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Identifying sustainability components of human health and wellbeing in vernacular neighborhood of Bangladesh through the lens of sustainable sites initiative guidelines and benchmarks

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Abstract

Building, infrastructure or man-made landscape might have harmful impact on life quality, ecological Systems and other resources if surrounding nature and environment are not taken into account properly. The Sustainable SITES Initiative, a sustainability guidelines and benchmark standard prescribed by American Society of Landscape Architects (ASLA) fund, The Lady Bird Johnson Wildflower Center at The University of Texas at Austin, and the United States Botanic Garden, counts landscape as the key component which can prevent or mitigate these harmful impacts. To do so, Sustainable SITES Initiative uses specific guidelines and benchmarks for design decisions and performance monitoring in terms of sustainability. Sustainability in the vernacular human settlements in different regions of the world is explicit both in tangible and intangible aspects. Vernacular settlements in Bangladesh comply the same. Though Sustainable SITES Initiative v2 Rating System provides ten criteria for sustainability certification and monitoring, this study focuses on the criteria of 'Human Health and Well-being' and uses its components as tools to identify sustainability components relevant to human health and well-being in the general neighborhood pattern of vernacular settlements in Bangladesh. Findings show high availability of sustainability components in terms of human health and well-being in the neighborhood of vernacular settlements of Bangladesh along potential rooms for improvement.

Keywords: Sustainable Design; Health and Design; Sustainable Community; Vernacular; Neighborhood

1. Introduction

Though SITES v2 Rating System provides guidelines and performance benchmarks for sustainable land development for new design projects, it is also applicable for existing sites worldwide. There is no maximum size for a site to be assessed by SITES benchmarks but the minimum size is 2000 square feet. SITES guidelines and benchmarks are applicable to sites with or without buildings but it basically focuses on areas outside of the buildings.

SITES v2 Rating System comprises of ten criteria to be used as site performance benchmarks. These are: (i) Site Context (ii) Pre-Design Assessment and Planning (iii) Site Design- Water (iv) Site Design—Soil + Vegetation (v) Site Design - Materials Selection (Vi) Site Design – Human Health and Well-being (vii) Construction (Viii) Operation and Maintenance (ix) Education + Performance Monitoring (x) Innovation Or Exemplary Performance.[1]

The intent of this study is not to use SITES criteria for any certification rather it focuses on the 6th criterion 'Human Health and Well-being' as an assessment tool to identify Human Health and Well-being components in the neighborhood of vernacular settlements of Bangladesh.

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Sustainability can be depicted in the vernacular settlements of Bangladesh through its adaptability with climate and environment. Being evolved through centuries, vernacular settlements have its deep roots of socio-cultural and ecological aspects with the topographical context and built environment. This sustainable adaptation of vernacular settlements of Bangladesh can be characterized through the following aspects: (i) Use of local materials (ii) Water Management (iii) Climatic considerations (iv) Energy efficiency (v) Cultural practices (vi) Biodiversity preservation etc. In addition to the above mentioned factors, neighborhoods of vernacular settlements retain a high level in terms of Human Health and Well-being.[2]

2. Methodology

As this study focuses on the Human Health and Well-being criterion of the SITES v2 Rating System as a set of assessment tools to identify relevant Human Health and Well-being components in the neighborhood of general vernacular settlement pattern of Bangladesh, at the initial phase an in depth literature study has been carried out to achieve a clear understanding of Human Health and Well-being components of SITES Initiative. Next, secondary data has been analyzed through further literature review on sustainability practices in Bangladeshi vernacular settlements by mainly focusing on Human Health and Well-being. Finally, based on the parameters found from SITES benchmarks and literature review, Human Health and Well-being influencing components have been identified through scrutinizing case studies from different regions of Bangladesh. Thus, this study attempts to provide a clear understanding of the vernacular neighborhood's morphology of the physical environment through the lens of Human Health and Well-being prescribed by SITES initiative. It is noteworthy that, while using the above mentioned SITES sustainability criterion, Rating Points for certification were skipped as it does not comply with the intent of this study. Additionally, SITES Human Health and Well-being components which are solely suitable for urban context were not in consideration as the context of interest was rural settlements.

3. Results

On the basis of the entire study and analysis, sustainability performance overview of the study context of Bangladesh has been summarized in the following table. Sustainability performance levels have been classified into three parts i.e. High, Satisfactory and Poor. Here, 'High' Sustainability performance level represents high availability of relevant sustainability components in the study context for the particular SITES criterion. 'Satisfactory' Sustainability performance level represents acceptable or alternative availability of relevant sustainability components in the study context for the particular SITES criterion. 'Poor' Sustainability performance level represents absence or under threat of relevant sustainability components in the study context for the particular SITES criterion.

