

Gig Workers On the Frontline: Navigating Climate Challenges in A Precarious Economy

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Article History

Received: 01-Mar-2025
Revised: 05-Apr-2025
Accepted: 10-Apr-2025
Published: 15-Apr-2025

Keywords

Climate Change
Gig Workers
Informality
Social Protection
Sustainability

Abstract

The gig economy, characterized by short-term contracts and freelance work, offers flexibility but often lacks the security and labor protections of traditional employees. The emergence of on-demand service applications like Uber, Swiggy, and Ola has made the gig economy more significant in the digital realm. These platforms provide rapid, straightforward, and adaptable services, making them useful for urban dwellers. However, the gig economy faces informality issues such as extended working hours, meager salaries, absence of formal employment contracts, inadequate social protection, restricted job security, lack of health insurance, nonexistence of paid leave, and insufficient access to utilities. Climate change is intensifying, leading to more frequent and severe extreme weather events, which disproportionately affect outdoor workers. The gig economy's reliance on digital platforms presents both opportunities and challenges for environmental sustainability. Digital platforms can facilitate efficient resource allocation, reduce commuting through remote work options, and optimize logistics, potentially leading to lower carbon emissions. However, the convenience-driven nature of on-demand services can increase vehicle emissions and urban congestion. This paper examines the intersection of the gig economy and climate change, highlighting the vulnerability of gig workers, particularly app-based workers, to climate-related risks. It examines the role of urban infrastructure, policy interventions, and technological solutions in mitigating these challenges. The study also considers the ethical responsibilities of platform companies in ensuring the safety and well-being of their workforce. It calls for integrating climate risks into occupational health guidelines and promoting sustainable practices within the gig economy.

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1. INTRODUCTION

The widespread usage of the internet and smartphones has led to global connectivity via digital platforms. This enables organisations to connect with remote workers on digital channels and communicate talent requirements. In the digital age, these changes make the gig economy increasingly important and visible. The gig economy is a free market where companies hire independent workers for short-term projects or services. A lack of stable employment leads to individuals seeking contractual work as independent workers, sometimes known as "gig workers" or "freelancers". The gig economy offers significant job opportunities in India. Currently, the

Indian economy is not seeing inclusive development due to jobless growth. The gig economy may provide teenagers lucrative jobs. It may generate new possibilities for women by allowing for flexibility in work location and hours, leading to increased enrolment in such occupations. Employing more gig workers in business services may decrease costs and streamline operations. Gig economy faces multitude of problems, due to the growing in number of gig workers they have difficulty in obtaining quality work and projects regularly. there is a lack of structure and government support for fostering quality employment, worker protection, and access to conventional job

benefits. The rise of gig economy and online talent portals has redefined the meaning of 'jobs', creating challenges for existing labour regulations and necessitating new labour models. As shown in the U.K. Uber case, self-employed or microentrepreneurs do not get the same benefits as normal workers¹. Gig workers' lack of a stable income makes it challenging to assess their creditworthiness. This problem is relevant in India since there is no unemployment insurance. Gig workers lack in legislative framework where they are denied with social security and labour welfare measures. The flexibility of gig workers combined with the susceptible working conditions is extremely affected by climatic conditions. These 'flexible workers' are generally unprepared for change. They must balance algorithms and climatic extremes, frequently sacrificing health for profit. Human activity has drastically affected the air quality, several chemicals harm health by entering the body via breathing. Gases that have no impact on human health build in higher atmospheric layers, destabilising the climate and disturbing the delicate biological balance essential for life. Air pollution is a major issue that causes early deaths and sickness combined with the issues of global warming, may be more dangerous to human health. Global warming causes heat waves and disruptions. It has created unpredictable weather systems more frequent violent occurrences, infectious illness concerns, and food supply challenges. As the global climate changes and the atmosphere warms, air pollution in cities may increase due to heat and sunshine driving urban smog formation². These gig workers are often working in this climatic condition devoid of any kind of security and certainty. As "Gig" is characterised under Precarious employment where the duration is uncertain and work is indefinite. This burdens gig workers considerably more when paired with the climate problem. Most of India saw harsh weather in the past years. Although some towns had temperatures up to 50°C, the subsequent monsoons inflicted severe damage in others. Extreme heat would cost India 5.8% of its working hours by 2030, according to UNESCAP³. App-based platforms have transformed urban transport, eating, and shopping. The gig economy has produced many flexible employments, but it has been accused for failing to address worker welfare and social safety.

