Course title: Climate Change and Development: Policies & Practices

Course code: PPS 159	**No. of credits:** 2	**L-T-P:** 24-06-00	**Learning hours:** 30

Pre-requisite course code and title (if any): None

Department: Department of Policy & Management Studies

Course coordinator(s): Dr. Chandan Kumar	**Course instructor(s):** Prof. Shaleen Singhal, Mr. R. R. Rashmi

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Course type: Core	**Course offered in:** 2nd Semester

Course description

This course provides a comprehensive exploration of climate change and its multifaceted developmental impacts. It is designed for understanding the interplay of climate science, political frameworks, and policy development while examining strategies for enhancing climate resilience. By offering an in-depth exploration of the interplay between climate change, development, and policymaking, it will equip students with the knowledge, skills, and perspectives to contribute positively to building resilient environments and settings. The insights gained through this course will empower the next generation of policymakers, urban planners, public health officials, and community leaders to create effective and sustainable responses to climate change.

This course is divided into four modules. The first module serves as a foundation for understanding climate change, exploring its scientific basis, causes, and global consequences. The module will also discuss global climate change agreements, equity in climate change, mitigation measures and risk assessment. In the second module, students will delve into politics, policies, key institutions, finance and technology transition surrounding climate change. The third module focuses on identifying and implementing strategies to build climate resilience in development planning. Students will explore various approaches and frameworks for assessing vulnerability and resilience, including green infrastructure, ecosystem-based and community-based approaches and initiatives aimed at mitigating the effects of climate change. In the final module, students will examine real-world case studies of places that have successfully implemented climate resilience strategies. Through collaborative analysis, students will identify key components that contributed to the success of these initiatives.

Learning objectives:

- To provide students with a nuanced understanding of the challenges posed by climate change, the political and policy contexts in which decisions are made.
- To orient students to the effective strategies that cities can employ to promote climate-resilience.
- To equip students with the skills necessary to contribute to climate action and sustainable urban development.

Course content

Module	Topic	L	T	P
1.	**Introduction to Climate Change** • Science of Climate Change (causes, effects, and projections): Mainstream view and Alternative view; The IPCC process and global assessments • International Climate Change Agreements: UNFCCC, Kyoto Protocol, Paris Agreement; India's engagement in Global Climate Negotiations • Equity in Climate Change: Approaches of developed and developing countries; Need for formal justification • Climate Change Mitigation: Sectors and Gases, Trends and Projections, GHG abatement costs; Net Zero goal, the theory and practice of the carbon market • Assessing Climate Risks, Vulnerability, Impacts, Adaptation, Loss & Damage; Tools and methods for climate risk assessment in Cities	8	0	0

2.	**Climate Change: Politics and Policy** • Divergence in approach of Developed and Developing Countries; Global geopolitical dynamics on climate change issues • International Climate Policies, Global Net Zero goal and energy transition strategy • National Climate Change Policy: National Action Plan on Climate Change (NAPCC); Nationally Determined Contributions; Roles of local governments in climate action. • Climate Finance: Issues and approaches, Flows, Mechanisms including Green Climate Fund (GCF), and Loss & Damage Fund	6	2	0
3.	**Strategies for Climate Resilience in Development Planning** • Defining adaptation and its significance in the context of climate change • Assessing climate vulnerability and resilience • Green Infrastructure; Climate-Resilient Infrastructure • Ecosystem-based Approaches: Ecosystem Restoration; Biodiversity Conservation • Community Engagement & Empowerment: Community-based Adaptation; Building Social Capital • Technology & Innovation • Education & Capacity Building • Climate action plans	6	2	0
4.	**Case Studies & Best Practices for Climate Resilient Development** • International Cases, such as, Rotterdam, Netherlands: Water Management and Infrastructure; Copenhagen, Denmark: Climate-Adaptive Urban Planning; New York City, USA: Coastal Resilience and Community Involvement; Singapore: Integrating Nature-Based Solutions; Cape Town, South Africa: Water Conservation and Management; Medellín, Colombia: Urban Green Spaces and Social Inclusion • Indian Cases, such as, Ahmedabad: Urban Heat Island Mitigation; Bengaluru: Water Management and Lakes Restoration; Chennai: Flood Management and Disaster Preparedness; Mumbai: Coastal Resilience and Protection; Hyderabad: Integrated Urban Planning for Climate Resilience; Visakhapatnam: Coastal Area Management	4	2	0
	Total	**24**	**6**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (20%)
- **Minor Test-2:** Seminar/Case Study - Group Presentation (30%)
- **Major Test:** Written Test/Term Paper Submission & Presentation (50%)

