SEMINAR PROPOSAL

Title: **NATURAL AND MANMADE HAZARDS UNDER CHANGING ENVIRONMENTS**

INSTRUCTORS:

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Semester: **Spring 2025**

Class Schedule: **Every Friday 10:30 AM – 12:00 PM**

Format: **Online via Zoom**

1. Background

In today's rapidly evolving world, the frequency and intensity of both natural and manmade hazards have become critical issues, amplified by the impacts of climate change, urbanization, and industrialization. Understanding these hazards in a changing environment is essential to develop effective mitigation, adaptation, and management strategies. Natural Hazards include phenomena such as earthquakes, floods, hurricanes, wildfires, and droughts. Climate change has intensified these events, as rising global temperatures lead to more frequent and severe storms, prolonged droughts, and shifting weather patterns. Ecosystem degradation, such as deforestation and loss of biodiversity, also heightens vulnerability to natural disasters, disrupting natural processes that once served as protective buffers. Manmade Hazards, on the other hand, arise from human activity and include industrial accidents, chemical spills, nuclear incidents, armed conflicts, air and water pollution, resource competition, and more. These hazards are often linked to industrial growth, population pressures, and the increased demand for resource use.

Changing environments encompass not only the impacts of climate change but also socio-economic transformations, such as urban expansion and population density, that elevate the risk and impact of both hazards. Overcoming the combined challenges of natural and manmade hazards under changing environments demands multidisciplinary approaches and innovative solutions. Addressing these threats requires collaboration among policymakers, scientists, and communities globally. Thus, developing resilient infrastructure, establishing early warning systems, and promoting sustainable practices are inevitable to reduce the risks and enhance adaptive capacity. Building capacities through professional development activities, and delivering training, and seminars for key experts in the field are essential for disaster mitigation, preparation, response, and recovery. Continuous advancement of skills and the sciences on natural and manmade hazards contribute to helping organizations and communities to develop the skills, they need to survive, adapt, and thrive in a fast-changing world.

2. Course Description

This 10-week seminar is designed to explore the complexities of natural and manmade hazards and discuss strategies to anticipate, mitigate, and adapt to their impacts in our rapidly changing world. Natural impacts include droughts, flooding, landslides, wildfires, and anthropogenic actions such as deforestation, armed conflict, environmental pollution and contamination, and climate change will be covered in the seminar. The course will familiarize students with key concepts, theories, and approaches in responding, studying, and assessing these hazards. This seminar is crucial in ensuring the safety and resilience of societies through effective mitigation strategies and emergency preparedness plans by the policymakers, stakeholders, and the wider community. This also helps minimize the impacts of disasters on human lives, infrastructure, and the environment by ultimately creating more sustainable and resilient communities.

2.1. Learning objectives:

1. Overview of natural and manmade hazards: origins, impacts, and risks
2. Understanding climate change impacts on the environment and society
3. Exploring drought and its environmental and societal impacts
4. Exploring flooding and floodplain impacts and their management
5. Understanding the impacts of armed conflict on society and the environment
6. Describing the impact of wildfires and deforestation on society and the environment
7. Examining landslides and their environmental and societal impacts
8. Understanding environmental pollution and contamination
9. Use tools and technologies for assessing and understanding the hazards
10. Investigating early warning, adaptation, and mitigation strategies of natural and manmade hazards

3. Teaching Methods and Schedule

The course will be given in weekly sessions that include lectures, discussions, and interactive activities.

Week 1: Overview of natural and manmade hazards

Brief descriptions: Natural and manmade hazards are events that can cause significant harm to life, property, and the environment. This session will address the type, causes, patterns, and frequency of natural and manmade hazards. Understanding their origins, causes, patterns, potential impacts, and risks is essential for developing effective strategies to prevent, mitigate, and respond to disasters.

Suggested readings:

1. Paul, B. K. (2011). *Environmental hazards and disasters: contexts, perspectives and management*. John Wiley & Sons. **Reading Pages 1-22**. (Link to the book)
2. Smith, K. (2013). *Environmental hazards: assessing risk and reducing disaster*. Routledge. (**Optional Reading**) (Link to the book)
3. Pine, J. C. (2014). *Hazards analysis: Reducing the impact of disasters*. CRC Press. (**Optional Rading**) (Link to the book).

