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Challenges to Energy Transitioning in Commercial Buildings in the Nigerian Built Environment - from Generator to Renewable Energy Economy

Abstract

Purpose – Challenges to energy access in Nigeria have resulted in the widespread use of fossil fuel generating sets (generators) despite their renewable energy (RE) potential. Given the climate crisis, combined with the country’s rapid population growth and expected rise in energy and building demand, transitioning to low-carbon electricity using REs like solar photovoltaic (PV) presents opportunities beyond securing its energy future. While PV use is growing in Nigeria, this is focused on the residential sector despite the identification of the commercial sector as a high energy consumer and a key platform for its integration. This paper investigates the challenges in transitioning to solar PV in commercial buildings from a building professionals perspective

Design/methodology/approach – A qualitative approach in line with grounded theory was adopted using in-depth face-to-face interviews with industry experts.

Findings – Two distinct but interrelated categories emerged: being held captive and being a saviour that represented a duality of systems, and/or processes formed the core category ‘Hostage Syndrome’. The core category (theory) was generated based on the explanations and expressions by participants about their concerns, interests, and the conditions under which they operate. The findings reveal the value attributed to generators beyond an operational role and the adjustments or mechanisms adopted by building professionals during their practice. It suggests a sphere of influence beyond the obvious financial and/or institutional aspects, as determining factors to what is viewed as sustainable which will be key to transitioning to REs.

Originality/value – This paper provides new and in-depth insight into understanding the conditions under which building professionals operate associated with their interpretations of ‘being sustainable’. The study highlights the need to consider psychological and cultural factors in the development of interventions, strategies, and/or policies to support RE transition, particularly towards achieving a sustainable construction industry.

Keywords Energy transitioning, Solar PV, Commercial buildings, Fossil-fuel generators, Nigeria

1. Introduction

The construction industry presents an interesting dichotomy, as inherent in its activities are beneficial and equally detrimental consequences to human and natural systems (Dalibi *et al.*, 2017; Sholanke and Opeyemi, 2019). Globally, it accounts for 36% of energy demand and 37% of energy-related CO₂ emissions (United Nations Environment Programme, (UNEP) 2021) which is expected to increase by 2060 due to the doubling of the global building stock (World Green Building Council (WorldGBC), 2019). As such, the industry will continue to constitute a major burden if its activities remain unchanged, making it a major target for sustainability. Consequently, significant emphasis has been placed on decarbonising it (IPCC, 2007; Chel and Kaushik, 2018), with a focus on improving energy use (Ugulu and Aigbayboa, 2019), although predominantly directed to countries within the Global North due to their significant greenhouse gas (GHG) contributions (Oborn and Walters, 2020).

There is however increasing focus on countries within the Global South, such as those in the sub-Saharan Africa (SSA) region, like Nigeria because they will constitute a significant share of both future growths in population and building stock (WorldGBC, 2019; Santamouris *et al.*, 2021). Furthermore, such countries already bear the brunt of the impacts of climate change, despite their minor contribution to GHG emissions (IEA, 2019). It is undoubtedly preferable

to proactively facilitate sustainable developments from the outset than reactively deal with the consequences.

To this end, Rowlands (2011) and others (see Du Plessis, 2007; Unuigbo *et al.* 2020) advocate elevating the issues associated with the SSA region – making it front and centre - to ensure the practice of climate-proofing. For instance, Unuigbo *et al.* (2020) argue for urgency in ensuring environmental preparedness in the region, particularly as it accounted for 57% of energy consumption in Africa and 32% of process-related CO₂ emissions in 2019 (UNEP, 2020). Therefore, achieving efficient and long-lasting positive change in the region's construction industry is linked to employing low-carbon pathways using REs (IPCC, 2007; Africa Progress Panel, 2015; Adenle, 2020). The aforementioned authors argue that given Africa's diverse and abundant RE resources, it is capable of not only meeting its energy demands but significantly contributing to global needs if optimally utilised. Africa has the richest global solar resources (IEA, 2019), which suggests that it can be a leader in low carbon development, and a key player in the fight against global climate change. Thereby, not only contributing positively to environmental development but equally, to socio-economic development towards achieving the UN Sustainable Development Goals (SDGs).

Considering this, the focus on Nigeria is of significance given it has the region's largest energy deficit, indeed one of the largest in the world (Ritchie and Roser, 2019), combined with being its most populated country with one of the fastest population rates in the world (IEA, 2019; Rabetanetiarimanana *et al.*, 2018). As such, its GHG contributions are certain to increase (IEA, 2019). These factors have and continue to drive the call for a cleaner energy sector (Adeyanju *et al.*, 2020), particularly as self-generation through privately-owned generators is widespread (Ajenikoko *et al.*, 2018; Adejoro, 2017; Imandojemu and Tonuchi, 2021). Nigeria is the largest user of generators in Africa (IEA, 2019) and the region's 2nd largest GHG emitter (Ritchie and Roser, 2019) as can be seen in Figure I.

(Insert Figure 1: Comparison of Electricity Demand met by Generators in selected SSA countries)

This is despite its noteworthy catalogue of both conventional and RE resources and energy potential (Akhator *et al.*, 2019; Chanchangi *et al.* 2022), described as underexploited and/or overshadowed due to its oil-producing capacity and exportation gains (Abdullahi, *et al.* 2021; Adeyanju *et al.*, 2020; Cervigni *et al.*'s, 2013). Nigeria is ranked as a leading country with high solar potential (Ohunakin *et al.*, 2014), with solar recognised not only key to its national energy diversification but also its direct and/or specific use in buildings due to its widespread availability and diverse application (Adesanya and Schelly, 2019; Mas'ud *et al.*, 2021). Additionally, low carbon projections using off-grid technologies such as PV in Nigeria, have been identified as more cost-effective than generators (Cervigni *et al.*'s, 2013), making it the most suitable alternative clean energy source and solution to its energy crisis (Chanchangi *et al.* 2022). Notwithstanding, Osuizugbo *et al.* (2020) note that solar energy has not been given the priority it deserves and it is important to understand why, particularly as the building sector consumes 60% of total energy utilisation (Bajere, 2014) and Nigeria seeks to improve and expand energy access through REs (Adesanya and Schelly, 2019) in line with SDG goal 7.

