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A Quality Assessment Directory for Evaluating Multi-functional Public Spaces

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Comfort, commercial streets, inclusiveness, multi-functional public space, pleasurability, quality assessment, safety.

Abstract

Public spaces facilitate opportunities for social interaction and promote social life. The social-spatial complexity of public spaces can be explored through the relationship between built forms and users' daily social activities. The contemporary needs of users have retrofitted or replaced the controversial public spaces such as streets, depriving the prime function of sustaining and facilitating social life. Thus, any factors influencing users' social/public life impact the quality of public spaces. Also, contextualization and definition of public spaces necessitate an evaluation of their quality. The lack of a quality assessment directory (QAD) for evaluating multi-functional public spaces motivated us to address it. To achieve the aim, this research has conducted a systematic literature review applying the content analysis to explore the principles and indicators influencing and enhancing social interactions in multi-functional public space design and then performed a normalization analysis to measure the weight of each indicator. The QAD constitutes five criteria (C1 – Inclusiveness, C2 – Desirable activities, C3 – Comfort, C4 – Safety, C5 – Pleasurability), and forty-two (42) embedded sub-criteria. The research found that Inclusiveness (Wn_{C1} = 4.38) and Pleasurability (Wn_{C2} = 3.88) have received the highest weights. Also, the research found that the sub-criteria 'Physical/visual connection or openness to adjacent spaces' ($Wn_{Sc.4.1}$ = 1.00), 'Users of diverse ages' and 'Community gathering third places' (Wn = 0.750) have received the highest weights. Using such a QAD, urban professionals can quantify the effectiveness and efficiency of public spaces' environmental and physical qualities in promoting social interactions and sociability.

Introduction

Public spaces form an important part of the public realm, which fosters public life through social interaction. Old typologies of public spaces such as streets have been replaced or retrofitted to meet contemporary needs. The recent interest is directed towards urban living and public spaces, as modern societies have shifted their focus from public squares to their users' basic needs [1]. The scholars of urbanism argue that public space functions (through the promotion of public-social life) have diminished. The public spaces act as controlled environments where users and functions are filtered, segregated, and separated, disrupting public life [2]. According to Banerjee [3], privatization of public spaces enhances sociability through interaction between users. Public spaces very from small physical scales (i.e., streets, squares, parks, etc.) to large (i.e., neighborhood, city, and country). Banerjee [3] and Chavoya Gama [4] stress supporting and creating opportunities to enhance/improve public life by improving the quality of

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these urban spaces at the micro-level. Designing public spaces within the city at a macro-scale setting can impact public life at a micro-scale [5]. Cooper et al. [6] suggest that favourable qualities and contextualization of public spaces are necessary to develop these spaces to cater to modern societies' social and psychological health.

A few quality assessment models and tools have been developed to evaluate the public space to date. For instance, the women's safety audit is a tool developed by UN-Habitat for assessing safety in public spaces at local and policy levels by increasing public awareness and commitment [7], [8]. Androulaki et al. [2] have developed a stewardship toolkit for urban policymakers, which provides a management plan, maintenance plan, best practices for community organizations, and guides to funding sources. The scholars have developed similar structures accumulating key common concerns on configuring and operationalizing the public space assessment; for instance, the Systematic Pedestrian and Cycling Environment Scale (SPACES) emerges aesthetics, safety, functional, destination, and subjective elements [9]. As can be understood, the empirical public space assessment tools/models have commonly measured the functionality that aids urban professionals in measuring public spaces' functionality and performance.

To evaluate the functionality and performance of the public space, we need a comprehensive quality directory. To close this knowledge gap, this research has aimed to develop a quality assessment directory that aids urban professionals in measuring the effectiveness and efficiency of the environmental and physical qualities of the public spaces, hence, promoting the public social life.

I. Methods and Materials

The research methodology was designed in two phases (see Fig. 1). The task of the first phase was to investigate and identify public space quality assessment variables through a systematic literature review and apply the content analysis method. The task of the second phase was to conduct a normalization analysis to indicate the criterion mostly contributing to the public space quality assessment. The following text presents the employed methods in detail.

A. Systematic Literature Review and Content Analysis Method

Urban professionals have attempted to enhance the quality of the literature review process through employing quality systematic, scientific, and reproducible synthesizing methods. As a result, e systematic literature review is one of the most accurate methods of reviewing literature in the built environment and urban studies.

A systematic literature review is a fundamental scientific activity and an organized literature review method following a systematic process to investigate the variables and categorize them into a series of criteria and embedded sub-criteria [10]. Unlike traditional literature review methods (such as meta-analysis, narrative review, integrative review, etc.), it has prominence by implementing a scientific, replicable, transparent, and comprehensive process [11]–[14]. Systematic literature review has four stages: identification, screening, eligibility, and synthesizing (see Fig. 1).

- *Identification:* The method aids in minimizing review errors and biases through an exhaustive search in available sources (such as Google scholar, Books, journals, proceedings, handbooks, etc.). The relevant references (i.e., literature) will be searched and identified through surfing in Google Scholar, ScienceDirect, Scopus, and journal publishers (such as Taylor and Francis, Emerald, Proquest, Elsevier, SAGE, John Willey, etc.), and top-rated journals (such as Journal of Urban Design, Architecture and Urban Planning, Applied Mobilities, Journal of Environmental Psychology, and so on). Therefore, the systematic literature review provides an audit trail of the review process, achieving valuable outcomes [10].
- *Screening*: In this step, a set of following keywords has been searched within each of the identified sources: included sustainable public space, multi-functional public space, and public space assessment, and so on. Also, the research investigated the functional variables across diverse research fields, including urban design and planning, landscape architecture, transportation planning, public health, and social science. In this step, 38 references have been found, while one reference was dropped due to non-relevancy. By reviewing these references and the cited references, 11 more references were reviewed, while one reference was dropped due to ineligibility. According to Lievense et al. [15], literature should be screened regarding the quality and consistency of the findings.
- *Eligibility*: In the eligibility step, the references need to be evaluated in terms of three relevancies: (1) strong relevancy, (2) limited relevancy, and (3) inconsistent relevancy [16]. We found out that one of 50 references did not consider open spaces, not purely public spaces, so those two referenced were dropped. The rest of the references (i.e., 47 references) were identified for input into the synthesizing process.
- *Synthesizing*: In this step, the 47 references were studied to explore the assessment variables (i.e., sub-criteria) of the multi-functional public spaces while categorizing the variables into clusters (i.e., criteria). The results of the synthesizing step are presented in Table I.

