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Identification of advantageous electricity generation options in sub-Saharan Africa integrating existing resources

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Nearly 70% of the population in sub-Saharan Africa (SSA) does not have access to electricity - approximately 621 million people.

To tackle this situation pioneering approaches are needed to accelerate universal access to electricity while simultaneously transitioning to reliable, sustainable and affordable energy systems. In sub-Saharan Africa the challenges lie in attracting the private sector to complement public investments.

A transformation of existing, poorly used or unexploited energy infrastructure in sub-Saharan Africa could represent lower-cost and lower-risk opportunities for investors and would ensure access to sustainably generated electricity for 15.4 million people, according to a JRC lead paper recently published in *Nature Energy*. The proposed investment strategy requires a €1-1.5 billion of investment for ensuring additional 1.1GW of power capacity.

The paper presents an integrated 'low-hanging-fruit' approach aimed at boosting private investment and speeding up the deployment of renewable energy systems in SSA.
The potential of existing energy infrastructure is analysed, where a significant upfront investment has already been made, that can be exploited for electricity generation.

The comprehensive methodology identifies and selects suitable locations in SSA and estimates their potential for exploitation. These locations have been further analysed in terms of power capacity potential, electricity output, investments needed and population to be benefited. This strategy to attract additional finance can easily be reproduced, engaging private investors while simultaneously helping to achieve the United Nations (UN) Sustainable Development Goals on energy.

The findings are based on an approach that identifies already existing infrastructure. This means that part of the investment has already been done and it builds on already available human capacities as technicians and managers keep on operating and maintaining the infrastructure. The authors developed a tailor-made multi-layer spatial analysis and processed satellite night images to identify existing rural mini-grids.

The work resulted in a complex spatial dataset and visualized in a map showing the identified sites and technologies in three categories of infrastructure: non-powered dams that can be converted to hydroelectric power facilities; rural mini-grids that can integrate solar PV systems; and coal power plants that could burn biomass (bagasse, a sugarcane residue), either co-fired with coal or separately.

The non-powered dams were originally constructed for one or more non-energy purposes, such as irrigation or flood control. A subset of these dams, which meet certain conditions, is attractive option because they can easily be retrofitted to produce electricity. Of the hundreds of African non-powered dams analysed, 52 have a potential to generate >1MW and 39 have a mini-hydro (<1MW) potential.

Integrating PV into existing rural mini-grids can result in half the electricity cost of new PV investments. This is due to the lower battery costs that typically constitute 40% of the total system cost and the existing distribution lines.

Although the estimated number of beneficiaries of the transformation of existing infrastructures in sub-Saharan Africa represents only 2% to 3% of the population without access to electricity, this approach identifies projects that can provide genuine momentum to scale up renewable energy investments for the private sector.

The full paper is available from: http://www.nature.com/articles/nenergy2016140
(Nature Energy applies publication fees in the embargo period)

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