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Stakeholder Perceptions of Drivers for, and Barriers to, the Incorporation of Sustainability in PPP Infrastructure Projects in Nigeria

Journal:	*Open House International*
Manuscript ID	OHI-05-2020-0037.R2
Manuscript Type:	Research Paper
Content Classification:	Socially and Culturally Sustainable Architecture and Urban Design
Keywords:	sustainability, PPPs, infrastructure, projects, developing countries

Stakeholder Perceptions of Drivers for, and Barriers to, the Incorporation of Sustainability in PPP Infrastructure Projects in Nigeria

Abstract

Purpose – Although several studies have been undertaken on sustainability within infrastructure projects, limited attention has paid to the drivers for, and the barriers to, the incorporation of sustainability in public-private partnership (PPP) infrastructure projects through empirical study, particularly in Nigeria. Therefore, this study identified and examined the drivers that promote sustainability in Nigerian PPP infrastructure projects, and assessed the barriers to the full integration of sustainability practices into current Nigerian PPP infrastructure projects.

Design/methodology/approach – Primary data were collected using a questionnaire survey. The questionnaire survey was targeted on four different stakeholders' organizations. They were public sector authorities, concessionaires, consultants, and banks already undertaking PPP infrastructure projects in Lagos State, Nigeria. The obtained data were analysed using frequency, percentage, mean score, standard deviation, and the Kruskal-Wallis test.

Findings – The study identified 17 drivers that promote the incorporation of sustainability in PPP infrastructure projects. The analysis of the total ranking of the drivers in Nigeria revealed the top five ranked drivers to be: consideration of long-term performance; contractual arrangements; incentives for new market penetration; award criteria, and selection criteria, respectively. The study further identified 11 barriers to sustainability integration in PPP infrastructure projects and the top five ranked barriers in Nigeria are: comprehensive sustainability procurement guidelines; no enabling environment; education needs; uncertain economic environment, and a lack of clear government policy, respectively. The results of the Kruskal-Wallis test conducted on both the 17 identified drivers for, and the 11 barriers to, the incorporation of sustainability in Nigerian PPP infrastructure projects, revealed that there is no significant statistical difference in both rankings from the perceptions of the aforementioned four different respondents' groups.

Practical implications – The study provides empirical insights on the knowledge and awareness of drivers which could lead to a greater uptake in sustainability measures by the stakeholders in Nigerian PPP projects; it also identified barriers to overcome.

Originality/value – The importance of the incorporation of sustainability in public procurement cannot be over-emphasized. It is anticipated that the study will be of great value to PPP stakeholders involved in sustainability decision-making processes when delivering sustainable PPP projects.

Keywords: PPPs, sustainability, infrastructure, projects, developing countries
Paper type Research paper

Introduction

Sustainability has been an important topic in many disciplines over two decades, and its urgency is rising (Grierson and Salama, 2016). The incorporation of sustainability within infrastructure projects is a vital policy for furthering the mission of sustainable development. Globally, infrastructure is the key player in social and economic development (Shen *et al.*, 2016). For instance, infrastructure provides an avenue for economic activity and contributes significantly to enhancing the standard of living and life value. The improved development and functions of an infrastructure can make an important contribution to the objective of sustainable development. An infrastructure project can be said to be sustainable when all the various aspects of sustainability (economic, social and environmental) are dealt with in such a project (Bragança *et al*., 2010). Sustainability principles are interrelated and the interaction of an infrastructure with its prevailing surrounding is also very important. A few years back, PPP was encouraged as an effective and efficient measure in developing infrastructure projects. It is assumed that the mode of sharing risk on project investment between the private and public sectors is one of the key factors in influencing the level of sustainability in PPP infrastructure projects. This is affirmed by the United Nations and international communities recognize explicitly that achieving sustainable development will not be possible without the involvement of the private sector (Marx, 2019). PPP has been described as the contractual arrangement between a public institution or governmental agency and a private institution that enables full involvement of the private institution in the development, construction and operation of a public infrastructure project, facility or service (Schneider and Davies, 2007). Similarly, PPP is a setting whereby private bodies partake in, or provide assistance for, the provision of public infrastructures (Grimsey and Lewis, 2007).

PPP has become an instrument that governments use to induce the incorporation of sustainability into any infrastructure project delivery. A consideration of sustainability is increasing in the development of personnel in the built environment adopting the PPP method of procuring public infrastructures. Sustainable development has a natural relationship with PPP in its principles. PPP contracts allow the private partner to invest more time and quality in the projects. It is taken into account, in the PPP life cycle of a facility, to attempt to achieve maximum benefits in the long-run and to reduce the risk transferred to the private sector (Hellowell and Pollock, 2009). The potential role of PPP in the delivery of sustainable development has been recognized by governments. The future derivatives of PPP have been considered, particularly by the UK government, as important tools in order to achieve sustainable development objectives (Addis and Talbot, 2001). It can, therefore, be inferred that PPP offers real scope in the implementation of sustainable construction. Hill and Collins (2004) claimed that the mechanism of PPP could be used as a tool to move the construction industry towards greater sustainability. This is affirmed by Hueskes *et al*. (2015) who stated that PPP is an arrangement used to deliver public infrastructure via a long-term integrated contract, and that projects delivered through PPP have encouraged the incorporation of sustainability considerations. Stan (2015) argued that urban development will not be fully optimized by urban design alone. He also believed that urban development should be guided by a long-term development vision; however, to ensure that this is being facilitated the existence of PPP must be strengthened.

