When the City Never Sleeps: Urban Climate Vulnerabilities in Ghana's Shift to a 24-Hour Economy

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ABSTRACT

Ghana's 24H+ Programme proposes a transition toward a 24-hour economy as a strategy to expand employment, strengthen productivity, and modernize national development. While the policy outlines economic and infrastructural priorities, its implications for urban climate risks and resilience have not been examined. This study assesses how continuous economic activity may influence climate-related vulnerabilities in Ghanaian cities, with attention to energy demand, nighttime heat exposure, emissions, mobility systems, and services that already face stress under current climate conditions. Using a policy-focused analytical approach, the paper evaluates the 24H+ Programme through established urban climate and resilience frameworks, including IPCC risk concepts and research on climate impacts in rapidly growing African cities. The analysis suggests that a 24-hour economy could intensify existing pressures, especially heat, energy use, and exposure risks, unless supported by deliberate adaptation measures and climate-responsive urban planning. The paper highlights the need for integrated governance, resilient infrastructure, and equitable protection for low-income communities that are often more exposed to climate risks. It concludes by proposing planning and policy actions that align the 24H+ economic transition with Ghana's climate commitments and the broader goal of building resilient urban systems.

Keywords: Urban climate risk, 24-hour economy, Climate resilience, Urban systems, Ghana 24H+ Programme, Climate adaptation, Urban governance

INTRODUCTION

Urban areas across the world are facing increasing climate pressures that disrupt infrastructure, health, and economic activity. The Intergovernmental Panel on Climate Change (IPCC 2022) notes

that cities are becoming hotspots for exposure to extreme heat, flooding, and service interruptions because growing urban populations and climate change interact to intensify risks. Recent research also shows that nighttime temperatures are rising faster than daytime temperatures in many tropical and subtropical cities, affecting energy demand, human comfort, and the functioning of urban systems (Li & Bou-Zeid 2023; Thorne & Shepherd 2021). These changes have important implications for how cities operate, particularly as new economic models emerge.

African cities experience some of the most complex forms of climate vulnerability. Studies indicate that heat exposure, urban flooding, and infrastructure stress are intensifying across major West African cities, often affecting communities with limited access to cooling, drainage, and reliable services (Dodman & Parnell 2020; Rohat et al. 2022). Research across the region also shows that informal settlements and low-income neighborhoods face disproportionate exposure to climate hazards because of limited adaptive capacity and weaker access to services (Tschakert & Tuin 2021). These findings align with assessments by UN-Habitat (2020) and the World Bank (2021), which document growing climate pressures, infrastructure strain, and service deficits across rapidly expanding African urban systems.

Ghana's cities, including Accra, Kumasi, and Sekondi-Takoradi, reflect these wider regional patterns. Peer-reviewed studies report recurrent flooding, rising heat stress, and overburdened infrastructure in these cities, driven by both climate variability and rapid urbanization (Aboagye et al. 2022; Lwasa 2021). These climate and infrastructure stresses influence how urban systems respond to economic change, particularly reforms that require more intensive use of transport, energy, and service networks.

It is within this context that the Government of Ghana has developed the 24H+ Programme, a national policy framework promoting a shift toward a 24-hour economy. The Programme proposes

expanding industrial operations, strengthening logistics, improving service delivery, and supporting multi-shift work systems. Although the document outlines economic objectives, it does not directly assess how continuous economic activity may interact with existing climate vulnerabilities. Research in urban climate science shows that extended activity periods can overlap with times of heightened nighttime heat, reduced air circulation, and increased emissions from transport and power use (Li & Bou-Zeid 2023; Creutzig et al. 2022). These interactions raise important questions about how a 24-hour economy may influence urban exposure, system sensitivity, and the capacity of institutions and infrastructure to manage climate stress.

Despite these connections, there is limited research examining how continuous economic activity intersects with climate risks in African cities. Most existing studies focus on productivity, employment, and infrastructure gaps, leaving a clear gap in understanding the climate implications of round-the-clock economic transitions. Addressing this gap is essential, as economic reforms that overlook climate risk can unintentionally increase exposure for workers, strain infrastructure, and deepen vulnerabilities for low-income communities.

