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MAINSTREAMING CLIMATE ACTION: A DISTRICT-LEVEL GOVERNANCE ANALYSIS OF SDG 13 IMPLEMENTATION IN JAMMU, J&K, INDIA

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Abstract: Climate change becomes an increasingly challenging problem for the local level governance. While international conventions, national laws and policies create duties of mitigating and adapting to climate changes, their execution ultimately lies with local level institutions that have to cope with consequences of environmental and climatic stress. SDG 13 focuses on resilience, adaptive capacities, policy integration, and capacity building. This paper investigates the localisation of SDG 13 in Jammu District by examining three interrelated aspects: Tawi River flood vulnerability, urban expansion and thermal stress, and urban mobility emissions. Using doctrinal and qualitative case study methodology, the research reveals that climate action requires integration across river management, urban planning, and transportation sectors. The study identifies challenges including institutional fragmentation, poor integration of climate evidence into planning, low capacity, and weak monitoring, and recommends a transition to integrated district-level climate governance..

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INTRODUCTION

"Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations."[1]

Climate change has evolved to become not just an issue of environment, but of governance and development, and even human security. Changes in temperature, precipitation patterns, occurrence of extreme weather conditions, water scarcity and other impacts of climatic change have consequences on public health, livelihood, infrastructure, food security and fundamental human rights.[2] Climate action under the Paris Agreement and the 2030 Agenda for Sustainable Development takes place within the larger framework of sustainable development.[3] In this context, SDG 13 becomes important for its emphasis on the need for adaptation and mitigation capacities at all levels of government.[4]

The relevance of local action is a consequence of the spatial nature of climate risks. Flooding affects certain river basins, heat exposure differs from one area to another, water scarcity has different implications in urban and rural settings, while decisions about land use expose areas to environmental risks.[5] As a result, local governments are the ones who can implement decisions about land use, transportation, drainage, waste management, water supply, building codes, forests, public health and disaster preparedness based on the national climate commitments.[6]

A comprehensive climate policy framework has been built in India through the National Action Plan on Climate Change (NAPCC),[7] missions at the sectoral level, nationally determined contribution under the Paris Agreement,[8] disaster management institutions and environmental laws. However, the effectiveness of these instruments rests heavily upon State, district and local-level implementation. Jammu District is suitable for this study as a rapidly growing urban centre confronting extreme summer heat, heavy rains, and Tawi floods.[9]

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[1] United Nations Conference on the Human Environment, Report of the United Nations Conference on the Human Environment, Stockholm, 5–16 June 1972, UN Doc A/CONF.48/14/Rev.1 (1973), Principle 1.

[2] Intergovernmental Panel on Climate Change, Climate Change 2022: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Sixth Assessment Report of the IPCC (Cambridge University Press, 2022).

[3] Paris Agreement, adopted 12 December 2015, entered into force 4 November 2016, art. 2; United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015).

[4] *Supra* note 2.

[5] *Ibid.*

[6] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), Target 13.1.3; United Nations Office for Disaster Risk Reduction, Sendai Framework for Disaster Risk Reduction 2015–2030 (2015).

[7] Government of India, Ministry of Environment and Forests, National Action Plan on Climate Change (2008).

[8] Government of India, India's Updated First Nationally Determined Contribution under the Paris Agreement (2022).

[9] Sanjay Sharma and Harpreet Kaur, 'Land Use/Land Cover Changes and Urban Expansion in Jammu City,

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The study thus seeks to explore whether current institutional arrangements and policies are adequate to implement SDG 13 at the district-level in Jammu. Instead of limiting the concept of climate action to mitigation only, the paper takes up a wider perspective considering adaptation, disaster resilience, sustainable urban development, conservation of ecosystems, civic engagement and institutional responsibility. The core claim is that while Jammu has achieved considerable success in terms of policies and administration, yet the process needs more integration to establish a comprehensive district-level climate governance system[10].

1.2. RESEARCH OBJECTIVES

a. To examine the conceptual and legal framework governing SDG 13 and its localisation.
b. To analyse the international and Indian frameworks relevant to local climate governance.
c. To assess major climate and environmental vulnerabilities affecting Jammu District.
d. To evaluate institutional contributions and limitations.
e. To identify implementation gaps and propose reforms.

1.3. RESEARCH QUESTIONS

1. What are the principal objectives of SDG 13 and how do they apply locally?
2. What legal and policy mechanisms support climate governance in India?
3. What are the principal climate vulnerabilities in Jammu District?
4. To what extent are local institutions translating climate commitments into effective action?
5. What reforms can strengthen climate resilience and accountability in Jammu?

