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Improving energy access for economic development of rural communities – A modelling approach

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Abstract

Access to energy is a fundamental component of development because it contributes to Gross Domestic Product (GDP) and improves the Human Development Index (HDI). Increasing access to modern clean energy services is essential to raise living standards and attain the eight Millennium Development Goals. A systematic approach to energy development over a wide range of socio-economic and environmental sustainability indicators can increase the chances of low carbon innovation technologies to positively affect long-term sustainability and economic development in poor areas. This paper analyses the design and development of an integrated decision- support system which seeks to define optimal energy solutions to enhance sustainable livelihoods among poor populations and communities, and reduce global CO_2 emissions. Based on a multi-criteria approach, it endorses social, environmental and economic sustainability and equity. The current paper discusses the approach and components of the proposed model and explains why this model is also a tool package. This paper discusses the design and application of *SURE-DSS* to increase financial income and refers to few case studies where the model has been tested.

Key words

Energy access, energy modeling, poverty and sustainable livelihoods, renewable energy, Colombia

Overview

Increased access to modern electricity supply is required to meet three contemporary social and environmental challenges: poverty reduction, sustainability, and mitigation of CO_2 emissions to tackle global climate change. Yet, a substantial number of poor people mostly in rural areas of developing countries have no access to clean modern energy. Although historically developing countries have contributed the least GHGs to the atmosphere, their emissions have increased significantly since 2004 and have exceeded those originated in developed economies. Projections indicate that between 2004 and 2030 the annual average emissions increase will be 2.6 percent in developing compared to only 0.8 percent in developed countries[i] (International Energy Outlook, 2014). Since the 1970s, Greenhouse gas (GHG) emissions originated in energy generation have grown quicker than from any other sector, i.e., over 145% compared to 120% in the transport sector[ii] and CO_2 contributing about 75 per cent of all GHG emissions.[iii] Paradoxically, a substantial number of people still lack access to electricity in developing countries: 1.3 billion worldwide have no electricity, 85 per cent of which live in rural areas[iv] in developing countries. Access to energy is a fundamental component of development because it contributes to Gross Domestic Product (GDP) and improves the Human Development Index (HDI). Increasing access to modern clean energy services is essential to raise living standards and attain the eight Millennium Development Goals.[v],[vi],[vii] Increased access to modern electricity supply, preferably from renewable sources, is necessary in order to meet at the same time the challenges associated to adaptation and mitigation of climate change.[viii]

The use of appropriate, effective and affordable modern energy solutions can make significant impact to poverty reduction in developing countries. Yet, addition of energy generating systems may also have a negative impact on the local and global environment or drain scarce financial resources, all of which could be mitigated if a technology solution were selected more carefully.[ix] The design of single decision-making approaches that correlate technical and non-technical information while also foreseeing the impact on economic development among users of the technology has been precisely the major scientific challenge for energy development. There exists a range of useful tools to assist energy