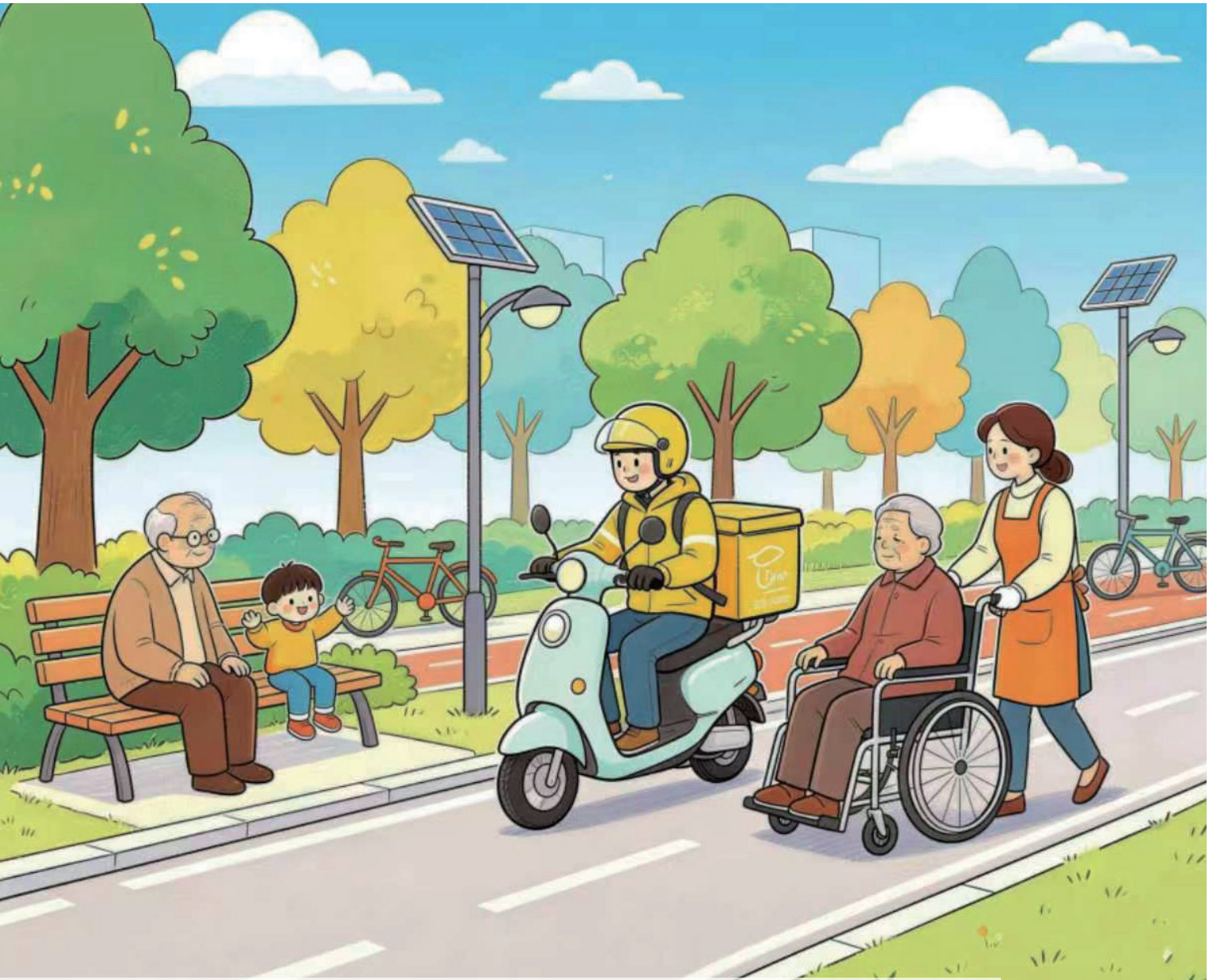


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Registered offices
Bonn and Eschborn, Germany

GIZ Office China
Tayuan Diplomatic Office Building
1-13-2 14 Liangmahe Nanlu,
Chaoyang District 100600 Beijing, PR China
T +86 10-8527 5180
F +86 10-8532 1405
E giz-china@giz.de
I www.giz.de/china

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Project Director
Heinrich Gudenus

Head of China Component
Liu Tong

Author
GIZ

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Beijing, June 2026

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I. Introduction

As global climate change intensifies, extreme weather events are transitioning from sporadic crises to systemic challenges that threaten both urban operations and social equity. As a region highly sensitive to global climate shifts, China has recently been battered by compounding climate hazards-including heatwaves, torrential rains, and cold snaps-with both frequency and intensity consistently breaking historical records. In 2024, China's climate risk index reached its highest level since 1961, with floods and oppressive heat posing particularly severe threats. Multiple regions have experienced successive periods of prolonged cold, dangerous heat indices, and historically heavy rainfall, exposing systemic vulnerabilities in urban infrastructure and public service networks when responding to extreme climate events. [1]

Climate risks are not distributed equally; rather, they are deeply embedded within social structures and are experienced disproportionately based on dimensions such as gender, occupation, and lived bodily and psychological experiences. Against this backdrop, persons with disabilities, domestic workers, and delivery workers represent three **highly vulnerable populations**. Burdened by compounding disadvantages, they find themselves trapped in a perpetual state of precarity. People with disabilities rely heavily on accessible environments and assistive systems; when infrastructure fails during extreme weather, their mobility, safety, and overall resilience face severe tests. Domestic workers, predominantly middle-aged and older women, operate as informal workers within the gig economy and lack essential institutional safety nets. Extreme weather disrupts their commutes and causes sudden spikes in physical exertion, directly undermining their livelihood stability. Similarly, delivery workers, an emerging workforce within the platform economy, are frequently forced to navigate extreme heat, torrential rain, or freezing conditions. Due to their flexible employment status, they lack robust social protection, leaving their physical safety and occupational health profoundly exposed to climate shocks.

The lived realities of these populations under climate stress not only reflect their individual quality of life but also highlight core deficits in contemporary urban governance. **Fundamental urban planning paradigms have yet to universally incorporate climate-resilient principles**, resulting in structural gaps in labor rights protections, inclusive public service delivery, and emergency response mechanisms. Furthermore, the **physical infrastructure and institutional frameworks** that sustain daily urban functions remain inadequately adapted to climate realities. To address these gaps, this study conducted three targeted empirical investigations between late 2025 and early 2026.

This research comprises three components. The first is a nationwide online survey of people with disabilities, encompassing physical, visual, and hearing impairments. Covering regions such as Beijing, Shanghai, and Shandong, this survey examined the impacts of extreme weather on accessible mobility, the use of assistive devices, information access, and emergency support, yielding 483 valid responses. The second component utilized a mixed-methods approach-combining surveys and in-depth interviews-to study domestic workers in Beijing. Focusing primarily on middle-aged and older women in both live-in and live-out arrangements, the research assessed how extreme climate events impact commuting safety, physical exertion, mental health, and employment dynamics, collecting 111 valid responses. The third component, conducted in November 2025, represents the first empirical study specifically examining climate adaptation among delivery workers in Beijing. It encompasses a diverse cohort of workers across different age groups, genders, employment types, and experience levels. Conducted via an online questionnaire, this survey investigates workers' actual exposure to and coping mechanisms during recent extreme weather events in Beijing, the primary safety risks they encounter, the impacts of platform algorithms, and the efficacy of existing protective measures. It further explores the unique challenges faced by female workers and workers with disabilities. By leveraging frontline data, this segment aims to drive highly targeted policy optimizations and strengthen social support systems, successfully collecting 203 valid responses.

Drawing on the systematic collation and analysis of this empirical data, we present this report. By delineating the lived realities of these three groups under extreme climate conditions, we aim to identify their shared institutional barriers alongside group-specific risks. In doing so, this report provides a solid empirical foundation and actionable policy recommendations for designing more inclusive, equitable, and resilient territorial-spatial planning and climate adaptation frameworks. Ultimately, we hope this study will elevate policymakers' awareness of the climate vulnerabilities faced by marginalized groups and foster the cross-sectoral collaboration necessary to embed climate resilience into every stage of future urban planning, construction, and governance.

1 Climate Change Centre of the China Meteorological Administration. (2025) [M]. Blue Book on Climate Change in China 2025. Beijing: Science Press.

II. Demographic Profiles of the Research Subjects

This research centers on three vulnerable urban populations: people with disabilities, domestic workers, and delivery workers. These groups face a higher probability of exposure to climate risks while possessing a diminished capacity to withstand them. They exhibit distinct characteristics in terms of age, gender, educational background, employment type, and living conditions, which in turn reflect their disparate social standing and institutional realities.

The sample of persons with disabilities skews relatively young, with a slight female majority, and impairments are predominantly physical, visual, and hearing-related. The vast majority reside in urban areas, with nearly half living in central city districts. While their housing conditions are generally adequate, a subset continues to lack basic household amenities. Although this cohort is comparatively well-educated, with many holding associate degrees or higher, their labor force participation remains notably low, and a significant proportion of working-age individuals are either unemployed or seeking employment.

Domestic workers predominantly consist of middle-aged and older women who enter the market via flexible employment arrangements, with educational attainment largely concentrated at the middle and high school levels. The majority are engaged in live-in domestic work, which encompasses childcare, eldercare, and routine household chores. Because their work relies heavily on physical commuting and is spatially confined to their employers' private residences, their occupational stability is inherently precarious.

Delivery workers are primarily young to middle-aged men, averaging around 30 years of age, with education levels ranging mainly from middle school to associate degrees. Their employment model is highly flexible, comprising both full-time workers and a large number of part-timers, many of whom accept orders across multiple platforms simultaneously. Their working hours are intensely concentrated during daily meal delivery peaks, resulting in generally high overall labor intensity.

Overall, these three cohorts exhibit stark differences in identity, age structure, and career trajectories. Domestic workers engage in paid reproductive labor within the private domestic sphere (such as cleaning, caregiving, and cooking). Their work blurs the boundaries between the public and private spheres, intertwining economic activity with intimate personal relationships; consequently, extreme climate conditions exert direct pressure on their commutes and labor processes. [23] For persons with disabilities, climate change acts as a magnifying glass-amplifying existing societal barriers while undermining their capacity for self-preservation and emergency response, plunging them into a state of double marginalization during climate crises. Meanwhile, delivery workers are fully integrated into the high-intensity, time-sensitive operational mechanisms of the platform economy. Despite their varying circumstances, all three groups are highly exposed to urban climate risks in their daily lives and work arrangements. Compounded by inadequate institutional protections and fragile social support networks, they exist in a state of systemic vulnerability. Recognizing these structural characteristics is essential for understanding the climate adaptation capacities and specific policy needs of these populations.

2 Li, J. (2024). "'Limited Autonomy' under Multiple Social and Spatial Conditions: A Study of Internet Platform Daily Cleaning and Domestic Work" [J]. Journal of Chinese Women's Studies, (1), 43–60.

3 Liang, M., Li, K., & Feng, X. (2022). "The Spear of Capital and the Shield of Labour: A Study of the Localised Model of Emotional Labour among Domestic Workers in China" [J]. Sociological Studies, (02).

III. Shared Challenges

Despite striking differences in their occupational profiles, socioeconomic status, and daily living conditions, the survey data clearly demonstrates that the climate vulnerability of people with disabilities, domestic workers, and delivery workers shares a common structural root. Urban infrastructure and public service systems systematically fail to account for the new realities of climate change in their design and day-to-day operations, ultimately shifting the burden of environmental risk entirely onto the individuals.

This vulnerability is primarily visible in the absolute reliance of these three groups on urban road networks and transit systems for their daily mobility - a dependency that is highly inelastic and non-discretionary. While typical office workers can choose to work from home or adjust their schedules during extreme weather, people with disabilities, domestic workers, and delivery workers are forced to maintain high-frequency, long-distance outdoor mobility regardless of hazardous conditions, driven by the pressures of economic survival, caregiving mandates, or platform algorithmic constraints. Street waterlogging from torrential downpours and icy, slick surfaces caused by heavy snow serve as the primary physical barriers confronting all three demographics. In these scenarios, these workers do not merely "use" the transport network; rather, in the absence of viable alternatives, they bear the brunt of structural infrastructure failures. To avoid poor customer ratings and financial penalties from employers, domestic workers must wade through flooded streets or risk their physical safety to reach their destinations. Bound by rigid on-time performance metrics, delivery workers cannot stop accepting orders even when acutely aware of the imminent risk of slipping and crashing. Meanwhile, people with disabilities are frequently left entirely unable to travel safely-or are marooned inside their homes-due to the suspension of accessible transit lines or the freezing over of wheelchair ramps. Because current urban roads and transit facilities are overwhelmingly predicated on the baseline of able-bodied individuals and stable, historical weather patterns, they lack the resilience needed to withstand extreme climate disruptions. Consequently, when disaster strikes, these marginalized groups cannot mitigate risk by staying indoors like the general public; instead, the very infrastructure meant to facilitate their mobility transforms into a major source of peril, leaving them exposed to safety threats far exceeding those of ordinary citizens.

At a deeper level, accessibility features specifically engineered for people with disabilities suffer from widespread operational failures during climate crises. The survey data reveals that the most prevalent challenges reported by disabled respondents are "street waterlogging from torrential rain making travel impossible" (204 respondents) and "frozen ramps and elevators rendered entirely unusable" (133 respondents). When crucial features like ramps, elevators, and tactile paving are exposed to severe precipitation or power outages, they cease to facilitate mobility and instead transform into active safety hazards, effectively isolating persons with disabilities from the outside world. Similarly, the outdoor public spaces relied upon by domestic workers and delivery workers are devoid of climate-adaptive design; a distinct lack of cooling stations to mitigate extreme heat or designated shelters to block heavy downpours leaves them exposed to severe environmental hazards for extended periods.

This physical infrastructural deficit extends into systemic blind spots within information architectures and emergency response protocols. Current urban emergency management systems exhibit structural gaps in inclusivity. On one hand, the dissemination channels and formats of weather warnings lack accessible design: hearing-impaired individuals cannot receive audio broadcasts, while visually impaired individuals are locked out of graphic and text-based alerts, leaving them completely isolated from critical communications during emergencies. Crucially, existing alerts predominantly communicate general meteorological data rather than providing tailored, actionable guidance on hazard avoidance and mobility for individuals with distinct types of impairments. On the other hand, when emergency evacuation or urgent medical assistance is required, all three groups face a definitive lack of institutional support. People with disabilities lack rescue vehicles equipped with wheelchairs as well as essential sign-language interpretation services. Concurrently, as highly mobile populations without local household registration (*hukou*), domestic workers and delivery workers are almost entirely excluded from neighborhood-level emergency response mechanisms. During extreme weather events, they are forced to rely solely on informal networks of friends and family for self-rescue. The survey data underscores this reality: nearly half of the disabled respondents and an alarming 73% of domestic workers stated they received absolutely no external assistance following a severe weather event.

In summary, the climate risks confronting these three groups are not triggered solely by natural disasters themselves; rather, they stem from the failure to integrate extreme climate trends and population diversity into the initial planning and design stages of urban

infrastructure, accessible environments, and emergency management systems. The baseline user profile assumed in modern urban development remains an able-bodied individual possessing high mobility, advanced digital literacy, and robust information-gathering capabilities. This structural blind spot pushes the most vulnerable populations to the absolute margins, leaving them entirely reliant on self-preservation. Therefore, the key to enhancing urban climate resilience and equity lies in transitioning infrastructure from "fair-weather utility" to "disaster-ready resilience", while deeply embedding inclusive design principles into every facet of urban planning and emergency management.



IV. The Impact of Extreme Weather on Persons with Disabilities

In recent years, global climate change has intensified dramatically, marked by extreme heatwaves, historic downpours, severe cold snaps, and powerful typhoons that arrive with escalating frequency and destructive force. These phenomena have evolved from isolated environmental concerns into profound societal challenges that threaten human livelihoods, well-being, and public health.

In the face of extreme weather, the disabled population (encompassing individuals with physical, visual, hearing, speech, and psychosocial impairments, as well as those with rare diseases) experiences significantly heightened exposure risks and coping vulnerabilities, necessitating urgent enhancements to their safety and health safeguards.

Although China has made positive strides in disaster prevention, mitigation, and the construction of accessible environments, empirical research at the nexus of climate change and disability-inclusive development remains in its infancy. Scientifically quantifying the mechanisms through which climate risks impact persons with disabilities is a fundamental prerequisite for formulating tailored relief and adaptation policies.

Conducted in 2025, this survey gathered 483 valid questionnaires across multiple provinces nationwide, demonstrating robust geographical and demographic representativeness across disability types. The survey investigated the impacts of extreme weather events on accessible mobility and health, evaluated the current landscape of accessible environments and institutional frameworks, mapped capabilities regarding information access and emergency response, and collected targeted recommendations and expectations from the community.

