Investigating the process of sustainable publicness in the solar energy market: A case study of Nigeria

Abstract

This study investigates the process of designing and setting-up a new market for solar energy in Nigeria and its expected sustainable values, such as low costs for end-users and positive climate change impact. Empirics come from a case-study conducted in Nigeria. Taking inspiration from the work of Deleuze and Guattari, we analyse the ways in which each key component of the new market form an assemblage; and how each assemblage has potentials to influence performance metrics of the new market. Further, we examine how using solar energy in households improves sustainability for climate change at macro organisational level. Findings show factors that enable or hinder public authorities and market actors from institutionalising the solar energy market throughout the whole country and what can be done to reach there.

Introduction

The concept of publicness, that is, organisational possibilities deliver to public values as outcome (Antonsen & Jørgensen, 1997) has increasingly become attractive in inter-disciplinary literature (Bozeman & Bretschneider, 1994; Scott & Falcone, 1998; Anderson, 2012) and management accounting (Steccolini, 2019; Bracci et al., 2021; Quayle, 2021). Public values are multifaceted; they include ecological, social, cultural and economic dimensions that add value to the public sphere (as opposed to private and individual spheres) (Benington, 2009). Historically, scholars have used three different approaches to conceptualise publicness: the generic, the core, and the dimensional. The generic approach tries to de-emphasise the relevance of profit maximization to differentiate public from private sector organisations as well as others (third sector) when analysing publicness, because each type organisation has other targets or missions rather than simply make profit-money. In fact, the main focus in the generic approach is rather on organisational processes, management standards and management values (Scott & Falcone, 1998). In contrast, the core approach holds that substantial difference between public and private sector organisations must be taken into account, because the level of publicness depends on contexts, such as, market structure (i.e., public choice theory), possibility to transfer ownership from one party to another (i.e., property rights theory) and externalities. The dimensional approach conceptualises publicness not as being based on organisational types (contrary to the core approach) but on how any organisation is expected to deliver public value as outcome (Bozeman & Bretschneider, 1994; Steccolini, 2019). Proponents of the dimensional approach argue that the level of publicness depends on economic and political authorities (i.e., influences) under which an organisation operates (Bozeman & Bretschneider, 1994). Political authority reflects on power (rights and obligations) that a government gives to an organisation to operate within, in order to deliver a specific output; that is, the level of control that key stakeholders (including public authorities, citizens, employees…) have (or can have) over an organisation. Economic authority reflects on sources of funding available to an organisation, such as, public funds, raising a capital from investors, setting borrowing limits and keeping financial surplus. The key issue here relates to the power of an organisation to make its financial decision (Bozeman & Bretschneider, 1994). The dimensional approach has been extended to a normative focus on how an organisation is attached to public values (Moulton, 2009). By combining metrics of political and economic authorities with the normative approach, it becomes possible to investigate critically potential limits of publicness in various types of organisations (Moulton, 2009; Anderson, 2012).

Research has shown that a high level of political authority is likely to lead to high level of organisational publicness. In contrast, a low level of organisational financial authority leads to tight governmental control which might constrain potentials to deliver public value as outcome (Anderson, 2012).

Little is still known, however, on how to conceptualise and analyse relationships between publicness and sustainability in a specific market field. This paper defines sustainability as any object (such as a policy) or activity that aims to continuously improve the well-being of peoples, organisations and societies (Massimo & Nora, 2022). Many studies have analysed multiple facets of sustainability (i.e., the social, environmental and economic facets) in different settings in public sector organisations around the world (Causevic et al., 2022; Twesigye, 2022; Venghaus et al., 2022; Mapani et al., 2023; Sereda & Flores-Sahagun, 2023). Findings have shown that there is a consistent gap between policies of sustainability and their publicness (or public value) in practice. In consequence, Steccolini (2019) has suggested shifting research attention from how public sector and hybrid organisations operate in order to examine the process of publicness (or publicness management) through which they deliver public value to end-users and the society. Bracci et al. (2021) have called for further studies analysing interconnectivities between individual, organisational and societal values and accounting practices in examining various levels of publicness. Further, Quayle (2021) has examined the role of whistleblowing as a mechanisms constraining possible organisational mis-behavior that might cause damage to public interest and values. The aim of this paper is to contribute to this research area by suggesting a framework to analyse how public authorities and private operators can design and set-up a market aiming to deliver specific products and services to end-users competitively (that is, at low costs) and sustainably (that is, sustainable publicness at macro level). Thereafter, we examine the overall benefits and challenges (especially the policy framework) associated with renewable energy in our context.

