Chapter 12
Can Educational Approaches Help to Revolutionize Quantitative Solutions for Climate Change?

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ABSTRACT

In order to apply web-supported education to solve one of the foremost issues revolutionizing our life on the planet Earth, this chapter focuses on global climate change and its driving forces from a both didactic and scientific perspective. It describes how to "tackle the task of a transition through technological targets" (T5). It suggests a technology-oriented quantitative approach based on the "Global Change Data Base" for the sharing of hypotheses, scenarios, political applications, and didactic strategies related to planning, developing, managing, using and evaluating technological targets towards climate protection and global sustainability in academia, administration, education and policy consulting. The complete logical chain of cause and effect from social drivers to CO_2 emission and climate change is used as an educational basis for advocating the global necessity and potential technological feasibility of CO_2 reduction. Students negotiate global structural transitions and a set of CO_2 abatement measures (similar to the game "Surfing Global Change").

OBJECTIVES

This chapter designs an *educational approach* for *assessing the drivers of climate change*.

One key achievement of *participatory* and web based training is to create *new structures of human interaction* and public forums for communication (Vogler et al., 2010, Ahamer, 2004). Interaction among learners and a peer review process are key to many real-world interactions (Roth et al., 2001, Prensky, 2001, Corbeil, 1997). Societal development appears to be facilitated by *comprehension of opposed standpoints* (Rauch & Strigl, 2006, Röhrs, 1998). The motivation for the present chapter was to create

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an environment in which optimised consensus building is learned in order to promote a sustainable future (Rauch, 2003; 2006). Interactive, web-based learning is used as a vehicle to impart such skills.

Material to stimulate teaching and learning are provided elsewhere (Ahamer, 2005, 2013, 2015a, b) and the difference of the present approach to earlier ones is analysed in Schinnerl (2003) and others (Kok, 2009, van Vliet et al., 2010, Frederickson, 2005, Rounsevell & Metzger, 2010) and institutionally implemented by FLIS (2015). An ethical approach towards global change is essential (Stähli, 1998, Sterman, 2000). The advantage of the present approach is that it includes quantitative methods for scenario writing (Grübler et al., 2012).

Regarding the didactic method, Restrepo and Christiaans (2004: 3) point out that "[didactic] design is a *discursive activity*. Designers propose design issues, reflect upon and discuss them and for each issue propose answers (also called positions)." Hence review activities (and role games) are the method of choice. The main learning problem seems to be: How can an educational process be suitably designed in order to provide a series of social patterns and procedures which are characteristic for situations encountered when assessing global change?

The Aim

This endeavour aims at integratively assessing the *relative importance of long-term techno-socio-economic developments* driving global climate change. We ask: Which *megatrends help* and which megatrends hinder *sustainable development*?

The results of an interdisciplinary analysis of long-term trends are intended to improve factual understanding and to rank the anthropogenic causes of environmental change in order to help in the formulation of consistent environmental policies, in particular CO_2 abatement measures on global and national levels.

Issues and State of the Art

Given the scientific and public increase in concern about global warming, policy makers have made several steps in the direction of cutting back greenhouse gas emissions (mainly of CO_2) in various documents, globally comprised in the UNFCCC procedures (UNFCCC, 2015). Recent literature (Weizsäcker et al., 1995; 2009) enumerates practical technological possibilities for reaching such necessary and envisaged targets. In order to strengthen the scientific basis for choosing appropriate, feasible and effective measures, the key linkages and feedbacks between human activities and behaviour – and significant environmental changes – are to be identified and evaluated by an interactive IT approach and evaluated in dialogue.

The differences to earlier modelling approaches for the energy-related drivers of global and climate change can be summarised as follows

A. Energy technology databases (such as IKARUS, GEMIS; see Kraft et al., 2002, IINAS, 2015) and energy models (such as E3ME, GEM-E3, CASPER) have until now reached a high level of differentiation into dozens of sectors for energy use and they comprise information on details for technical performance, costs and emissions for thousands of combustion facilities. The family of optimisation models is the choice for identifying a path towards a desired target. What is still missing is (1) their combination with the subsequent chain of models and (2) the usage of their results for ongoing political negotiations. In Europe the increasing need of harmonised emission reporting and monitoring calls for detailed energy-economy-environment modelling.

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