(i) Basic Demographic Data

This survey gathered a valid sample of 483 persons with disabilities, comprising 284 women (58.9%), 190 men (39.6%), and 7 individuals identifying as non-binary or other gender identities. The sample spans ages from 18 to over 60 and skews relatively young: the 18–35 age bracket accounts for 62%, followed by 36–45 at 22%, and 46–60 at 13.3%.

Regarding residential distribution, nearly half of the respondents reside in central urban districts, with the remainder primarily located in urban suburbs, rural areas, or townships, alongside a small fraction belonging to floating urban populations. Categorized by disability type, the sample predominantly consists of individuals with physical (35%), visual (26%), and hearing (26%) impairments, which cumulatively account for nearly 90% of the total pool. Individuals with multiple disabilities represent a smaller proportion, while those with speech, psychiatric, or intellectual impairments constitute a very minor segment of this survey.

In terms of living conditions, approximately 80% of respondents reside in homes equipped with air conditioning and water heaters, whereas 7.3% report lacking any of the primary household amenities listed in the survey. The proportion of those living alone is low at just 17.6%, with the vast majority cohabiting with family members or others. Educationally, over half of the respondents hold associate degrees or higher, nearly 20% have completed high school, and slightly over 10% either did not complete formal schooling or possess only a primary-school education.

Employment data indicate that, after excluding students and retirees, one-quarter of the working-age disabled population remains unemployed or is actively seeking work, underscoring the persistently severe employment challenges facing this demographic. Regarding daily mobility and socialization, nearly half of the respondents leave their homes almost daily, 40% travel outdoors occasionally, and just over 10% rarely venture outside.

(ii) Widespread Experiences of Extreme Weather and Overall Impact

Survey data demonstrates that extreme weather has become a significant and unavoidable disruptive factor in the daily lives of persons with disabilities. Among the 483 respondents, 92.3% (446 individuals) reported having experienced at least one extreme weather event, with only 7.7% (37 individuals) indicating no significant exposure to such weather. This stark contrast highlights the profound ubiquity of climate risks.

An analysis of the types of weather experienced reveals that heatwaves (≥35°C) are the most prevalent, reported by 66.5% of respondents (321 individuals). This is followed by torrential rain and flooding at 63.2% (305 individuals) and cold snaps (≤5°C) at 54.0% (261 individuals). Fewer respondents reported experiencing typhoons/hurricanes (29.4%, 142 individuals), hail (24.0%, 116 individuals), and sandstorms (22.0%, 106 individuals). Drought was the least frequently experienced event, reported by only 9.1% (44 individuals). This distribution not only reflects the increasing frequency of extreme heat and severe rainfall in China in recent years but also corresponds to the distinct regional and seasonal profiles of various climate hazards.

Further analysis evaluating the restrictive impact of specific weather events reveals that rainy conditions pose the most prominent barrier, limiting the daily lives of 75.4% of respondents (364 individuals). This is followed by strong winds/typhoons at 72.1% (348 individuals) and snowy conditions at 65.6% (317 individuals). Hail, sandstorms, extreme heat, and extreme cold also affect a substantial number of respondents, at 60.9% (294 individuals), 53.8% (260 individuals), 47.0% (227 individuals), and 34.0% (164 individuals), respectively. In terms of perceived impact, torrential rain and flooding were rated as the most severely disruptive, accounting for 57.1% (276 individuals), followed by heatwaves at 51.1% (247 individuals) and cold snaps at 37.1% (179 individuals). Notably, although heatwaves are the most frequently experienced event, the proportion of respondents perceived them as highly disruptive is lower than that for heavy rainfall. This discrepancy likely stems from how different groups of people with disabilities exhibit varying sensitivities to environmental factors, such as humidity and physical terrain navigability. For individuals with hearing, visual, and physical disabilities, rain and snow present a significantly greater barrier to mobility than extreme heat.



Figure 1-1: A visually impaired woman utilizes a white cane to navigate outdoors on a clear day, seated on a bench in an urban park.

When asked to rate the impact of extreme weather on a self-perceived scale of 0 to 10 (where 0 indicates no impact and 10 indicates severe impact), respondents reported an average score of 6.04 with a standard deviation of 2.65, indicating a moderate-to-high overall impact. Within this cohort, 50.1% (242 individuals) scored between 7 and 10, demonstrating that nearly half of persons with disabilities believe extreme weather significantly to severely disrupt their lives. Another 38.7% (187 individuals) scored between 4 and 6, indicating a moderate impact, while 11.2% (54 individuals) scored between 0 and 3, reflecting a relatively mild impact. This distribution underscores both the pervasive severity of climate risks and the reality that perceptions of these risks vary widely across individuals based on disability type, geographic location, and available support networks. The high standard deviation further confirms the diversity of adaptation needs and highlights the critical necessity for tailored policy interventions.



Figure 1-2 : A woman with a physical disability, wearing a black down jacket, leans forward and tightly grips her wheelchair handrims, pushing the wheels with focused effort to ascend an incline.

(iii) The Impact of Extreme Weather Events on Accessible Mobility and Health

1. Outdoor Transit and Mobility

Extreme weather events exert a profound restrictive impact on the ability of people with disabilities to travel outdoors. The survey indicates that 62.1% (300 respondents) experience a marked reduction in outdoor excursions during severe weather; furthermore, 54.7% (264 respondents) are compelled to cancel critical activities-such as work, medical appointments, rehabilitation sessions, or social engagements-due to severe transit difficulties. Analysis of the specific barriers revealed that safety apprehensions emerged as the most prominent issue, cited by 61.7% (298 respondents). This primarily manifests as the risk of slipping, the danger of becoming disoriented, and the lack of accessible emergency support in the event of sudden physical distress. Physical transit barriers ranked second at 52.4% (253 respondents), encompassing obstacles like waterlogged roads, snow-blocked paths, and slippery steps that render routes impassable for wheelchairs and other mobility aids. Third was the disruption or downgrading of public transit services, reported by 45.1% (218 respondents), which includes the suspension of accessible bus and metro lines, severe reductions in service frequency, or the malfunction of wheelchair lifts.

These direct constraints pose tangible barriers to daily life, forcing nearly half of the respondents to frequently abandon necessary trips and make short-term behavioral adjustments, such as taking temporary leave from work, postponing medical care, or missing community activities. Such iterative and sustained mobility constraints generate far-reaching social consequences. When extreme weather events intensify and emergency response frameworks lack accessible design, a segment of the disabled population becomes indefinitely confined indoors. Struggling to re-enter public spaces, they gradually decouple from their existing social roles and support networks. This involuntary isolation forces individuals to withdraw from social participation amid climate shocks, leaving them stranded in climate-induced isolation. This phenomenon starkly highlights the lack of inclusive design within current urban emergency management systems and reflects a systemic disregard for the needs of disabled populations in broader climate adaptation policies.



Figure 1-3 : A visually impaired woman in a pink plush coat holds a white cane, attentively sweeping the path ahead to navigate.

2. Assistive Devices

Assistive devices are highly vulnerable during extreme weather events, transforming from vital physical extensions into distinct burdens during emergencies. The three most frequently used assistive devices are smartphone accessibility applications (220 respondents), wheelchairs or electric mobility scooters (140 respondents), and hearing aids or cochlear implants (138 respondents). However, nearly 40% of respondents have experienced device damage during severe weather, with equipment malfunction (182 respondents) and operational difficulties (175 respondents) standing out as the most pervasive issues. Concurrently, the escalating cost of repairing or replacing these devices (137 respondents) compounds their economic burden. During adverse weather conditions such as high winds and torrential rain, the operational difficulties of these devices spike dramatically; for instance, maneuvering a wheelchair with one hand while holding an umbrella is practically impossible. This directly compromises the independent mobility and evacuation capabilities of people with disabilities. Furthermore, the diminished availability of accessible infrastructure (such as ramps and elevators) during extreme weather further exacerbates the challenges of utilizing assistive devices.



Figure 1-4 A woman with a physical disability sits in an electric wheelchair, facing away from the camera, as she slowly approaches a glass door.



Figure 1-5 A visually impaired woman wearing a baseball jacket holds a white cane in her right hand, preparing to scan her immediate surroundings.

3. Domestic Life

Although the home environment is relatively enclosed, extreme weather still poses a systemic threat to the daily lives of over 60% of respondents. Among these threats, disruptions to basic daily routines (205 respondents), water and power outages (145 respondents), and difficulties in regulating indoor temperatures (126 respondents) represent the three primary impacts. For individuals who are reliant on life-sustaining medical equipment-such as ventilators or oxygen concentrators-power grid failures present immediate, life-threatening risks. For those living alone, the disruption of food and courier deliveries severely limits access to essential daily supplies. Moreover, given the high risks associated with outdoor travel during extreme weather, many individuals are confined to their homes for prolonged periods. This not only disrupts social connections but also necessitates the constant reorganization of sleep schedules, care routines, and professional plans, entirely upending the normal rhythm of daily life.

4. Health

The health ramifications of extreme weather on people with disabilities manifest as pronounced physical and psychological burdens. Physically, 62.7% (235 respondents) reported a decline in stamina or heightened fatigue; 45.5% (170 respondents) indicated that pre-existing physical discomfort significantly worsened; and 27.5% (103 respondents) developed entirely new physical symptoms. Particularly during extreme heat or severe cold, pre-existing conditions such as phantom limb pain, muscle spasm, and neuropathic pain are highly prone to flare-ups. Some individuals experience acute physiological reactions, such as abnormal blood pressure spikes or respiratory distress, due to an inability to promptly regulate indoor temperatures. Psychologically, 63.1% (236 respondents) reported persistent anxiety or tension; 55.3% (207 respondents) frequently experienced fear or apprehension; and 39.8% (149 respondents) experienced feelings of loneliness or depression. Many described themselves as trapped in a prolonged

state of waiting for conditions to improve-simultaneously anxious about outdoor hazards yet increasingly disconnected from society due to prolonged confinement. Under the repeated shocks of climate risks, their psychological resilience gradually erodes. Furthermore, disabled women face unique, intersecting challenges: 31.2% (117 respondents) noted that during critical physiological phases such as menstruation or pregnancy, emergency evacuation routes or temporary shelters typically lack private spaces, adequate sanitation facilities, and tailored care accommodations, making it exceedingly difficult to maintain basic hygiene and dignity. This exposes a glaring gap in the systematic consideration of disabled women's needs within current climate emergency responses.

5. Disruptions to Caregiving Support

Extreme weather significantly undermines the stability and promptness of the caregiving support available to people with disabilities. In the survey, 38.2% (123 respondents) noted that caregivers or family members were unable to provide in-home care due to weather constraints; 28.6% (92 respondents) reported difficulties in procuring or receiving deliveries of essential medical supplies, including medications and assistive devices; and 20.0% (64 respondents) indicated that rehabilitation centers and adult day-care facilities had suspended operations.

These challenges stem primarily from two factors. First, professional care providers (such as rehabilitation therapists and home care aides) face severe transit or safety hazards that prevent them from reaching their clients. Second, the pressure on family caregivers escalates sharply; they must simultaneously navigate adverse weather conditions while managing relatives whose emotional states and physical health may fluctuate significantly due to environmental shifts.

This breakdown in caregiving networks directly derails the daily routines and rehabilitation trajectories of people with disabilities. For households managing moderate-to-severe disabilities, a single torrential rain event or cold snap can cause previously reliable care arrangements to collapse entirely, plunging families into a desperate predicament with no available assistance and nowhere to go. Far from being anomalous occurrences, these disruptions represent a critical structural vulnerability in the resilience of the broader caregiving apparatus when exposed to climate risks.

(iv) Status of Accessible Environments and Institutional Support

The overall evaluation of current accessible environments and institutional support by respondents is characterized by lukewarm perception and insufficient resource allocation. Only 30.4% of respondents rated support as relatively good, while the largest segment (45.8%) characterized their satisfaction as merely "average." Regarding the adequacy of support, 26.1% deemed it sufficient, whereas 39.3% rated it as average. Although macro-level institutional frameworks are gradually improving, the high concentration of average ratings highlights a distinct perception gap in grassroots implementation. Persistent issues-such as uneven resource allocation, a weak service-delivery focus, and inflexible response mechanisms-mean that the practical support received by many people with disabilities during extreme weather falls drastically short of formal policy commitments.

Most existing accessibility infrastructure is designed for optimal climate baselines, rendering it largely ineffective during severe weather events. Over half of the respondents (54.5%, 204 individuals) reported being unable to use accessible facilities due to street waterlogging caused by torrential rain; 35.6% (133 individuals) found routes impassable due to iced-over ramps or elevators; and 29.4% (110 individuals) noted a severe lack of shading or cooling infrastructure during extreme heatwaves. Under adverse weather conditions, these critical installations fail to facilitate mobility and instead pose latent safety hazards. These underscores that deferred maintenance and a systemic lack of climate adaptability are primary drivers of restricted mobility.

In terms of emergency mobility, the disabled demographic faces a systemic support deficit. Nearly a third of respondents (30.4%) were unsure whether any emergency mobility support existed, while 28.0% stated definitively that it did not. Routine emergency travel relies overwhelmingly on conventional taxis or ride-hailing applications (47.3%, 177 individuals), being driven by family members (36.1%, 135 individuals), or receiving assistance from friends (15.0%, 56 individuals). However, standard passenger vehicles universally lack wheelchair securement mechanisms and are ill-equipped to accommodate motorized wheelchairs or guide dogs. More alarmingly, the evacuation process systematically lacks communication accommodation such as sign language interpretation or tactile guidance-marooning hearing- and visually impaired individuals in information voids when trying to receive and execute emergency directives. This exposes a critical flaw in the inclusive design of current emergency management systems.

At present, community and governmental interventions remain disproportionately skewed toward post-disaster remediation rather than pre-disaster prevention. Only 30.3% of respondents felt that authorities devoted an average level of attention to their group, while 20.7% considered that attention insufficient. Regarding localized emergency policy measures, 43.3% stated that none existed, and 25.3% reported that while measures were in place, they were profoundly inadequate. The primary support provided by the government consisted of weather alerts (25.7%, 96 individuals), priority transit or pick-up services for disabled persons (19.0%, 71 individuals), and emergency evacuation assistance (14.7%, 55 individuals). However, community-level administrative bodies generally fail to maintain dynamic, real-time data registries of individuals who live alone or have severe disabilities, creating critical operational blind spots in vital nodes such as early warning dissemination and the delivery of essential supplies.

Disabled women face a compounded predicament resulting from the intersection of disability and gender during extreme weather events. Over half of the female respondents reported experiencing gender-specific challenges, with 36.6% noting a marked erosion of their sense of safety when traveling at night. Specific challenges reported included acute vulnerability during nighttime travel (102 individuals), an inability to secure specialized support during menstruation or pregnancy (65 individuals), and the absence of secure, private, and accessible restrooms or changing facilities (40 individuals). Furthermore, disabled women who shoulder household caregiving responsibilities endure disproportionate stress when support networks collapse. Yet, existing policy frameworks routinely view them solely through the lens of their caregiving responsibilities, failing to recognize them as vulnerable individuals who themselves require targeted assistance. Consequently, their dual roles and compounded burdens remain systematically unrecognized and unaddressed by current service-delivery networks.

(v) Information Access and Emergency Response

The survey reveals that while the overall reach of extreme weather alerts among persons with disabilities is generally adequate, there are stark demographic disparities and structural deficiencies. More than 70% of respondents indicated they could access early warning information "promptly" or "most of the time." However, nearly 30% still experienced low access rates. Even among those with access, over half could only obtain information "most of the time," indicating that systematic coverage still requires substantial improvement. Disaggregating the data by impairment type reveals that the information access rate for individuals with physical disabilities (71%) is significantly higher than that of individuals with visual (62%) and hearing (44%) impairments. The hearing-impaired group faces the most severe bottlenecks: the current warning infrastructure relies heavily on audio broadcasting, which fails to effectively reach them during critical windows. At present, the primary channels for information remain standard weather applications, social/news media, and word-of-mouth from relatives and friends. Dedicated, accessible early warning channels remain exceedingly scarce, reflecting an overarching deficit in the inclusive design of the alert infrastructure.

More crucially, contemporary weather warnings generally lack explicit, actionable guidance tailored to specific disability cohorts. Over 60% of respondents reported that the alerts they received lacked guidance or provided unclear directives-limiting themselves to general meteorological descriptions without offering concrete, operational safety protocols. Consequently, over 80% of respondents encountered difficulties in acquiring and comprehending these alerts. The primary hurdles cited were inaccessible dissemination platforms, difficulties in signal reception, discrepancies between official forecasts and actual ground conditions, and the absence of targeted behavioral guidance. This demonstrates that the true protective value of an early warning system for people with disabilities hinges not on the mere broadcasting of weather states, but on its capacity to be translated into executable action plans.