Week 2: Climate change and its impact on the environment and society

Brief descriptions: Climate change has significant impacts on both the environment and society. Climate change leads to more frequent and intense heatwaves, hurricanes, floods, droughts, and wildfires, disrupting ecosystems and damaging infrastructure. It also jeopardizes food security as changing weather patterns affect crop yields, potentially leading to shortages and increased prices, especially in vulnerable regions. In a session focused on climate change and its impacts on the environment and society, the following key contents are typically covered: understanding climate change, causes of climate change, environmental impacts, societal impacts, adaptation strategies, mitigation strategies, climate justice, and future outlook.

Suggested Reading:

1. Ting, D. S., & Stagner, J. A. (Eds.). (2021). *Climate Change Science: Causes, Effects and Solutions for Global Warming*. **Reading Pages 171-190.** (Link to the book)
2. IPCC, (2023) Summary for Policymakers. In: *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland. **Reading Pages 1-34.** (Link to the Book)

Week 3: Drought and its environmental and societal impacts (2 references)

Brief descriptions: Drought is a complex phenomenon with far-reaching consequences for both the environment and society. It is a prolonged period of abnormally low rainfall that leads to water shortages that can have significant environmental and societal impacts. Addressing drought impacts requires integrated management strategies, including sustainable water use, improved agricultural practices, and community resilience planning to mitigate effects and adapt to changing climate conditions. This session addresses the following key concepts and principles. Definition of drought, types of droughts, causes of drought, impacts of drought, drought monitoring and assessment, mitigation strategies, adaptation strategies, and drought preparedness and response

Suggested Reading:

1. Sheffield, J., & Wood, E. F. (2012). *Drought: past problems and future scenarios*. Routledge. **Reading Pages 9-38** (Link to PDF)
2. Wilhite, D. A. (2005). *Drought and water crises: science, technology, and management issues*. **Reading Pages 33-53** (Link to the Book)

Week 4: Flooding and floodplain impact and management

Brief descriptions: Flooding is one of the most common and destructive natural hazards worldwide, impacting human lives, property, infrastructure, and the environment. Effective floodplain management is crucial for mitigating flood risks and minimizing adverse impacts. This session covers the causes and effects of flooding and its forecasting the importance and impacts on floodplains, and various management strategies.

Suggested Reading:

1. Bronstert, A. (2003). Floods and climate change: interactions and impacts. *Risk Analysis: An International Journal*, *23* (3), 545-557. (Link to the Article)
2. MG Wolman, LB Leopold. (1957). River flood plains: some observations on their formation. USGS PROFESSIONAL PAPER 282-C. **Reading Pages 91-106.** (Link to PDF)
3. Opperman, J. J., Moyle, P. B., Larsen, E. W., Florsheim, J. L., & Manfree, A. D. (2017). *Floodplains: Processes and management for ecosystem services*. Univ of California Press. Optional Reading Material (Link to the Book)

Week 5: Societal and environmental impacts of armed conflict

Brief descriptions: Armed conflicts have far-reaching and devastating impacts on multiple aspects of society, the environment, and economies. These impacts can be both immediate and long-term, affecting infrastructure, human well-being, natural resources, and geopolitical stability. This session will discuss an overview of the key societal and environmental impacts of armed conflicts.

Suggested Reading:

1. Austin, J. E., & Bruch, C. E. (Eds.). (2000). *The environmental consequences of war: Legal, economic, and scientific perspectives*. Cambridge University Press. **Reading Pages 16-38.** (Link to the Book)
2. Brauer, J. (2009). *War and nature: The environmental consequences of war in a globalized world*. Rowman & Littlefield. **Reading Pages 1-3 and 19-26**. (Link to the Book)

Week 6: Wildfires and deforestation

Brief descriptions: Wildfires and deforestation represent critical anthropogenic hazards that threaten both environmental health and human well-being. Wildfires can be ignited by a variety of human actions, including land management practices, agriculture, and urban expansion. While wildfires are a natural part of many ecosystems, increased human activity can lead to more frequent and intense fires. This section covers understanding wildfires, causes of wildfires, impacts of wildfires (environmental impacts, air quality, and economic consequences), understanding deforestation, impacts of deforestation (biodiversity loss, soil degradation), interconnection between wildfires and deforestation, and their management and mitigation strategies.