While there are numerous reviews and studies in the literature on energy access in Nigeria relating to PVs and REs in general, some of which have been noted and/or discussed above, and others (see for example Babakatcha *et al.*, 2020; Ikudayisi, 2020; Ohunakin *et al.*, 2014; 2017; Ugulu, 2019). Most, have predominantly focused on the national context and/or residential perspective. This is understandable given the country's energy epidemic and fuel

poverty which continues to drive the RE discourse for energy improvements (Adeyanju *et al.* 2020). As such, highlights the need for a national green approach. Additionally, the residential (domestic) sector in Nigeria has historically consumed the bulk of energy demand (Anyanele *et al.*, 2019, Ugulu, 2019) which speaks to why dwellings are the focus of energy policies and initiatives in Nigeria (Ugulu and Aigbayboa, 2019). Although these studies reveal the necessity and/or benefit of RE in diversifying the country's energy portfolio and have equally identified some key barriers notably, financial, technological, and institutional related. They also show a limitation in its exploitation empirically and across other sectors, particularly the commercial sector.

This is noteworthy because globally the commercial sector is linked to economic wellbeing (Usman *et al.*, 2019), and Nigeria, is seeing an increase in energy demand and consumption, particularly from office buildings (Anyanele *et al.*, 2019; Unuigbe *et al.*, 2020). As well as a growth in office developments due to expanding global markets (Usman *et al.*, 2019). For instance, Unuigbe *et al.*, (2020) note that this is due in part to how they are designed and used, with multiple generators operating as both the main and backup supply over long periods. Generators account for over 90% of the energy supply in organisations (Anyanele *et al.*, 2019). This not only makes them a significant burden to human and natural systems (Akhator *et al.*, 2019) but also a financial one (IEA, 2019). Furthermore, and arguably, more importantly, office buildings are identified as having the greatest potential to improve energy access, reduce energy use, and cost-effectively contribute to climate change mitigation through the integration of REs (Heinstein *et al.*, 2013). This highlights the significance and viability of the sector and justifies the need to understand the status, extent, and/or impact of PV integration in commercial buildings in Nigeria to identify opportunities for enhanced adoption and/or promotion. However, there is no comprehensive empirical study on this. The available literature on commercial buildings is limited and primarily focuses on reviews, audits, or user/business perspectives (see for example Adewale *et al.*, 2018; Anyanele *et al.*, 2019; Komolafe *et al.*, 2016).

Only Unuigbe *et al.* (2020) attempted to explore this to an extent, focusing on REs. While the authors identified a high generator dependency similar to other Nigerian studies in the literature, they found a willingness to adopt REs and other sustainable measures. As such, resulting in a gradual shift toward REs such as PV for decentralised electricity generation and a push for sustainability building certification independent of national incentives. This revealed that although a concern, financial and technological related barriers were not perceived as the main barrier contrary to the literature and speaks to more contextual elements as significant. This supports the argument by the aforementioned scholars of the need to holistically discover and embrace local perspectives and contexts. This study seeks to do that, building on Unuigbe *et al.* (2020) findings, aimed to explore the challenges to energy transitioning from generators to PV deployment in commercial buildings in Nigeria. It focuses on the perspectives of building professionals within the context of the design stage, given its influence on building construction and environmental impact. Furthermore, this paper makes the case for employing a qualitative strategy as best suited to understand the actors (building professionals), conditions, and context in which they perform. This is based on the methodological culture of construction management research which is predisposed to quantitative approaches and Global North references as evidenced in the literature (Erebor *et al.*, 2019; Laryea and Leiringer, 2012; Umeokafor and Windapo, 2018). Consequently, limiting the insight of studies in the Global South like Nigeria due to the adoption of generalised and/or predefined factors and frameworks not suited to their context (Katikiro, 2016) which will have an impact on RE adoption.

2. Method

A qualitative approach using Constructivist ground theory (CGT) was chosen informed by the research problem, interpretive nature of the study, and context under investigation. A key tenet of CGT is the mitigation of mechanical applications such as predefined frameworks to enable unbridled insight into the situation on the ground (Charmaz, 2014). This serves to give voice to participants, allowing them to tell their stories without any form of limitations or interference, which was key to this study, as it sought to gain in-depth first-hand accounts of participants. As such, grounding the data on the actual happenings leads to the development of a theory grounded on empirical data, as opposed to preconceptions (Glaser, 1998). In this way, CGT facilitated the exploration of the research problem and context with a fresh perspective to aid in the development of an understanding of the concerns of industry experts. Thereby, filling in the gaps where useful, nuanced, and/or sensitive information is missing to explain the situation on the ground. As well as for lessons to be learned that may have otherwise been lost (Du Plessis, 2005).

CGT also recognises the researcher's role in co-constructing meaning and, where necessary, enhanced by the review of literature throughout the process, without limiting openness or directly influencing the process and outcome (Charmaz, 2014). This is an area of contention among grounded theorists (McCallin, 2003). In this study, literature was used in both preliminary and theoretical contexts. The former contextualised the research and framed the problem and the latter examined the findings in extant literature. Given the exploratory nature of the study, the research problem and questions emerged as the study developed, which is a key feature of grounded theory studies (Liu *et al.*, 2014). This allowed for flexibility to investigate without restrictions, thereby allowing the researcher to follow the leads to fully understand the situation on the ground. Although this study commenced with a question, it only served to guide the process as is characteristic of grounded theory studies. In line with the tenets of CGT, the study employed core principles aligned with openness, coding, theoretical sampling, and theory generation.

2.1 Sampling, Data Collection, and Data Analysis

Data was collected using semi-structured interviews guided by theoretical sampling, which enables leads to be followed towards theory construction (Charmaz, 2014). However, it commenced with purposive sampling, aimed at guiding the selection of a sample best suited to provide insight (Glaser, 1988). As such sampling in grounded theory changes, which ensures relevance, fit, and grounding of the data for theory generation (Larsson and Poel, 2002). Participants were initially recruited from a network of contacts, then from a wider network through participant referrals. A selection criterion as suggested by Charmaz's (2014) was adopted to limit researcher bias, which included selecting professionally and statutory accredited and registered participants with subject matter expertise. Furthermore, the selection criterion contributed to enhancing rigour in the selection process. Based on the principle of "*maximum variation in sampling*" (Morse, 2010), initial purposive sampling was diverse, recruiting professionals of varied disciplines within the built environment. A target population of 34 consisting of architects (16), mechanical engineers (5), electrical engineers (6), structural engineers (3), facilities managers (2), and project managers (2) made up the sample. The sample size was deemed appropriate, due to the aim for in-depth insight for quality and robustness as a basis for further research as opposed to generalisations (Baker, 2012). Participants had between 10 – 46 years of industry experience and were all registered with the statutory institutions.

