सड़क परिवहन और राजमार्ग मंत्रालय
Ministry of Road Transport and Highways
Government of India

सत्यमेव जयते

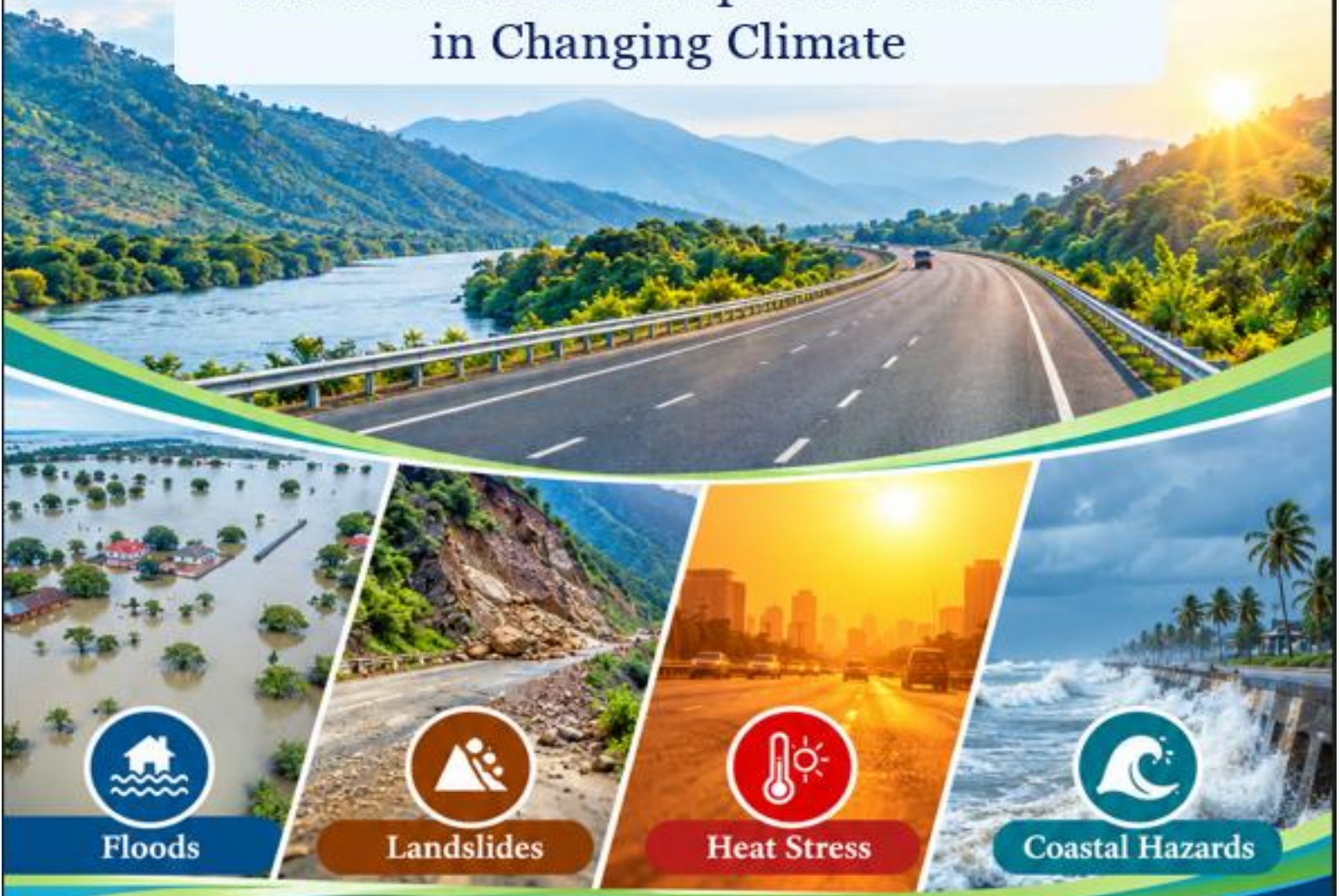
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Concept Note

on

Resilient and Adaptive Highway Infrastructure

Innovations and Adaptation Practices in Changing Climate



National Institute of Disaster Management
Ministry of Home Affairs, Govt. of India