1.4. RESEARCH METHODOLOGY

This research employs doctrinal and qualitative methodology, analysing international environmental laws, constitutional provisions, general and specific regulations, court judgments, and national policies. In addition, the paper analyzes the performance of Jammu district on the basis of the key aspects of SDG 13 including resilience, policy integration, institutional capacity, and public awareness.

2. SDG 13 AND THE IMPERATIVE OF LOCALISATION

India and its Surroundings' 5(5) *International Research Journal of Environment Sciences* 32-40 (2016); Yaggesh Sharma, Ashish Aggarwal and Jaspal Singh, 'Development of Flow Duration Curves and Eco-Flow Metrics for the Tawi River Basin- Jammu, India 8(1) *International Journal of Advanced Remote Sensing and GIS* 3114-3125 (2019).

[10] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), Goal 13.

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Goal 13 calls upon States to "*take urgent action to combat climate change and its impacts.*" [11]The localisation approach is important because SDG 13 overlaps with other goals - resilience in water management promotes SDG 6; sustainable transport and land-use planning promote SDG 11;[12] use of clean energy promotes SDG 7;[13] ecosystem restoration promotes SDGs 14[14] and 15;[15] while heat-health planning is a component of SDG 3. This means that any climate plan at the district level should not exist in isolation as an environmental planning document. Instead, it should be seen as an organizing tool through which the effects of development plans on the climate are assessed.

For Jammu, the distinction between adaptation and mitigation measures is crucial. While the district may not significantly affect national emissions, local emissions can be influenced by municipal transport, waste, energy efficiency, and urban planning. However, Jammu's most pressing climate issues relate to adaptation—heat, floods, and water stress.

Goal 13 calls for immediate action to deal with climate change and its consequences. The main targets under Goal 13 are related to resiliency and adaptability (13.1), integration of climate actions into policies and planning (13.2), and education, awareness and institutional capacity (13.3)[16]. All of these are the targets which have direct bearing on a district-level analysis. Crucially, SDG indicator 13.1.3 focuses precisely on the percentage of local government units that have local disaster risk reduction strategies aligned with the national strategies. For Jammu, Target 13.1 involves heat waves, flash floods, heavy rainfall, water stress and disaster management; Target 13.2 requires integrating climate considerations into land use, building, transport, drainage, and waste management; Target 13.3 covers climate awareness and early warning systems.[17]

Thus, any measure of climate action must be on the basis of its results and not just on the basis of the presence of such schemes. A heatwave warning scheme will matter only if the warning reaches the vulnerable people and brings about a difference in terms of the health effects. Similarly, a flood warning system matters only if the drainage and evacuation process works well.[18]

3. INTERNATIONAL LEGAL FRAMEWORK

3.1. Paris Agreement

The Paris Agreement, established in 2015,

[11] *Ibid*.
[12] *Ibid.*
[13] *Id.,* Goal 7.
[14] *Id.,* Goal 14.
[15] *Id.,* Goal 15.
[16] *Id.,* Goal 13, Targets 13.1–13.3.
[17] *Ibid.*; See also, United Nations Office for Disaster Risk Reduction, Sendai Framework for Disaster Risk Reduction 2015–2030 (2015).
[18] *Id.,* at paras. 20–33.

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aims to ensure that global temperature rise is kept well below 2°C and to pursue efforts to restrict this to 1.5°C.[19] Unlike the Kyoto Protocol, which imposed binding emission reduction targets primarily upon developed countries, the Paris Agreement adopted a more inclusive approach. Article 2, in this regard provides that the Agreement seeks to:

> "*Hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels."*[20]

The framework of this agreement includes that all parties communicate their Nationally Determined Contributions and build their ambition through climate action. Under Article 4, every Party is required "*Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions"*[21] reflecting its highest possible ambition.

While there are individual country-level commitments in terms of the obligations under this agreement, their implementation cannot be ignored at the level of local governments due to the nature of transport, buildings, land use, waste, energy, and infrastructure.

India's Nationally Determined Contributions illustrate this approach. They include commitments relating to inter alia - reducing the emissions intensity of the economy, increasing the share of non-fossil fuel-based energy, creating additional carbon sinks through forests and promoting sustainable lifestyles.[22] These commitments demonstrate that climate action is not confined only to technological advancement or governmental regulation. It also requires changes in the way people consume and utilise natural resources.

3.2. Sendai Framework

While the Sendai Framework for Disaster Risk Reduction 2015-2030 serves to complement SDG 13 through a focus on the understanding of risk, risk governance, resilience, and preparedness, it is important to point out that the connection between the Sendai Framework and SDG 13[23] can be said to have more relevance to the city of Jammu since climate action in the locality should consider disaster-risk reduction and not just response to

[19] Paris Agreement, adopted 12 December 2015, entered into force 4 November 2016, art. 2(1)(a).