Prior to commencing the interviews, ethical approval was obtained from the relevant institution(s) and all participants gave their informed consent for voluntary participation and

for the interviews to be audio recorded. Furthermore, an ethical thread was maintained throughout the study to avoid any potential issues which served to build trust. All interviews were conducted face-to-face using an interview guide that developed in line with the analytical process to account for new insight and/or emerging ideas based on participant responses. Interviews were designed to collect data regarding the activities, conditions, and context in which the participants engaged during their practice. Issues such as design contexts, energy provision, and sustainability, among others were addressed. Interview questions commenced by being broad and then more focused as the process evolved, thereby, facilitating the emergence of categories supported by a reflective process using memos. Memos had the significance of creating an audit trail to guide the process for quality control, ensuring it was grounded in the data (Charmaz, 2014).

For example, some of the interview questions included: “How is the energy supplied to buildings?”, “Tell me about what comes to mind when you think about the term sustainability generally”? What alternative sources of energy do commercial buildings have? “Could you say more about how you see it as being part of us?”. The interview questions sought not only to elicit general and specific information but also to expand on categories such as, “being part of us” in order to gain rich insight for robust development of a theory during the theoretical sampling stage. Thereby allowing leads with ‘theoretical reach’ as described by Charmaz (2014). Theoretical sampling enabled the enrichment of the category “being part of us” as it directed focus on “What it meant to participants?”, “To what extent it influenced their behaviour and/or practice in relation to generators, REs, and sustainability in general”? and “Are there external influences?”. After in-depth exploration, including the engagement with related concepts and categories, such as ‘accepting and maintaining the status quo’, ‘designing for generators’, and ‘co-existing’, the category was renamed ‘normalising/minimising to function’

In line with grounded theory, data collection and analysis were undertaken simultaneously. Data analysis was facilitated through coding, following a 2-stage process, starting with initial coding and focused outlined by Charmaz (2014) and employed grounded theory principles of constant comparative analysis (CCA), theoretical sensitivity, and memo writing throughout the process. This ensured the development process relating to codes and categories remained grounded in the data. Coding was repeated for subsequent interviews and the new and previous codes were compared with one another, larger data sets, and memos (analytical and reflective notes). This facilitated the process of CCA (reviewing, sorting, integrating, and organising) to form higher-level conceptual categories, until theoretical saturation for theory development.

3. Findings

This study aimed to investigate the challenges to energy transitioning from generators to PV in commercial buildings. Based on the analysis of the interviews, a core category, conceptualised as Hostage Syndrome (theory) was developed based on the explanations and expressions of participants about their concerns, interests, and the conditions under which they operate. Hostage Syndrome is underpinned by two interrelated categories namely, being a saviour and being held captive. The development of the theory and its interrelated categories are presented and discussed below with the aid of exact participant statements. The quotes are not exhaustive and merely offer some insight into the theory development process.

3.1 Hostage Syndrome

Hostage Syndrome conceptualised how participants managed what they believed to be an existential threat and equally a necessity such as generators during their practice. It captured a duality of systems and/or processes co-existing as rescuer (categorised as Being a saviour) and

1
2
3 captor (categorised as Being held captive), and the psychological adjustments made by
4 participants (their peers and public) based on their perceived value.
5

6 7 3.1.1 Being held captive

8 Being held captive represents the threat element (captor side) of 'Hostage Syndrome' and
9 conceptualised the pressure and constraint building professionals experienced regarding their
10 operational continuity and the subsequent actions taken to ease the constraints.–Building
11 professionals emphasised the permanence of generators such that they have become entrenched
12 in everyday life as the norm and in turn, they had not only become accustomed to it and its
13 associated impacts. It had also influenced building design and the wider construction process.
14 This is represented in the example excerpts below.
15

16
17 *"People are born into some of these smells [relating to generators and pollution]
18 and they are totally immune, they can't even smell, they can't tell the difference
19 anymore."*
20

21
22 *"I think they [building professionals] have just thrown in the towel. You know, I
23 think they have accepted to a certain extent the dysfunction, because that's what it
24 is, it's dysfunction. So, it is a case of look we need to make the best of a bad
25 situation. We need to just make this work the best we can and move on."*
26

27
28 *"Some people have generators that they don't use, or they don't need, but it is our
29 culture you know...So, it's like part of us. In fact, we do not think that we can do a
30 design with it."*
31

32 The key point in these excerpts is the willingness of building professionals (and through them
33 their clients) to adjust their way of thinking/approach to survive. It revealed a vulnerability to
34 surrender to a situation for a semblance of stability and the feeling of powerless to improve
35 things and/or the belief that their actions would be to no avail. As such the rationalisation and
36 acceptance of situations (using generators) and consequently, the lack of will to push beyond
37 what they deemed necessary (considering sustainable measures, REs). Thereby leading to the
38 immersion of generators in building design, particularly, the practice of designing to
39 accommodate them and the priority given to them as a key consideration.
40

41 Designing for generators is standard practice, and indeed institutionalised as part of the
42 vernacular architecture which participants attributed to lacking an enabling environment. This
43 was a key concern due to perceived non-existent and/or deficit infrastructural and regulatory
44 systems aiding the establishment of informal sectors and/or systems linked to the construction
45 and energy industries. As such, undermining formal sectors and/or systems and opening them
46 up to exploitation for financial and other gains as well as encouraging non-compliance and
47 unsustainable practices as is exemplified in the statements below.
48

49
50 *"...my general perception or the general psyche is that there is a deliberate attempt
51 to ensure that the power sector does not work. It's just not explainable, nobody can
52 fathom it, can understand it."*
53

54
55 *"There is a word called the cabal [laughs] in Nigeria. So, cabals got no name
56 attached to anyone but there are people who benefit from the use of generators.
57 There are people who bring in generators, they would I mean, they pray every day
58 to sell. So, I am sure they would do anything."*
59
60

"For instance, I know developers once they start the foundation, they go to China, and they buy all the material... So, they compromise, they bring in, materials - sub-standard and it affects the end-product, the building that eventually is built."

"...a lot of people just say, oh that solar thing is expensive because the information about the price has gone all round...I mean, some people have had experiences where they installed faulty ones, maybe they got a bad shipment. So, they just say, this thing is just expensive, it's not functional. That also doesn't inspire confidence."

The key point in these excerpts is the value of good regulatory and institutional systems which ensure compliance through policies and standards but also aid in creating awareness through advocacy as a means of propelling movement toward achieving sustainability. It underscores the need for energy sector reform and the direct impact it has on achieving sustainability in the construction industry. As well as the value in not only having access to but also generating (through research) relevant and correct information to enhance understanding, change preconceived ideas, and break barriers for informed decision-making.

