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Brief

A Nexus Perspective on Africa's Energy Transition.

Insights for decision makers

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Abstract

FEEM Policy Brief

Improving energy access in Africa can have a tremendous impact on other sectors, particularly when it comes to water supply, agriculture, and forestry. Moreover, it can stimulate local economies and trigger social change. However for this potential to be harnessed an effort should be made to increase coordination and cooperation at different levels. This Policy Brief includes key messages for policy makers and investors who play a role in Africa's energy transition at continental, national, and local scale, with specific reference to three promising energy solutions (multipurpose hydropower, solar pumps, and efficient cookstoves).

01 A multi-dimensional challenge

While a clear definition in research is missing, the nexus usually refers to the challenges of achieving water, energy and food security simultaneously and to the complexity of natural resource management when uses are multiple, resources are scarce, and cross-sectoral dependencies and impacts can no longer be ignored (Hoff, 2011). Regardless of the novelty of the nexus concept (often debated) the real ambition of nexus research is to help policy makers taking more informed decisions when it comes to resource management.

In Sub-Saharan Africa electricity reaches only 32% of the population, while 80% still largely depend on biomass, particularly in rural areas. Low access to modern energy has profound social and environmental implications: indoor air pollution caused by the inefficient use of solid biomass kills around 600 thousand people every year; almost 40% of the firms identify poor electricity access as a major constraint to their business; and the agricultural sector remains seriously vulnerable to weather conditions.

At the same time, about 319 million people in Sub-Saharan Africa still lack access to drinking water, 695 million do not have basic sanitation facilities, rain fed agriculture accounts for around 95% of farmed land, and about 80% of land theoretically suitable for agricultural production has serious problems of soil fertility or other limitations that compromise its productivity. Poverty (of which low access to natural resource is only one dimension) exacerbates environmental degradation, so that African poor can be seen as both “victims and perpetrators of environmental damage” (Hope, 2007).

Africa will be hit particularly hard by climate change due to a combination of high exposure and low adaptive capacity. Among others, this will shake the energy system at its core with two key resources - freshwater and wood - shrinking quickly as a result of growing demands, reduced rainfalls, higher temperatures, and desertification.

02

The nexus potential of energy policies and investments

With water and food insecurity threatening entire populations, African governments and international financing institutions face significant tradeoffs when it comes to budget allocation. Similarly, budget limitations can influence choices at household level, a key issue for demand-side interventions on water and energy access. Maximising the impact of energy investments in Africa is therefore more than reasonable, it is necessary, and the need to economize investments automatically translates into a search for synergies with non-energy sectors.

