

RESEARCH ARTICLE

Enhancing urban regeneration at the neighbourhood level: the role of sustainability assessment frameworks [version 1; peer review: 2 approved with reservations]

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Abstract

Purpose: Urban centres have been argued to be crucial in the battle for sustainability. With more than half of the global population presently living in cities, the sustainability challenges of global warming, environmental degradation, social inequality, and economic recessions have continued to thrive. To this end, there have been efforts to revive and improve the existing physical and social structure of cities in a process known as urban regeneration. The aim of this paper is to explore the role of sustainability assessment frameworks in urban regeneration.

Approach: Aligning with the positivism philosophical position, and using document analysis as a data collection method, the study discusses the state of the art of urban regeneration and its application in recent times. The study also reviewed selected neighbourhood sustainability assessment frameworks as a tool for decision-making towards sustainability to know the extent in which they capture the goal of urban regeneration.

Findings: Findings showed that the uptake of the sustainability assessment frameworks could play a major role in enhancing integration of local context, social wellbeing and economic prosperity, environmental quality, and stakeholder engagement at the neighbourhood level which are the main aspects of urban regeneration.

Theoretical and practical implications: In theory, this paper establishes the assumption that sustainability assessment frameworks could serve as a tool for decision-making in urban regeneration process. Practise-wise, urban regeneration at the neighbourhood level can now be measured against sustainability benchmarks and indicators.

Keywords

Cities, Global warming, Indicators, Neighbourhood, Sustainability, Sustainability assessment frameworks, Urban regeneration

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Introduction

The idea that the battle for sustainability will be won or lost in urban areas has been established by various scholars (Glaser, 2011; Komeily & Srinivasan, 2015; Owen 2010). This is because in the last 100 years, urbanisation has resulted in key environmental, social, and economic challenges. For example, it has been noted that whilst cities occupy just 3 per cent of the earth's landmass, they disproportionately account for 60–80 per cent of energy consumption and 75 per cent of carbon emissions (Robinson & Cole, 2015; UN, 2016). Urban population has increased in recent years, from only 2 per cent of the world's population in 1800 to more than 50 per cent in 2008 (Wu *et al.*, 2014), and presently at 55 per cent. According to UN-Habitat (2016), it is projected to reach 68 per cent by 2050.

As a result, several approaches to enhance urban sustainability have been devised in various contexts, in addition to the various international agenda (e.g. sustainable development goals, and the new urban agenda). One of such approaches is the Building Environmental Assessment tools developed to assess the sustainability credentials of buildings. This evolved when it was discovered that the construction industry accounts for about 60 per cent of total energy consumption (Curwell *et al.*, 2005; Deakin & Curwell, 2004; Lehmann, 2015:5). However, sustainability studies and lessons from practice have clearly indicated that a conglomerate of green buildings does not guarantee urban sustainability, without a focus on the neighbourhood scale which has been regarded as the planning unit and building blocks of cities (Berardi, 2013; USGBC, 2018; Wangel *et al.*, 2016). The main argument is that if sustainability considerations, principles, and targets are integrated at the decision-making process of a new neighbourhood, then this can in the long-term and wider picture create a sustainable urban area (Bahadure & Kotharkar, 2018; Cole, 1999; Komeily & Srinivasan, 2015). This concept and approach of planning at the neighbourhood level are traceable to the 1898 Garden city of Ebenezer Howard and pioneers like Clarence Perry, among others (Farr, 2008). This idea has been operationalised with the emergence of the Neighbourhood Sustainability Assessment Frameworks (NSAFs) through which a proposed development can be assessed against an array of sustainability indicators. Examples include BREEAM Communities, LEED-ND, CASBEE-UD, etc.

While these frameworks have been useful for new developments, urban regeneration scheme as a deliberate process to change an urban environment by a large-scale adjustment to standard requirements for urban living and working (Dimuna & Omatson, 2010) has continued to thrive globally. This has been conceived as the most practical way to change the economic, social, and environmental status of a degenerated location. However, there exists a gap in terms of a benchmark in ensuring that urban regeneration delivers sustainable outcomes, most especially at the neighbourhood level. That is, how can it help to operationalise global sustainability agenda and pacts like the SDGs, and most recently the New Urban Sustainability Frameworks at the neighbourhood level?