3.1.2 Being a saviour

Being a saviour represents the necessity element (rescuer side) of 'Hostage Syndrome' and conceptualised the dependence of, and value attributed to generators as 'a knight in shining armour', due to the assurance of continuity (safety and comfort) it offered construction professionals during their practice. Building professionals believed that their ability to function was contingent on generators, which further reinforced the cycle of dependence as represented in the example excerpts below.

"I mean, we can't understate how they [generators] have been able to help, because power is an integral part of business anywhere, integral part. The power sector has had its challenges over the years, failings and somehow you have to, I mean you basically can't do much without them."

"Generators are a saviour. I grew up with generators, power is super epileptic and people don't have a choice but to have generators."

The key point in these excerpts is the value and/or significance attributed to generators as ensuring the country's existence, beyond the activities of the construction industry. Building professionals described the country as 'having a generator economy' based on its established status. There was a level of assurance and trust that generators provided because they had filled the void created by national power, indeed 'rescued' the power sector, as such they were indispensable. Similar to the structural elements of a building, generators were perceived as the framework which kept the country together, hence their elevated status as saviours. Furthermore, excerpts also speak to the concept of 'self-power generation' as the driving force of the economy and reinforces the broader concept of 'self-help' as ingrained in the fabric of the country.

4. Discussion

The findings in the study highlight a construction industry underpinned by generators albeit its detrimental impact and speaks to an ingrained culture of generators informed by fear and longing. It revealed the value attributed to generators beyond an operational role and the adjustments or mechanisms adopted by building professionals during their practice. This is significant because it evidences a challenge(s) to the adoption of PV and REs in general beyond the basic and singular concept of barriers and/or more tangible or practical factors such as

financial related as is commonly documented in the field and/or subject matter literature (both national and global) to intangible ones that are psychological and cultural related. They are arguably more influential as determining factors to what is viewed as sustainable which will be key to transitioning to REs.

Building professionals described the rationalisation, acceptance, and as a result the institutionalisation and growth of systems and/or practices associated with generators due to the lack of enabling conditions. Thereby leading to an environment in which both formal and informal systems co-existed and competed, with the latter having the upper hand due to their perceived value/benefits. Consequently, although building professionals perceived generators as a threat and associated it with the existence of a '*generator cabal or cartel*', they also offered a sense of security. Thereby leading to a willingness to make concessions towards their design approach, which manifested in the practice of '*designing for generators*'. As such, continuity was chosen at the price of the environment and/or sustainability, which Wood (2003) notes exemplifies the 'Faustian bargain'. According to Wood (2003), it is the continual sacrifice or holding up of future or long-term sustained prospects for security and survival in the short term.

The practice of '*designing for generators*' also revealed a pervasive theme running through most aspects of the country, namely, '*forced self-reliance*', which engendered the '*instinct to survive*'. Survival after all, as described by Woo (1992) is a determinant for what is attributed as being of value, thus what can be done with or without. This had a significant influence on the decisions and approaches to sustainability by building professionals, as they actively sought and employed ways to meet clients' needs according to their knowledge, experience, and available resources, as such relying on themselves. Forced self-reliance manifested not only in the form of self-power generation but in '*designing for generators*'. Generators were seen as both a blessing and a curse reflecting the dual role, of a liberator and captor, with the former supporting development through continuity in operation and as such viewed as indispensable. Such that it created an environment in which building professionals believed that without it, the country would cease to function, thereby, engendering a psychological attachment to generators beyond the functional over time. Thus, cementing the practice of designing for them as part of the building process and indeed the 'vernacular architecture' as characterised by some building professionals.

Building professionals characterised their experiences when resolving their clients' building needs, as one of safety, within captivity. This revealed a duality in their feeling and/or experiences which was one of impotence and fatalism - coming to terms with the situation they found themselves in - and independence and sense of safety - feeling secure and experiencing relief with the opportunity of activity generators offered. This was important as it provided insight into their thinking and decision-making process as reflected in their attitude and approach to sustainability. The captor and saviour portrayals/characterisations expressed by building professionals and the explanations of their experiences were akin to Stockholm syndrome as presented by Graham *et al.* (2001). Stockholm syndrome sought to explain the relationship, in which a captive sympathises or identifies with the captor, creating a situation in which the captive remains tied and/or loyal to the captor to its own detriment. According to Graham *et al.* (2001), it characterises a situation in which denial, rationalisation, and/or minimisation of abuse act as defences to aid in dealing with situations.

Although initially aligned within the context of kidnappings and/or hostage situations, Stockholm syndrome has since been widely used in different studies within diverse fields such as business/management (Tapishnu and Manish, 2020), religion (Schulman, 2009), and health (Karan and Hansen, 2018) given its representation of a captor/captive dynamic, power

imbalance, and/or emotional bond (Adorjan *et al.*, 2012). This Adorjan *et al.* (2012) notes are due to its manifestations in varied situations and formats, some of which may not be immediately recognised as the syndrome. According to Graham *et al.* (2001) and evident in the aforementioned studies, the existence of the syndrome is pre-conditioned by four instances: (1) the victim perceiving no way to escape except by winning over the abuser, (2) the victim perceiving some kindness, however small, from the abuser/captor, (3) the victim being isolated from others who might offer an alternative perspective from that of the abuser, and (4) the victim perceiving a threat to his or her survival. While the pre-conditions are based on human relationships and/or interpersonal situations, within the context of this study, they are based on the relationship between generators and humans. The researcher argues that the fundamental principle and conditions remain, as it reflects a pattern of behaviour exhibited by building professionals under the specific conditions and proposes that the phenomenon provides further insight, understanding, and explanation of building professionals behaviour. Figure II illustrates the pre-conditions in relation to this study, within the 'Hostage Syndrome' context as prescribed by Graham (2001) and adopted in the aforementioned studies.