Sustainable development in any nation has been traced to growth in infrastructure. This is corroborated by Salama *et al*. (2016) who stated that for any new key player to be successful in entering the global network, it must invest in the establishment of infrastructure that will enable it to access foreign markets and international producers. Therefore, adequate infrastructure must be put in place in order to ensure meaningful development in any nation. In this regard, much research has been carried out on the sustainability of infrastructure projects. For instance, Zhou *et al*. (2013) developed a sustainability indicators' framework for UK PPP projects. Wiedmann *et al*. (2016) explored affordable housing projects and their impact on sustainability in Doha and Dubai. The study established a preliminary assessment framework that involves relevant sustainability parameters. Laishram and Patil (2016) explored PPP from the sustainability perspective in India. Shen *et al*. (2016), amongst others, investigated sustainability performance in PPP projects in China. Based on the foregoing, Salama and Hurol (2020) asserted that awareness and training programs are needed in the field of sustainable development because it would enable the development of positive attitudes, by all parties involved, towards the environment. However, in Nigeria, there is a paucity of studies that have investigated the drivers that promote sustainability in Nigerian PPP infrastructure projects. Similarly, empirical studies that have examined the challenges to sustainable PPP infrastructure projects can hardly be found in Nigeria. In this regard, this study was guided by the following research questions:

- what are the drivers promoting the incorporation of sustainability concepts in the Nigerian PPP infrastructure projects; and
- what are the barriers to the full integration of sustainability concepts into current Nigerian PPP infrastructure projects.

It is anticipated that this study will contribute to improving knowledge and awareness of drivers which could lead to a greater uptake in sustainability measures by the stakeholders in Nigerian PPP projects, and provide insights on the barriers to overcome.

Literature review

Sustainable development in infrastructure projects

The term sustainability or sustainable development has been described in various ways but a consensus has been reached as to its general implication which is that sustainable development needs a certain level of improved environment that assures a good well-being for future generations. For instance, Brundtland (1987) described sustainable development as those development activities that satisfy the requirement of the immediate need without unnecessarily compromising the ability of the generations to come to meet their own needs. It can be inferred that sustainability or sustainable development contains two major concepts: the first concept is needs; it is essential for any sustainable practices to place priority on how to meet the basic needs of society in terms of socio-economic infrastructure. The second concept is the state of technology and social organization which imposes limitations on the environment's ability to meet both the immediate and future needs (Stoddart, 2011; Mustaq and Azeem, 2012). Shen *et al*. (2011) pronounced that the principle of implementing sustainable development has major effect in terms of infrastructure projects. Infrastructure projects have been developed for many years and will continue developing in the future particularly in developing countries; therefore, it is important to find ways in which the sustainability of such projects can be ultimately improved. An infrastructure project can be said to be sustainable when all the various aspects of sustainability (economic, social and environmental) are dealt with in such a project (Bragança *et*

al., 2010). Sustainability concepts are interrelated and the interaction of an infrastructure with its prevailing surrounding is also very important.

The key principle of sustainability (which serves as a fundamental principle) is combining a review of economic, social and environmental concerns into all aspects of making decisions (Abdelfattah, 2017). The interactions among economic, social and environmental factors provide the thrusts in sustainability practices that each firm needs to be aware of (Dernbach 2003). Sustainability is not only a goal that ensures that policies and practices improve the present living standards but it should also provide the policies and practices that ensure that future generations have good prospects and that future risks are lowered (McClure and Bartuska, 2011). In general, the overall goal of sustainability is only achievable through the integration and acknowledgment of economic, social and environmental concerns throughout the decision-making process.

Drivers for the incorporation of sustainability in PPP projects

The natural relationship that exists between the sustainability of infrastructures and PPP projects has been recognized by both the public and private sectors. The mechanism of PPP can be used as a tool to move the construction industry towards greater sustainability. For instance, Hill and Collins (2004) stated that one of the criteria for evaluating PPP project bidders should involve an assessment of the incorporation of sustainable development put forward by the bidder. Ugwu and Haupt (2007) identified that better decision-making, the minimization of wastage, efficient project delivery and avoiding delays are the factors that have led to implementation of sustainability. PPPs are actually capable of promoting sustainable development through the generation of socio-environmental benefits. PPP can, therefore, be considered as a model of infrastructure delivery which is capable of promoting sustainable development goals through the generation of economic and socio-environmental benefits. Shen *et al*. (2011) and Hueskes *et al*. (2017) highlighted the drivers that promote sustainability in PPP projects as presented in Table I.

