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The role of energy policies and markets in promoting sustainable development

Semida Silveira
Professor, PhD, Head of Division
Energy and Climate Studies, School of Industrial Engineering and
Management
KTH - Royal Institute of Technology
Brinellvägen 68, 100 44 Stockholm, Sweden
Email: semida.silveira@energy.kth.se

Abstract

This paper discusses the use of energy provision as a strategy for promoting sustainable development. We briefly discuss the role that bioenergy can play in addressing environment and development issues through the promotion of efficient renewable alternatives for transport and electrification in developing countries. We argue that accumulated experiences provide guidance to how energy policies and programs can contribute to overall development goals in developing countries. The topic is of high relevance for multilateral organizations such as UNCTAD, the World Bank, development assistance agencies, and national governments in developing countries.

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The role of energy policies and markets in promoting sustainable development

Semida Silveira

Professor, PhD, Head of Division

Energy and Climate Studies, School of Industrial Engineering and Management, KTH

semida.silveira@energy.kth.se

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Abstract

This paper discusses the use of energy provision as a strategy for promoting sustainable development. We briefly discuss the role that bioenergy can play in addressing environment and development issues through the promotion of efficient renewable alternatives for transport and electrification in developing countries. We argue that accumulated experiences provide guidance to how energy policies and programs can contribute to overall development goals in developing countries. The topic is of high relevance for multilateral organizations such as UNCTAD, the World Bank, development assistance agencies, and national governments in developing countries.

1. Introduction

The preoccupation with the environment, particularly climate change, has provided a source of innovation in the approaches applied to development since the 1990s. Meanwhile, two billion people remain outside markets due to their extremely low income levels, a major problem for a world economy that puts strong focus on the formation and operation of markets. Not only are the poor outside food markets, but they are also excluded from basic services such as education, health and energy. Properly applied to the benefit of development, the environmental agenda can make clear contributions to employment generation and the formation of markets for new commodities produced in developing countries. Examples can be found in the energy sector. By exploring the potential for biofuel production that exists in many developing countries today, a significant fuel substitution could be accomplished in the transport sector at the same time that electrification is made possible in many parts of the world that still lack basic energy services. A coordinated effort between industrialized and developing countries is still needed if this potential is to be realized not least due to the financial resources required in the poorest countries. The result is a win-win situation with reduced greenhouse gas emissions and improved energy security, at the same time that more employment and development is created in the South. In this paper, we discuss and exemplify how energy access can play a role and become a vector to promote sustainable development in developing countries.

2. Energy and development – a strong correlation illustrated in the HDI

Access to modern energy services is generally viewed as one of the basic requirements for sustainable development as these services are central to industrialization and improved welfare (UNDP, 2002). Energy influences socio-economic conditions in developing countries providing a key strategy for promoting sustainable development in rural areas (Srivastava and Rehman, 2006; Ilskog, 2008). Nevertheless, 25% of the world’s population lacked access to electricity in 2005, 80 per cent of whom lived in rural areas (UN, 2008).

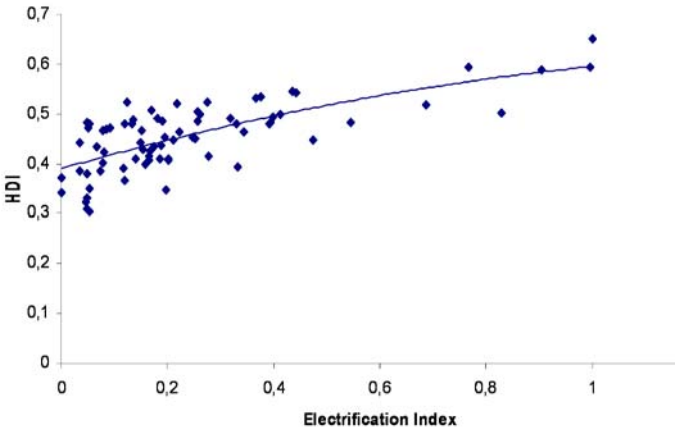


Figure 1. Relation between HDI and electrification in Nepal.
Source: Mainali and Silveira (forthcoming)

