NEGATIVE EMISSIONS IN SOUTH EAST ASIA: RENEWABLE ENERGY OPTIMIZATION WITH BECCS FOR INDONESIA

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Key Words: Energy systems optimization; renewable energy; BECCS; Indonesia; negative emissions

Indonesia, on the one hand, is a tropical country with large biomass productivity and increasing oil and gas sector activities. On the other hand, it is the 3rd largest GHG emitter globally and some 90% of its emissions are generated from massive land-use change. However, Indonesia has also developed very ambitious climate targets aiming at up to 41% emission reduction by 2020. These targets need to be balanced with an envisaged GDP growth by 7% and projected 5 times higher energy consumption in 2050. To decrease its fossil fuel dependency and emissions, the government of Indonesia has decided to increase the renewable energy supply from 6% to 23% by 2025, along with a 100 percent electrification target by 2020. Furthermore, BECCS (i.e. the combination of forest based bioenergy with carbon capture and storage) is seen as a promising tool to bridge between the various future challenges Indonesia is facing and at the same time to deliver large quantities of negative emissions needed by the end of this century. But - irrespectively of Indonesia's abundant resources to meet ambitious renewable energy and mitigation targets - there is lack of proper integrated planning, regulatory support, investment, distribution in remote areas of the Archipelago, and missing data to back the planning.

To support the government of Indonesia in its sustainable energy systems planning, a geographic explicit energy modeling approach is applied. IIASA's BeWhere Model identifies the optimal location of energy conversion sites based on the minimization of the supply chain costs. The model incorporates the existing fossil fuel-based infrastructures, and evaluates the optimal costs, potentials and locations for the development of renewable energy technologies (i.e. wind, solar, hydro, biomass and geothermal based technologies), as well as the development of biomass co-firing in existing coal plants. An optimally adapted renewable energy mix – vis-à-vis the competing fossil fuel based resources – is identified. In addition, the in situ BECCS capacity for different scenarios is assessed for Indonesia. Special focus is put on nature protection and cultural heritage areas, where feedstock (e.g., biomass harvesting) and green-field power plant sites will be limited – depending on the protection type and renewable energy technology.

First results of the study provide indications on where, how and which technologies should be implemented. Moreover, the assessment indicates that the BECCS potentials vary substantially over the different scenario assumptions. Sustainable biomass feedstock production, energy demand and supply as well as competing industries and existing transport infrastructure are key to achieve an optimal BECCS solution. Clean energy access for all with special emphasis on remote areas and small islands in Indonesia turns out to be especially interesting from a socio-economic, emission savings and innovation perspective.