Climate change will serve as a 'wicked multiplier' in the gig economy⁴, increasing the vulnerability of developing country workers. Flexible workers cannot adapt to changing conditions. Current gig labour largely disregards climate change's influence on workers. Climate change threatens their lives and livelihoods, but it is only one of many risks added with other issues faced by them. Extreme weather highlights the strain of these fragile situations. Heatwaves and flash floods enhance road accident risk and traffic-related injuries. Gig workers in these nations suffer long hours and dangerous roads and traffic during heatwaves, storms, and floods. Two-wheeler riders experience dust inhalation, sunburn, heatstroke, and road shade shortages. Gig workers are at danger of weariness, dehydration,

and other health issues due to algorithmic management and 'lightning fast' services. That their salaries rely on gig performance makes their status vulnerable⁵. Thus, this study mainly focusses on the need for proper welfare mechanisms and how the platform-based companies can play a vital role in preventing climate change. The study also gives a comparative perspective of other countries on how to tackle the issue of climate change which is affecting gig workers.

2. LITERATURE REVIEW

Navraj Singh Ghaleigh (2019)⁶ explored the intersection of labour law, social democratic thought, and environmental/climate law, areas that have historically had limited engagement. The paper challenges the traditional separation and even suspicion between labor and environmental concerns, arguing for shared interests and mutual gains through engagement. It introduced the concept of Just Transition for Workers as a crucial element in responding to climate change. JTW emphasizes the need for a radical reorganization of production and distribution methods in the shift to a low-carbon economy, acknowledging the significant challenges this poses for workers, communities, and industries. The author frames climate change as a major force, similar to robotics or globalization, that will fundamentally alter labor markets. The paper highlights the urgency of addressing climate change, referencing the IPCC's "1.5-degree report" and its findings on the severe consequences of global warming. It emphasizes that both responding to climate change and failing to do so will drastically reshape labour markets. The paper cautions against overly deterministic views that assume scientific predictions automatically dictate social relationships. It advocates for incorporating the complexities of law and the values of legal actors into climate action narratives, with a focus on social democratically informed approaches. The paper highlights the ILO's positive view that well-managed transitions to sustainable economies can drive job creation, improve job quality, promote social justice, and reduce poverty. Friedemann Bieber and Jakob Moggia (2021)⁷, This paper addresses the growing prevalence of the "gig economy" and its normative implications. The paper argues that the gig economy represents a fundamental shift in the distribution of risk, with businesses externalizing risk onto workers, leading to increased precarity and undermining workers' agency. They propose a "Principle of Inverse Coverage" (PIC) to mitigate these risks through a Pigouvian tax on short-term, variable employment, which would fund an insurance scheme against income volatility. The authors describe the increasing prevalence of on-demand work, characterized by short-term contracts and freelance arrangements. They highlight the growth in alternative work arrangements, zero-hour contracts, and income volatility for workers. The central argument is that the gig economy represents a "risk shift," where businesses reduce their own risk by demanding greater flexibility from

¹ Roy, G. and Shrivastava, A.K., 2020. Future of gig economy: opportunities and challenges. *Imi Konnect*, 9(1), pp.14-27.

² Change, C., 2014. Climate change. *Intergovernmental Panel On Climate Change*: Geneva, Switzerland.

³ India to lose 5.8% of daily working hours and heat stress in 2030 : UNESCAP, Business standard dated April 2024.