Table 1 Summery of sustainability performance overview of vernacular neighborhood of Bangladesh according to SITES v2 Rating System criteria for Human Health and Well-being

SITES v2 Rating System Criteria	**Sustainability Performance**		
	High	**Satisfactory**	**Poor**
Protect and maintain cultural and historic places			✔
Site Accessibility, Safety, and Wayfinding	✔		
equitable site use	✔		
Support mental restoration	✔		
Support physical activity	✔		
Support social connection	✔		
Provide on-site food production	✔		
Reduce light pollution		✔	
Encourage fuel efficient and multi-modal transportation		✔	
Minimize exposure to environmental tobacco smoke (ETS)			✔
Support local economy		✔	

4. Discussion

SITES v2 Rating System has prescribed 11 components as benchmarks for sustainable Human Health and Well-being. These are: (i) Protect and maintain cultural and historic places (ii) Optimum site accessibility, safety, and wayfinding (iii) Equitable site use (iv) Support mental restoration (v) Support physical activity (vi) Support social connection (vii) On-site food production (viii) Reduce light pollution (ix) Fuel efficient and multi-modal transportation (x) Minimize exposure to environmental tobacco smoke (xi) Support local economy. Following discussion provides scope for deep understanding of each above mentioned component and their respective elements and concurrently attempts to identify those elements in the general neighborhood pattern in the vernacular settlements of Bangladesh.

4.1. Protect and maintain cultural and historic places

This section put emphasis on site's identity along protecting and maintaining historic structures as well as cultural landscapes. In response to this component study show that, historic structures across the rural area of Bangladesh usually does not remains under proper protective measure not by the local authority nor by the inhabitants. This kind of structures generally includes century old Temple, Tomb, Houses and Mosques with significant archetypes and architecture. As most of the land area of Bangladesh is deltaic plain, the landscape would mainly be distinguished as water dominant and rice cultivation cultural landscape. Besides these, number of tribal community settlements retains notable practices of cultural, spiritual and infrastructural trait.[3]

4.2. Optimum Site Accessibility, Safety, And Wayfinding

This component is concerning understandability and accessibility across the outdoor spaces, which mainly focuses accessibility, safety and wayfinding issues. Here, accessibility represents local and national standards for accessibility including provisions for physically challenged. In the rural areas of Bangladesh roads and paths are not adequately suitable for physically challenged users in terms of construction materials, slope and height dimensions [4]. Most of the public facilities are not accessible for the physically challenged users and in the rural region this scenario is even worse [5].

Elements of safety includes access control and defined spaces, Natural surveillance at walkways and entry areas, natural surveillance with proper lighting, diverse access options, security measures and visibility.

Space distribution in the neighborhood of vernacular settlements of Bangladesh usually is very functional and well defined in terms of access, visibility and privacy [6]. Natural surveillance would be considered in a different dimension compared to urban contexts as in rural areas the trait of crime and security means are different. In such context, social relations and sharing are strong where the presence of intruder is highly detectable [7]. Walkway and entrances are usually visible even from distance. Most of the roads and walkways across the rural areas in Bangladesh lack adequate street lighting for night time [8]. Depending on the need and use, common spaces and houses are managed with night time lighting. All the buildings in a neighborhood are not necessarily accessible from the primary roads. Secondary and tertiary level paths along shortcut connections are quite common [9]. Though neighborhoods in this context are commonly found with fencing or boundary wall, very often these types of security measures are not used. Common and public spaces have high visibility throughout these neighborhood but spaces like inner courtyard or backyard have limited visual connection to the surrounding areas. Temporary and permanent partitions are also common in use to maintain privacy especially when the users are female in some specific functions of household, education etc. due to cultural and religious practices [10].

According to SITES guidelines, sustainable wayfinding need to meet at least five components of the following: Defined Gateways and entrances, Viewpoints, Landmarks, Nodes, Hierarchy of walkways and vehicular circulation, distinguished areas, Orientation devices, Maps and brochures.