Learning outcomes

Upon completion of this course, candidates would be able to:

1. possess a comprehensive understanding of climate change and the tools necessary to evaluate, promote, and implement effective climate resilience strategies (All evaluations)
2. develop skills to communicate complex climate change issues and resilience strategies to various audiences, including policymakers, community members, and the general public (Minor Test-2)

Pedagogical approach

Classroom lectures; Student Seminars; Invited talks from Climate Change Experts including Practitioners and Senior/Superannuated Govt. Officers; Case studies.

Suggested Readings

Module 1:

- Johansen, B. E. (2023). *Global Warming and the Climate Crisis: Science, Spirit, and Solutions*. Springer.

- Dessler, A. E. (2021). *Introduction to Modern Climate Change, 3rd edition*. Cambridge University Press.
- Ingram, A. (2023). *Climate Change Simplified: A Comprehensive Guide to Global Warming and Sustainable Living with 101 Essential Tips for a Greener Future and Reduced Carbon Footprint*. Authentic EcoPress.

Module 2:

- Tondon, U. (2016). *Climate Change: Law, Policy and Governance*. Eastern Book Company.
- Dubash, N. K. (ed.) (2011). *Handbook Of Climate Change and India: Development, Politics, and Governance*. Oxford University Press.
- Hussain, S., Hussain, E., Saxena, P., Sharma, A., Thathola, P., & Sonwani, S. (2024). Navigating the impact of climate change in India: A perspective on climate action (SDG13) and sustainable cities and communities (SDG11). *Frontiers in Sustainable Cities*, *5*, 1308684. https://doi.org/10.3389/frsc.2023.1308684.

Module 3:

- Singh, A. K. (2023). *Global Warming and Climate Change: Story of India's Climate Disaster and How to Avoid it*. Chennai, Notion Press Media Pvt Ltd.
- Pathak, B., & Dubey, R. S. (eds.) (2023). *Climate Change and Urban Environment Sustainability*. Gateway East, Singapore: Springer Nature Singapore Pte Ltd.
- Seto, K., Solecki, W., & Griffith, C. (2020). *The Routledge Handbook of Urbanization and Global Environmental Change*. Routledge.
- Norman, B. (2022). *Urban Planning for Climate Change*. Routledge.
- Bhadouria, R., Upadhyay, U., Tripathi, S., Singh, P. (eds.) (2022). *Urban Ecology and Global Climate Change*. Wiley-Blackwell.
- Dubash, N. K. (ed.) (2019). *India in a Warming World: Integrating Climate Change and Development*. Oxford University Press. https://doi.org/10.1093/oso/9780199498734.001.0001.
- Oktari, R. S., Syamsidik, Idroes, R., Sofyan, H., & Munadi, K. (2020). City Resilience towards Coastal Hazards: An Integrated Bottom-Up and Top-Down Assessment. *Water*, *12*(10), 2823. https://doi.org/10.3390/w12102823.
- Tyler, S., & Moench, M. (2012). A framework for urban climate resilience. *Climate and Development*, *4*(4), 311–326. https://doi.org/10.1080/17565529.2012.745389.
- Dakey, S., Deshkar, S., Joshi, S., & Sukhwani, V. (2023). Enhancing Resilience in Coastal Regions from a Socio-Ecological Perspective: A Case Study of Andhra Pradesh, India. *Sustainability*, *15*(12), 9565. https://doi.org/10.3390/su15129565.
- Urban Design Lab. Integrating Nature-Based Solutions (NBS) into Urban Planning Practices. https://urbandesignlab.in/integrating-nature-based-solutions-nbs-into-urban-planning-practices/#:~:text=Case%20Studies%20of%20NBS%20in%20Urban%20Planning&text=In%20Singapore%2C%20vertical%20gardens%20and,rainwater%20to%20reduce%20flooding%20risk.
- Parikh, J., Jindal, P., & Sandal, G. (2013). Climate Resilient Urban Development, Vulnerability Profiles of 20 Indian Cities. COE-IRADe. https://irade.org/Climate_Resilient_Urban_Development.pdf.
- Govindarajulu, D. (2014). Urban green space planning for climate adaptation in Indian cities. *Urban Climate*, *10*, 35-41. https://doi.org/10.1016/j.uclim.2014.09.006.

