IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Impact Of Climate Change On Hyderabad: A Review

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Abstract:

Hyderabad, a rapidly growing metropolitan city in India, faces significant challenges due to climate change. This review examines the multifaceted impacts of climate change on Hyderabad, focusing on temperature rise, altered precipitation patterns, water scarcity, urban flooding, and public health risks. Rising temperatures and more frequent heatwaves contribute to health hazards and energy demand surges, while erratic rainfall exacerbates water shortages and flood risks. Groundwater depletion and compromised drainage systems further amplify these issues. Additionally, climate change affects local biodiversity and increases socio-economic vulnerabilities, particularly in low-income communities. This review highlights the need for integrated mitigation and adaptation strategies, including resilient infrastructure, improved water management, enhanced public health systems, and a shift toward renewable energy. A holistic approach is essential for building climate resilience in Hyderabad and ensuring sustainable urban development.

Key points: Urban flooding, Socio economic vulnerability, sustainable urban development. **Introduction**

Hyderabad, the capital city of Telangana, is rapidly emerging as one of India's largest urban centres, home to over 10 million people. As the city continues to expand economically and geographically, it is increasingly vulnerable to the impacts of climate change. Like many urban areas globally, Hyderabad is experiencing rising temperatures, erratic rainfall patterns, and increased occurrences of extreme weather events. These changes pose significant challenges to the city's infrastructure, public health systems, and water resources.

Global temperature increases have led to more frequent heatwaves in Hyderabad, intensifying the urban heat island effect, which is worsened by the city's rapid urbanization. According to Kumar and Chandran (2021), the city's average temperature has shown a noticeable upward trend in recent years, increasing the risk of heat-related illnesses and placing additional stress on energy consumption due to heightened demand for

cooling systems.

Additionally, altered monsoon patterns have contributed to unpredictable rainfall, resulting in both water scarcity and urban flooding. As per the Greater Hyderabad Municipal Corporation (GHMC) report (2021), intense rainfall events have caused significant damage to infrastructure, while prolonged dry spells are exacerbating groundwater depletion. The city's over-reliance on monsoon rains and unsustainable water extraction practices have further compounded its vulnerability to climate change-induced water shortages (Mani, 2020).

The public health sector in Hyderabad is also facing new challenges, with climate change contributing to the spread of vector-borne diseases, respiratory ailments, and other climate sensitive health risks (Jain & Singh, 2020). Vulnerable populations, particularly those in low income areas, are disproportionately affected by these changes, highlighting the need for integrated and sustainable urban planning.

Considering these pressing issues, this review examines the multifaceted impacts of climate change on Hyderabad, with a focus on temperature rise, water scarcity, urban flooding, and public health risks. It also explores potential adaptation and mitigation strategies that are critical to building a resilient and sustainable future for the city.

Case Study 1: Water Scarcity and Groundwater Depletion in Hyderabad

Context:

Water scarcity is a growing issue in Hyderabad, primarily driven by erratic rainfall patterns and overdependence on groundwater resources. The city's rapid urbanization and increasing population have strained its water supply infrastructure. Hyderabad's main water sources, the Osman Sagar and Himayat Sagar reservoirs, have been experiencing significantly reduced water levels due to declining rainfall and poor watershed management.

Climate Change Impact:

Hyderabad faced a severe water crisis during the summer of 2019 when major reservoirs reached critically low levels. The city experienced delayed monsoons, leading to prolonged dry spells. Residents had to rely heavily on groundwater, leading to a sharp decline in water table levels. According to the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB, 2020), groundwater levels in several parts of the city dropped by 20-40 meters due to unsustainable extraction practices.

The government introduced emergency measures such as deploying water tankers, rationing water supplies, and drilling more borewells. However, these short-term solutions failed to address the underlying issues of poor water management and the over-extraction of groundwater (HMWSSB, 2021). The depletion of groundwater also created a domino effect on agriculture and drinking water supply in peri-urban and rural areas surrounding the city.

Key Lessons:

This case illustrates the need for long-term water conservation strategies, including rainwater harvesting, improved management of surface water bodies, and stricter regulations on groundwater extraction. Additionally, sustainable urban planning that integrates efficient water use and recycling systems will be vital in addressing water scarcity in the context of climate change.

Case Study 2: Heatwaves and Public Health Challenges

Context:

Hyderabad has experienced an increasing number of extreme heatwaves in recent years, with temperatures frequently exceeding 45°C during the peak summer months. The rising temperatures, driven by global warming and exacerbated by the urban heat island effect, have led to significant public health challenges, particularly among vulnerable populations such as the elderly, children, and low-income communities.

