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Article

AI- POWERED CLIMATE MODELLING: A LEGAL ANALYSIS OF DATA GOVERNANCE AND PRECAUTIONARY REGULATION

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Abstract: With the advancement of technology and growing climate crisis, artificial intelligence has emerged as a significant tool for Epredicting change in the climate and natural calamities with precision. AI models, today process and analyse large data sets to provide minute details regarding a slight rise in the sea level, extreme changes in weather and increased carbon emissions that traditional physics-based models fail to recognize. However, the integration of artificial intelligence into climate prediction introduces legal challenges that remain largely unaddressed by international as well as domestic frameworks. The core issue addressed in this paper is the responsibility gap created by the 'black-box' nature of AI- based climate predictions. When policy-oriented decisions such as urban zoning, investments in infrastructure and emergency evacuations are based on algorithm that later proves to be biased or inaccurate on the basis of data stored in the model, the problem of accountability arises. Furthermore, the paper examines the friction surrounding data governance and the importance of 'right to information' for public climate adaptation. The doctrinal analysis of emerging legislations such as the EU AI Act and the India's Digital Personal Data Protection Act, 2023 will be done in order to evaluate how precautionary principle of environmental law can be implemented within the artificial intelligence framework. This paper proposes Sustainability by Design framework along with other suggestions. This framework advocates for mandatory transparency in training data, standardizing audit protocols for AI based climate model and a multifaceted liability framework to ensure that AI serves as a reliable instrument for climate justice.
Keywords: AI Governance, Climate Modelling, Environmental Law, Liability, Data Protection, Precautionary Principle.

1. INTRODUCTION

Climate change constitutes one of the most pressing global challenges, posing irreversible consequences for both ecological systems and human societies. The increasing frequency and intensity of climate-related events have contributed to the emergence of compounding and cascading risks (Mehryar et al., 2024), wherein multiple hazards interact to produce complex and amplified impacts. This has significantly complicated process of climate risk assessment, thereby necessitating more advanced and adaptive analytical approaches. In this context, AI-driven systems will facilitate the analysis of large and heterogeneous datasets, thereby enhancing the accuracy and efficiency of climate forecasting, disaster management, and real-time environmental monitoring. Notwithstanding the advantages, the integration of AI into climate modelling raises significant legal, ethical, and governance concerns. The "black-box" nature of many AI systems limits transparency and explainability, thereby impeding the identification of errors and biases within predictive outputs. This opacity complicates the attribution of accountability, particularly where AI-informed decisions result in adverse environmental or policy outcomes. (Mujiyana, 2025) Furthermore, the reliance on large-scale datasets introduces complex issues relating to data governance, ownership, access, and regulatory compliance, especially in jurisdictions where existing legal frameworks are not adequately equipped to regulate autonomous and adaptive technologies. Additional concerns pertain to the environmental costs associated with AI systems and their potential to exacerbate existing social and ethical inequalities.

A significant gap persists in understanding the extent to which current legal frameworks address these emerging challenges. In particular, questions remain regarding the adequacy of data governance regimes, the allocation of liability among relevant stakeholders, and the applicability of the precautionary principle in regulating AI-driven decision-making under conditions of uncertainty. The authors have attempted to address these issues through a mixed-method approach by combining doctrinal legal analysis with empirical data collected through an online survey administered to legal and technical professionals, specifically lawyers and engineers. The study evaluates the adequacy of existing regulatory frameworks, examines stakeholder perceptions of risk and accountability, and assesses the need for precautionary regulatory mechanisms.

2. LITERATURE REVIEW:

Often AI is widely recognised as a powerful tool for climate prediction and environmental management, yet its governance remains fragmented, underdeveloped, and normatively contested.

A major contribution is provided by Leveraging artificial intelligence for research and action on climate change: opportunities, challenges, and future directions **(**Tan et al., 2025**).** This paper highlights AI's ability to process large-scale datasets in real time, thereby outperforming traditional climate models in speed and granularity. While the study strongly establishes AI's technical value, it does not deeply engage with the legal or institutional frameworks required to regulate its deployment.