In the context of this study the users are mostly native people hence use of orientation device or maps are not considerable in this reality. Gateways and entrances are usually well defined with natural and manmade elements. Row of specific plant species or fencing along both sides of entryways, use of hard surface on the ground, built gateway structures with decoration or lettering are commonly seen [11]. Effective viewpoints could be found at diverse spots of public, shared and private spaces in a particular neighborhood [12] Manmade and natural landmarks are explicit in this study context. Besides historic structures old or new religious structures, Tomb structures, Bridges, Stoppages of waterways etc. plays significant role as landmarks in the rural life [13]. Specific large scale plants e.g. Banyan tree, Arjun tree and other wide canopy plants might be considered not only as landmarks but they also hold spiritual and cultural significance [14]. Ratio of nodes across the road networks are very less compared to urban contexts due to less density of settlements. Except primary roads, secondary or other levels of paths are mostly suitable for Pedestrian, Bicycle,

Rickshaw and Motor Bike. Hierarchy among these road networks are explicit and even the segmentation of farmlands as property border with earth barriers serves as circulation way for people and animals. Spaces throughout such neighborhoods are well distinguished in terms of their physical structure, functions, connectivity, visibility, privacy etc. e.g. entrance zone. Inner house areas, backyards, vegetable, fruit or flower gardens as well as shared amenity zone.

4.3. Equitable Site Use

Equitable site use stands for social and economic benefits of the inhabitants through amenities facilities, events etc. Support mental restoration, physical activity, social connection need to be ensured to maintain equity across a chosen site. These three components of equity have been discussed onwards with assessing them in the study context along relevant examples. The findings show high level of equity in the neighborhoods of vernacular settlements in Bangladesh.

4.4. Support Mental Restoration

This criterion of SITES v2 Rating System urges to ensure inhabitants physical and visual connection to restorative outdoor spaces. It includes outdoor seating, physical and visual access to vegetation, mitigate negative distraction and noise, consider microclimate.

Though, in the rural context of the study area, planned seating is not very often seen but some specific functional spaces usually seen with some seating provision. Step-down platforms locally known as 'Ghat', Entrance zone of houses, community gathering spots like local commerce zone are commonly seen with seating provisions [15,16]. Access to vegetated areas is a common scenario as the rural settlements are situated in nature dominant atmosphere in Bangladesh [17]. Visual connections between living areas and green areas are also is a common phenomenon both in private and public spaces [18]. Distant visibility is a general character of rural environment (19]. Moreover, the study context is usually quiet and free from manmade noise and other distraction except roads with high traffic and commerce zones [20]. Microclimatic considerations have influenced the vernacular architecture throughout the centuries in terms of materials, orientation, function and space distribution, construction techniques, shape etc. of buildings [21].

SITES provides other preferences to ensure mental restoration quality of a space e.g. quiet places, places with shade and view, restorative places in different location aligning connection with nature, away from distraction and noise, audio visual essence of nature. Mostly the study context vicinity is abundant with these kinds of space qualities.

4.5. Support Physical Activity

The intent of this criteria is to assess elements those encourage outdoor physical activities. According to SITES standard, it is important to manage outdoor physical activities provision for four major user groups of a chosen site with some prescribed measures e.g. on-site drinkable water, Trail or Bicycle path, physically challenging playground, events or programs those involves physical activities e.g. Sport competition, tournament etc.

The chosen study context of vernacular rural neighborhood of Bangladesh meets most of those mentioned outdoor physical activity measures. In rural areas of Bangladesh, lifestyle of majority of the people involves active physical involvement in farming, household management, livestock management etc.[22] Walking, cycling and other regular and occasional formal and informal setup of different sports types are quite common[23,24]. Drinkable water sources are usually located at inner courtyard or backyard of the houses, around mosques, market areas most of which are shared with neighbors and local inhabitants [25].

4.6. Support Social Connections

SITES sustainability guidelines encourage social connections through providing spaces for community gathering for recreation, work etc. According to SITES, certain measures to be present to enhance social connection in outdoor spaces. These are planned seating considering microclimatic issues and comfort, amenities, activity or service spaces e.g. outdoor games, picnic or dining areas, performing area, playgrounds.

In the study context, outdoor public gathering is more likely to be seen within the periphery of religious buildings during prayers times [26], close proximity of rivers or ponds [27], around the farmlands and water bodies during fish and crop harvesting seasons [28], local market places and at playgrounds[29,30]. Courtyards and building roofs are also highly interactive gathering spaces with privacy [31]. Seasonal and cultural programs along sports events are also common phenomena [32].

4.7. On-site Food Production

Involvement of the community in food production along enhancing nutrition knowledge is the objective of this criterion of SITES v2 Rating System to ensure sustainability in Human Health and Well-being. According to SITES standard 10% of the vegetated area should be food productive and the produced food products should be distributed within this locality e.g. directly consumed by the site users, selling in the local market, schools, hospitals, restaurants.