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1. Introduction

National highway infrastructure systems are critical lifelines that facilitate economic growth, regional connectivity, mobility and social development. However, the increasing impacts of climate change and disaster risks pose significant challenges to the sustainability, safety and operational reliability of highway infrastructure National highways are exposed to a wide range of climate-related hazards, including floods, landslides, cloudbursts, extreme rainfall, heatwaves and droughts. The increasing frequency and intensity of such hazards underscore the urgent need to integrate climate adaptation and disaster resilience into the planning, design, construction, operation, maintenance and reconstruction of national highway infrastructure.

Recent years have witnessed significant disruptions to national highway networks due to climate extremes and disaster events. Floods can damage or wash away road sections, bridges and associated infrastructure, disrupting transportation and affecting regional economies. Heavy rainfall and cloudbursts can trigger landslides and debris flows, blocking critical highway corridors and resulting in prolonged traffic disruptions, increased maintenance requirements and substantial economic losses. Rising temperatures can accelerate pavement deterioration, affect material performance and reduce the service life of highway assets. In mountainous regions, changing precipitation patterns, slope instability and extreme weather events further increase the vulnerability of roads and associated structures. Similarly, coastal highways are increasingly exposed to sea-level rise, coastal flooding and erosion, posing significant risks to connectivity and infrastructure safety. Without proactive and context-specific adaptation measures, such impacts may continue to impose substantial economic and social costs, particularly in regions already exposed to multiple hazards.

Enhancing the climate adaptation and disaster resilience of national highway infrastructure requires a holistic and coordinated approach involving policy, planning, engineering, technology, institutional capacity and risk-informed decision-making. A whole-of-government approach is essential for strengthening policy and institutional mechanisms and for mainstreaming climate and disaster risk considerations across the highway development cycle. At the same time, effective adaptation requires enhanced scientific knowledge, improved climate and hazard information, innovative engineering solutions and appropriate use of emerging technologies. Collaboration and knowledge networking among government institutions, academic and research organizations, infrastructure agencies, industry, private-sector entities and local communities are therefore, essential for developing and implementing practical and region-specific solutions.

The documentation, evaluation and dissemination of recent research, innovative technologies, case studies and good practices can significantly support knowledge exchange and facilitate the adoption of appropriate adaptation and resilience measures. Such knowledge is particularly important for addressing the diverse physiographic and climatic conditions across India, where adaptation solutions need to be tailored to regional hazard profiles, infrastructure characteristics and local requirements. Sharing experiences and lessons learned can also help strengthen institutional capacity and promote the integration of climate resilience into highway planning, design, construction, operation, maintenance and reconstruction.

As part of the project entitled “Development of National Highways Climate Adaptation Policy and Guidelines (HighCAP)”, the National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Government of India, has undertaken initiatives to strengthen the integration of climate adaptation and disaster resilience within the national highway sector project

webpage. The project aims to support the development and implementation of a comprehensive National Highways Climate Adaptation Policy and Guidelines to promote climate-resilient national highway infrastructure. As part of this broader initiative, NIDM seeks to facilitate knowledge sharing and dissemination of adaptation practices in key areas including climate-resilient planning and design, construction, slope and drainage management, pavement performance, maintenance, disaster risk reduction, reconstruction and the application of innovative technologies.

In this context, the edited book on "Resilient and Adaptive Highway Infrastructure: Innovations and Best Practices for a Changing Climate" provides a platform for researchers, academicians, policymakers, highway authorities, engineers, practitioners, industry professionals and other stakeholders to present and exchange recent research findings, innovative approaches, field experiences, case studies and good practices. The edited book will particularly encourage contributions addressing resilience of highway assets, adaptation planning, resilient engineering solutions, disaster risk reduction, climate-informed design and construction, sustainable maintenance practices, technological innovations, institutional mechanisms and policy approaches.