(Insert Figure II: Diagrammatic Representation of Pre-conditions)

As it can be seen in Figure 11, within the context of this study, similar to the captor/captive dynamic, power imbalance, and/or emotional bond, the extreme experiences and behaviours are represented in the sphere of influence that captures feelings of impotence and fatalism at one end and independence and assurance on the other side. It revealed building professionals expression of disdain for generators due to the harm they caused but equally their gratitude for the access it provided based on their fear of not being functional. Consequently, generators were seen as saviours, providing the necessary respite and a sense of security but at the same time their captors, holding them to ransom with the threat of power stoppage perpetually hanging over them. Generators had indeed become in control of the situation, facilitating the fruition of the achievement of their basic needs but also addressing their fears, typifying a power imbalance. This led to an attachment being formed. Strentz (1980) attributes and associates the formation of a bond to a situation in which one fears for their survival and the "need to survive is stronger than the impulse to hate the person who has created the dilemma" (p.148). Therefore, is arguable that this will happen, which Adorjan *et al.* (2012) describe as a "pathological transference or identification". This resonated with the building professionals in this study, as it typified their characterisations of the country in the context of generators and could not see the country without it. The Nigerian identity to some was inherently associated with and indeed regarded as one and the same with generators.

This 'psychological perspective' and/or 'captor/capture dynamic' and its implications had not previously been identified in studies investigating experiences relating to Nigerian construction professionals in the construction industry and more specifically on issues relating to sustainability. Although previous studies, conducted in Nigeria have identified findings in the context of dependence in relation to generator use (Bajare, 2016; Zuofa and Ochieng, 2016). They primarily focused on the institutional (practical) perspective, which can be characterised in this study as lacking an enabling environment. They however lacked insight into the psychological perspective which was identified as key in gaining a fuller picture of the duality which existed based on construction professionals perceptions and experiences. Stockholm syndrome as it is currently understood may not only be relevant but be a significant contributor beyond the practical's needs of energy to the psychological challenge construction professionals experience. In particular, regarding ending their attachment to generators and transitioning to RETs. Although the go-to primary problem and/or solution to RET transition

by numerous studies both Nigerian and international alike are associated with economic and technological factors (Fuselier, 1999; Painuly, 2001). However, in a country where building professionals characterise it as 'having a generator economy' and as previously discussed has one of the highest energy deficits in the world, combined with a rapidly growing population within the context of economic, social, and infrastructural challenges. It is not a simple matter of finance and technology.

5. Conclusion and Recommendation

The need for energy goes beyond convenience but is a matter of wellbeing. This is a truism that should compel action for change, not only within the context of the construction industry but in all aspects of human activity. In line with the need to decarbonise the built environment, this study using a grounded theory approach sought to investigate the challenges to energy transitioning from generators to PV deployment in commercial buildings in Nigeria. The significance of the commercial sector and particularly commercial (office) buildings is due to their increasing visibility in the country's skyline, energy, and environmental impact, and equally high potential to mitigate climate change through RE adoption provided appropriate justification for the study. As well as the lack of evident empirical studies conducted in this area.

The study identified psychological and cultural challenges beyond the more commonly documented barriers in literature, the former which has been missing in previous studies due to blanket applications of predefined factors and/or frameworks. The findings (psychological and cultural challenges) reveal the decision making and behaviour of building professionals to be influenced and informed by fear to achieve the perceived demands of now as opposed to hope for what should and could be, manifesting in the almost wholly use of generators and practices associated with them such as 'designing for generators' in the construction industry. Although the practice offered positive human results, it has detrimental implications to practice given its institutionalisation as the norm and through it, ingrained as part of the culture and/or country identity. Thereby challenging change and/or movement towards RE transitioning.

For most building professionals this resulted in the rationalisation, acceptance, growth, and establishment of systems and practices associated with generators based on their perceived value/benefit despite their detrimental effects. As such, normalising to function within a dysfunctional system. The findings reveal the significance and/or value of fossil-fuel generators beyond their operational/functional role to one anchored on psychological dependence. Furthermore, the study highlights self-help as a determining factor in the direction of change. Self-help represented a duality for or against sustainability action as a reflection of construction professionals beliefs and experiences. In essence, a multi-dimensional idea and/or practice of sustainability on one hand based on self-preservation fuelled by anxiety and desire to function; business continuity. Thereby hindering RE adoption. On the other hand, based on environmental security fuelled by responsibility as its custodians, thereby supporting RE adoption. Both however viewed as striving to be sustainable and/or being sustainable. The former is the case in this study, different from the typical scenarios attributed to self-help. Self-help presented itself as a challenge to RE transition.

The study has developed a framework of how building professionals make sense of their role within the context of fossil-fuel generators; learn to deal with it and adapt and integrate it into their practice towards meeting energy goals in relation to their understandings of 'being sustainable'. It provides relevant and useful insight on what they deemed to be challenges to transitioning from generators to PV for improved awareness and a better understanding of their decisions, actions, and conditions under which building professionals the function using

Stockholm Syndrome theory to enable the development of ground actionable interventions towards PV adoption and/or reduced generator dependence. Stockholm Syndrome theory due to its captor/captive dynamic, power imbalance, and/or emotional bonding offered a way in which to explain and demonstrate the psychological link beyond transactional engagement. This study has shown the broader applicability of Stockholm syndrome within the energy, sustainability, and/or climate change contexts given its underpinning concept of self-help (either through self-preservation or environmental security). It suggests that understanding how cultural contexts and concepts and practices such as ‘duality of self-help’, ‘designing for generators’, and ‘generator economy’ work will be key to moving RE adoption in commercial buildings. Furthermore, beyond the need for electricity, generators symbolised hope to construction professionals. It embodied the elements they reported were deficit and/or lacking in the country and as such, something they wanted to hold on to. Hence being branded as a ‘saviour’ and described as ‘*Being part of us*’. This is significant due to the potential to inform the design and implementation of sustainable developments that can disrupt the generator dependency and contribute to its eventual eradication. As such it would have significant policy and future research implications, particularly as the Nigerian Government aims to achieve Zero carbon by 2060, which the construction industry is not only uniquely positioned to actively contribute to but to champion.

In line with the findings of the study, given the aim and taking into consideration the limitations of the study based on its focus on the design process, commercial buildings, and specific participant disciplines. The following recommendations are proffered in support of policy development, practice, and for further research.

- Regulatory reform in the construction industry to ensure compliance and continuous identification of areas for improvement through the establishment of multidisciplinary building commission.
- Establish mandatory requirements for sustainability (achievements) for new projects to curb the impact of ‘designing for generators’ and promote PV adoption. Level of sustainability achievement to be dependent on project specification/set criteria.
- Set up research bodies and repositories to encourage research for reference, benchmarking and further development.
- Exploration of further research on effective strategies and/or frameworks to accelerate RE transitioning within the generator economy.

Although this study presents a commercial perspective, it applies to other sectors. Additionally, it offers potential for exploration within the wider SSA context, including developing countries.