>>>>>>>>>>>>>Insert Table I>>>>>>>>>>>>

Barriers to the incorporation of sustainability in PPP projects

PPP is a procurement method for the provision of infrastructure that has an element of sustainability incorporation in all stages (Abdelfattah, 2017). As indicated in Table II, Wang *et al*. (2014) and Abdelfattah (2017) identified some barriers to sustainability in PPP projects.

>>>>>>>>>>>>>Insert Table II>>>>>>>>>>>>

Research methodology

The study used both a literature review and a questionnaire survey. A literature review was carried out. 17 drivers for the incorporation of sustainability into PPP infrastructure projects were identified (see Table I), and 11 barriers to sustainability integration in PPP projects were identified (see Table II). These identified drivers and barriers were used in designing the questionnaire for the study. The target population for the study comprised four different groups of key stakeholders' organizations undertaking PPP infrastructure projects in Lagos State,

Nigeria. These stakeholder organizations were public sector authorities, concessionaires, consultants, and banks. The rationale for the selection of the study area included: there are sufficient appropriate PPP infrastructure projects; the availability of adequate PPP stakeholder organizations, and accessibility to obtaining the required data for the analysis (Babatunde *et al*., 2016; Babatunde and Perera, 2017). The sampling frame of stakeholders undertaking PPP infrastructure projects in Nigeria cannot be easily determined. However, a comprehensive list of key stakeholders already undertaking PPP infrastructure projects was generated by Babatunde (2015) when exploring strategies for PPP infrastructure projects in Nigeria, and this list was utilized and adapted. Hence, a total of 145 stakeholder organizations were identified as the sampling frame. These comprised 31 public sector authorities (including ministries, department and agencies), 41 concessionaires, 51 consultants, and 22 financiers (i.e. banks) in the study area. Utilizing the total list of 145 stakeholder organizations was based on the assertion made by Fellows and Liu (2008) who stated that if the target population for a study is small, using a full population sample is adjudged to be appropriate. Thus, in this regard, the entire sample of the 145 identified key stakeholder organizations was utilized in this study.

The designed questionnaire for this study was divided into two parts. Part 'A' comprised the respondents' demographic characteristics. Part 'B' contained the identified drivers for, and the barriers to, the incorporation of sustainability into PPP infrastructure projects. A total of 145 questionnaires were self-administered to the aforementioned 145 key stakeholders' organizations (regarded as respondents). Out of these, 94 questionnaires were fully completed and returned. The collected data were analyzed by both descriptive and inferential statistics through SPSS. These included standard deviation, mean score, and the Kruskal-Wallis test. The mean score was used for ranking the identified drivers for, and barriers to, the incorporation of sustainability into PPP infrastructure projects. The Kruskal-Wallis test was undertaken to confirm whether there was a significant statistical difference in the ranking amongst the four stakeholder groups of respondents (see Fellows and Liu, 2008).

Data presentation and analysis

Respondents' demographic characteristics

Table III~~Figures Ia-Id~~ shows the respondents' demographic characteristics in relation to the respondents' work roles, academic qualifications, years of professional experience, and the number of PPP infrastructure projects already executed by the respondents. Regarding the respondents' work roles, ~~Figure Ia~~ Table III indicates that 23 respondents were from public sector authorities, 26 respondents were concessionaires, 15 respondents were financiers, and 30 respondents were consultants. ~~Figure Ib~~ Table III further reveals the respondents' academic qualifications, showing that 49% of the respondents had obtained a Master's degree, 37.2% of the respondents had Bachelor degrees, while 7.4% and 6.4% of the respondents had higher national diploma and doctoral degrees, respectively. ~~Figure Ic~~ In addition, Table III shows the respondents' years of professional experience: 46.8% had 6-10 years' experience; 41.5% had 11-15 years of experience; 9.6% had above 16 years of experience, while 2.1% had below 5 years' experience. ~~Figure Id~~ Table III also shows the number of PPP infrastructure projects executed by the respondents. It can be seen that 40 respondents had undertaken three different PPP projects, 22 respondents had participated in over four different PPP projects, 19 respondents had engaged in two PPP projects, while 13 respondents had participated in only one PPP project in the study

area. Based on the aforementioned respondents' demographic characteristics, it can be inferred that the respondents are adjudged to provide reliable and accurate data for this study.

>>>>>>>Insert ~~Figures Ia–Id~~Table III>>>>>>>>>>

Respondents' sustainability awareness in PPP infrastructure projects

Figure ~~II–I~~ reveals that all the respondents (irrespective of their organizational category) were very much aware of sustainability concepts in PPP infrastructure projects. This is not surprising because the respondents had the understanding that PPPs promote the integration of sustainability. As the respondents had this sustainability awareness within PPP projects, it enabled the respondents to provide accurate information for this study.