The edited book will contribute to strengthening the knowledge base for climate adaptation and disaster resilience in the national highway sector and support the exchange of region-specific and practice-oriented solutions.

2. Aim and Objectives

The edited book aims to bring together innovative approaches, emerging technologies, research findings, case studies and adaptation strategies to strengthen the climate resilience and adaptive capacity of highway infrastructure. The book will particularly highlight practical and sustainable solutions for climate-resilient planning, design, construction, operation and maintenance of highways. The documented knowledge and adaptation practices will provide a valuable resource for policymakers, highway authorities, engineers, researchers and practitioners and support the advancement of sustainable and resilient highway development in a changing climate.

3. Call for Chapters

Under the HighCAP project, NIDM is compiling innovative approaches, recent research, emerging technologies and adaptation practices related to resilient and adaptive highway infrastructure in a changing climate through a call for chapters. The call will cover diverse thematic areas related to resilient and adaptive highway infrastructure, including emerging technologies and innovative materials, climate-responsive design and construction, asset management, nature-based and ecosystem-based solutions, digital and data-driven approaches, sustainable infrastructure practices, adaptive operation and maintenance, institutional and governance innovations and national and international case studies and adaptation practices for highway resilience in a changing climate. The call for chapters will be disseminated through the NIDM website (https://nidm.mha.gov.in/default_hi.asp) and other relevant platforms to encourage active participation and knowledge exchange.

All interested researchers, scientists, engineers, practitioners, policymakers, disaster management professionals and other relevant stakeholders are invited to submit abstracts on or before 22 November 2026. Upon acceptance by NIDM, authors will be required to submit their full-length chapters by 13 December 2026.

4. Target Group

This call is open to all researchers, engineers, scientists, planners, disaster risk managers, and professionals from government agencies, academic institutions and private sector entities.

5. Themes and Scope

Contributors are invited to submit chapters addressing the following themes:

Theme 1: Climate-Resilient and Adaptive Highway Infrastructure: Life-Cycle Approaches

- Climate-resilient planning and corridor development
- Climate-responsive highway design and engineering
- Resilient pavement and material technologies
- Climate-resilient bridges, culverts and drainage systems
- Slope stabilization and geotechnical resilience
- Climate-resilient construction practices and quality management
- Adaptive operation and maintenance strategies
- Rehabilitation, retrofitting and reconstruction of highway assets
- Life-cycle assessment and life-cycle cost analysis

Theme 2: Regional Adaptation Strategies for Highway Infrastructure across India

- Adaptation strategies for Hilly regions
- Adaptation strategies for Plains regions
- Adaptation strategies for Plateau regions
- Adaptation strategies for Coastal Plains regions
- Hazard-Specific Case Studies and Adaptation Strategies for Resilient Highway Infrastructure

Theme 3: Applications of Emerging Technologies for Highway Adaptation and Resilience

- GIS and remote sensing for climate-risk mapping
- Artificial intelligence and machine learning for risk assessment
- IoT and sensor-based highway monitoring
- Early warning and real-time hazard detection systems
- Climate modelling and high-resolution projections
- Drones and UAV-based infrastructure assessment
- Predictive maintenance and asset condition monitoring
- Decision-support systems for climate adaptation

Theme 4: Adaptation Practices for Resilient Highway Management

- Adaptation practices in climate-resilient highway development
- Sustainable and construction practices
- Nature-based and ecosystem-based solutions
- Disaster preparedness and emergency response
- Resilient highway operation and traffic management
- Innovative maintenance and asset-management practices
- Climate adaptation and cost-benefit approaches
- Institutional coordination and stakeholder engagement
- Policies, standards, codes and guidelines for resilience
- National and international case studies and lessons learned

6. Evaluation Criteria

Evaluation of the submitted entries of abstracts/full chapter will be based on the relevance of the theme, innovation, impact and scalability of the submitted abstract through peer review. The decision will be intimated through emails to corresponding authors. After acceptance of the abstract, the full chapter should be submitted in the prescribed format given as sample format. The review of full chapter will also be done in the blind peer review mode after submission from selected abstracts. The received comments from the reviewer, will be shared with corresponding authors for necessary changes as per the format or from technical point of view. All the submitted chapters will be checked for plagiarism. Chapters will be accepted/published if the plagarism level is <=10% and AI <=20%. Please make sure to minimize plagiarism as much as possible. Published Book volume of good practices would be launched later and e-copies will be disseminated to the participants and included in NIDM website. The accepted full-length chapters that successfully qualify the review process will be published in reputed publisher with an ISBN.

