

# Public spaces and urban sustainability in the tropical built environment

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**Abstract.** Sustainability is an overarching sense of responsibility towards the future. On a city-wide level, urban sustainability incorporates a wide body of changes especially as they relate to the built environment, all of which intended at creating a livable place. This paper discusses existing public spaces in view of their achievement against a set of criteria for the built environment. The paper introduces performance design criteria for the tropical built environment. The key findings indicate that long-term strategies, guidance and directions for the city and region can achieve development which corresponds to local climate, synergies and provide a higher proportion of public spaces that offer something for everyone.

**Keyword:** built environment, public space, sustainable planning, landscape design, permeable urban form

## 1. Introduction

Conventional wisdom says that the cities undergo complex spatial organization and reorganization over time and it's the interrelated spaces where people move in and out every day and every time that essentially contribute to sustainable spaces. Even though there is still no consensus on how to comprehensively define the concept of sustainability as it pertains to the built environment, nor is there consensus on what aspects of the built environment should be considered in evaluating the sustainability of a built facility [1], the tropical built environment is not all different to other built environments. The built environment of cities in the tropics seems to suggest micro planning of public spaces with consideration given to temperature variations as to where the city warms and cools more slowly; experience increased surface runoff during heavy rainfall, less evaporation; public spaces more likely having a surge in usage at certain hours of the day; with potential for vernacular solutions to public spaces problem. All of which eventually impacts on how people consume the public spaces.

Deriving from the dialogues [2], [3], [4], [5], it can be said that to understand the synergies between public spaces and the tropical built environment and its contribution to sustainability, requires an analytical framework which is geared for a specific environment, in this case, the tropics, and a strategic set of performance design criteria. Thus following Weiss [6] Theory of Change, the purpose of this study is to propose a conceptual road map that becomes the basis of performance measurement criteria for the tropical environments. The desired outcome can be used to inform planning authorities, managers, and the community, on achievements of a public space and how well it did it. This method will then be



illustrated in a case study of Bandar Seri Begawan (BSB), Brunei on the island of Borneo, by a critical evaluation of the state of the existing public space.

### *1.1 What about urban public spaces in the tropical built environment: how to measure its performance?*

Flagging off Carmona's [7] research on new and regenerated public space, the author reconceptualises the nature of public space to conceive of a set of normative principles that are evolving, balanced, diverse, delineated, social, free, engaging, meaningful, comfortable and robust. Performance measurement of the space is then an on-going and responsive process and the design criteria measure an aspect or various aspects of a place and/or site in order to reflect on how best the area fits within a certain standard.

**Table 1.** Measurement of urban tropical public spaces.

<b>Public-street Spaces</b>	<b>Landscape Design</b>	<b>Building-street Interface</b>	<b>Building Design</b>	<b>Sustainable Planning and Design</b>
<b>Intangibles</b> Character, Form, and Function: size and shape, scale, bulk and character of surrounding buildings	Connected, walkable, convenient access, continuous, perceptible urban green	Building/street edge, building orientation, setback, height, character and facade	Integration of built form with the natural environment, permeability at ground level, horizontal and vertical landscapes	Increase water supply, reliability, waste management
<b>Measurement</b> Street width (building height to street width ratio not greater than 3:1), urban enclosure, access and connectivity, robustness, pedestrian, cycling friendly environments, outdoor activities, security and surveillance, view corridors, connectivity to water elements.	Canopy trees, soft landscaping, floor surface treatment, street furniture, lighting, way-finding and signage, shaded shelters, water fountains	Treatment and the location of service and car parking areas and utility installations	Building articulation, openings, and sun-shading devices, verandas on the external façade, use of climate responsive building materials	Capturing rain and stormwater: swales, infiltration, rooftop rainwater harvesting, energy efficiency, sustainable waste management

Source: [8-25]