From a legal standpoint, (Goff, 2025) explores the possibility of extending established environmental law principles such as prevention, precaution, and sustainability to AI systems. He proposes that environmental law can provide a foundational structure for governing AI, particularly in high-impact domains like climate modelling. However, the work remains largely theoretical and does not translate these principles into concrete enforcement mechanisms for algorithmic systems.

Ethical concerns are extensively addressed by (Nordgren, 2022). He highlights risks related to fairness, accountability, and intergenerational justice, particularly when algorithmic outputs influence public policy. He also warns that biased datasets and opaque models may reinforce existing inequalities. However, while the ethical analysis is strong, the study does not provide operational governance solutions or legal instruments to mitigate these risks in practice.

In the European regulatory context, (Pagallo et al., 2022) critically examine the EU's risk-based regulatory framework. They emphasise on the fact that the AI Act represents a significant step toward structured AI governance by categorising systems according to risk levels. However, the framework is insufficient for addressing the dynamic and evolving nature of AI applications in environmental governance.

Preventive governance mechanisms such as pre-deployment risk assessments, continuous monitoring, and early intervention strategies are advocated in the paper (Vipiana & Botto, 2026). However, it does not fully address how such precautionary principles can be implemented to fast-evolving AI systems that require adaptive governance.

Finally (Anand & Coeckelbergh, 2026) introduce a critical justice-oriented perspective. They argue that AI governance frameworks are disproportionately shaped by Global North priorities, thereby marginalising vulnerable populations in the Global South who are most affected by climate change. The authors emphasise the need for equitable distribution of AI benefits and risks, as well as inclusion of diverse epistemologies in governance design. However, the study lacks detailed regulatory models for implementing climate justice in AI systems.

Despite extensive scholarship, several key gaps remain. There is limited integration between technical AI capabilities and enforceable legal frameworks, resulting in a disconnect between innovation and regulation. The existing regulatory models, particularly risk-based frameworks like the EU AI Act, struggle to accommodate dynamic and adaptive AI systems used in climate modelling. Ethical and justice-based arguments remain largely theoretical, lacking operational legal mechanisms for enforcement. This study addresses these gaps by empirically analysing stakeholder perceptions and proposing a structured, precaution-oriented governance framework for AI in climate modelling.

3. CONCEPTUAL AND THEORETICAL FRAMEWORK

Precautionary principle is defined as

where there are threats of serious or irreversible damage, a lack of scientific uncertainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. (United Nations Conference on Environment and Development, 1992, Principle 15)

Since the AI systems are highly unpredictable, particularly in climate prediction, this principle justifies the need for anticipatory regulation. Complementing this, risk regulation theory emphasises on proportionality, balancing innovation with safety, and has been an integral part of the EU's risk-based model of AI governance. Finally, the framework of algorithmic accountability and AI ethics focuses on transparency, explainability, fairness, and responsibility in automated systems. It is particularly relevant in addressing the "black-box" nature of AI models and the challenges of assigning liability for their outcomes.

4. LEGAL & REGULATORY FRAMEWORK

The climate related data forms a nexus between environmental law frameworks, data protection and AI regulation frameworks. The UNFCCC is the first international legislation that encourages global participation to stabilize greenhouse gas concentrations and prevent anthropogenic interference with the climate system. The IPCC, however, is a scientific body that provides for procedural rules. These rules help in ensuring transparency, legitimacy and scientific integrity in assessment process. Additionally, IPCC is packed with structural limitations, such as inadequate representation of non-linear climate risks, hence not satisfying the standard of 'best available science' under the Paris Agreement. The EU AI Act which came into force in 2024 is a risk-based framework. It can be made directly applicable to AI systems which are deployed in climate change modelling. The climate decisions such as emission forecasting models, and mapping tools that help in locating climate vulnerability fall under human oversight mechanism as enunciated under Article 14. Additionally, Article 27 of the Act requires deployers of high-risk AI system to conduct Fundamental Rights Impact Assessments so that the impact on environmental rights and access to information are kept in check. However, the EU AI Act is silent on the aspect of climate action. It fails to classify AI applications that are harmful to the climate as high-risk. The GDPR applies to processing of all personal data including environmental modelling provided data governance principles as listed under Article 5(1) are satisfied.