⁴ Vu, A.N. and Nguyen, D.L., 2024. The gig economy: The precariat in a climate precarious world. *World Development Perspectives*, 34, p.100596.

⁵ Bliss, I.B., Rain or shine, the gig must go on—Platform workers navigate climate extremes.

⁶ Ghaleigh, Navraj Singh, *Just Transitions for Workers: When Climate Change Met Labour Justice* (September 18, 2019).

Edinburgh School of Law Research Paper No. 2019/30, Available at SSRN: <https://ssrn.com/abstract=3456148> or <http://dx.doi.org/10.2139/ssrn.3456148>

⁷ "Risk Shifts in the Gig Economy: The Normative Case for an Insurance Scheme against the Effects of Precarious Work" by Friedemann Bieber and Jakob Moggia (2021)

workers, thereby exposing them to increased personal risk. This shift is facilitated by mechanisms that allow firms to adjust employment levels and salaries in response to market fluctuations. The authors argue that this risk shift is normatively problematic. It particularly affects low-skilled workers, diminishing their ability to plan for the future and undermining their agency. The authors contend that the voluntary acceptance of gig work does not necessarily make it unproblematic, as it can entrench relationships of domination and exploitation. Gig work has a corrosive effect on the skill level of the workforce, the provision of care work in families, and social cohesion. Bieber and Moggia propose the Principle of Inverse Coverage (PIC) as a policy solution. This principle suggests that the shorter, more variable, and less predictable a form of employment, the higher the contributions to social insurance schemes should be from the employer. This acts as a Pigouvian tax, discouraging excessive use of gig work. The revenue generated from the PIC-based tax would fund a new insurance scheme designed to protect gig workers from income volatility, mitigating the risks associated with precarious work. Bieber and Moggia contribute to the literature on the gig economy by shifting the focus from traditional concerns like income inequality and power imbalances to the issue of risk. They offer a novel framework for analyzing the normative implications of the gig economy, highlighting the ways in which it can undermine workers' agency and create societal costs. The proposed Principle of Inverse Coverage and the associated insurance scheme provide a concrete policy proposal for addressing these challenges. Cheng-Kai Hsu's (2025)⁸ paper investigates the impact of incentive structures and heat exposure on risky driving behaviors among on-demand food delivery (ODFD) motorcyclists in Kaohsiung, Taiwan. The study addresses the rising occupational safety concerns within the gig economy, specifically focusing on road safety risks and heat-related issues faced by ODFD workers who rely on motorcycles. By employing a mobile sensing scheme and a case-crossover approach, Hsu provides quantitative evidence linking platform-established incentive models and heat conditions to increased risky driving among this vulnerable worker population. Hsu situates the research within the broader context of the gig economy's expansion and the associated rise in precarious work. The paper highlights how platform companies often circumvent traditional employment relationships, leading to a lack of worker protections and increased occupational risks like income volatility, lack of health coverage, and inadequate workplace safeguards. The study emphasizes the specific road safety challenges faced by ODFD workers, who often rely on motorcycles in hazardous traffic conditions. The paper cites statistics from Taipei, Taiwan, indicating a high incidence of traffic crashes involving ODFD motorcyclists, with a large percentage attributed to risky driving behaviors. This is further supported by evidence from other countries showing ODFD workers frequently engaging in traffic violations. Hsu addresses the issue of prolonged heat exposure faced by ODFD workers, particularly in the context of climate change. The paper argues that ODFD workers are more vulnerable to the dangers of heat due to their lack of control over work schedules and conditions. The increasing demand for ODFD services during hot weather further exacerbates this issue, effectively shifting the burden of thermal discomfort onto these workers.

