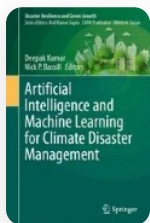


The Climate Science, Designing, and Implementation of Climate Policy

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Artificial Intelligence and Machine Learning for Climate Disaster Management

Syed Shahid Mazhar, Farhina Sardar Khan, Prateek Srivastava & Ambrina Sardar Khan 



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Abstract

This research explores the complex relationships between climate science, policy-making efforts, and the development of effective adaptation to change as well as resilience strategies based on scientific literature and documents related to policymaking. It breaks down the intricate issues caused by climate change, such as increased temperatures, extreme weather events, sea-level surges, and changes in rainfall patterns. This study highlights the importance of incorporating scientific knowledge into policy structures to strengthen adaptive capabilities and enable resilience at local, regional, and global scales (Adger et al. [2007](#)).

A thorough review of critical aspects of climate science, such as climate modelling and risk evaluations, along with vulnerabilities, is presented. This study ventures to discover

ways by which such scientific understanding can be used to drive the development and implementation of policies (Jones and Preston [2011](#)). The research also emphasizes cases and examples of successful development climate adaptation resilience and provides insight into the vital role of interdisciplinary cooperation and stakeholder involvement, as well as long-term strategies (Pelling [2011](#)).

By interconnecting the disciplines of climate science and policy, this study strives to close gaps in present knowledge with the overall goal of significantly adding value toward building sound strategies ready for efficiently addressing the various effects stemming from a changing geophysical environment. Its broad aim is to increase societal and ecological strength in the face of these threats.

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References

Adger WN, Agrawala S, Mirza MMQ, Conde C, O'Brien K, Pulhin J et al (2007) Assessment of adaptation practices, options, constraints and capacity. Climate change 2007: impacts, adaptation and vulnerability. In: Contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change, pp 717–743

Buchner BK, Falconer A, Herve-Mignucci M (2015) Global landscape of climate finance 2015. Climate Policy Initiative

Cash DW, Clark WC, Alcock F, Dickson NM, Eckley N, Guston DH et al (2003) Knowledge systems for sustainable development. Proc Natl Acad Sci 100(14):8086–8091

Chan H-W, Tam K-P (2020) Exploring the association between climate change concern and mitigation behaviour between societies: a person-context interaction approach. Asian J Soc Psychol 24. <https://doi.org/10.1111/ajsp.12430>

Guston DH (2001) Boundary organizations in environmental policy and science: an introduction. Sci Technol Hum Values 26(4):399–408

Hasselmann K (1997) Multi-pattern fingerprint method for detection and attribution of climate change. *Clim Dyn* 13(9):601–611

Huang Y, Ding Y, Zhao D (2015) Public perceptions of climate change in China: results from the questionnaire survey. *Nat Hazards* 77(3):1849–1863

IPCC (2014) Climate change 2014: impacts, adaptation, and vulnerability. In: Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change. Cambridge University Press

IPCC (2018) Global warming of 1.5°C. An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change. World Meteorological Organization

IPCC (2019) IPCC guidelines for national greenhouse gas inventories. Prepared by the National Greenhouse Gas Inventories Programme. Accessed from: <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol1.html>

Jones L, Preston F (2011) Adaptive capacity in the public sector: a comparative study of municipal adaptation planning in England and Sweden. *Glob Environ Chang* 21(2):392–400

Jordan A, Huitema D, Hildén M, van Asselt H, Rayner T, Schoenefeld J (2018) Emergence of polycentric climate governance and its future prospects. *Nat Clim Chang* 8(6):1–7

Khan M, Khan J, Ali Z, Ahmad I, Ahmad M (2016) The challenge of climate change and policy response in Pakistan. *Environ Earth Sci* 75. <https://doi.org/10.1007/s12665-015-5127-7>

Maibach E, Roser–Renouf C, Leiserowitz A (2010) Global warming's six Americas 2009: an audience segmentation analysis. Yale University and George Mason University

Meadowcroft J (2009) What about the politics? Sustainable development, transition management, and long-term energy transitions. *Policy Sci* 42(4):323–340

Moser SC, Dilling L (2011) Communicating climate change: closing the science–action gap. In: *The Oxford handbook of climate change and society*, pp 161–174

Newell P, Paterson M (2010) Climate capitalism: global warming and the transformation of the global economy. Cambridge University Press

O'Brien KL, Sygna L, Haugen JE (2009) Vulnerable or resilient? A multi-scale assessment of climate impacts and vulnerability in Norway. *Clim Chang* 97(3–4):509–543

O'Neill S, Nicholson–Cole S (2009) “Fear won't do it”: promoting positive engagement with climate change through visual and iconic representations. *Sci Commun* 30(3):355–379

Ostrom E (2005) Understanding institutional diversity. Princeton University Press

Pelling M (2011) Adaptation to climate change: from resilience to transformation. Routledge

Peters GP, Le Quéré C (2016) GCP carbon budget 2016: global carbon budget 2016. *Earth System Science Data* 8(2):605–649

Pielke RA Jr (2007) *The honest broker: making sense of science in policy and politics*. Cambridge University Press

Piggot G, Cooper A (2020) Policy feedbacks and climate governance: the lessons of failed emissions trading reforms in Australia. *Environ Politics* 29(1):55–76

Reed MS, Graves A, Dandy N, Posthumus H, Hubacek K, Morris J et al (2009) Who's in and why? A typology of stakeholder analysis methods for natural resource management. *J Environ Manag* 90(5):1933–1949

Stavins RN (2019) The future of US carbon pricing policy. *Rev Environ Econ Policy* 13(1):87–107

UNFCCC (2009) Reporting and review of information: guidelines for national communications from parties not included in annex I to the convention, part I: UNFCCC reporting guidelines on annual inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases

United Nations (2015) Paris agreement. Retrieved from https://unfccc.int/sites/default/files/english_paris_agreement.pdf

Van de Graaf T, Colgan JD (2017) *The global energy challenge: environment, Palgrave Macmillan, development and security*

Webster MD, Forest CE, Reilly JM, Babiker MH, Kicklighter DW, Mayer M, Prinn RG, Sarofim MC, Sokolov AP, Stone PH, Wang C (2003) Uncertainty analysis of climate change and policy response. *Clim Chang* 61:295–320

Weible CM, Sabatier PA (2007) A guide to the advocacy coalition framework. In: Theories of the policy process, vol 2, pp 123–156

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