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An indicative Climate-Land-Energy-Water (CLEW) nexus analysis of Sierra Leone

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Integrated approaches to implementation of the Sustainable Development Goals (SDGs) are a crucial requirement if the global development agenda is to move at pace to 2030. In this regard, and noting the interlinkages between the different SDGs we propose pilot studies of integrated approaches to climate (SDG13), land (SDG 15), energy (SDG7) and water (SDG6) in various countries, including Sierra Leone. Policies towards the achievement of one SDG may affect positively or negatively the achievement of the others. This work analyses the impact of energy sector development and policies on energy access as well as water and land resources use, in a context of changing climate. It focuses on Sierra Leone, one of the countries with the lowest access to electricity in the world, recently struck by civil conflicts, ebola outbreak and fall in international iron prices, yet endowed with abundant resources to fuel its own development. The long-term energy planning tool OSeMOSYS (Open Source integrated Modelling System) is employed the analysis. Three scenarios are studied:
• An outlook for high growth, resulting in high increase in the demand for energy;
• A dry-climate under which there is limited adaptation in the power sector and water scarcity in other sectors;
• Introduction of a liquid biofuel policy, where gasoline used in transportation is blended with 3% of bioethanol, in energy content.
The results show that investments are required to meet national development goals - yet these are at risk due to crucial interactions between the energy-water-land systems. These interactions cause constraints and are potentially vulnerable and sensitive to climate change. In particular, though the GHG emission outlook looks favourable due to large hydro and solar potentials, GHGs emissions in the transport sector could significantly increase in the event of dry climatic conditions. Additionally, land is limited and thus deforestation and land use changes may be needed to meet national development. This has implications for increasing domestic growth of biofuel feedstocks. If done, crop imports would increase. A dry climate can impact the economy significantly affecting power generation and further ramping up the need for crop imports. The model developed has the potential for further extension and application.