ClimTrans2050 – a Research Plan for Open Source Model for Analyzing Austria's Transition to a Low-Carbon Economy by 2050

Motivation and aims of the ClimTrans2050 project

The Paris agreement substantiates the immediate need for action to mitigate climate change. In order to meet the 2°C warming target challenging mitigation measures need to be implemented, which will put national economies under unprecedented strain. This emphasizes the need for national strategies to manage the transition to low-carbon economies. Development of effective transition strategies require: 1) holistic understanding of the socio-economic-nature system and the interactions between its components; 2) identification of national targets for greenhouse gas (GHG) emission reductions embedded in the global context and consistent with internationally accepted levels of global warming; and 3) means of assessing the impacts and effectiveness of different transformation options.

The **ClimTrans2050** project aims at developing an open-source modelling framework moving beyond the boundaries of the current modelling practices and enabling the transition to a low-carbon economy at the national level. The potential of this new framework was illustrated with Austria serving as a case. The project's outcome is a research plan which is unique in two ways: i) it follows the innovative approach built around functionalities (such as nutrition, shelter, access to goods, services and people) understood as interactions of stocks and flows and which are to be satisfied from the perspective of well-being of individuals living in a low-carbon world; and ii) it embeds the national economy into the global GHG global warming context.

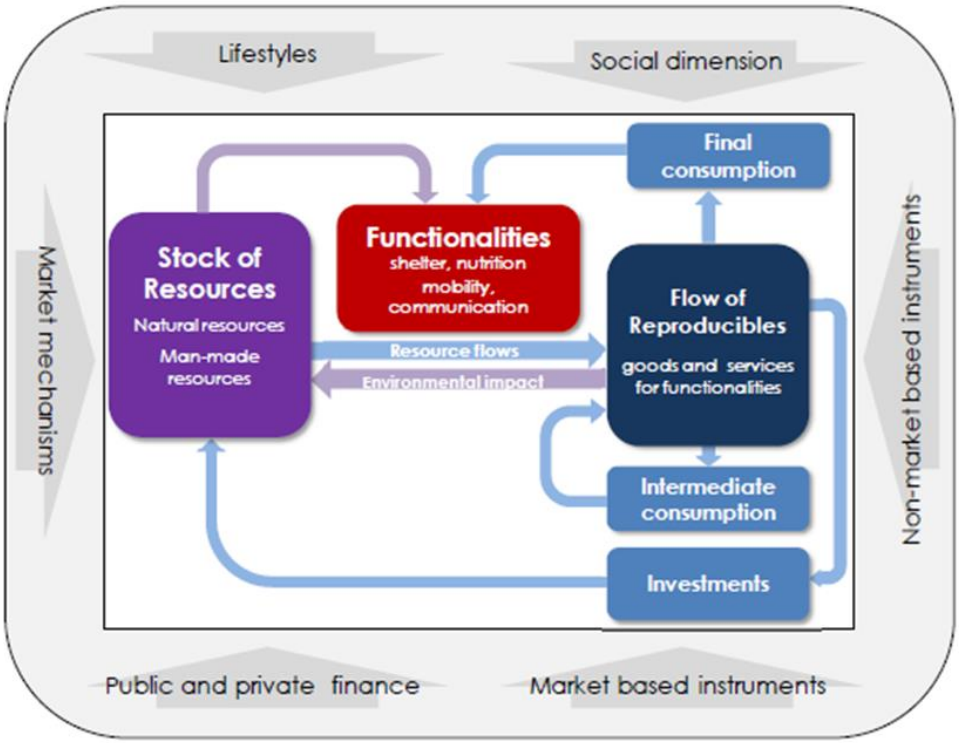

Figure 1. Innovative aspect of the economic transition modeling framework proposed in the ClimTrans2050 research plan : a deepened modular structure of the economic activity model built around the concept of functionalities.