Regarding social support, nearly half of the respondents reported never receiving any external assistance following an extreme weather event; because of this, approximately 10% actively sought help but received no response. Those who did secure assistance relied overwhelmingly on informal support networks, such as family, friends, and neighbors, followed secondarily by community or village committee personnel. Interventions from government hotlines, medical institutions, and mutual aid organizations were largely ineffective. This starkly highlights the clear deficit of formal support frameworks, forcing the majority of people with disabilities to navigate extreme climate risks relying solely on themselves and their immediate social circles.

Post-disaster recovery trajectories are equally concerning. Approximately one-quarter of respondents struggled to restore their normal daily routines following an extreme weather event. The primary impediments clustered around severe financial strain, the inability to venture out to procure essential supplies, and a lack of necessary physical assistance. Furthermore, damage to assistive devices, persistent psychological distress, and utility outages (water

and power) were also highly salient issues. Because these impacts are inherently multidimensional and highly individualized, there is an urgent imperative to develop a comprehensive response mechanism that integrates material aid, mobility support, assistive device maintenance, and psychological intervention.

An examination of localized community needs revealed that 68.4% of respondents (257 individuals) identified the door-to-door delivery of basic living supplies as their most critical priority. This was closely followed by urgent demands for accessible evacuation/transfer assistance and unambiguous emergency protocols. Additionally, a subset of respondents articulated the need for welfare checks, infrastructure repair, and psychological counseling. These findings illustrate that extreme weather interventions for disabled populations cannot be reduced to isolated, one-off solutions. Instead, municipal authorities must establish a multi-dimensional, end-to-end emergency response framework-spanning pre-disaster early warning, mid-disaster response, and post-disaster recovery-to tangibly safeguard their physical security, fundamental dignity, and basic livelihood rights amidst escalating climate risks.

(vi) Summary and Recommendations

Overall, 73.4% of respondents (354 respondents) identified "financial assistance" as their most pressing need, reflecting the acute economic pressures-such as income disruption and unforeseen expenditures-faced by persons with disabilities during extreme weather events. Accessibility upgrades (53.1%, 256 respondents) and transit and evacuation support (51.2%, 247 respondents) followed closely, indicating that an accessible physical environment and emergency transfer services constitute core priorities second only to financial security. Furthermore, respondents highlighted the need for community-based mutual aid (51.0%, 246 respondents) and accessible information services (47.3%, 228 respondents). Other notable areas of concern included emergency shelter safeguards (36.9%, 178 respondents), assistive device provision (35.7%, 172 respondents), safety inspections (34.6%, 167 respondents), gender-specific protection (31.5%, 152 respondents), and psychological support (30.9%, 149 respondents). This hierarchy of needs provides a clear blueprint for policy resource allocation: priority must be given to constructing an integrated, three-pronged foundational support model characterized by financial relief, accessible environments, and unimpeded evacuation, while simultaneously fortifying response capacities across all other dimensions.

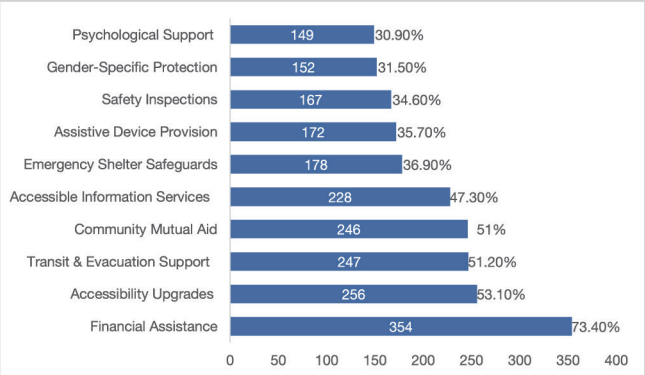


Figure 1-6: Priority Distribution of Core Support Needs Among Persons with Disabilities During Extreme Weather

Data Source: Statistical tabulation of questionnaire results by the research team

A disaggregated analysis by disability type reveals that, among the ten categories of support, financial assistance consistently ranks as the highest priority across most cohorts. Specifically, 80% of individuals with psychiatric disabilities, 79% of those with multiple disabilities, 78% of visually impaired individuals, and 77% of individuals with mobility disabilities classified it as an urgent need. Disparities emerge more distinctly in specific support preferences. Because hearing-impaired individuals rely heavily on visual information to process risk alerts, their demand for accessible information services-such as subtitled alerts, sign language interpretation, and visual prompt reaches 80%. This is significantly higher than the demands from the visually impaired (40%) and individuals with mobility disabilities (24%) cohorts. Conversely, physically disabled individuals exhibit a profound reliance on barrier-free physical environments for daily mobility. Consequently, 67% emphasized the need for accessibility upgrades to ensure ramps and elevators remain safe and operational during severe weather like torrential rain and icing - drastically exceeding the 31% reported by the hearing-impaired group. Meanwhile, individuals with psychiatric disabilities demonstrated an overwhelming need for emergency shelter safeguards, peaking at 80% (substantially higher than any other group). Their core requirements necessitate stable temporary accommodation coupled with the consistent presence of specialized support personnel.

Survey Prompt: "If the government and society were to provide better support for individuals in your situation, which of the following areas do you consider most urgent?" × "What is your primary disability type?"								
	Visual Impairment	Hearing Impairment	Speech Impairment	PhysicalDisability	Intellectual Disability	Psychosocial Disability	Multiple Disabilities	Other (Hidden / Rare Disease / Uncertified)
Financial Assistance	78%	63%	33%	77%	67%	80%	79%	90%
Accessibility Upgrades	65%	31%	17%	67%	33%	40%	34%	50%
Accessible Information Services	40%	80%	83%	24%	33%	40%	68%	30%
Community Mutual Aid	54%	44%	17%	56%	67%	40%	53%	40%
Transit & Evacuation Support	63%	42%	0%	53%	67%	40%	53%	30%
Psychological Support	24%	29%	33%	35%	67%	60%	37%	30%
Emergency Shelter Safeguards	45%	26%	17%	38%	33%	80%	39%	30%
Assistive Device Provision	27%	30%	17%	44%	33%	40%	50%	30%
Safety Inspections	40%	26%	33%	34%	33%	60%	39%	70%
Gender-Specific Protection	35%	30%	17%	28%	33%	40%	42%	20%

Table 1-1: Cross-Tabulation of Urgent Support Needs by Disability Type During Extreme Weather (%)

Data Source: Statistical tabulation of questionnaire results by the research team

V. The Impact of Extreme Weather on Female Domestic Workers

As extreme heatwaves, torrential rains, cold snaps, and snowfall become increasingly frequent, climate change is permeating the lives of urban workers in a sustained and routine manner. However, compared to demographics widely recognized as "highly climate-vulnerable"-such as food delivery couriers and construction workers-the climate risks confronting domestic workers have been historically overlooked. Integrating questionnaire data and interview transcripts, this study aims to delineate how climate change persistently impacts the working conditions of domestic workers across their occupational environments, commuting networks, and physical and psychological well-being. Furthermore, it reveals how these risks are systematically transferred onto individuals in the absence of institutional buffers.

(i) Demographics and Extreme Weather Exposure

Demographically, the survey respondents are predominantly middle-aged and older workers: individuals aged 46–55 constitute the largest cohort at 69.37%; those aged 56 and above represent 27.03%; the 36–45 demographic accounts for a mere 3.6%; and no respondents under the age of 35 were present in the sample. This age distribution highlights that the study's subjects are largely at a life stage characterized by naturally declining physical function and reduced physical resilience. Consequently, climate events such as extreme heat, cold waves, and heavy precipitation are more likely to inflict compounding adverse effects on their health and labor capacity.

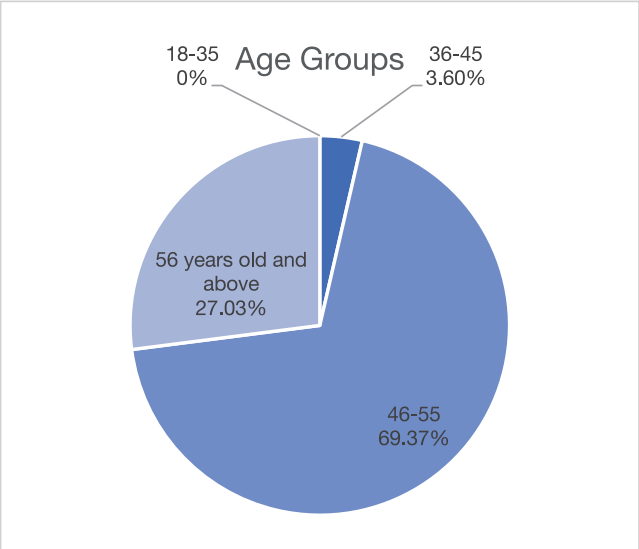


Figure 2-1: Age Distribution of Domestic Workers

Data Source: Data compiled and independently visualized by the research team following interviews; the same applies to subsequent tables.

Regarding educational backgrounds, the respondents' attainment levels are clustered at the secondary level and below. Junior high school graduates account for 47.75%, while senior high school (including vocational equivalents) graduates make up 43.24%. Those with a primary school education or below constitute 9.01%, and there are no individuals with a bachelor's degree or higher in the sample. This educational structure reflects the broader social positioning of domestic labor within the job market. It also indicates that the majority of respondents possess relatively limited access to information resources and restricted bargaining power when confronting extreme weather risks or labor rights infringements.

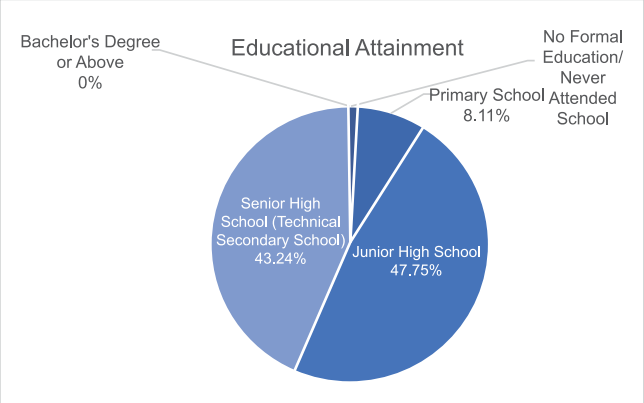


Figure 2-2: Educational Backgrounds of Domestic Workers

In terms of exposure, the extreme weather events most frequently cited by respondents are torrential rain (35.14%) and extreme heat (27.93%). Reported exposure rates for cold snaps (12.61%), sandstorms (11.71%), and typhoons/strong winds (6.31%) are comparatively lower. This distribution largely reflects the most common climatic conditions domestic workers encounter during their daily duties and commutes. However, when respondents were asked "which type of extreme weather has the greatest personal impact," the results shift significantly: heatwaves were identified by 27.93% of domestic workers as the most disruptive event, a figure that vastly exceeds its raw exposure rate. Similarly, the perceived impact of torrential rain and waterlogging reached 35.14%, again surpassing its isolated exposure frequency. The perceived impacts of cold snaps, sandstorms, and typhoons/strong winds also consistently exceeded their respective exposure probabilities.

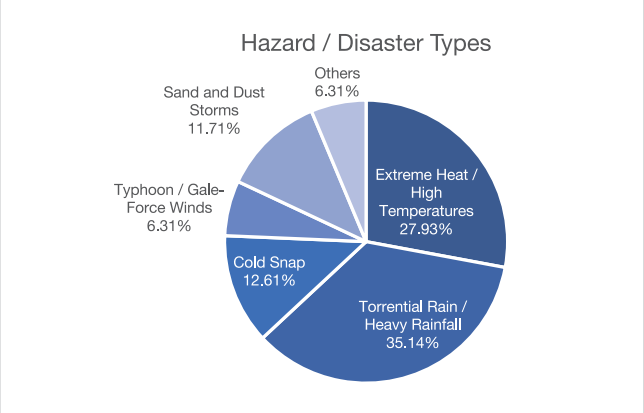


Figure 2-3: Extreme Weather Exposure Rates Among Domestic Workers

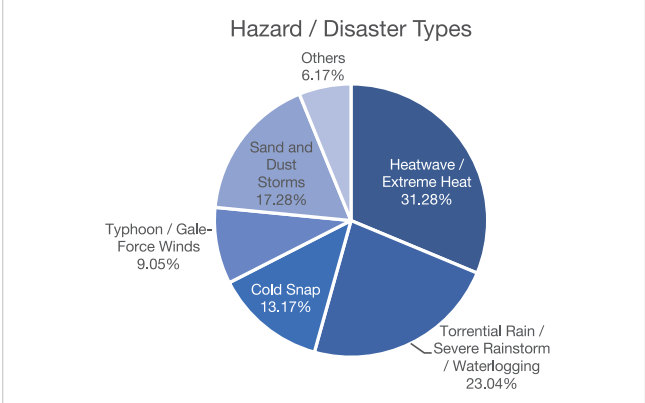


Figure 2-4: Distribution of Perceived Impact (Which Extreme Weather Event Impacts Them the Most)

This discrepancy indicates that not all "frequently encountered" weather conditions result in equal occupational disruption. Extreme heat and torrential rain dominate impact perceptions not just because of their frequency, but because they acutely intersect with the structural nature of domestic work, commuting patterns, and the physical vulnerabilities of the workers. For non-live-in domestic workers, severe rainfall and waterlogged streets disrupt transportation, prolong commutes, and elevate safety hazards, thereby amplifying the likelihood of tardiness, injury, and income instability. At the same time, 63% of respondents employed as live-in domestic workers-and the 11% in hybrid arrangements-are similarly exposed to significant climate risks. Routine errands such as grocery shopping, walking pets, or accompanying employers to medical appointments inevitably expose them to extreme weather. Running errands outdoors during a heatwave easily triggers heatstroke, while navigating rain-slicked roads significantly heightens the risk of slips and falls. Conversely, although events like typhoons and sandstorms occur less frequently in certain regions, their abrupt onset severely compromises mobility and physical health, rapidly translating into acutely negative labor experiences.

(ii) How Extreme Weather Alters Domestic Labor

For domestic workers, climate change is not merely an isolated, disastrous event; rather, because their routine duties demand sustained outdoor exposure, it has become a normalized, daily stressor. The data indicates that during extreme weather conditions, 27.03% of domestic workers felt their workload increased significantly, while 11.71% reported a slight increase. More than half (54.05%) stated their workload remained essentially unchanged; 5.41% felt it decreased, and only 1.8% were unable to continue

working due to the weather. These figures reveal a stark reality: nearly 40% of domestic workers face a heavier labor burden during severe weather.

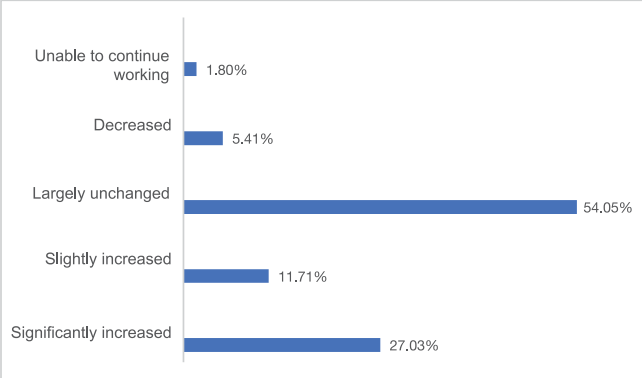


Figure 2-5: Changes in Domestic Workers' Workloads During Extreme Weather

Many employers allow domestic workers to use air conditioning or heating equipment during extreme weather, but this represents only a localized improvement in the physical working environment. The workers' assigned tasks, schedules, and overall labor intensity are neither reduced nor adjusted. Survey data shows that during extreme weather events, 67.57% of employers are "very willing" or "occasionally willing" to adjust work arrangements; however, 18.92% of employers still impose additional occupational demands during these periods. This means that even when employers express a subjective willingness to accommodate, domestic workers often bear a heavier occupational burden, paradoxically facing additional tasks even as the ambient temperature indoors improves.

(iii) The Physical Toll of Extreme Weather

Among female domestic workers, climate risks are further amplified by female physiological realities. When asked whether extreme weather induces heightened physical discomfort, the largest cohort of respondents (37.84%) reported "moderate" discomfort; an additional 23.42% "agreed," and 19.82% "strongly agreed" . Cumulatively, these three categories account for over 80% of the sample, indicating that the vast majority experience a significant physical toll. Only 6.31% "disagreed," and 12.61% "strongly disagreed."

More specifically, regarding access to sanitary products while navigating extreme weather during menstruation, only 47.75% of respondents reported being able to procure them "smoothly." Conversely, 36.94% cited "occasional difficulty," 5.41% reported "frequent difficulty," and 9.91% stated it was "completely impossible." This indicates that over half of female domestic workers have faced difficulties accessing sanitary products during extreme weather.