The core argument is that platform-established incentive structures promote risky driving behaviors among ODFD workers. Drawing from research in organizational psychology Hsu suggests that monetary bonuses and the pressure for quick deliveries encourage workers to take risks, leading to increased speeding and other unsafe driving practices. This builds upon qualitative insights from ethnographic studies. The paper contributes methodologically by employing a mobile sensing scheme to collect real-time data on driving behaviors and environmental conditions. The use of a case-crossover approach allows for the study of individual-level exposure and its association with risky driving, addressing a gap in existing research. Hsu's research makes a significant contribution to the understanding of occupational safety risks in the gig economy, particularly in the ODFD sector. It provides quantitative evidence linking incentive structures and heat exposure to risky driving behaviors among ODFD motorcyclists. The findings offer valuable insights for policymakers to mitigate these risks, especially in motorcycle-dominant cities in warmer regions, and highlight the importance of addressing climate-related inequities within the evolving gig economy. Narayane Annamalai's paper (2021)⁹ examines the rapidly growing gig economy in India, focusing on its advantages, disadvantages, and the extent to which Indian labor laws address the unique challenges faced by gig workers. The paper discusses the surge in gig work due to digitalization, particularly accelerated by the COVID-19 pandemic, and analyzes the implications of the Social Security Code 2020 for this increasingly important segment of the workforce. Annamalai highlights the rapid growth of the gig economy in India, driven by factors such as increased 4G connectivity, the availability of AI and automation technologies, and the widespread use of digital platforms. The paper notes the expansion of gig work beyond simple delivery services to encompass a wider range of skilled roles, including software engineering, content creation, and social media marketing. The paper acknowledges the benefits of the gig economy for both workers and employers. For workers, these include flexible working hours, the ability to choose work that suits them, and the opportunity to take on multiple jobs. For employers, the gig economy offers access to specialized skills on demand and the ability to avoid the costs and complexities of traditional hiring processes. The author also notes that online platforms allow employers to monitor and assess workers based on ratings and reviews. Annamalai examines the Social Security Code 2020 and its provisions for gig workers. The paper notes that the Code defines gig workers and platform workers, bringing them under the umbrella of social security benefits for the first time. The Code mandates registration on a government portal, sets eligibility criteria (age, prior work experience), and requires contributions from companies engaged in gig work towards a Social Security Fund. The paper also addresses the significant challenges faced by gig workers in India, including, a) Lack of an organized structure to protect them, b) Overloading of workers despite flexible hours due to pressure to meet customer needs, c) Reliance on ratings and reviews, which may not always be accurate or fair, d) Impact of physical and mental stress, as well as climate conditions, on workers' performance, e) Lack of workplace facilities and benefits, such as leaves, particularly affecting students and women, f) Arbitrary hiring and firing practices by employers, g) Limitations on the right to strike

⁸ Cheng-Kai Hsu's paper, "Incentive and heat condition on risky driving among on-demand food-delivery motorcyclists in Kaohsiung, Taiwan".

under the Industrial Relations Code, h) Eligibility criteria that may exclude some workers from social security benefits. Annamalai proposes several recommendations to improve the status of gig workers in India, including:

- Establishing a separate portal for gig workers to anonymously register complaints against employers.
- Adding a section to platform apps for addressing employee issues.
- Ensuring uniformity in the terms and conditions offered by different platform aggregators.
- Providing medical expense coverage for workers affected by health issues during working hours.
- Enhancing access to social security benefits.
- Implementing laws that prevent exploitation and ensure fair wages.
- Providing greater clarification and categorization within existing labor laws.
- Offering legal aid and establishing mobile courts for gig workers.
- Recognizing the essential role of gig workers and providing them with adequate care and attention, especially during crises like pandemics.

Annamalai's paper provides a useful overview of the status of gig workers in India, highlighting both the opportunities and challenges associated with this evolving form of work. The analysis of the Social Security Code 2020 is particularly valuable, as it sheds light on the extent to which Indian labour laws are adapting to the realities of the gig economy. The recommendations offered by the author provide a roadmap for policymakers and platform companies seeking to improve the working conditions and social protections of gig workers in India.

