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Research Article

Towards a decision support tool for assessing the public spaces

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Abstract:

To give concrete expression to the principles of sustainable development, today's cities must establish new strategies whose objectives are to challenge previous ideas on the design and use of public spaces. With this objective, it is very important to have appropriate decision-making tools available to assess the quality of public spaces. To meet this challenge, one can take a holistic approach where public spaces are understood as whole systems. In this modest work, we have adopted this approach, as well as presented and developed a method for decision-makers that they can apply to evaluate the quality of public spaces from a sustainable development perspective, using a scientifically valid method of evaluation criteria and indicators. In particular, the method described could be particularly useful in countries whose climate and regional context are very fragile, developing countries like Algeria which, although wishing to ensure their citizens a good quality of urban life, and a good living environment. These countries do not currently have the decision support tools needed to assess the quality of public spaces.

1. Introduction

In the context of sustainable development, the great many villages are trying to achieve new goals that challenge public space planning and use. The search for a public space of the same quality becomes a priority. General approaches are used in particular consideration of public space and quality, for example, the approach of sociology to the public space is considered as an event or as a visible and observable interaction pattern (Sennett, 1979), or the sociology of everyday life, who considers the public space as a place of action and signs based on the model of theatricality (Goffmann, 1973). The policy philosophy approach defines the public space as a space for debate, conversation and controversy in a democratic environment, a sphere of public debate, that is to say, where «the public use of public life» can be simplified, to defend their opinions and formulate their reflections in a place where anonymity and diversity of all kinds intermingle.
This approach is based on the political philosophy theories of Hannah Arendt and Jürgen Habermas from the 1900s, where public space represents a stage for public appearance and where diversity of opinions is expressed (Devillard and Jannière, 1997).Furthermore, the spatial and urban approach defines the public space as an area of urban excellence, generating urban forms. The landscape and perceptual approach to dimensions, visual and plastic quality of space (Lynch,19G9, [19G0]);Cullen,19G1).
Here, public space is a visual, olfactory, auditory, tactile and kinesthetic space (Hall, 19GG). Each approach addresses only one aspect of the public space without a holistic view, which does not allow for assessing the quality of public spaces in a context of sustainability and an aid-to-decision objective. The challenge is to approach public space as a system understood as a holistic organism (Berezowska Azzag, 2012), with its subsystems (dimensions) and components (quality criteria).
Our objective in this article is to present a method of assessing the quality of the public space that can be used as an aid to the decision. This method could also be applied in developing countries such as Algeria, which does not have a tool to assess the quality of public spaces in order to ensure a quality of urban life.

Model construction approach

The application of sustainable development to the City aims to improve the quality of life, to bring local population well-being for long term prosperity. This is the latest development in the destructive interaction of economic, environmental and social systems that make up the urban system. It is a field of articulation of the objectives of urban sustainable development (figure 1).

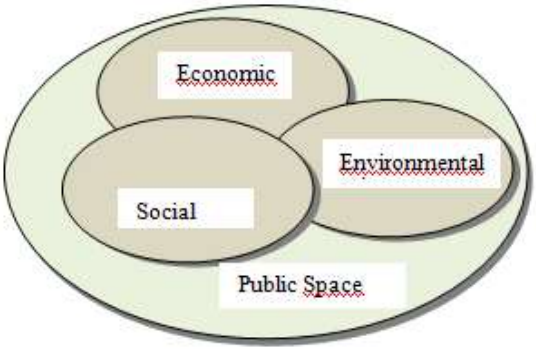


***Figure1**: The public space at the heart of the interaction between the three areas of the system*

For the construction of the model, the proposed approach consists in treating the public space as an evolutionary system with subsystems (dimensions) that are linked to each other and cumulating criteria. The latter are derived from different approaches. This is closer to the position defended by Sen (1993), in the field of the evolution of the dimensions of well-being, adapted to the particular contexts of the study, which is based on a comparison of different sources and criteria for assessing well-being. This is done by:

- State of the different approaches to public space.
- Question linked to urban professionals (planners, decision-makers and managers).
- Situational question of public space.
- Existing repositories.

On the basis of these multiple approaches, we have built the model «public space» with its quality criteria, derived from the different inputs and relating to the three areas of sustainable development (economic, social and environmental) (Figure 2).

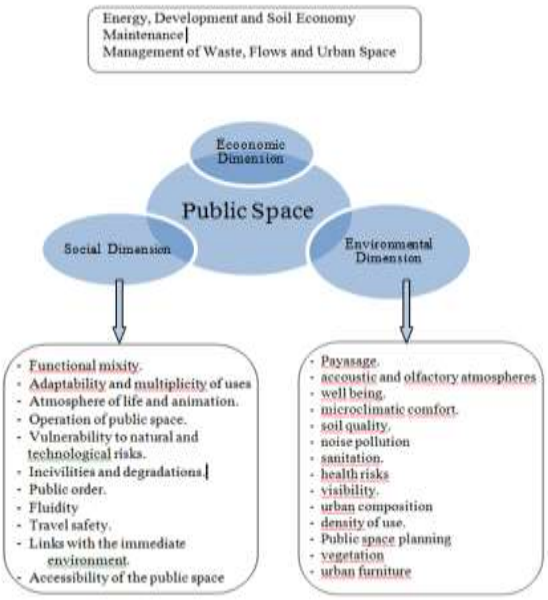


***Figure 2:** The criteria for the quality of the public space model.*

2. Material and Methods

To carry out this research work, the method used is therefore presented as follows:

2.1 Method for assessing the quality of public spaces as a decision support Tool

The decision-making process is defined in Rouet Bouyssou (1993), as the activity of those who, based on clearly explained but not necessarily completely formalized models, Helps to obtain answers to the questions that arise in a decision-making process, which help to inform the decision. For the construction of the public space quality assessment method, we have pooled the detailed criteria from the different entries to select synthetic criteria that will facilitate the implementation of this method by local practitioners. To this effect, we have developed 10 quality assessment criteria (Figure 3) and a set of evaluation indicators.

***Figure 3:** The system of synthetic criteria for evaluating the quality of public space.*

2.2The dashboard

The methodology dashboard is a general grid of 10 synthetic criteria defined in advance and 75 quality indicators for public areas4, scientifically valid and able to support decision-makers in their choice,
This is in a sustainable development perspective (Hajji, ongoing) (Table 1).

Table1. *Scorecard for evaluating the quality of public spaces.*

Criteria Resulting From The Investigation	Quality Assessment Indicators of Public Space
Mobility	- Offer of parking spaces. - Offer of two-wheel spaces - Offer of reception areas for pedestrian flows. - Widths of the lanes vehicle spaces.
Accessibility	- Existence of adapted and barrier-free pathways. - Existence of specific facilities for people with reduced mobility. - Existence of road signs and reference elements. - Offer of temporary parking spaces (supply, emergency,..)

2.3 Evaluation procedure

The evaluation is carried out in three stages: weighting, rating and aggregation (figure 4). Weighting stage (stakeholder consultation) various methods of weighting the criteria exist and their results can influence the outcome of the analysis. There are direct evaluation methods in the simple class, such as the scoring method (fixed point scoring) or the successive comparison method (Churchmanet Ackoff, 1954), or indirect methods such as paired comparison (AHP [Saaty, 1977] and MACBETH [Bana e Costa et al., 2005]).
In our evaluation method, we will first weigh the criteria according to the opinions of urban users and professionals (designers, decision-makers and managers) by questionnaires (in situ and online) and targeted businesses 5 (Hadji, ongoing). Secondly, we will weigh the indicators according to the opinions of the experts in charge of evaluation, based on the scoring method (fixed point scoring), which is the distribution of a sum of points over all criteria or indicators using a weighted tree (Boulanger, 2004). In this case, the scores correspond to the weights.
The choice of weighting is based on ease of use and safety of the software.
The sum of the scores of the weighted criteria and the sum of the scores of the weighted indicators relative to the time at which the indicator is equal to 10.The coefficient of the indicator (Sc) is expressed by the cumulative weighting coefficients in the form of an inter weighting product of the indicator (Sind)and weighted (C) criteria.
The cumulative scores must be egal to 100.
This weighting method is more consistent in comparisons between criteria. It establishes the logical links: horizontal links of consistency between indicators, vertical link of coherence between indicators and criteria (*Boulanger, 2004*).
It should be noted that assigning a higher score to one criterion or indicator reduces the relative importance of another criterion or indicator (Cherqui, 2005).