>>>>>>>Insert Figure ~~II~~I>>>>>>>>>>

Ranking of the drivers that could promote the incorporation of sustainability in PPP infrastructure projects

Table ~~III–~~IV shows an analysis of the ranking of the 17 identified drivers of sustainability integration in PPP infrastructure projects from the four different respondents' groups (which comprised public sector authorities, concessionaires, financiers, and consultants who had already undertaken PPP projects in the study area). As presented in Table ~~III~~IV, standard deviation (SD) was used to rank factors with the same mean value. For example, a factor with the lowest standard deviation value is given a higher rank (Field, 2005). Therefore, the results from the ranking analysis based on each respondent group are as follows:

Public sector authorities: The top five ranked drivers that promote sustainability integration in PPP infrastructure projects from the respondents in the public sector authorities are: end user's consideration; tax exemptions and reduction; consideration of short-term performance; formulation of output specifications, and consideration of long-term performance, with mean values of 4.52, 4.39, 4.30, 4.30 and 4.30 respectively.

Concessionaires: The top five ranked drivers for sustainability incorporation in PPP infrastructure projects from the concessionaires' perspectives are: consideration of long-term performance; contractual arrangements; formulation of output specifications; selection criteria, and tax exemptions and reduction, with mean values of 4.46, 4.31, 4.23, 4.23 and 4.08 respectively.

Financiers: The top five ranked drivers for sustainability integration in PPP infrastructure projects from the perceptions of the financiers are: contractual arrangements; consideration of long-term performance; incentives for new market penetration; procurement method, and stakeholders' involvement, with mean values of 4.67, 4.60, 4.53, 4.07 and 4.07 respectively.

Consultants: The top five ranked drivers that promote the incorporation of sustainability in PPP infrastructure projects from the consultants' perspectives are: contractual arrangements;

incentives for new market penetration; consideration of long-term performance; consideration of short-term performance, and PPP model adopted, with mean values of 4.37, 4.10, 4.00, 3.77 and 3.73 respectively.

>>>>>>>Insert Table ~~III~~IV>>>>>>>>>>

In addition, Table ~~III~~ IV shows the ranking of the total mean values of the 17 identified drivers for the incorporation of sustainability in PPP infrastructure projects. It can be seen that the total mean values range from 3.63 to 4.30. This indicates that all the aforementioned respondent groups regarded the 17 identified drivers as very important to the incorporation of sustainability in Nigerian PPP infrastructure projects. It should be noted that any factor is very important if its mean value is 3.5 or above, based on a five-point Likert scale (Badu *et al*., 2012; Babatunde and Perera, 2017). Moreover, the top five ranked drivers that promote the incorporation of sustainability in Nigerian PPP infrastructure projects alongside their mean values are: consideration of long-term performance; contractual arrangements; incentives for new market penetration; award criteria, and selection criteria, with total mean values of 4.30, 4.23, 4.13, 3.96 and 3.89 respectively. In addition, the Kruskal-Wallis test was carried out to ascertain whether a significant statistical difference exists in the perceptions of the four respondents' groups (which comprised public sector authorities, concessionaires, financiers, and consultants) in the ranking of the 17 identified drivers for the incorporation of sustainability in PPP infrastructure projects. The Kruskal-Wallis test results revealed that there is no significant statistical difference in the perceptions of the four respondents' groups because the Kruskal-Wallis significance value for each of the 17 identified drivers is greater than 0.05 (see Table ~~III~~IV).

Ranking of the barriers to the incorporation of sustainability in PPP infrastructure projects

Table ~~IV~~ V shows the ranking of the 11 identified barriers to sustainability integration in Nigerian PPP infrastructure projects from the aforementioned four different respondents' groups. The results of the ranking analysis based on each respondent group are as follows:

Public sector authorities: The top five ranked barriers to sustainability integration in PPP infrastructure projects from the perception of public sector authorities are: educational needs; uncertain economic environment; comprehensive sustainability procurement guidelines; no enabling environment, and a lack of integrated research, with mean values of 4.54, 4.43, 4.39, 4.17 and 4.04 respectively.

Concessionaires: The top five ranked barriers to sustainability incorporation in PPP infrastructure projects from the concessionaires' perspectives are: no enlightened campaign on sustainability; a lack of integrated research; a lack of a clear government policy; comprehensive sustainability procurement guidelines, and no enabling environment, with mean values of 4.46, 4.46, 4.23, 4.22 and 4.19 respectively.

Financiers: The top five ranked barriers to sustainability integration in PPP infrastructure projects from the perceptions of the financiers are: no enabling environment; comprehensive sustainability procurement guidelines; uncertain economic environment; educational needs, and financial and budgetary structure challenges, with mean values of 4.80, 4.54, 3.93, 3.87 and 3.82 respectively.

Consultants: The top five ranked barriers to sustainability incorporation in PPP infrastructure projects from the consultants' perspectives are: educational needs; a lack of clear government policy; no enabling environment; uncertain economic environment, and comprehensive sustainability procurement guidelines, with mean values of 4.69, 4.27, 4.23, 4.20 and 4.11 respectively.

