



Assessing the land-energy nexus in Southern Africa: An integrated assessment and scenario approach

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About 70% of Sub-Saharan African households rely on fuelwood and charcoal for cooking, which is larger than in any other region in the world. The use of these traditional biomass fuels is related to deforestation and forest degradation, but impacts are often locally specific. Zambia is one of the countries with the highest deforestation rates in the world (Vinya et al., 2011), and the use of fuelwood and charcoal is regarded as an important driver (Gumbo et al, 2013). Similar findings have been reported for Malawi (Kambewa, 2007). The use of woody biomass is a major source of greenhouse gas emissions. Some sources indicate it might contribute between 2-18% of global GHG emissions (World Bank, 2011; FAO, 2017). The rapid increase in population, combined with a rise in income is expected to substantially increase the demand for household energy in Africa. Under a business as usual scenario, the use of woody biomass energy sources is likely to remain high putting additional pressure on forest resources and further increase greenhouse gas emissions.

There has been a recent surge in scientific analyses of the land-water-energy nexus. However, the nexus between household energy demand and deforestation, which is particularly relevant for Southern Africa, seems to have attracted limited attention. This study tries to fill this gap by offering an assessment of the land-energy nexus in Southern Africa using an innovative integrated modelling framework. A household energy model (MESSAGE-Access), employing detailed information on household fuel consumption from nationally representative expenditure surveys, is used to project future cooking energy demand for Malawi and Zambia up to 2050. These results are used as drivers in a spatially explicit land use model (GLOBIOM) to project deforestation, land use change related greenhouse gas emissions and wider socio-economic impacts such as food security, in the Southern African region. Emissions from woody biomass combustion in homes is also accounted for. Preliminary model runs indicate that the demand for charcoal will double between 2010-2050 in the business as usual scenario. Several additional scenarios will be implemented to assess the impact of potential solutions, including the expansion of protected areas, and increase in the supply of alternative energy sources.