Thematic introduction: climate (change), adaptation and mitigation
Overview

Climate change terminology
• Weather, climate, climate variability & climate change
• Greenhouse effect & emission pathways
• Climate change signals

Adaptation to climate change
• Definition and examples

Mitigation
• Definition and examples
Basic definitions

Weather

The state of the atmosphere at a given time with regard to temperature, rainfall, wind, etc.

Climate

The weather averaged over a long period of time, typically 30 years or more

Climate variability

Variations in the mean state of the climate

Climate Change

A change of the global climate
Solar radiation powers the climate system.

Some solar radiation is reflected by the Earth and the atmosphere.

About half the solar radiation is absorbed by the Earth’s surface and warms it.

Infrared radiation is emitted from the Earth’s surface.

The Greenhouse Effect
Some of the infrared radiation passes through the atmosphere but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth’s surface and the lower atmosphere.
Global GHG composition, 2010

Others:
- Hydrofluorocarbons (HFCs) = 1.5%
- Perfluorocarbons (PFCs) = 0.2%
- SF6 = 0.3%

Natural and anthropogenic sources of CO₂
Where do emissions come from?

Energy Total 66.5%

Land use change/Agriculture 26%

CO₂: 77% of GHG

Methane: 15%

Nitrous oxide: 7%

Source: cait.wri.org


CO₂ concentration before industrialisation: ca. 280 ppm
GHG emissions by country per capita (2000)

Source: wikipedia
GHG emissions by country (2000)

Source: wikipedia
IPCC Scenarios (RCP – Representative Concentration Pathways)

Source: Climate Change 2014: Impacts, Adaptation, and Vulnerability. IPCC
Global temperature changes
Signals of global warming

Rising temperatures, heat waves

Sea level rise

Melting ice

Ocean acidification

Changing rainfall patterns

Changes in extreme events

Scientists very sure

Less clear, and regional differences

Source: Red Cross Climate Training Kit, Module 1a – Climate change science and impacts
From signals to tangible effects

Climate signals
- change in temperature patterns
- change in precipitation patterns
- increase in extreme weather events (storms, heat waves...)
- melting of pole caps, glaciers and permafrost
- sea-level rise
- ocean acidification

Effects
- droughts
- change of natural systems’ productivity
- increase in forest fires
- exceptional floods
- loss of land
- health issues
- ...

- food insecurity
- loss of income
- ...

→ vulnerable livelihoods
→ economic damages
How to react?

- **Adaptation:**
  Manage the unavoidable

- **Mitigation:**
  Avoid the unmanagable
Adaptation to climate change

Adaptation (IPCC, 2013): The process of **adjustment** to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or **avoid harm** or exploit **beneficial opportunities**. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

**Goal:**
reduce negative effects of climate change and benefit from positive effects
Adaptation - thinking in impact chains
Adaptation measures – examples

Photos: C. Berger
Adaptation measures – examples

Photo: C. Berger

Photo: MetOffice UK
Mitigation of GHG

**Mitigation (IPCC, 2013):** A human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs).

**Paris (CoP 2015):** +2°C maximum, desirable: 1,5°C

**Goal:**
reduce emissions in order to alleviate the extent of climate change
Mitigation measures – examples
Adaptation and mitigation: complementary strategies

Global climate change: change in mean global temperature, changes in regional temperature, rainfall, pressure, circulation, etc.

Mitigation: reduce emissions, reducing magnitude of CC (global)

Greenhouse gas emissions

Climate change impacts

Adaptation: reduce risk to actual & expected CC, reduce losses, seize opportunities (local)