



A bottom-up assessment method of limitations to and vulnerability of energy supply in developing countries

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Sufficient energy access is essential for development and adequate livelihood conditions, as the majority of societal activities depend on reliable and sufficient energy. Especially in developing and threshold countries, energy access remains limited and intermittent. Moreover, compared to developed countries, often the expenditures for energy constitute a huge part of the available money.

The vulnerability of energy systems to the impacts of climate change differs depending on the utilized source of energy. A special characteristic of developing and threshold countries is the fact that the spatial heterogeneity of the energy supply structure, especially between urban and rural regions, is generally larger than in developed countries, while the adaptive capacity of people is often much lower. A sound consideration of these complex conditions is a necessary basis for determining in how far climate change impacts can further diminish energy access in regions, where energy access is already limited.

The topic of energy vulnerability has often been addressed for developed countries, but assessments for less developed countries remain scarce. On the one hand, data needed for energy vulnerability assessments, as they exist for the developed world, is usually not available. On the other hand, existing assessment methods for the developed world are often not transferable because they focus on specific supply infrastructure or energy carriers. Transferability is also hindered by the large differences in energy access and energy use patterns.

We propose a novel approach to assess domestic energy supply vulnerability, by reversing the usual chain of assessment. On the basis of a basket of household energy needs for different purposes, we first assess which sources are used in order to fulfil specific energy needs. By focussing on the regionally specific energy carriers, we are able to significantly reduce data needs and assess directly, how energy vulnerability may play out in a specific context. Using Sankey diagrams to visualize energy flows, the method allows identifying household reliance on specific energy carriers. The approach provides a basis on which to identify specific patterns of vulnerability as well as existing limitations to energy access. Finally, options for a pathway towards reliable as well as sustainable energy access can be assessed. We will present the conceptual basis of the approach and show a first implementation for two case study countries.