[20] *Ibid.*

[21] *Id.,* art. 4(2)– (3).

[22] Government of India, India's Updated First Nationally Determined Contribution under the Paris Agreement (2022).

[23] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), Goal 13, Target 13.1.

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emergencies.[24]

4. INDIAN CONSTITUTIONAL AND STATUTORY FRAMEWORK

It is pertinent to note that there is no separate statute dealing with climate change issues in India. However, climate governance in India has been achieved through a combination of constitutional provisions, environmental and disaster management legislations, national policy and judicial interventions.[25] The climate governance regime in India offers various points of entry to climate change issues. In this regard, the issue of lack of a separate climate change legislation in India is not relevant. Rather, the issue that arises is about how the existing regime can be used to address climate change issues in an integrated manner.[26]

The constitutional framework sets the stage for environmental protection. Article 48A mandates that the State shall endeavour to protect and improve the environment and safeguard forests and wildlife.[27] Environmental protection is also the duty of every citizen under Article 51A(g).[28]Article 21 guarantees the right to life and personal liberty. In *Subhash Kumar v. State of Bihar,* the Supreme Court has recognized the right to enjoyment of pollution-free water and air as a part of the right to life.[29] In *M.K. Ranjitsinh v. Union of India,* the Court has recognized the protection from adverse consequences climate change consequences as part of constitutional protection under Articles 14 and 21.[30] This decision is especially important for local governance because climate-specific threats like excessive heat and flooding might influence life, health, and equality.[31]

Moreover, the constitutional protection is reinforced by legislative tools, which despite the fact that they were not enacted specifically as climate legislation still offer important mechanisms for climate-relevant activities. First, the Environment (Protection) Act, 1986 authorizes the Central Government to take all necessary measures to protect and improve the quality of the environment and to prevent, control and abate environmental pollution.[32] Section 3 and 5 empower the Central Government to take measures and issue directions.[33] Second, the Air (Prevention and Control of Pollution) Act, 1981 offers another climate-specific legislative tool, particularly relevant for the transportation aspect of this research. This legislation establishes the institutional

[24] United Nations Office for Disaster Risk Reduction, Sendai Framework for Disaster Risk Reduction 2015–2030 (2015), paras. 17–33.

[25] *M.K. Ranjitsinh v. Union of India,* 2024 INSC 280.

[26] Government of India, Ministry of Environment and Forests, National Action Plan on Climate Change (2008).

[27] Constitution of India, 1950, art. 48A.

[28] Constitution of India, 1950, art. 51A(g).

[29] *Subhash Kumar v. State of Bihar,* (1991) 1 SCC 598.

[30] *Supra* note 25.

[31] *Ibid.*

[32] The Environment (Protection) Act, 1986

[33] The Environment (Protection) Act, 1986, sections 3, 5.

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structure for prevention, control and abatement of air pollution.[34] Although it is not climate legislation, clean and energy-efficient mobility can help to achieve both air quality and reduction in fossil fuel consumption.

In terms of adaptation and resilience, the Disaster Management Act, 2005 provides an institutional link between disaster governance and district-level activities. Specifically, the Act mandates the creation of District Disaster Management Authorities and the preparation of District Disaster Management Plans under Section 31.[35] This framework is especially significant in view of the localised nature of climatic hazards, which demand localised planning. In Jammu, local disaster-management structures can be employed for preparedness, risk mapping, early-warning systems, and identification of hazardous locations. These can also be coordinated with land-use planning to ensure that development does not unnecessarily expose residents to known hazards.[36]

At the policy level, there is the National Action Plan on Climate Change (NAPCC), which outlines the general framework of climate action in India[37]. NAPCC includes eight National Missions, covering the following areas: solar energy, energy efficiency, sustainable habitat, water, Himalayan ecosystem, green India, sustainable agriculture, and strategic climate knowledge.[38] Some of these are especially relevant for Jammu: the National Mission on Sustainable Habitat relates to urban development and mobility; National Mission for Sustaining the Himalayan Ecosystem relates to the wider Himalayan region; National Mission for a Green India relates to vegetation and ecosystem resilience; and National Mission on Strategic Knowledge for Climate Change relates to scientific knowledge in climate decision-making.[39]

Thus, the Indian legal and institutional structure provides a good base for local climate governance. Constitutional provisions define environmental protection, laws provide mechanisms, the Disaster Management Act gives district-level resilience mechanism, and the NAPCC defines the wider policies to follow. Hence, localizing SDG 13 in Jammu need not necessarily involve building a completely new system but integrating existing institutions, using scientific evidence in decision-making, and considering climate in the district governance.[40]

[34] Air (Prevention and Control of Pollution) Act, 1981, sections 3–6, 16–19.