In the Indian context, The Environmental Protection Act, 1986 regulates environmental governance and forms the basis of greenhouse gas emissions. However, it lacks explicit provisions on climate change. (Rengarajan et al., 2018). The processing of personal data is governed by DPDP Act, 2023. The consent and purpose limitation framework under the DPDP Act must reconcile with international transparency mechanisms. However no subordinate legislation has addressed this gap yet.

5. RESEARCH METHODOLOGY

The authors have adopted a mixed-method approach, incorporating doctrinal legal analysis with empirical data to examine the regulatory challenges surrounding AI-powered climate modelling. The doctrinal part includes an analysis of international and domestic legal frameworks governing data, technology, and environmental risk, while the empirical part provides insight into stakeholder perceptions regarding AI governance, accountability, and precautionary regulation.

The empirical data was collected through a structured questionnaire through an online survey. It was developed using a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." The survey was designed to capture responses across key thematic areas including trust in AI systems, transparency, accountability, regulatory adequacy, and support for precautionary approaches.

The authors have used purposive sampling technique, targeting specifically lawyers and engineers. This sampling strategy ensures that the data reflects informed perspectives at the intersection of legal and technical expertise.

6. EMPIRICAL ANALYSIS AND FINDINGS

6.1 Research Questions

- How effective is Artificial Intelligence in climate modelling in terms of accuracy, detection capability, and disaster preparedness?
- What are the concerns regarding transparency, accountability, and legal adequacy in the use of Artificial Intelligence for climate governance?

- Which governance dimensions: such as utility, transparency, accountability, legal adequacy, and regulatory demand most strongly shape public perceptions of Artificial Intelligence in climate-related decision-making?
- Is there a need for legislative intervention and precautionary regulatory approaches in governing Artificial Intelligence systems?
- What form of regulatory framework is most appropriate to balance the benefits of Artificial Intelligence with emerging governance and legal risks in climate applications?

Table 6.1 Overall Respondent Perceptions of AI in Climate Modelling

X-axis Label	Mean Score
AI Accuracy	3.91
AI Detection	3.87
Disaster Preparedness	4.2
Black-box Issue	3.26
Transparency → Accountability	4
Developer Liability	3.38
Government Accountability	3.64
Legal Adequacy	3.02
Need for Legislation	4.33
RTI Importance	3.93
Precautionary Principle	4.22
Sustainability by Design	4.04

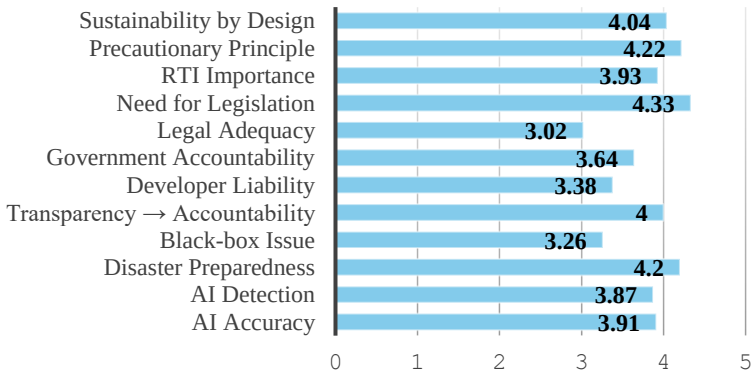

Fig. 6.1 Overall Respondent Perceptions of AI in Climate Modelling

The results of Figure 6.1 show that there is an overall positive perception of AI in climate modelling, particularly in terms of its practical utility and governance expectations. Respondents have shown relatively high agreement that AI performs well in accuracy (3.91%) and detection capabilities (3.87%). The role in enhancing disaster preparedness (4.20%), suggesting that AI is widely viewed as a valuable tool for forecasting and managing climate-related risks. Similarly, the study shows high percentage for transparency leading to accountability (4.00%), RTI importance (3.93%), precautionary principle (4.22%), sustainability by design (4.04%), and especially the need for legislation (4.33%) shows that there is a need for structured governance, transparency, and proactive regulatory intervention.

