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E-learning, climate change and carbon footprints

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Climate Change Impacts, Adaptation and Mitigation is an interdisciplinary 15 ECTS MSc E-learning course offered by the University of Copenhagen (<http://www.climate-change.dk>). The focus of the course is climate change impacts and the human response to climate change, including efforts to adapt to climate change, as well as efforts to avoid or reduce the negative impacts of climate change. Using the IPCC Fourth Assessment Report as the main reference together with recent complementary and contrasting findings, the relevant managerial and economic tools are applied to analyse the different aspects of climate change and discuss possible solutions.

The course is divided in four main parts. In the first part of the course the E-learning platform is introduced and a basic understanding of the physical science of climate change is given, together with a brief introduction to the ongoing climate change debate. Natural and anthropogenic drivers, and direct observations of recent climate change are presented. Different climate change models and scenarios are presented and discussed in relation to future climate change projections.

In the second part of the course the impacts of climate change and potential adaptation strategies in different sectors are presented. After a short introduction to adaptive management and adaptive capacity, the climate change impacts and adaptation practices for ecosystems, land use, water resources, society and human health are presented and discussed in relation to both options, constraints, costs and benefits.

The third part of the course deals with different climate change mitigation strategies. First, a number of strategies are presented, including carbon sequestration, transition to carbon neutral energy sources, geo-engineering as well as measures to increase energy efficiency. Afterwards, it is analyzed and discussed which of the strategies for climate change mitigation are the most effective and cost-effective, both on a global scale and in various regions of the world.

In the fourth and final part of the course the focus is climate change policy and social change. First, the current status of international climate change negotiations is discussed. Afterwards, the regulatory instruments that may be applied to achieve climate change policy goals are presented. Finally, the course ends with a discussion of the need for voluntary agreements and social change in order to reduce the negative impacts of climate change.

Two objectives were integrated in the development of the course. First, the use of E-learning should increase the quality of teaching/learning. Second, the carbon footprint of the course should be kept as low as possible. The first objective was met in two ways. First an interdisciplinary team of teachers from the University of Copenhagen, the Danish Meteorological Institute, University of California at Berkeley and Australian National University was established in autumn 2008. These teachers, who are all experts within their respective fields, would not have been able to contribute together in a normal face-to-face course.

Second, the fact that the course is offered as E-learning makes it available for students all over the world. In order to use this to increase the quality of learning, international and interdisciplinary students groups are formed, thereby facilitating collaborative interdisciplinary learning and maximising the exchange of information and creation of knowledge about climate change impacts, adaptation practices and mitigation options from a wide range of countries.

The second objective is also met in two ways. First, during the development of the course the carbon footprint is kept low by replacing, flight travels between Denmark, US and Australia with online meetings in web conference rooms. Similarly the number of car trips are reduced.

Second, in the beginning of the course students are requested to calculate their estimated carbon footprints from taking the course as an online course and compare it with their carbon footprint if the course had been a face-to-face case. This comparison shows that taking the course as an online course saves a substantial amount of CO₂ from flight travels and car trips to and from Copenhagen.

In conclusion our study suggests that the use of E-learning makes it possible to increase the quality of higher education courses on climate change, while at the same time reduce the actual carbon footprints compared with face-to-face courses.