This physical and emotional toll is corroborated by the respondents' firsthand accounts. One domestic worker recounted: *"The moment the sun hits my skin, it breaks out in itchy welts. If you scratch them, they bleed. When the welts heal, my skin is left severely discolored, almost like vitiligo. I wear long sleeves all summer just to hide my arms."* Another noted: *"When it gets bitterly cold in the winter, my arms ache with a dull pain."* These descriptions underscore that extreme weather not only exacerbates acute physical discomfort but also compounds pre-existing physiological vulnerabilities, generating sustained systemic stress.

When confronting these dual challenges, these women systematically lack institutional support or flexible work arrangements. Within prevailing employment dynamics, female physiological needs are routinely relegated to the private sphere and excluded from baseline working conditions. Consequently, when navigating compounding environmental and physical stressors, they struggle to secure employer understanding or scheduling accommodations, ultimately leaving them to endure these burdens entirely on their own.

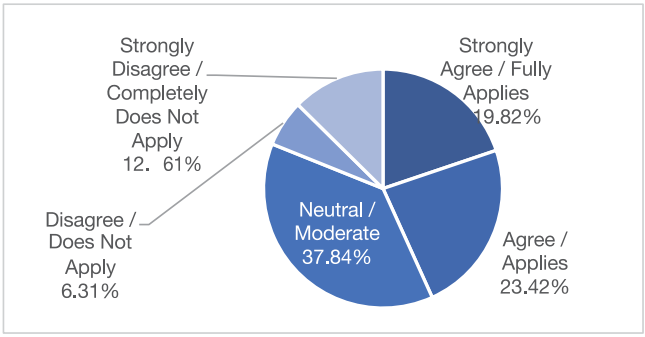


Figure 2-6: Perception of Increased Physical Discomfort During Extreme Weather Events

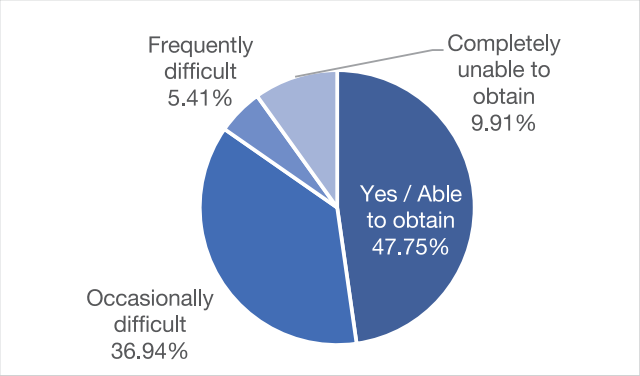


Figure 2-7: Ability to Smoothly Procure Sanitary Products During Extreme Weather

(iv) Extreme Weather and Commuting Risks

While climate risks in the immediate workplace primarily manifest as escalated labor intensity and physical strain, the daily commute represents a critical nexus where these risks are significantly amplified. The data shows that 80% of domestic workers reported their commutes were disrupted by extreme weather: 53% faced mobility barriers due to flooded or iced-over roads, 28% were impacted by reduced public transit frequencies, 21% were hindered by ride-hailing difficulties or price surging, and 26% were physically unable to complete pedestrian commutes under extreme heat. Crucially, 32% of domestic workers have been tardy strictly due to transit delays-an outcome directly linked to wage deductions or negative performance ratings.

"Once, on a bitterly cold day, I finished work at seven in the evening and waited for the bus. I waited for ages and it just wouldn't come. I stood there for forty minutes."

"When it snows, the electric scooter's battery dies quickly in the cold. My scooter often loses power mid-ride, and I have to push it the rest of the way. By the time I arrive at the client's house to start my shift, I am completely drenched in sweat."

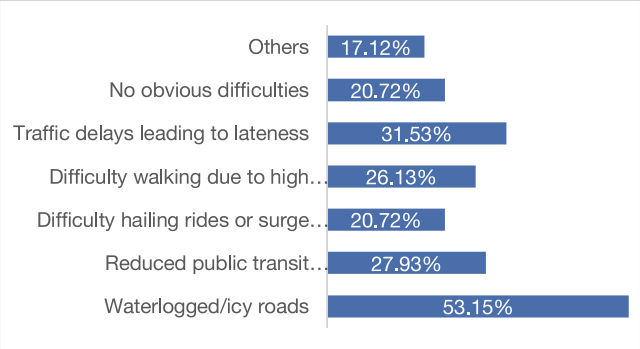


Figure 2-8: Distribution of Commuting Disruptions for Domestic Workers During Extreme Weather

(v) The Psychological Toll of Extreme Weather

Navigating these highly precarious transit conditions subjects domestic workers to sustain psychological distress. Questionnaire data reveals that the most pervasive psychological stressor during extreme weather is safety anxiety (59.46%), followed closely by general anxiety/tension (50.45%) and the fear of tardiness (43.24%). Furthermore, 27.93% of respondents reported heightened irritability, 18.92% experienced no noticeable change, and 8.11% cited other emotional impacts. In interviews, this pressure frequently manifested as a state of hyper-vigilance. Respondents continuously reiterated imperatives like *"must be careful," "cannot afford to fall,"* and *"must leave earlier."* They also actively exchanged grassroots coping strategies, such as *"gliding with one foot near the ground"* while riding in the snow to maintain physical stability. Collectively, these data points and narratives illustrate that extreme weather generates more than mere physical transit hazards; it structurally degrades the everyday psychological well-being of domestic workers through relentless safety anxiety and chronic time pressure.

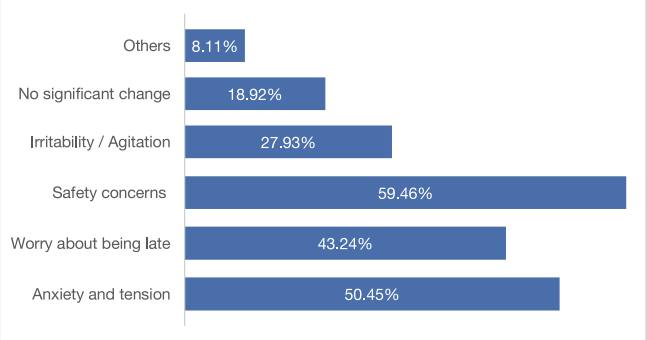


Figure 2-9: Distribution of Psychological Stressors Among Domestic Workers During Extreme Weather

(vi) The Absence of Institutional Protection

At the institutional level, climate risks are borne almost entirely by the individual worker. Questionnaire data indicates that 59% of domestic workers have had service orders canceled due to extreme weather. In 52% of these instances, the employer or platform offered mere verbal "understanding" without any financial restitution; only 6% actually received formal compensation.

Notably, although 67% of employers expressed a willingness to adjust schedules due to extreme weather, this stated willingness does not translate into tangible compensation for abrupt order cancellations. In other words, even with subjective employer cooperation, domestic workers remain entirely devoid of institutional safety nets to mitigate the risk of sudden income disruption.

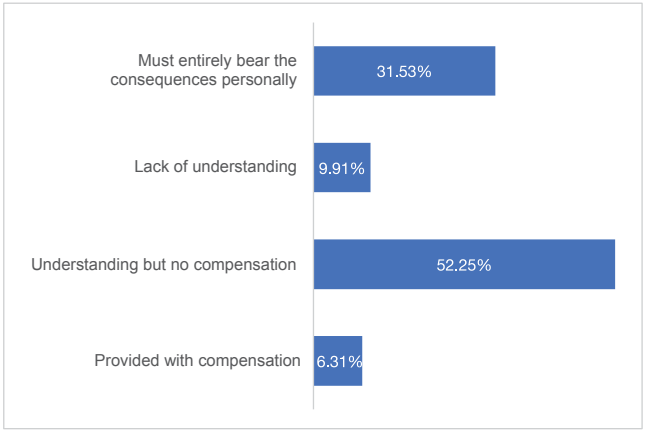


Figure 2-10: Provision of Understanding or Compensation by Employers/Platforms Upon Weather-Induced Order Cancellations

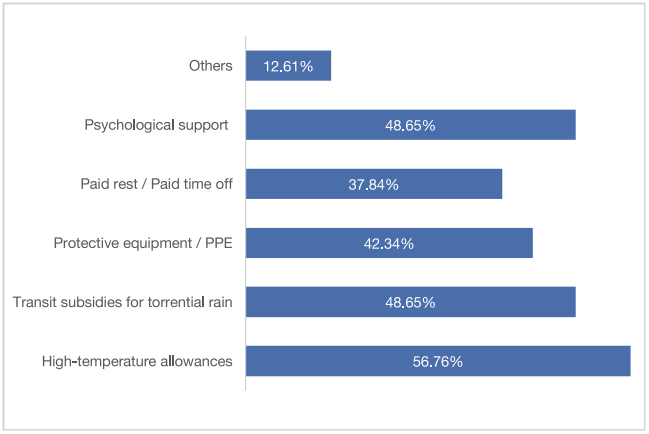


Figure 2-11: Categorization of Desired Subsidies or Support from Employers/Platforms During Extreme Weather

Concurrently, 73% of domestic workers reported never having received any intervention or assistance from community organizations or government institutions during extreme weather. The negligible support that was provided typically consisted of sporadic, ad-hoc relief items, such as disposable raincoats.

When asked, "What subsidies or support should employers or platforms provide during extreme weather?", the respondents' demands were highly concentrated. Over half (56.76%) advocated for a high-temperature allowance; nearly half prioritized transit subsidies for torrential rain (48.65%) and psychological support (48.65%); 42.34% requested the provision of protective gear; and 37.84% emphasized the critical necessity of paid rest periods during extreme weather. During interviews, when queried about specific forms of intervention, respondents did not articulate complex demands. Instead, they consistently underscored the most fundamental safeguard: the right to suspend labor without sacrificing baseline income when conditions render transit or operations unsafe. Typical sentiments included: *"On days with heavy snow, let us take a day off without docking our pay,"* and *"If the roads are too treacherous, it's better to arrive late than to fall and bear the liability ourselves."* This exposes their core imperative: the establishment of a climate-responsive, safety-triggered work suspension mechanism supported by a baseline income guarantee.

(vii) Summary and Recommendations

Synthesizing the questionnaire data and interview narratives reveals that the impact of climate change on domestic workers is not an isolated issue. Rather, it is continuously embedded in their work, commuting, and daily lives through increasingly normalized extreme weather events such as heatwaves, torrential rain, and cold snaps. Extreme weather not only directly escalates labor intensity and operational difficulty, but also chronically erodes the long-term employability and occupational safety of domestic workers through the compounding burdens of transit hazards, physical exhaustion, and chronic psychological stress.

Crucially, under current direct-hire and platform-based employment models, climate risks have yet to be systematically recognized as occupational hazards. Instead, they are entirely individualized, passed onto practitioners as personal burdens. For instance, even when employers permit the use of air conditioning, workers are still expected to fulfill their original workload; similarly, there is a pervasive lack of compensation when orders are canceled due to severe weather. These practices expose profound institutional gaps in labor relations amidst climate shocks. Pre-existing information asymmetries and power imbalances between employers and workers are drastically magnified during extreme weather, resulting in a paradigm where climate impacts are implicitly treated as externalities that domestic workers must absorb alone.

For nearly 40% of female domestic workers, the additional fatigue and pain induced by menstruation form a compounding structural burden when combined with high-intensity labor and high-risk commutes during extreme weather. Furthermore, the difficulty of procuring sanitary products during emergencies-a challenge

cited by over half of the female respondents-exacerbates their precarious situation. Current institutional frameworks universally relegate physical health needs to the private sphere; they are neither accommodated within flexible scheduling provisions nor supported by emergency response channels, forcing female workers to bear these intersecting crises entirely on their own.

The core demands articulated by domestic workers are high-temperature allowances, transit subsidies for torrential rain, the provision of protective gear, and the right to safely suspend work during extreme weather-are fundamentally calls for the establishment of an income floor and a safety net commensurate with the climate risks they face. If urban climate adaptation policies continue to marginalize this demographic, they will not only fail to mitigate worker vulnerability but will actively entrench systemic inequalities within the labor market.

Based on these findings, we propose the following recommendations:

1. **Codify Extreme Weather as an Occupational Hazard to Address Policy Gaps**

We recommend that Human Resources and Social Security authorities explicitly integrate extreme weather events-such as heatwaves, heavy precipitation, and cold snaps-into the occupational risk management frameworks for the domestic service industry. Corresponding operational standards must be formulated to clearly define the legal responsibilities of platforms, domestic service agencies, and private employers regarding early warning dissemination, workload adjustments, and income compensation. This will fundamentally transform the current situation in which climate risks are borne exclusively by individual workers.

2. **Establish Income Protection and Compensation Mechanisms for Domestic Workers During Extreme Weather**

Modeled on the existing high-temperature allowance system, relevant regulatory bodies should establish standard hazard pay or attendance allowances for severe weather events like torrential rain and cold snaps. Furthermore, clear regulations must dictate the liable parties and the minimum compensation standards when service orders are canceled due to extreme weather, thereby safeguarding the basic income rights of domestic workers under severe climatic conditions.

3. **Integrate Domestic Workers into the Scope of Urban Climate Adaptation Policies**

Current urban climate adaptation policies routinely omit gig and informal workers from their scope of protection. We advise that during the revision of municipal emergency contingency plans (e.g., heatwave mitigation, flood control), domestic service personnel and other outdoor/transit-exposed laborers be explicitly designated as priority protection groups. This entails providing targeted early warning communications, access to emergency public shelters, and direct material assistance.

4. **Formulate Specialized Protection Standards for the Intersecting Risks of Female Physical Health and Extreme Weather**

First, platforms and domestic agencies must implement flexible scheduling and temporary task adjustments. Second, public infrastructure support must be strengthened: free emergency sanitary supply kits (containing menstrual pads, thermal patches, wet wipes, etc.) should be deployed at community emergency shelters and major transit hubs. Additionally, community health centers should establish dedicated service windows for women in the gig economy to provide physical health consultations, distribute emergency medications, and offer guidance on extreme temperature protection. Concurrently, employers should be encouraged to facilitate easy access to sanitary products, and these provisions should be formally incorporated into standard labor contract templates. This will elevate the physical health and safety needs of female domestic workers from a hidden, individual hardship into an actionable, institutionalized labor right.

VI. The Impact of Extreme Weather on Delivery Workers

In Beijing-a metropolis with a resident population exceeding 20 million[4]-approximately 330,000 ride-hailing drivers, couriers, and delivery workers navigate the urban expanse daily[5]. They function as vital arteries sustaining the city's operations, making them the frontline laborers most directly exposed to extreme climate risks. When extreme heat, torrential downpours, freezing conditions, and high winds jeopardize travel safety, workers are still compelled by algorithmic dispatch systems to race against the clock to complete their deliveries. To systematically document the realities of this group under extreme climate stress, the research team conducted a specialized survey focusing on delivery workers and climate adaptation. Utilizing an online questionnaire, the team collected 203 valid samples encompassing Beijing delivery workers across diverse ages, genders, employment types, and lengths of employment. The survey comprehensively examined workers' actual exposure to and coping mechanisms during recent extreme weather events in Beijing; the core occupational hazards and safety vulnerabilities they encounter; the substantive impacts of platform rules and algorithmic dispatch mechanisms; the efficacy of existing safety nets; and the specific challenges confronting female and disabled workers. The ultimate objective is to leverage this frontline data to drive targeted policy reforms and robust social support systems.



Figure 3-1 A female supermarket delivery worker waits at a red traffic light.

Although the sampling for this survey is concentrated in Beijing, we assess that the overarching labor conditions-shaped by urban infrastructure, the algorithmic economy, and gig employment structures-are highly consistent across major metropolitan centers. Consequently, the specific issues and mechanisms revealed by this Beijing case study are highly representative. They provide critical empirical evidence for addressing institutional policy gaps at the national level and for building climate-resilient urban infrastructure.

(i) Demographic Profile and Employment Characteristics

A total of 203 valid questionnaires were collected from delivery workers. The age distribution indicates that the workforce skews heavily young: nearly 60% (57.5%) are concentrated in the 18–30 age bracket, with the 26–30 cohort constituting the largest single demographic (35.6%). The 31–35 age group accounts for 19.0%, and those aged 36 and above cumulatively represent approximately 23.6%. The workforce is predominantly composed of young to middle-aged adults, while older workers (aged 46 and above) make up a comparatively low proportion (12.6%).

