

Modelling the economy-wide impacts of climate change and adaptation in Asian countries – A comparative view of the Asian countries Kazakhstan, Mongolia and Nepal

Topic: Input-Output Modelling: Disaster analyses (2)

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Climate change is a global phenomenon and a major concern in countries that are highly dependent on climate-sensitive sectors such as agriculture. Policymakers should be aware of how key economic sectors are affected by which climate hazards to initiate the transition to climate-sensitive economy and society.

Focusing only on the directly impacted economic sector is somewhat short-sighted. Indirect and income-induced impacts as well as environmental implications should be additionally considered to get a more comprehensive picture of possible impacts. For decisionmakers, it is important to better understand the economy-wide impacts of climate change and adaptation options to provide “Better (Adaptation) Policies”.

Environmentally extended Input-Output models, so-called E3 (economy-energy-emission) models, in combination with scenario analysis are suitable tools to investigate the direct, indirect and income-induced impacts as well as effects on environmental indicators. Such models support policymakers in finding suitable solutions by comparing the outcome of different adaptation options. Results help to identify potential unwanted feedback effects that could conflict with other policies.

The e3 models for Kazakhstan, Mongolia and Nepal are fully developed in Microsoft (MS) Excel using the GWS model building framework DIOM-X (Dynamic Input-Output Models in Excel). One of the key features of the framework is time-saving scenario analysis that does not require any programming or model building skills and thus is more suitable for policy makers. The full data set, framework and model code as well as the scenarios are stored in just one Excel workbook allowing for easy distribution and evaluation in line with a “white box” approach.

These country-specific E3 models were built from scratch using publicly available, national data for macroeconomic, sectoral and environmental indicators. Then, scenario analysis was used to implement sectoral economic implications from climate change (e.g. harvest losses and impaired hydropower generation due to droughts or damage caused by flooding) and adaptation options (e.g. investments in irrigation infrastructure) into the E3 models. For the models to consider the future impacts of climate change, climate projections need to be linked to economic damages and losses which have been observed in the past. In other words: Physical effects need to be translated into monetary values to calculate the economic effects. Sector-specific adaptation options were assessed regarding their economy-wide impacts that are built on sector- and country-specific cost-benefit analyses.

Finally, comparing both scenarios – a scenario including climate change effects but no adaptation measures and a scenario including adaptation measures – shows the impacts (such as adaptation costs and avoided damages) of adaptation activities. Results from the similar modelling approach for Kazakhstan, Mongolia and Nepal show positive effects on GDP and employment for all countries for the period up to 2050. Environmental indicators such as GHG emissions accelerate to certain extent depending on the energy carriers used which call for additional mitigation actions and preferably nature-based adaptation solutions.