However, the study also found that certain parameters have obtained moderate to low scores like legal and ethical control mechanisms, particularly the black-box issue (3.26%), developer liability (3.38%), and government accountability (3.64%), indicating uncertainty about responsibility allocation in AI-driven climate decisions. The lowest score for legal adequacy (3.02) highlights a clear perception that existing legal frameworks are insufficient to address the complexities of AI in climate modelling. The findings of the authors reveal that while AI is trusted for its functional capabilities and potential benefits, there is a strong consensus that current legal and regulatory structures are insufficient, necessitating urgent legislative reform and stronger accountability mechanisms.

Table 6.2 Comparative perceptions of AI governance in climate modelling

Question	Lawyers Mean	Engineers Mean
AI Accuracy	4	3.84
AI Detection	4.05	3.72
Disaster Preparedness	4.33	4.08
Black-box Issue	3.29	3.24
Transparency → Accountability	4	4
Developer Liability	3.29	3.46
Government Accountability	3.81	3.5
Legal Adequacy	2.95	3.08
Need for Legislation	4.33	4.32
RTI Importance	3.86	4
Precautionary Principle	4.14	4.28
Sustainability by Design	4.24	3.88

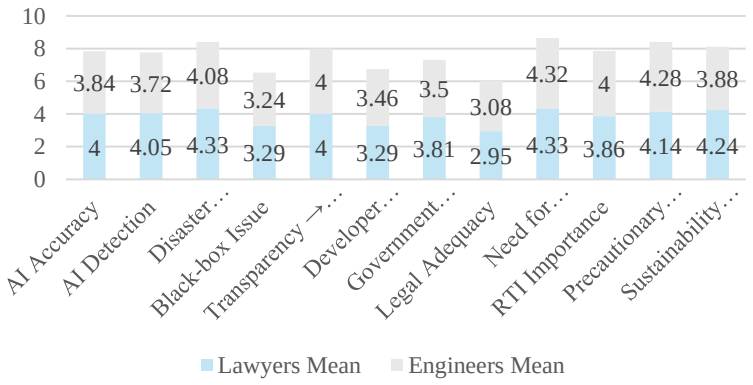

Fig. 6.2 Comparative Perceptions of AI Governance in Climate Modelling: A Study of Lawyers and Engineers

The comparative analysis shows how both professional groups perceive artificial intelligence in governance, accountability, and regulatory design. On one hand, lawyers consistently exhibit higher mean scores in domains related to AI accuracy (4.00 vs 3.84), AI detection (4.05 vs 3.72), government accountability (3.81 vs 3.50), and sustainability by design (4.24 vs 3.88), suggesting a strong support to institutional trust, regulatory oversight, and systemic governance of AI technologies. This aligns with the legal profession's traditional emphasis on accountability structures, liability attribution, and the preservation of rights-based frameworks particularly in contexts where automated decision-making systems may dilute transparency and traceability. Engineers, on the other hand

demonstrate comparatively higher or more cautious alignment in areas such as developer liability (3.46 vs 3.29), precautionary principle (4.28 vs 4.14), RTI importance (4.00 vs 3.86), and a slightly higher perception of legal adequacy (3.08 vs 2.95). This shows that people with technical knowledge emphasis more on responsibility and risk during the design and deployment of AI systems. Notably, both groups converge strongly on the need for legislation (4.33 vs 4.32) and the principle that transparency leads to accountability (both at 4.00), reflecting a shared recognition that existing governance frameworks are insufficient to fully regulate AI-driven systems without explicit statutory intervention. Disaster preparedness shows relatively high alignment (4.33 vs 4.08), reinforcing the idea that both professions acknowledge AI's critical role in real-world applications. Where on one hand lawyers prioritise macro-level governance and institutional control, and engineers focus more on technical responsibility and precaution in implementation reveals an interdisciplinary tension that is complementary. This indicates that effective regulation must bridge normative legal accountability with embedded technical safeguards, rather than privileging one disciplinary logic over the other.