>>>>>>>Insert Table ~~IV~~V>>>>>>>>>>

Table ~~IV~~ V further reveals the total mean ranking of the 11 identified barriers to sustainability incorporation in Nigerian PPP infrastructure projects. It can be seen that the total mean values ranged from 3.27 to 4.32, with 10 (out of 11) identified barriers having total mean values above 3.50. This implies that all the respondent groups regarded these 10 identified barriers as critical barriers to sustainability incorporation in PPP infrastructure projects in the study area (see Badu *et al*., 2012). In addition, Table ~~IV~~ V shows the total mean values for the top five ranked barriers to sustainability incorporation in Nigerian PPP infrastructure projects. These barriers (and their mean values) are: comprehensive sustainability procurement guidelines; no enabling environment; educational needs; uncertain economic environment, and a lack of clear government policy, with mean values of 4.32, 4.30, 4.25, 4.18 and 3.89 respectively. Table ~~IV~~ V also shows the Kruskal-Wallis test result which reveals no significant statistical difference in the perceptions of the four respondents' groups on the ranking of the 11 identified barriers to sustainability incorporation in Nigerian PPP infrastructure projects. As Table ~~IV~~ V shows that the Kruskal-Wallis significance value for each of the 11 identified barriers is greater than 0.05 (see Table ~~IV~~V).

Discussion of findings

Figure ~~II~~ I indicated that all the respondents (from Nigerian public sector authorities, concessionaires, financiers and consultants' organizations) are very much aware of sustainability practices in PPP infrastructure projects. This is not surprising because the respondents have the very good understanding that PPPs promote the integration of sustainability. Table ~~III~~ IV showed the ranking of the 17 identified drivers that could promote the incorporation of sustainability practices in Nigerian PPP infrastructure projects. It can be seen that the total mean values ranged from 3.63 to 4.30. It should be noted that any factor is very important if its mean value is 3.5 or above, based on a five-point Likert scale (Badu *et al*., 2012; Babatunde and Perera, 2017). This implied that the four different respondent groups regarded the 17 identified drivers as very important drivers that can bring about a greater uptake of sustainability by stakeholders in PPP projects. Moreover, the top five overall ranked drivers that could promote the incorporation of sustainability practices in Nigerian PPP infrastructure projects are: consideration of long-term performance; contractual arrangements; incentives for new market penetration; award criteria, and selection criteria, respectively. These findings confirm that in the existing literature, namely

that sustainability finds its way through PPP. For instance, Hueskes *et al*. (2015) stated that PPP is an arrangement used to deliver public infrastructure and is a long-term integrated contract. Hence, projects delivered through PPP have encouraged the incorporation of sustainability considerations. Aschieri (2018) found that the structure, process of planning and management involved in PPP have, to a large extent, the potential for allowing the consideration of sustainability integration. Hill and Collins (2004) found that one of the criteria for evaluating PPP project bidders should involve, within their bid, how they would incorporate sustainability.

Similarly, Table ~~IV~~ V showed ranking of 11 identified barriers to the incorporation of sustainability practices in Nigerian PPP infrastructure projects. The study revealed the top five overall ranked barriers as follows: comprehensive sustainability procurement guidelines; no enabling environment; educational needs; uncertain economic environment, and a lack of clear government policy respectively. These study findings confirm some previous studies' findings on barriers to sustainability integration in construction projects. However, one of this study's findings is in contrast with Hueskes *et al*. (2017) who found that bidders are not interested in applying sustainability practice within their tenders because they believe – that without including it they have a higher chance to win the bid. Anderson (2004) found that there is a lack of effective tools, throughout the procurement process, that can assist stakeholders wishing to undertake sustainability practices.

Therefore, this study now believes that there should be further study to investigate the costs relating to producing sustainable PPP infrastructure projects and the relationship that exists between these costs. Also, studies should be conducted to investigate as to how the deployment of sustainability tool/tools would enhance the socio-economic gains of PPP infrastructure projects. The results of the Kruskal-Wallis test conducted on both the 17 identified drivers and the 11 identified barriers to the incorporation of sustainability in PPP infrastructure projects revealed no significant statistical difference exists in the perceptions of the four respondents' groups. This implied that there was consensus among the four respondent groups on the rankings given to these factors. This could be attributable to the respondents' good understanding of the drivers and the barriers to sustainability integration in the Nigerian PPP environment.

Conclusion and recommendations

This study examined the drivers and barriers to the full integration of sustainability practices in Nigerian PPP infrastructure projects. The study found that infrastructure projects delivered through PPP have encouraged the incorporation of sustainability considerations. Similarly, the study concluded that there are more critical barriers influencing the full integration of sustainability practices into current Nigerian PPP infrastructure projects. This study is not without limitation. Although using questionnaire survey allows large sample to be captured, using other methods (such as interviews) together may enrich the findings. Despite this limitation, the study findings are very important. For instance, the importance of the incorporation of sustainability in public procurement cannot be over-emphasized. The study provides empirical insights on the knowledge and awareness of the drivers that will enhance a greater uptake of sustainability by stakeholders in PPP projects, and also on the identified barriers that need to be overcome. It further anticipated that the study will be of great value to

PPP stakeholders involved in sustainability decision-making processes when delivering sustainable PPP projects. Based on these study findings, the study recommends as follows:

- identified drivers promoting the incorporation of sustainability principles in the PPP infrastructure projects should be encouraged by government including other stakeholders involved in PPP projects;
- appropriate government policies and guidelines that support the incorporation of sustainability principles in PPP infrastructure projects should be in place;
- government including other stakeholders involved in PPP infrastructure projects should engage in massive awareness of the importance of sustainability principles incorporation into PPP projects, and
- an enabling environment for the full integration of sustainability principles should be created by the joint effort of both the public and private sectors.