## **2. Research Method**

In this study, it is then possible to envisage performance design criteria (PDC) for tropical urban environments founded on the knowledge arising from scholarly and evidence-based research, and the most commonly used criteria or indicators in planning and designing of subtropical and tropical urban environments. 40 PDCs have been identified [7 – 23]. Each criterion is assigned one unit (1) making a total of 40 units. Visual analysis of each criterion ensures currency of the selected sites. The range of recurring criteria manifests consideration of local character, respect of topography, permeable urban and built form, optimizing solar access and air movement, use of traditional elements and vernacular structures, avoiding high fences and blank walls, good visual and physical connectivity, presence of water, promoting active building/street interface, extended pedestrian sidewalks, quality floors capes and street furniture, dense tree planting, and access for pedestrians and cyclists. These criteria fully summarized and broadly categorized as Public-street Spaces, Landscape Design, Building-Street Interface, Building Design, and Sustainable Planning and Design as shown in Table 1.

The major elements of the urban environment include streets, open spaces (squares, plazas, urban parks) and buildings [7]. For this research, the public-street spaces address diverse character, form, and function, size, shape and scale, economically vibrant space. Significant tropical climate urban design may include street width, urban enclosure, access and connectivity, robustness and provision of pedestrian and cycling friendly environments, outdoor activities, security and surveillance, important view corridors and connectivity to water elements. Permeable and active building/ street interface, outdoor activities, planting of vegetation and canopy shady trees, climate responsive surface materials and vertical landscapes in new buildings influence the outcome of the public-street spaces [24].

The perceptible landscape design requires connectedness, walkable, convenient access, and fluidity which emphasizes on the provision of canopy trees and soft landscaping, floor surface treatment, street furniture, lighting, way finding and signage, provision of shaded shelters and water fountains. Soft landscaping and canopy shady trees significantly contribute in mitigating the urban heat island effect. Meaningful building street interface addresses building/street edge, building orientation, setback, height, character and façade treatment and the location of service and car parking areas and utility installations. Evolving building design aims at integrating the built form with the natural environment, permeability at ground level, horizontal and vertical landscapes. The focus is on building articulation, provision of openings and sun-shading devices and semi-open verandas on the external façade, and the use of climate responsive building materials [18], [19], [20]. Sustainable planning and design address issues related to capturing rain and storm water, energy efficiency, and sustainable waste management. All these criteria are prerequisites for the achievement of a fully ecological sustainable urban environment [22], [23].

### **3. Results and Discussion**

#### *3.1 Case Study of Bandar Seri Begawan, Brunei*

Brunei developed a network of water villages and in the 16th century known as the ‘Venice of the East’. During the British administration in the early 20th-century, urban development commenced on dry land opposite Kampung Ayer (the water village). In the 1970s, the Pusat Bandar or the Central Business District of Bandar Seri Begawan seated major national institutions, commercial offices, and retail establishments. However, with the expansion of the city, many government institutions and commercial establishments moved to the new suburbs and the traditional city centre commenced on a trajectory of gradual decline [24]. Attempts to revive public spaces and promote new development have only partially revitalised the centre. Much of new developments are economic-led growth which often neglects the local conditions, natural settings, topography and the local tropical climate. Subsequently, delineating of spaces are unclear and architecture less meaningful thus affecting the quality of public space. Under the Bandar Seri Begawan Master Plan, the Central Business District (CBD) is designated as the hub of finance, business, education, and multinational headquarters, underpinning a diversification of the economy. Following those recommendations, the intent of the local authority is to transform the center into a thriving waterfront precinct which is characterized by strong cultural context featuring MIB architecture and re-adaptation of existing buildings to mixed-uses.