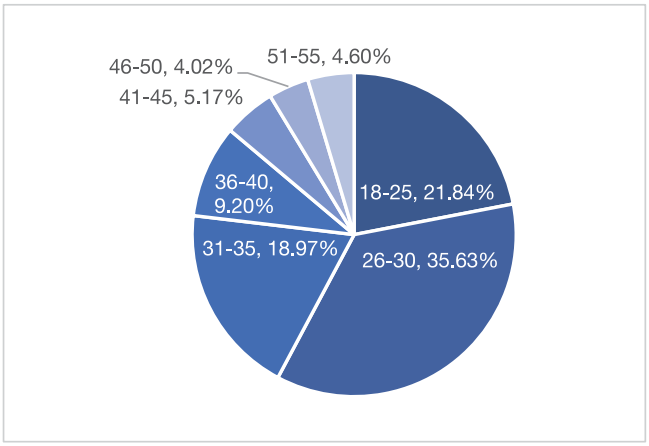


Figure 3-2: Age Distribution of Workers

Regarding educational attainment, individuals with a junior high school education constitute the largest segment at 33% (67 Workers), while those with a senior high school education account for 30% (61 Workers). Notably, Workers holding a college-level degree or higher cumulatively represent 32% (65 Workers), whereas those with only a primary school education or no formal education make up a mere

4 Hu, Y., Wu, J., & Du, J. (Eds.). (2024). Beijing Population Development Research Report (2024) [M]. Beijing: Social Sciences Academic Press.

5 Beijing Academy of Social Sciences (Compiler); Bao, L. (Ed.); Li, X., & Zhao, X. (Assoc. Eds.). (2025). Beijing Social Development Report (2024–2025) [M]. Beijing: Social Sciences Academic Press.

4% (10 Workers). The data indicates that while the worker cohort is predominantly characterized by a secondary education level, over one-third possess post-secondary qualifications, reflecting a relatively solid overall level of education.

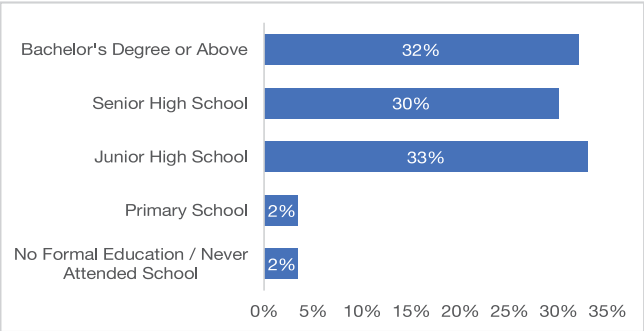


Figure 3-3: Educational Attainment of Workers

In terms of employment type, 48.3% (98 Workers) operate as part-time delivery Workers, 37.4% (76 Workers) are employed full-time, and the remaining 14.3% (29 Workers) engage in alternative work arrangements-such as multi-platform laborers who concurrently handle food delivery and other delivery services. This distribution highlights the pronounced flexibility of the profession, with part-time practitioners outnumbering their full-time counterparts.

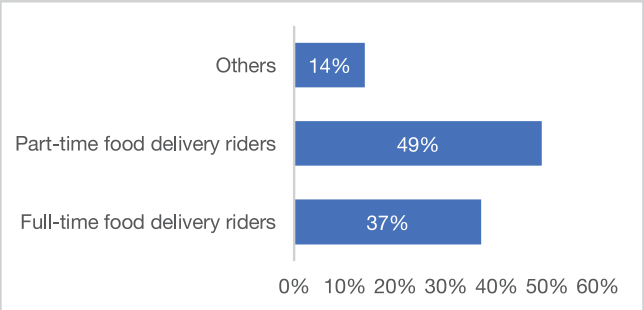


Figure 3-4: Employment Classifications of Workers

An analysis of employment length reveals that the largest cohort, comprising 30.5% (62 Workers), has been in the industry for 1 to 3 years. This is followed by those with an employment length of 3 to 6 months (16.3%, 33 Workers) and 6 months to 1 year (13.3%, 27 Workers). Additionally, 13.3% (27 Workers) have been in the profession for over 5 years, 9.4% (19 Workers) for 3 to 5 years, 11.8% (24 Workers) for 1 to 3 months, and 5.4% (11 Workers) for less than one month. This distribution illustrates a high degree of labor mobility and turnover within the demographic.

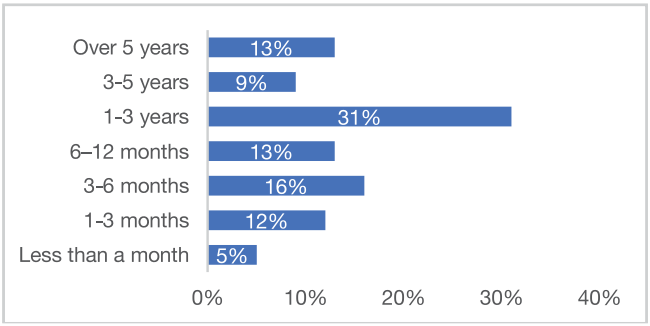


Figure 3-5: Length of Employment of Workers

Regarding recent work intensity, the largest proportion of workers (48.8%, 99 individuals) logged between 50 and 70 hours of active time on the road per week. Those working 10–30 hours accounted for 23.6% (48 Workers), under 10 hours accounted for 19.2% (39 Workers), and 30–50 hours accounted for only 8.4% (17 Workers), indicating that nearly half of the workforce operates under highly demanding schedules. In terms of daily shifts, the 17:00–20:00 window is the most prevalent, selected by 59.6% (121 Workers), followed by 09:00–11:00 (59.1%, 120 Workers) and 14:00–17:00 (53.2%, 108 Workers). The operational distribution for 11:00–14:00, 20:00–23:00, and 06:00–09:00 stands at 52.2%, 48.8%, and 42.4%, respectively. Only 11.3% (23 Workers) work the late-night shift (23:00–06:00). Overall, delivery schedules are heavily concentrated around the morning, noon, and evening dining peaks, with a comparatively low proportion of nighttime deliveries.

Furthermore, the data underscores that active delivery time is densely clustered from daytime through the early evening. The minimal late-night (23:00–06:00) operational rate (11.0%) suggests that extreme climate interventions and protective policies should be strategically targeted toward these high-exposure, high-density peak hours.

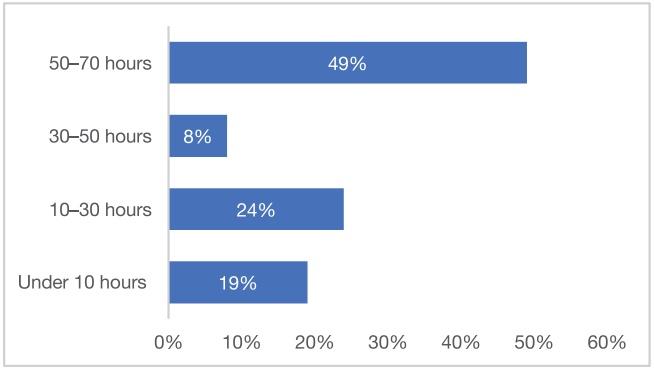


Figure 3-6: Weekly Active Delivery Hours of Workers

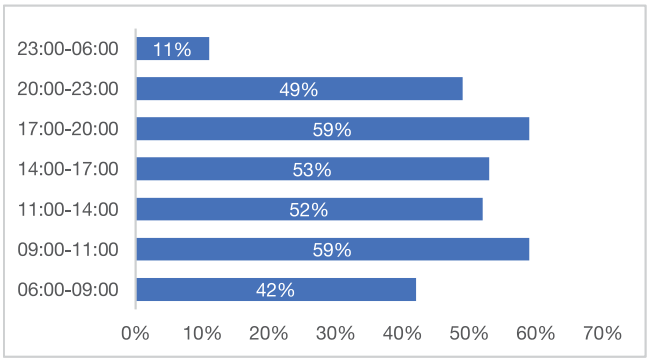


Figure 3-7: Daily Operational Shifts of Workers

(ii) Exposure to Extreme Weather Events

Survey data reveals that the 203 Beijing-based delivery workers surveyed have been generally exposed to a wide range of extreme weather events over the past three years. Specifically, 71.4% (145 Workers) endured sustained heatwaves of ≥35°C over consecutive days; 68.0% (138 Workers) experienced street flooding and severely impaired visibility resulting from torrential rain and short-term intense precipitation; and 66.5% (135 Workers) were confronted with hazardous, slippery road conditions caused by ice or accumulated snow. Furthermore, high winds and sandstorms (57.6%), freezing cold snaps (51.2%), and severe smog and heavy pollution (48.3%) also constituted significant climatic pressures. Only 5.4% (11 Workers) reported no noticeable exposure to extreme weather.

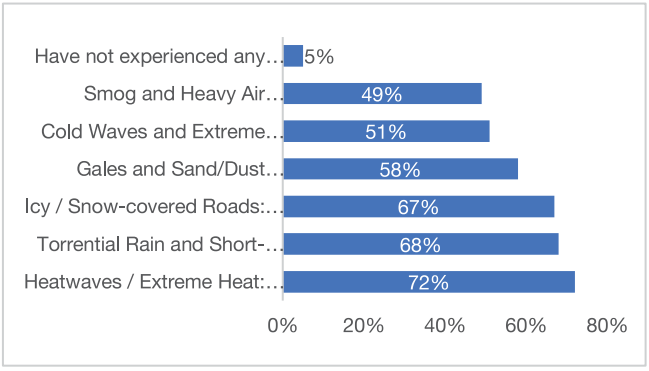


Figure 3-8: Extreme Weather Types Most Frequently Encountered by Workers Over the Past Three Years

These high-frequency weather events pose immediate safety threats-such as heatstroke and reduced electric scooter battery life during heatwaves, vehicles skidding or stalling during torrential rains, and an elevated risk of falls on icy roads. Crucially, these hazards are transformed into a systemic labor burden by platform operational mechanisms. Over 80% of workers (80.7%) noted a surge in order volume during extreme weather, with 57.1% reporting that order volume increased by 50% to 100%, and 69.5% stating that overall demand rose significantly. Concurrently, 42.9% experienced more frequent delivery pressure from customers rushing their orders, 36.9% had to shoulder greater liability for order cancellations, 31.5% pointed out that platform tolerance for late deliveries actually decreased, and 25.6% reported that assigned delivery radiuses were extended. Notably, despite chronic exposure to these high-risk environments, 49.3% of workers never suspended work due to extreme weather over the past year, while an additional 24.6% did so only occasionally (1 to 4 times). Rather than providing effective safeguarding mechanisms during severe weather, platforms use algorithmic order allocation and performance metrics to transfer climate risks onto the workforce, placing workers in a structural dilemma between personal safety and delivery performance.

Survey findings indicate that 86.2% of workers (175 individuals) are most worried about "falling due to slippery road surfaces," making it the primary safety concern during extreme weather. Furthermore, 70.0% (142 Workers) cited "impaired visibility" (due to rain, snow, or haze), 67.5% (137 Workers) noted "vehicle instability caused by high winds," 62.1% (126 Workers) expressed anxiety over "heatstroke," and 60.6% (123 Workers) highlighted the risk of "meals or goods being damaged by the weather." Additionally, 47.3% (96 Workers) were aware of the risk of "vehicles stalling in deep water," 44.8% (91 Workers) remained vigilant against lightning hazards, and 35.5% (72 Workers) reported a deterioration in their personal health. In open-ended responses, Workers further described the

cascading pressures triggered by severe weather, noting that it brings a *"higher accident rate,"* a *"greater likelihood of customer complaints," "drastically increased road hazards," "frequent timeouts,"* and *"severe delivery difficulties."* This feedback demonstrates that extreme weather not only directly threatens physical safety but also intensifies systemic anxiety across the labor process through a chain reaction of increased customer grievances and compressed delivery windows.

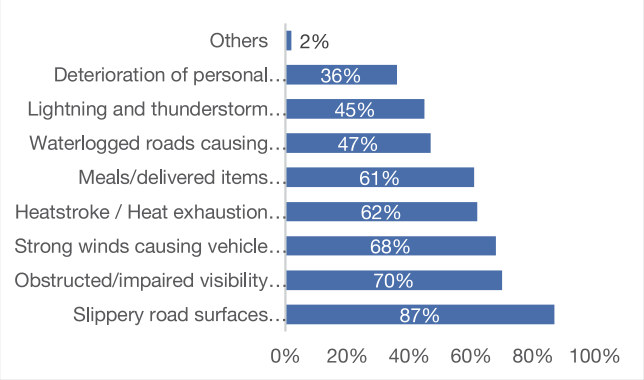


Figure 3-9: Risks Feared by Workers During Extreme Weather

Overall, workers' quantitative assessments of how extreme weather affects their work skew highly negatively, yielding an average score of 8.0 out of 10 and a median score of 9. This underscores that the overwhelming majority of respondents view the disruption to their work as severe. Specifically, 95 individuals (46.8%) assigned a maximum score of 10 (extremely severe impact), 33 individuals (16.3%) gave a score of 8, and only 10 individuals (4.9%) submitted a score of 1 (no impact). These metrics align closely with specific risk perceptions, illustrating that extreme weather transcends physical danger; it systematically amplifies uncertainty and psychological distress by elevating accident probabilities, complicating order fulfillment, and increasing broader operational risks.

In summary, during extreme weather conditions, delivery workers face high-frequency, multi-faceted environmental hazards. Moreover, driven by platform algorithms, order allocation models, and performance evaluation systems, they are compelled to absorb the systemic labor pressures transferred down by climate shocks. Their perception of climate risk is heavily concentrated on road safety and health exposure, and their negative evaluations regarding work disruptions are pervasively strong. This illustrates that the hazards precipitated by extreme weather have become inextricably intertwined with the intrinsic vulnerabilities of gig labor, exacerbating employment precarity. At the same time, the platform's algorithmic externalization of climate shocks systematically erodes worker autonomy. This predicament is not an isolated anomaly, but a structural feature of the on-demand delivery sector. Set against the dual backdrop of rapid platform economy expansion and increasingly frequent extreme climate events, workers-as the final executors at the bottom of the delivery chain-must constantly endure physical exposure to maximize platform efficiency. The systemic absence of robust labor protections fundamentally reflects a deep structural inequity within the gig economy's distribution of climate risks.

(iii) Impact Analysis of Extreme Weather

1. Summer Heat, Icy Roads, and Torrential Rain Form the Three Core Climate Challenges for Workers

Survey metrics indicate that when identifying weather scenarios with the most profound impact on workers' physical health and work quality, "extreme summer heat" (20.49%) and "iced or snow-covered roads after winter precipitation" (18.98%) lead by a significant margin. Both thresholds exceeded 50%, establishing them as the primary challenges universally recognized by the riders. These are closely followed by "short-duration torrential rainfall or storms" (15.6%) and "low winter temperatures" (15.41%), which tied for third. Additionally, intense sunlight, smog/air pollution, and sandstorms present persistent operational impediments for a subset of workers.

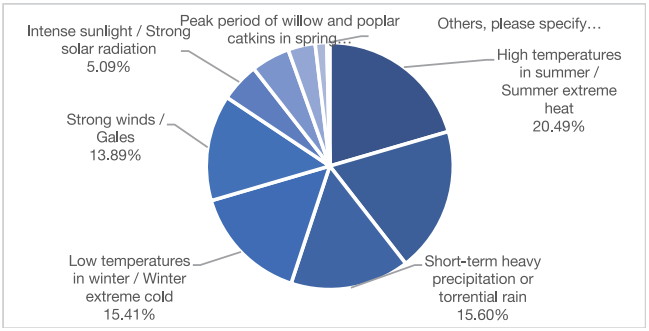


Figure 3-10: Climate Scenarios Exerting Significant Impacts on Workers

2. High Incidence of Safety Accidents Under Extreme Weather, with a Significant Proportion of Recurrent Incidents

Over 70% of workers reported experiencing safety-related accidents during extreme weather events over the past year, with nearly 30% encountering more than three such incidents. This not only confirms that extreme weather significantly increases the overall accident rate among workers, but further underscores that a distinct segment of the workforce is regularly exposed to repeated high-risk working environments.

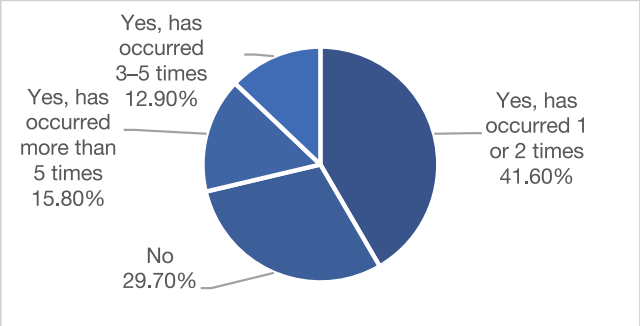


Figure 3-11: Prevalence and Frequency of Safety Accidents Encountered by Workers During Extreme Weather

3. Direct Threats to Personal Safety Precipitated by Extreme Climate

Virtually all workers have encountered personal safety threats attributable to extreme weather events over the course of their careers. Broken down granularly, losing traction leading to falls and collisions, severely compromised visibility, and difficulty controlling vehicles in high winds constitute the three most urgent hazards.