Figure 1 shows the co-relation between electrification and the human development index in 75 districts of Nepal. As access to electricity increases, there is significant rise in the human development index (HDI), illustrating the importance of access to electricity for human development and welfare. The importance of access to modern energy (including electricity) for development has been discussed by various authors (M.A.C. Chendo, 1997; Goldemberg et al, 2004; Martinez and Ebenhack, 2007; Gomez and Silveira, 2010). In general, there is consensus and evidence confirming the role of energy services in improving the HDI at early stages of development. For example, electricity can fuel human development by facilitating health, education and communication, and this has an enormous impact on the welfare of regions with low HDI. The HDI includes basic dimensions of development: longevity, education and income, and is increasingly accepted as an indicator of human development.

3. Bioenergy as a vector for sustainable development

As a result of increased understanding about the role of energy for promoting sustainable development, policies have been designed in many developing countries to promote electrification. The countries that have had most success are the countries that have treated energy access as a key component of the government’s strategy to reduce poverty and promote sustainable development. In addition, because bioenergy is the most important energy source in many poor countries, orchestrating an energy transition towards modern and more efficient energy technologies and services is a requirement in the development process.

Let us consider for a moment some achievements of the Brazilian energy policies. Brazil went from an almost total dependency on biomass in the 1940s to a largely diversified energy

matrix today. Still 32% of Brazil's energy supply is attributed to biomass. But the use of biomass today is quite different than it used to be in the forties. Brazil reinvented the use of its biomass potential. Traditional low-efficient technologies are still used in households and industries but more than half of Brazil's bioenergy is based on sugar cane mostly for the production of liquid biofuels for transport and also for heat and electricity production.

Today, the sugar/ethanol industry is a modern industry in Brazil. Behind that progress, there is a strong modernization of agriculture, as well as constant research and innovation along the whole production chain. For example, the productivity of sugar cane fields improved 35% in the last three decades. Modernization of sugar-cane plantations have allowed a sustainable expansion of the production and is at the basis of the global competitive advantage that Brazil has in first generation biofuel production. The sugar/ethanol industry has evolved in an integrated fashion allowing for a diversification of products and total efficiency improvement. But sugar and ethanol are produced from the juice extracted from the cane, and that contains only one third of the total energy content of the cane. The residues, in the form of bagasse and trash contain the other two thirds of the energy which can be used for other purposes such as production of heat and electricity. The heat and electricity are partially used in the process itself, but the rest can be used for providing energy services to households and other industries, through the grid, for example. The model is simple, like all good models, and has proved to be an efficient and economically competitive way to provide energy services. The opportunity is also there for further development of this model, for example, using technologies for second generation biofuel production.

Can the Brazilian experience be replicated and useful for African countries, for example, countries that energy-wise look very much like Brazil did in the forties? The answer is yes. Many developing countries are today sugar producers, so they already have a basic structure from where to start their biofuel production. In the past few years, sugar industries in many developing countries invested in bagasse power plants including Argentina, Colombia, India, Mexico, Nicaragua, Thailand and Uruguay. Global fuel ethanol production doubled between 2004 and 2008 reaching 67 billion litres. For the first time ever, half of the non-diesel vehicle fleet consumption in Brazil (in volume) came from ethanol. While Brazil and the US are still by far the largest ethanol producers today, an increasing number of countries are producing the fuel. This includes Australia, Canada, China, Colombia, Costa Rica, Cuba, the Dominican Republic, Zambia, Thailand and many EU countries, including Sweden. Certainly, the technologies being used vary. Countries with low biomass potential prefer to develop the so-called second generation biofuels so that they can become competitive. Bio-diesel rather than ethanol has been the preferred option of some countries. This expansion of ethanol and bio-diesel production provides good basis for the development of a global biofuel market.