#### *3.2 Correlations between public spaces and tropical built environment*

The urban enclosure is generally not suitable for tropical climates, with the height of some buildings significantly less than the width of the street. The street has practically no defined enclosure along the southern side which contributes to the heat impact during the daytime. There are clear view corridors from the street, southwards towards Sungai Brunei and Kampung Ayer and eastwards featuring Bukit Subok. The majority of surface treatment materials (mainly concrete pavers) are not appropriate for tropical conditions, and the street lacks soft landscape, canopy native trees which have an impact on the thermal comfort of the end-users. Many of the modern buildings along Jalan Kianggeh are devoid of tropical design elements. Specifically, the correlations to build form, landscape design and built environment is shown in Table 2.

**Table 2.** Typology of correlations between public spaces and tropical built environment.

Correlation to built form	Correlation to landscape design	Correlation to tropical built environment
<ul style="list-style-type: none"> <li>• Loss of visual connectivity</li> <li>• Defined five-foot footways create sheltered approach for pedestrian</li> <li>• Incidental spaces have a less coherent form than other spaces and are generally less clean and comfortable</li> <li>• Building articulation inconsistent with tropical environment with few buildings designed with semi-open verandas on the external façade</li> </ul>	<ul style="list-style-type: none"> <li>• Consumption spaces shows active day-time frontages</li> <li>• Insignificant greenery is a common feature of all space types</li> <li>• Public spaces tend to lack sun-shading devices</li> <li>• Private spaces generally rundown</li> </ul>	<ul style="list-style-type: none"> <li>• Public urban spaces are the most active, they are less enclosed and more open</li> <li>• Lack of fine urban grain with few network of small and detailed streetscapes</li> <li>• Spaces are usually contemporary in style generally showing less regard to historical context</li> <li>• Public buildings and spaces vary significantly in their architectural treatments</li> <li>• Feel like very safe places.</li> </ul>

*3.3 Sustainability compromised*

The analysis of the streets and public spaces in the Bandar Seri Begawan CBD identified a few distinct stereotypes (see Figure 1). The analyzed streets are physically and visually well connected and provide a good sense of enclosed and contained urban space but lack tropical landscaping and buildings with tropical design features. There are pedestrian sidewalks however the absence of shading devices, sitting and resting areas, canopy tropical trees, and other soft landscaping elements significantly reduces the comfort for pedestrians. Dermaga di-Raja, the principal waterfront area in Bandar Seri Begawan, representing a historical sense of place for all Bruneians, was redeveloped along the typical model of ‘a western style waterfront’ which looks out of context with its predominant hard floor-scaping suitable for temperate climatic zones. The redevelopment was not in keeping with the eco-corridor [26] proposed a few meters away from the site. As a result, the waterfront area is mainly used as the gateway to Kampung Ayer.

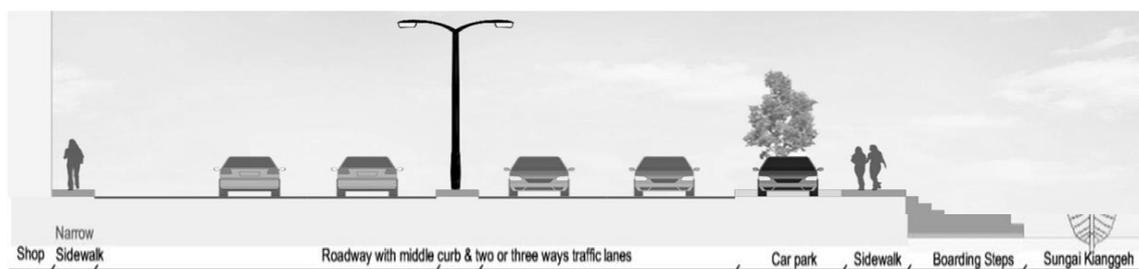
Visual sight analysis	Location	Findings
		<p>Waterfront</p> <ol style="list-style-type: none"> <li>1. Detachment of visual connectivity leading to the loss of active frontage</li> <li>2. The old Customs Building blocks the view of Kg Ayer from users on Jalan McArthur</li> <li>3. Deficiency in softscaping elements and street furniture, surface materials not suitable for tropical conditions, absence of continuous pedestrian connectivity, lacking activities along Brunei River</li> </ol>

