[1]Sustainable Development, Disaster Resilience, and the Changing Roles of a Quantity Surveyor: The Nexus

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Abstract

Recently, a series of emerging critical issues have gained centre stage in the policy, practice and research quarters. Among these issues are sustainable development and disaster resilience. Similarly, professions have been evolving, some are being redefined, roles are expanding and new ones are emerging. Based on these dynamics, the need for Quantity Surveying Practice that spans beyond traditional services becomes topical like never before. It is therefore important to critically examine some emerging issues, synthesize literature and identify how the services of a Quantity Surveyor can be redefined to cover the relevant areas of the emerging issues. This paper presents a literature synthesis on targets of Sendai framework, Paris Climate Change Agreement (COP21), sustainable development, and nexus with the changing roles of a quantity surveyor. The literature materials used were gathered from reputable sources using carefully selected keywords and focusing on the purpose of this paper. This paper accentuates the need for a thorough review of societal/market needs and its subsequent alignment with the training and practice of Quantity Surveying among other built environment professions. Sustainable development and disaster resilience are two key directions where the knowledge and understanding of Quantity Surveyors need to be strengthened so as to effectively match-up with the present societal demands.

Keywords: disaster**,** duties, nexus, quantity surveying, sustainability.

INTRODUCTION

The need to review and redefine the scopes of professional trainings and practices has become much more prominent than ever. This is occasioned by the change in the demands of the society, triggered by change in taste and global challenges as well as advancements in knowledge, technologies and methodologies. Among the emerging directions initiated by global challenge of disasters and the need to meet the needs of today and preserve the future are disaster risk reduction and sustainable development respectively. Several efforts are being made in the research and policy arena.

Among the key international policy frameworks implemented thus far is the Hyogo Framework for Action (HFA) for disaster risk reduction. The framework was adopted

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in 2005 and this led to a visible progress in disaster risk reduction at all levels (UNISDR, 2015a). Reportedly, the progress is evident in the reduction in death rate from hazards (UNISDR, 2015a). However, despite the progress, damages to properties, communities, and countries are still high and this is a threat to sustainable development. Upon the expiration of the HFA in 2015, the Sendai framework for disaster risk reduction (2015 – 2030) was endorsed in March 2015 by the UN General Assembly. The Sendai Framework for disaster risk reduction contains priorities for action which include "understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience, and enhancing disaster preparedness for effective response, and to build back better in recovery, rehabilitation and reconstruction" (UNISDR, 2015). It is clear that these priorities for action open areas that can aid the redefinition of the new age quantity surveying practice. Hitherto, there is perhaps limited or no definite training for Quantity Surveyors in the areas of disaster risk governance in the built environment, investment in disaster risk reduction in the built environment, disaster preparedness and its implication in the built environment as well as post-disaster reconstruction and recovery and the build back better principles. These areas are open to further exploration by Quantity Surveyors.

Another area of key importance and opportunity is sustainable development. There are so much research efforts on the need for sustainability, but the trainings and practice of Quantity Surveyors in respect to disaster resilience does not reflect the depth of the need. It should be noted that some international policy frameworks on sustainable development and climate change also exist; but, its depth of entrenchment in the built environment curricular and practice including Quantity Surveying is minimal (Amaratunga et al, 2017; Perera et al, 2018). This paper describes the nexus between sustainable development, disaster resilience frameworks and the opportunities of a role enlargement for Quantity Surveyors as a key stakeholder in the built environment. The paper is based on the synthesis of key literature including policy documents on sustainable development, disaster risk reduction, and an overview of the traditional roles and potentials in emerging areas for a quantity surveyor. It should be noted that the negative impact of climate change and the sustenance of health and well-being of the society cannot be achieved if the understanding of the professions that are required to ensure that facilities and infrastructure meets user demands and supports healthy environment is limited. Presented in the next section is a summary of disasters, the management efforts and resilience, overview of climate change and sustainable development policy efforts.

