



Economic Assessment of the Impacts of Climate Change in Uganda

National-level assessment

Climate Change and Energy

Introduction

This study has analysed the supply and demand for energy in Uganda to 2050, the impact that climate change could have on supply and demand of the sector and possible adaptation measures to deal with any climate change impacts. The analysis has been performed using the LEAP model, which is an energy sector planning model that is widely used for this purpose. The model allows different kinds of energy supply to be evaluated as sources to meet demand by type of energy service in different sectors and for different periods of time. Options are then assessed in terms of costs and the model allows the analyst to choose the least cost combinations subject to whatever constraints are considered appropriate.

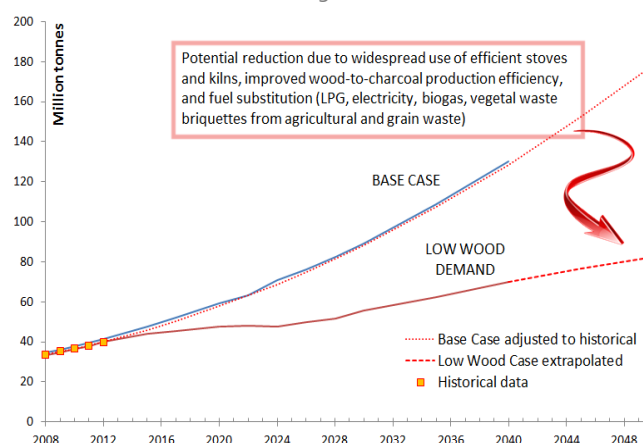
Estimated Impacts

Current Projections

Energy supply in Uganda is dominated by traditional biomass, with electricity and other fuels playing a very small role. The current balance between supply and demand for biomass, however, is very fragile and predictions are that there will be a huge deficit of biomass in the 2020s and beyond.

The report concludes that a **Business as Usual** scenario for **growth in biomass demand is not sustainable and a solution is needed to address the predicted deficit**. Options evaluated include a major increase in the use of LPG as well as electricity for households that currently rely on biomass. This is feasible but will entail a large programme to import wood or LPG or other fuels.

Figure 1: Scenarios of projected annual fuelwood demand in Uganda



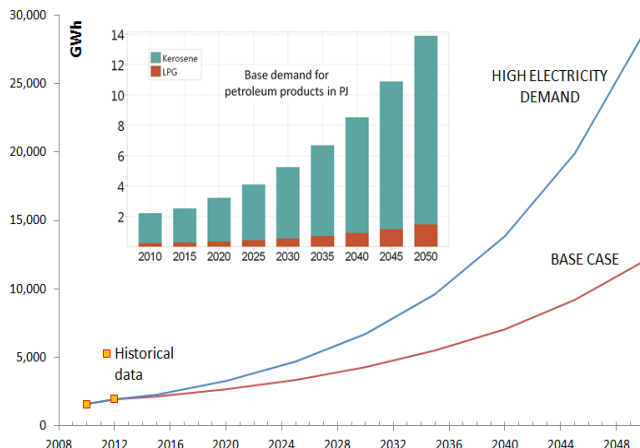
In addition, more electricity will have to be generated to fill the gap. With the currently proposed electricity investment programme¹, almost all of the extra demand could be met, but in this scenario there will be a deficit in electricity of around 9 percent of total demand. This deficit could be eliminated if part of the biomass deficit is met through the use of imported biomass – equal to



about 86 million tons in the next 40 years, or around 2.2 million tons per year.

These broad conclusions hold under a variety of scenarios, including a higher growth in electricity demand and a reduction in hydropower capacity.

Figure 2: Scenarios of projected demand of electricity and petroleum products in Uganda



Projections under Climate Change

When climate change impacts on the energy sector are evaluated, two things stand out. **The first is that climate change will almost certainly reduce biomass availability**, although it is difficult to quantify by how much. The study estimates that a plausible loss of 5 to 10 percent of domestic wood between 2020 and 2050 would imply the need for additional expenditures of US\$0.6-1.3 billion if the gap is filled with imported biomass and between US\$5-11 billion if it is filled by LPG.

Secondly, there is a possibility that hydropower potential will decrease due to a reduction in precipitation. If there is a decline, it is estimated to be around 26 percent by 2050. Under that scenario, the analysis shows that the government's current expansion programme is sufficient to cover the hydropower deficit, as long as the other components of the programme are implemented according to the proposed schedule.

ⁱ Ministry of Energy and Mineral development, *Power Sector Investment Plan*, 2011

It is important to remember, however, that this is a very ambitious and resource intensive programme. The estimated additional capital investment in hydro, nuclear and other generation from now to 2050 is around US\$83 billion. The country will need to invest around one billion dollars in power, or around US\$200 million per year, equal to about one percent of its GDP, in the first five years. In future years the amounts increase very sharply.

Adaptation Priorities

The government of Uganda's Costed Implementation Strategy document ⁱⁱ reflects a number of the issues discussed above. **The strategy focuses heavily on reducing dependence on biomass and these components should be implemented effectively and urgently.**

The strategy also gives importance to **promoting energy conservation and efficient utilisation of energy to reduce GHG emissions.** The proposed programmes that aim to increase energy efficiency are similar to programmes that have been implemented in many developing countries and these typically show a high level of cost effectiveness. Programming should draw on best practice from other countries, and ensure that standards requiring the adoption of efficient devices, which can be supported by subsidies, are in place.

The strategy does not, however, contain any component encouraging a switch to modern energy of households currently dependent on traditional biomass. LPG is one option and imported biomass or kerosene are other. These alternatives need further investigation but a preliminary analysis indicates that **the benefits of developing an alternative fuel program** (in terms of reducing the unmet demand) **are in excess of costs and should constitute a priority area of intervention.**

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ⁱⁱ Ministry of Water and Environment, *Uganda National Climate Change Policy Costed Implementation Strategy*, 2012.