

Keynote speech

Climate change: Overview of risks, uncertainties and response strategies

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Abstract

Greenhouse gas emissions and climate change are generally seen as one of the most serious environmental problems. According to the assessment reports compiled by the Intergovernmental Panel on Climate Change (IPCC), the risks due changing climate can be large and they are unevenly distributed. Largest impacts are likely to be in developing countries, e.g. due increased draughts and floods, impaired availability of water and food and due to low adaptation capacity in general.

The uncertainties in assessing the climate change and its impacts are large, however. First, the development of ghg emissions in the long term includes many uncertainties due to varying estimates for population growth, development of technology, governance and economy in general. Second, the removal of emissions from the atmosphere includes uncertainties like those in the carbon cycle. The radiative forcing due to anthropogenic changes in the atmosphere is quite uncertain especially concerning the impact of aerosols. The sensitivity of climate to a certain increase of the atmospheric CO₂ concentration is still poorly known and the range of the sensitivity has not considerably decreased during the last decade. Further, the biospheric impacts depend mainly on local changes of temperature and soil moisture which are typically more difficult to estimate than global average changes. Impacts on humans depend to a great extent on adaptation capacity which varies by countries. As a conclusion, the uncertainty of impacts is large, however, the risk of high consequences exists.

Central questions in response strategies is how to cover the uncertainty and how to react to possible high consequences estimated. The components of the response could be research of climate change phenomena in all levels for reducing uncertainties, improvement of adaptation to consequences, and mitigation of climate change including research on mitigation measures and technologies. The adaptation and mitigation measures are linked with each other and with general development issues. Countries have selected different strategies depending on their interests. At the global level, UN Framework Convention on Climate Change (FCCC) has been agreed, but the Kyoto Protocol giving specific emission commitments to the industrialised countries has not entered into force.

Mitigation of climate change is generally taught to take place through the control of atmospheric greenhouse gas concentrations via enhancing sinks, i.e. accumulating carbon from the atmosphere in forests and soils, and via reducing ghg emissions. The reduction of emissions is the main response measure, it has great potential but it can be costly. The emission reductions should be done in global scale to be of importance. The UNFCCC and the Kyoto Protocol are attempts to contribute to this goal.

In the emission reduction, technology has a crucial role. First, technology is important in the efficiency of energy distribution and use. Improvement of energy efficiency have great potential in global emission reduction. Second, the choice of energy sources and technology are important for efficiency of energy production and emission control. There are many ways to improve the efficiency of fossil-fuel based energy technologies. The ghg emissions can also be limited by capture and storage of CO₂ and increasing the share of nuclear power and renewable energy like hydro, biomass, waste derived fuels, wind, solar, geothermal etc. However, in addition to R&D, commercialisation and diffusion of technologies need also support measures.