In the rural context of Bangladesh homestead gardening is a common practice which very often includes fruits, vegetable, flower and medicinal plants. This practice plays important role on their nutrition, economic and food safety, climatic and environmental benefits as well as visual aesthetics of living environment [33]. Study show that 30-50% of the vegetated area in a neighborhood of rural regions of Bangladesh is used for food production [34]. Food produced in such neighborhood is consumed within the neighborhood as well as sold in the local market [35].

Other recommendations from SITES includes soil contamination check, organic gardening, diversity of gardening methods, food production in different location, rainwater harvesting, waste materials to composting and animal husbandry.

In Bangladesh soil contamination occurs mostly for industrial disposal, use of Pesticides, Poor Waste Management, presence of Non-biodegradable elements into the soil, Flood and Water Clogging etc. Organic gardening and food production are being popular in the rural regions of Bangladesh which is also an important strategy to mitigate soil contamination [36]. Diverse methods of gardening and cultivation e.g. Container Garden, Raised Bed etc. are being adopted for resource and space utilization [37]. Homestead gardens are usually seen within close proximity of households. These are commonly found in front of a house, around inner courtyards as well as at backyards [38]. Other fruit and medicinal plants are commonly seen throughout the surrounding area and neighborhood [39]. Though most of the rural regions are located in high precipitation zone in Bangladesh and during the dry season there is high demand of water consumption for agriculture relevant activities [40], there are no effective initiatives for rainwater harvesting and management of stormwater [41]. Waste management is a critical issue in the context of rural regions of Bangladesh due to unplanned development of settlements, over population, lack of environmental consciousness, lack of planned disposal [42]. Organic waste from the households and livestock has high potential to produce fertilizers, biogas etc.by utilizing composting methods [43]. Very few initiatives have been taken by the Government and some NGOs on this regard [44]. Animal husbandry plays important role to provide economic, food and nutrition security in the rural context of Bangladesh [45]. Small single family household to collective initiatives are used to practice animal husbandry for personal or commercial purpose [46].

4.8. Reduce light pollution

There has not any significant study been carried out on night time lighting pollution across the rural areas of Bangladesh yet. Current light pollution studies are mostly focused on urban contexts [47]. In the rural areas of Bangladesh use of artificial lighting is still significantly low compared to urban areas but use of different lighting systems is increasing [48].

4.9. Encourage fuel efficient and multi-modal transportation

This criterion urges for efficient and adaptable transport system. Though topographically it is water dominant region, across the rural areas of Bangladesh road transportation has increased exponentially since last two decades due to economic growth and infrastructural development [49]. Though rural regions still have less vehicular pollution, due to rapid urbanization air quality is degrading even in the rural regions [50]. However, increasing use of electric auto-rickshaw, Paddle-Rickshaw seems convenient. Use of Compressed Natural Gas (CNG) has also reduced rapid air quality degradation [51]. Use of Bicycle is common for personal use for short distances. During the long monsoon season waterway is extensively used in the flooded and lowland regions of Bangladesh [52].

4.10. Minimize exposure to environmental tobacco smoke

Environmental tobacco smoke (ETS) also known as secondhand smoke retains significant health risks especially for the children. In the rural areas of Bangladesh, ETS exposer is high and approximately 39% children remains in close contact of household ETS [53]. Socio-cultural norms, lack of health consciousness and education, household smoking practice are the pre-dominant factors behind high rates of ETS across the rural areas of Bangladesh [54].

4.11. Support local economy

SITES guidelines for sustainable landscape development encourage local community benefit during the construction development phase of a selected site. Mainly it requires involvement of local people in construction works as well as to buy materials from local business.

This criterion of SITES can be assessed for different construction and development initiative of private owners from the neighborhood. Involvement of local masons and use of materials from the local sources are common practice in the neighborhoods of vernacular context of Bangladesh [55].

5. Conclusion

The intention of this study was not to utilize SITES v2Rating System guidelines and benchmarks for certification purpose rather it has been used as a set of parameters to assess and identify sustainability components in terms of Human Health and Well-being in the neighborhoods of general vernacular settlements of Bangladesh. This study show that, except cultural and historic buildings / places protection and minimizing inhabitant's exposer to Environmental Tobacco Smoke, the study context meets all other SITES v2Rating System criteria regarding Human Health and Well-being from Moderate to High level. It is expected that this study would be helpful to draw attention of Environmental Experts, Planners, Architects, Policy Makers as well as the Local and National Authority regarding maintaining and enhancing sustainability in rural regions of Bangladesh. However, due to rapid urbanization, cultural shift due to economic and technological reasons, climatic change and unconsciousness the sustainability performance seems vulnerable to be degraded in some extents over the future.

Compliance with ethical standards

Disclosure of conflict of interest

Authors declare no conflicts of interests.

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