References

Abdelfattah, F. (2017), "Relation between green buildings and sustainable development practices",*The 1st International Conference: Towards A Better Quality of Life.*

Addis, B. and Talbort, R. (2001), *Sustainable Construction Procurement: A Guide to Delivering Environmentally Responsible Projects*, C571, CIRIA, London.

Anderson, M. (2004), *Sustainable Energy Strategy for the UK: A Sectoral Investigation*, CIBSE National, London.

Babatunde, S. O. (2015), "Developing public-private partnership strategy for infrastructure delivery in Nigeria", (Ph.D. Thesis), Northumbria University, United Kingdom.

Babatunde, S. O., Perera, S., Zhou, L. and Udeaja, C. (2016), "Stakeholder perceptions on critical success factors for public-private partnership projects in Nigeria", *Built Environment Project and Asset Management,* Vol. 6 No.1, pp.74-91.

Babatunde, S. O. and Perera, S. (2017), "Analysis of traffic revenue risk factors in BOT road projects in developing countries", *Transport Policy*, Vol.56, pp.41-49.

Badu, E., Edwards, D. J., Owusu-Manu, D. and Brown, D. M. (2012), "Barriers to the implementation of innovative financing of infrastructure", *Journal of Financial Management of Property and Construction*, Vol.17 No.3, pp.25-273.

Bragança, L., Ricardo, M., and Heli, K. (2010), "Building sustainability assessment", *Sustainability*, Vol. 2, No. 7, pp.2010-2023.

Brundtland, G. O. (1987), *Our Common Future, The Brundtland Report*, The World Commission on Environment and Development, Brussels.

Dernbach, J. (2003), "Achieving sustainable development: the centrality and multiple facets of integrated decision making, *Indiana Journal of Global Legal Studies*, Vol.10 No.1, pp.247-285.

Fellows, R. R. and Liu, A. (2008), *Research Methods for Construction*, Wiley-Blackwell Science, London.

Field, A. (2005), *Discovering Statistics using SPSS*, Sage, London.

Grierson, D. and Salama, A. M. (2016), Editorial: "Forging advances in sustainable architecture and urbanism", *Open House International*, Vol.41 No.4, pp.4-5.

Grimsey, D. and Lewis, M. K. (2004), *Public Private Partnerships: The Worldwide Revolution in Infrastructure Provision and Project Finance*, Edward Elgar Publishing, Cheltenham, UK.

Hellowell, M. and Pollock, A.M. (2009), "The private financing of NHS hospitals: politics, policy and practice", *Economic Affairs*, Vol. 29 No.1, pp. 13-19.

Hill, J. and Collins, J. (2004), *PFI: Meeting the Sustainability Challenge*, Green Alliance, London.

Hueskes, M., Verhoest, K. and Block, T. (2017), "Governing public-private partnerships for sustainability, an analysis of procurement and governance practices of PPP infrastructure projects", *International Journal of Project Management,* Vol.35 No.6, pp.1184-1195.

McClure, R. and Bartuska, J. (2011), *The Built Environment: A Collaborative Inquiry into Design and Planning*, John Wiley & Sons, New Jersey, USA.

Mustaq, N. and Azeem, M., (2012), "Conceptual understanding of sustainable development", *Academic Research International*, Vol.2 No.2, pp.627-640.

Patil, N. A. and Laishram, B. S. (2016), "Sustainability of Indian PPP procurement process: development of strategies for enhancement", *Built Environment Project and Asset Management*, Vol. 6 No.5, pp.491-507.

Salama, A. M., Wiedmann, F., Thierstein, A. and Al Ghatam, W. (2016), "Knowledge economy as an initiator of sustainable urbanism in emerging metropolises: the case of Doha, Qatar", *Archnet-IJAR: International Journal of Architectural Research*, Vol.10 No.1, pp.274-324.

Salama, A. M. and Hurol, Y. (2020), "Polyphonic narratives for built environment research" *Open House International*, Vol.45 No.1, doi: 10.1108/OHI-05-2020-0026.

Shen, L., Wu, S. and Zhang, X. (2011), "Key assessment features for the sustainability of infrastructure projects", *Journal of Construction Engineering and Management,* Vol.6 No.3, pp 441–451.