After completing the systematic literature review process, the content analysis method was applied. Content

analysis is a technique to make valid and replicable judgments by exploring the keywords (i.e., codes) from the reviewed literature and documents for finalizing the assessment variables [17]. The method systematically evaluates the contents and texts and converts the qualitative data into quantitative data [18]. In the current research, the content analysis method explored the variables affecting the quality and performances of public spaces, developed a matrix table, and then estimated the frequency (i.e., degree of impact) of each variable in developing a quality multi-functional public space. The method zanalyzed the contents quantitatively using frequency (i.e., degree of depth) to measure the impact value (i.e., weight counts) of every single sub-criterion in the literature.

B. Normalization Analysis

Indeed, the frequency values of sub-criteria may lead to a dilution in the effectiveness of assessment, which may receive less citation than other criteria. This issue may lead to insufficient data in the process of data mining and data analytics [19]. Hence, this research has conducted the feature scaling method to normalize the independent criteria. Data normalization aided in determining the weight of every single sub-criterion that contributes proportionately approximately to its corresponding criterion and the whole network. In particular, the research has conducted the min-max rescaling normalization method, which performs a linear transformation on the original data. It scales the model's variables in the range of 0 to 1. The min-max rescaling was selected for this research, which can fit the nature of our data, see Equation (1); where $\acute{x}$ is the normalized value, and x is the original value.

$$\acute{x} = \frac{x - \min(x)}{\max(x) - \min(x)}, \tag{1}$$

II. Research Findings

C. Typologies and Characteristics of Public Space Assessment Models/Tools

Each model/tool has a specific assessment process/framework for evaluating the public spaces' functionality and features. The literature review determines that the public space assessment models/tools can be clustered into five typologies; 1) Public / Private Partnership Models, 2) Event-Based Models, 3) Self-Governing Special Assessment District Models, 4) maintenance and technical assistance partnership models, and 5) Grassroots Partnership Models. Further, each typology is briefly described:

- *Public / Private Partnership Models:* These models rely on private companies, organizations, government entity leadership, and small businesses for maintaining and activating purposes. The partner is asked to provide a

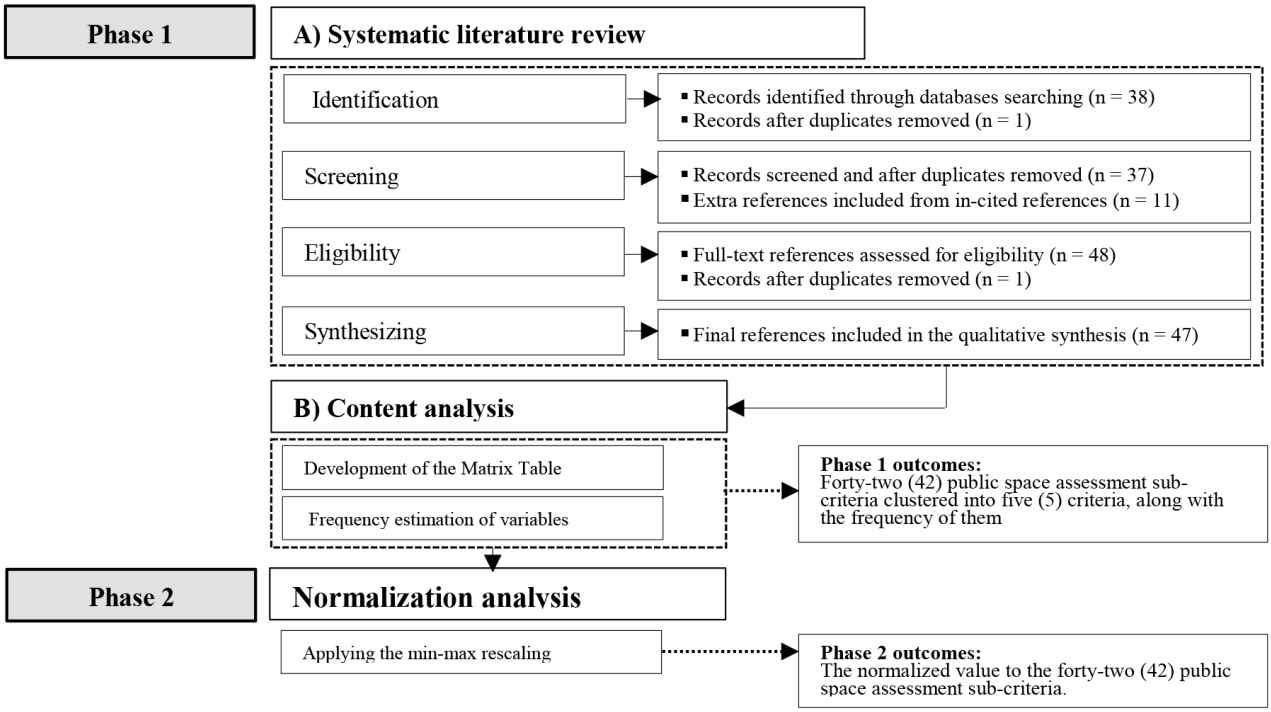

Fig. 1. Research methodology flow [developed by authors].

minimum number of free community programs. It would be equally distributed in the neighborhoods, and the partner is expected to generate revenue in the public spaces through retail, vending, and similar activities.

- *Event-Based Models:* These models make public spaces conducive to a social gathering or activate them for a specific time (evening, season, full-day, etc.). Such public spaces are equipped with a blanket or bundled structure that allows community groups to host small-scale community events.
- *Self-Governing Special Assessment District Models:* The property owners agree to pay for extra services beyond the basic services the local government has already provided using these assessment models. These models provide the guides or open-source toolkits for district formation or support creating an overarching coalition to help assessment districts share resources.
- *Maintenance and Technical Assistance Partnership Models:* Using these models, the organizations, partnerships, and programs can specifically support public space managers through either subsidized direct services or technical assistance. The model users should identify responsible parties and ensure the public space programs and policies focus on maintenance and corrective actions (e.g., New York city's neighborhood Plaza Partnership (NPP) technical assistance model). The partnership engages in advocacy to assist community-based organizations and in-direct services in high-need areas through citywide plaza promotion, marketing assistance, and workforce training.
- *Grassroots Partnership Models*: These models are suitable for small public spaces led by volunteer organizations for improvement, management, and stewardship purposes. These models aim to grow recognition of fiscal sponsorship resources, support grassroots group practices and share organizational knowledge.