Despite the progress, many countries with great potential have not yet taken advantage of these bioenergy developments. I will illustrate how significant these untapped opportunities are by giving some insight into a study developed at KTH. We calculated that already today, Nepal would be able to produce more than enough ethanol to introduce E20 in the country, that is, a mix of 20% ethanol in gasoline. This calculation is based on cane production as per

established today and installed capacity for ethanol production which is in place but is not being used at present. It is important to point out that this would not require any major new investments nor affect the output of food products derived from sugar cane. The use of E20 would greatly reduce pollutants which are the cause of severe environmental problems particularly in the Kathmandu Valley, one of the most polluted cities in the world due to its vulnerable geographical location. The fuels substitution generates also global gains in the form of avoided CO₂ emissions. But the story does not end there.

Nepal does not have oil. As much as 14% of gasoline import reduction and annual savings of US\$ 10 million could be achieved through the introduction of the E20. Once the ethanol production is put in place and the E20 is introduced, efforts could be made to enhance the resource base by improving the yields of sugarcane. Today, the average cane yield in Nepal is 36 tons per hectare or 40% the Brazilian average. Yield improvements of 50% would bring the Nepalese sugarcane production to the level of the Indian production and are achievable with knowledge available in the region. If bagasse is used to produce electricity, the sugar-ethanol industry can play an important role in the electrification of the country, where 61% of the population still lack electricity. As a matter of fact, a Nepalese citizen only consumes 5% of what an average Swedish citizen consumes in terms of energy.

The case of Nepal is also the case of many other poor countries that are fully dependent on oil imports which, in turn, have become a real drain in their economies. Their agriculture needs modernization, not least to produce more food, their industries wait for a dynamic push of markets, and their populations need jobs, income and electricity. This is still the reality of 1.5 billion people in the world today who still lack access to electricity. The IEA (2009) estimates that 1.3 billion people will still be deprived from electricity in 2030. In Africa, the number of people without electricity is expected to go from 587 million to 698 million people, thus an increase of almost 20%! Industrialized countries use ten times more energy per capita than developing countries and energy consumption continues to grow. Not making electricity access a high political priority, means we are condemning people to a life of low opportunities, we are promoting the rural exodus, and we are not acting in favor of a sustainable development.

4. Breaking the barriers

The acknowledgment of the biomass potential in past decades has led to the reinvention of bioenergy. This reinvention implies taking the road that starts in traditional technologies for processing cooking fuels and extending it to the use of modern technologies that provide all kinds of energy services we need in the modern society, from car fuels to electricity for lighting homes. In some parts of the world, this is equivalent to a revolution. Fortunately, many countries have realized the need to harness local renewable resources to increase the security of energy supply, reverse fossil fuel dependency and improve trade balance. Many governments have also become aware of the important benefits that bioenergy can bring in the form of job and income generation, not to mention climate change mitigation. This has contributed to make biomass, in the form of solid and liquid fuels, an attractive option among modern renewable energy sources. However, many barriers have been detrimental to a timely

development of the bioenergy potential available in the world, depriving large populations from energy services that are standard in the rich world.

Lately, a large debate has taken shape which puts the production of biofuels and the production of food as diverging objectives and competitors for land and water. This debate often ignores the established economic and productive realities found in various developing countries, the potential to create synergies with existing industries, and the decentralized character of decision making. Often the global dimension of the problem is emphasized and policy makers deal with it as if the global issues were all encompassing. However, climate mitigation strategies need to address multiple scales. In other words, both top down and bottom up scales of action are needed to mitigate climate change. For poor countries, economic, social and environmental benefits at the national level provide the strongest motivation for change. At the international level, understanding the regional realities is important so that financial resources can be mobilized to make the necessary investments and realize the existing potential. For a country such as Nepal, for example, an international decision not to support bioenergy could further delay the realization of the national potential in this area since the country is largely dependent on development aid.

Planning for social, economic, spatial and environmental balance simultaneously is crucial for correcting distorted processes of regional degradation and turning them into processes of sustainable development. It is time to break the mental barrier that has transformed developing countries into a world where there is large potential demand for energy but no money. Let us seriously consider developing countries part of the solution – a world full of renewable resources that can help create welfare and mitigate climate change. Let us realize the bioenergy potential together in a true spirit of globality.

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