LITERATURE REVIEW

Disasters and Disaster Resilience

In recent years, natural disasters have posed grave threat to lives and the built environment resulting in huge loss of economic and human resources. Disaster is a global menace that has interrupted social and economic activities of various countries (Abolade *et al.*, 2013; Emeribeole, 2015). Crowley and Elliott (2012) revealed the concern of different countries to disasters and its impact on the development of the nations. For instance, Anderson and Bausch (2005) reported 70% increase in hurricane intensity in the past five decades. 425,000 lives and loss of properties to the tune of US$235billion were also reported between 1990 and 2000 was also reported by (Nierkek, 2005). Ndace (2008) also reported about 3,561 significant disasters across the globe between 1994 and 2003 resulting in massive loss to the built environment. A

statistical breakdown of this figure showed that 36.75% of it occurred in Asia, 22.9% in Africa, 17.9% in America while 22.45% occurred in other continents of the world. Zhou et al. (2014) also revealed that 310 disasters occurred in 2012 that affected about 106 million people, killing 9300 persons. The United Nation *World Risk Index* (2016) report shows vulnerability percentage of 173 nations on 28 indicators to disasters such as storms, floods, earthquakes, volcanic eruptions, high sea level and drought. The result reveals 3.54% in the UK and 7.98% in Nigeria. Though, the report shows a 0.17% and 0.34% reduction between 2013 and 2016 respectively. The reports of these disasters imply that lives and global built environment is confronted with the jeopardy of disaster occurrence. The rate at which a different kind of disasters occur and affects lives and properties of the built environment had propelled design of disasters mitigating measures and management.

Disaster management is a complex phenomenon and multi-disciplinary (Babatunde et al., 2016). The multi-disciplinary nature gives opportunities for different professionals to carve out niche for participation in the global joint effort in sustaining the built environment and disaster resilience. Disaster management has also been a topical issue in recent decades (O'Brien et al., 2010; Zhou et al., 2014; Perdikou, et al., 2014; Babatunde et al., 2016). According to O'Brien et al. (2010), disasters are social events that reflect the way we live and structure our societies and communities. This underlies the sociology nature of the catastrophe and this call for analysis of organisational behaviour in response to disaster management. For some time, there has been claims that disasters arise as a result of human inputs and actions, and this outlines the need to address disasters on a social level (Quarantelli, 1992). O'Brien et al. (2010) also submitted that social responsibility is a significant driver to disaster reduction. It is therefore fallible to term most disasters as 'acts of God' because in actual sense, disaster is a reflection of interaction between the society and its environment. The knowledge of disaster occurrence as a social-driven event had propelled the design of social-driven frameworks via series of training, conferences and seminars to addressing the global menace.

One of the frameworks designed to aid disaster management is the HFA introduced and presented at a conference in mid-January 2005 at Kobe, Hyogo, Japan (UNISDR, 2005). The framework focused on risk preparedness and project involvement or community participation in disaster reduction (Tozier de la Poterie and Baudoin, 2015). The framework was designed for use from 2005 to 2015. At the expiration of HFA, the Sendai Framework for Disaster Risk Reduction (SFDRR) was introduced at Sendai, Japan in 2015 as improved strategies for disaster reduction (UNISDR, 2015). This framework was designed for use from 2015 to 2030 and it was developed to bridge the gaps in previous disaster management frameworks and also address other related issues. The framework is directed at reducing disaster risk across multiple sectors. By adopting the Sendai framework, a substantial reduction is expected in disaster risk and loss of lives, livelihood, as well as all other social, economic, physical, cultural and environmental impacts of disasters (UNISDR, 2015). The framework is targeted at ensuring a risk-informed and disaster resilient future (COP21, 2015). According to COP21 (2015), the Sendai framework emphasized the need to sustain a credible link between climate change, Disaster Risk Reduction (DRR), sustainable development goals, development financing, policy improvement, collaboration, monitoring and reporting methodologies and performance evaluation approaches. Sendai framework

for disaster risk reduction has seven targets and four priorities for action (UNISDR, 2015). Alongside the conference in Kobe, Japan that led to the SFDRR was United Nation Framework Convention on Climate Change (UNFCCC) that was held in France in December 2015. The convention led to a legal binding agreement in dealing with climate change tagged Paris Climate Change Agreement (COP 21). The SFDRR and Paris Climate Change Agreement (COP 21) were strategic frameworks for combating disasters and climate change globally.