Expected Outcomes

- Identification of life-cycle-based approaches for integrating climate and disaster risk into highway planning, design, construction, operation, maintenance and rehabilitation.
- Documentation of hazard-specific and location-specific adaptation measures for floods, extreme rainfall, landslides, slope failures, debris flows, extreme heat, coastal flooding, erosion and other hazards.
- Sharing of regional case studies and best practices that can be replicated or adapted in similar highway environments.
- Application of GIS, remote sensing, IoT, AI/ML, advanced monitoring systems, climate modelling and early warning technologies for enhancing highway resilience.
- Development of actionable recommendations and management frameworks to improve the reliability, safety, continuity and long-term resilience of highway networks.
- Publication of the volume of adaptation practices as comprehensive knowledge repository for wider dissemination.

- Enhanced collaboration and knowledge exchange between different stakeholders in the highways sector.
- Promote and support research and development towards disaster resilience and climate adaptation in highways sector.

7. Submission Guidelines and Timelines

- Abstracts (up to 200 words) should be submitted as per the given sample format.
- Full-length chapters (3,000-5,000 words, excluding references) should be prepared and submitted in accordance with the given sample format. All chapters accepted for presentation must be original and unpublished work.
- Submissions must follow formatting guidelines and to be submitted in English.
- Entries will be taken for abstract/ full chapter through email and via registration link. The Queries related to chapter submission will be taken up through email highcap.nidm@nidm.gov.in and through provided contact information at Page no. 8.
- Each entry should focus on one of the thematic areas related to highway resilience.
- All chapters would be subjected to blind peer review and selected chapters will be published in reputed publisher with an ISBN.
- The content should reflect a detailed account of the successful case studies, use of innovative scientific approaches, advanced technologies and effective adaptation measures to enhance the climate resilience of highway infrastructure.

Abstract Submission Last Date: 22 November 2026
Full chapter submission Last Date: 13 December 2026

8. Contact Information

For submission of abstract and full chapter submission Email: highcap.nidm@nidm.gov.in

Contact for any related query:
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The National Institute of Disaster Management (NIDM) was constituted under an Act of Parliament with a vision to play the role of a premier institute for capacity development in India and the region. The efforts in this direction that began with the formation of the National Centre for Disaster Management (NCDM) in 1995. Gained impetus with its redesignation as the National Institute of Disaster Management (NIDM) for training and capacity development. Under the Disaster Management Act 2005, NIDM has been assigned nodal responsibilities for human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management. NIDM has performed a crucial role in bringing disaster risk reduction to the forefront of the national agenda. The Institute believes that disaster risk reduction is possible only through promotion of a "Culture of Prevention" involving all stakeholders.



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MANUSCRIPT GUIDELINESAND SAMPLE FORMAT

Title of the paper

First Author[1][0000-1111-2222-3333] and Second Author[2][1111-2222-3333-4444]

[1] Princeton University, Princeton NJ 08544, USA
[2] Springer Heidelberg, Tiergartenstr. 17, 69121 Heidelberg, Germany

Abstract *The abstract should summarize the contents of the paper in short terms, i.e. in 200 words, 12 point size italics.*

Keywords: First Keyword, Second Keyword, Third Keyword (4-5 keywords)

1 Introduction

(Sections like Introduction, methodology, analysis, results, discussion, conclusion, acknowledgments and references should be given.) Paper length excluding references is 3000-5000 words. A4 pages including tables and illustrations

1.1 A Subsection Sample

Please note that the first paragraph of a section or subsection is not indented. The first paragraphs that follows a table, figure, equation etc. does not have an indent, either.

Subsequent paragraphs, however, are indented.