[35] Disaster Management Act, 2005, sections 25, 30, 31.

[36] *Id.,* sec 31(3).

[37] Government of India, Ministry of Environment and Forests, National Action Plan on Climate Change (2008).

[38] *Ibid.*

[39] *Ibid.*

[40] *M.K. Ranjitsinh v. Union of India,* 2024 INSC 280; Government of India, Ministry of Environment and Forests, National Action Plan on Climate Change (2008); Disaster Management Act, 2005.

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5. JUDICIAL DEVELOPMENT

Environmental law in India has continuously evolved from being an administrative issue to becoming part of constitutional law. Through the Forty-Second Constitutional Amendment, environmental protection was incorporated into Directive Principles of State Policy under Article 48A and the Fundamental Duties under Article 51A(g)[41]. At the same time, judicial interpretation expanded the scope of Article 21 to recognise the right to a clean and healthy environment as an integral part of the right to life.[42]

The Apex Court in *Rural Litigation and Entitlement Kendra v. State of Uttar Pradesh,*[43] *M.C. Mehta v. Union of India (Oleum Gas Leak Case),* and *Indian Council for Enviro-Legal Action v. Union of India*[44] established the foundational principles of environmental protection.

An important case in this regard is *Vellore Citizens' Welfare Forum v. Union of India* wherein the Court accepted sustainable development, precautionary principle and polluter pays principle as Indian environmental law principles.[45] According to the Court, it is justified to take preventive action despite lack of scientific certainty of serious or irreversible harm.[46] This principle has special significance to climate governance.

The case of *A.P. Pollution Control Board v. Prof. M.V. Nayudu* establishes the role of science and informed decision-making in environmental matters.[47] The case is significant to climate governance in relation to adaptation, which entails scientific analysis of potential dangers posed by extreme temperatures, floods, water scarcity and ecological destruction among others.

The principle of public trust was developed in *M.C. Mehta v. Kamal Nath,* establishing that natural resources are owned by the state in trust for the public and cannot be subjected to degradation simply for personal or temporary benefit. [48] This is especially relevant to the issue of climate in relation to rivers, lakes, forests and other environmental resources of Jammu district.

This jurisprudence attained an important constitutional dimension in the case of *M.K. Ranjitsinh v. Union of India.* The Supreme Court found the constitutional connection between climate change and the right to life and liberty, establishing that protection from the consequences of climate change is related to Articles 14 and 21[49]. This jurisprudence provides a robust legal basis for considering climate-related risks in

[41] Constitution (Forty-second Amendment) Act, 1976, ss. 10 & 27 (introducing Article 48A and Article 51A(g)).

[42] *Subhash Kumar v. State of Bihar,* (1991) 1 SCC 598; *M.C. Mehta v. Union of India,* (1987) 1 SCC 395.

[43] AIR 1985 SC 652.

[44] AIR 1996 SC 1446.

[45] *Vellore Citizens' Welfare Forum v. Union of India,* (1996) 5 SCC 647.

[46] *Ibid.*

[47] *A.P. Pollution Control Board v. Prof. M.V. Nayudu,* (1999) 2 SCC 718.

[48] *M.C. Mehta v. Kamal Nath,* (1997) 1 SCC 388.

[49] *Supra* note 25.

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urban planning and drainage decisions.

6. EVIDENCE-BASED CLIMATE VULNERABILITY IN JAMMU DISTRICT

According to the SDG India Index 2023–24 released by NITI Aayog, the Union Territory of Jammu and Kashmir has demonstrated considerable progress in the implementation of Sustainable Development Goals and has emerged among the better-performing Union Territories in the country.[50] The Union Territory secured a composite score of 74 under the "Front Runner" category.[51] However, composite SDGs scores do not indicate effectiveness of climate actions at the district level.[52]

In light of the scientific literature review, there are three interlinked systems, which will serve as the most relevant starting point for assessing the localisation of SDG 13 in Jammu District: Tawi River flood vulnerability; urban expansion and thermal conditions; and urban mobility and vehicular emissions.[53] These topics relates to resilience and adaptive-capability outlined in SDG Target 13.1 and the consideration of climate aspects in policies, strategies and planning, stipulated by Target 13.2.[54] The selection of these specific systems does not mean that any other environmental issues are less significant; they are chosen based on the existence of the sufficient amount of Jammu-specific scientific literature that makes possible the analysis of these aspects of climate action.[55]

6.2. Tawi River: Hydrology, River Modification and Flood Vulnerability

The significance of the Tawi River in relation to climate resilience in Jammu lies in the fact that it is not merely a water resource but an ecological system and a source of floods. Hence, any management of the river must take into account more than simply flood management, but also other properties such as flow, sediments, quality, and land-use relationships.[56]

A study of three decades of daily discharge data at Gulab Singh Bridge characterized the Tawi River as mostly ecosurplus, but noted decreasing eco-flow indicators, suggesting potential ecological

[50] NITI Aayog, SDG India Index 2023–24: Statistics and Programme Implementation (Government of India, 2024) 20–22, *available at:* https://www.niti.gov.in/sites/default/files/2024-07/SDA_INDIA.pdf (last visited on June 7, 2026).