Table I shows synthesized characteristics of the different typologies of the public space assessment models/tools. According to Table I, all assessment models/tools emphasize creating social interaction and infrastructure for users, making strong partnerships for maintenance, and providing a safe and lively environment. However, it can also be understood that some characters are specific for an assessment model/tool; for instance, the Event-Based Model only deals with the enticing user to linger among all typologies. On the other hand, maintenance and Technical Assistance Partnership Models is the only typology coping with distributing the management obligations to several organizations.

TABLE I

Public Space Assessment Models/Tools' Typologies and Characteristics with the Perspectives of Strategic Planning and Management [developed by authors]

Typology of assessment models	Create users'social interaction and infrastructure	Entice user to linger	Foster positive impacts and experiences	Generate revenue	Support for organizing events and programs	Support small community organizations to lead	Host permanent activities	Facilitate event productions	Contribute to users gather for the social congregation through events	Be strong partners for maintenance	Be strong partners for fundraising	Being flexible and capable in responding to users needs	Keep management costs low	Provide a foundation of community ownership	Secure financial donations	Have high levels of accountability	Manage small local business partners and diverse stakeholders	Provide a safe and lively environment	Neighborhood level application	Has a costly assessment district formation	Distribute the management obligations to several organizations	Address equity issues
Public / Private Partnership Models	✓				✓		✓		✓	✓						✓	✓	✓	✓			✓
Event-Based Models	✓	✓	✓	✓	✓	✓			✓						✓			✓	✓	✓		✓
Self-Governing Special Assessment District Models	✓				✓		✓			✓	✓							✓				
Maintenance and Technical Assistance Partnership Models	✓									✓	✓						✓				✓	✓
Grassroots Partnership Models	✓		✓				✓			✓	✓	✓	✓	✓				✓	✓	✓		✓

D. Principles of the Public Space Quality Assessment

A series of principles have been drawn to public space quality assessment from diverse urban disciplines (urban design and planning, landscape architecture, transportation planning, public health, and social science). These principles cover the personal psychology (e.g., linger, meeting, relaxation, etc.), public health purposes (e.g., exercise, recreation, entertainment, etc.), urban context and setting (e.g., pocket park within a dense urban district, loose open space in a sprawling suburban, etc.), and cultural and environmental interventions. The scholars mostly rely on a solid approach in public space performance assessment. For instance, Cervero and Kockelman [20] have initiated 3Ds (Density, Diversity, and Design), which were promoted to 5Ds by Ewing et al. [21], adding Distance to transit, and Destination accessibility. Furthermore, focusing on traffic's impact on public spaces in the policy levels, the researchers have expanded the dimensions to 7Ds by generating the Commitment and Coexistence layers [22]. Finally, focusing on quality assessment of public spaces, the current research has explored the following principles: 1) urban public space values, 2) sociability and 3) street as the primary public space.

E. Multi-Valued Public Spaces

According to Stevenson [23], the city is a sociological spatial entity providing social life opportunities at micro and macro levels. Therefore, we need to enhance interactions representing social life at a micro-scale in everyday life as a necessity to transform the city into a sociological entity. Rapoport [24] highlighted that the city comprises public spaces encouraging users to communicate and form relations. These spaces represent areas of harmony, bringing vitality and life to the city. Low [25] states that public spaces are at various scales and levels, extending from small-scale physical streets, squares, and parks to large-scale neighborhoods, cities, and countries. Thus, designing public spaces within the city at a macro-scale setting can impact public life at a micro-scale.

Previous discussions on physical public space at various scales have led to different conceptual interpretations among urban designers, sociologists, and political scientists. Urban designers, architects, and planners relate public space to physical space concerned with the interrelation between space and its users. However, sociologists view public space within the context of social dynamics, whereas political scientists and geographers discuss public space within civil society and individual rights. Nevertheless, scholars reveal a general agreement amongst urban geography, planning, and other multi-faceted disciplines that public spaces fall under the public realm's rubrics [1], [26]. Therefore, it is necessary to contextualize and define public space for research and evaluate quality of urban public spaces.

Much of the relevant literature suggests that being a segment of the public realm, public spaces are distinguished by aspects of 'possession of space, control, access, and use' [1]. Based on ownership, Madanipour [27] defines public spaces as those not restricted by private individuals or organizations and open to the general public. Public spaces are those accessible to the public, encouraging involvement in a group or individual activities [28]. Mitchell [29] states that public spaces as arenas encourage social and political movements. Duncan [30] argues that these public spaces often do not completely materialize the above-mentioned public realm's roles. It is due to the filtration of certain user groups or separating them over time and space [1]. Researchers define public spaces as freely accessible spaces and including roofed or unroofed enclosed spaces. Banerjee [3] defines these open public spaces as any urban ground unroofed by an architectural structure regardless of its accessibility to the public. Scholars define public spaces as well-designed spatial environments based on social, economic, aesthetic, and environmental values [26]. Mehta [1] states that public spaces include in-between building spaces and furniture, artifacts, and building edges defining the physical space boundaries. Thus, public space can be summarized as an 'open publicly accessible place' facilitating community interactions and activities [28].

In addition to the above discussion, Banerjee [13] highlights public spaces as major civic resources. Rybczynski [31] stresses public spaces as an attempt to humanize a practical city. He suggests that open public spaces inspire civic pride, social interaction, a sense of freedom and security, highlighting republican values. Thus, public spaces exhibit both republican and democratic values [3]. However, humanizing the environment through social contact between users from diverse backgrounds provides opportunities to ensure democratic values of open public spaces. Hence, the social life created within these public spaces is regarded as one of the most important values forming the core of civil society while maintaining the harmonious built environment-human interaction.

F. Social Role of Public Spaces

Public spaces' social role is the most important aspect of various values, functions, and symbolisms. Urbanism scholars regard public spaces as arenas enhancing individuals' and society's development [32]. Supporting Berman's [32] view, scholars suggest that political and democratic growth and enhancement of any society depends on the opportunities provided for meetings and interactions, enabling the resolution of differences and inner contradictions. Arendt [33] highlights that public spaces allow people to interact and resolve their contradictions. Such spaces act as crucibles of social life,

enabling discussions and recognition of users. Mehta [1] highlights that public spaces' social role suggests that these spaces are essential for enriching and developing users' lives within the community. Accordingly, the five social roles of public spaces include: a) facilitating public/social life; b) serving as an arena encouraging meeting of different social groups; c) forming a stage displaying the city symbol; e) representing the city image, and f) forming communication link between different urban activities. Thus, public spaces' social role, where users meet their friends and experience/exchange their daily lives, plays a crucial role in enhancing the quality of these spaces [25].