The strategic structuring of SFDRR and UNFCCC climate change agreement in 2015 suggests a link between disaster reduction and climate change. This was corroborated by the study of Kelman et al. (2015) that shows the interconnection of climate change and disaster. Kelman et al. (2015) also opined that climate change a subset of disaster. Meanwhile, McManus (2000) described the earliest views of researchers about disaster as an occurrence without human actions; the events were only termed hazardous when human lives are claimed in the process. But, IPCC (2014) argued that climate change resulted from human actions through the anthropogenic release of hazardous materials (carbon dioxide and methane) and anthropogenic changes to the earth's surface. The former affects the gaseous state of the planet,and the later disrupts the solid sphere. This forms the bedrock of Okoli (2014) definition of disaster as veritable societal existential mishaps. Ndace (2008) believed that catastrophe is centred on human existence. To this end, Kelman *et al.* (2015) concluded that disaster reduction would help in achieving sustainable development and its goals across the globe.

There are many definitions of disaster resilience, UNISDR (2009) defined disaster resilience as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions. Resilience was described by Tainter and Taylor (2014) as the ability to recover from a setback; it is also seen to help achieve sustainability goals. Amidst the recognition of the interdisciplinary attribute and the existence of many definitions for resilience (Alexander, 2013). Twigg (2007) opined that it could be 'confusing', however, having a closer look at all the definitions even across variety of disciplines, one can draw a high level of similarity and consistence in its practical implications. A new paradigm was introduced when Manyena (2009) submitted that disaster resilience is the ability to 'bounce forward' and move on following a disaster. A note of caution was however attached as the 'bounce forward' idea is the author's conception. Further development on its interpretation by stakeholders especially, humanitarian intervention providers and intervention beneficiaries, is deemed necessary (Manyena, 2009).

Sustainable development

There are 17 sustainable development goals but not all are directly related to the built environment. Among the sustainable development goals drafted by the United Nations and directly related to the built environment are "ensure availability and sustainable management of water and sanitation for all, ensure access to affordable, reliable, sustainable and modern energy for all, build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" (UNDESA, 2015). Related to sustainable development but specifically on climate change is the Paris Climate Change Agreement (COP21). The policy document acknowledged the importance of investors,

private sector players, and several other stakeholders to the achievement of sustainable and resilient future (UNFCCC, 2015). A stocktaking of progress has been scheduled to start in 2023 (UNFCCC, 2015).

Obviously, the stocktaking will be based on the crucial areas of the agreement. This includes: reduction of emission towards achieving the agreed targets and temperature goals (i.e. mitigation), transparency of action, system and support, adaptation i.e. strengthening of stakeholders' ability to deal with or manage climate impacts, loss and damage i.e. loss from climate impact, risk transfer and the strengthening of recovery abilities, finance i.e. provision of financial resources and supports to build a clean, sustainable and disaster resilient future (UNFCCC, 2015; United Nations, 2015). All the identified issues have implications on the built environment, especially, adaptation, loss and damage, finance and delivery of sustainable and disaster resilient infrastructure for now and the future. Once again, for Quantity Surveyors to expand their services and remain relevant in world matters, the identified areas require significant consideration.

Perera, Adeniyi, Babatunde and Ginige (2018) posited the place of the built environment professionals in attaining sustainable development goals. For instance, reducing emission towards achieving the agreed targets and temperature goals has birthed numerous researches of zero carbon (Kennedy and Sgouridis, 2011; Heffernan, Pan, Liang and De Wilde, 2015). The quest to reduce emission into the environment has also birthed frameworks for environmentally friendly built infrastructure. The sustainable development goal of 'build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation' require the inputs of built environment professionals. Achieving a sustainable and disaster resilient future requires significant appropriate contribution from the built environment professionals (Haigh and Amaratunga, 2010; Thayaparan et al., 2010; Siriwardena et al., 2013; Thayaparan et al., 2015).