Shen, L., Tam, V. W. Y., Gan, L., Ye, K. and Zhao, Z. (2016), "Improving sustainability performance for public-private-partnership (PPP) projects", *Sustainability*, Vol.8 No.3, pp.1-15.

Stan, M.I. (2014), "Public-private partnership – a solution for sustainable urban development of cities", *Curentul Juridic*, Vol.56 No.1, pp.139-147.

Stoddart, H. (2011), *A Pocket guide to sustainable development governance, Stakeholder Forum*, London, UK.

Ugwu, O. O. and Haupt, T. C. (2007), "Key performance indicators and assessment methods for infrastructure sustainability – a South African construction industry perspective", *Building and Environment*, Vol. 42 No. 2, pp. 665-680.

Wang, Y., Yi, H. and Fang, M. (2014), "Developing a sustainability performance assessment tool for public funded projects according to policies and stakeholders' perceptions", *The Open Construction and Building Technology Journal,* Vol.8 No.1, pp.52-62.

Wiedmann, F., Salama, A. M. and Ibrahim, H. G. (2016), "The impact of affordable housing developments on sustainability in gulf cities", *Open House International*, Vol.41 No.4, pp.31-38.

Zhou, L., Keivani, R. and Kurul, E. (2013), "Sustainability performance measurement framework for PFI projects in the UK", *Journal of Financial Management of Property and Construction*, Vol.18 No.3, pp.232-250.

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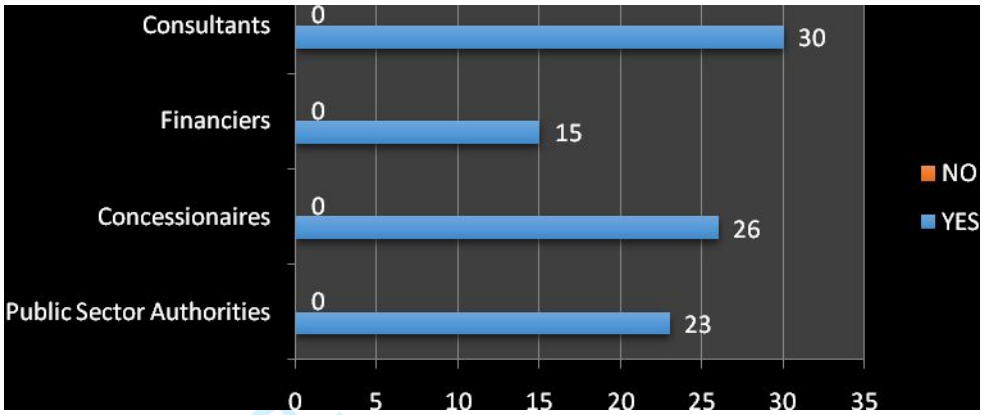

Figure I: Respondents awareness of sustainability concepts in the PPP projects

List of Tables

Table I: Identified drivers to sustainability in PPP projects

Code	Drivers to sustainability in PPP projects
D01	Project definition
D02	PPP model adopted
D03	Procurement method
D04	Stakeholders involvement
D05	End user's consideration
D06	Selection criteria
D07	Award criteria
D08	Formulation of output specifications
D09	Proportion of investment or contribution between public and private sectors
D10	Consideration of short-term performance
D11	Consideration of long-term performance
D12	Benefits to local economic development
D13	Incentives to new market penetration
D14	Tax exemptions and reduction
D15	Access to the public sector market
D16	Contractual arrangements
D17	Structure of management organization

Table II: Identified barriers to sustainability in PPP projects

Code	Barriers to sustainability in PPP projects
BA1	No enabling environment
BA2	Uncertain economic environment
BA3	Technological barriers
BA4	Lack of integrated research
BA5	Lack of interest in the issue of sustainability
BA6	Political influence
BA7	Lack of clear government policy
BA8	No enlightenment campaign on sustainability
BA9	Comprehensive sustainability procurement guidelines
BA10	Financial and budgetary structure challenges
BA11	Education needs

Table III: Respondents' demographic characteristics

Respondent's profile	Frequency	Percentage
Category of organization		
Public sector authorities	23	24.5
Concessionaires	26	27.7
Financiers	15	15.9
Consultants	30	31.9
Total	*94*	*100.0*
Academic qualification		
HND (Higher National Diploma)	7	7.4
BSc (Bachelor of Science)	35	37.2
MSc (Master of Science)	46	49.0
PhD (Doctor of Philosophy)	6	6.4
Total	*94*	*100.0*
Years of professional experience		
5 years and below	2	2.1
6-10 years	44	46.8
11-15 years	39	41.5
16 years and above	9	9.6
Total	*94*	*100.0*
Number of PPP projects undertaken		
One	13	13.8
Two	19	20.2
Three	40	42.6
Four	22	23.4
Total	*94*	*100.0*

Table ~~III~~IV: Ranking of the drivers to sustainability incorporation in PPP infrastructure projects