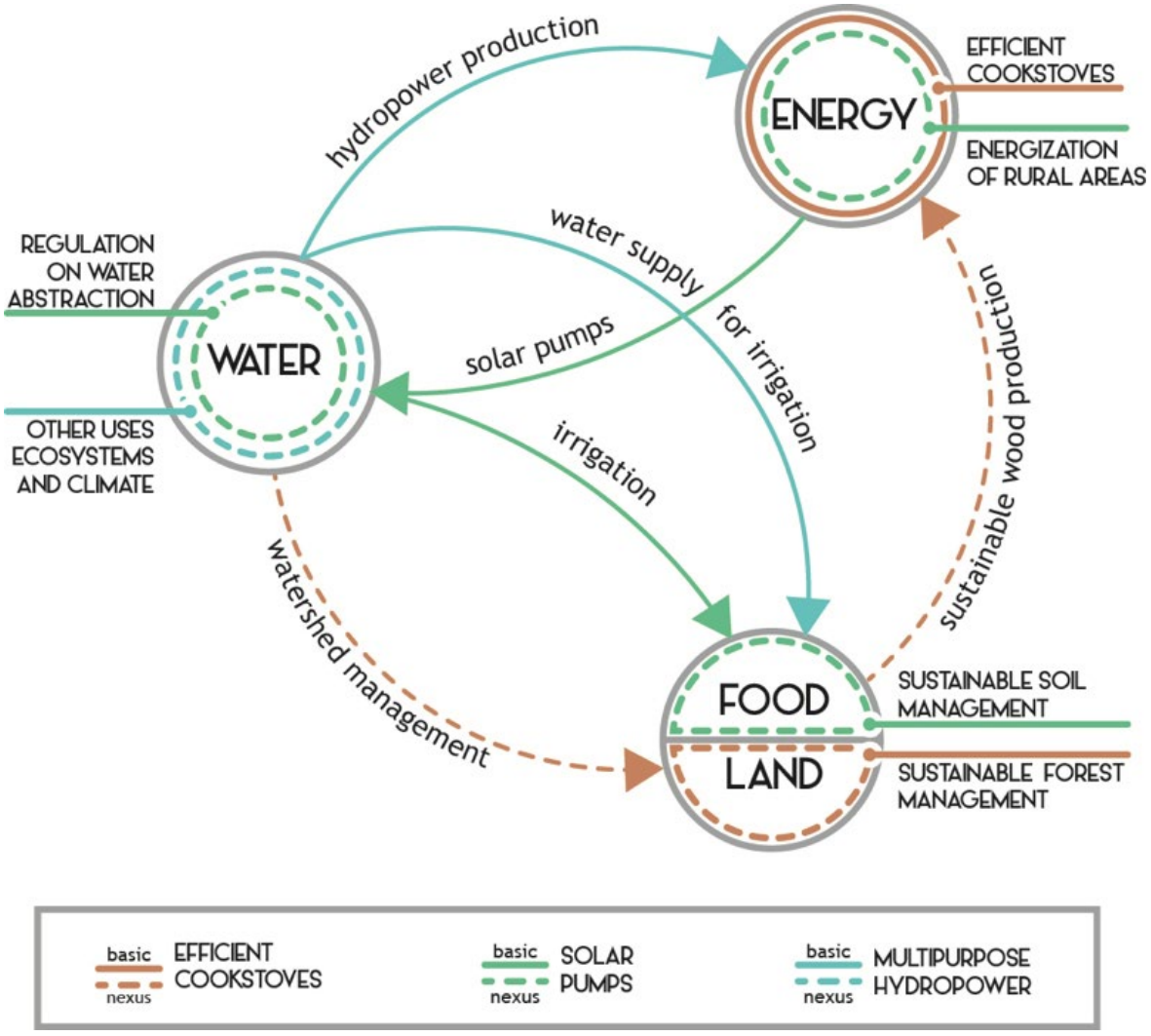
As noted in the Agenda 2030, improving and modernizing energy access can significantly contribute to improving access to water and sanitation, enhance food security and rural development, and advance climate mitigation and adaptation. So when looking at energy technologies it is worth asking how they stands in relation to the bigger picture of the water-food-energy nexus and to map areas where cooperation can be activated. The options are many and of course renewable technology solutions make sense due to their vast potential in the continent.

Even though technological innovation cannot address, alone, the most pressing social challenges of the nexus, it offers a base to multiply benefits across sectors and to activate partnerships between public, private, and non-governmental organizations (Sarni, 2015). We give three examples for the purpose of illustration: multipurpose hydropower, solar pumps, and efficient cookstoves, which have the potential to increase water access, modernize food production, and reduce the use of biomass respectively.

Our idea is that nexus research should help broadening the perspective of policy makers, and that a nexus approach can be used to facilitate dialogue across sectors and stakeholders (de Strasser et al., 2016; Johnson and Karlberg, 2017). With reference to our examples, nexus thinking can help policy makers and investors in at least three ways (as illustrated in FEEM Working Paper 39.2017).

03 Ensuring environmental sustainability

The environmental sustainability of our solutions is not necessarily intrinsic in their design and it largely depends on the effectiveness of cross sectoral cooperation and environmental regulation. As represented in the nexus scheme below, a multipurpose dam serves by definition various water users and, at least in Africa (where the agricultural sector is considerably vulnerable), providing water for irrigation can be considered the minimum requirement for a hydropower dam to be called multipurpose. At a smaller scale, solar pumps allow farmers to access water using clean energy. In contrast, the third solution



(efficient cookstoves) only serves the purpose of improving energy.

In order to be environmentally sustainable, a multipurpose hydropower dam should ensure a balance of various water uses, safeguard ecosystems, and be resilient to climate change; the implementation of solar pumps should go hand on hand with appropriate regulation on water abstraction, integrate sustainable soil management, and stimulate a broader energization of rural areas; the deployment of efficient cookstoves should be part of a modern value chain for bioenergy that ensures sustainable wood production and forest conservation (in turn a vital element of integrated water resource management at the level of watershed).

Notably, failing to tackle the environmental sustainability issues of energy solutions undermines the long-term usability of the energy solutions themselves. So if water becomes scarce agricultural supply may be given priority over hydropower production; if groundwater levels drop too much or agricultural soil is degraded, irrigation becomes challenging or less effective; if forests get depleted, efficient cookstoves start lacking fuel and become useless.