Survey data demonstrates that over 80% of respondents classify "falls or vehicle collisions due to slippery or icy road surfaces" as the most severe or immediate threat. This is followed by "severely impaired visibility" and "high winds," the dangers stem from their direct disruption of vehicle control and their potential to cause secondary injuries (such as being struck by airborne debris). Conversely, risks like "e-bike mechanical failures in deep floodwaters" (29.0%), "lightning strikes" (15.0%), and "acute heatstroke under extreme temperatures" (11.0%) rank lower in terms of perceived urgency. This lower prioritization likely stems from their lower statistical probability or because the immediate perceptual threat is less frequent than the top three hazards, despite their potentially catastrophic consequences.

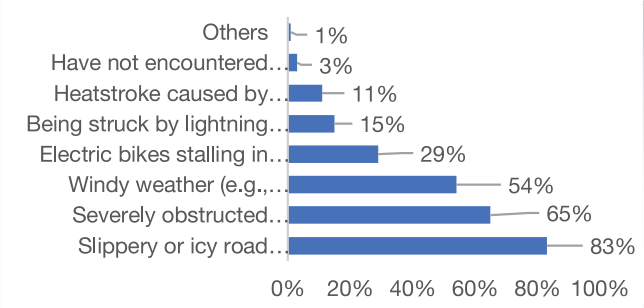


Figure 3-12: Extreme Weather Events Threatening Workers' Personal Safety Encountered During Their Careers

4. Physiological Health Threats: The Prominence of Heat-Related Health Risks

Questionnaire data reveals that within the spectrum of climate impacts on physical health, heat-related risks are the most prominent and immediate. Specifically, approximately 60% of workers identified the risk of heatstroke, while roughly 40% reported dehydration vulnerabilities in high-temperature environments. Furthermore, over 30% of workers indicated that prolonged exposure to intense sunlight combined with profuse sweating under heavy clothing routinely triggers severe skin discomfort. These findings reveal that extreme heat has become the primary, most pervasive source of health threats confronting the worker population.

Beyond extreme heat, other meteorological factors present non-negligible physical risks: over 30% of workers noted musculoskeletal stiffness or frostbite induced by low temperatures (37.0%). Health complications stemming from atmospheric hazards such as dust and sandstorms accounted for 26.0%, while health issues arising from the prolonged immersion of feet in rainwater during downpours comprised 23.0%. Fewer than 10% of respondents stated they *"virtually never encountered physical conditions severe enough to impede work,"* which conversely verifies the widespread impact of extreme climate on workers' physical well-being.

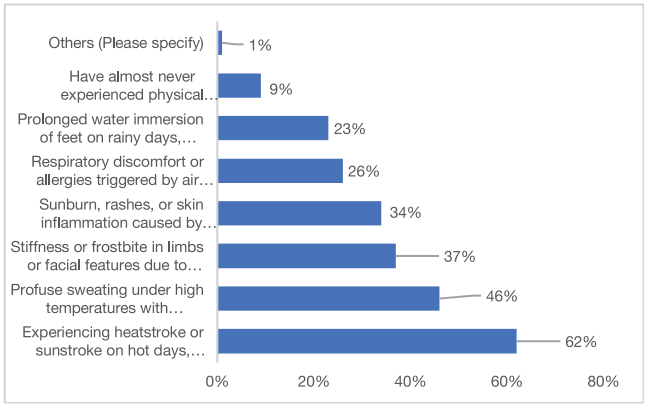


Figure3-13: Risk Factors Affecting Workers' Physical Health Under Extreme Climate Conditions

5. Compounding Psychological Stressors Induced by Extreme Weather

Survey data demonstrates that workers grapple with multi-layered psychological stress under extreme weather conditions. "Acute anxiety over delivery timeouts and customer complaints" and "feeling deeply wronged when maximum effort is met with customer complaints, algorithmic rejection, or unfair compensation" emerged as the two

dominant stressors, each selected by over 60% of workers. This explicitly reveals that the core catalyst of psychological distress among workers is not merely adverse weather conditions itself, but rather the performance evaluation mechanisms and structural asymmetries in value recognition embedded within their work. The platform's metrics-predicated on hyper-timeliness and rigid ratings-are rarely adjusted in a reasonable manner during extreme weather events. Consequently, workers are caught in a dual dilemma: they must navigate hazardous environments at high speeds while rigidly upholding standard service benchmarks, thereby precipitating profound psychological anxiety. Simultaneously, workers perceive a severe mismatch between their high-risk physical exposure and their realized rewards (including financial remuneration, algorithmic validation, and customer recognition). This perception of undervalued or dismissed labor value acts as another critical source of psychological distress.

Furthermore, half of the surveyed workers reported experiencing persistent fear (knowing that traveling in extreme weather is dangerous but being forced to rush anyway), directly illustrating how systemic pressures translate into visceral threats to personal safety. Over 30% of workers recounted feelings of isolation, exposing the stark deficit in social support networks and real-time assistance when facing environmental crises. Only slightly more than 10% of workers indicated "virtually no psychological distress," proving that mental strain under extreme weather is a pervasive and systemic issue within the workforce. Synthesizing these dimensions, the data reflects that the current platform labor model and performance metrics systematically fail to protect workers' labor rights and psychological well-being during extreme climate events. The structural pressure of the workplace stands out as a far more potent source of psychological trauma than the raw inclement weather itself.

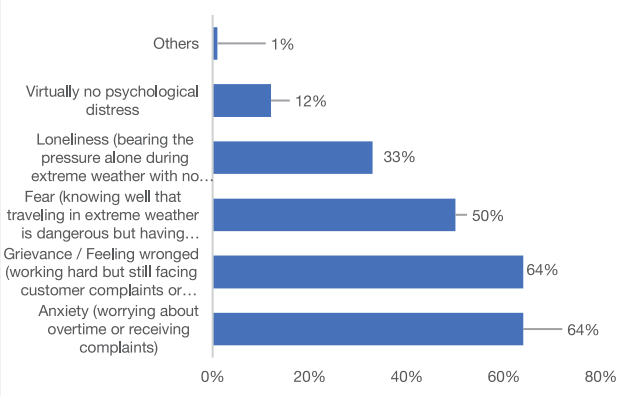


Figure 3-14: Types of Psychological Stress Inflicted by Extreme Weather Conditions

6. The Impact of Extreme Weather on Family Caregiving

6.1 Over Half of Workers Are Primary Caregivers, Bearing Heavy Caregiving Burdens

Questionnaire data show that among the 203 valid respondents, over half (103 Workers) explicitly identified themselves as the "primary caregiver" in their households, taking on core responsibilities such as childcare, eldercare, nursing sick family members, and doing household chores [6]. An additional 20% (41 workers) stated they shoulder "half of the caregiving responsibilities." Together, this indicates that over 70% of workers (144 individuals) bear moderate to heavy family caregiving burdens while simultaneously engaging in high-mobility, high-intensity outdoor work. By contrast, those who bear minimal caregiving responsibility or rely mainly on other family members account for only 20.0% (41 individuals), while those who live alone without any care obligations make up a mere 8.0% (16 individuals).

This distribution clearly highlights the dual burden faced by the workers: on the one hand, they must navigate the physical hazards inherent to their profession, such as extreme weather and traffic risks; on the other hand, the majority serve as the primary caregivers at home. This dual role means their work flexibility is likely much lower (as they need a stable income to support the household), yet their need for flexible working hours is much higher (to accommodate family duties). Consequently, their physical and mental health, as well as their job stability, directly impact the welfare of their entire family. Therefore, when formulating social security, vocational training, or extreme-weather policies for workers, policymakers must factor in the high proportion of "primary caregivers." It is essential to assess whether these policies provide adequate support for workers to balance work and family. Policies must acknowledge their dual roles as both workers and caregivers, ensuring that specific measures-such as subsidy criteria, flexible dispatch mechanisms, and community emergency services-do not inadvertently force workers into a harsh choice between caring for their families and earning a living.

6 In this context, "caregiver" refers to the person actually performing the physical labor and direct care, rather than someone who solely provides financial support to the household.

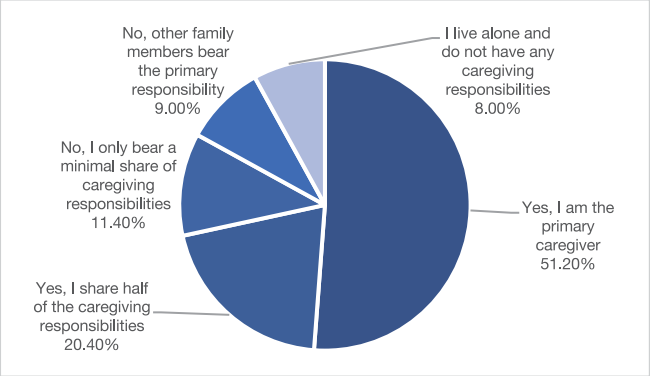


Figure 3-15: Family Caregiving Responsibilities Shouldered by Workers

6.2 Extreme Weather Severely Disrupts Workers' Ability to Fulfill Caregiving Duties

The impact of extreme weather on workers' ability to fulfill their family care obligations is significant. The average impact score was 4.0 (on a scale of 1 to 5, with higher scores indicating greater disruption). Notably, 51.7% of respondents selected the highest score of 5, indicating that the majority feel the impact is severe.

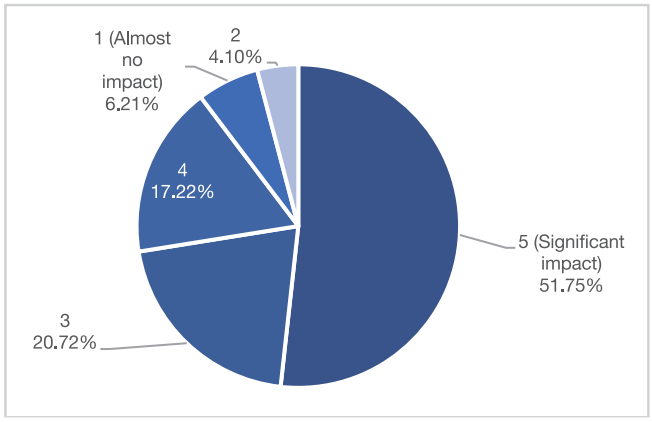


Figure 3-16: Rated Impact of Extreme Weather on Fulfilling Family Caregiving Responsibilities

6.3 Extreme Weather Significantly Exacerbates Caregiving Pressures and Forces Reduced Work Hours

Specifically, among workers with caregiving obligations, nearly 60% (120 individuals) reported that dangerous weather made them worry more about their family's safety, constituting their main psychological burden. Furthermore, over half (108 individuals) faced the tangible dilemma of being "unable to pick up/drop off children on time or care for elderly relatives." Over 30% (71 individuals) had to reduce their working hours or reject orders to accommodate family needs, demonstrating that family pressures translate directly into lost income and missed work opportunities. While this group is smaller than the first two, the impact is more direct and profound, highlighting the need for public policy to recognize the chain reaction through which extreme weather impacts domestic duties and ultimately undermines workers' livelihoods.

Overall, only slightly more than 10% of workers felt there was "no additional impact," showing that the negative effect of extreme weather on family responsibilities is highly universal. This requires that occupational protection and support measures during extreme weather fully account for the immense pressure workers face in their roles as family caregivers.

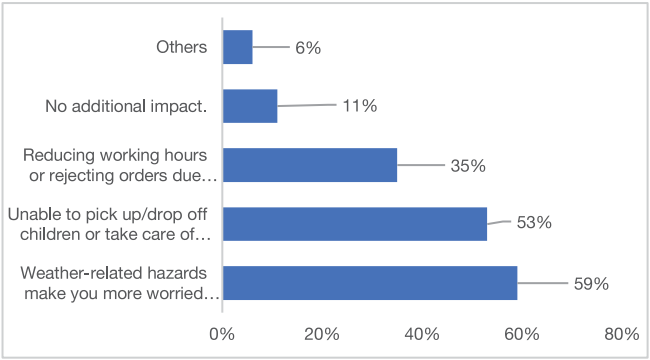


Figure 3-17: Specific Family Caregiving Pressures Exacerbated by Extreme Weather

7. Additional Risks Facing Female and Disabled Delivery Workers

7.1 Female Delivery Workers

A total of 21 valid questionnaires were collected from female delivery workers, representing 10.4% of the sample. The data show that during extreme weather events, the majority of female delivery workers face unique risks compared to their male counterparts. These include worsening menstrual cramps or irregularities due to severe cold and high winds; discomfort in private areas caused by heat and humidity; standard-issue gear (such as raincoats and helmets) that is ill-fitting for female body types; difficulty finding restrooms or private spaces; and sanitary pads being soaked through during heavy rain. These are all direct safety and health risks tied specifically to female physiological characteristics. Because women experience different physiological baseline needs than men during extreme weather, targeted policy interventions are necessary to help them navigate these distinct challenges.

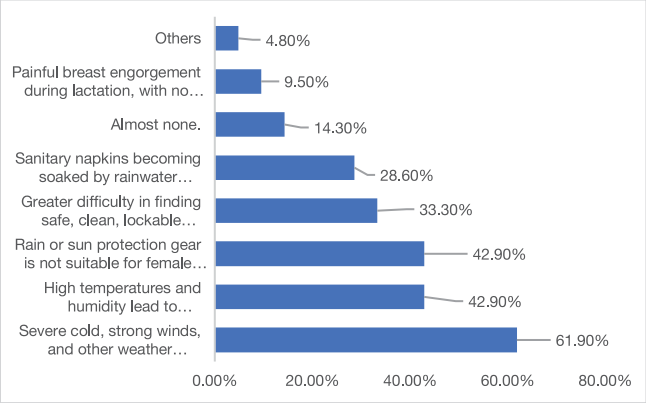


Figure 3-18: Physiological-Specific Risks Encountered by Female Delivery Workers During Extreme Weather

7.2 Delivery Workers with Disabilities

A total of 12 questionnaires were collected from delivery workers with disabilities, representing 5.9% of the sample. Among them, 11 are hearing-impaired and one has a physical disability; therefore, the following data primarily reflects the challenges faced by hearing-impaired workers. All disabled workers reported experiencing at least one additional occupational risk (with 0% selecting "virtually none"). The most commonly reported hazard was hearing aids malfunctioning due to heavy rain and high winds, though these workers also mentioned various other compounding risks.

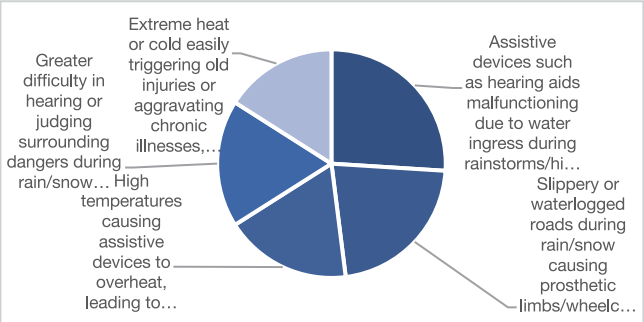


Figure 3-19: Climate Risks Reported by Delivery Workers with Disabilities

In the open-ended responses, these workers described their difficulties in practical terms:

"When delivering in extreme weather like heavy rain or strong winds, my hearing impairment makes it impossible to clearly hear the restaurant calling my order number or to communicate delivery details with customers on the phone. It's also hard to hear the horns of cars behind me. The noisy environment of wind and rain interferes with my hearing aids, which not only slows down my deliveries but creates a huge safety hazard on the road."

"Normally, I can just use Bluetooth earphones. But because of my hearing impairment, when the weather is terrible with rain or snow, it is incredibly inconvenient to have to type out messages to communicate about picking up the food."

For hearing-impaired workers who rely heavily on assistive devices, rain and snow are undoubtedly the greatest threats. Policymakers must prioritize protecting assistive devices for disabled workers, expanding accessible infrastructure, and providing targeted emergency support. These steps are vital to reducing health hazards in their work environment and easing their communication barriers.

(iv) Extreme Weather and Platform Pressures

1. Economic Penalties and Equipment Damage

Survey data shows that delivery workers face multiple sources of pressure during extreme weather. Over half of the respondents (55.0%, 112 Workers) identified "incurring customer complaints due to weather-induced delivery delays or errors, the difficulty of appealing these complaints, and the subsequent risk of fines or reduced order dispatch" as their primary stressor. This indicates that in uncontrollable situations like extreme weather, current performance evaluation and appeal mechanisms lack the necessary flexibility to account for weather factors. Consequently, these risks are largely borne by individual workers, significantly impacting their income stability and psychological well-being. Closely related to this is the issue that "delivery time limits during extreme weather are inconsistent across different platforms, resulting in significant differences in timeout penalty risks" (53.0%, 108 Workers). In a multi-platform market, the lack of unified rules during extreme weather increases workers' uncertainty regarding their work outcomes, forcing them to constantly weigh their personal safety against rigid platform requirements.

