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Regional cooperation in widening energy access and also mitigating climate change: Current programs and future potential

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ABSTRACT

Access to energy can significantly contribute to the development of the living standards of the energy poor. Also if the provision of access to energy is sustainable, i.e. via renewable energy sources, there is an added benefit of contributing to mitigation of climate change. Currently, the percentage of population with access to energy varies significantly between countries and across regions. This is due to the nature of national socio-economic situations and energy resource availability in differing settings. This article addresses issues and hindrances to energy access in regional contexts and also examines, in particular, the prospects of how regional cooperation initiatives linked with climate change mitigation objectives could assist in widening energy access. Existing relevant regional cooperation initiatives that may be upscaled or used as models to widen access to modern energy services are evaluated. Findings are that regional cooperation initiatives linked with climate change mitigation can potentially facilitate widening energy access. However, in order to realise such potential, synergies from regional cooperation that are indirectly linked to energy and wider climate change mitigation programs should be harnessed. Recommendations are made for development of sustainable energy programs in energy deprived regions that will also mitigate climate change impacts.

1. Introduction

Energy is central to addressing the major global challenges of 21st century – climate change, economic and social development, human well-being, sustainable development and global security (IIASA, 2012). At the individual level, usage of energy is strongly interlinked with access to food supply sources, water, health, education, income generation, empowerment of women and good governance (Oparaocha and Dutta, 2011). However, energy access and patterns of energy use vary significantly across societies in various geographical landscapes – ranging from rural to urban, remote to accessible locations (off-grid to on-grid), and from developing to developed countries and regions. Regions are defined primarily geographically, with further differentiation related to their economic relationships as well as proximity. Regions can be considered both be at the supra- and sub-national level, but here the term refers to the supra-national level. Also, regions may be differentiated within by level of development, geographical setting and common interests (economy, trade, etc.). Sub-national regions also addressed in the paper.

Scarcity of energy sources is compounded by issues of security of supply. Also challenges associated with affordability of energy services can escalate such variances. In fact, energy use patterns are strongly linked with income profiles in every society from an equity point of view, as people with different income levels aspire to different thresholds of energy use (SE4ALL, 2014).

While there is no universal definition of energy access, rather a range of definitions in the literature reveal that energy access generally means access to both electricity and other useful forms of energy (cooking fuel, mechanical power and heating) that may be sourced from both conventional and renewable energy sources in different geographical contexts (Pachauri, 2011). Electricity and cooking energy issues are the principal focus of this article.

A major global challenge is to ensure universal access to energy in sustainable modes. Responding to this energy access challenge also means addressing the external effects that are associated with all adverse impacts due to the use of energy over its life cycle. These include global climate change impacts due to emissions of greenhouse gases (GHGs) over the energy supply-chain (Uddin et al., 2006; Uddin and Barreto, 2007) and local negative effects, for

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example, indoor air pollution from solid fuels used for cooking (Malla et al., 2011). Arguably, use of renewable energy could assist in enhancing energy access especially in off-grid locations (Uddin et al., 2006; Uddin and Taplin, 2009). This could also contribute to mitigation of climate change and offer synergistic benefits (Uddin et al., 2006; Beg et al., 2002). In particular, access to energy is crucial for achieving most of the global agendas associated with the Millennium Development Goals (MDGs) (www.un.org/millenniumgoals) (IIASA, 2012).

Regional cooperation on energy undoubtedly is a powerful force in the global economy and is reflected in numerous agreements related to economic cooperation and social development (IPCC, 2014a). Regional cooperation on energy can happen even without regional integration although it is easier in areas of strong regional integration. In particular, regional cooperation initiatives related to energy together with technology cooperation potentially offer synergistic benefits. For example, initiatives and programs involving regional cooperation that include sustainable energy, could offer GHG mitigation opportunities. Some regional cooperation initiatives could also facilitate widening of energy access, which is the main focus of this paper. The potential for linking regional climate change mitigation projects with widening access to energy also is discussed in the paper.

Overall this article addresses issues that are hindrances to the widening of energy access in regional contexts and in particular, examines the prospects for regional cooperation to form building blocks in order to achieve universal access to energy. Existing relevant regional cooperation initiatives that have the potential to be upscaled or used as a model to address issues of wider access to energy are evaluated. The first section of the article outlines observed trends in energy access. This is followed by consideration of energy access challenges and opportunities. Relevant regional cooperation initiatives are reviewed and analysed in order to identify their potential links with energy access. Then opportunities for, and challenges with regional cooperation initiatives directed towards widening energy access are discussed. The concluding discussion includes recommendations for future activities and further harnessing of energy access.