Table 6.3 Thematic trends in AI governance perceptions

Theme	Questions Covered	Mean Score
AI Utility	Q1–Q3	3.99
Transparency Concerns	Q4–Q5	3.63
Accountability	Q6–Q7	3.51
Legal Adequacy	Q8	3.02
Regulatory Demand	Q9–Q12	4.13

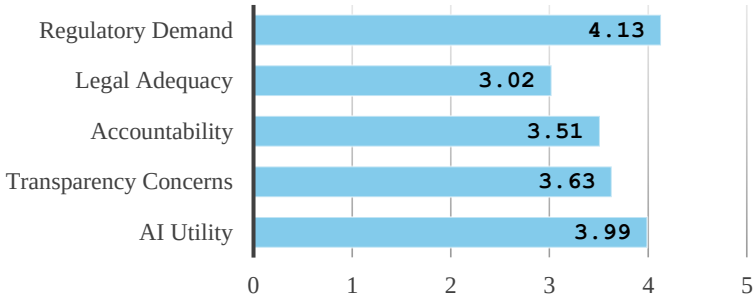

Fig. 6.3 Thematic Trends in AI Governance Perceptions

The thematic results reveal a structured pattern in how respondents perceive artificial intelligence governance, moving from functional acceptance towards increasing regulatory concern. The highest mean score for Regulatory Demand (4.13), indicates a strong consensus that existing governance frameworks are inadequate. This suggests that respondents view regulation as the primary solution to the challenges posed by AI systems. The AI Utility (3.99), indicates that respondents do not oppose AI itself but support its controlled and structured integration. The Transparency Concerns (3.63) and Accountability (3.51) reflect moderate levels of concern regarding the opacity of AI systems and uncertainty in assigning responsibility for algorithmic outcomes. The lowest score is observed in Legal Adequacy (3.02) which suggests that existing legal frameworks are only partially sufficient to address AI-related challenges. Overall, the findings indicate a governance gap where AI is accepted for its utility but is expected to operate under significantly strengthened regulatory and legal structures.

Table 6.4 Response Distribution on Core Issues in AI Governance

Question	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)

Need for Legislation	4	8	14	38	36
Precautionary Principle	6	10	18	34	32
Legal Adequacy	9	15	22	30	24

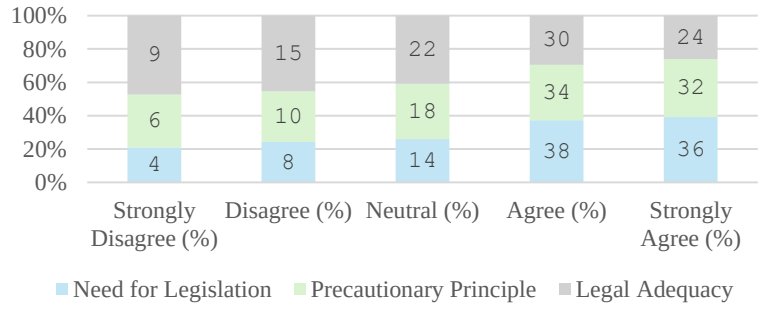

Fig. 6.4 Response Distribution on Core Issues in AI Governance

The distribution of responses reveals a clear consensus, moving from strong institutional demand to comparatively weaker confidence in existing legal frameworks. The Need for Legislation exhibits the highest level of agreement, with 74% of respondents (38% Agree, 36% Strongly Agree) supporting the statement, while only 12% express disagreement. This shows that AI systems require legislative intervention, reflecting widespread concern over regulatory gaps and the inadequacy in governance mechanisms. The Precautionary Principle also receives substantial support, with 66% combined agreement (34% Agree, 32% Strongly Agree) and a higher proportion of neutral responses (18%). This suggests that while respondents broadly endorse preventive regulatory approaches to AI risk management, there is some degree of uncertainty in how strictly precaution should be applied across domains. Legal Adequacy receives the lowest level of agreement, with only 54% (30% Agree, 24% Strongly Agree), while 24% disagree and a notable 22% remain neutral. This distribution indicates that a significant portion of respondents are questioning whether current laws are sufficient to address AI-related challenges. This shows that people with technical knowledge are often more aware of responsibility and risk during the design and deployment of AI systems.