7. Reference

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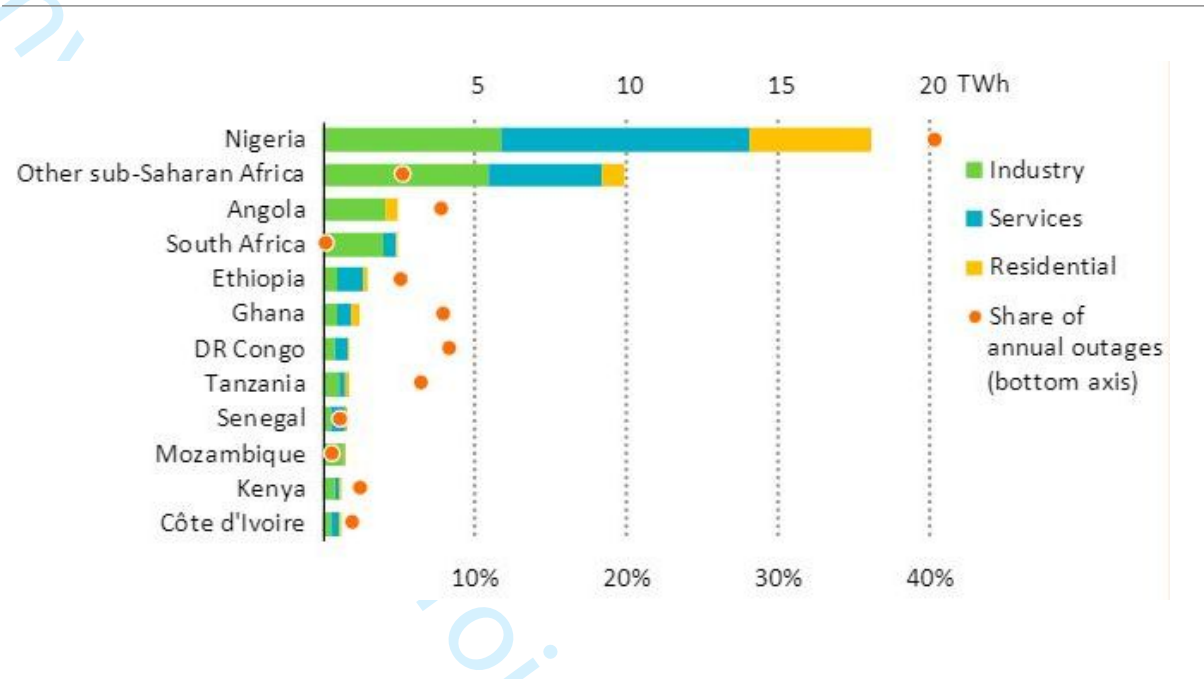
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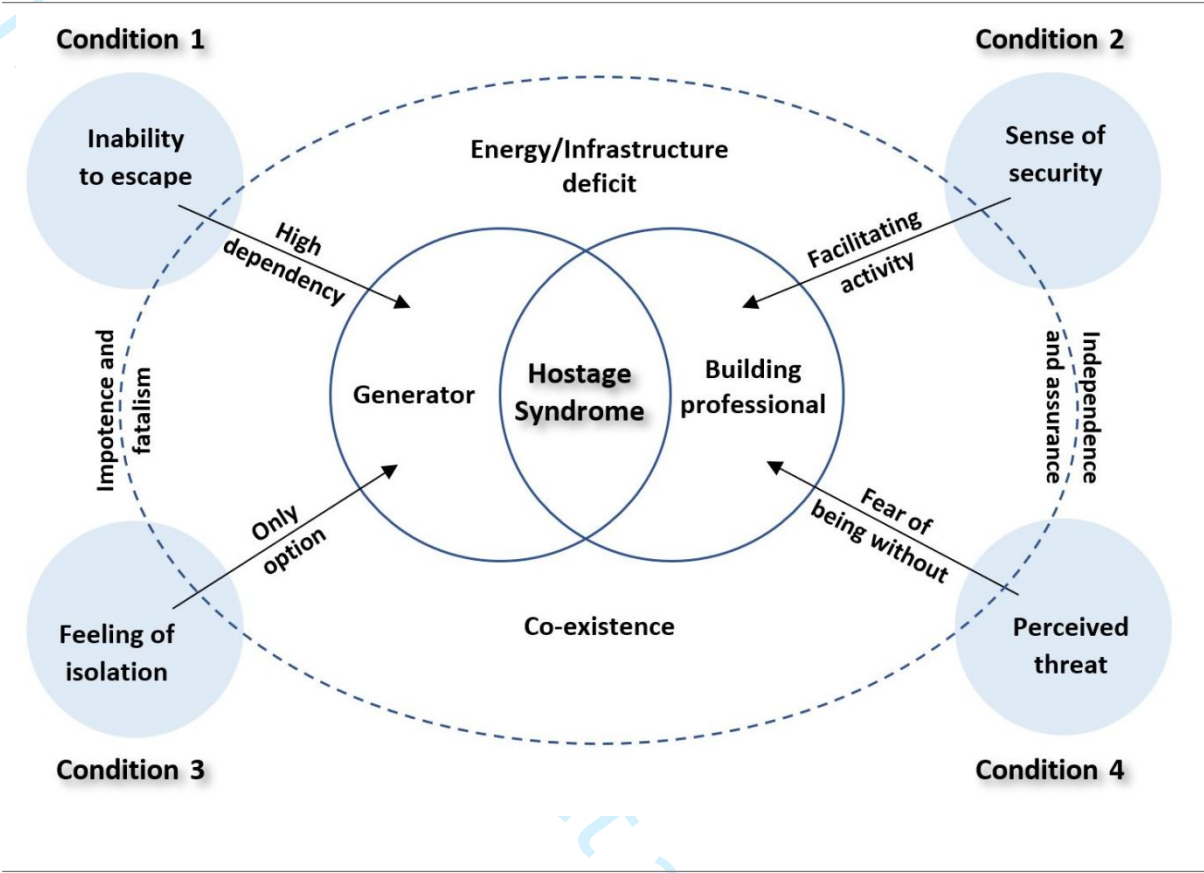
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Figure I: Comparison of Electricity Demand met by Generators in selected SSA countries



Source: IEA (2019, p. 63)

Figure II: Diagrammatic Representation of Pre-conditions within the Hostage Syndrome Context



Source: Researcher's construct based on Graham's (2001) precursors.