Public spaces facilitate social life, where they serve as platforms for social functions, discussions, planned or unintentional encounters revealing users' attitudes and beliefs [1]. Further, public spaces' social functions include promoting learning, exchanging information and social dialogue, maintaining coherence, fostering social awareness, and integrating various social functions. In addition, public space offers possibilities for such social contact enhancing personal growth [23]. Thus, the quality and meaning of public spaces support, facilitate, and promote social life, enhancing contact and communication outside the home and workplaces [34].

Additionally, public spaces can be categorized as urban squares, cafes, and streets. Public life is promoted within public spaces due to social and environmental characteristics [35]. Putnam [36] suggests that social interactions within these public spaces at the micro-level provide opportunities for specific social activities enhancing/enriching social life. Supporting Putnam's view, Stevenson [23] adds that these public spaces are a product of social interaction and appropriate physical characteristics that introduce quality to urban space. Furthermore, the researchers argue that public squares satisfy only the basic needs and do not encourage modern communities' sociological and psychological development. Jane Jacobs [37] and Lynch [38] suggest that streets serve as areas of incidental social interactions to promote public life among public spaces. Therefore, streets represent primary public spaces serving as the city's main arteries, influencing the quality of urban spaces through social life. To sum up, the five social roles of public spaces are 1) facilitating public/social life; 2) serving as an arena for social groups meetings; 3) forming a stage displaying the city symbol; 4) representing the city image, and 5) creating a communication link between urban activities. Therefore, the degree of socializing in the streets plays an important role in determining the quality.

G. Streets as Primary Public Spaces

Previous discussions suggest that streets form an important part of the open urban space within the city. Traditional liveable streets are developed due to informal interactions between users engaged in various social activities [38]. Urban sociologists George and Steve [39] highlight that these traditional liveable streets are developed due to users' association within familiar social spaces. Therefore, streets serve as primary public spaces encouraging social interactions.

Literature studies suggest that traditional liveable public spaces have deteriorated due to privatization and increased globalization [3]. However, public life in traditional street spaces still witnesses active social interaction [29]. Social interaction within streets is due to consumer culture exhibited in business varieties like coffee shops, bookstores, civic centers, etc. This develops commercial streets serving as venues for both public and social life. Studies conducted by urban designers and sociologists on behavioural sciences suggest that people and place-based characteristics of commercial streets affect social life by creating informal social interaction places. Mehta [1] suggests that intermixing land uses within commercial streets by introducing different business categories provides desirable physical and social development opportunities. The different business categories develop pocket spaces that further enhance social commune, creating a sense of trust [37]. Hence, commercial streets have formed an important part of social space, performing multiple roles promoting formal and informal social engagement.

H. Indicators of Public Space Quality Assessment

Scholars concerned with public spaces' quality suggest that users' preference for public space depends on responsiveness, democratic provisions, and the nature of the meaning attached. Thus, for evaluation, we need to define a public space with desirable quality as those spaces are a) easily accessible and open; b) generate and support diverse, social, associated, and meaningful activities; c) ensure a sense of convenience, physical-environmental safety and comfort; d) attain a strong sense of magnetic control; and e) ensure sensory pleasure [16], [26]. By applying the systematic literature review method**,** this research has explored public space quality assessment indicators. By reviewing the literature, we found that these indicators can be clustered into five criteria (C1 – Inclusiveness, C2 – Desirable activities, C3 – Safety; C4 – Comfort, and C5 – Pleasurability), where each criterion constitutes a series of sub-criteria. Table II presents and defines the indicators synthesized through the content analysis matrix.

I. Criterion 1: Inclusiveness

Urbanism researchers designate public spaces as arenas promoting participation and collective shared interests of users [29]. These spaces at the street level

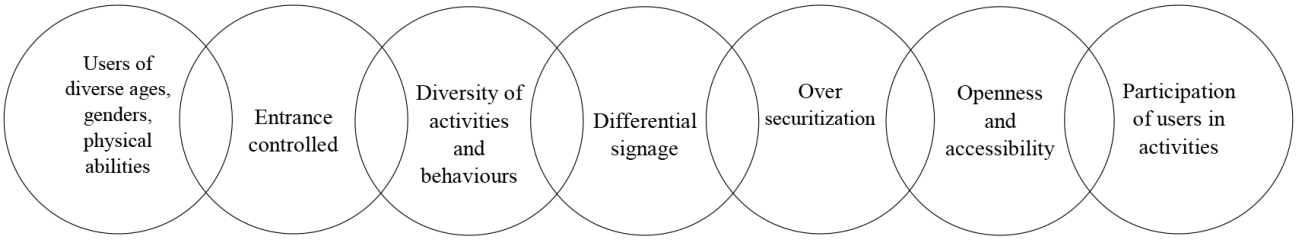

Fig. 2. The sub-criteria for assessing the inclusiveness of the public spaces [developed by authors].

witness the differences and conflict resolution of various groups included within social life. Studies conducted by Mitchell [29] suggest that street publicness determines socializing's inclusiveness. Mehta [1] suggests that the appropriate use of space fulfilling the needs of diverse groups of users makes the space public. Another important aspect is the flexibility and ambiguity of its diverse users in accommodating changes in their behaviours and offered activities. These activities may be due to the users' various needs and behaviours associated with appropriate pockets within public spaces [5]. Thus, the concept of inclusiveness involving overall accessibility can be regarded as an attribute of public space even though all the activities are not supported, or the space is not open to all users.

Extending any public space's inclusiveness depends on the range of activities supported within the public space and the users' engagement. Thus, users' activities and behaviour are important factors in assessing inclusiveness [1]. Indeed, the participants involved, permitted or restricted within the public space, play an active role in supporting daily life and access inclusiveness. Meanwhile, accessibility to the place, entering and using the area identify it as an ideal public space. Thus, inclusiveness criteria measure the accessibility of the space to varying individuals or groups and the development, sustenance, and support of users' various activities and behaviours. Figure 2 presents the indicators that shall be applied for assessing the inclusiveness of the public spaces.

J. Criterion 2: Desirable Activities

Urban sociologists suggest that constructing place identity depends on its users' influence and collective experiences associated with appropriate activities. Furthermore, the familiarity of its users influences the meaningfulness of a place. Thus, the desirability and meaningfulness of space are determined by its usefulness in satisfying the users' diverse needs in shopping, eating, entertainment, etc. The public spaces also cater to special needs, including gatherings, discussions, debates, and other community activities [1], [5]. However, the presence of goods and services provided by businesses makes the environment useful and designates quality.