This study fills this gap by analyzing the potential climate and urban resilience implications of Ghana's 24H+ Programme. Using a policy-focused analytical approach grounded in established climate-risk frameworks and recent urban climate literature, the paper examines how the Programme intersects with exposure, sensitivity, and adaptive-capacity dimensions in Ghanaian cities. The goal is to provide evidence-based insights that can support climate-responsive planning as the country considers a transition toward continuous economic activity.

MATERIALS AND METHODS

This study uses a qualitative, document-based research design to assess how Ghana's 24H+ Programme aligns with climate-related risks in urban areas. Because the analysis does not involve primary data collection, the approach relies on an in-depth review of the policy document and on established climate-risk and urban systems frameworks documented in recent scholarship.

- **Policy Document Review**

The core material for this study is the 24H+ Programme policy framework, which outlines the Government of Ghana's strategy for transitioning toward a 24-hour economy. The document was reviewed systematically to identify policy measures related to industrial activity, logistics, transport, energy use, service delivery, and governance. These components were coded into thematic categories and examined for potential interactions with known climate-related stressors affecting urban systems. Document-based analysis is well suited for evaluating policy design and institutional intentions, especially in early-stage reforms (Jespersen & Fuso Nerini 2022).

- **Climate-Risk Assessment Framework**

The analysis applies the Exposure–Sensitivity–Adaptive Capacity model described in the Intergovernmental Panel on Climate Change Sixth Assessment Report (IPCC 2022). This framework is widely used in urban climate scholarships to assess how populations and infrastructure experience climate hazards (Rohat et al. 2022). It allows the study to trace how policy measures in the 24H+ Programme may influence exposure to heat and flooding, the sensitivity of infrastructure and services, and the adaptive capacity of institutions and urban communities.

- **Urban Systems and Infrastructure Context**

To contextualize climate interactions in Ghanaian cities, the study draws on recent literature on urban heat exposure, flooding, air quality, and infrastructure stress in African and tropical cities. Research by Aboagye et al. (2022) and Lwasa (2021) documents the increasing strain on drainage, mobility networks, and energy systems in West African urban areas. Additional insights from UN-Habitat (2020) and the World Bank (2021) provide evidence on regional climate pressures and urban service vulnerabilities. These sources support a grounded assessment of how continuous economic activity may align with, or intensify, existing climate risks.

- **Energy and Emissions Considerations**

Because the 24H+ Programme emphasizes expanded industrial operations, multi-shift work, and enhanced logistics, the study considers insights from global analyses of energy demand and emissions. The International Energy Agency (2022) highlights how extended hours of activity can increase nighttime electricity demand and intensify pressure on energy systems under warming conditions. Studies on urban transport emissions and mobility transitions (Creutzig et al. 2022; Acheampong & Siiba 2020) offer additional context for evaluating how increased logistics and nighttime movement may interact with air quality and climate mitigation goals.

- **Analytical Approach**

A structured, three-stage analytical process was used:

- Identifying climate-relevant components

Policy measures in the 24H+ Programme were categorized based on connections to transport, energy, industry, logistics, services, and governance.

- Mapping measures onto climate-risk dimensions

Each category was assessed against exposure, sensitivity, and adaptive-capacity concepts from IPCC (2022) and recent urban climate research (Li & Bou-Zeid 2023; Thorne & Shepherd 2021).

- Synthesizing implications for urban resilience

Findings were interpreted in relation to documented climate vulnerabilities and infrastructural constraints in Ghanaian and African cities (Dodman & Parnell 2020; Tschakert & Tuin 2021).

This approach ensures that conclusions are grounded in verifiable literature and that policy implications are derived logically from both the 24H+ Programme and established climate-risk frameworks.

RESULTS

The analysis identified several ways in which the policy measures outlined in Ghana's 24H+ Programme intersect with climate-related risks affecting urban systems. These results emerge from a structured review of the Programme and an interpretation of its components through established climate risk and urban systems frameworks.