To this end, the aim of this paper is to explore the role of NSAFs in urban regeneration at the neighbourhood scale of

spatial development. The main question is: how can the uptake of NSAFs in urban regeneration projects enhance the delivery of sustainable neighbourhoods? The paper is divided into the following headings: the literature review provides an overview of NSAFs and urban regeneration; the methodology which presents strategies and the methods applied in the study; the results which conceptualises the role of NSAFs and how its integration can help to delivery of sustainability at the neighbourhood level; the discussion and conclusions which highlights the key inferences from the results.

Literature review

Urban regeneration

Urban regeneration emerged after the Second World War in Europe and Britain as a result of the post-war decline of industries (McDonald *et al.*, 2009). It is also traceable to the public housing slum clearance movement launched in 1949 as captured in the 1949 Act with the main aim of providing a better and quality housing through the removal of residential slums. To date, urban regeneration has evolved in terms of its substantive and procedural characteristics (McDonald *et al.*, 2009). It has been a process to address poverty in an urban context by a change in the physical landscape, which has the potential to yield social and economic benefits. Urban regeneration programmes have been driven by both government institutions and residents, with strong advocacy for a joined-up approach (Couch *et al.*, 2003). However, the first decade of the 21st century heralded an understanding that urban regeneration could be helpful to deliver sustainable places. That is, places where people can live and work, now and in the future, as characterised by consideration for equity, provision of necessary services, transport and connectivity, environmental integrity, economic prosperity, affordable housing and built environment, social and cultural integration, and governance (Office of the Deputy Prime Minister, 2003).

These characteristics have shaped the understanding of the concept by various scholars, which according to La Rosa *et al.* (2017) is a multidisciplinary field of research. As a problem-solving strategy, it involves a comprehensive and integrated vision, which will resolve urban issues and enhance development in urban neighbourhoods (Roberts, 2009). It encompasses the restoration of both physical and social environments due to a decline in its physical, economic, and environmental status (Egan *et al.*, 2015). In addition, urban regeneration helps to eliminate sub-standard housing while stimulating housing production that is sufficient, decent and enhances quality living (Dimuna & Omatson, 2010). As a process to deliver sustainability, urban regeneration is considered as one of the most effective instruments in evolving long-term solutions for economic, cultural, environmental, physical and social concerns (Alpopi & Manhole, 2013).

The above submission suggests that urban regeneration aims to deliver four key goals, as illustrated in Figure 1.

Neighbourhood Sustainability Assessment Frameworks

Evolution. Sustainability assessment (SA) as a concept, process, and method was developed as a decision-making strategy that directs decisions towards sustainability (Hacking & Guthrie, 2008).

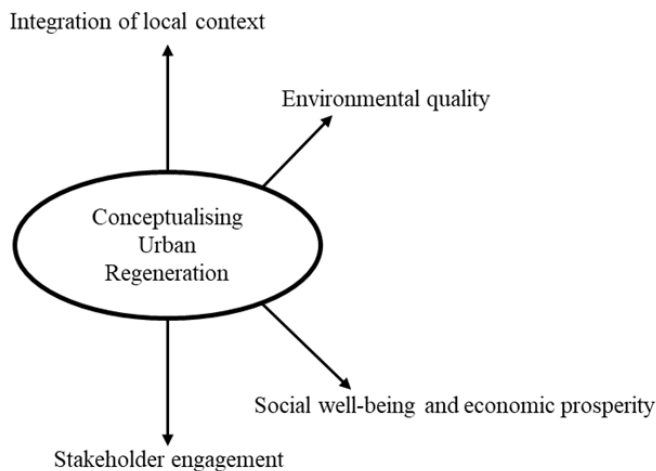


Figure 1. Components of urban regeneration.

It is a “formal process of identifying, predicting, and evaluating the potential impacts of a wide range of relevant initiatives (such as legislation, regulations, policies, plans, programmes and specific projects) and their alternatives on sustainable development of society” (Devuyst, 2000; Hacking & Guthrie, 2008). SA is a distinctive form of integrated assessment (IA) which considers the social, economic, and environmental impacts of a proposed development, plans, policies, programmes, and other initiatives (Bond & Morrison-Saunders, 2013; Gibson *et al.*, 2005; Scrase & Sheate, 2002). It is a type of an ex-ante assessment because it is conducted at the preliminary stage of a project to predict future outcomes. This helps to choose between various options. With this, it helps to avoid taking decisions that would not lead to the delivery of sustainable places.

In recent times, SA frameworks have been useful tools and mechanisms to support the decision-making process in planning for urban sustainability, even recently at the neighbourhood scale (BRE, 2017; GBCA, 2014; Wangel *et al.*, 2016). This it does in three stages. Firstly, by clarifying the definition of sustainability based on the needs, values, and aspiration of the people. The second is by transferring the definition and interpretation of sustainability into an operational information unit in a properly communicated approach using indicators. Thirdly, by implementing the assessment framework to trigger action and solutions based on the simplified and well-communicated information that would enhance urban sustainability (Waas *et al.*, 2014). Executing the first stage which involves exploring the meaning of sustainability to the people implies the appreciation and recognition that the concept of sustainability is context-specific.

NSAFs emerged around a decade ago (Joss *et al.*, 2015); this was triggered by Agenda 21 (a non-binding action plan of the United Nations about sustainable development), which had earlier called for local stakeholders’ participation to implement local plans. This was also coupled with the need to enlarge the

scale of SA from the building to the neighbourhood level (Berardi, 2011; Berardi, 2011; Cole, 1999; Komeily & Srinivasan, 2015) due to the perceived ineffectiveness of the pioneer Building Environmental Assessment (BEA) tools in assessing the impact of a proposed development holistically. For instance, how can an assessment at the building scale inform us of the sustainability credentials of a neighbourhood? Will it be more worthwhile to take into consideration the host environment in the assessment process? Is assessment at the building scale, not a reductionist approach which necessitates the need for a larger-scale system that affords the opportunity to access how a building and its occupants relate with the environment?

NSAFs have evolved as tools to aid decision-making for a better and holistic assessment in monitoring progress toward sustainability. NSAFs have been at the front banner in the campaign for urban sustainability (Berardi, 2013; Cashmore & Kornov, 2013). Scholars agree that it has both helped to integrate the various dimensions of sustainability holistically and in the decision-making process by setting out clearly the indicators that must be met in order of priority when conceptualising a new neighbourhood. Pioneering the NSAF movement was the development of HQE²R between 2001 and 2004 and Earthcraft communities in 2003. Subsequently, between 2006 and 2009, the CASBEE-UD, the U.S. Star community Rating System (STAR-CRS), LEED Neighbourhood Development (LEED-ND), and the UK BREEAM communities were launched. The German system DGNB New Urban Districts and the Australian system Green Star Communities were released in 2011 and 2012, respectively (Wangel *et al.*, 2016).

Classifications of NSAFs. There are complexities in classifying NSAFs. Scholars have therefore attempted to classify NSAFs based on their mode of development and their functions. A NSAF can either be third-party or plan-embedded in terms of development (Sharifi & Murayama, 2013). It is third-party if it was developed as an extension of a BEA tool with an enlargement in the scope of its assessment. That is, from the building to the neighbourhood scale. Most of the well-known NSAFs (e.g. BREEAM Communities, CASBEE-UD, and LEED-ND among others) are in this category. It is plan-embedded if it was specifically developed to evaluate proposed plans with respect to their sustainability performance, e.g. Ecocity, HQE²R.

Classifying by function, a NSAF can be in one the following three categories: (i) performance; (ii) certification, and (iii) planning tool kit (Joss *et al.*, 2015). Performance NSAFs measure the sustainability of a neighbourhood development against some criteria in order to make a comparison with another development. Urban areas use performance assessment frameworks to set targets in measuring progress over time which is also useful for policymaking. Examples include: CASBEE for Urban Development/Cities; City Biodiversity Index (Singapore Index); City Grid; Eco-City Development Index System; European Common Indicators; Global City Indicators Facility; Global Urban Indicators; Green City Index; REAP for Local Authorities; Slim City; Sustainable Cities Index.

Certification NSAFs assess a proposed neighbourhood development for the purpose of certification or endorsement, which mostly involves an accreditation process with some fee payment (Joss *et al.*, 2015). In most certification frameworks, the results are classified to make it understandable. The certification helps to benchmark new developments and market a proposed development in terms of its sustainability potential (Wangel *et al.*, 2016). Examples include: BREEAM Communities; Climate Positive; Enterprise Green Communities; Green Star Communities; IGBC Green Townships Rating System; LEED ND; Living Building Challenge; Star Community Rating System; DGNB NSQ; One Planet Communities; Sustainable Communities; EcoQuartier; Estidama Pearl Community Rating System; National Eco-County, Eco-City and Eco-Province; National Eco-Garden City; Selo Casa Azul Caixa.

Lastly, the planning tool-kit NSAFs serve the purpose of guiding the processes of planning for sustainability geared towards enhancing a collaborative decision-making process within stakeholders (Joss *et al.*, 2015). They advocate for community engagement and participation in the planning process. Examples include: ASEAN ESC Model Cities; Biosphere Eco-City; Community Capital Tool; Eco Districts; Eco2 Cities; Green Communities; Urban Sustainability Indicators; Charter of Eco Mayors (Les Eco Maires); Eco-Model Cities; Green Climate Cities; and RFSC.

While some NSAFs can perform more than one function, some frameworks can perform one function. Others can perform all the three functions in the design process. For instance, BREEAM Communities, which is categorised under 'certification assessment frameworks', is also used a planning tool-kit encouraging and facilitating community engagement through consultation plan. Furthermore, it can also be used for performance assessment of a regeneration project.

Structure of a NSAF. A NSAF framework comprises of (i) indicators (ii) weighing system; (iii) certification level; (iv) rating stages.

Indicators: Sustainability indicators are measurable variables which are used to evaluate a proposed development. There are three significances of indicators in a NSAF. One, since they are locally developed in consultation with stakeholders, they have the potential to stress the context-specificity of sustainability in an assessment framework. Two, they simplify communication which helps to guide decision-making towards sustainability (Valentin & Spangenberg, 2000). Therefore, this process helps to extend sustainability from abstract formulation to explicit discussions on its concepts and operational meaning which is essential in meeting sustainability targets (Rigby *et al.*, 2001; Rennings & Wiggering, 1997). Three, they serve to actualise the call for greater involvement of the grassroots and local stakeholders as it helps to establish the view of sustainability in a context in a simplified way accommodating its social and political ideologies (O'Riordan & Viosey, 1998).

Weighing system: The weighing system gives information about the weight assigned to each indicator, which demonstrates its

significance in contributing to a decision during the decision-making stages. For instance, the greater the weighting, the higher such indicator is perceived to contribute to a sustainable neighbourhood in that context. How then do we determine the weighting of an indicator in a way that will not be controversial and highly subjective? This can be addressed using any of the multi-criteria decision analysis (MCDA) methods such as the Analytic Hierarchy Process (AHP); Analytic Network Process (ANP); Preference Ranking Organisation Method for Enrichment of Evaluations (PROMETHEE), involving stakeholders which perhaps offers a less subjective scoring and weighing process as the consistency of the result can be determined (Lee *et al.*, 2009; Sharifi & Murayama, 2015).

Certification level: The certification level is obtained after the assessment of the proposed neighbourhood against the indicators. The final score obtained determines the level of certification. This varies from one assessment framework to another. For example, the certification levels in the BREEAM Communities are outstanding, excellent, very good, good, pass, and unclassified, with each level of certification indicating how well a proposed neighbourhood meets BREEAM sustainability credential. The certification level is conducted in various stages of the proposed development. For instance, the LEED-ND V4 has three stages which are: (i) conditional approval; (ii) pre-certification; (iii) full certification.

Methods

This study aligns with the positivism philosophical stance, which postulates that knowledge can be obtained through observation and measurement. As a result, this study is limited to data in an objective manner. This is appropriate in this context because data was obtained primarily from the technical manuals of selected NSAFs using document analysis. The assessment frameworks selected based on their geographical spread include: BREEAM Communities (Europe), LEED-ND V4 (North America), and Green Star Communities (Australia). The following documents: (i) [BREEAM communities technical manual SD202 \(v1.2:2012\)](#), (ii) [LEED v4 for Neighbourhood Development](#), and (iii) [Green Star Communities 2012](#), were obtained from the website of Building Research Establishment; US Green Building Council; and Green Building Council of Australia, respectively, which are the institutions responsible for the development of the assessment frameworks. These manuals are the established and recognised documents for each of the NSAFs which are to serve as a guide for developers and other built environment professionals prior to the submission of their proposals for assessment. They have also been used by various scholars (Adewumi *et al.*, 2019; Sharifi & Murayama, 2013; Wangel *et al.*, 2016) in a similar study. Document analysis as a method is useful for obtaining data from existing documents such as official gazettes, policy documents, newspapers and journal publications among others majorly through a process of reviewing and evaluation (Bowen, 2009). One of the advantages of this method is that it allows the readily available data to be well examined and interpreted in order to give it meaning. It is also cost-effective, and there is also no obstruction to the research process (Yin, 2009). The process involved a review of the selected NSAFs in terms of their content and how they address

the following: integration of local context; social wellbeing and economic prosperity; environmental quality; and stakeholder engagement which are the four components of urban regeneration as presented in the literature review. The reliability of the data sourced was strengthened using the technical manuals of the selected assessment frameworks, which are available and readily accessible to the public, ensuring its repeatability and consistency with similar studies (Sharifi & Murayama, 2013; Wangel *et al.*, 2016). The validity of the study was ensured in two ways. First, that document analysis seemed to be the appropriate data collection method as it allowed the gathering of detailed information of each assessment framework. Second, that the geographical spread of the frameworks ensures the capturing of context-related issues.

Results

This section presents the extent to which the selected assessment frameworks addresses the four main components of urban regeneration.

Integration of local context

The LEED-ND and the BREEAM Communities have targeted categories and indicators that address local context (see Table 1). To address the current challenge of urban sprawl in most parts of the United States, targeted indicators were used in LEED-ND with the ‘neighbourhood pattern and design’ category, with criteria such as ‘walkable streets’, ‘compact development’, ‘mixed-use neighbourhoods’, and ‘connected and open community’ amongst others. The LEED-ND also has the ‘Regional Priority Credit’, which is targeted to address geographically specific environmental issues (USGBC, 2018). BREEAM communities also attempt to address the concern for social wellbeing which has not been properly addressed in the UK introduces key social wellbeing indicators to the BREEAM communities 2012 which was an improvement to the 2008 version of the assessment framework.

Social wellbeing and economic prosperity

BREEAM Communities gives adequate consideration for social wellbeing which is aimed at delivering a socially-inclusive community. In addition to enhancing social wellbeing, it also aims to achieve economic prosperity by creating healthy employment opportunities and a community where local businesses can thrive. LEED-ND attempts to address social wellbeing with the ‘smart location and linkage’. Although the framework does

not have a category that addresses economic prosperity, this consideration of this can be seen in some categories. For example, the ‘neighbourhood pattern and design’ category has indicators such as ‘local food production’, ‘transit facilities’, and ‘transportation demand management’ that could contribute to economic growth. Also, indicators such as ‘smart location’, ‘access to quality transit’ under the ‘smart location and linkage’ category can help to achieve economic prosperity. The Green Star Communities attempts to deliver social wellbeing by permitting and recognising developments that are “diverse, safe, inclusive, and improve the wellbeing of those that live, work and play within them” (GBCA, 2014). Examples of indicators in the ‘liveability’ category which addresses this include: access to amenities, community development, and safe places amongst others. The framework also aims to ensure that new development enhances business diversity, education, and development of skills. Indicators in the category of ‘economic prosperity’ include: ‘affordability’, ‘employment and economic resilience’, and ‘return on investment’ amongst others. Table 2 presents a summary of the consideration for social wellbeing and economic prosperity in the selected assessment frameworks.

Environmental quality

BREEAM Communities attempts to promote environmental quality by ensuring minimum impacts of environmental conditions on the health and wellbeing of residents using six indicators. Examples are flood risk assessment, adapting to climate change etc. LEED-ND V4 addresses this with the ‘green infrastructure and buildings’ category, with indicators like ‘construction activity pollution control’, ‘renewable energy production’, and ‘wastewater management’ amongst others. In addition to this is the ‘smart location and linkage’ category with such indicators as ‘brownfield remediation’, ‘floodplain avoidance’, and ‘wetland and water body conservation’. The Green Star Communities also has the ‘environment’ category which aims to ensure that developments are “less resource-intensive and prioritise practices that reduce a community’s impact on land, water and the atmosphere” (GBCA, 2014). Table 3 presents a summary of the consideration of environmental quality in the selected assessment frameworks.

Stakeholder engagement

BREEAM Communities has the ‘governance’ category which aims at ensuring community involvement in the decision-making process at the various stages of new development. This category

Table 1. Targeted indicators in selected neighbourhood sustainability assessment frameworks.