[51] Press Information Bureau, Government of India, 'Release of SDG India Index 2023-24' (12 July 2024), *available at:* https://www.pib.gov.in/PressReleasePage.aspx?PRID=2032857&reg=3&lang= (last visited on June 7, 2026).

[52] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), Goal 13, Targets 13.1–13.3.

[53] *Supra* note 9; See also, Arvind Jasrotia, Nitan Sharma and Kartika Bakshi, 'Vehicular Pollution in Jammu City: Implications on Environment and Health' 6(S1) *International Journal of Health Sciences* 5630–5652 (2022).

[54] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), Goal 13, Targets 13.1 and 13.2.

[55] *Supra* note 53.

[56] *Supra* note 9, Yaggesh Sharma *et al.*

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worsening.[57] Human modification of the river is another aspect -Salgotra's geographical study (2018) used GIS and field observations to map sand-mining locations from Nagrota to Sidhra and studied the impact of those on the Tawi flow characteristics. Research on water quality issues of the river provides more substantial evidence.[58] Slathia and Jamwal examined fourteen points over the distance of 12 km of the Tawi River through Jammu City. Using water quality indices and multivariate statistics, the researchers were able to identify the spatial and seasonal differences in water quality and a pollution gradient from the upstream to the downstream locations.[59] These results suggest that there are human-caused problems with the quality of water in the Tawi River.[60]

Human interference through pollution and morphological changes of rivers could make a river system less resilient when it needs to cope not only with variability but also with extremes in the hydrological system. Adaptation to the hazard of flooding without taking into account morphological changes, sediments, water quality and land-use changes would mean that adaptation would solve the problem of the hazard but not of resilience.

6.3. Policy Priorities for the Tawi

Jammu must establish an integrated monitoring program for the Tawi River through cooperation of the District Administration, water authorities, pollution control authorities and academic institutions. The program will cover:

i. discharge of the river and seasonal flow patterns;
ii. transport of sediments and river morphometry;
iii. quality parameters of water;
iv. river-bed characteristics and their evolution;
v. legal extraction from the river; and
vi. changes in land use along vulnerable stretches of the river.

Risk assessment of floods needs to be coordinated with land use planning so that there is no additional exposure to floods due to new development in vulnerable river and drainage areas. River-bed extraction needs to be managed on the basis of existing knowledge about sediment transport and morphometry of the river and not just license-based management.

Above all, the Tawi River needs to be treated as a living river system and not just flood protection channel. This would be more

[57] *Ibid.*

[58] Vishabh Salgotra, Analysing the Impact of Sand Mining on the Flow of Tawi River, Jammu and Kashmir (M.Sc. Dissertation, Central University of Punjab, 2018).

[59] D. Slathia & K.D. Jamwal, 'Water Quality Characterization and Pollution Source Apportionment in the Himalayan River Flowing Through Jammu City, India, Using Multivariate Statistical Approach and Geospatial Techniques' 29 *Environmental Science and Pollution Research* 76712–76727 (2022).

[60] *Ibid.*

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consistent with the connection between SDG 13.1 and SDG 13.2.[61]

7. URBAN EXPANSION AND THERMAL STRESS

Another important issue is the link between urban growth and the thermal regime of Jammu. Rather than basing claims on general literature about urban heat islands, studies focusing specifically on Jammu give examples of changes in land use and urban growth as well as in land-surface temperature.

Sharma and Kaur (2016) studied the dynamics of land use and land cover in Jammu City and surroundings through Landsat images for 1989, 2000 and 2014. They found considerable urban growth and changes in the distribution of built-up areas[62]. This information provides the basis for understanding the development trends against which recent thermal studies will be measured.

Varade et al. (2023) studied urban and peri-urban growth in Jammu using Landsat images for 2002, 2013 and 2021, identifying considerable urbanisation spreading to the peri-urban zone, with distinctions between urban and suburban areas in land-surface temperature and aerosol optical depth.[63] Further research investigated seasonally varying land-surface temperature, finding built-up areas have higher temperatures while vegetated and water-covered surfaces have lower temperatures.[64]

This information is highly relevant to SDG 13.2 as it shows that urban form has impacts on climate.[65] Urban planning determines the proportion of built-up surfaces, vegetation and water. Thus, development decisions influence thermal properties of the urban environment even though they are not officially recognized as such.