Climate Change Impact:

In May 2019, Hyderabad recorded one of its hottest summers in decades, with temperatures soaring above 45°C. The heatwave lasted for several weeks, leading to a spike in heat-related illnesses and deaths. According to the India Meteorological Department (IMD), Hyderabad experienced a 2.5°C increase in average maximum temperatures between 1980 and 2020, a clear indicator of climate change's impact on the region (IMD, 2020).

The heatwave also put enormous pressure on Hyderabad's healthcare system, with hospitals reporting a sharp rise in cases of dehydration, heatstroke, and other heat-related conditions. Poor air quality, driven by high temperatures and vehicular pollution, further aggravated respiratory issues in the city. The municipal government responded by setting up temporary cooling shelters and distributing drinking water, but these measures were insufficient in addressing the scale of the problem (GHMC, 2019).

Key Lessons:

This case highlights the importance of developing heat action plans, improving public awareness about heatwave preparedness, and enhancing healthcare infrastructure to manage
climate-induced health crises. Green urban planning, such as increasing tree cover and creating open spaces, can also help mitigate the urban heat island effect and reduce the impact of extreme heat.

Case Study 3: Biodiversity Loss and Urbanization

Context:

Hyderabad's rapid urban expansion has significantly impacted its natural ecosystems, with lakes, wetlands, and green spaces being replaced by residential, commercial, and industrial infrastructure. Climate change, through altered temperature and precipitation patterns, has further compounded biodiversity loss, particularly in urban wetlands and peri-urban green spaces that are vital for ecosystem

services.

Climate Change Impact:

The loss of urban wetlands, such as the famous Hussain Sagar Lake, and green spaces like KBR National Park, has had serious ecological implications for Hyderabad. Wetlands, which play a crucial role in flood mitigation, water purification, and habitat provision, have shrunk by over 50% in the last three decades (Centre for Science and Environment, 2021). This loss, driven by urban encroachment and mismanagement, has reduced the city's resilience to floods and water scarcity.

Additionally, climate change-induced changes in rainfall patterns and higher temperatures have disrupted local biodiversity. Native plant and animal species that once thrived in Hyderabad's lakes and parks are now under threat due to habitat fragmentation and altered ecosystems. Birds, reptiles, and amphibians that depended on these wetlands for breeding have seen significant population declines (Biodiversity Research Institute, 2020).

Key Lessons:

This case underscores the need for sustainable urban development that preserves natural ecosystems. Protecting urban wetlands and green spaces through conservation policies and community involvement is critical to maintaining ecological balance and building climate resilience. Restoring degraded wetlands and implementing biodiversity-friendly urban planning practices can mitigate the negative impacts of climate change.

Case Study 4: Socio-Economic Vulnerability in Informal Settlements

Context:

Low-income and marginalized communities in Hyderabad, particularly those living in informal settlements, are disproportionately affected by climate change impacts. These communities often reside in flood-prone areas or regions with inadequate access to basic services, making them especially vulnerable to extreme weather events such as floods, heatwaves, and water shortages.

Climate Change Impact:

The 2020 Hyderabad floods particularly highlighted the socio-economic vulnerabilities of these communities. Many informal settlements located near water bodies or in low-lying areas were submerged, displacing thousands of residents. Due to a lack of proper drainage and flood management infrastructure, these areas were waterlogged for days, causing damage to homes, loss of livelihoods, and outbreaks of waterborne diseases (NDMA, 2020).

Residents of informal settlements also suffer disproportionately during heatwaves. Poor housing conditions, lack of access to cooling infrastructure, and inadequate healthcare facilities exacerbate the impact of extreme heat. In the absence of air conditioning or adequate water supply, these populations face increased health risks during prolonged heatwaves (Jain & Singh, 2020).

Key Lessons:

This case demonstrates the need for inclusive urban planning that addresses the specific vulnerabilities of marginalized communities. Improving infrastructure in informal settlements, providing access to basic services such as water and sanitation, and ensuring better disaster preparedness can help reduce the socio-economic impact of climate change on vulnerable populations.

Conclusion

Hyderabad is facing significant challenges due to the impacts of climate change, including rising temperatures, erratic rainfall, urban flooding, water scarcity, and public health risks. The city's rapid urbanization, combined with inadequate infrastructure and environmental management, has exacerbated its vulnerability to these climate-induced issues. Events such as
the 2020 floods and increasing heatwaves highlight the urgency for integrated adaptation and mitigation strategies.

To build a resilient future, Hyderabad must adopt sustainable urban planning, improve water resource management, strengthen public health systems, and invest in green infrastructure. Policy reforms and community-based initiatives will be essential to address the socio-
economic disparities worsened by climate change. Collaborative efforts between government, local agencies, and citizens are critical to ensure that the city can adapt to the changing climate and safeguard its future growth and development. Without such measures, Hyderabad risks enduring more severe and frequent climate-related disruptions, jeopardizing both its ecological and socio-economic stability.

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