Country	Core/local urban challenges	Assessment systems	Targeted indicators
UK	Inadequate social wellbeing; non-engagement of citizens in planning	BREEAM Communities	SE02- Demographic needs and priorities; SE05- Housing provision; SE06- Delivery of services, facilities, and amenities; SE07- Public realm; SE09- Utilities; SE11- Green infrastructure; SE12- Local parking; SE14- Local vernacular; SE15- Inclusive design
USA	Urban sprawl; high dependence on automobile; urban heat island	LEED-ND	NPD C1- Walkable streets; NPD C2- Compact development; NPD C3- Mixed-use neighbourhood centres; NPD C4- Mixed-Income diverse communities
Australia	None	None	None

has such indicators as ‘consultation plan’, ‘demographic needs and priority’, and ‘design review’ amongst others. LEED-ND has the ‘LEED accredited professional’ indicator under the ‘innovation and design process’ category for stakeholder engagement which one of its objectives is to encourage team integration required by a new development. Green Star communities by its content encourages engagement with stakeholders with the ‘governance’ category with such indicators as ‘sustainability awareness’, ‘engagement’, and ‘operational governance’ amongst others. [Table 4](#) presents a summary of the consideration of stakeholder engagement in the selected assessment frameworks.

Discussion and conclusions

The review of the selected NSAFs showed that their uptake in an urban regeneration project at the neighbourhood could be

helpful to achieve its four main goals of integration of local context, social wellbeing and economic prosperity, environmental quality, stakeholder engagement. To this end, a NSAF can serve as a guide to identify how each of the four components can be addressed in a regeneration scheme. However, there is a need to establish contextual meanings of the four goals, so that the aspirations and values of all stakeholders are captured. This is because the study revealed the differences in the meaning of social wellbeing and economic prosperity in the selected NSAFs, based on the indicators assigned to each one. This supports the findings of [Joss *et al.* \(2015\)](#) and [Adewumi *et al.* \(2019\)](#) that NSAFs are context-specific. The uptake of NSAFs in urban regeneration could also be helpful to set sustainability benchmarks which are essential in urban regeneration projects to know the extent to which regeneration

Table 2. Indicators in selected neighbourhood sustainability assessment frameworks addressing social wellbeing and economic prosperity.

NSAF	Social wellbeing	Economic prosperity
BREEAM Communities	SE02- Demographic needs and priorities; SE05- Housing provisions; SE06- Delivery of services, facilities and amenities; SE07- Public realm SE09- Utilities; SE11- Green Infrastructure; SE12- Local parking; SE14- Local vernacular; SE15- Inclusive design	SE01- Economic impact; SE17- Labour and skills
LEED-ND	Housing and jobs proximity; Access to civic and public spaces; Neighbourhood schools; Access to recreation facilities; Visitability and universal design; Access to quality transit	Local food production; Transport demand management; Infrastructure energy efficiency; Housing types and affordability
Green Star Communities	Healthy and active living; Community development; Sustainable buildings; Culture, heritage, and Identity; Walkable access to amenities; Access to fresh food; Safe places	Community investment; Affordability; Employment and economic resilience; Education and skills development; return on investment; Incentive programs; Digital Infrastructure; Peak electricity demand

Table 3. Indicators in selected neighbourhood sustainability assessment frameworks (NSAFs) addressing environmental quality.

NSAFs	Environmental quality
BREEAM Communities	SE03- Flood risks assessment; SE04- noise pollution; SE08- Microclimate; SE10- Adapting to climate change; SE13- Flood risk assessment; SE16- Light pollution
LEED-ND	Wetland and Water body conservation; Agricultural land conservation; Brownfield remediation; Certified green buildings; Heat island reduction; Solid waste management
Green Star Communities	Integrated water cycle; Greenhouse gas strategy; Materials; Sustainable transport and movement; Sustainable sites; Ecological value; Waste management; Heat island effect; Light pollution

Table 4. Indicators in selected neighbourhood sustainability assessment frameworks (NSAFs) addressing stakeholder engagement.

NSAFs	Stakeholder engagement
BREEAM Communities	GO 01- Consultation plan; GO 02- Consultation and engagement; GO 03- Design review; GO 04- Community management of facilities
LEED-ND	LEED accredited professional
Green Star Communities	Accredited professional; Corporate responsibility; Sustainability awareness; Engagement; Operational governance; Adaptation and resilience; Environmental management

projects meet sustainability target. For example, in order to ensure that some acceptable level of sustainability is attained, BREEAM Communities, LEED-ND V4, Green STAR Communities have what are called ‘mandatory criteria’. The mandatory criteria or indicators are compulsory before a new development can be certified; that is, they are not tradeable. The BREEAM communities’ certificate, for example, will not be issued to development without addressing all mandatory criteria (BRE, 2017). Mandatory criteria are referred to as ‘prerequisites’ in LEED-ND. LEED-ND V4 does not assign a score to their mandatory criteria, whereas BREEAM Communities assessment system does. This further echoes Newman & Jennings (2008), who found that there is a need for sustainability to be integrated into policies and practices of urban regeneration has been emphasised in the literature. This has the potential to decrease the demand for new developments in peri-urban centres, while also making cities more appealing and attractive (Turcu, 2012).