7. RESULTS AND DISCUSSION:

The combined empirical findings drawn from all four analytical layers: AI perception, comparative professional perspectives, thematic clustering, and response distribution patterns reveal a consistent but complex narrative. Importantly, the data demonstrates a clear duality, where artificial intelligence is widely perceived as technically reliable and functionally transformative in climate modelling, yet simultaneously viewed as institutionally under-regulated and legally deficit. This contrast produces a governance gap in which technological confidence significantly exceeds regulatory confidence. High mean scores for disaster preparedness (4.20) and AI utility (3.99) reflect strong confidence particularly in high-stakes climate prediction scenarios where speed and analytical capacity are critical. However, this confidence diminishes when attention shifts from outputs to processes. Lower scores associated with black-box concerns (3.26), developer liability (3.38), and legal adequacy (3.02) expose a significant limitation that respondents are willing to accept AI-generated outputs, but remain sceptical about the opacity of algorithmic decision-making and the absence of clear governance structures.

Across thematic and distributional analyses, regulatory demand emerges as the most dominant governance expectation, with a thematic score of 4.13 and 74% agreement for legislative intervention. The data suggests that participants give a clear preference for formalised statutory intervention, indicating a shift toward legal centrality in AI governance discourse. The high support for the precautionary principle (4.22; 66% agreement) further reinforces this orientation, revealing that respondents favour anticipatory regulation designed to prevent harm ex ante rather than address it ex post.

Accountability, on the other hand, emerges as an analytically unstable and structurally fragmented category. While not as low as legal adequacy, accountability scores (3.51 overall and thematically) indicate moderate concern

without a clearly defined institutional solution. Legal professionals emphasise formal institutional accountability frameworks and liability attribution, whereas engineers tend to conceptualise accountability as embedded within system architecture and technical safeguards. This divergence highlights that AI accountability is dispersed across multiple actors, developers, deployers, institutions, and regulators resulting in what can be described as a diffusion of responsibility. In such a case, no single actor holds comprehensive liability, thereby weakening enforceability and creating governance ambiguity.

The most critical structural weakness identified across all datasets is the consistently low score for legal adequacy (3.02), supported by only 54% agreement in distributional analysis. This indicates a strong perception that existing legal frameworks are fundamentally misaligned with the operational logic of AI systems. Traditional legal systems are grounded in human-centric decision-making models, whereas AI systems operate adaptively, and often opaquely. This mismatch produces three interrelated deficits: first, a lack of algorithmic specificity within existing laws, which fail to address machine learning complexity; second, weak liability attribution mechanisms that cannot clearly assign responsibility across distributed AI ecosystems; and third, a reactive regulatory structure that intervenes only after harm has materialised, in contrast to the preventive logic required for high-risk predictive systems such as climate modelling.

The high scores for both regulatory demand and precautionary principle, indicate a clear normative shift toward anticipatory governance. The findings suggest a nuanced balancing requirement. On one hand, insufficient regulation creates severe systemic risks, including opaque decision-making, erosion of public trust, accountability vacuums, and potential policy distortions arising from erroneous climate predictions. On the other hand, excessive regulation may inadvertently suppress innovation and concentrate AI capabilities within heavily regulated entities, thereby limiting broader accessibility and adaptive innovation.

The analytical synthesis therefore points toward a balanced but precaution-oriented regulatory architecture. In climate modelling specifically, precaution should operate not as a symbolic ethical principle but as a design-stage regulatory requirement, mandating pre-deployment risk assessments, disclosure of uncertainty margins, and human-in-the-loop validation for consequential decisions. This approach recognises that AI-generated climate predictions are not neutral technical outputs but governance inputs with direct implications for disaster management, resource allocation, and policy formulation.

Empirical evidence establishes that AI is simultaneously a high-confidence technological instrument and a low-confidence governance system. The central challenge, therefore, is not the legitimacy of AI itself but the adequacy of the institutional frameworks that govern it. The study ultimately argues for a legally reinforced, precaution-driven regulatory architecture that preserves the innovative potential of AI while embedding it within structures of transparency and accountability.