7.1. Policy Priorities for Urban Heat

Jammu should develop an Urban Thermal and Land Cover Atlas, incorporating periodically updated satellite-derived data on:

i. rapidly expanding built-up areas;
ii. areas with consistently high land surface temperature;
iii. areas with low vegetation or open space cover;
iv. public facilities situated in thermally

[61] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), Goal 13, Targets 13.1 and 13.2.

[62] *Supra* note 9, Sanjay Sharma & Harpreet Kaur.

[63] Divyesh Varade, Hemant Singh, Abhinav Pratap Singh and Shubham Awasthi, 'Assessment of Urban Sprawls, Amenities, and Indifferences of LST and AOD in Sub-Urban Area: A Case Study of Jammu' 30(49) *Environmental Science and Pollution Research* 107179–107198 (2023).

[64] Naveen Kumar, Habibullah, Manisha Kumari, Mansoor Ahmad, Neha Thappa, Shafiq Ahmed, Shahfahad & Md. Sarfaraz Asgher, 'Analysing Seasonal Variability of Land Surface Temperature with Land Use Land Cover Pattern in Jammu District, India' in Environmental Risk and Resilience in the Changing World (Springer, 2024), pp. 75–90.

[65] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), Goal 13, Target 13.2.

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stressed areas; and

v. targetable areas for cooling

Urban development permissions need to consider impacts on surface temperature, vegetation, runoff, and open space. Adaptation efforts should concentrate on retaining existing vegetation and cooling elements, not replacing them after construction. Shaded pedestrian walkways, protection of urban open space, suitable roof treatment, vegetation in public buildings, and conservation of water bodies should be a part of a targetable strategy.

8. URBAN MOBILITY, VEHICULAR EMISSIONS AND CLIMATE MITIGATION

From the perspective of mitigation, the transportation constitutes an essential local mitigation opportunity in the current case study. According to Jasrotia et al., vehicular pollution in Jammu City is characterized by increasing number of vehicles, traffic congestion, and reliance on petrol and diesel as the major factors contributing to the problem of air-pollution and environment degradation. They call for stronger mitigation measures in terms of the improvement of public transportation and mobility management.[66]The importance of transportation as an environmental concern is shown in the air-quality planning of the city through its sources of pollutants: particulate pollution, road dust, vehicular pollution and construction-related emissions.[67]

Transport is a local mitigation opportunity through reduction of unnecessary travels in terms of fossil fuels utilization, reducing GHGs emissions with co-benefits for conventional air pollution.[68] Low-carbon mobility strategy of Jammu should go beyond replacement of conventional vehicles by the electric ones. Reduction of unnecessary travelling, shift to public and non-motorized transportation, improvement of mobility systems' efficiency and their subsequent electrification are among the main elements of low-carbon mobility.[69] Practically, it means that there is a need for efficient public transportation, safe pedestrian transport, bicycle facilities, better traffic management, parking management and gradual electrification of public and municipal fleets. This way, there will be reduction of dependence on fossil-fuel transportation in addition to the sustainable urban development.[70] Still,

[66] *Supra* note 9, Arvind Jasrotia *et al.*

[67] Jammu and Kashmir Pollution Control Committee, Action Plan for Control of Air Pollution in Non-Attainment City: Jammu (Government of Jammu and Kashmir).

[68] Intergovernmental Panel on Climate Change, Climate Change 2022: Mitigation of Climate Change, Contribution of Working Group III to the Sixth Assessment Report of the IPCC (Cambridge University Press, 2022).

[69] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), Goal 11, Target 11.2; Intergovernmental Panel on Climate Change, Climate Change 2022: Mitigation of Climate Change

[70] United Nations Human Settlements Programme, World Cities Report 2022: Envisaging the Future of

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electrification should constitute an important element of the low-carbon strategy. Electric transportation reduces tailpipe emissions; and in combination with cleaner electricity generation contributes to the decarbonization of the sector.[71] But in case of treatment of electric vehicle ownership as the sole solution to the problem, a number of issues related to mobility of urban population would not be solved. These aspects would not be solved by themselves. A transport policy for Jammu that is aimed at reducing the carbon footprint of transportation must include a modal shift, improved public transport, and electric vehicles, as opposed to considering electrification as an alternative to improving urban mobility planning.