Quantity Surveying Profession

Built environment project delivery involves various professionals that should thoroughly understand some concepts and societal issues such as sustainable development and disaster resilience to function well. For successful delivery of built projects within stipulated cost, a quantity surveyor's skills are needed in achieving value for money on construction works (Ibrahim and Adogbo, 2013). Kadiri and Ayodele (2013) described a quantity surveyor as a professional trained to ensure judicious allocation of resources such as materials, manpower, machinery, money, methods and management. Ogunsemi (2015) also defined quantity surveying as a profession concerned with financial probity and achieving value for money in the conceptualization, planning and execution of any types of construction projects. Quantity surveyor's services span through conception of a construction work to completion and contribute to overall construction project performance (Nkado and Meyer, 2001). For several years, the focus of quantity surveying service delivery has largely been on cost and time performance.

As built environment projects become more dynamic through varying demands of construction clients, the need for built environment professionals to move with the tides of change becomes apparent also. This was emphasized by Lenard (2002) that the changing nature of built environment projects requires high focused professional with

sound knowledge in emerging technologies. Lee, Trench and Willis (2011) also submitted that the training Quantity Surveyors get this decade equipped them to provide services in all aspects of procurement, contractual and project cost management for any project i.e. building works, civil engineering works and heavy engineering works.

Traditionally, Quantity Surveyors are known with quantification of construction works and building up of rates to help the probable cost of a given construction work. This was corroborated by the description of Olatunji, Sherard and Gu (2009) of traditional service of a quantity surveyor as measurement and pricing of construction works. Fanous (2010) also buttressed this that measurement and simple system value remain the basis of quantity surveying, if not only the purpose of Quantity Surveyors working on smaller projects. Ashworth (2010) also revealed that Quantity Surveyors conduct initial cost planning, quantify all elements of a project, control costs throughout construction, give procurement advice, prepare financial documents accounts and valuations to the client and/or contractor. Fanous (2010) also posited nine basic roles of a quantity surveyor. They include preparation of approximate cost estimates, advice on procurement, cost planning, measuring items on site, preparing bills of quantities, preparing schedules of works, controlling costs throughout the project, assessing and negotiating tenders.

In this new era, quantity surveying profession has evolved and diversified into new areas of practicing, providing a wider range of services, with the modern quantity surveying covering all aspects of project cost management, procurement and contract management (Lee, Tranch and Willis, 2011). This was in response to the call of Smith (2011) for diversification of both consulting and contracting Quantity Surveyors. Fanous (2010) summarized the recent services of Quantity Surveyors entails investment appraisal, analysis of financial risks, project planning, contractual dispute resolution, facilities management, project management, insurance valuates, providing insolvency services, measuring environmental impact and costs, managing maintenance programmes, cash flow accounting forecasts and value management. NIQS (2006) also gave a list of services expected of a competent quantity surveyor. It include feasibility studies of capital projects, cost modeling, contract documentation and procurement, contract administration and management, Monitoring of capital projects, Project management, facility management, preparation of cost reports, pricing bills of quantities and appropriate documentation for, capital allowance and taxation advice, technical and contract auditing, bank loans and facilities, capital market finance and proposals and planning approvals. All the mentioned responsibilities are not exempted in engineering construction projects. However, despite the seeming change in scope of services, the coverage of issues relating to key global matters such as sustainable development and disaster resilience is unclear.

Clearly, the desire of Quantity Surveyors to go beyond the provision of traditional services on building projects is evident, for instance, from the vision of the Nigerian Institute of Quantity Surveyors as follows: "To take responsibility for Total Cost and Procurement Management for the achievement of clients objectives in all types of capital projects and developments from conception to commissioning and maintenance, in all sectors of the economy to the attainment of sustainable national development and goals." To attain such goal amidst the dynamism of the society and the built environment in line with emerging societal demands, the training of quantity surveyors

might have to be reviewed. Towards this end, a conceptual model describing the consolidation of Quantity Surveying competence areas with sustainable and disaster resilience targets was developed.

