

**Extended Abstract: *The energy challenges facing African countries and their socio-economic development***

Comprehensive understanding of the nature of the causal relationship between energy consumption and income that has a significant implication for development policy decisions is crucial. This is particularly true since the lack of access to modern energy services is recognized as a serious hindrance to economic and social development and the achievement of the Millennium Development Goals (MDGs). This is also true given the current debate about global warming and the need to reduce Greenhouse Gas Emissions by conserving energy consumption, since any constraints put on energy consumption to help reduce emissions will have an effect on growth and development if causality from energy to GDP exists.

In the area, the purpose of most of the studies, utilizing diverse methodologies and data sets for various time periods, has been to uncover the temporal relationship between energy consumption and economic growth. Thus, in the literature, there is evidence supporting the precedence of energy consumption to growth and vice versa as well as neutrality and bi-directional relation. The evidence of a bidirectional causal relationship between energy consumption and GDP confirms the value of energy in economic growth. Furthermore, these results reinforce the importance of energy access for social and economic development of developing countries.

However, since the growing awareness of the international community that the access to modern energy is an important vector for triggering economic development and for reaching the MDGs, and since that the shortcomings of GDP as method of measuring human well-being are well known, it becomes interesting to explore the link between energy consumption and indicators taking account others dimension of development such as the Human Development Index (HDI).

Hence, by employing both qualitative and quantitative assessment approaches and used primary and secondary data and information, our dissertation topic addresses the interrelated challenges of energy, development and environmental sustainability. The purpose is to assess the energy and climate vulnerability of the Sub-Saharan Africa, to understand more clearly the link between energy poverty, economic poverty, environmental fragility and then to see how Sub-Saharan Africa can improve access to modern energy, energy security, crucial for development enhancing while mitigating the impacts of Climate Change. In other words, how to make development more resilient to climate change?

To uncover the temporal relationship between energy consumption and economic growth, *we apply recently developed panel unit root, panel cointegration and panel causality techniques* for estimating the long-run relationship between GDP and the total energy consumption as well as the electricity and oil price on the one hand and other hand, that of HDI with the same variables for a subsample of countries in sub-Saharan Africa, the fifteen' Economic Community of West African States (ECOWAs) from 1980 to 2008.

According to our results, in the short term, the real income growth has a positive impact on energy consumption and that of electricity. In the long term, the direction of causality is reversed: the increasing of energy consumption and electricity leads to GDP growth.

Hence, if in the short term, there is a causal relationship between growth and total energy and electricity consumption, in the long term, the quantitative increasing in energy and electricity consumption is crucial for economic growth.

Concerning the HDI, in the short run, growth in human development have a positive effect on energy consumption while in the long-run causality is negatively running from the energy consumption to HDI due to the inefficiently use of energy.

Electricity consumption creates a positive effect on development but only in long run (neutral effect in the short run).

Moreover, the results from this study support the view that electricity is a limiting factor to economic development (electricity consumption plays an important role in economic development not only as the main input in development of industry but also as a fundamental factor which increases quality of life). This implies that the shortage of electricity consumption infrastructure may constrain the economic and human development in these countries.

Based on the above results, our first conclusion is that the government should make long-run energy consumption policy to lower the effect from economic development to energy consumption through:

-improving of energy access, security of supply, while addressing the impacts of Climate Change, by developing Sub-Saharan Africa potential of renewable energy resources (hydro-small, micro, optimization et expansion of electric pool – modern biomass, solar as well as biofuel...).

-improving energy efficiency both from demand side management (encourage energy saving in households, businesses and administrations; deployment of energy saving appliances and equipment) and supply side (investments to improve the technical efficiency of enterprises in energy supply). Therefore a policy to increase investment in the electricity supply is likely to stimulate economic growth for these countries.

Significant financial support will be mobilizing through a wide variety of sources (public and private, bilateral and multilateral, alternative sources of finance) to address the needs of developing countries and could be as grants, ODA, carbon finance mechanisms. The challenge for international assistance programs that support energy sector development in Africa is meeting the needs of the countries for energy access scale-up while also meeting the global imperative for clean energy that protects the planet and preserves the future.

### **Keywords**

Energy poverty, Energy vulnerability, Economic development, Climate Change, Human Development Index (HDI), Sub-Saharan Africa, ECOWAs, Panel Data and Unit roots test, Cointegration and Causality tests.