At the same time, 53.0% of workers cited "repair costs for phones or e-bikes damaged by rain or extreme heat" as a major pressure point. This demonstrates that weather-induced damage to their work equipment constitutes a widespread and significant economic burden, directly eating into their earnings. Furthermore, nearly half of the workers (49.0%, 99 individuals) pointed out that "high-temperature or rain subsidies require completing a certain number of orders or maintaining perfect attendance to claim." This means that subsidy policies originally intended as compensation often come with preconditions that force workers to take dangerous risks in extreme weather just to meet the quotas, failing to effectively alleviate their safety risks and economic pressure.

Overall, the additional burdens workers face during extreme weather stem primarily from rigid rule execution, a high concentration of economic risk falling on the workers, and increased equipment maintenance costs. While existing subsidies and protective measures provide some support, there is significant room for improvement in their coverage, triggering conditions, and actual accessibility to effectively address the real-world risks workers face.

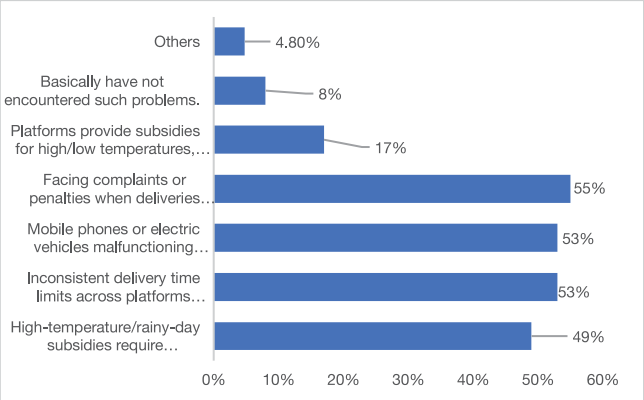


Figure 3-20: Sources of Additional Burdens Faced by Workers During Extreme Weather

2. Insufficient Platform Support and Low Satisfaction

The data indicates that nearly half of the workers (44.0%, 88 individuals) report that platforms "never" or "rarely" provide supplies, subsidies, or incentives during extreme weather. Another 18.3% (37 individuals) stated they were unclear about such support. Less than 10% of workers (7.9%, 16 individuals) indicated that platforms "frequently" provide support during severe weather. Consequently, platform-level support remains limited in both scope and consistency. A widespread, clearly recognized, and routine support mechanism has yet to be established, leaving most workers unable to rely on substantive help from platforms during severe weather.

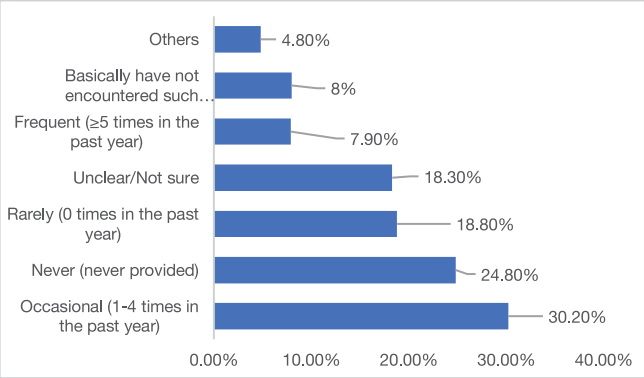


Figure 3-21: Frequency of Workers Receiving Platform Support During Extreme Weather

Specifically, the limited support that platforms provide mainly consists of physical supplies (e.g., raincoats, cooling sleeves) and information (e.g., safety training and push notifications about protective measures). Direct financial subsidies specifically for extreme weather are the least common form of support.

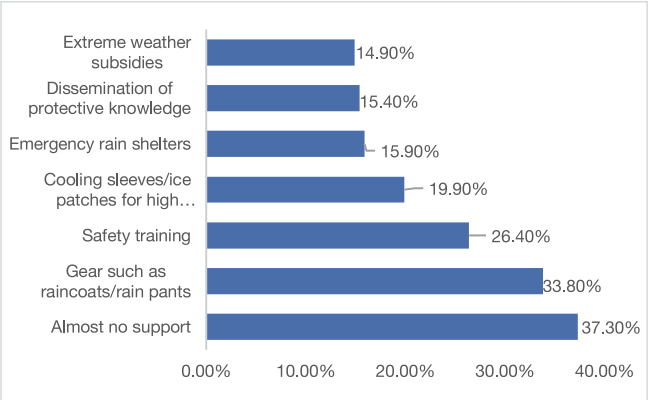


Figure 3-22: Types of Specific Support Available to Workers

In terms of satisfaction, nearly 60% of workers (58.0%) feel that current platform support is inadequate. In stark contrast, only 11.0% of workers feel the support is either "very adequate" or "somewhat adequate." This further confirms the widespread inadequacy of current safety nets. Overall, workers' approval of existing support arrangements is low. The measures platforms plan to provide-whether financial compensation, protective gear, dispatch adjustments, or health care-still have significant room for improvement regarding their actual coverage, execution, and ease of access. The reality that these measures "exist in theory but fail to meet actual needs" results in low overall satisfaction.

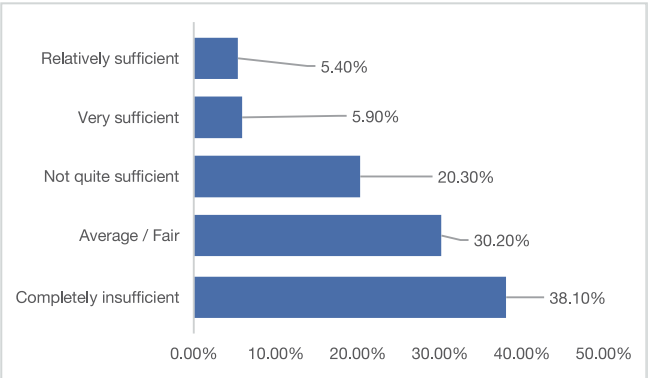


Figure 3-23: Worker Satisfaction Regarding the Adequacy of Platform Support and Protective Supplies

When evaluating the actual effectiveness of platform support, 68% of workers consider the protective measures to be either "slightly useful, but far from enough" (43%) or "basically useless" (25%). Only 12% consider them "very helpful." This data clearly shows that the extreme weather support measures currently provided by platforms severely lack practical utility and effectiveness when workers actually try to use them.

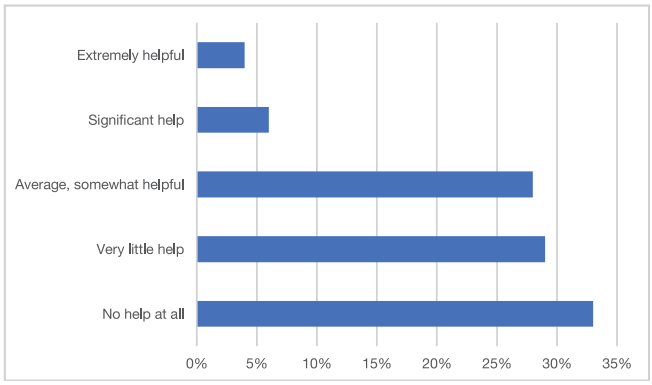


Figure 3-24: Worker Evaluation of the Practical Helpfulness of Platform Support

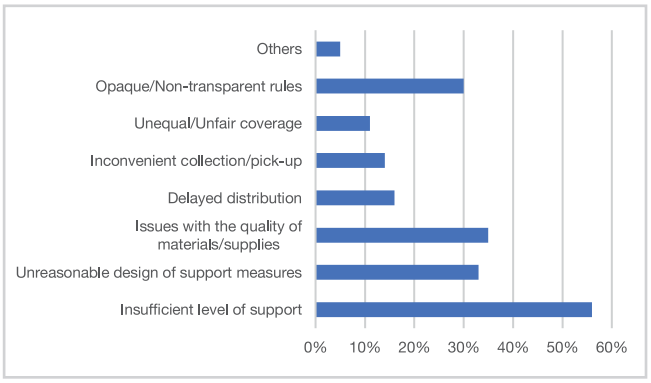


Figure 3-25: Primary Problems with Current Platform Support as Identified by Delivery Workers

3. Core Demands and Expectations of Workers

Survey data reveals that workers' feedback on the platforms' current extreme weather support systems is highly concentrated. The primary pain point is "insufficient support," cited by 56.0% of respondents. This shows that over half of the workers believe there is a significant gap between the actual demands of extreme weather and the quantity of supplies, rest stations, and subsidies provided. This is the most widespread and urgent structural issue to solve. The second most prominent issue is "poor quality of supplies," which indicates that even when gear like raincoats or cooling sleeves are provided, their low-quality ruins their effectiveness, meaning the platform's investment fails to translate into actual safety and health protections for the workers.

Additionally, "unreasonable support design" (33.0%) and "opaque rules" (30.0%) were frequently cited. This demonstrates that beyond the lack of quantity and quality, the support policies are poorly adapted and hard to access. Subsidies or supplies often do not match the workers' actual working environments or the times of highest risk. Furthermore, unclear application rules and distribution standards increase the difficulty and uncertainty of obtaining these benefits, diluting the good intentions behind the policies.

In summary, the data clearly outlines the workers' priorities: they most urgently want platforms to significantly increase the amount of support resources provided (Quantity) and ensure these resources are reliable and effective (Quality). Building on this, platforms must optimize the design of their support policies to match real-world conditions and establish transparent, clear rules and communication mechanisms. Only then can the systemic protection of workers during extreme weather be meaningfully improved.

(v) Summary and Recommendations

Based on a systematic analysis of the survey data regarding delivery workers in Beijing, it is evident that extreme weather has a continuous and widespread impact on their work processes, safety, and daily lives. These issues stem not only from a lack of individual coping capacity, but are also deeply embedded in current platform operational mechanisms, urban public service capabilities, and the labor protection structures of the gig economy.

Although this study focuses on a sample from Beijing, the risks and adaptive experiences faced by gig economy workers under climate change share universal characteristics. To present the findings systematically, the following section summarizes the main conclusions across three dimensions: extreme weather exposure, actual impacts, and platform support. Corresponding policy recommendations are provided accordingly.

1. High Exposure to Extreme Weather has Become a Normalized Occupational Risk

The survey shows that extreme weather has become a structural risk factor deeply embedded in the labor process of delivery workers. In recent years, workers have been widely and frequently exposed to multiple types of extreme weather scenarios, including heatwaves, heavy rainfall and short-term intense precipitation, and icy or

snow-covered roads. Compounded by strong winds, cold snaps, and air pollution, these conditions create a continuously hazardous environment for outdoor work. The vast majority of workers have experienced more than one type of extreme weather over the past three years, facing the dual exposure of prolonged outdoor riding and high-intensity delivery quotas. Extreme weather has become profoundly embedded into the daily reality of the food delivery industry, leaving the worker population in a state of long-term, high-frequency exposure to climate risks.

2. Compounding Impacts: Simultaneous Amplification of Safety, Health, and Family Pressures

Given this sustained exposure, the impact of extreme weather on workers extends far beyond mere travel inconvenience; it constitutes a compounding shock to their personal safety, physical health, psychological well-being, and family responsibilities. Survey data indicate that slippery roads, impaired visibility, and vehicles becoming unstable in high winds are the most acute safety threats. Extreme weather significantly elevates the incidence of traffic accidents and falls, with a substantial proportion of workers experiencing multiple safety incidents within a single year, demonstrating a pattern of repeated harm.

Physiologically, heatstroke, dehydration, and skin discomfort triggered by extreme heat are the most prevalent issues, while low temperatures, rain, snow, and air pollution likewise inflict continuous physical strain. Psychologically, workers universally endure intense anxiety, fear, and frustration during extreme weather. These emotions are directly tied to platform evaluation mechanisms that strictly link timeouts and customer complaints to their income. Concurrently, extreme weather further exacerbates their time conflicts and emotional burdens, in some cases forcing workers to accept fewer orders or shorten their working hours, triggering a chain reaction that impacts their household livelihood and stability.

Female and disabled workers bear additional risks amidst these impacts. Female workers confront highly specific and often overlooked physiological and privacy challenges during severe heat, heavy rain, and extreme cold. Meanwhile, disabled workers-who heavily rely on assistive devices and specific communication methods-experience a pronounced amplification of safety risks under extreme weather. This demonstrates that the impacts of climate hazards are not uniform; they produce distinctly differentiated consequences based on existing labor vulnerabilities.

3. Insufficient Platform and Urban Infrastructure Support Coupled with Rigid Rules: The Systemic Transfer of Climate Risk to Individual Workers

Despite extreme weather risks being highly concentrated and widespread, survey results reveal that platform-level support measures remain limited in overall coverage and practical effectiveness, and prove insufficient to offset the multiple risks workers face in these scenarios. Many workers report rarely or never receiving physical supplies, subsidies, or other forms of substantive assistance from platforms during severe weather. Existing support largely centers on basic protective gear such as raincoats, which vary widely in supply stability, suitability, and quality, making them relatively unhelpful in actual work environments.

At the same time, current platform algorithms exhibit a glaring lack of flexibility regarding performance evaluations, order dispatch, and incentive structures under extreme weather. Institutional arrangements-such as rigid penalties for timeouts, complex appeal processes, and making subsidies strictly conditional upon fulfilling high order quotas-largely fail to account for uncontrollable weather factors. This structural rigidity allows climate risks to be easily transferred down to individual workers through rule enforcement, manifesting as income volatility and heightened psychological distress. Furthermore, the varying rules across different platforms during extreme weather increase the unpredictability of workers' work outcomes, putting them under greater pressure to weigh their physical safety against strict platform requirements. Overall, existing platform systems have significant room for improvement in buffering climate risks, and their potential to protect workers has yet to be fully realized.



Figure 3-26 A delivery worker wearing a green uniform down jacket and a safety helmet navigates the street with focused attention.

At the level of urban infrastructure and public services, the deficits are equally severe and highly systemic. Current urban planning and municipal management generally fails to include mobile outdoor workers as a target demographic for public services. During extreme weather, workers lack access to rest spaces, hydration stations, adequate shelter, and emergency help channels, which severely limit their ability to protect themselves. This manifests in several specific ways: High Temperatures: Commercial hubs, residential communities, and transit nodes generally lack designated cooling rest stops open to outdoor laborers. While convenience stores and subway stations can be used temporarily, they lack institutional backing and necessary amenities (e.g., charging stations, water dispensers, seating), making it difficult for workers to rest safely without delaying their orders. Heavy Rain: Urban road-flooding alert systems are not effectively linked with delivery routing algorithms. Delivery workers are generally forced to rely on personal experience to judge the danger of flooded routes, lacking real-time traffic updates or automated platform alerts. Cycling Infrastructure: The construction of non-motorized vehicle lanes is uneven; some areas lack continuous, dedicated bike lanes, forcing gig workers into mixed traffic that significantly increases traffic safety risks during severe weather. Public Restrooms: The uneven distribution and restricted operating hours of public restrooms have become tangible challenges to the physical and mental health of female workers, a problem that becomes especially acute during extreme weather.

Synthesizing the core findings across these three dimensions, this study proposes the following targeted policy recommendations:

1. Improve Platform Algorithm Response Mechanisms During Extreme Weather

We recommend that relevant regulatory authorities push for industry guidelines requiring all food delivery platforms to automatically trigger an "Extreme Weather Mode" when meteorological departments issue orange or higher alerts (for heatwaves, heavy rain, strong winds, etc.). These mechanisms should include, but are not limited to: reasonably extending delivery time limits, suspending timeout penalties and deduction mechanisms, opening simplified appeal channels, and prohibiting the penalization or demotion of workers who refuse or temporarily suspend orders. Furthermore, subsidies should be tied to actual attendance during extreme weather; unreasonable requirements, such as perfect attendance or high minimum-order thresholds, must be canceled so that subsidies truly serve as safety incentives rather than shifting the risk onto the workers.

2. Include Outdoor Workers in Urban Public Service Planning to Build a "Worker-Friendly" Infrastructure Network

We recommend integrating the rest and emergency needs of mobile outdoor workers, such as delivery workers, into the urban public service planning system, reducing individuals' exposure to extreme weather by providing adequate physical spaces. Specific measures include: planning and setting up outdoor worker service stations equipped with weather shielding, air conditioning, water dispensers, charging stations, first-aid kits, and restrooms in high-density delivery areas (e.g., commercial hubs, community centers, and near subway stations). The construction standards for these stations should be incorporated into policy documents for urban renewal and community governance, with clearly defined responsible parties and maintenance mechanisms. Additionally, large commercial complexes, office buildings, and public facilities should be encouraged to open their internal public spaces to workers for brief rests during extreme weather, framing this as a guiding indicator of corporate social responsibility.



Figure 3-27 : A female delivery worker in a green high-visibility uniform drinks water and rests at a dedicated worker service station.