Suggested Reading:

1. Runyan, C., & D'Odorico, P. (2016). *Global deforestation*. Cambridge University Press. **Reading Pages 1-38** (Link to the book)

2. Shroder, J. F. (2014). *Wildfire Hazards, Risks, and Disasters*. Elsevier. **Reading pages, chapter 11** (Link to the Book)

Week 7: Landslides and their environmental and societal impacts

Brief descriptions: A landslide is the sudden and fast movement of rock, soil, or debris down a slope, driven primarily by gravity. Landslides can occur in various forms, including rockfalls, mudslides, and debris flows. Common triggers include heavy rainfall, earthquakes, volcanic eruptions, and human activities like mining, deforestation, or construction. Topics to be covered under this section include environmental impacts (soil erosion, habitat destruction, water quality degradation, altered landscapes, and increased flooding risk) and societal impacts (property damage, loss of life and injury, displacement of communities, economic consequences, and mental health impacts)

Suggested Reading:

2. Glade, T., Anderson, M. G., & Crozier, M. J. (Eds.). (2005). *Landslide hazard and risk* (Vol. 807). Wiley Online Library. **Reading Pages 1-40** (Link to the Book)

3. Highland, L. M., & Bobrowsky, P. (2008). *The landslide handbook-A guide to understanding landslides* (No. 1325). US Geological Survey. (Link to the Book)

Week 8: Environmental pollution and contamination

Brief descriptions: Environmental pollution and contamination are significant issues that negatively impact ecosystems, human health, and the planet's sustainability. Pollution refers to the introduction of harmful substances, contaminants, or pollutants into the environment. At the same time, contamination is a broader term that describes the presence of unwanted substances in the air, water, soil, or food. This session provides the concepts and overview of the key types, sources of pollution and contamination, and their associated societal and environmental impacts.

Suggested Reading:

1. Pepper, I., Gerba, C. P., & Brusseau, M. L. (2011). *Environmental and pollution science*. Elsevier. **Reading Pages 3-12**. (Link to the Book)

2. Harrison, R. M. (Ed.). (2023). *Pollution: causes, effects and control*. Royal Society of Chemistry. **Optional Reading** (Links to the Book)

Week 9: Tools and technologies for assessments and monitoring of natural and manmade hazards

Brief descriptions: Assessing and monitoring natural and manmade hazards requires various tools and technologies to predict, detect, and manage the risks associated with these events. By enabling real-time monitoring, predictive modeling, and effective communication, these technologies help mitigate the impact of disasters, save lives, and protect infrastructure. As the frequency of extreme events continues to rise, investing in advanced hazard monitoring systems and technologies will be key to building resilient communities capable of withstanding future challenges. This session discusses the most recent and important tools and technologies and their significance in enhancing disaster resilience and risk management.

Suggested Reading:

1. Van Westen, C. J. (2013). Remote sensing and GIS for natural hazards assessment and disaster risk management. *Treatise on geomorphology*, *3*(15), 259-298. **Reading pages 12-25** (Link to PDF)

2. Jain, S. K., Mani, P., Jain, S. K., Prakash, P., Singh, V. P., Tullos, D., ... & Dimri, A. P. (2018). A Brief review of flood forecasting techniques and their applications. Link to PDF

2. Artiola, J. F., Pepper, I. L., & Brusseau, M. L. (Eds.). (2004). *Environmental monitoring and characterization*. Academic Press. **Optional Readings Material**

3. Gardoni, P., & Murphy, C. (2009). Capabilities-based approach to measuring the societal impacts of natural and man-made hazards in risk analysis. *Natural hazards review*, *10*(2), 29-37. **Optional Reading Material**

Week 10: Early warning, adaptation, and mitigation strategies of natural and manmade hazards

Brief descriptions: Early warning, adaptation, and mitigation strategies are essential for managing both natural and manmade hazards effectively. These strategies form a comprehensive approach to disaster risk management, enhancing resilience and protecting lives, property, and the environment from both natural and anthropogenic hazards. This section covers early warning systems (monitoring technologies, real-time forecast, and communication networks), adaptation strategies (infrastructure resilience, land use planning, and ecosystem restoration), and mitigation strategies (emission reduction, sustainable practices, and disaster preparedness).

Suggested Reading:

1. Kull, D., Gitay, H., Bettencourt, S., Reid, R., Simpson, A., & McCall, K. (2016). Building resilience: World Bank Group experience in climate and disaster resilient development. *Climate Change Adaptation Strategies–An Upstream-downstream Perspective*, 255-270. (Link to the Article)
2. Smith, K. (2013). *Environmental hazards: assessing risk and reducing disaster*. Routledge. **Reading Pages, chapter 1** (Link to the Article)
3. Montz, B. E., Tobin, G. A., & Hagelman, R. R. (2017). *Natural hazards: explanation and integration*. Guilford Publications. **Reading Pages chapter 1** (Link to the Book)
4. Wisner, B., Gaillard, J. C., & Kelman, I. (2012). *Handbook of hazards and disaster risk reduction*. Routledge. (Link to PDF)