METHODOLOGY

Systematic review of extant literature on disaster resilience, Sendai framework, Paris climate change agreement (COP21), Sustainable development goals (SDGs) and competence areas of Quantity Surveyors was conducted. The review was to present the place of quantity surveying in disaster resilience and sustainability of the built environment. The source of the publications for this study was not limited to published manuscripts in Scopus indexed journals; other databases were considered to avoid publication bias. Policy documents and reports were also utilised. The search for the publications was with appropriate keywords. Meta-synthesis of disaster, disaster resilience and the competence areas of quantity surveyors were carried out to indicate the present position of the subject matter. The essence of meta-synthesis is to present the findings of related studies for the purpose of creating new knowledge (Hunter, Schmidt and Jackson, 1982). Meta-synthesis has been adopted in wide range of studies such as medicine, psychology, economics, construction management etc. (Saka and Chan, 2019). The methodology is suitable for qualitative studies, quantitative studies, policy documents and unpublished materials (Hopewell *et al.*, 2007). The methodology helps in comprehensive review of subject areas, key details and identification of grey areas. This was considered appropriate for this study. The approach involves a systematic review and analysis or analysis of previous thoughts and findings with a view to show a knowledge gap. The competence areas of quantity surveyors utilised in this study were garnered from extant literature which includes journal publications and Quantity Surveying competence areas identified by professional bodies such as the Royal Institution of Chartered Surveyors (RICS) and the Nigerian Institute of Quantity Surveyors (NIQS). Findings were sorted to identify and merge the same competence areas indicated with different nomenclature. The competence areas that favourably aligns with issues in Sendai framework, COP21 and SDGs were identified and synthesized to develop a conceptual model to aid the understanding of the nexus between Quantity surveying, Sendai framework, COP21 and SDGs.

THE MODEL

A panoramic presentation of the place of Quantity Surveying Competencies in the space of Sustainable Development and Disaster Resilience targets is presented in Figure 1.

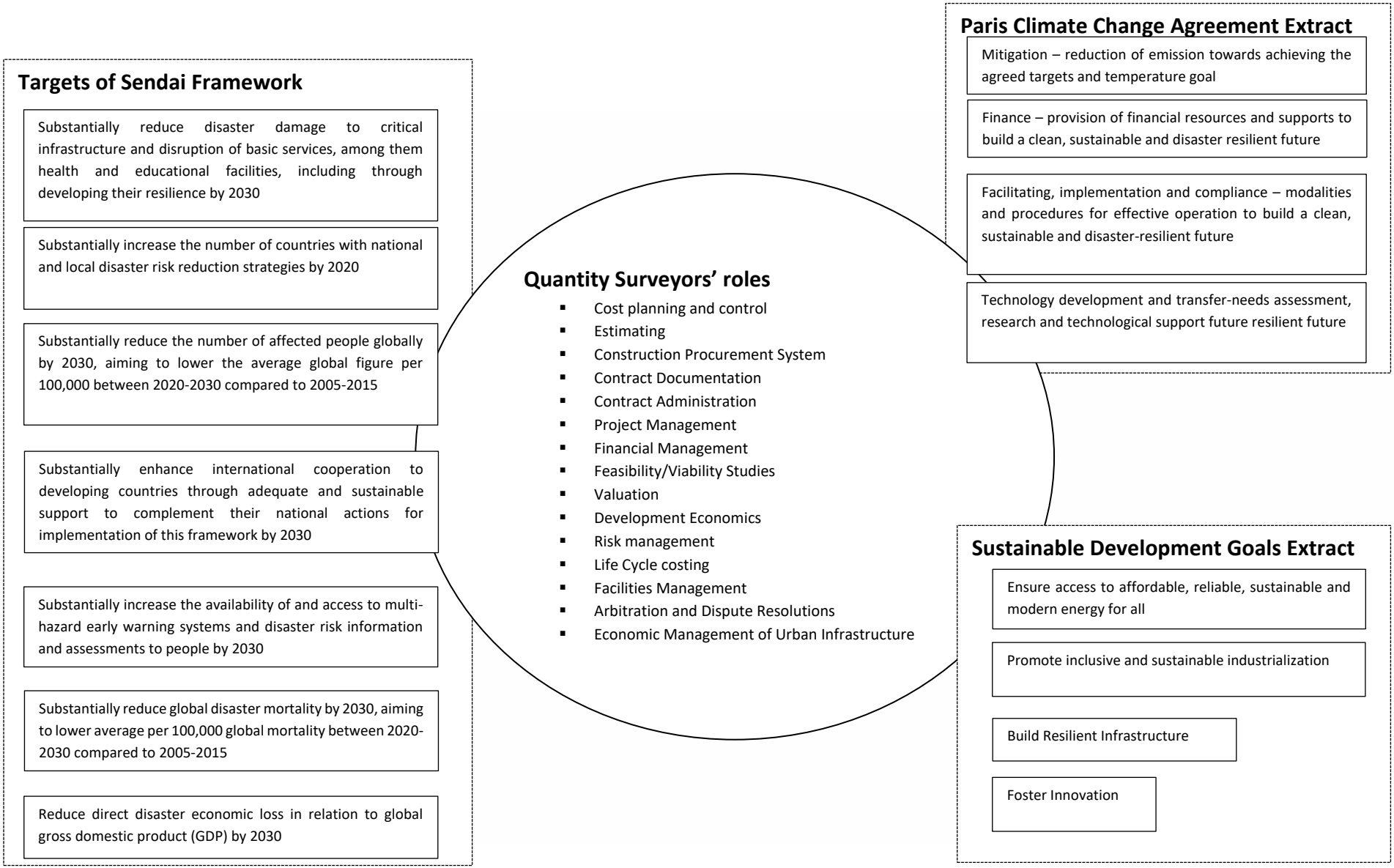

Figure 1: Linking Quantity Surveyors' duties with Sustainable Development and Disaster Resilience Targets (A conceptual model)

DISCUSSIONS

This study explored disaster resilience and sustainable development with a focus on the 7 targets on Sendai framework, crucial areas of Paris climate change agreement (COP21), Sustainable development goals (SDGs) as it relates to Quantity Surveying as a built environment profession. The frameworks (Sendai framework and COP21) were born out of the need for an action-oriented framework for managing disaster risks and promoting sustainable development (UNISDR, 2015; UNDESA, 2015). Thus, there is urgent need to leverage the understanding of disaster risk reduction and sustainable development in all its dimensions among the stakeholders working towards enhancing disaster resilience and sustainable development. Quantity Surveyors are among the built environment professionals that should act on the frameworks but the understanding of the connection between Quantity Surveying Practice, Disaster Resilience and Sustainable Development needs to be further enhanced. This led to the development of a conceptual model that presents a panoramic view of the competence areas of Quantity Surveyors and three (3) strategic policy frameworks.

The 7 targets of Sendai framework include Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030; Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020; Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared to 2005-2015; Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030; Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030; Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared to 2005-2015; and Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030. These targets have built environment undertone and the quantity surveyor with the responsibility of total cost and procurement management of all infrastructure project has a significant role to play. How decisions affect emissions and disaster risks need to be well understood and considered among other intricacies of the frameworks and agreements. The outlined competencies in Figure 1 will have to be redefined to reflect the specific demands of the Sendai framework also presented in the same figure. Perera *et al.* (2018) emphasized the need of built environment professionals in disaster resilience. Key roles and responsibilities of built environment professionals in disaster management were also presented by Amaratunga (2014) and Witt et al. (2014). However, there was no specific discussion on the part to be played by individual built environment professionals in meeting the targets of Sendai framework.

