



Enhancing household energy consumption: How should it be done?



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ABSTRACT

Households have become one of the most crucial factors shaping the management of developments towards sustainability. However, for some nations, addressing such challenges appears to be too difficult. A lack of awareness and strong policies has led to the misuse of energy resources in Guinea. This provides us with grounds to assess the discourses on which the notion of efficiency is based on according to various actors who are attempting to affect household energy behaviour around the world. This study first attempts to improve household energy behaviour in Guinea-Conakry based on feedback from interest groups, authorities and energy companies. Our research is based on the results of a recently concluded pilot study conducted in Sweden. The outcomes of this pilot study will have some important implications in terms of enhancing household energy behaviours in Guinea-Conakry.

1. Introduction

The Republic of Guinea is the source of major rivers in the West African region, including the Niger, Gambia and Senegal Rivers (Fig. 1). It is often identified as the “water-tower of West Africa”. Previously known as French Guinea, it is now called Guinea-Conakry. The Republic of Guinea had installed energy capacities of approximately 239 MW [1] until July 2015, and 9 hydro plants and 18 thermal power plants provided for an estimated population of 12.61 million inhabitants [2]. The July 2015 launch of the Kaleta Dam (240 MW) increased the total installed capacity to 479 MW [1]. Nonetheless, the country possesses an estimated hydropower potential of roughly 6000 MW [3]. The total hydropower potential of the continent (Africa-Fig. 2) is estimated as approximately 1750 terawatt-hours [4]. However, On June 12, 1992, Guinea became a member [5] of the United Nations Framework Convention on Climate Change (UNFCCC). The Convention (UNFCCC) enacts two policy responses on climate change: the mitigation of climate change by reducing greenhouse gases (GHGs) in the atmosphere and enhancing carbon sinks and the mitigation of effects of climate change [6]. Thus, reductions are to be realized through the use of measures that improve energy efficiency [7,8]. However, according to Jesse and Ribot [9], the failure of energy policies of African countries is attributable to the fact that these countries are solely concerned about supplies, and for many years they

have overlooked the benefits of controls on household demand, particularly in regards to the regulation of domestic fuel consumption in Africa. They ignore the fact that households have been identified by researchers as an important target group for energy conservation. For example, households represent 25% of the total energy uptake in the US, 26% of that in Japan, 50% of that in Saudi Arabia [10], 39% of that in Sweden [11] and 40% of that in Guinea. For some nations, however, maintaining the drive to tackle challenges such as control features of household energy consumption appears too difficult. For instance, Guinea has only built 2 hydroelectric dams (Samankou and Garafiri) since UNFCCC 1992 [1] despite its population growth of 77% [12] from 1992 to 2013. In addition, generalized fraud and a lack of household awareness have left the electrical sector entirely defective. This shows that energy users have significant effects on demand side management (DSM) master plans that promote **successful**¹ strategies. Energy demand refers to the energy needs of end users, while energy consumption refers to energy used in different sectors of the economy. Therefore, demand is what is actually offered, while consumption refers to the usage of what is accessible, and what is accessible contributes a lion's share of climate and environmental degradation effects. On one hand, when what is accessible is insufficient (e.g., unaffordable tariffs or a lack of electricity), consumers may resort to more inefficient alternatives (e.g., wood, charcoal, or fraud). On the other hand, when what is accessible is sufficient (e.g., affordable

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¹ A successful overall strategy should aim to [140] (i) reduce the imbalance between energy demand and supply; (ii) encourage investment in energy infrastructure; (iii) diversify energy sources; (iv) control price fluctuations in energy vulnerability; and (v) encourage investment in research and development.



Fig. 1. Map of Guinea.



Fig. 2. Map of Africa.

electricity), consumers may abuse resources (e.g., high electricity bills). Regardless of what we do, it is evident that there is a need to control consumer behaviours with an invisible hand that orients consumers in the right direction. The behaviouristic approach, however, involves the examination of the **output**² of objects and of the relations of this output to the **input**³ [13]. For instance, the use of fossil fuels (inputs) contributes to environmental (object) degradation (output) and climate (object) change (output). Accordingly, behaviour refers to any change in an entity relative to its surroundings [13]. Similarly, household energy behaviour can be defined as a household's ability to cause any change (output) to its surroundings (object) by using energy as an input. For these reasons, consumption has become one of the most important tools or factors for encouraging sustainability [14].