Furthermore, phenomenologists suggest that a sense of place and place attachment is created due to familiarity with the environment and repeated and frequent visits [40]. These time-space routine visits are due to the usefulness and satisfaction offered to users. Scholars recognized the sense of belonging and shared symbolic identification as basic needs to achieve a sense of community [41]. Thus, public spaces with provisions of meaningful activities attain a sense of 'collective-symbolic ownership,' 'place identity-attachment', and 'sacredness.'

The desirable activities within public spaces depend on the various activities generated within the stretch, including community gathering areas or third places. Thus, diversity of businesses carried out, availability of eating and drinking establishments (developing sociability), the usefulness of businesses, and flexibility in activities that are carried out in the spaces . Also, the desirable activities measure the social value and meaning of space in terms of symbolic identity and cultural value developed due to diverse activities [42]. Therefore, desirable activities criteria measure small local businesses or informal gathering 'third places,' developing the space as public and desirably privately owned. Figure 3 presents the indicators that shall be employed for assessing the desirable activities of the public spaces.

K. Criterion 3: Safety

Safety is one of the prime concerns in public spaces. The real and perceived safety of public spaces depends on both social and physical characteristics. Considering social characteristics, Davis [43] suggests that socializing opportunities among users depend on the sense of safety offered by accommodated public spaces. Researchers remark that control, including over-securitization, makes space perceptibly unsafe [1]. As a resort to means of control, Davis [43] highlights the sense of safety attained by just the presence of people and Jacobs' [37] concept of 'eyes on the street,' where the space is self-securitized. Perkins [44] stresses the power of perceptions in making places appear safe or unsafe. In contrast, lack of control and lack of attention to userscreate a perception of low safety.

In support of the above discussions, studies conducted by urbanists regarding physical characteristics relate

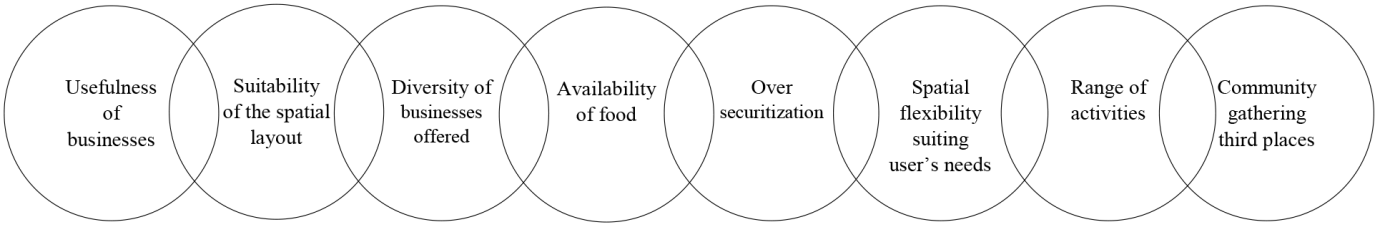

Fig. 3. The sub-criteria for assessing the desirable activities of public spaces [developed by authors].

safety to traffic volume and the maintenance of built environments. Public spaces' safety depends on the inverse relation between street traffic and activity [45]. Scholars stress the presence of businesses and non-residential units within a properly maintained built environment to measure safe public space [44]. Businesses, restaurants, cafes, and third places act as surveillance and safety [45], [46]. Personalization of street fronts, street furniture, and iartifacts adds a sense of safety [44]. Also, a sense of safety perceived within the context of social characteristics is measured in terms of surveillance (security) and the presence or absence of different types of people within certain pockets. Safety measured in physical characteristics includes visual and physical connection with the adjacent built environment, lighting quality, space configuration, diversity of land uses, modifications to the built environment, and traffic volume. Thus, a sense of safety can be regarded as an attribute of public space that invites and determines its users' presence and behaviour. Figure 4 presents the indicators that shall be employed for assessing the safety of the public spaces.

L. Criterion 4: Comfort

Regarding basic physiological needs, the need for environmental comfort and protection from natural elements play a more important role than secondary needs, such as a sense of belonging, functions, and activities in public space. Thus, certain physiological needs such as comfortable micro-climatic conditions, including temperature, sunlight, wind, and shade, influence the sustenance of secondary needs such as functions supported by public space and outdoor activities [47]. Changes in micro-climatic conditions resulting from human-made alterations to the natural environment determine the favourability in hosting outdoor activities in public spaces. The scholars argue that public spaces need to address physiological and culturally driven aspects such as various activities and user behaviour patterns [48]. Thus, it is mandatory to address both anthropometric and ergonomic aspects to ensure a comfortable environment for the users to achieve quality public spaces.

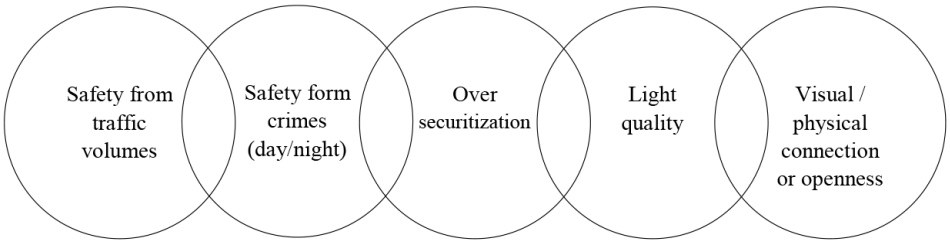

Fig. 4. The sub-criteria for assessing the safety of the public spaces [developed by authors].

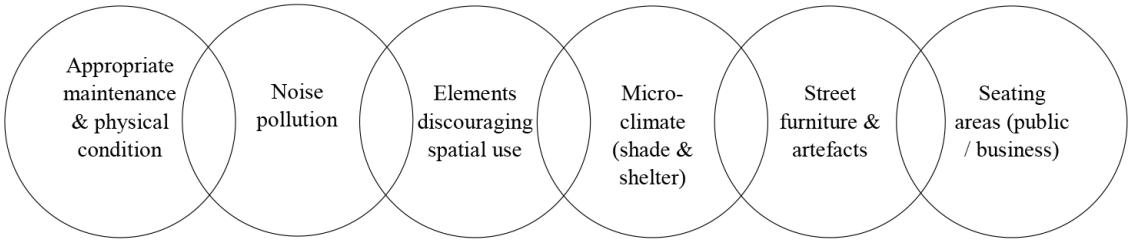

Fig. 5. The sub-criteria for assessing the comfort of the public spaces [developed by authors].

Urbanism scholars highlight that numerous factors, including the perception of safety, familiarity with the setting and other users, physical built environment, desirable activities, conveniences, and so on, influence the users' comfort [1], [5]. Among the above attributes, physical characteristics that contribute to comfort include seating areas, street furniture, artifacts, sidewalks, shade and shelter, articulation of street edges, and modifications such as landscape elements. Thus, users' sense of comfort only in terms of physical and environmental effects is measured. Figure 5 presents the indicators that shall be employed for assessing the comfort of the public spaces.