Sample Heading (Third Level). Only two levels of headings should be numbered. Lower level headings remain unnumbered; they are formatted as run-in headings.

Sample Heading (Forth Level). The contribution should contain no more than four levels of headings. The following Table 1 gives a summary of all heading levels.

Table 1. Table captions should be placed above the tables. (All tables and illustrations (1.5 spaced with 1 inch margins and justified).

Heading level	Example	Font size and style
Title (centered)	**Lecture Notes**	14 point, bold- Times New Roman
1st-level heading	**1 Introduction**	12 point, bold- Times New Roman
2nd-level heading	**2.1 Printing Area**	10 point, bold- Times New Roman
3rd-level heading	**Run-in Heading in Bold.** Text follows	10 point, bold- Times New Roman
4th-level heading	*Lowest Level Heading.* Text follows	10 point, italic- Times New Roman

Displayed equations are centered and set on a separate line.

$$x + y = z \tag{1}$$

Please try to avoid rasterized images for line-art diagrams and schemas. Whenever possible, use vector graphics instead (see Fig. 1).

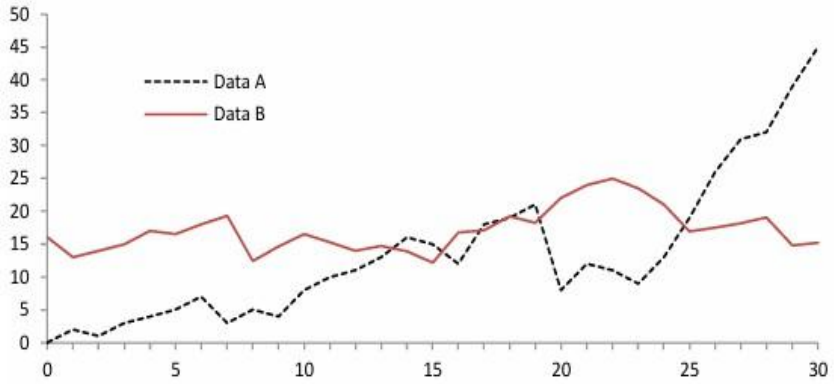


Fig. 1. Figures, maps and diagrams should be of good resolution (150 dpi or more), numbered consecutively. A figure caption is always placed below the illustration. Short captions are centered, while long ones are justified. The macro button chooses the correct format automatically.

For referencing and index citations should be as per American Psychological Association (APA) guidelines. Prefer the use of square brackets and consecutive numbers. Citations using labels or the author/year convention are also acceptable. The following bibliography provides a sample reference list with entries for journal articles [1], an LNCS chapter [2], a book [3], proceedings without editors [4], as well as a URL [5].

References

a. Journal Articles: Scruton, R. (1996). The eclipse of listening. The New Criterion,15(30), 5-13.

b. Article in a Magazine: Henry, W.A., III. (1990, April9). Making the grade in today's schools. Time,135, 28-31.

c. Book (Single and multiple Author(s)) McKibben, B. (1992). The age of missing information. New York: Random House. Larson, G. W., Ellis, D. C., & Rivers, P. C. (1984). Essentials of chemical dependency counseling. New York: Columbia University Press.

d. Article or Chapter in an Edited Book Barlow, D. H., Chorpita, B. F., & Turovsky, J. (1996). Fear, panic, anxiety, and disorders of Emotion. In R.Dienstbier (Ed.), Nebraska Symposium on Motivation: Vol. 43. Perspectives on anxiety, panic, and fear (pp. 251-328). Lincoln: University of Nebraska Press.

e. Conference Proceedings Schnase, J. L., & Cunnius, E. L. (Eds.). (1995). Proceedings from CSCL '95: The First International Conference on Computer Support for Collaborative Learning. Mahwah, NJ: Erlbaum.

f. Individual document/report/web page authored by an organization and available on organization Web site, no publication date: Accreditation Commission for Programs in Hospitality Administration. (n.d.). Handbook of accreditation. Retrieved from http://www.acphacahm.org/forms/ acpha/acphahandbook04.pdf