Extract of Paris Climate Change Agreement (COP21) related to the built environment is also presented in Figure 1. The extracts consist of mitigation-reduction of emission towards achieving the agreed targets and temperature goal, which can be discussed in the light of zero carbon, low carbon homes and the likes. This has been the focus of sustaining the built environment in most developed nations. Facilitating, implementation and compliance-modalities and procedures for effective operation to

build a clean, sustainable and disaster-resilient; Finance – provision of financial resources and supports to build a clean, sustainable and disaster; and Technology development and transfer-needs assessment, research and technological support future resilient future are all issues relating the built environment. This also implies the contribution of built environment professionals. The need for inputs of Quantity Surveyors being the built environment professionals with knowledge in financial management appears glaring in the COP21 and this is also germane to the achievement of the sustainable development goals.

The research community including professional bodies and international organisations had attempted to identify the key roles and responsibilities of the built environment professionals in disaster management (Max Lock Centre 2009; Amaratunga, 2014; Witt et al., 2014). Earlier researchers have also identified the skills that built environment professionals could contribute to disaster resilience (Bosher *et al*., 2007; Thayaparan et al., 2010; Siriwardena et al., 2013; Perera *et al*., 2015; Thayaparan et al., 2015). Others advocated for the education of built environment professionals and proactive multi-stakeholder approach that involves construction professionals in their studies (Bosher, 2009; Gencer, 2013). However, identifying and aligning the specific educational needs of built environment professionals with individual built environment professional in line with the three international policy frameworks has been contextualized further in this study. This is needed to facilitate the incorporation of the contents of the policy frameworks into built environment professionals' educational needs and incorporation of different services of specific built environment professional (Quantity Surveyors) with disaster resilience.

In a submission, COP21 (2015) stated that the Sendai framework highlighted the need to ensure credible links between climate change, disaster risk reduction, the sustainable development goals, development financing, and improved coherence of policies, collaboration among institutions, reporting methodologies and performance measurement. Sendai framework has seven targets and four priorities for action which are directly connected to a goal and an expected outcome (UNISDR, 2015). The priorities for action of Sendai framework are "understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience, and enhancing disaster preparedness for effective response, and to build back better in recovery, rehabilitation and reconstruction" (UNISDR, 2015). Da Silva *et al.* (2010) described post-disaster reconstruction or recovery as a complex and resource consuming process. The study through the conceptual model developed revealed that cost planning and control, estimating, construction procurement system, contract documentation, contract administration, project management, financial management, feasibility/viability studies, valuation, development economics, risk management, life cycle costing, facilities management, arbitration and dispute resolutions, economic management of urban infrastructure among others are knowledge areas that Quantity Surveyors could bring to leverage the disaster management and the sustainable development process. However, integrating the skills with the demands of the policy frameworks require further thinking. Upgrade in the curriculum of tertiary institutions at postgraduate levels and introduction to disaster resilience and management at undergraduate pogramme of quantity surveying discipline seems inevitable.

CONCLUSIONS

This study synthesizes literature on three important policy frameworks geared at reducing disasters and enhancing sustainable development. Extract of the frameworks relating to the built environment were coined out and integrated with quantity surveyors' competence areas to form a conceptual model which was discussed. The traditional training of quantity surveying in actualizing a built environment client's objective were discussed and the need in achieving sustainable and disaster resilient built environment were contextualised also presented in a logical manner. The framework developed represents a concise panorama of quantity surveying practice in the space of sustainable and disaster resilient built environment. The place of traditional training of Quantity Surveyors in the built environment cannot be left underrated; however, the need to move with the tides of societal change remains germane. This study recommends review of built environment academic curricula to clearly incorporate issues relating to disaster resilience, sustainable practices in relation to achieving sustainable development goals early. This will consolidate the topical issues and Quantity Surveying practice and will favourably reposition Quantity Surveying in the global competitive market. The need to fully absorb the demands of the global agreements towards achieving the global targets of disaster resilience and sustainable development crucial. A more detailed mapping of emerging societal demands with Quantity Surveying Practice will be done in a future study.

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