REVISIONS SUMMARY

Reviewers comment	Response/revision
The author(s) attempted to investigate the challenges of energy transitioning from fossil fuel generators to renewable energy technologies in commercial buildings in Nigeria. By conducting a grounded theory method using semi interviews of construction professionals, the authors suggest two categories of challenges of energy transitioning: being held captive and being saviour, which appear to be in tune with social challenges in the extant literature.	
The paper has the potential to be published, but some work will be needed to get it into publishable status. In this regard, the author(s) will have to review the concerns I raise for quality improvement of the manuscript such as:	
The authors did not include the findings of the review extant literature on the research problem and the purpose or aim of the study including recently published studies in journals as well as comparing and contrasting the findings of the relevant literature with the findings of the paper.	The introduction/section 1 has been extensively enhanced including additional literature cited. The number of references cited has increased from 58 to 71
The authors did not provide a succinct discussion on some key of principles of grounded theory method in the study paper.	we have provided further discussion on grounded theory giving more detail and justification for the methodical choices in the methodology section
Some errors were identified in the manuscript. I recommend that the author(s) should consider the concerns raise and thoroughly review and revise the entire manuscript.	The whole paper has been thoroughly reviewed, and corrections made where appropriate
I deeply appreciate the author(s) efforts in contributing to the research area of renewable energy. I do hope that the authors find the recommendations constructive and as an attempt to help improve the quality of their manuscript. I wish the author(s) all best in pursuing research in this dynamic area and their goal of ensuring that the manuscript reaches publication.	Thank you for the constructive comments which has helped to enhance the quality of the resubmitted paper.

Additional Questions: 1. Originality: Does the paper contain new and significant information adequate to justify publication?: Overall, the paper contains new information to support its publication and can make a useful contribution to the extant literature on the topic.	
2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: The paper ignores a preliminary literature review on the key challenges and barriers to renewable energy adoption and diffusion in various regions and countries in the world. The review of the literature could consider general and building sector specific issues of renewable energy (RET) adoption and diffusion. This relevant preliminary literature review will help to contextualise the phenomenon that the study will investigate, and to provide an over view of what will be explored in the study. This is in keeping with the Constructivist strand of grounded theory.	We have enhanced the introduction/literature review section and referred to relevant extant literature. This is evidenced by the increase in number of cited references from 58 to 71.
In the Introduction Section, the author(s) gave some background information on the energy use and waste emission within the construction industry. They further gave background information on the future expectation of energy use and waste emission of the building sector. The author (s) however, did not give an indication of the current state of energy use and waste emission from building sector.	Issues around energy use/demand are alluded to in the introduction. However, given the context of the paper, the limitations on word count, and with newly enhanced discussion in the literature review a dedicated discussion on energy use and waste emissions from buildings was not included. A detailed discussion was deemed out of scope of the paper.

The author(s) indicated that the focus of the research is on commercial buildings. However, the author(s) did not give an indication of the importance of the commercial building stock or inventory to Nigeria or the economy of Nigeria. In this regard, the author(s) could have include some metrics to show the importance of commercial buildings to Nigeria. This could include but not limited to the following: • The value of commercial buildings to total value of all existing buildings in Nigeria. • Commercial building value in relation to total assets in Nigeria. Furthermore, the author did not give an indication of the current state of energy use and waste emission from existing commercial buildings in Nigeria. however, they indicated that there are slow pace of renewable energy uptake in commercial building in the purpose of the study under the Abstract Section. The author could also give a definition for commercial building and sustainable or green building, identify the key building types that constitute commercial building and clear state which building type that is under investigation in the research. The author could also include in this section the renewable energy technologies that are commonly used in commercial buildings.	This has now been adequately addressed in the introduction/ literature review section and have adequately justified the value of commercial buildings.
Some research articles were already published in journals, such as Unuigbe et al. (2020), Usman, et al. (2019), and Adejoro (2017), which are closely related to the authors' paper. The author(s) did not, however, review and provide the key findings of those articles in the paper. Following which the author(s) could show that their paper will be a valuable addition to the extant literature in the area.	These articles and others have now been referred to.
The first sentence under paragraph 5 under the Introduction Section "although there is significant research on energy access...." appeared to be confusing in my opinion, which might be due to the length of the sentence and need to be reviewed.	The whole paper has now been thoroughly reviewed, and corrections made where appropriate

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: The methodology employed is appropriate to the research. However, it is not sufficiently described by the author(s). Generally, the selection of grounded theory method is driven by the research problem, which could be formulated as an initial research question(s) that the researcher seek to address in conducting the research. In particular, the research problem informs the initial methodological procedures for data collection. Grounded theory method is an emergence method and hence the author(s) could have begun the methodology section by articulating the specific research problem clearly to determine the initial research design, which is expected to emerge during the course of inquiry. In this section, the author(s) should detail the method(s) employed to carry out the research including a description of exactly what they did and why, discuss its/their advantages and disadvantages and references of the range of the research that adopted the method(s). There are some fundamental areas of constructionist grounded theory method (CGTM) missing in the Methodology Section. The areas are as follows: • Theoretical saturation is what grounded theorists ought to aim for. The author(s) did not provide a succinct discussion on theoretical saturation, and indicate when the theoretical categories are saturated. • Reflexivity – the author(s) could provide a succinct discussion of reflexivity. • Treatment of the literature review - the author(s) could have discussed the treatment of the literature review in the research within this section. The author(s) should note that the initial (purposive and convenient) sampling in grounded theory is used to establish sampling criteria for people, cases, situations, and/or settings before they conducting the field. Whereas, theoretical sampling directs the researcher to seek and collect relevant data to identify, elaborate, refine and ultimately, achieve saturation of categories in order to develop emerging theory. In this regard, sampling ceases when saturation of categories has been achieved. Therefore, theoretical sampling uses data analysis	We have enhanced, the discussion in Section 3-Methodology. Given the context of the paper and the limitations on word count, we have provided content and context of the application of GT deemed necessary. We acknowledge the differences in style of presentation of grounded theory research publications.
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to inform and shape further data collection and focuses on conceptual and theoretical development. In my opinion, the study was guided by the fundamental principles of grounded theory but not by theoretical sampling that facilitated the collection and analysis of data as indicated by the author(s) in Design/methodology/approach under the Abstract Section. Based on the previously mentioned comments, the authors(s) should revise the methodology section.	
4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: The author's need to ensure that the findings, discussion and conclusions of the research adequately address the research problem or the aim of the study. The authors are encourage to begin the Discussion Section with a statement of the important findings of the paper. The author(s) made very little explicit reference to the existing literature on the challenges of renewable energy adoption and diffusion in the Discussion Section. Furthermore, readers would have anticipated that the author(s) to integrate the relevant literature into the constant comparative process of the research in the Discussion Section as per suggestion of GTM - based researchers. This would allow the comparison of the research findings (the substantive grounded theory) with relevant work in the literature of earlier research. This also involved looking for similarities and/or contradictions to the exiting literature as far as the authors' findings can allow. Proponents of constructionist grounded theory suggest author(s) should use extensive and relevant literature review at the later stage of the research (e.g. discussion stage) to make explicit connections between their research and earlier research, and thereby position their research within the existing critical literature and theories relevant to their chosen topic and its context with the larger community. This would give a better and more substantiated understanding of the problem under investigation.	We acknowledge the differences in style of presentation of grounded theory and qualitative research publications. Our approached adopted in this paper was to present the findings (section 3) and then discuss these (section 4) in the context of existing literature. The discussion section (Section 4) has been enhanced to addressed and reference made to relevant literature. Section 4 has been enhanced. We are confident that in section 4, we have made the connection between our findings and existing literature.
Moreover, the conclusions did not adequately tie together the other elements of the paper.	The conclusion section (section 5) has been adequately enhanced.