9. WHAT THESE THREE SYSTEMS REVEAL ABOUT SDG 13

The three systems - Tawi River, urban thermal stress, and urban mobility - provide a focused evaluation of SDG 13 localisation in Jammu District. They represent adaptation and resilience, climate-sensitive planning, and mitigation respectively.[72]

The Tawi is the adaptation-oriented aspect. Literature confirms environmental pressures including sands extraction, pollution, and land-use changes.[73] The importance of these problems for SDG 13 lies in the fact that they may affect the resilience of the river in conditions of water flow variability and flooding. Hence, flood resilience cannot be limited to emergency measures alone but involves the preservation of river ecology and regulation of development activities in the vulnerable zones.[74]

Urban expansion and thermal stress are the main examples of the climate-sensitive planning aspect. Jammu-specific remote sensing studies show considerable changes in the built-up area and land surface temperature. While land surface temperature should not be confused with human heat exposure, it nevertheless provides an indicator of transformations in the urban thermal regime. Thus, it is evident why consideration of the climate should be incorporated in spatial planning in terms of built-up expansion, vegetation and infrastructure.

Urban mobility is the mitigation aspect studied in this paper. Research on vehicular emissions indicates the importance of traffic, growing number of vehicles and conventional fuel use as environmental and health risks. It is possible to make no accurate estimations

Cities (UN-Habitat, 2022); United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development

[71] International Energy Agency, Global EV Outlook 2024: Moving Towards Increased Affordability (IEA, 2024).

[72] United Nations, Transforming Our World: The 2030 Agenda for Sustainable Development, UN Doc. A/RES/70/1 (2015), Goal 13, Targets 13.1 and 13.2.

[73] *Supra* note 9, Yaggesh Sharma *et al.*

[74] United Nations Office for Disaster Risk Reduction, Sendai Framework for Disaster Risk Reduction 2015–2030 (2015), paras. 17 - 33.

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regarding the share of transport sector in greenhouse gases emission in Jammu. At the same time, reduction of fossil-fuel-based mobility may be seen as one of possible mitigation strategies with health-related co-benefits.

Overall, the above-presented systems clearly demonstrate that climate action in Jammu should not be based on a list of environmental issues. On the contrary, climate considerations must be incorporated into existing mechanisms of river management, urban planning, and transport policy. Such approach implies the necessary differentiation between environmental degradation and climate vulnerabilities. It is not about linking every environmental problem with climate change, but rather understanding how existing stresses affect resilience and how local governance can mitigate future impacts of climate change.

10. ANALYSIS

The evidence suggests that the main problem with regard to implementing SDG- 13 in Jammu is not related to the creation of new climate policies but rather to the inclusion of the climate issue into existing governance frameworks.

The Tawi River illustrates institutional fragmentation. Even though all mentioned processes occur within one river system, flood risk management, river pollution, extraction, changes in land use and disaster management can relate to different administrative jurisdictions. Thus, the resilience-based strategy calls for coordination of several policies including river management, disaster management, environmental policy and land-use planning. The flood risks should provide information on development decisions while the physical state of the river needs to be included in the adaptation plan.

The evidence related to urban heat islands also shows that climate governance starts before a climate event. Built-up surfaces and vegetation affect the thermal environment. This demonstrates the value of using scientific spatial information when planning urban growth.

Transport offers a good example of what can be achieved through local mitigation measures. While Jammu cannot control overall national emissions, local government can influence transport patterns, public transport, traffic management, and municipal transport fleet.

The common trend across all three systems is the necessity to shift climate change actions from activities performed to the actual results achieved. Having a flood prevention strategy, urban plantation program, or electric vehicle project does not necessarily mean that SDG 13 was properly implemented. It is necessary to check whether these measures have resulted in decreasing people's exposure, increasing their resilience, or reducing emissions.

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The interconnected nature of environmental challenges in Jammu is further evidenced by studies linking waste site exposure to morbidity and productivity loss[75] and highlighting the public health implications of the solid waste crisis.[76] These findings reinforce the argument that environmental governance in Jammu must move beyond siloed approaches toward integrated strategies that simultaneously address climate resilience, public health, and sustainable development. The health and productivity costs of environmental degradation—whether from river pollution, urban heat, or vehicular emissions—underscore the urgency of mainstreaming climate considerations into all aspects of district-level governance.

11. RECOMMENDATIONS

1. Prioritize the Tawi for ongoing monitoring and management

A monitoring program needs to be set up for the Tawi that will integrate information regarding river flow, water quality, sediment dynamics, morphology and flood-prone zones. Rather than waiting for a catastrophic flood or the degradation of the river, the authorities concerned can use this information to pinpoint vulnerable stretches and take preventive steps. Sand mining and other kinds of extraction from the river bed have to be assessed scientifically in relation to the morphology and sediment status of the river. Flood maps must also be considered when approving construction and other development projects near the river. The idea must be to maintain the natural function of the river while minimizing its potential to flood.

