, Asmare (Av. Contorno)
-  11, Asmare (R. Ituiutaba)

#### Flooding 2030

-  High Risk
-  Low Risk

1:180.000

Sources: IBGE, PBH, IDE-Sisema, Google Earth  
SIRGAS 2000 UTM ZONE 23S  
Transverse Mercator



*Note: The flood data used in this study are from 2014 and represent the most recent information available to understand the city's vulnerability. This situation highlights the need to update these data, which are essential to inform climate change adaptation policies and strategies more accurately and effectively.*

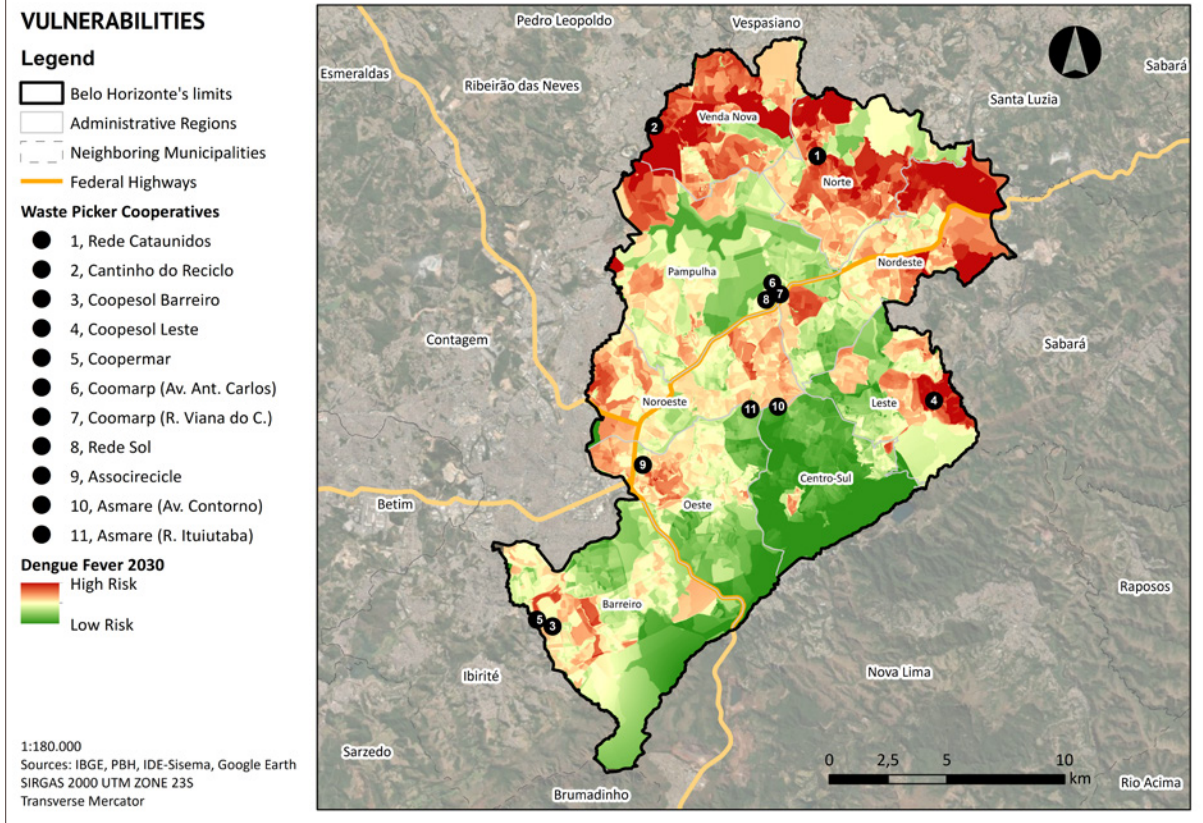
Floods are events in which large volumes of water flood usually dry areas, often due to heavy rainfall, river overflows or inadequate drainage systems. They are considered extreme weather events due to their ability to cause significant damage to infrastructure, public health and the environment, in addition to causing economic losses and displacement of communities. The analysis considers rainfall data from the city of Belo Horizonte, including during extreme weather events, such as the

maximum number of consecutive rainy days and torrential rains. Information on vulnerable social groups, such as low-income families and densely populated neighbourhoods, as well as fragile territories characterized by impermeable, concave areas close to bodies of water, is also included. The Northeast, East, and Centre-South regions are the most affected due to the vulnerability associated with their sub-basins.