This paper has examined the role of NSAFs in better delivery of urban regeneration projects. It argued that they could serve as a planning tool kit during a regeneration exercise at the neighbourhood level. Additionally, the assessment framework could be used to measure the performance of an urban regeneration project, as to how well it meets sustainability targets. Therefore, it implies that urban regeneration schemes should be conceptualised with NSAF at the early phase of the exercise. As urban regeneration will continue to shape the fabric of the 21st century’s neighbourhoods, such initiatives should be

executed in hand with sustainability targets which can be worked with using NSAFs.

Data availability

Source data

LEED v4 for Neighborhood Development is available at: <https://www.usgbc.org/resources/leed-v4-neighborhood-development-current-version>.

The LEED v4 for Neighborhood Development document is used for the planning and design of new neighbourhood developments by presenting the various sustainability categories and criteria including their respective scores.

The Green Star Communities scorecard is available at: <https://new.gbca.org.au/green-star/rating-system/communities/>.

The Green Star Communities scorecard explains the sustainability criteria and the score attached to each criterion in the assessment of a proposed development.

The BREEAM Communities Technical Manual is available at: <https://www.breeam.com/communitiesmanual/>.

The BREEAM Communities Technical Manual presents the structure of BREEAM communities (which is a Neighbourhood Sustainability Assessment Framework), explaining its categories and credits for assessing a new neighbourhood development.

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Luke Boyle

Urban Real Estate Research Unit, University of Cape Town, Cape Town, South Africa

The introduction does not outline how the study is going to be carried out.

I think the link between urban regeneration and sustainability could be made a little clearer. I suggest a little more depth in articulating why urban regeneration is necessary for urban sustainability. This aspect of the argument is a little thin.

I would have liked to see a more balanced discussion about NSAFs. There is a lot of literature that is critical of these tools (i.e. top-down, market-driven, prescriptive, reductionist, inadequate consideration for context and socio-economic aspects of sustainability etc.)

The paper makes the point regarding how an assessment at the building scale inform us of the sustainability credentials of the neighbourhood. By this logic, how can neighbourhood assessment tools inform us of the sustainability credentials of the city when they are seen in isolation to the economic, political and social forces that influence urban regeneration and sustainability? Are we just now drawing an arbitrary circle around a bigger target? Thus, explain how NSAFs are different to green building assessment tools and how they promote sustainable urban regeneration and development in a broader sense.

The paper does not discuss the link between NSAFs and urban regeneration. This is an important link as the tools tend to be aligned more with new developments and urban regeneration typically involves uplifting inner city districts or areas in decline.

I feel that more clarity is required in demonstrating how the research objective will be achieved through the methodological approach. It is my understanding that three NSAF manuals were used as the primary data for the research based on their geographical spread (which seems arbitrary). I question how reliable inferences regarding NSAF tools more generally can be made by examining three manuals. Further, how can it be applied to urban regeneration without drawing upon any evidence of their use for urban regeneration projects? There is plenty of literature that looks at the application of these tools and looks at their role in urban regeneration. It is suggested that these

are used to build the case for the argument, since the research objective is to explore the role of NSAFs in urban regeneration.

The findings offer very little detail and depth. There needs to be a deeper discussion about each aspect and how it relates to urban regeneration. For example, the author asserts that: "*BREEAM Communities gives adequate consideration for social wellbeing which is aimed at delivering a socially-inclusive community*" without providing any depth to support this statement or to describe what 'adequate consideration' means. As a result, the findings read more like a summary/review of the NSAF categories rather than an evaluation pertaining to their application for driving sustainable urban regeneration.

Unfortunately, I do not feel that there is a strong enough case made by the author that the NSAFs uphold the imperatives of sustainable urban regeneration. This is partly due to the lack of depth provided by the literature review, findings. The outcome is that there is little reflection and interrogation whether NSAFs can drive sustainable urban regeneration. The author starts to do this to a limited extent in the discussion and conclusion. Should the author address the comments and apply more depth to their analysis, perhaps supported by examples, I believe the paper could make a valued contribution. For the most part the paper is well-written but could do with another proofread as some grammatical errors may have slipped through the cracks.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Is the argument information presented in such a way that it can be understood by a non-academic audience?