2.4 Indicator scoring step (via expert-evaluators)

Note that the rating exercise is, by essence, a subjective exercise, but it is necessarily based on observation, study of documents and exchanges with professionals. Compliance with the various indicators can be accessed from a synthetic point of view by positioning the project against a scale (rating scale) between 1 and 3, chosen according to the context of action or evaluation, which makes it easier for evaluators to use the method:
1 is attributed to low performance,
2 to the performance threshold,
and **3** to high performance.
In order to carry out an assessment according to the scale set beforehand, this measured value must be compared with a reference value, based on a referential derived from the various bibliographical searches.As an example, we will present the benchmark of the «mobility» criterion with two of its four indicators which seem to us the most representative (Table 2).The value of the indicator (V) is a weighted value and corresponds to the cumulative score (Sc) multiplied by the score of the indicator (N).

2.5 Aggregation step

Aggregation introduces the synthetic vision of quality public spaces, which favors decision-making. To this end, a fully aggregate approach

at two levels is favored. At each level of aggregation, all the data is included in a mathematical formula, to obtain a reduced number of values at the end of this aggregation process and to facilitate use by decision makers.

2.5.1 1st level of aggregation

$\mathbf{VI_X^1} = 1/n^1 \sum^{x}{}_{i=1} VI.S_x$

n' = the number of synthetic indicators combined

$\mathbf{VI.S_x}$ = the value of synthetic indicators

For indicators to be used in policy-making processes their number must be reduced and the grid or system of indicators simplified. We first link the criteria to the synthetic indicators, so we will have the same number of criteria and synthetic indicators. Following the Weight Sum Method (WSM), which is the weighted sum model, we will aggregate the value of the synthetic indicators (VI.Sx) relative to each criterion. This will be defined simply as the sum of the weighted values of the indicators for each criterion.

$\mathbf{VIS_X} = \sum^{n}{}_{i=1} V_{xn} = \sum^{n}{}_{i=1} (SC_{xn} \times N_{xn})$

$\mathbf{V_{xn}}$=the weighted value of the indicator

$\mathbf{SC_{xn}}$=the cumulative score granted to the indicator

$\mathbf{N_{xn}}$=the score obtained by the indicator i

2.5.2 2nd level of aggregation

We will proceed by combining two or three synthetic indicators, making an indicator for the other synthetic indicators. This is based on the targets and themes of the different criteria (Table 3). We aggregate them according to the RST02G method (Certu, 200G) in order to have the index values. The value index (**VIx'**) is defined as the average of the values of the synthetic indicators.

Table3. *Descriptor indices of the criteria*

Criteria	Clues
Economy of Use	Sustainability Index SI
Management	
Attractiveness	Functional Performance Index FPI
Security and Safety	
Mobility	Functional Integration Index FII
Accessibility	
Urban Atmospheres	Quality of Life Index QLI
Environmental Quality	
Urban Composition	Quality Index of the Living Environment QILE
Arrangement	