2. Methods and materials

The methods used for this research included: review of the energy access and other related literature, collection of data from a range of documentary sources including reports from national governments, multilateral organisations, development banks, regional agencies and personal communications with representatives of key agencies and organisations in order to obtain first-hand data. These data collection methods were employed in order to allow systematic analysis and assessment of available evidence regarding energy access, demographic data and social statistics.

To ensure authenticity of data gathered, cross-comparison was carried out among different datasets and the most reliable and up-to-date data have been incorporated. Thus, the important issues addressed in this article are representative of energy access trends in various regions. Clustering of gathered data followed the approach adopted by UNDP (UNDP, 2009).

All energy access, demographic data and social statistics quoted in this article are the most recent publicly available data from development banks (for example, the World Bank, the Asian Development Bank), international agencies (International Energy Agency, UN Development Program, and the World Health Organization). Also a range of published peer reviewed literature was reviewed. Information on climate relevant and climate specific regional cooperation initiatives was sourced from various government and donor agencies' reports. Authenticity and appropriateness of data and information collected was assessed according to IPCC guidelines (IPCC, 2010). Regional cooperation initiatives have been assessed via two filters, first, assessing whether they are linked with energy access and if yes, second, how much they have impacted on widening energy access.

Although the research intention was to collect the most recent available data, unfortunately, in a very few cases, the only data available was from over a decade ago as more recent information has not been aggregated and made publicly available. Internet based data from non-accredited sources was excluded due to reliability concerns. Also data from such resources can raise issues of authenticity and often are not in compliance with guidelines such as the IPCC General Guidance on the Use of Literature in IPCC Reports (IPCC, 2010). Also primary data collection was not performed as data sourced from recognised sources was assessed as representative and following rigorous approaches for collection e.g. UNDP's (UNDP, 2009) and the World Bank's data (WB, 2012). Any incompleteness of data and information for decision-making recognised in this research provides indications of the magnitude of the task if universal energy access is to be pursued and achieved.

3. Energy access trends

Energy access covers two important areas of energy usage – electrical energy for lighting (and in some cases, power) and energy for cooking. Up until recently, access to electrical energy for domestic lighting has received limited or no attention as a significant development topic (Kees and Feldmann, 2011). However, the global trends in terms of access to domestic energy remain a challenge, especially in energy deprived regions of developing countries.

An indication of energy deprivation is that about 1.3–1.5 billion people, or over 20% of the global population lacked access to electricity in 2009 i.e. based on the most recent assessments available (IEA, 2010c; WB, 2012). Although the proportion of the world's population with no access to electricity has fallen sharply, from 51% in 1970 to 41% in 1990, 27% in 2000, and 20% in 2009, the number of people without electricity still exceeds 1.3 billion (Shyu, 2014; WB, 2012). Population percentages with access to electricity in various world regions are given in Table 1.

There are considerable variations in electricity access for different regions as shown in Table 1. South Asia and South East Asia are characterised by high density populations (Urmee et al., 2009) with about 62.2% and 74.3% (including Pacific), respectively, of their total populations having access to electricity (WB, 2012). Although the electrification rate in Africa increased significantly from 23% in 2000 to 42% in 2009, nearly 487 million people still lacked access to electricity throughout the continent in 2009 (Shyu, 2014; WB, 2012). This lack of access to electricity in Africa represents over 26% of total households for the same continent (Agbemabiese et al., 2012). This shows the magnitude of efforts required in order to ensure 100% population access to electricity across various regions.

Rural areas in developing countries suffer more than urban areas from deprivation from electricity as 41% of rural populations do not have electricity access, compared to 10% of the urban populations in developing countries (UNDP, 2009). Table 2 shows percentages of population without access to electricity in urban and rural areas in Africa, Asia, Latin America and developing countries as a whole (Kaygusuz, 2012; IEA, 2010c). The lack of access to electricity is much more severe in rural areas of Least Developing Countries (LDCs) (85%) and Sub-Saharan Africa (79%) (Kaygusuz, 2012; IEA, 2010c). According to the UN, LDCs are defined as low-income countries suffering from structural impediments to sustainable development. LDCs include: 33 countries in Sub-Saharan African (SSA), 5 in South Asia (SAS), 9 in South-East Asia and the Pacific (PAS), and one each in Latin

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