1 2 3 4 5 6 7 8	Readers would have expected the author(s) to provide a succinct and accurate summary of the main research findings within the Conclusion and Recommendation Section. Further, the author(s) is/are expected to ensure that the conclusions reached are directly related to the research problem, are gathered from the available results and is kept in the context of the research.	
9 10 11	In the Discussion Section, the author(s) provided Figure II representing the preconditions within Hostage Syndrome but did not sufficiently and succinct discuss the key variable in the figure in relation to the findings of the research.	This has now been addressed in section 4 - discussion
12 13 14 15 16 17	The author(s) identified three key words 'self-help', 'designing for generators', and 'generator economy' in the paper. In my opinion, the first key word 'self-help' was not appropriate to the research because the main aim of the paper is to investigate the challenges of energy transitioning from fossil fuel generators to renewable energy technologies in commercial buildings in Nigeria and not to overcome the challenges or transitioning to RET.	The Findings (section 3) and discussion (section 4) has been enhanced and now clarifies the context of the key words used.
18 19	The author(s) could include the limitations of the research within the Conclusion and Recommendation Section or another suitable section.	These are now included in the conclusion/recommendation section
20 21 22 23 24 25 26 27 28 29 30 31	5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: The author(s) indicate(s) that the paper focuses on the challenges of transitioning from fossil fuel energy to renewable energy technologies (RET) in commercial building in Nigeria. Yet the author(s) did not adequately reflect the impact of the study for research, practice, and society.	The impact on research, practice and society has been addressed in section 5 - Conclusion
32 33 34 35 36 37 38 39 40 41 42 43 44 45 46	6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: I identified the following errors amongst others: • Categories was spelled incorrectly in the findings under the Abstract Section. • Adejoro, I. S. (2017) was included in the references but was included and discussed in the body of the research.	The paper has been thoroughly reviewed

The author(s) need to proofread and review the entire paper thoroughly in order to improve the quality of communication.	
Reviewer: 2	
Recommendation: Minor Revision Comments: A good paper. Please revise the title of the paper to clearly state the jurisdiction (Nigeria) in which the paper is based. Additional Questions: 1. Originality: Does the paper contain new and significant information adequate to justify publication?: Yes 2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: Yes, the paper does demonstrate adequate understanding of the relevant literature in the subject area and does cite appropriate range of literature 3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: Yes, the paper is built on an appropriate base of theory. The paper has certainly been well designed and the same can be said on the methods employed. 4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: Yes, interesting results have been clearly presented and analysed appropriately. Conclusions adequately tie in with other elements of the paper.	Thank you for the feedback

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: Does the paper identify clearly any implications for research, practice and/or society? Yes	
Does the paper bridge the gap between theory and practice? Yes How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper? The answers to these questions is YES. The authors concluding remarks outline issues that respond to all the questions in this part. The implications are certainly consistent with the findings and conclusions in the paper	Thank you for the feedback
6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The paper largely does express its case measured against technical language. However, there are some issues in terms of sentence structure, particularly, the abstract. In the abstract for example, there are some hanging sentences, missing punctuations and long winding sentences. Missing punctuations and sentence structure issues are also apparent in places throughout the paper. Acronyms should be written in full on first use.	As above, the paper has been thoroughly reviewed.

GUEST EDITOR COMMENTS TO AUTHORS 1. Overall Wordcount: Carrying out the recommended major revisions properly is important, indeed critical, before the next review and this may require extra text. I note that the present Wordcount the manuscript is 8194. I also note that more space could be needed for the expected major improvements, including the additions recommended. Therefore, to ensure that this is done properly, we are extending the BEPAM word limit (from 8,500) to 8,800 so as to enable authors to carefully and completely address the many constructive comments and recommendations of the reviewers and Associate Editor in charge. If any more space is needed, the authors would also need to trim non-essential text/ parts including any redundant (or less important) references since some new one may need adding now too - so as to stay within this extended limit.	The word count is below 8780
2. (a) Please edit again carefully. Also, (b) in terms of formatting: you should include All tables together in a separate file as per Author Guidelines, marked 'Tables' and 'for review'. 3. Furthermore, please submit the required 'Revisions Summary' as a Word File (and classed as a "Supplementary File for Review") – clearly itemising changes done, for easier Re-review, also clearly specifying in page/ line numbers, or by some other means, the exact location of each of the revisions.	Tables and figures have been submitted in separate files
4. Please Also remember to download, complete and submit the BEPAM Checklist. See:https://eur02.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.emeraldgrouppublishing.com%2Fauthors%2Fwriting%2Fbepam_checklist.doc&data=04%7C01%7Cm.unuigbe7892%40student.leedsbeckett.ac.uk%7C433c44f16bd94cdaefac08d9fb2331a7%7Cd79a81124fbe417aa112cd0fb490d85c%7C0%7C0%7C637816953052691557%7CUnknown%7CTWFpbGZsb3d8eyJWljoIMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6IjEhaWwiLCJXVCi6Mn0%3D%7C0&data=5sGRAkivMIMHrGahqRgITCOC%2Fexc54W%2FHYzlpEJ8Kg8%3D&reserved=0	
5. Please also follow all other Author Requirements/ Guidelines.	
6. In conclusion, we look forward to a substantially improved submission that will address the above comments and make a significant contribution to knowledge in this domain. Best	

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Wishes!	
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