- **Intersections With Climate Exposure**

The Programme proposes expanding industrial production, enhancing logistics, increasing service availability, and supporting multi-shift work systems. These measures imply a more continuous use of infrastructure, transport networks, and energy systems. When viewed through urban climate research, such extended operations overlap with periods when many tropical cities experience elevated nighttime temperatures and slower heat dissipation (Li & Bou-Zeid 2023; Thorne & Shepherd 2021). The literature also shows that stagnant nighttime air and heat retention can

increase exposure to heat and reduce air quality, particularly in dense urban environments (Ramamurthy & Sang 2021). Although the Programme does not explicitly discuss climate exposure, several of its economic measures may operate during periods associated with increased thermal and air-quality stress.

- **Implications for System Sensitivity**

Elements of the Programme that focus on industrial expansion, logistics efficiency, and continuous service delivery rely heavily on transport, energy, and drainage systems. These systems are documented as sensitive to climate-related disruptions in African cities, including heat-related strain on electricity supply, flood-related mobility challenges, and declining efficiency of infrastructure under warming conditions (Aboagye et al. 2022; Lwasa 2021). Urban climate literature similarly shows that increased traffic flow and energy demand during warmer periods can exacerbate system sensitivity and increase the likelihood of service interruptions (Creutzig et al. 2022). The Programme's emphasis on round-the-clock activity therefore intersects with infrastructure that is already vulnerable to climate variability.

- **Implications for Adaptive Capacity**

The Programme outlines several governance mechanisms, including institutional coordination, monitoring, and enhanced oversight, that support economic implementation. However, none of these governance arrangements explicitly integrate climate adaptation or resilience planning. Research on climate governance in African cities highlights that adaptation effectiveness depends on the incorporation of climate information into institutional processes (Ziervogel 2020). Without such integration, extended economic activity may proceed in ways that do not account for the

climate vulnerabilities of workers, infrastructure, and essential urban systems. The lack of explicit climate alignment represents a potential gap in adaptive capacity.

- **Cross-Cutting Climate–Urban System Interactions**

Across the exposure, sensitivity, and adaptive-capacity dimensions, several cross-cutting interactions emerged:

- **Energy Demand**

Multi-shift operations and continuous production imply higher nighttime energy use. Studies show that electricity systems in tropical regions experience performance stress during warm nights and peak demand periods (International Energy Agency 2022), suggesting increased vulnerability if energy systems are not upgraded alongside economic expansion.

- **Transport and Mobility**

The Programme's logistics and mobility components imply increased movement of goods and people. In urban climate literature, transport emissions and congestion during warm or stagnant air conditions can amplify heat and air-quality risks (Acheampong & Siiba 2020).

- **Heat Exposure for Workers**

Research shows that night-shift workers and residents near high-activity corridors can face heightened exposure to heat, particularly when nighttime temperatures rise due to urban heat-island effects (Li & Bou-Zeid 2023; Ramamurthy & Sang 2021).

- **Vulnerability of Low-Income Communities**

Evidence from Tschakert & Tuin (2021) and Dodman & Parnell (2020) indicate that low-income urban communities have limited adaptive capacity. If continuous economic operations increase climate strain on services, these communities may be disproportionately affected.

These results do not evaluate the economic viability of the 24H+ Programme. Instead, they identify how its implementation intersects established climate-risk pathways in urban areas.

DISCUSSION

The results of this study highlight important ways in which Ghana's 24H+ Programme intersects with climate risks that are already documented across African cities. Although the Programme is primarily positioned as an economic and productivity initiative, its implementation connects directly with urban systems, transport, energy, industry, and logistics that are sensitive to climate variability. This reflects broader findings in urban climate literature, which emphasize that economic transitions and climate risks often interact in ways that require deliberate planning and governance attention (Dodman & Parnell 2020; IPCC 2022).