Contribution of IIASA researchers: national emission targets embedded in global context

The main contribution of IIASA's Advanced Systems Analysis (ASA) Program consisted of 1) determining a global budget of allowed GHG emissions until 2050 which reduces the risk of overshooting the 2°C warming target below specified levels (e.g. less than 50%); and 2) scaling global emissions constraints to the national level and deriving national GHG emissions reduction paths consistent with the global warming context. Providing this context is necessary to model emission reduction paths for Austria (or indeed any country) meaningfully since planning and implementation of national emission reduction efforts in isolation are unlikely to have the designed mitigation effect on global warming. To achieve these two goals the recently published IIASA Emissions-Temperature-Uncertainty (ETU) framework (Jonas et al. 2014: doi: 10.1007/s10584-014-1103-6) was employed.

In a nutshell, the ETU framework can be used to monitor a country's performance–that is, past as well as projected emissions—in complying with a future warming target in a **quantified uncertainty-risk context** (i.e. the global emissions constraint can be estimated only imprecisely and whether it will secure the agreed warming target is also uncertain). The ETU framework allows a country to understand its national and near-term mitigation and adaptation efforts in a globally consistent and long-term emissions-temperature context (warming range of 2–4°C). This is achieved by establishing the reference path for national emissions reductions resulting from national emissions quotas derived by splitting the global budget of cumulative GHG emissions on the basis of equal per-capita emissions in 2050.

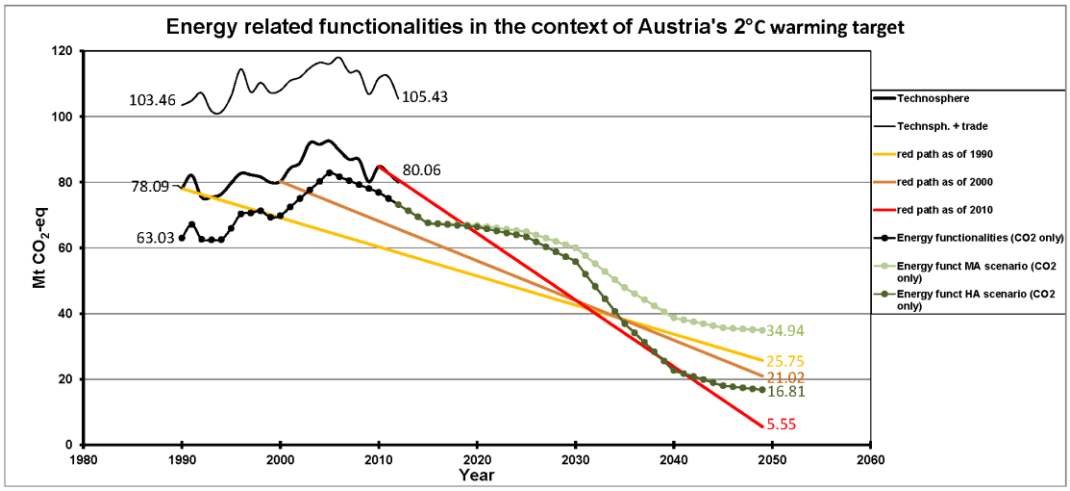

Figure 2. Two scenarios of Austria's CO_2 emissions resulting from energy related functionalities compared against a linear GHG emissions target paths corresponding to 2°C warming target. The moderately ambitious (MA) scenario (reductions due to increase of productivity and use of clean technologies) results in cumulative emissions of 2,210 Mt CO_2 in period 2010–2050.The highly ambitious (HA) scenario (requiring disruptive changes in functionalities, especially in mobility) results in cumulative emissions of 1,919 Mt CO_2. Neither of these scenarios is in line with Austria's GHG emissions budget of 1,807 Mt CO_2-eq for period 2010–2050 corresponding to a 2°C global warming.

Collaborators

ClimTrans2050 has been conducted in collaboration with the Austrian Institute of Economic Research (lead), the Environment Agency Austria, and the Wegener Center for Climate and Global Change of the University of Graz.

ClimTrans2050 Webpage: https://climtrans2050.wifo.ac.at/tiki-index.php