

## Chapter 7

# Analysis of the Nexus Between Smart Grid, Sustainable Energy Consumption, and the Smart City

**Luke Amadi**

*University of Port Harcourt, Nigeria*

**Prince I. Igwe**

*University of Port Harcourt, Nigeria*

### **ABSTRACT**

*Since the 1990s, the field of smart grid has attempted to remedy some of the core development deficiencies associated with power supply in the smart city. While it seemingly succeeds in provision of electricity, it fails to fully resolve the difficulties associated with sustainable energy consumption. This suggests that the future of smart grid analytics in the smart city largely depends on efficiency in energy consumption which integrates sustainability in the overall energy use. This chapter analyzes the nexus between smart grid, sustainable energy consumption, and the smart city.*

### **INTRODUCTION**

Cities are the hub of economic development where energy consumption plays a key role. According to the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012, half of humanity lives in cities. The urban population has increased from 750 million people in 1950 to 3,600 million in 2011. It is estimated

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that by 2030 almost 60% of the population of the world will reside in urban areas. The question of green energy and technology has not been adequately resolved in both developed and developing societies.

The strategies to have electricity consumption under efficient control are the basis of smart grid. This involves the control of energy usage based on the process data. The argument is that the process of achieving consensus on the future vision for technology development should lead to the mobilization of different environments around the idea of propagating a smart grid for a smart city. According to the European 2020 Strategy Document (European Commission, 2010b), Europe is suffering a period of structural transformation in the socio-economic framework. The priorities to favor the new model that Europe needs include institutionalization of a smart city dynamics. This includes a variety of activities and lifestyles.

In the United States, the first official effort at defining Smart Grid was provided in the Energy Independence and Security Act of 2007 (EISA-2007). The US Congress gave its approval in January 2007 and it was signed to law by President George W. Bush in December 2007. The EISA (2007) argued that a smart grid is an electrical grid which includes a variety of operational and energy measures including smart meters, smart appliances, renewable energy resources, and energy efficient resources.

Beyond secure and equitable energy consumption among the high-income societies, are the challenges of greenhouse gas emissions which are produced in cities. These appear to be at variance with the smart city prognosis. Equally, a number of studies explore “inclusive grid” within the sustainability contexts. This largely explores the persistent dichotomy between the rich and poor societies. Across Africa, parts of Asia and Latin America power outage points to opposite direction with the smart grid analytics.

This suggests the saliency of engagement with the question of smart grid analytics within sustainability contexts. In particular, this encompasses building solutions with the evolving needs and nature of citizens to accommodate adaptable foundations to shape the future of cities. This is premised on the notion to accommodate a number of evolving interests in the smart city dynamics including clean and green energy consumption, inclusive grid, grid control models etc. Thus, smart grid analytics emerged as basic building block to implement smart city.

Smart cities which could act as catalyzers of the foreseen energy, environmental and social equity are expected to play key roles in order to achieve a sustainable energy consumption. Energy issues relating to sustainable development were discussed at inter-governmental level for the first time at the 9th Session of the Commission for Sustainable Development (CSD-9), held in April 2001. Countries agreed that stronger emphasis should be placed on the development, implementation and transfer of cleaner, more efficient technologies and that urgent action is required to further develop and expand the role of alternative energy sources.

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