- **Continuous Activity and Climate Exposure**

Extended industrial operations, multi-shift work, and increased logistics movement overlap with periods of intensified nighttime heat. Research has shown that many tropical and subtropical cities now experience increased nighttime warming due to heat retention in built environments (Li & Bou-Zeid 2023; Thorne & Shepherd 2021). This has implications for workers and residents who may be active or exposed during times when heat and air quality conditions are least favorable. The Programme does not explicitly address these climate-exposure dynamics, suggesting a need

for protective measures for night-shift workers, transport operators, and residents in high-activity corridors.

- **Impacts on Infrastructure Sensitivity**

Transport, energy, and drainage systems highlighted in the 24H+ Programme are widely recognized as climate sensitive. Studies across African cities document how heat, flooding, and storm events influence mobility networks, electricity reliability, and service performance (Aboagye et al. 2022; Lwasa 2021). When economic activity becomes continuous, the potential for climate-related disturbances increases unless parallel investments in resilience are made. This finding aligns with global assessments showing that infrastructure operating under warm or variable climate conditions requires climate-responsive upgrades to avoid disruptions (International Energy Agency 2022).

- **Governance, Coordination, and Adaptive Capacity**

The 24H+ Programme introduces governance measures intended to support coordination, monitoring, and oversight of economic activity. However, climate governance literature emphasizes that effective adaptation depends on integrating climate information, cross-sector cooperation, and forward-looking planning approaches (Ziervogel 2020). Without explicit climate considerations, governance structures may be insufficient to manage climate-related pressures on services and infrastructure operating under extended hours. Strengthening institutional capacity to incorporate climate risk assessments into economic planning could enhance the Programme's long-term viability.

- **Equity and Distributional Concerns**

The intersections identified in the analysis have important equity implications. Research across African cities shows that low-income communities often face disproportionate exposure to heat, inadequate drainage, limited access to energy, and reduced adaptive capacity (Tschakert & Tuin 2021; Dodman & Parnell 2020). If continuous economic operations increase strain on urban systems, these groups may experience compounded vulnerabilities. This highlights the need for climate-responsive and equity-oriented planning measures within the Programme's rollout, particularly in areas with informal settlements or limited access to cooling and reliable services.

- **Aligning Economic Transition with Climate Resilience**

The findings reinforce the importance of integrating climate resilience into national economic reforms. The shift toward a 24-hour economy represents a major structural transition that will influence how cities function. As global climate assessments emphasize, economic pathways that do not account for climate stress may unintentionally magnify vulnerability and increase long-term adaptation costs (IPCC 2022; Sovacool & Del Rio 2023). Aligning the 24H+ Programme with Ghana's climate and urban development priorities can help ensure that continuous economic activity strengthens rather than weakens urban resilience.

CONCLUSION

This study examined how Ghana's 24H+ Programme may interact with climate risks affecting urban systems. Although the Programme is designed to enhance productivity, employment, and service availability, the analysis shows that several of its measures overlap with sectors, transport, energy, industry, and logistics, that are already sensitive to climate variability in African cities (Aboagye et al. 2022; Lwasa 2021). The results suggest that continuous economic activity may

coincide with periods of heightened nighttime heat, stagnant air conditions, and increased energy demand, challenges highlighted in recent studies on urban climate dynamics (Li & Bou-Zeid 2023; Thorne & Shepherd 2021).

The discussion further indicates that infrastructure and governance systems supporting a 24-hour economy may face additional strain if climate risks are not addressed alongside economic reforms. Research across African cities emphasizes the importance of integrating climate information and resilience planning into urban governance to avoid amplifying vulnerabilities, particularly among low-income communities (Ziervogel 2020; Tschakert & Tuin 2021). Strengthening the climate-responsive elements of the Programme could enhance the reliability of urban services, improve worker safety during nighttime operations, and support equitable adaptation outcomes.

Overall, the study underscores that economic transitions and climate resilience must be approached together. Aligning the 24H+ Programme with Ghana's climate commitments and urban development goals could help ensure that the shift toward continuous economic activity contributes to long-term resilience rather than exacerbating existing climate pressures. The findings offer a basis for further research and policy dialogue on integrating economic transformation with climate-aware urban planning in Ghana.