M. Criterion 5: Pleasurability

According to Lynch [29], 'imageability', 'high spatial quality', and 'sensory complexity' create a pleasurable public space. In support of Lynch's view, Rapoport [24] remarks that several factors coherently contribute to developing a strong image providing comfort and pleasure to users within public spaces. These factors include vividly identified shape, colour, or arrangement of structures built or open spaces [38]. The high spatial quality of public spaces is determined by two important factors-human scales and sense of enclosure. Urban psychologists highlight that users' interacting with physical elements in the body or body parts experience comfort and pleasure through convenience. Physiological and psychological comfort is attained through a sense of enclosure where users distinctly experience being within a space from outside.

Furthermore, sensory complexity creates pleasurable spaces through various environmental stimuli through light, sound, touches, colours, shapes, textures, and so on [49]. Researchers argue that this complexity resulting in pedestrian pleasure can be achieved only through variety, novelty, and coherence at the micro-level [3], [5]. Thus, users prefer those public spaces which are imageable, memorable, physiologically and psychologically comfortable, human-scaled with high spatial quality and portray sensory complexity.

The pleasurability criteria of public spaces are measured in numerous factors, including imageability, spatial quality, and sensory stimuli. Firstly, imageability at the micro-level is measured in the presence of remarkable features, articulation, and variety in architectural features of building facades and density/variety of elements along the street front. Secondly, spatial quality is measured in terms of the perceived attractiveness and interestingness of the space to its users. Finally, visual complexity involves groups of different users and activities performed, permeability and personalization of street fronts, and diversity in size, texture, and colour of different spatial elements. Figure 6 presents the indicators that shall be employed for assessing the pleasurability of public spaces.

III. Analysis Results

As shown in Table II, the research has found 42 sub-criteria that should be considered in any public space quality assessment. The sub-criteria are grouped in five criteria (C1 – Inclusiveness, C2 – Desirable activities, C3 – Comfort, C4 – Safety, and C5 – Pleasurability). For example, the sub-criterion 'physical/visual connection or openness to adjacent spaces' has received the largest frequency value ($F_{Sc.4.1}$ = 10), followed by 'users' diverse ages' and 'community gathering third places', (F = 8). In contrast, the sub-criterion 'elements discouraging spatial use' has earned the smallest frequency value ($F_{Sc.3.5}$ = 2).

The research has conducted a normalization analysis and measured the weights of indicators. According to Table III, the sub-criterion 'physical/visual connection or openness to adjacent spaces' has received the highest weight ($Wn_{Sc.4.1}$ = 1.00), followed by 'users of diverse ages' and 'community gathering third places' (Wn = 0.750). On the other hand, among all sub-criteria, nine sub-criteria have received the lowest weights (Wn = 0.125), which are: Sc. 1.8. Opening hours; Sc. 1.9. Differential signage; Sc. 2.4. Availability of Foods; Sc. 2.6. Suitability of space layout and design; Sc. 2.7. The usefulness of Businesses; Sc. 3.4. Microclimate comfort (shade and shelter); Sc. 3.5. Elements discouraging spatial use; Sc. 3.6. Appropriate maintenance and physical condition; and Sc. 4.4. Over securitization.

Besides, the research has calculated the cumulative weights for criteria. According to Table III, Inclusiveness has received the highest weight (Wn_{C1} = 4.38), followed by Pleasurability (Wn_{C2} = 3.88). In contrast, Comfort has earned the lowest weight (Wn_{C3} = 1.75).

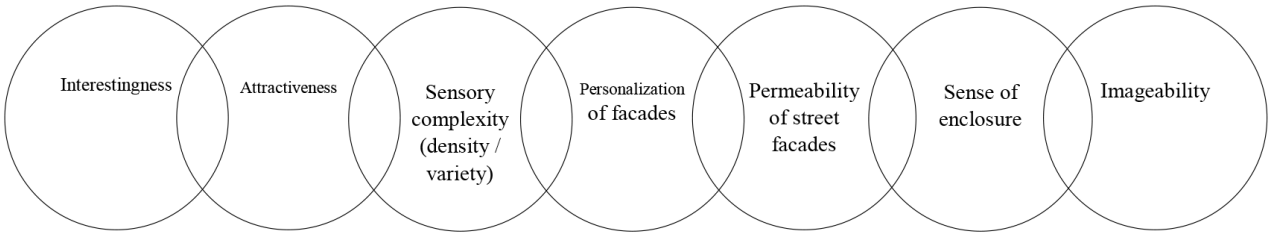

Fig. 6. The sub-criteria for assessing the pleasurability of the public spaces [developed by authors].

TABLE II

The Results of Content Analysis of Indicators (i.e., Criteria and Sub-Criteria) Applied in Quality Assessment of Public Space [developed by authors]