8. RECOMMENDATIONS

The growing integration of Artificial Intelligence into climate modelling and governance systems necessitates a robust, forward-looking, and structured regulatory response. Based on the findings of this study, several key recommendations are proposed to ensure that AI systems operate in a transparent, accountable, and legally sustainable manner while continuing to support innovation. Regulatory frameworks must mandate transparency requirements, including disclosure of dataset origins, data cleaning methods, algorithmic parameters, and model validation processes. Additionally, auditability mechanisms should be introduced, enabling independent third-party review of AI models to verify accuracy, fairness, and environmental reliability. Such measures would not only enhance credibility but also reduce risks associated with misinformation or model bias in climate forecasting.

The liability in AI-driven decision-making remains fragmented and ambiguous, particularly when errors arise from complex interactions between developers, datasets, and deployment environments. A structured accountability framework should assign differentiated responsibilities to different stakeholders. In high-risk applications such as climate prediction and disaster management, a strict or hybrid liability model may be more appropriate, so that affected parties can seek redressal without being burdened by the technical complexity of proving fault. Furthermore, algorithmic decision-making systems should incorporate explainability requirements, ensuring that outcomes can be interpreted and justified in legal and administrative contexts.

India requires a context-specific regulatory model for AI governance that aligns with its developmental priorities, constitutional values, and technological aspirations. Rather than adopting a rigid or overly restrictive legal structure, India may benefit from a hybrid governance framework that combines centralised oversight with sector-

specific regulation. A dedicated national AI regulatory authority could be established to set baseline standards for safety, ethics, and transparency, while specialised regulatory bodies oversee AI applications in domains such as climate science, agriculture, healthcare, and energy. This approach would ensure regulatory consistency while allowing flexibility for sectoral innovation. Additionally, India's regulatory model should be aligned with global standards to facilitate international cooperation, particularly in addressing transboundary climate risks.

Finally, the study underscores the importance of interdisciplinary oversight mechanisms in AI governance. AI is inherently a multidisciplinary field, intersecting with computer science, environmental science, law, ethics, economics, and public policy. Establishing multi-stakeholder governance boards that include data scientists, climate experts, legal scholars, ethicists, and policymakers would ensure more balanced and informed regulatory outcomes.

9. LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

- Limited sample size: The authors have conducted this study on a small dataset, which may not completely represent all relevant views and experiences.
- Limited scope of respondents: The respondents do not capture the full diversity of perspectives across regions, institutions, and professional backgrounds.
- Limited generalisability: Since the sample size is limited, the findings may not apply to all stakeholders involved in AI governance and climate modelling, especially at the international level.
- Rapidly changing field: The AI is ever-evolving and due to this rapid evolution, some future prospects might have remained unaddressed.
- Need for broader datasets: Future research should use larger and more diverse datasets to produce stronger and more reliable findings.
- Need for comparative studies: There is value in conducting cross-country research to understand how different legal systems regulate AI in climate-related applications.
- Developed and developing country comparison: Comparing developed and developing countries can provide useful insights into regulatory effectiveness, practical challenges in implementation, and emerging best practices.

10. CONCLUSION

The authors have critically examined the intersection of Artificial Intelligence, climate modelling, and legal governance, highlighting both the transformative potential of AI and the regulatory challenges it presents. The analysis states that AI significantly enhances the accuracy, efficiency, and predictive capabilities of climate systems, thereby contributing to improved disaster preparedness, environmental monitoring, and policy formulation. However, these benefits are accompanied by substantial concerns relating to transparency, accountability, legal adequacy, and ethical oversight.

The central argument of this research is that technological advancement in AI and a sophisticated evolution in legal and regulatory frameworks should walk hand in hand. Without adequate governance structures, the deployment of AI in high-stakes domains such as climate prediction risks will result in unreliable outcomes, reinforce systemic biases, and undermine public trust. Therefore, law and policy must actively shape its trajectory. The future of AI in climate governance depends on the development of adaptive, transparent, and interdisciplinary regulatory systems that balance innovation with accountability. For countries like India, this presents both a challenge and an opportunity to design governance models that are technologically informed, legally robust, and socially responsive. As climate risks intensify globally, the integration of AI into environmental decision-making will only deepen, making it imperative for legal systems to evolve in tandem. Ultimately, sustainable and responsible AI governance will be essential to ensuring that technological progress serves the broader goals of environmental protection, public welfare, and intergenerational equity.

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