² The output is defined as any change generated in the surroundings by the object.

³ The input, inversely, is defined as any occurrence external to the object that changes this object in any way.

Moreover, energy consumption behaviour has been identified as a source of demand that refers to the needs and preferences of individuals in terms of their energy use [15,16]. To illustrate, Stafford states that “buildings per se do not consume energy; rather people living and working in buildings use energy” [17]. Cramer et al. [18] similarly argue that “human attitudes, incomes and intentions do not directly consume electricity. Rather, they influence how the physical devices are operated”. These early statements support the notion that user behaviour is key to explaining energy consumption. From the above, it is evident that consumption gives some power to end users to pollute the environment. How do we control this power so that consumers efficiently use energy? One way involves influencing consumer behaviours. How can we influence their behaviours? A simple way involves examining the discourse that principles of efficiency are based on in consideration of the various actors who attempt to influence household energy behaviours around the world. According to Gyberg and Jenny [19], a discourse is a process through which terms (e.g., energy efficiency orientation) are defined. However, we believe that when the notion of efficiency is based on discourse, such discourse becomes part of our knowledge and thus becomes information. As information is derived from one's knowledge, discourse is an accumulation of information. Nonetheless, knowledge and information are recognized as crucial to enhancing everyday consumer behaviours. There is evidence that utility companies and government agencies seeking to reduce household energy consumption levels must focus on empowering consumers with more information and knowledge on how to effect such change [20]. This shows us that bad habits (e.g., sedentary lifestyles and fraud) could be the result of a lack of knowledge and information. For this reason, it is important to understand how and when households use energy to deliver the right information to the target audience. This is crucial because when overloaded with information, people tend to adopt the solution that satisfies minimum requirements rather than choosing the best option [21]. Therefore, useless complications and sensory overcrowding should be avoided by framing messages in a clear format and by communicating short and simple messages that most consumers can rapidly and readily comprehend [22]. In line with growing anxieties surrounding climate change, efficiency has become increasingly more crucial. Within such a context, doing more with less is **efficient**⁴; therefore, doing less with more is inefficient. According to Castillo et al. [23], efficiency is defined herein as the actions that consume the lowest possible volume of assets in producing a definite volume of production. From the above, it is perhaps unsurprising that before July 2015, Guinea's energy supply mix was as follows: 80% from biomass, 18% from hydrocarbons and only 2% from electricity [24] (Fig. 3). Electricity has become critical to human life and has allowed us to accomplish far more than that which evolutionary processes and nature had restricted us to. For this reason, the knowledge and information received by energy users should be very important. The specific objectives of the paper are (i) to examine the discourse that the notion of efficiency is based on by assessing several actors who are trying to influence household energy behaviour around the world, and especially in Sweden with regards to enhancing household energy behaviour in Guinea; (ii) to examine 24 years of energy consumption data for various sectors in Guinea to evaluate the

⁴ Efficiency behaviours are recognized as one-time actions, such as buying new energy-efficient technology and building modifications (e.g., replacing incandescent bulbs with new LEDs; installing fixtures like low-flow shower heads, insulation and solar panels; and upgrading old, inefficient appliances) [141]. For instance, suppose that you must cook a meal and that you have three options: 1. open fire; 2. new stove; and 3. second-hand stove. From these options, the second one is of course the efficient option because we could do more (e.g., cooking, eating, showering and sleeping) with less (15min + modest cost), while with the first option we could do less (e.g., cooking) with more (e.g., carbon dioxide emission, environmental and health degradation, one hour and little cost for now, which might increase in the future because of issues concerning particulate matter in smoke). From this example, we can see that efficiency is a rather complex idea with choices and decisions that require considerable knowledge and information.

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