Public space design principles: 1) urban public spaces and values; 2) sociability role of public spaces; 3) streets as primary public spaces			[1]	[5]	[23]	[26]	[29]	[38]	[40]	[41]	[42]	[43]	[44]	[45]	[48]	[49]	[50]	[51]	[52]	[53]	[54]	[55]	Frequency (degree of depth)
	C5. Pleasurability	Sc. 5.9. Interestingness of space	✓			✓		✓	✓						✓								5
		Sc. 5.8. Attractiveness of space	✓			✓		✓									✓				✓		5
		Sc. 5.7. Sensory complexity (variety of sidewalk elements)				✓		✓	✓						✓	✓					✓		6
		Sc. 5.6. Sensory complexity (density of sidewalk elements)						✓	✓						✓	✓					✓		5
		Sc. 5.5. Articulation and variety of architectural features						✓	✓						✓	✓		✓			✓		6
		Sc. 5.4. Personalization of street-front buildings front				✓		✓					✓			✓					✓		5
		Sc. 5.3. Permeability of facades to the street front				✓		✓					✓			✓					✓		5
		Sc. 5.2. Sense of enclosure	✓					✓	✓		✓				✓				✓				6
		Sc. 5.1. Imageability						✓	✓			✓			✓	✓						✓	6
	C4. Safety	Sc. 4.7. Safety from traffic volume	✓			✓						✓		✓								✓	5
		Sc. 4.6. Safety from crimes after dark			✓	✓						✓										✓	4
		Sc. 4.5. Safety from crimes during the day			✓	✓						✓										✓	4
		Sc. 4.4. Over securitization				✓															✓	✓	3
		Sc. 4.3. Lighting quality											✓	✓		✓				✓		✓	5
		Sc. 4.2. Appropriate maintenance and physical condition	✓			✓									✓							✓	4
		Sc. 4.1. Physical/visual connection or openness to adjacent spaces	✓			✓	✓		✓	✓	✓	✓	✓				✓		✓				10
	C3. Comfort	Sc. 3.7. Noise pollution							✓						✓	✓				✓			4
		Sc. 3.6. Appropriate maintenance and physical condition	✓												✓							✓	3
		Sc. 3.5. Elements discouraging spatial use							✓													✓	2
		Sc. 3.4. Microclimate comfort (shade and shelter)	✓												✓					✓			3
		Sc. 3.3. Street furniture and artefacts							✓						✓	✓				✓			4
		Sc. 3.2. Seating areas (by business)	✓		✓											✓				✓		✓	5
		Sc. 3.1. Seating areas (public)	✓								✓					✓				✓	✓	✓	6
	C2. Desirable activities	Sc. 2.7. Usefulness of businesses	✓			✓			✓														3
		Sc. 2.6. Suitability of space layout and design						✓	✓						✓								3
		Sc. 2.5. Diversity of businesses offered	✓		✓	✓			✓														4
		Sc. 2.4. Availability of foods	✓								✓								✓				3
		Sc. 2.3. Spatial flexibility suiting user needs		✓	✓			✓													✓		4
		Sc. 2.2. Range of activities and behaviours	✓		✓	✓			✓							✓							5
		Sc. 2.1. Community gathering third places	✓	✓		✓	✓			✓	✓							✓	✓				8
	C1. Inclusiveness	Sc. 1.12. Users participation in activities within space					✓			✓					✓		✓			✓		✓	6
		Sc. 1.11. Openness and accessibility	✓					✓							✓	✓						✓	5
		Sc. 1.10. Over securitization			✓			✓													✓	✓	4
		Sc. 1.9. Differential signage										✓				✓	✓						3
		Sc. 1.8. Opening hours			✓	✓						✓											3
		Sc. 1.7. Diversity of activities and behaviours		✓	✓			✓			✓				✓				✓	✓		✓	8
		Sc. 1.6. Entrance controlled	✓		✓	✓						✓				✓					✓	✓	7
		Sc. 1.5. Users with diverse physical abilities	✓		✓	✓			✓							✓							5
		Sc. 1.4. Users of diverse races	✓		✓				✓							✓							4
		Sc. 1.3. Users of diverse classes					✓	✓		✓											✓		4
		Sc. 1.2. Users of different gender	✓		✓				✓							✓							4
		Sc. 1.1. Users of diverse ages					✓	✓		✓		✓			✓		✓	✓	✓				8

TABLE III

The Results of Frequency Analysis and Normalization of the Public Space Quality Assessment Criteria and Sub-Criteria [developed by authors]

Citation. Sc.1.1. Users of diverse ages	Sub-criterion Frequency (degree of depth) value	Sub-criterion normalization (N) of network		Criterion normalized value
		A/(max-min)	x-min = A	
C1. Inclusiveness				
Sc.1.2. Users of different gender	8	0.750	6	4.38
Sc.1.3. Users of diverse classes	4	0.250	2	
Sc.1.4. Users of diverse races	4	0.250	2	
Sc.1.5. User with diverse physical abilities	4	0.250	2	
Sc.1.6. Entrance controlled	5	0.375	3	
Sc.1.7. Diversity of activities and behaviors	7	0.500	4	
Sc.1.8. Opening hours	8	0.625	5	
Sc.1.9. Differential signage	3	0.125	1	
Sc.1.10. Over securitization	3	0.125	1	
Sc.1.11. Openness and accessibility	4	0.250	2	
Sc.1.12. Users participation in activities within space	5	0.375	3	
Sc.2.1. Community gathering third places	6	0.500	4	
C2. Desirable activities				
Sc.2.2. Range of activities and behaviors	8	0.750	6	2.00
Sc.2.3. Spatial flexibility suiting user needs	5	0.375	3	
Sc.2.4. Availability of Foods	4	0.250	2	
Sc.2.5. Diversity of businesses offered	3	0.125	1	
Sc.2.6. Suitability of space layout and design	4	0.250	2	
Sc.2.7. Usefulness of Businesses	3	0.125	1	
Sc.3.1. Seating areas (public)	3	0.125	1	
C3. Comfort				
Sc.3.2. Seating areas (by business)	6	0.500	4	1.75
Sc.3.3. Street furniture and artefacts	5	0.375	3	
Sc.3.4. Microclimate comfort (shade and shelter)	4	0.250	2	
Sc.3.5. Elements discouraging spatial use	3	0.125	1	
Sc.3.6. Appropriate maintenance and physical condition	2	0.125	1	
Sc.3.7. Noise pollution	3	0.125	1	
Sc.4.1. Physical/visual connection or openness to adjacent spaces	4	0.250	2	
C4. Safety				
Sc.4.2. Appropriate maintenance and physical condition	10	1.000	8	2.63
Sc.4.3. Lighting quality	4	0.250	2	
Sc.4.4. Over securitization	5	0.375	3	
Sc.4.5. Safety from crimes during the day	3	0.125	1	
Sc.4.6. Safety from crimes after dark	4	0.250	2	
Sc.4.7. Safety from traffic volume	4	0.250	2	
Sc.5.1. Imageability	5	0.375	3	
C5. Pleasurability				
Sc.5.2. Sense of enclosure	6	0.500	4	3.88
Sc.5.3. Permeability of facades to the street front	6	0.500	4	
Sc.5.4. Personalization of street-front buildings front	5	0.375	3	
Sc.5.5. Articulation and variety of architectural features	5	0.375	3	
Sc.5.6. Sensory complexity (Density of sidewalk elements)	6	0.500	4	
Sc.5.7. Sensory complexity (Variety of sidewalk elements)	5	0.375	3	
Sc.5.8. Attractiveness of space	6	0.500	4	
Sc.5.9. Interestingness of space	5	0.375	3	
	5	0.375	3	

IV. Discussion

The urbanism scholars respect public spaces as arenas enhancing sociability development of individuals and society. Any society's political and democratic growth depends on the opportunities provided for meetings and interactions, enabling inner contradictions. Such spaces act as crucibles of social life, enabling discussions and recognizing users to play a crucial role in enhancing functional spaces for the community. Indeed, social life is of the most important factors other than physical infrastructure influencing public spaces' functionality, enabling the city's endowment and quality [35]. The social life of open, publicly accessible spaces is influenced by cultural and socio-cultural values, involves interaction between the built environment and its users [24]. This research has found that this interaction is characterized by human scale, inclusiveness, meaningfulness, safety,

comfort, playfulness, coherence, transparency, and so on at the micro-level. Hence, the urban public spaces representing a multi-dimensional and complex phenomenon provide opportunities for social interaction between the space, activities, and users' social life, influenced by diverse factors.