04 Maximising impact at local level

When it comes to the actual implementation of energy projects, social impact stands out as the most critical aspect of the nexus. Here the water-food-energy nexus framework falls too short of details, and it becomes necessary to think in terms of local constraints and opportunities. The applicability of particular solution is to be evaluated on a case by case basis and, at the same time, its particular design needs to be context specific - in line with an interpretation of the nexus that sees reflexion (i.e. the account of errors and uncertainties) and reflexivity (i.e. the account of different perspectives) as guiding principles in the quest for solutions to complex problems (Stirling et al, 2015).

The services that multi-purpose hydropower dams can provide are: domestic water supply, flood and drought management, irrigation, navigation, fisheries/aquaculture, environmental services, as well as recreation production (EDF and WWC, 2015). Precision farming is becoming possible as digital tools become affordable and accessible, so that solar pumps can be easily enhanced with drip irrigation and monitoring systems for water consumption, and further combined with fertigation for a more efficient application of nutrients. Moreover, solar pumps can provide income diversification (selling extra electricity) (IRENA, 2016). Finally, the attainable benefits from the creation of a modern wood value chain go beyond a reduction forest degradation and include: local job creation, stronger control over a largely informal sector, gender empowerment, improvement of health conditions, climate mitigation, and improved water management (GIZ, 2014).

In order to maximise these benefits, investors can refer to guidelines that specifically target the final beneficiaries, such as: ECOWAS' "Guidelines for the development of water infrastructure in West Africa" (ECOWAS, 2012), IWMI's "Framework for business model development for incentivizing adoption of solar pumps" (CGIAR and IWMI, 2017), and GACC's "Conceptual framework to measure social impact" (Global Alliance for Clean Cookstoves, 2016).

05 Seeking coherence in the bigger picture

Our examples indicate that cooperation needs to be strengthened both horizontally (across ministries and agencies) and vertically (along value chains). When it comes to infrastructure development, international financing institutions are best positioned to take a lead on transboundary, regional, and continental coordination (e.g. through the African Development Bank's Programme for Infrastructure Development in Africa (PIDA)) as well as on knowledge development and capacity building in the area of water-energy integrated planning (e.g. along the lines of the World Bank's Thirsty Energy initiative).

Energy and agricultural ministries should work together to develop concrete plans to make the sector climate-smarter and more resilient, as well as to facilitate rural electrification developments linked to agri-food businesses. Capillary interventions for improving cookstove efficiency on the demand side needs to be framed in a broader policy of modern woodfuel production and sustainable forest management, and the way forward here is to generate stronger political commitment towards a largely neglected aspect of the clean energy transition (e.g. within the mandate of national Renewable Energy Agencies).

Special support should be given to small entrepreneurs, demand-driven innovation, and customized solutions. In particular, local start-ups have a major role to play in the uptake of renewable solutions in agriculture, but governments need to be supportive. The development of appropriate information and communication technologies, increased access to finance, and targeted subsidies stand out as particularly important actions that need to be taken at national level.

Considerations on resource use efficiency and multiple benefits should not hide social challenges which are often at the root of environmental and resource-related problems. As partly illustrated in this paper, the poverty-environmental degradation link can only be broken with an improvement of socio-economic conditions that passes not only through sustainable development, but also social justice and inclusion. So for the poorest to benefit from technological innovation, not only governments need to put in place appropriate incentives (e.g.

cross-subsidies, tax exemptions), they may also need embark on structural reforms (e.g. on land tenure).

Lastly, it is of outmost importance to streamline energy policies within the broader framework of the SDGs and the international community has an important role to play here. A number of initiatives already encourage a nexus approach to energy policy development, notably the Sustainable Energy for All initiative (SE4A) that features the water-food-energy nexus in its list of "High Impact Opportunities" action areas. The SE4A is a well-established intergovernmental platform where policy makers can share their experiences and lessons learned.

Policy conclusions

Essentially, nexus thinking means responsible planning at different levels of the decision making process, specifically targeting the environmental and social dimensions of development. When it comes to Africa's energy planning, this is not only urgent from a sustainability perspective, it is also economically sound given the entity of development challenges (beyond energy poverty) versus limited financial availability.

Adopting a nexus approach to specific energy projects means much more than economizing resource use, it means aiming at a maximisation of social impact, for instance in terms of employment, women empowerment, or health improvement. Of course, investors should find concrete support in a policy and regulatory framework that seeks coherence in the bigger picture of sustainable development and, in particular, facilitates the establishment of necessary coordination mechanisms. Considerations on multipurpose hydropower, solar pumps, and efficient cookstoves indicate that cooperation can (and should) be strengthened both horizontally - e.g. across ministries and agencies, public and private sector, among project stakeholders - and vertically along value chains.

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