Module 4:

- Dolman, N., & Verlinde, J. (2024). Achieving a Water-Resilient Rotterdam: Past, Present and Future Perspectives. *Blue Papers*, *3*(1). https://doi.org/10.58981/bluepapers.2024.1.13.
- Graaf R.E. De, Der Brugge R. Van, J. Lankester, Der Vliet W. Van, L. Valkenburg. Local water resources and urban renewal. A Rotterdam case study. https://hal.science/hal-03231425/document.
- Negrello, M. (2023). Designing with Nature Climate-Resilient Cities: A Lesson from Copenhagen. In: Arbizzani, E., et al. *Technological Imagination in the Green and Digital Transition*. CONF.ITECH 2022. The Urban Book Series. Cham: Springer. https://doi.org/10.1007/978-3-031-29515-7_76.
- Jørgensen, G., Fryd, O., Lund, A. A., Andersen, P. S., & Herslund, L. (2022). Nature-based climate adaptation projects, their governance and transitional potential-cases from Copenhagen. *Frontiers in Sustainable Cities*, *4,* 906960. https://www.frontiersin.org/journals/sustainable-cities/articles/10.3389/frsc.2022.906960/full.

- Rudge, K. (2021). Participatory climate adaptation planning in New York City: Analyzing the role of community-based organizations. *Urban Climate*, *40*, 101018. https://doi.org/10.1016/j.uclim.2021.101018.
- Gornitz, V., Oppenheimerb, M., Koppc, R., Hortona, R., Ortond, P., Rosenzweiga, C., Soleckie, W., & Patrickf, L. (2020). Enhancing New York City's resilience to sea level rise and increased coastal flooding. *Urban Climate*, *33*, 100654. https://www.sciencedirect.com/science/article/pii/S2212095519301798?via%3Dihub
- Rosenzweig, C., Solecki, W.D., Blake, R., Bowman, M., Faris, C., Gornitz, V., Horton, R., Jacob, K., LeBlanc, A., Leichenko, R., Linkin, M., Major, D., O'Grady, M., Patrick, L., Sussman, E., Yohe, G., & Zimmerman, R. (2011). Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies. *Climatic Change*, *106*, 93–127. https://doi.org/10.1007/s10584-010-0002-8.
- U. S. Climate Resilience Toolkit: Case Studies. https://toolkit.climate.gov/case-studies?f%5B0%5D=field_workflow_step%3A58.
- Tan, B. A., Gaw, L. Y., Masoudi, M., & Richards, D. R. (2021). Nature-Based Solutions for Urban Sustainability: An Ecosystem Services Assessment of Plans for Singapore's First "Forest Town". *Frontiers in Environmental Science*, *9*, 610155. https://doi.org/10.3389/fenvs.2021.610155.
- Cui, M., Ferreira, F., Fung, T. K., & Matos, J. S. (2021). Tale of Two Cities: How Nature-Based Solutions Help Create Adaptive and Resilient Urban Water Management Practices in Singapore and Lisbon. *Sustainability*, *13*(18), 10427. https://doi.org/10.3390/su131810427.
- Calverley, C. M., & Walther, S. C. (2022). Drought, water management, and social equity: Analyzing Cape Town, South Africa's water crisis. *Frontiers in Water*, *4*, 910149. https://doi.org/10.3389/frwa.2022.910149.
- Brühl, J., & Visser, M. (2021). The Cape Town drought: A study of the combined effectiveness of measures implemented to prevent "Day Zero". *Water Resources and Economics*, *34*, 100177. https://doi.org/10.1016/j.wre.2021.100177.
- Visser, M., Booysen, M. J., Brühl, J. M., & Berger, K. J. (2021). Saving water at Cape Town schools by using smart metering and behavioral change. *Water Resources and Economics*, *34*, 100175. https://doi.org/10.1016/j.wre.2020.100175.
- Anguelovski, I., Irazábal-Zurita, C., & Connolly, J. T. (2018). Grabbed Urban Landscapes: Socio-spatial Tensions in Green Infrastructure Planning in Medellín. *International Journal of Urban and Regional Research*, *43*(1), 133-156. https://doi.org/10.1111/1468-2427.12725.