The next section explains the theoretical framework, followed by a brief review of the solar energy market in Nigeria. This leads to derivation of the research question. Then, a brief presentation of the next phase of the project.

Theoretical framework

By taking inspiration from the seminal work of Deleuze and Guattari (1987) and DeLanda (2016), this study conceptualises relationship between public policies, market actors, publicness and sustainability as composed of inter-related assemblages, each being territorised to behave in an expected way.

Deleuze and Gattary (1987)'s definition of an assemblage can be best understood by applying syllogism of *a warrior* holding *a weapon* while riding on *a horse* during a fight. Here, to achieve desired outcome, it is not enough for the warrior to just hold the weapon. It is rather a requirement that the warrior must first be an agile soldier capable of maneuvering his/her weapon during a riding fight. This means in consequence, that an assemblage cannot be reduced to its component parts anymore. Further, relationships between parts of an assemblage (that is, their agency) produce *emerging properties* that are appropriate to the assemblage itself as affecting its behavior in a way or another (DeLanda, 2016). It is a requirement that emerging properties be constantly activated to reach the level of *in-decomposability* (Deleuze & Guattari, 1987; DeLanda, 2016).

DeLanda (2016) argues that any assemblage has two dimensions: 1) material and expressive components; and 2) lines of territorialisation and de-territorialisation. Material components are contents, such as, infrastructure, skills, culture… Expressive components are instruments of expression including symbols, icons, brands… Territorialisation consists of filtering and establishing boundaries of a specific object or a group of objects (Deleuze & Guattari, 1987). An object is anything that is capable of a study. Hence, territorialisation is not only geographical; it also applies to abstract objects, such as, accounting or management (Miller & Power, 2013); people, such as, social group activities (Martinez & Cooper, 2017); and things, such as, controlling a new product in a given market (Martinez et al., 2022)…

Actors of territorialisation use *codes* to define how well the identity of a specific assemblage is. The process of coding and decoding plays a crucial role during the work of territorialisation and de-territoriazation (DeLanda, 2016). For example, a bank (or any other organisation) is an assemblage composed of well-defined material and expressive components. To be governable, bank managers need to use accounting and other managerial devices (such as, rules and policies) to territorise quantitatively and qualitatively bank's activities. For further details, read: Miller and Power (2013); Miller (2014). In this setting, accounting devices including information system tools, such as ERP software help to shape and monitor the *flow* of information concerning people and things that are part of an assemblage; as well as those coming into or/and moving from one assemblage to another (Martinez & Cooper, 2017; Martinez et al., 2022). An assemblage with a high coding *intensity* becomes a strata (Abrahams, 2020). In the contrary scenario, de-territorialisation enfolds (DeLanda, 2016). A big assemblage, such as a market or a network is composed of many small assemblages (Pollock & D'adderio, 2012; Martinez et al., 2022). In this setting, emerging properties of the new assemblage enable or/and constrain potential behavior of its composing assemblages (DeLanda, 2016). According to Deleuze and Guattari (1987) assemblages are not static; they are rather in a continues process of "becoming" and "un-becoming" and each "object" presupposes a continuous "flow" among other objects (Deleuze and Guattari, 1987, p.6).

In this study we start by investigating the flow of objects (people, technologies, discourses and things) into and from the solar energy market of Nigeria. Objects that come into the market include public policies, public authorities, private operators and households. Objects that emerge from the market include solar energy contracts (financing contracts, procurement contracts, employment contracts, insurance contracts…) and electric solar power sold to end-users. Objects that connect inputs and outputs into/from the solar energy market include technologies of governance (i.e., accounting metrics, management control systems, accountability mechanisms), market ethics (whistleblowing, corruption, transparency) as well as accessibility and affordability factors. To be consistent, all factors have to be analysed in relation to public and economic authorities and mechanisms (Moulton, 2009; Anderson, 2012).