		<p><b>McArthur Road</b></p> <ol style="list-style-type: none"> <li>1. Buildings yielding an unappealing sight</li> <li>2. Lack of shade and greenery</li> <li>3. Large sections of the street exposed to direct sunlight, lack of canopy trees and softscaping elements, many buildings devoid of tropical character and local motifs, potential to be converted to city boulevard</li> </ol>
		<p><b>Kianggeh Road</b></p> <ol style="list-style-type: none"> <li>1. Flanked by Brunei River and Kianggeh River, limited diversity in activities</li> <li>2. Potential for kinetic use of land</li> <li>3. Street softened by water edge (Sungai Kianggeh), shortage of tropical design elements on majority of building facades, lack of sufficient pedestrian sidewalk on the western side</li> <li>4. Absence of canopy trees and softscaping elements, and active frontages on the western side. Potential to be converted to city boulevard</li> </ol>
		<p><b>Alleyway</b></p> <ol style="list-style-type: none"> <li>1. Tunnel effect</li> <li>2. Not forming a part of pedestrian network</li> <li>3. Lacking good lighting in the evening</li> <li>4. Lack of active frontages and landscaping elements</li> </ol>

**Figure 1.** Stereotypes of public spaces.

*3.4 Homogenous public-streets*

Homogenous existing street typology of Jalan Macarthur, Jalan Sultan, Jalan Roberts and Jalan Kianggeh impedes vibrancy of the city center (see Figure 2). Even though the streets are important east-west connectors of the CBD and provide connectivity but hollowed out buildings flanking the road create a deserted oasis from early evening onward. The pedestrian sidewalk is narrow on one side while on-street parking is rampant, to top it all, there is lack of natural shading and shading devices.



**Figure 2.** Existing street typology.

In all the selected public space, the average full compliance with the performance design criteria for tropical urban environments is 5.7 out of 40. The average non-compliance with the PDC is 6.7 out of 40. This implies major deficiencies in addressing tropical design elements in the urban environment of Bandar Seri Begawan's CBD. Shortcomings are observed in the design of modern buildings and in landscape design where local tropical climate themes are often non-existent. The study revealed the strong presence of vernacular styles in the 1990s which is outweighed by a modern, austere approach to design, typical of the late global modernist period. There is a visible pedestrian environment in the study area however its attractiveness for the end-users is hindered by low thermal comfort and leisure activities. The city needs canopy trees, permeable building edge and provision of active frontages which is rare here. Today, despite catalyst rejuvenation projects, the CBD is still characterized by a large number of decayed buildings, struggling businesses, vacant premises, and of significance, local Bruneians do not frequent the area.

#### 4. Conclusion

The analysis unveils an urgent need for tropical urban design guidelines and green interventions for public spaces and building forms to address the local tropical climate at all scales and levels: the regional, city-wide district, neighborhood and site levels. Such guidelines provide a series of performance measures necessary for the tropical revitalization of streets and public spaces and promote the sustainable tropical urban environment. Tropical design and planning should be a leading theme in the national, regional, city-wide local and neighborhood planning documents. Developing tropical design guidelines for the Bandar Seri Begawan CBD in due course fills-up a noticeable gap in the field of urban studies in Brunei. It will identify measures that could soften the impact of global economy on the changing urban environment. This research offers an innovative contribution in the disciplines of urban planning and design by opening a Bruneian tropical design chapter. Responding to the local climate and enforcing them at regional and city-wide level with urban design/planning tools is important as it provides long-term strategies, guidance and directions for the region and the city. Arguably, whilst Bandar Seri Begawan is a medium-sized city with a less diverse range of public spaces, the city will need a higher proportion of spaces that offer something for everyone. In turn, the city center needs to put a break on decantation of the city center. Local community and stakeholders would be at the core of the planning stages ensuring design led by and needed by the community.

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