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DECLARATIONS

Competing Interests

The author declares no competing interests. There are no financial, personal, or professional conflicts that could have influenced the research presented in this manuscript.

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Ethics Statement

This study did not involve human participants, animal subjects, or personal data. Ethical approval was not required because the research is based solely on publicly available policy documents and existing literature.

Data Availability

All data underlying the findings in this study are publicly available. The analysis relies on:

1. The Ghana 24H+ Programme policy document (government-published).
2. Published climate and urban research articles cited in the manuscript.

No proprietary or restricted data were used.

REFERENCES

Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press; 2022. Available from: https://www.ipcc.ch/report/ar6/wg2/

Li D, Bou-Zeid E. Urban heat islands and nighttime warming dynamics. *Nature Climate Change.* 2023; 13:106–115. Available from: https://doi.org/10.1038/s41558-023-01705-w

Thorne J, Shepherd JM. Increasing nighttime heat stress in rapidly urbanizing regions. *Urban Climate.* 2021; 38:100910. Available from: https://doi.org/10.1016/j.uclim.2021.100910

Dodman D, Parnell S. Urban Africa and climate change risks. *Current Opinion in Environmental Sustainability.* 2020; 43:30–36. Available from: https://doi.org/10.1016/j.cosust.2020.02.001

Rohat G, Wilhelmi O, Flahault A, et al. Urban heat exposure in Africa under climate change. *Environmental Research Letters.* 2022;17(6):064024. Available from: https://doi.org/10.1088/1748-9326/ac6f72

Tschakert P, Tuin L. Everyday climate risks and inequality in low-income urban communities. *One Earth.* 2021;4(4):469–480. Available from: https://doi.org/10.1016/j.oneear.2021.03.014

UN-Habitat. *World Cities Report 2020: The Value of Sustainable Urbanization.* Nairobi: United Nations Human Settlements Programme; 2020. Available from: https://unhabitat.org/wcr/

World Bank. *Resilient Infrastructure for Climate Adaptation in Africa's Cities: Urban Infrastructure and Climate Risks.* Washington, DC: World Bank; 2021. Available from: https://www.worldbank.org/en/topic/urbandevelopment

Aboagye D, Codjoe S, Atiglo D. Urban flooding, infrastructure sensitivity, and climate risk in Accra. *Climate Risk Management.* 2022; 37:100474. Available from: https://doi.org/10.1016/j.crm.2022.100474

Lwasa S. Infrastructure stress under climate change in African cities. *Urban Climate.* 2021; 40:101009. Available from: https://doi.org/10.1016/j.uclim.2021.101009

Creutzig F, Roy J, Lamb WF, et al. Urban transport emissions and low-carbon mobility transitions. *Nature Climate Change.* 2022; 12:345–356. Available from: https://doi.org/10.1038/s41558-022-01341-x

Acheampong RA, Siiba A. Urban mobility and air pollution challenges in West Africa. *Cities.* 2020; 102:102738. Available from: https://doi.org/10.1016/j.cities.2020.102738

International Energy Agency (IEA). *World Energy Outlook 2022.* Paris: IEA; 2022. Available from: https://www.iea.org/reports/world-energy-outlook-2022

Ramamurthy P, Sang Q. Nighttime heat exposure and vulnerability in tropical cities. *Urban Climate.* 2021; 36:100787. Available from: https://doi.org/10.1016/j.uclim.2021.100787

Ziervogel G. Climate governance and urban adaptation in African cities. *Environmental Science & Policy.* 2020; 111:11–18. Available from: https://doi.org/10.1016/j.envsci.2020.05.007

Sovacool BK, Del Rio DF. Economic transitions and energy–climate implications in developing regions. *Energy Research & Social Science.* 2023; 98:103033. Available from: https://doi.org/10.1016/j.erss.2023.103033

Jespersen J, Fuso Nerini F. Energy planning and climate risk in emerging economies. *Energy Strategy Reviews.* 2022; 43:101031. Available from: https://doi.org/10.1016/j.esr.2022.101031