

# Vulnerability to environmental change

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[Word version of course outline](#)

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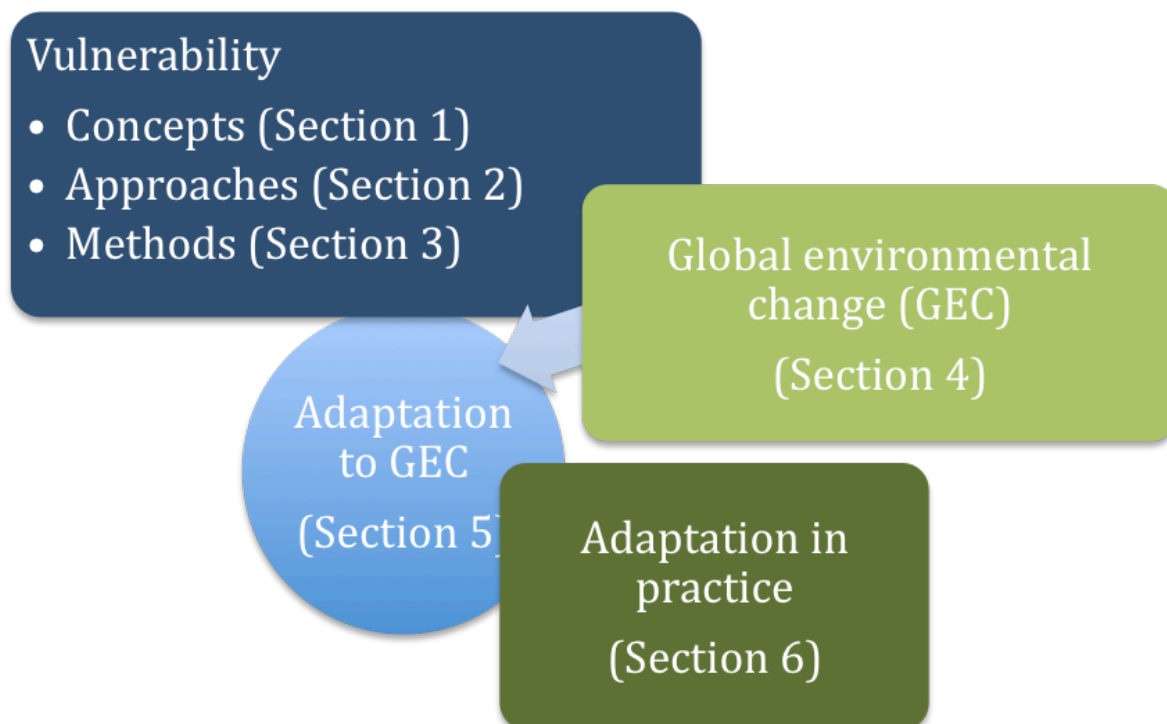
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Figure source: <http://wakeupfreakout.org>

## Overview

This is a 4 week module that is part of a third year course called *Sustainability and the Environment* (EGS 3021F) in the [Department of Environmental and Geographical Science](#), [University of Cape Town](#). The course introduces the concept of vulnerability and explores its origin, drawing on three different conceptual approaches namely Risk/Hazard, Political economy/ecology and Ecological resilience. It then looks at different methods for undertaking vulnerability assessments. Building on the theory and method sections it focuses on why the concept of vulnerability is important in the field of environmental change with a focus on climate change. The international process of assessing the science is explored followed by material addressing adaptation to climate change and examples of vulnerability and adaptation in practice in South Africa. A schematic of how the different sections fit together is shown below.



**Figure 1: Components of course 'Vulnerability to environmental change'**

## ***Teaching and learning context***

The material is presented in the form of powerpoint presentations for 6 sections. Activities to accompany the slides are presented here. The slides form the basis of presenting the theory and linking it to key literature. Examples are provided in many places of how the theory is applied in case studies, often from work that the lecturer has been involved in and relevant to the southern African region. It is suggested that teachers who use this material in other contexts draw on local examples to support the theoretical discussions. At times, buzz group questions are provided. These are used within large classes to encourage discussion among students. Usually students are asked to turn to the person next to them and discuss the question for 60 seconds. There is then time for feedback from these discussions so that the class discussion draws on individual experiences.

This field is constantly changing so it is important that up-to-date material is included where relevant.

*Course objectives:*

1. understand theoretical concepts of vulnerability
2. overview of what methods to use to assess vulnerability
3. understanding of the concept and application of adaptation to climate change

## ***Course components***

### **Course overview [\(ppt\)](#)**

The first presentation outlines the different components of the course as seen in the figure above.