**Sorting warehouses of cooperatives and other associations are structures that are often located in flood-prone areas or areas with urban drainage problems and, by reading the map, it is difficult to analyze the specific vulnerabilities of waste pickers' work infrastructures.**



# Dengue



Dengue is a viral disease transmitted by mosquitoes, mainly *Aedes Aegypti*. It causes symptoms such as high fever, muscle pain, joint pain and skin rashes.

Its incidence can increase significantly during periods of hot and humid weather, which favours the mosquitoes' breeding. Climate change can intensify these patterns, leading to more frequent and severe outbreaks, with serious impacts on public health. The analysis includes data on air temperature, humidity and rainfall, identifying vulnerable

social groups, such as low-income families, densely populated neighbourhoods, children and older populations, as well as fragile territories, which include vacant urban lots and areas with irregular waste disposal, as well as neighbourhoods with high rates of arboviruses.

The North, Venda Nova, and Northeast regions stand out as the major hotspots of exposure, vulnerability and threat to the proliferation of vectors.

**The analysis of risk and vulnerability to dengue has specificities that may be aggravated by the conditions of waste pickers' workplace facilities. Therefore, areas of great vulnerability tend to face even more critical situations due to such conditions, which can favour the proliferation of the mosquitoes that transmit dengue and other diseases.**

## Recommendations

Waste pickers are among the sectors of workers who emit the least greenhouse gases (GHG). In addition, their work plays an essential role in mitigating such gases. However, these workers are among the groups most vulnerable to the impacts of climate change. In this context, we must consider that, in addition to the specificities of the territories where they are located, sorting warehouses have additional factors that can aggravate the situation of waste pickers who work in these spaces, especially in the face of extreme weather events. Therefore, it is necessary to develop more in-depth studies that identify climate vulnerability associated with the work of waste pickers, taking into account the analysis of their workspaces in sorting warehouses and, eventually, of waste pickers who also work on the city streets.

Identifying the climate vulnerability of waste pickers' workspaces can contribute to the development of investments and planning aimed at renovating and constructing climate-sensitive work infrastructure. This would make it possible to adapt

warehouses to withstand floods, strong winds or heat waves, ensuring the safety of workers, the continuity of operations, and avoiding significant impacts on waste pickers' income.

In addition, studying these vulnerabilities can guide actions to mitigate health risks, such as exposure to extreme heat or contamination by materials after severe weather events. It is essential to consider the physical facilities of workplaces when measuring climate vulnerability, because these spaces can directly influence workers' ability to adapt and be resilient to extreme weather events.

Belo Horizonte stands out as one of the few Brazilian metropolises with a climate action plan, which is crucial to address the challenges posed by climate change. Having a plan allows the city to identify its vulnerabilities, develop strategies to mitigate impacts, and promote the resilience of affected communities. Therefore, it is recommended that climate vulnerability factors related to waste pickers are integrated into the local



*The construction of climate-sensitive work infrastructure for waste pickers is essential.  
Photo credit: Sonia Dias*



adaptation plan, as a way to advance climate justice and a just transition. This integration is essential to ensure that all social groups, especially the most vulnerable, have their needs considered in adaptation actions.

In addition to identifying climate vulnerabilities, it is essential to identify ways to contribute to increasing the resilience of waste pickers through actions specifically designed for and focused on the particularities of the sector, such as:

- Developing studies on climate vulnerabilities in city administrations, analyzing the location of workspaces, that is, both sorting warehouses and the streets. This initiative is essential to bring visibility to the labour dimension of a sector that contributes significantly to GHG mitigation. These studies could be conducted in partnership with social movements, NGOs and universities in a system of co-production of knowledge. Communicating the findings of these studies in the form of popular education is essential to increase waste pickers' ability to respond to extreme events.
- Conducting climate awareness campaigns to disseminate information and climate emergency protocols, as well as intensifying campaigns against dengue fever. This would contribute to increasing waste pickers' response capacity and resilience.
- Analyzing the vulnerabilities of the infrastructure of sorting warehouses, since the current poor conditions can add extra layers of exposure – a factor that is outside the scope of this

study. This research could guide waste pickers' demands regarding access to funds to renovate and/or build climate-sensitive work facilities.<sup>2</sup>

We highlight the crucial need for waste pickers to use existing systematized information and data to support their demands for climate justice. The critical need to produce evidence-based climate policies will increase. By using climate vulnerability maps and developing other studies, the waste pickers' social movement will make a valuable contribution to the improvement of climate adaptation policies in their regions.

## **Acknowledgements**

The authors thank the Environmental Department of the City of Belo Horizonte, as well as the cooperatives and associations of waste pickers in Belo Horizonte for providing essential data and information for this study. They are also grateful to the Climate Change Working Group of the Waste and Citizenship Forum of Belo Horizonte for their valuable contributions, reflections and recommendations offered throughout the process of producing this work.

---

<sup>2</sup> Climate-sensitive work facilities are workspaces, such as sorting warehouses, designed or adapted to withstand and adapt to the impacts of extreme weather events. This includes protection against floods, adequate ventilation to cope with heat waves, reinforced infrastructure against strong winds, and strategies to prevent the proliferation of disease vectors, such as the dengue mosquitoes. Based on technical studies, this sensitive infrastructure seeks to ensure safety, health, and continuity of work, minimizing climate impacts and preserving the income of waste pickers.



## References

O'Brien, K. L., Eriksen, S., Nygaard, L. P. and Schjolden, A. 2013. Why different interpretations of vulnerability matter in climate change discourses. *Climate Policy*, 7(1), 73-88. At: <https://doi.org/10.3763/cpol.2007.0706>

Dias, S. M., Castán Broto, V., Cypriano, B., Ogando, A. C., and Gonçalves, J. 2024. The case for a climate bonus: waste pickers' perceptions of climate change in Minas Gerais. *Environment & Urbanization*, 36(1), 93-111.

Dias, S. M., Castán Broto, V., Cypriano, B., Ogando, A. C. and Gonçalves, J. 2023. *Impactos das mudanças climáticas e estratégias de adaptação: experiências de catadoras*. [Impacts of climate change and adaptation strategies: experiences of waste pickers.] WIEGO. At: <https://www.wiego.org/publications/impactos-das-mudancas-climaticas-e-estrategias-de-adaptacao-experiencias-de-catadoras>

Intergovernmental Panel on Climate Change (IPCC). 2014. *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Summary for Policymakers*. At: <https://www.ipcc.ch/report/ar5/wg2/>

WayCarbon. 2021. *Resumo para os tomadores de decisão: estudo de vulnerabilidade às mudanças climáticas de Belo Horizonte*. [Summary for decision-makers: a study of the vulnerability to climate change in Belo Horizonte.] At: <https://conteudo.waycarbon.com/resumo-para-os-tomadores-de-decisao-estudo-de-vulnerabilidade-as-mudancas-climaticas-de-belo-horizonte..>

## About WIEGO



Women in Informal Employment: Globalizing and Organizing (WIEGO) is a global network focused on empowering the working poor, especially women, in the informal economy to secure their livelihoods. We believe all workers should have equal economic opportunities, rights, protection and voice. WIEGO promotes change by improving statistics and expanding knowledge on the informal economy, building networks and capacity among informal worker organizations and, jointly with the networks and organizations, influencing local, national and international policies. Visit [www.wiego.org](http://www.wiego.org).

## About FMLC



The Municipal Waste & Citizenship Forum of Belo Horizonte is a multi-stakeholder platform for debating and articulating inclusive recycling policies. Created with the aim of gathering together waste pickers' organizations, civil society, academia and municipal entities, the Forum has helped shape policies in Belo Horizonte city, Brazil. The Forum is guided by key principles: solidarity, social inclusion, circular economy and shared responsibilities.

## About ICLEI



Local Governments for Sustainability is a global network working with more than 2500 local and regional governments committed to sustainable urban development. Active in 125+ countries, we influence sustainability policy and drive local action for low emission, nature-based, equitable, resilient and circular development. Our team, as well as our associated governments work together through peer-to-peer exchange, partnerships, and technical training towards the creation of systemic changes for the urban sustainability. Visit [www.iclei.org](http://www.iclei.org).