Figure 7 presents the summary of findings on the quality assessment of public spaces. Accordingly, this research has found that the public spaces can be in-between building spaces where furniture, artifacts, and building edges define physical space boundaries. The current research found that a good public space can offer desirable activities to its users, promoting third places acting as refuge areas outside the home or workplace. It creates familiarity with the environment, creating a sense of place and place attachment, enhancing community sense, and creating a social life. The diverse needs of users in terms of shopping, eating, entertainment, and so on are perceived as unsatisfactory due to the repetition of similar businesses along the stretch. Comfort experienced by users depends on both physical and environmental effects allowing the users to socialize. The users perceive comfort and safety due to familiarity with the setting (human scale) and the desirability of activities promoted within the stretch. The flexibility of seating areas, street furniture, artifacts, and the built-user interface modification make the Corniche Stretch comfortable. The absence of additional shading devices such as canopies, awnings, and so on reduces the sense of micro-climatic comfort in terms of shade and shelter offered, in addition to the discouraging factor of ongoing construction works.

Also, public space is less pleasurable due to lack of imageability in identifiable architectural elements, unsatisfactory sense of enclosure, monotonous nature of covered or exposed street areas, variety, and density of used elements. Thus, the study highlights that the users do not experience being within the stretch as distinctive. On the other hand, the users experience high spatial quality indicating pleasurable experience, permeability, and personalization of the street fronts creates attractive and interesting space, encouraging users' social engagement.

Furthermore, users of diverse ages, classes, genders, and races promoting shared interests make the street-oriented public space inclusive. The fulfilment of a diverse group of users needs enhances the street's appropriateness, making it more inclusive. The stretch promotes diverse businesses fostering various social and behavioural activities, enhancing the inclusiveness of users within the urban space. Additionally, overall accessibility to the users (for certain businesses) and desirable activities encourage social life within the stretch. On the other hand, over-securitization and lower participation of the users in various activities diminish the inclusiveness.

Conclusions

The quality of public spaces determines the social interaction of users within the area. To create a space of appropriate urban quality, five dimensions of public spaces and assessment factors influencing each dimension should be planned and implemented accordingly. The outcome of the research provides the following recommendations on how to improve and enhance the public spaces by implementing the inclusiveness, desirable activities, comfort, safety, and pleasurability criteria:

- Introduce intermixing and diversity of businesses along the stretch, including supermarkets, antique shops, bookstalls, galleries, heritage exhibition areas at intervals with open community gathering places promoting desirable user activities.
- Create focal points within the stretch in public art, encouraging users to socialize, improve imageability, and enhance pleasurability.
- Utilize existing iartifacts in the area to develop temporary structures generating activities along the

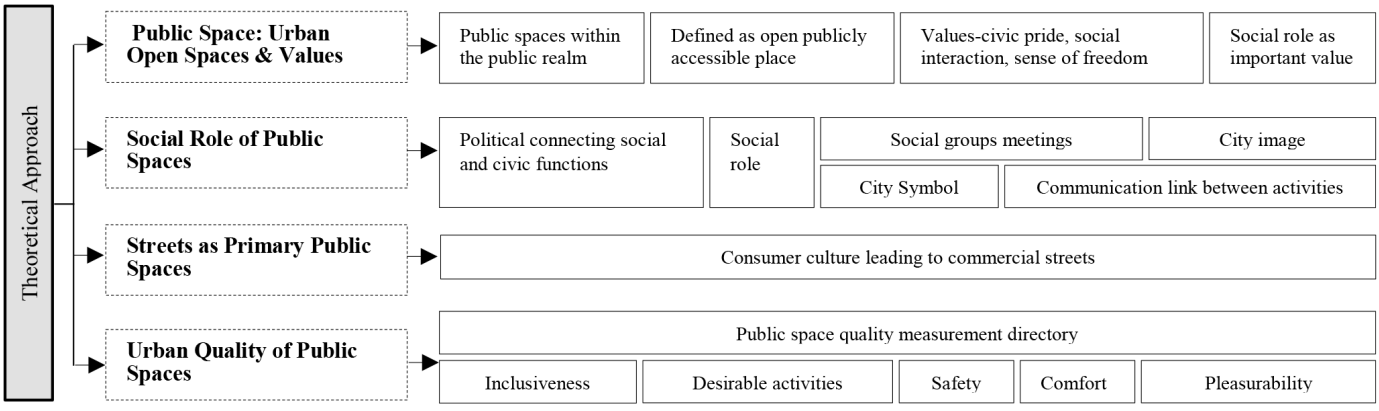

Fig. 7. Summary of findings on quality assessment of public spaces [developed by authors].

beach stretch, ensuring a sense of enclosure and at the same time creating sensory complexity.
- Improve visibility of the built form and sensory complexity by fostering recognition and appreciation of the built environment by introducing visually attractive stimuli including bright coloured displays, signboards, imagery in shop windows, ensuring a pleasurable atmosphere.
- Enhance sensory experience through aroma use in businesses like restaurants, cafes, etc., to draw people engaged in other activities to enhance participation.
- Densify the walking Corniche Stretch with various elements such as street furniture, lampposts, textured floor covering, sculptures, green planter boxes, territory boundaries such as fences, and enhancing pleasurability.
- Enhance the inclusiveness by encouraging users' participation in various activities by combining shopping and business activities to introduce large sociable spaces for community events like games, kiting, TV program shows during special occasions.
- Introduce additional shading devices such as umbrellas and canopies outside every business allowing spatial flexibility in usage, and encouraging users' comfortable social lives.
- Limit the securitization by restricting to any means of surveillance (such as cameras, guards, or guides) in addition to natural surveillance, ensuring inclusiveness of its users.

According to the findings of this research, an assessment model for evaluating multi-functional public spaces can be developed in the future. Meanwhile, complex decision-making methods (such as analytical hierarchy process, analytical network process, social network analysis, etc.) can be applied in weight estimation.

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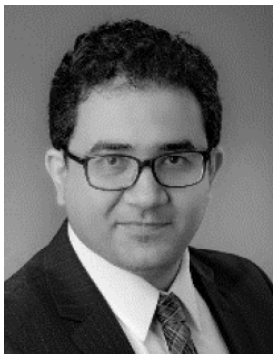

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