3. Optimize Urban Cycling Infrastructure to Reduce Non-Motorized Travel Risks in Extreme Weather

Cities must accelerate the improvement of urban non-motorized vehicle lane systems. Priority should be given to building continuous, dedicated bike lanes in high-density delivery areas (such as dining districts and main roads around residential complexes) to reduce mixed motor/non-motorized traffic and lower the risk of traffic accidents for workers during extreme weather. Concurrently, traffic management departments should establish a regional extreme weather early-warning mechanism for non-motorized travel. Flood-prone roads and areas with a high risk of icing should be integrated

into real-time traffic platforms. Through digital tools, local alerts can be pushed through workers' commonly used apps, transforming urban climate risk data into actionable cycling safety guidelines.

4. Establish an Extreme Weather Emergency Response System for Outdoor Workers

Within the existing urban emergency management framework, mobile outdoor workers should be explicitly recognized as a key priority group during extreme weather, complete with specific emergency response plans. Specific measures include: during red-alert heatwaves, coordinating with relevant departments to distribute free heatstroke medicine to workers and opening emergency cooling centers; during blue-alert (or higher) rainstorms, establishing a real-time information sharing mechanism for flooded roads; and during freezing conditions, ensuring that de-icing and salting operations prioritize high-density delivery routes. Furthermore, community health centers should be utilized to provide occupational health screenings and fast-track medical channels for extreme weather-related illnesses, streamlining the process for recognizing conditions like occupational heatstroke and frostbite as work-related injuries.

5. Address the Specific Needs of Female and Disabled Workers Through Inclusive Facility and Policy Design

For Female Workers: Urban public restroom planning must account for operating hours, accessibility designs, and distribution density, ensuring facilities are readily available in delivery-intensive areas. Simultaneously, platforms must provide protective gear (like raincoats and helmets) that accommodate women's sizing. For Disabled Workers: Platforms should optimize alternative communication and operational functions tailored to different disabilities. For example, deaf or hard-of-hearing workers should be provided with text messaging and vibration alerts instead of voice-based dispatch, while voice navigation and screen reader compatibility should be enhanced for visually impaired workers. Furthermore, urban emergency broadcast systems must ensure multi-channel accessibility to prevent disabled workers from falling into information blind spots due to a sole reliance on audio alerts.

6. Advance Legislation on Occupational Safety Standards and Labor Relations Recognition for Gig Workers

The successful implementation of the above recommendations ultimately relies on the institutional support of occupational safety protections for gig workers. Under the current labor law framework, we recommend introducing occupational safety guidelines specifically tailored to flexible platform workers. These standards must clearly define the platforms' safety obligations and legal responsibilities during extreme weather. Additionally, efforts should be made to expand work-related injury insurance coverage for workers by lowering enrollment barriers. Finally, a consultation mechanism for extreme weather labor protection-involving the government, platforms, industry associations, and worker representatives-should be established to make climate adaptation a core issue in gig economy labor governance.



VII. Conclusions and Recommendations

(i) Conclusions

Through a systematic survey of three groups-persons with disabilities, female domestic workers, and delivery workers-this study reveals the widespread, compounding, and structural impacts of extreme weather on vulnerable urban populations.

Among people with disabilities, over 90% of respondents have experienced extreme weather events such as heatwaves, heavy rainfall, or cold snaps. More than 60% report that climate risks cause significant extreme disruptions in their daily lives, having become a normalized source of stress. These impacts are deeply embedded in their residential environments, mobility routes, and daily activities, creating systemic risks through three main paths: 1. **Severely restricted mobility**: Due to safety hazards, public transit suspensions, or deteriorating road conditions, many essential activities-such as working and seeking medical care-are forced to stop; 2. **Equipment vulnerability**: Extreme weather increases the failure rate of assistive devices. Tools meant to enhance independence instead become sources of safety risks; 3. **Fragile home care systems**: Power and water outages, disrupted supply deliveries, or the inability of caregivers to arrive on time place disabled individuals-especially those living alone or with severe disabilities-in immediate crises regarding their basic needs.

Currently, urban accessibility environments and emergency systems widely suffer from "failure during disasters." Many facilities, such as ramps, tactile paving, and elevators, are only designed for normal weather conditions and lose their functionality-or even become safety hazards-when encountering floods, icy conditions, or extreme heat. Emergency evacuation and rescue mechanisms also lack disability inclusivity; wheelchair-accessible rescue vehicles are scarce, and dedicated information support (like sign language interpretation or tactile indicators) is missing, exposing a significant gap between institutional design and the actual experiences of the disabled community. Regarding information access, current weather warnings rely heavily on audio broadcasts and lack multi-modal accessible designs (such as text or images), which particularly restricts information access for the deaf, hard-of-hearing, and visually impaired. Furthermore, current warnings generally lack specific evacuation guidelines tailored to different disabilities, making it difficult for individuals to translate received information into actionable risk-response measures. Survey data shows that nearly half of the disabled respondents received no external assistance during extreme weather, relying entirely on family and friends. The proactive intervention from communities and the government was highly limited, reflecting that local emergency systems fail to clearly identify and promptly respond to disabled groups. Notably, disabled women face compounding risks at the intersection of disability and gender. They bear more prominent pressure regarding nighttime travel safety, specific needs during menstruation and pregnancy, and access to private accessible spaces. However, in existing policy frameworks, they are often simplified as family caregivers rather than individuals needing targeted support. Their dual identities and unique circumstances have not yet been adequately addressed in current climate response mechanisms and urban infrastructure.

For female domestic workers, extreme weather has evolved from occasional shocks to a normalized risk deeply embedded in their daily work and commutes, with extreme heat and heavy rain being the most prominent threats. Over 80% of respondents have had their commutes disrupted by extreme weather, and over 40% have faced wage deductions from employers or received unfavorable client reviews due to weather-induced travel delays. Due to the nature of their profession, domestic workers - whether non-live-in workers commuting daily, or live-in workers running errands and accompanying clients to medical appointments-are continuously exposed to environmental risks like extreme heat, flooded roads, and slippery surfaces. From a labor intensity perspective, nearly 40% of respondents actually take on more tasks during extreme weather, yet current employment relationships generally do not factor weather into workload adjustments. An employer allowing a domestic worker to use air conditioning does not equate to a substantive reduction in their labor burden.

Crucially, neither private domestic employment relations nor platform labor mechanisms recognize extreme weather as an occupational risk. The economic losses caused by climate shocks are almost entirely borne by individual workers. Survey data shows that 59% of respondents have had orders canceled due to weather; among them, 52% received only "understanding" from employers or platforms without any form of compensation, and only 6% actually received financial compensation. Furthermore, 73% of domestic workers have never received support from their communities or agencies during extreme weather. For an industry predominantly made up of middle-aged and older women, the overlap of menstruation and extreme

weather constitutes a hidden but very real dual burden: nearly 40% of female respondents stated that menstruation significantly increases the difficulty of working during extreme weather, and over half face difficulties obtaining sanitary products in these conditions. Yet, this need remains absent from any labor protection or urban emergency response framework, leaving workers to endure the hardship entirely on their own.

For delivery workers, exposure to multiple extreme weather scenarios during work in Beijing is widespread and highly frequent. Over the past three years, heatwaves (71.4%), heavy rain (68.0%), and icy roads (66.5%) were the most common climate threats reported by respondents. The impact of extreme weather on workers is not merely travelling inconvenience; it is a compounding shock that affects personal safety, physical health, psychological well-being, and family livelihoods. In the past year, over 70% of workers had safety accidents while delivering in extreme weather, with nearly 30% experiencing three or more accidents, indicating a pattern of repeated harm. Physiologically, heatstroke and dehydration caused by high temperatures, along with stiffness and frostbite from extreme cold, are the most common tolls on their bodies. Psychologically, over 60% of workers report enduring intense anxiety and frustration during extreme weather. The core source of this psychological pressure is not the weather itself, but the fact that platform evaluation mechanisms remain rigidly in place-timeout deductions, difficult appeal processes, and subsidies strictly tied to completing high volumes of orders systematically transfer climate risks onto the workers.

At the same time, over 70% of workers are the primary caregivers in their families. Reduced orders and shortened working hours caused by extreme weather trigger a chain reaction that impacts the stability of their household livelihoods. Regarding platform support, nearly half of the workers stated they rarely or never receive supplies, subsidies, or incentives during extreme weather. Nearly 60% believe the current level of support is insufficient, and nearly 70% feel the platforms' existing protective measures have limited effect, revealing a deep inequity in how platform economy models distribute climate risks. Female and disabled workers (primarily hearing-impaired) bear additional risks in this process: female workers face specific challenges such as ill-fitting gear, a lack of private spaces, and compromised physiological health; hearing-impaired workers face heightened safety risks and decreased efficiency due to hearing aids failing in the rain and snow, which blocks their communication channels.

Synthesizing the survey results across the three groups, three common, cross-group conclusions emerge:

First, the impacts of extreme weather span multiple dimensions, presenting compounding shocks. All three groups face overlapping pressures across personal safety, physical health, psychological states, and family responsibilities. For workers, slippery roads, poor visibility, and strong winds are immediate safety threats, while extreme heat and algorithm-driven anxiety take a multidimensional toll on their labor capacity. For female domestic workers, extreme weather not only increases labor intensity and commuting risks but combines with the physiological traits of middle-aged and older women to form a dual pressure; the difficulty of obtaining sanitary products and the lack of labor protections during menstruation reach critical points in extreme weather. For people with disabilities, restricted travel, failed assistive devices, broken care networks, and information barriers intertwine, putting them at risk of systemic social isolation. Across all three groups, female members universally bear additional risks intersecting with their gender, occupation, and disability status, yet existing policy frameworks remain highly limited in addressing these intersectional challenges.

Second, urban infrastructure and public service systems are structurally absent during extreme weather. The design logic of current urban public spaces and accessibility facilities defaults to serving "able-bodied people operating in normal weather conditions." It fails to adequately consider the adaptive needs of extreme climates, nor does it fully include outdoor mobile workers (like workers and domestic workers) or people with disabilities in its service scope. Flooded roads, icy facilities, a lack of shade in high heat, and nowhere to shelter during heavy rain are physical environmental challenges universally reported by all three groups. This reflects a systemic gap between infrastructure being "usable in normal times" and "usable during disasters."

Third, climate risks are systematically transferred to individuals under current institutional arrangements. Whether it is the lack of extreme weather compensation in domestic employment, the rigid platform evaluation systems that persist in severe weather, or the ongoing neglect of disabled groups in emergency responses, all point to the same structural problem. Current labor relations, platform rules, and public governance frameworks have not yet recognized extreme weather as a labor and social risk that requires institutional burden-sharing. Instead, the default expectation is that individuals must absorb these shocks through their own physical health, economic losses, and psychological toll. As climate change continues to intensify, this risk-transfer mechanism will only further amplify existing social inequalities.

(ii) Policy Recommendations

Based on the above findings, this report proposes the following six policy recommendations to help build a more inclusive, fair, and resilient urban climate adaptation governance system.

1. Include the Needs of Vulnerable Groups in Disaster Prevention and Mitigation Planning. We recommend explicitly listing highly vulnerable groups-such as persons with disabilities and flexible workers (including domestic workers and delivery workers)-as priority targets for protection in disaster prevention and mitigation plans. A risk assessment and prevention mechanism covering travel, health, care, and income should be established. This shift requires integrating the climate vulnerabilities and specific needs of these groups into the city's risk governance considerations and response mechanisms, rather than merely treating them as special groups requiring temporary attention after a disaster strike.

2. Integrate Vulnerable Groups' Needs into Urban Public Service Planning to Build a Climate-Resilient Infrastructure Network. We recommend planning and building multi-functional service stations that accommodate the needs of both people with disabilities and mobile outdoor workers in high-density pedestrian and delivery areas (e.g., commercial districts, community service centers, and near subway stations). These stations should be equipped with wind and rain shelters, cooling facilities, water dispensers, accessible restrooms, and first-aid kits. Construction standards for these stations should be included in urban renewal and community governance policy documents, with clearly defined responsible parties and maintenance mechanisms. Furthermore, large commercial complexes, office buildings, and public facilities should be encouraged to open their internal, accessible public spaces during extreme weather so workers can briefly rest; this should be established as a guiding indicator for corporate social responsibility. Building this network essentially shifts a portion of the climate response costs - originally borne by families and individuals - onto the urban public service system, reflecting the values of inclusive urban governance.

3. Upgrade Accessible and Outdoor Public Facilities from "Usable in Normal Times" to "Usable During Disasters" by Embedding Climate Adaptation Requirements. We recommend systematically incorporating extreme weather adaptation requirements into the design specifications, completion inspections, and routine maintenance standards for relevant facilities. Climate resilience indicators such as drainage, slip resistance, frost protection, and shading should be clearly defined. A mechanism for emergency inspections and rapid repairs of facilities during extreme weather should be established to ensure that key infrastructure, like ramps and elevators, remains basically functional during disasters. Concurrently, cities must accelerate the improvement of non-motorized vehicle lanes, prioritizing the construction of continuous, dedicated bike lanes in high-density delivery areas to reduce the risk of traffic accidents during extreme weather.

4. Improve the Accessibility and Targeting of Weather Warnings to Build a Categorized Action Guide System. Meteorological and emergency departments should simultaneously provide multi-modal warnings - including text, audio, and images-while offering clear, actionable safety advice tailored to different disability types and occupational groups. Proactive community risk-alert mechanisms must be strengthened to ensure that specific vulnerable groups, such as the hearing impaired, are not overlooked. For outdoor workers like delivery workers, flood-prone roads and high-risk icy areas should be integrated into real-time traffic platforms. Warning alerts should be pushed through the apps workers commonly use, translating urban climate risk data into actionable cycling safety guidelines. The true value of warning information lies in whether it can be translated into actionable steps; this requires the design logic of warning systems to shift from one-way information broadcasting to an audience-driven, categorized response.

5. Include Extreme Weather in the Scope of Occupational Risks to Establish a Climate Risk-Sharing Mechanism for Flexible Workers. We recommend urging human resources and social security departments to explicitly include extreme weather (such as extreme heat, heavy rain, and cold snaps) in the occupational risk management frameworks of the domestic service and food delivery industries. Industry operational standards should be formulated to clarify the legal responsibilities of platforms, domestic service companies, and employers regarding warning notifications, work adjustments, and income compensation. For delivery platforms, we recommend requiring them to automatically trigger an "Extreme Weather Mode" when meteorological departments issue orange or higher alerts. This mode should reasonably extend delivery times, suspend timeout deductions, and open simplified appeal channels. Furthermore, subsidies should be tied to actual attendance during extreme weather; unreasonable requirements, such as perfect attendance or high minimum-order thresholds, must be canceled so that subsidies truly serve as safety incentives rather than shifting the risk onto the workers. This will fundamentally change the current situation where climate risks are borne solely by individual workers, gradually establishing an institutional arrangement where the government, platforms, employers, and society share the climate risk.

6. Institutionalize an Intersectional Perspective to Provide Differentiated Protections for Women and Persons with Disabilities.

For Women: We recommend incorporating gender-inclusive design requirements into domestic service industry standards, platform protective gear procurement standards, and urban public facility planning. The operating hours, distribution density, and female-appropriate amenities of public restrooms should be included as planning indicators in high-density delivery areas. When platforms distribute protective gear (like raincoats and helmets) to workers, they must include sizing suitable for women's bodies. Standard domestic service employment contracts should explicitly state the right to adjust schedules during menstruation. Additionally, free emergency sanitary product boxes should be placed in community emergency shelters and transit hubs, transforming women's physiological health needs from a hidden personal struggle into an actionable, institutionalized labor right.

For Persons with Disabilities: This should be addressed on two levels. For disabled workers, platforms should optimize their apps to include text messaging, vibration alerts, and other communication features that replace voice prompts, ensuring hearing-impaired workers can still receive orders and communicate with merchants and customers if their hearing aids fail in rain or snow. Protective gear issued to workers should feature waterproof functions to protect hearing aids and other assistive devices from water damage. For the broader disabled population, urban emergency information must be provided via SMS, flashing lights, and subtitles, rather than relying solely on broadcasts and audio announcements. During emergency evacuations, wheelchair-accessible vehicles and sign language guides must be provided. Finally, the additional economic burdens caused by extreme weather should be alleviated through temporary subsidies, electricity bill reductions, and assistive device repair grants; applying for these subsidies should not require fixed employment or a stable income as a prerequisite.

Ultimately, these six recommendations cover planning design, facility construction, warning information, labor protection, and differentiated support. They all point to one core shift: transforming the risks caused by extreme weather for these three groups from a burden borne solely by individuals into an institutional arrangement where urban public services, employers, and platforms share the responsibility.





Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

GIZ Office China

Tayuan Diplomatic Office Building
1-13-2 14 Liangmahe Nanlu,
Chaoyang District 100600 Beijing, PR China
T +86 10-8527 5180
F +86 10-8532 1405
E giz-china@giz.de
I www.giz.de/china