- Grey, J. (2023). Making Space for Peace: A Case-study of Medellín Colombia. DGSi Working Paper No. 1, 2023. https://www.dur.ac.uk/media/durham-university/departments-/school-of-government-amp-int-affairs/DGSI_Diss1_DUFormat-final.pdf-2023-No.1.pdf.
- Smith, H., Medero, G.M., Crane De Narváez, S., & Mera, W. C. (2023). Exploring the relevance of 'smart city' approaches to low-income communities in Medellín, Colombia. *GeoJournal*, *88*, 17–38. https://doi.org/10.1007/s10708-022-10574-y.
- Mohammad, P., Goswami, A., & Bonafoni, S. (2019). The Impact of the Land Cover Dynamics on Surface Urban Heat Island Variations in Semi-Arid Cities: A Case Study in Ahmedabad City, India, Using Multi-Sensor/Source Data. *Sensors*, *19*(17),3701. https://doi.org/10.3390/s19173701.
- Veena, K., Parammasivam, K. M., & Venkatesh, T. N. (2020). Urban Heat Island studies: Current status in India and a comparison with the International studies. *Journal of Earth System Science*, *129*, 85. https://doi.org/10.1007/s12040-020-1351-y.
- Ramchandra, T., Sincy, V., & Asulabha, K. (2020). Efficacy of Rejuvenation of Lakes in Bengaluru, India. *Green Chemistry & Technology Letters*, *6*(1), 14–26. https://doi.org/10.18510/gctl.2020.613.
- Nagendra, H. (2016). Restoration of the Kaikondrahalli lake in Bangalore: Forging a new urban common. Pune, Maharashtra: Kalpavriksh. https://kalpavriksh.org/wp-content/uploads/2018/06/KaikondrahallilakecasestudyJune2016.pdf?srsltid=AfmBOoqyTX4yNgDLIl3a4yq2-PYTn1oDsghlimptCErVN1aFarTbQcYQ.
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- Bremner, L. (2020). Planning the 2015 Chennai floods. *Environment and Planning E: Nature and Space*, *3*(3), 732-760. https://doi.org/10.1177/2514848619880130.
- Sehra, V., & Punia, M. (2020). Overcoming Barriers to Urban Flood Resilience: A Case of Hyderabad, India. IntechOpen. https://www.intechopen.com/chapters/72789.
- Baig, M. R. I., Ahmad, I. A., Shahfahad, Tayyab, M., & Rahman, A. (2020). Analysis of shoreline changes in Vishakhapatnam coastal tract of Andhra Pradesh, India: an application of digital

shoreline analysis system (DSAS). *Annals of GIS*, *26*(4), 361–376. https://doi.org/10.1080/19475683.2020.1815839
- Ramakrishnan, R., Agrawal, R., Remya, P., NagaKumar, K., Demudu, G., Rajawat, A., Nair, B., & Nageswara Rao, K. (2018). Modelling coastal erosion: A case study of Yarada beach near Visakhapatnam, east coast of India. *Ocean & Coastal Management*, *156*, 239-248. https://doi.org/10.1016/j.ocecoaman.2017.08.013.
- TERI (2014). Planning Climate Resilient Coastal Cities: Learnings from Panaji and Visakhapatnam, India. Working Paper. https://www.teriin.org/eventdocs/files/Working-Paper-climate-resilient.pdf.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.
- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Dr. Chandan Kumar, Prof. Shaleen Singhal, and Mr. R. R. Rashmi

Course Reviewers

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2. Dr Manish Kumar Shrivastava, Associate Director, Earth Science and Climate Change Division, The Energy and Resources Institute (TERI), New Delhi, India.

Additional Information

This Course outline was approved in the 60th Academic Council Meeting held on 24th December 2024 at TERI School of Advanced Studies, New Delhi.