3. CASE STUDIES AND BEST PRACTICES AROUND THE GLOBE

Precarious employment in a broad sense is defined as, insecure labour involves businesses shifting risks and duties to workers. It refers to labour in the official and informal economy, with varying levels of objective (legal) and subjective (feeling) uncertainty and insecurity¹⁰. Precarious jobs are characterised by uncertainty in duration, multiple employers, ambiguous employment relationships, limited social protections and benefits, low pay, and significant legal and practical barriers to collective bargaining¹¹. The gig economy, it is self-evident that these new kinds of work are more precarious than established forms. Indeed, the gig economy operates in a context in which 'social, economic, and political forces have aligned to make work more precarious. The problems faced by the gig workers such as loss in employer connection, resulting in more job changes and a propensity to shift occupations over time. The chance of rise in long-term unemployment, indicating more job seekers which happens in nations were many individuals have never had a traditional job. The growth of job insecurity perceived makes the individual view employment as increasingly unstable and which impact them drastically. There

is also an increase in the non-standard labour arrangements and contingent employment, already seen in the gig economy. The uncertainty can also be seen from the rise in risk transferring from employers to workers, which is evident in the gig economy¹². The Global study analysis is necessary to identify the various steps taken by different countries in handling the issues faced by Gig workers.

3.1 India – Urban Company's Sustainable Practices

Urban Company, a major gig platform in India, introduced an electric vehicle (EV) transition program for its gig delivery and service partners. The initiative includes partnerships with EV providers and financial support for workers to shift to sustainable modes of transport. Additionally, it offers occupational health and safety training to mitigate heat-related risks, especially for outdoor gig workers during extreme summers.

The steps taken are in tune with the ESG commitments of promoting economic empowerment, social security, safety net, equity and a better quality of life for all the stakeholders. The safety net includes life accidental and health insurance cover to all partners. Minimize single-use plastic from service delivery and supply chain¹³.

3.2 United Kingdom – Deliveroo's Climate Resilience Initiative

Deliveroo launched a Climate-Resilient Gig Work Pilot in collaboration with local governments. It includes:

- Real-time weather alerts to riders,
- Heat-protection gear and hydration kits,
- Incentives for working in safer hours (e.g., early mornings or late evenings in heatwaves).
- Insurance coverage to delivery workers.
- Electric vehicle incentives

This initiative aims to prevent gig workers from overexposure to extreme weather while maintaining economic activity¹⁴.

3.3 Philippines – Tricycle Drivers' Digitalization and Green Transport

Gig workers in the transport sector, like tricycle drivers, were supported by NGOs and local government units through¹⁵:

- Training in climate-safe driving practices,
- Access to low-emission vehicles, and
- Inclusion in disaster preparedness planning.

This model shows how informal gig workers can be integrated into local climate action plans.

3.4 United States – Gig Worker Climate Insurance Program (Pilot)

A pilot initiative in California provided micro-insurance and income protection schemes for gig workers affected by climate disruptions (e.g., wildfires, flooding). The program also explored portable benefits platforms, allowing gig workers to retain access to insurance regardless of platform mobility.

¹⁰ Tokman, V.E., 2007. *The informal economy, insecurity and social cohesion in Latin America*. International Labour Review, 146(1-2), pp.81-107.

¹¹ ILO definition

¹² Woodcock, J. and Graham, M., 2020. *The gig economy*. Polity.

¹³ Urban Company, ESG India Report FY 2024, Published in July 2024.

¹⁴ Deliveroo, Annual Report 2021
¹⁵ Guno, C. S., Collera, A. A., & Agaton, C. B. (2021). *Barriers and Drivers of Transition to Sustainable Public Transport in the Philippines*. World Electric Vehicle Journal, 12(1), 46.
<https://doi.org/10.3390/wevj12010046>

Proposition 22 allowed gig economy companies to offer app-based drivers limited benefits such as accident insurance, a health care stipend for drivers who exceed a threshold number of hours worked and partial earnings guarantee while identifying their status as independent contractors¹⁶. In 2021 the Bipartisan federal legislation directed to award grants to states, local governments or non-profits in order to support innovative portable benefit pilot projects. The project seeks to provide gig workers with access to certain retirement plans and health insurance protections typically offered to full-time employees¹⁷.

