Course title: Climate Change Vulnerability and Adaptation

Course code: NRC 135	**No. of credits:** 3	**L-T-P:** 27-14-08	**Learning hours:** 45

Pre-requisite course code and title (if any):

Department: Natural and Applied Sciences

Course coordinator(s): Dr Anand Madhukar	**Course instructor(s):** Dr Anand Madhukar

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

Course description

The course is designed to inform students about the factors influencing the vulnerability both the ecological and social systems to climate change and the various adaption options for building resilience to climate change. It introduces the students to the concepts of vulnerabilities, risk and adaptation to climate change and various tools and techniques for assessing vulnerabilities to climate change. The course will also expose the students to an array of adaptation options and how this can be incorporated into the regional developmental plan. The students, through the field study, will learn how to apply various tools and techniques for assessing vulnerabilities to climate change and to identify adaptation priorities.

Learning objectives

- To introduce the students the various vulnerabilities to climate change, and an array of adaptation possibilities.
- To inform about the necessity to incorporate and consider the changing climate in various long-term planning and development activities.

Course content

Module	Topic	L	T	P
1.	Introduction to the concepts of vulnerability and adaptation	4		
2.	**Risk and Vulnerability** Key risk and emergent risk; climate risk management Vulnerabilities of different ecological and social systems, coastal vulnerability, issues for developing countries, refer to tipping points in the Earth System. Qualitative to semi-quantitative methods to assess vulnerabilities to climate change.	9	4	
3.	**Adaptation** Indicators of adaptation, problems of its operationalization. Discussion on prioritization of different adaptation options, to qualitative measures of decision support, and connections between adaptation and mitigation: trade-offs and mal-adaptation. Potential adaptation options in key development sectors (Agriculture; Forestry; Cities; Water; Health; Energy). Factors influencing adaptation strategies (technical, institutional, financial) and constraints to developing strategies; consequences of adaptation strategies.	8	2	
4.	**Seminar** Explanation of exercise, how the system's perception of vulnerabilities can be developed with/unearth from stakeholders. Stakeholder dialogue on a case study – students will be divided into different stakeholder group and have a multi-stakeholder dialogue on a case study to decide on adaptation measures.	2	4	

5.	**Practical/ Field work** Interaction with planners, architects, officials from the authorities, locals, etc. and make their investigations and collect data, draw concept maps, etc. Later analyze results with different evaluation methods (network analysis, including a software solution), and to derive and test various adaptation means.	4	4	8
	Total	**27**	**14**	**8**

Evaluation criteria

The evaluation policy is designed to verify the knowledge acquired by students during the course. Evaluation will be based on written tests, seminar paper and assignments.

- Test 1: 20%
- Seminar paper: 20%
- Assignments: 20%
- Test 3: 40%

Learning outcomes

After this course, students should have a profound view about climate vulnerability of different systems under the current climate change regime, different adaptation possibilities and conflicts of implementation.

Pedagogical approach

Lectures and discussion of assigned readings. Students would be required to do an assignment and presentation which will be evaluated by the course instructor.

Materials

Suggested readings

1. Adenle A., Azadi H., Arbiol J., 2015. Global assessment of technological innovation for climate change adaptation and mitigation in developing world, Journal of Environmental Management, 161 (15): 261-275.
2. Adger W. N., 2006. Vulnerability, Global Environmental Change 16 (2006) 268–281.
3. Barnett, J. & S. O'Neill (2010). Maladaptation. Global Environmental Change—Human and Policy Dimensions 20: 211–213.
4. Berrang-Ford, L., J.D. Ford & J. Paterson (2011). Are we adapting to climate change? Global Environmental Change—Human and Policy Dimensions 21: 25-33.
5. Kelkar U., Kapil Kumar Narula, Ved Prakash Sharma, Usha Chandna (2008) Vulnerability and adaptation to climate variability and water stress in Uttarakhand State, India, Global EnvironmentalChange18: 564–574
6. Khajuria A. and Ravindranath N.H. 2012, Climate Change Vulnerability Assessment: Approaches DPSIR Framework and Vulnerability Index, J Earth Science and Climate Change, 3:1.
7. Orlove B., 2005. Human Adaptation to Climate Change: A Review of Three Historical Cases and Some General Perspectives, Environmental Science & Policy, 8(6): 589-600.
8. Sovacool B.K., D'Agostino A.L., Meenawat H., Rawlani A., 2012. Expert views of climate change adaptation in least developed Asia. Journal of Environmental Management, 97 (30): 78-88.
9. Tanner, T.M. and Horn-Phathanothai, D.L., 22014. Climate Change and Development, Routledge Perspectives on Development.
10. Varma et al 2014_Climate change disasters and development: Testing the waters for adaptive governance in India. Vison 18 (4) 327-338.

Case studies

Journals **Field work and assignment**
Advanced Reading Material
Additional information (if any)
Student responsibilities The students are expected to submit assignments in time and come prepared with readings when provided.

Course Reviewers

The course is reviewed by the following experts.

1. Dr. Mustafa Ali Khan, Team Leader IHCAP, Swiss Cooperation Office India, Embassy of Switzerland.
2. Dr. Thomas Tanner, Head of Adaptation and Resilience, Overseas Development Institute, India.
3. Dr Usha Mina, Associate Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi.