

UNU-IC Course Outline: Global Change and Planetary Boundaries

This course is part of the [UNU Intensive Core \(UNU-IC\) Courses](#).

Global change, which largely refers to planetary-scale changes in the Earth system mainly caused by anthropogenic activities, is threatening sustainable development prospects in multiple ways. In the last century, global change has become critical although interactions between people and the environment have been taking place over thousands of years. Global changes like rapid urbanization, population growth, industrialization, and land conversions have affected life support systems by challenging different demands and deteriorating environmental systems extensively. This course will cover the concepts related to such global environmental changes; their implications on food, water and health; and various solutions including climate change adaptation and mitigation measures; and initiatives such as Future Earth and the 2030 Agenda for Sustainable Development. This course is structured into four clusters with 12 lectures and 2 debate sessions including an interactive lecture by Johan Rockstrom via video from Stockholm. In the first cluster, an introduction on global environment change, urbanization and governance issues will be covered.

Lectures under cluster 2 will cover topics on planetary boundaries, Future Earth and the Sustainable Development Goals (SDGs). Planetary boundaries are the central concept in the Earth system framework proposed by Johan Rockstrom and other associated researchers. It assesses the Earth system through nine planetary systems: climate change, ocean acidification, stratospheric ozone depletion, nitrogen and phosphorus cycles, global freshwater use, change in land use, biodiversity loss, atmospheric aerosol loading, and chemical pollution. According to Rockstrom, some planetary systems, such as biodiversity, have pushed beyond their planetary boundaries. A lecture on planetary boundaries and the challenges of global change will explore the nexus of global change and the Earth system to find answers towards global sustainability. Later sessions under this cluster will talk about different initiatives including Future Earth and the SDGs. Future Earth, a collaborative global knowledge platform, was initiated to address the reality that human activities have already transformed the Earth system. The Future Earth initiative emphasizes research that supports deliberate transitions and transformations towards global sustainability. The 2030 Agenda for Sustainable Development comprehensively integrates and balances the three dimensions of global challenges: environmental, social and economic.

Climate change due to global warming is considered one of the greatest challenges the global community has faced in recent years. Sessions under cluster 3 will provide an overview on causes of climate change and its impact on different sectors like water, food and health. In the first session, global warming brought on by extensive bio-mass burning, industrialization, urbanization, land use change, population growth and other causes of climate change will be discussed. Climate projections are necessary to make climate change impact assessments on different sectors. Such projections from different global climate models considering different greenhouse emission scenarios proposed by the Intergovernmental Panel on Climate Change (IPCC) are largely employed to understand potential impacts of climate change on different sectors. Water, food and health security are key challenges under climate change which largely include increased temperature, precipitation extremes and sea level rise. Studies on the effects of global change on the water sector (flood, drought, water pollution, water shortage, etc.) indicate the need to manage water wisely through sustainable water resource management practices. Food production systems are largely dependent on climatic conditions. Climate change impact assessments are required for the sustainable management of food production systems such as farming practices, crop varieties and related technologies. The effects of climate change on our health can be assessed by looking at the nexus of food, water, air and weather. Following the overview of climate change and projections session, this course will provide three lectures on the nexus of climate change and the water, food and health sectors.

Assessment Reports by the IPCC have pointed out that climate change due to global warming is probably unavoidable. In order to address the implications of climate change, it is essential to project, adapt to and mitigate climate change for the sustainable management of affected sectors. Cluster 4 sessions will provide an overview of different measures to address the challenges of climate change through lectures on adaptation and mitigation, and interactive debate sessions. Adaptation involves formulation of different ways to reduce the vulnerability of expected climate change impacts such as increased flood levels and sea level rise. An example of adaptation may be to increase the height of embankments to protect surrounding areas from increased flooding due to climate change. Non-structural adaptation measures could include awareness-raising, risk mapping, relocation, and community involvement. On the other hand, mitigation measures aim to prevent further climate change through reduction of greenhouse gas emissions. Examples of mitigation include promoting forestation, use of renewable energies, and energy efficient technologies.

Coordinators

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Course Outline

Cluster 1: Introduction, Global Environment and Governance

- Session 1: Introduction and Overview: Introduction of the Course Outline
- Session 2: Global Environmental Change and Urban Environment
- Session 3: Planetary Boundaries, Overview

Cluster 2: Climate and Social Change Impact on Food, Water and Health

- Session 4: Climate Science and Projection
- Session 5: Water Sustainability under Climate Change
- Session 6: Urban Water Management in Developing Countries
- Session 7: Food Sustainability under Climate Change Stress
- Session 8: Sanitation and Health Issues in Urban Area

Cluster 3: Climate Change Mitigation and Adaptation

- Session 9: Climate Change Adaptation for Regional Sustainability
- Session 10: Climate Change Mitigation, Practical Approach in Developing Countries

Cluster 4: Biodiversity in the Context of Global Change and Ecosystem Assessments from Local, National, Regional to Global Scale

- Session 11: Global Change and Challenges of Biodiversity and Ecosystem Services and its governance
- Session 12: Convention on Biological Diversity (CBD), Aichi Biodiversity Targets, and Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)
- Session 13: Toward the Creation of a Sustainable Society in Harmony with Nature and governance of biodiversity and ecosystem services

Session 14 & 15: Debate on global changes (including presentation)

**Please note that these topics and schedule are subject to change.*