In a study similar to ours, Antonsen and Jørgensen (1997) analysed the degree of publicness among public organisations in Denmark. They argued that a high level of political authority (i.e., high external stakeholder control, low managerial autonomy, high professional orientation) in the context of conflicting environmental demands and complex tasks (such as promoting using environment friendly sources of energy than those producing high carbon emission) usually leads to high degree of publicness and hence sustainability.

To explain findings Anderson (2012) distinguish between organisational performance indicators and public service outcome indicators (i.e., achievement of public value), because each contributes (albeit differently) to a specific type of sustainability and publicness. For

instance, the level at which an organisation is dependent on public funds is a good indicator of economic authority, which is relevant in analysing resource publicness. Resource publicness deals with relationship between organisational performance indicators and how that performance contributes to improving public values, such as the quality of public services provided, recovery rate from specific medical treatments, and the capacity of corporate operators or SMEs to reimburse their investment loans… Likewise, the quality of communication, social dialogue and contact between political decision makers, private operators, market employees and citizen (households) is a good indicator of communication publicness, which is relevant analysing how and why some organisations can have good managerial performance without delivering good public service outcomes and sustainability (Moon & Chung, 2018; Min et al., 2020). By combining all factors explained above, it becomes possible to understand factors that enable or hinder a specific market assemblage to produce and deliver products and services with a high level of sustainable publicness

The case of Nigerian solar energy market as illustrative example

With several possible energy sources for renewables, hydropower, solar, wind, and biomass energy (Bamisile et al., 2017, p. 243), and sizable reserves of conventional energy or fossil fuels (e.g., natural gas, coal, oil, and lignite), Nigeria is heavily endowed with abundant renewable energy (RE) and non-RE (conventional fossil) resources. However, Nigeria has, over the years relied almost entirely on, and has committed huge non-commensurable (in terms of obtained output) resources to, hydro energy despite the opportunity other sources of energy offer. Specifically, with a respective 1938.4 MW and 1060 MW installed and available capacity, hydro is the sole renewable energy power plant that is wired into Nigeria's electrical grid (N.E.R.C, 2018). Well documented is the infrequent and epileptic power supply, with its several negative economic and social outcomes. Inadequate power supply results in low capacity utilisation, low productivity, low growth or weak economy, and by implication, high level of unemployment, poverty and crime. This seems to correctly describe the state of Nigeria economy. For example, in May 2019, the governor of the Central Bank of Nigeria linked the unprecedented insecurity in Nigeria (armed-robbery, kidnapping for ransom, and terrorism) to the weak economy and unemployment. 93.7 million Nigerians (46.5 percent of the population) live in extreme poverty, making Nigeria the country with the most such individuals in the world (Igudia et al, 2022). Nigeria has very high unemployment (23.1 percent), with youth unemployment at 55.4 percent. It has rapid urban population growth (4.3 percent per year), and inflation (13.7 percent), but weak GDP growth (-1.6 percent in 2016; 0.8 percent in 2017, NBS, 2018), albeit with modest pick-up since (1.9% in 2018, 2.2% in 2019, World Bank World Development Indicators). We argue in this article that regular and stable power supply can and will change the narrative, and that to achieve the much-needed power supply, there must be a deliberate focus, exploitation and investment in renewable energy – particularly - solar energy.

Solar energy is the most promising renewable energy source in Nigeria for many reasons. Nigeria's proximity to the equator guarantees abundant sunlight and potentially, large-scale solar development as a source of economic growth. With a 5 percent conversion efficiency, the yearly technological potential of solar energy in Nigeria is deemed to be 1.50 x 1018 of energy. The estimated daily average solar radiation in Nigeria is 3.84 kWh/m2, or the equivalent of 1.082 million tons of oil (Lin & Ankrah, 2019). Solar energy is sustainable, environment friendly, and will help Nigeria attain the sustainable development goal (SDG7). My experience during the recent fieldwork in Lagos, Nigeria will help here:

> "When I wanted to feel a bit of Lagos and have lunch outside of the comfort of my hotel room, I was asked to go into a mini-open-market with about four large buildings,

> several opposite-facing and adjacent mini-stores. As I worked in, the first thing I noticed was that every shop had its power generating set. The second was similar - the noise and fumes emanating from the generating sets, which were unbearable. I began to think about the high volume and cost of fuel required by each shop/store owner to power these generators, and what could possibly happen to their businesses when there is fuel scarcity (as witnessed in recent times in Nigeria). Without a doubt, the shops will be forced to close, production grounded, and productivity goes southward. But, with solar energy, both noise and fumes pollution will be eliminated, and shops will remain open."