### **Section 1: Overview of risk and vulnerability**

[\[powerpoint presentation of section\]](#)

The first lecture provides an overview of why we need to understand risk to manage environmental change. Risk and hazard are presented as important terms to understand in underpinning the understanding of vulnerability. The nature of vulnerability is also unpacked, by exploring different types of vulnerability such as social or environmental vulnerability and the importance of understanding vulnerability at different scales

*Activity:*

1. Print out 10 definitions of vulnerability from [VulnerabilityNet.org](http://VulnerabilityNet.org) to people in the class and ask them to read out.
2. Vulnerability to Food insecurity exercise: Show slide with 4 boxes with different scenarios in terms of vulnerability to food security (without explanatory text).

## Section 2: Conceptual frameworks underpinning vulnerability approaches

[\[powerpoint presentation of section\]](#)

First some of the broad conceptual framing of vulnerability approaches are presented before different approaches are explored. Vulnerability has been the focus in a number of different disciplines resulting in different aspects of vulnerability being prioritised, measured and understood. Three different vulnerability approaches are explored in detail, specifically Risk/Hazard; Political economy/ecology; Ecological resilience approaches. This section highlights the contested nature of vulnerability as well as how it is used in practice.

*Activity:*

1. Buzz group: When have you been vulnerable and why?
2. Ask class about recent 'natural hazards' and then get images from reliefweb to show them examples from around the world

## Section 3: Assessing vulnerability

[\[powerpoint presentation of section\]](#)

In order to assess vulnerability it is important that the right questions are asked. This section highlights the need to understand the complexity of vulnerability and the details of the case in question in order to choose appropriate methods and tools that capture relevant information. The example of assessing livelihood vulnerability is used to illustrate examples of a number of methods including role-play, climatic calendars, cognitive mapping and oral histories. Some specific tools such as indicators and mapping and agent-based modelling are then presented in more detail. This section highlights that both qualitative and quantitative methods are useful but it is the question being asked that is most important to establish in order to choose appropriate methods.

*Activity:*

1. Role-play example
  - o 3 class volunteers (actors): 1 student 'in distress' with injured hand, 1 friend and 1 emergency personnel
  - o Actors are told scenario and have to act out. Class discusses response.
  - o Scene 1: Student is panicky about accident, goes to friend for help, who tries to call for help.
  - o Scene 2: Student injures hand and is calm about it..
2. Buzz group: Between the 2(3) of you, each choose 1 method (Scenarios, Indicators and mapping, Participatory livelihood methods) – describe to the other the strengths and weaknesses of your chosen approach
3. Video: Resilience: How is scenario planning useful? Garry Peterson  
<http://www.youtube.com/watch?v=vI8leCy7Qvc>

## Section 4: Vulnerability to environmental change

[\[powerpoint presentation of this section\]](#)

This section focuses on climate change in the context of broader environmental change, drawing on the IPCC to highlight some of the expected impacts. It also looks at the IPCC process of assessing and presenting the science. The previous lectures on the topic of vulnerability help to highlight why Africa is particularly vulnerable. Although South Africa is one of the less vulnerable countries in Africa, it is used to present the specific impacts of climate change in order to introduce the topic of adaptation to this change.

*Activity:*

1. **Film:** Wake Up, Freak Out - then Get a Grip is a short, animated film about climate change by Leo Murray (<http://wakeupfreakout.org/about.html>). Film discussion: Note 2 aspects of each of the 3 components of vulnerability (Exposure, sensitivity and resilience) and feed back to class
2. **Buzz group:** Given the expected biophysical impacts of climate change, what do you think the impacts will be on South Africa's people

## Section 5: Adaptation to environmental change

[\[powerpoint presentation of this section\]](#)

Adaptation is presented as a deliberate response to a changing environment. In order to prioritise adaptation responses and know how to adapt it is important to understand current and potential vulnerability. By focusing on current vulnerability, adaptation can aim to reduce vulnerability to environmental change. The focus of adaptation can be top-down but the bottom-up approach is presented here to include ways to encourage agency. Different types and characteristics of adaptation show that it is a broad concept.

1. **Buzz group:** Why is the concept of vulnerability important to understand in the context of climate change?

## Section 6: Adaptation plans and practice

[\[powerpoint presentation of this section\]](#)

In this section, projects are presented to show examples of adaptation research, planning and practice in South Africa. The Ethekwini Municipal Climate Protection Programme (MCP) is a good example of an adaptation response at the municipal scale that includes a focus on climate science, adaptation and mitigation with their work on health, food security and water and sanitation. Then the case of rural livelihoods' vulnerability to climate risk is explored through a case study from Limpopo province. This case study looks at vulnerability to a range of stressors and then places the key vulnerabilities in a climate change context in order to address local concerns rather than imposing a focus on climate change at the outset. This section ends by exploring why adaptation should be a priority in South Africa.

2. **Buzz group:** Why do you think adaptation should be a priority in South Africa?

## Assignment for module: Vulnerability essay

*Length:* 2500 (over 3 000 not marked)

*Marks:* 100 (worth 10%)

*Choose 1 topic:*

1. Vulnerability has numerous definitions and conceptual origins. Using a case study (either from the literature or your experience), explain the concept of vulnerability, the conceptual lineage of the approach you are using and examples of vulnerability within the case study.
2. Vulnerability is a concept used within the field of global environmental change. Explain the advantages and challenges of this concept within the field, using examples to support your argument.



## Course reference list

### Essential readings for course

- Smit, B., and Wandel, J. (2006). Adaptation, adaptive capacity, and vulnerability. *Global Environmental Change* 16, pp. 282–292.
- Eakin, H and Luers, A.L. (2006). Assessing the vulnerability of social-environmental systems. *Annu. Rev. Environ. Resour.* 31: 365-94.
- Kasperson, R.E., E. Archer, D. Caceres, K. Dow, T. Downing, T. Elmqvist, C. Folke, G. Han, K. Iyengar, C. Vogel, K. Wilson and G. Ziervogel. (2005). *Vulnerable Peoples and Places*. (Eds) Hassan R, Scholes R and Ash N. *Ecosystems and Human-Well-being; Millennium Assessment Report: Current State and Trends*. Washington D.C.: Island Press.
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### Additional Section 1 and 2:

- Adger W.N., Hughes, T.P., Folke, C., Carpenter, S. et al. (2005) Social-ecological resilience to coastal disasters. *Science* 309(5373), 1036-1039.
- Cutter, S. and Smith, M. (2009). Fleeing from the hurricane's wrath: Evacuation and the two Americas. *Environment*. 51. 2. 26-39.
- Kaplan M., Renaud F.G. and Lüchters G. (2009): Vulnerability Assessment and Protective Effects of Coastal Vegetation during the 2004 Tsunami in Sri Lanka. *Natural Hazards and Earth System Sciences*. 9:1479-1494.
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- Wisner, B., Blaikie, P., Cannon, T., Davis, I., (2004). *At Risk: Natural Hazards, People's Vulnerability, and Disasters*. Routledge, New York.
- Wong, K and Zhao, X. (2001) Living with Floods: Victims' Perceptions in Beijiang, Guangdong, China. *Area*. 33, 2. 190-201.

### Additional Section 2:

- Methods addressed in essential readings and Kaplan et al. (2009)
- Ziervogel, G. (2005) "Vulnerability Assessment" in Erhardt, Gunther, Klasing, Nilsson, Ziervogel, Wagner: *Sustainability Appraisal Tools, TT6 Overview Paper, Sustainability A-Test*, (Unpublished Working Paper), available from IVM, Free University Amsterdam, Netherlands  
<http://www.vulnerabilityindex.net/>
- Archer, E.R.M., Oetlél, N.M., Louw, R, Tadross, M.A. (2008) 'Farming on the Edge' in arid western South Africa: adapting to climate change in marginal environments. *Geography*. 93. 98-107.
- Dow, K. (2005) Steps Toward Mapping Vulnerability to Climate Change [http://www.directionsmag.com/article.php?article\\_id=901&trv=1](http://www.directionsmag.com/article.php?article_id=901&trv=1)
- Eakin and Bojorquez-Tapia, L.A. (2008). Insights into the composition of household vulnerability from multicriteria decision analysis. *Global Environmental Change*. 18. 112–127.
- Wilbanks, T. J., Ensminger, T. and C. K. Rajan. (2007) Climate Change and Vulnerabilities and Responses in a Developing Country City: Lessons from Cochin, India. *Environment*. 51.2.26-36
- FIVIMS – vulnerability mapping [http://www.fivims.org/index.php?option=com\\_content&task=blogcategory&id=37&Itemid=56](http://www.fivims.org/index.php?option=com_content&task=blogcategory&id=37&Itemid=56)

### Additional Section 4-6:

- Adger, W.N. (1999). Social Vulnerability to Climate Change and Extremes in Coastal Vietnam. *World Development* Vol. 27, No. 2, pp. 249-269.

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- Ford, J. (2008). Vulnerability of Inuit food systems to food insecurity as a consequence of climate change: a case study from Igloolik, Nunavut. *Regional Environmental Change*.
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Photos Gina Ziervogel