Drivers	Public sector authorities			Concessionaires			Financiers			Consultants			Total			Kruskal Wallis Sig
	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	
D01Project definition	3.65	0.248	12	3.42	0.210	16	3.93	0.300	11	3.63	0.206	8	3.63	1.136	17	0.635
D02 PPP model adopted	3.83	0.195	9	3.85	0.132	13	3.60	0.163	15	3.73	0.126	5	3.77	0.739	8	0.772
D03 Procurement method	3.57	0.207	14	4.04	0.162	8	4.07	0.280	4	3.40	0.163	11	3.72	0.967	12	0.069
D04 Stakeholders involvement	3.57	0.200	13	4.04	0.150	7	4.07	0.282	5	3.40	0.160	10	3.72	0.969	13	0.070
D05 End user's consideration	4.52	0.152	1	3.54	0.169	15	4.00	0.352	8	3.10	0.158	17	3.71	1.232	14	0.080
D06 Selection criteria	3.87	0.158	7	4.23	0.187	4	3.87	0.165	13	3.63	0.101	6	3.89	0.769	5	0.150
D07 Award criteria	3.57	0.208	15	4.04	0.164	9	4.07	0.284	6	3.40	0.173	14	3.96	0.732	4	0.130
D08 Formulation of output specifications	4.30	0.159	4	4.23	0.150	3	3.93	0.118	9	3.47	0.93	9	3.72	0.732	10	0.075
D09 Proportion of investment between public and private sectors	3.57	0.307	16	4.04	0.170	10	4.07	0.287	7	3.40	0.168	13	3.72	0.966	11	0.141
D10 Consideration of short-term performance	4.30	0.132	3	3.58	0.113	14	3.87	0.133	12	3.77	0.133	4	3.86	0.682	7	0.102
D11 Consideration of long-term performance	4.30	0.171	5	4.46	0.159	1	4.60	0.190	2	4.00	0.144	3	4.30	0.814	1	0.141
D12 Benefits of local economic development	3.83	0.102	8	4.08	0.235	6	3.93	0.228	10	3.33	0.211	16	3.76	1.034	9	0.082
D13 Incentives to new market penetration	4.13	0.181	6	3.92	0.146	12	4.53	0.215	3	4.10	0.154	2	4.13	0.833	3	0.124
D14 Tax exemptions and reduction	4.39	0.122	2	4.08	0.175	5	3.80	0.107	14	3.40	0.166	12	3.89	0.836	6	0.095
D15 Access to the public sector market	3.43	0.106	17	4.00	0.208	11	3.27	0.182	17	3.63	0.102	7	3.63	0.776	16	0.106
D16 Contractual arrangements	3.70	0.277	10	4.31	0.190	2	4.67	0.187	1	4.37	0.131	1	4.23	1.010	2	0.161
D17 Structure of management organization	3.65	0.245	11	3.42	0.216	17	3.37	0.182	16	3.37	0.195	15	3.69	0.962	15	0.112

Note: Significant at 5%, SD-Standard Deviation

Table ~~IV~~V: Ranking of barriers to sustainability incorporation in PPP infrastructure projects

Barriers	Public sector authorities			Concessionaires			Financiers			Consultants			Total			Kruskal Wallis Sig
	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	
BA1 No enabling environment	4.17	0.195	4	4.19	0.147	5	4.80	0.145	1	4.23	0.133	3	4.30	0.787	2	0.135
BA2 Uncertain economic environment	4.43	0.123	2	4.08	0.175	8	3.93	0.153	3	4.20	0.139	4	4.18	0.747	4	0.194
BA3 Technological barriers	3.26	0.940	9	3.92	0.135	9	3.27	0.118	9	3.90	0.121	7	3.65	0.667	9	0.120
BA4 Lack of integrated research	4.04	0.147	5	4.46	0.216	2	3.80	0.223	6	3.27	0.135	11	3.87	0.975	6	0.090
BA5 Lack of interest in the issue of sustainability	3.74	0.169	6	4.08	0.950	7	3.47	0.192	8	3.90	0.162	8	3.84	0.766	7	0.150
BA6 Political influence	2.78	0.198	11	3.54	0.186	11	2.60	2.350	11	3.73	0.166	9	3.27	1.028	11	0.195
BA 7Lack of clear government policy	3.26	0.943	10	4.23	0.115	3	3.53	0.192	7	4.27	0.106	2	3.89	0.725	5	0.085
BA8 No enlightenment campaign on sustainability	3.39	0.306	7	4.46	0.169	1	3.00	0.338	10	4.00	0.173	6	3.82	1.235	8	0.103
BA9 Comprehensive sustainability procurement guidelines	4.39	0.156	3	4.22	0.173	4	4.54	0.182	2	4.11	0.164	5	4.32	0.169	1	0.904
BA10 Financial and budgetary structure challenges	3.25	0.256	8	4.12	0.200	6	3.82	0.368	5	3.32	0.344	10	3.63	0.292	10	0.124
BA11 Education needs	4.54	0.163	1	3.91	0.176	10	3.87	0.222	4	4.69	0.185	1	4.25	0.187	3	0.178

Note: Significant at 5%, SD-Standard Deviation