Recognising the need to diversify and seek alternate sources of energy, government policies in Organisation for Economic Co-operation and Development (OECD) member-nations have favoured the promotion of RE through a variety of channels since the 1970s oil crises (Lawal, 2020). Through the "renewable energy portfolios" for example, the US has established RE objectives, supported by laws requiring either public utilities or private generation businesses to produce or buy a specific quantity of electricity from RE sources. A feed-in tariff (FiT), which essentially aims to remove cost, obstacles by guaranteeing generators of RE at a minimum price for renewable power, is a second method that has been widely adopted throughout the world (Victoria State Government, 2018). Recently, governments have paired FiTs with reverse RE auctions, in which developers compete to build a specific capacity of RE at the lowest possible cost. The successful developer is then given the project as well as a FiT for the production of renewable electricity (Butler & Neuhoff, 2004)

From the OECD experience, financial and fiscal incentives have been implemented as they are important in growing and promoting renewable energy, and in showing government's commitment to diversifying away from fossil fuels. However, it appears there are little or no such government policy or incentives on renewable energy in Nigeria, as current incentives and policy tend to promote investments in conventional electricity (Nadabo, 2010). Or where they exist, it has not achieved its desired effect. In fact, we are in a situation where government grid power subsidies deter and punish investment in renewable energy sources.

Another issue with the development of renewable energy in Nigeria is that it has been impacted significantly by the lack of a level playing field for alternative energy sources and technologies. Nigeria government has exclusive control of the country's energy sector, and there is lack of a suitable institutional framework on renewable energy. These factors reinforce to hamper the growth of Nigeria's renewable energy sector. In his work for example, Nadabo (2010) claims that Nigeria has no agencies that are in charge of issuing licenses to companies that are ready to provide renewable energy electricity in smaller quantities, and that businesses entering the renewable energy market find it difficult to do so. However, the National Council on Power (NACOP, 2012) claims that the enabling laws have now been established, but question remains as to how enabling or effective are these laws? The extant laws, starting with the National Energy Policy (NEP) was introduced in 2003 to the Renewable Energy Master Plan, and the Renewable Energy Policy Guidelines (REPG) (Lawal, 2020), set goals for the amount of electricity to be sourced from Renewable Energy RE (such as solar energy) sources and target electricity generation from RE sources. In addition to these agreements, Nigerian economic policies are centered on achieving goals for renewable electricity. The report of the National Technical Working Group on Energy Sector (also known as the Vision 20:20 Program), which was established in 2009 to re-evaluate the nation's economic development objectives with regard to power generation, is one such economic document (Lawal, 2020).

That said, the reality on ground suggests that policies are yet to influence the proportion of renewable energy generated, despite policy-guidance on the usage and exploitation of RE for sustainable electricity (Chukwuka, 2018). Some have therefore argued that the renewable energy laws are insufficient for Nigeria to meet its goals for sustainable/renewable power (Omorogbe, 2008). Further, Omorogbe claims that the lack of laws governing energy policies is the bane of RE in many African nations, and that government's inability to establish the proper legal framework often results in both policy failure and "a skewed legal environment." This more than justifies the focus of our work on the process of publicness in sustainable solar energy in Nigeria. Thus, in this research, we seek answers to the following questions:

RQ1: In what ways, and to what extent is the Nigerian solar energy market driven by demand-side (supply-side) forces?
RQ2: Is the Nigeria renewable energy market a win-win for all stakeholders? What benefits are accruable from a fully harnessed solar energy in Nigeria?
RQ3: In what ways do households solar energy usage improve or enhance (or hamper) climate change sustainability?
RQ4: In what ways, and to what extent, are institutions enabling or hindering the solar energy revolution in Nigeria? What are the remedies?

Next phase of the study involves a survey of critical stakeholders currently operating in the Nigeria renewable energy space to enable us answer the questions raised above. The arrangements to carry out the survey has been concluded, and results that will emerge will be analysed in time for the conference.

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