3.5 Rwanda – Green Jobs for Motorcycle Gig Workers

In Kigali, gig platforms collaborated with the government to promote electric motorcycles through leasing programs, skill training, and maintenance hubs. This improved environmental outcomes and created stable green jobs for youth in the informal sector¹⁸.

3.6 Vietnam – ‘Weather Fee’ for Gig Workers by Baemin

In 2023, Baemin Vietnam, a food delivery platform, introduced a ‘weather fee’-a small bonus paid to delivery riders during extreme weather conditions like heavy rains or intense heat. This additional compensation acknowledges the heightened physical and safety risks gig workers face in challenging weather¹⁹. The key features mentioned in the global arena such as dynamic pay adjustment based on real-time weather data, Incentive to ensure continued service while acknowledging extra risk. Open communication about the weather fee in the app interface to promote transparency has improved the worker. All these activities will improve worker morale and retention during harsh climate events as well as recognition of gig workers’ exposure to environmental risk, setting a precedent for climate-sensitive compensation. Vietnam’s approach is an example of cost-sharing between platforms and workers, ensuring that gig workers are not alone in bearing the burden of climate-related job risks.

4. RECOMMENDATIONS

After considering the global policies and available literatures, these recommendations help in providing a basic framework in providing protection to gig workers to tackle the issues of climate change.

- Governments must formally recognize gig workers in national climate adaptation and employment policies to ensure inclusive disaster planning and social safety nets.
- Platforms should integrate heat and weather alert systems, flexible scheduling during extreme events, and provide gear (e.g., sun protection, raincoats) to reduce climate exposure.
- Support gig workers in adopting green tools and technologies (e.g., electric vehicles, solar charging stations) via subsidies, low-interest loans, or leasing models.
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- Design and implement portable benefits systems (health, insurance, pensions) accessible across platforms, especially for climate-induced job disruptions.
- Enable multi-stakeholder partnerships to develop climate-resilient gig work models through community-based training, urban planning, and participatory governance.
- Encourage evidence-based policymaking by investing in climate vulnerability assessments focused on platform workers, particularly in Global South cities.

5. CONCLUSION

Gig workers are becoming the unsung backbone of urban economies, especially in logistics, transport, and delivery services. However, as climate change intensifies-bringing extreme heat, floods, and air pollution-these frontline workers face disproportionate risks due to their outdoor work settings, lack of social protections, and economic precarity. The intersection of climate vulnerability and labour informality means that gig workers are both victims of and crucial actors in building climate resilience. Case studies across the globe show that when public-private partnerships invest in green infrastructure, digital tools, insurance, and policy inclusion, gig workers can transition into roles that are not only environmentally sustainable but also socially secure.

Conflict of Interest

Conflict of interest declared none.

Funding

The review presented in the article did not receive any external financial support.

Acknowledgements

The authors would like to acknowledge that no external funding or assistance was received for this research, and therefore, no acknowledgements are necessary.

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¹⁶ Dubal, V.B., 2022. *Economic security & the regulation of gig work in California: From AB5 to Proposition 22*. *European Labour Law Journal*, 13(1), pp.51-65.

¹⁷ Foster, N., Nelson, G. and Reder, L., 2016. *Portable benefits resource guide*. The Aspen Institute (July 13).

¹⁸ Sitas, R., Cirolia, L.R., Pollio, A., Sebarenzi, A.G., Guma, P.K. and Rajashekhar, A., 2022. *Platform Politics and Silicon Savannahs: the rise of on-demand logistics and mobility in Nairobi and Kigali*. Cape Town: African Centre for Cities, University of Cape Town.

¹⁹ Vu, A.N. and Nguyen, D.L., 2024. *World Development Perspectives*. *World Development*, 34, p.100596.