Partly

Does the piece present solutions to actual real world challenges?

Partly

Is real-world evidence provided to support any conclusions made?

Partly

Could any solutions being offered be effectively implemented in practice?

Partly

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 22 Apr 2020

Ayomikun Solomon Adewumi, University of Dundee, Dundee, United Kingdom

Dear Reviewer,

I want to sincerely appreciate your gesture in accepting to review this article. Also, your thoughtful comments on how its quality can be enhanced. I agree with your suggestion on the need for more clarity on the link between urban regeneration and sustainability because that is the only basis by which we can discuss urban regeneration from the lens of a sustainability assessment framework. Also, a more balanced discussion on NSAFs will be considered in the revised article from the perspective of the challenges and limitations as established in the literature. I have gathered some new literature (Peng et al., 2015; Boyle et al., 2017; Sharifi & Murayama, 2014; Zheng et al., 2017) which will be helpful in this regard.

Yes, I agree on the need to discuss the link between NSAFs and urban regeneration knowing well that these tools are tailored for new development, unlike urban regeneration which involves the renewal of existing development. Document analysis as explained in the methods section was adopted in this study. On the selection of the NSAF used for this study, while the geographical spread was a factor, the primary criteria was the availability and accessibility of the technical manuals. Also, these are the most dominant in existing literature allowing this study to make a comparison with the existing study. The revised article will expand the selection to DGNB used in Germany. Yes, I hold a similar view on the need to draw evidence from case studies. References will be made to the MediaCityUK and Hoyt Yards regeneration projects in the UK and US respectively in the revised articles in the discussion of results. A detailed review of each sustainability aspect in the light of urban regeneration is presented in the revised article.

Thank you also for your comment that most of the article is well-written. The revised article will address some already identified grammatical errors. I plan to submit the revised article soon. I will be most grateful if you could please give a review based on your comments.

Thank you and kind regards
Ayomikun

Competing Interests: There are no competing interests.

Reviewer Report 26 February 2020

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Helen Wei Zheng 

Department of Planning and Environmental Management, Manchester Urban Institute, University of Manchester, Manchester, United Kingdom

This paper provides a review of sustainability assessment frameworks, which is interesting. However, it is still not ready for indexing in terms of contribution to knowledge.

First of all, sustainability assessment at the neighbourhood scale for urban regeneration is not a new topic. This paper does not well address the research gaps. What are the research gaps in literature? Why is the review important?

'There exists a gap in terms of a benchmark in ensuring that urban regeneration delivers sustainable outcomes, most especially at the neighbourhood level.'
Why did the author claim this gap? It is suggested to add more detailed analyses on existing frameworks rather than proposing a gap out of blue.

Second, literature review on NSAFs is very descriptive. It is OK to include evolution and structure. But it would be better to provide a critical analysis. For example, what are the current challenges of NSAFs? Again, with this analysis, the gap can be better clarified.

Third, the review of the frameworks mainly draws upon three tools. How can the three frameworks shed light on the proposed research aim? There is a need to explore more frameworks. Another suggestion is to include case studies at the neighbourhood level that address practical issues to strengthen the critical power of the paper.

The framework in Figure 1 is a good start to further strengthen the paper. It is suggested to include more in-depth analyses for further development of the paper.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Is the argument information presented in such a way that it can be understood by a non-academic audience?

Partly

Does the piece present solutions to actual real world challenges?

Partly

Is real-world evidence provided to support any conclusions made?

Partly

Could any solutions being offered be effectively implemented in practice?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: The first strand of my research is decision-making support for sustainable urban regeneration by developing different indicator frameworks and simulation models. The second strand of my research focuses on sustainable urbanisation from a spatial planning perspective.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 27 Feb 2020

Ayomikun Solomon Adewumi, University of Dundee, Dundee, United Kingdom

Dear Dr Helen,

Thank you very much for accepting to review the article and I must admit that your comments will enhance the quality of the article. I have been able to access more articles (e.g. Boyle et al., 2018 and Zheng et al., 2017) that focus on sustainability assessment frameworks and decision support for urban regeneration which I will review to identify more gaps in literature agreeing to your comments. The current challenges of NSAFs will also be looked in to. The choice of three frameworks was justified based on their dominance in existing literature coupled with the accessibility of their technical manuals for review. In this regard, I will explore further if I could access more manuals of existing NSAFs such as CASEE-UD and DGNB.

Once again, thank you very much for your time in reading through the article and providing your comments.

Competing Interests: No competing interest