2. Identify warmer neighbourhoods using satellite data

Jammu must develop a regularly updated method for mapping land surface temperature, built-up areas, and vegetation. The objective is to identify neighbourhoods with intense development, little vegetation, and increased surface temperatures for targeted cooling measures.

3. Embed climate evaluation into major developments

Climate assessment should be integral to evaluating major urban and infrastructure projects. When considering the approval of large-scale developments, decision-makers need to assess whether there is any likelihood of the project increasing the surface cover with buildings, decreasing the amount of vegetation or open spaces, changing the drainage pattern and exposure to heat and floods.

[75] Arvind Jasrotia, Rinnie Mahajan, Nitan Sharma, Kartika Bakshi, and Shilpa Mehrotra, Linking Waste Site Exposure to Morbidity and Productivity Loss: A Case Study of Jammu City, India 26(8) *Journal of Environmental Protection and Ecology* 3075-3085 (2025)

[76] Rinnie Mahajan, Arvind Jasrotia, Kartika Bakshi, Nitan Sharma and Manik Sharma, Environmental Governance: Public Health and Solid Waste Crisis: A case study of Jammu City with proposals for integrated remediation 17(4) *Advances in Bioresearch* 354-364 (2026).

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4. **Protect and conserve urban cooling elements**

Vegetation, green and open spaces, and water bodies should be regarded as a part of climate resilience infrastructure of the city. Their removal cannot be compensated by plantation elsewhere. Planning should identify the strategically important urban green spaces.

5. **Make public transport the priority of Jammu's mobility policy**

Climate mitigation should start with reducing unnecessary dependence on private fossil fuel-powered vehicles, not only with electrification of the vehicle fleet. Jammu should enhance the reliability and availability of the public transport system, provide comfortable conditions for walking and promote cycling infrastructure where appropriate. Traffic and parking management should be used to prevent the inefficient use of vehicles in areas of traffic congestion.

6. **Transform the SDG -13 into measurable goals**

The District Administration should develop an annual climate action dashboard with specific measures, such as changes in water quality of Tawi river and its conditions; extent of mapping of flood risk zones; trends in land surface temperature and vegetation; projects being reviewed for climate impacts; progress in public transport and vehicle fleet electrification and relevant air quality indicators. The responsible department for each of these indicators must be identified, and the indicators assessed annually. In other words, the focus of evaluation of SDG 13 needs to shift from "what programs have been carried out" to "what impact did the program make"?

7. **One mechanism for all local climate action**

There is a need for nodal mechanism to bring together the relevant departments concerned with disaster management, rivers and water resources, pollution control, urban planning, transport and municipal services. The purpose of this mechanism should be practical, such as sharing of information between departments and review of major projects. This mechanism will ensure that climate action becomes part of current governance structure without establishing a new system.

CONCLUSION

Climate action under SDG 13 takes place primarily in local policy processes. Three particular aspects of the same can be seen in the analysis of the climate situation in Jammu District: the resilience of the Tawi River system; the climate-related consequences of the growth of urban areas and the potential for mitigation related to urban mobility.

River resilience in the Tawi demonstrates that adaptation efforts should not be limited solely to flood response. Morphological

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structure, water quality, extraction and area development affect resilience to climatic risks. Adaptation is, thus, the process requiring scientific river monitoring, proper regulation, and integration of flood-risk information into urban planning.

Urban growth and thermal stress highlight the importance of climate-responsive urban development. Remote-sensing research specific to Jammu indicates changes in land cover and land surface temperature. While these measurements alone do not establish human heat exposure, they form a scientific foundation for understanding and planning the urban thermal environment.

Finally, urban mobility offers the potential of mitigation. Existing research establishes environmental and public health issues associated with vehicles and their dependence on fossil fuels. Reducing fossil-fuel-dependent mobility is a plausible mitigation option with air-quality benefits.

This study shows environmental damage should not be automatically considered climate change. Sand mining, pollution of rivers, and traffic are highly anthropogenically-driven problems. However, since these environmental issues interact with climatic risk factors, they are relevant to SDG 13 and offer the potential for enhancing resilience and mitigating impacts.

Mainstreaming thus becomes the key issue rather than proliferation of climate policies in Jammu. There is a need for incorporating climate change considerations in river management, urban planning, disaster response and transport policy. Scientific monitoring, climate-responsive development assessment, conservation of urban cooling areas and public-transport-based mobility will help develop climate action mechanisms. The implementation of SDG - 13 in Jammu can be evaluated by whether the district becomes more resilient to hydrological risks, more climate-responsive in its development, and less fossil-fuel-intensive in mobility.