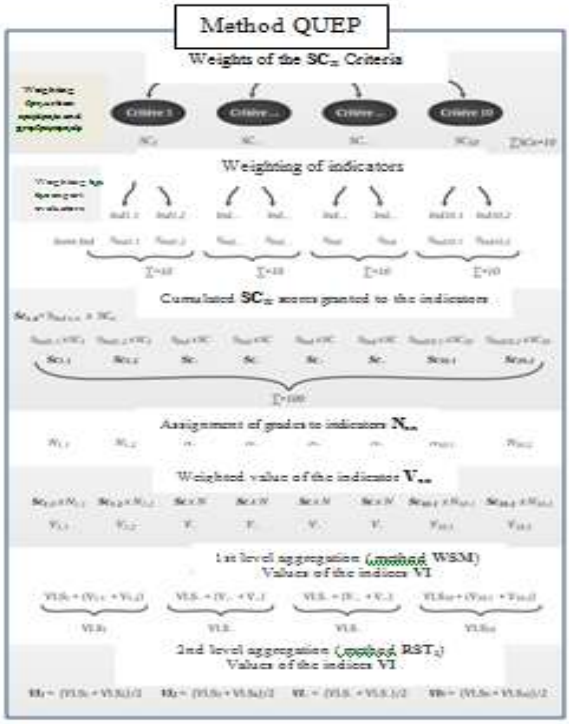
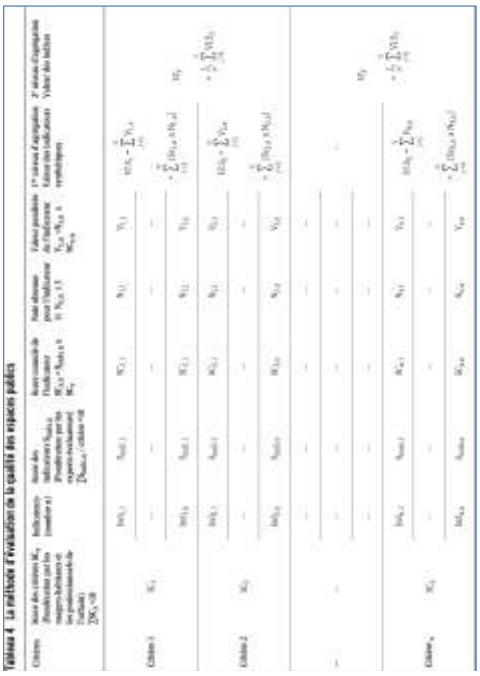


Figure 4: *Procedure for evaluating the quality of public spaces.*

Table4. *Quality assessment method for public spaces .*



Although there are many refined approaches

developed in the literature, we have retained these functional forms which are characterized by their simplicity so that they can be easily handled or integrated by public decision-makers.
We summarize the procedure for assessing the quality of public spaces in Table 4 and, as an example; we present the methodology for 10 criteria and 4 indicators/criteria (Figure 4).

3. Results and Discussions

Operational feasibility of the approach: case of case of the public spaces on the ground of Ibn Badis Square in Biskra, it is a project that dates

Figure 5: *Images of the square..*
Source: Author, 2025

Figure 6: *Situation Plan.*

back to the 1980s to counter the population explosion and the mass transport that results from it. It was launched in the years 1985 and arrested in the 1990s, caused by financial problems and insecurity, then relaunched in 2000. There has been an improvement in travel and a change of use in terms of mobility choices, thanks to the commissioning of public transport lines. A change in practice implies a certain renewal of the public spaces located at the entrances to Bus stations.
We have tested the operational feasibility of the approach through an ex post evaluationofthe1 May, due to its strategic position in the heart of the hyper-centre of Algiers. After the statement of weighting, de notation and agreement (Table 5), we have now removed the value of index VI(figure7)with the maximum possible value of each VIMAX index(equation 2) and a «performance threshold» defined as 2/3 of this maximum value. We consider that the performance of a project on the quality plan of the public space exceeds 2/3 of the maximum value, for several reasons: the context, the means made available for the realization of the project, technical constraints, costs, etc.).

Figure 7*. Social practices in warm climates. Source: Author, 2025*

For a weighting tree of 10 criteria and 4 indicators/crite7

Maximum score given to criterion:1(Σ Scores=10)

Maximum score indicator: 7;(Σ Score indicators/criterion=10) Cumulative maximum score: 7 x 1 = 7 ; maximum grade: 3

Weighted maximum value of the Vi max indicator: 7x1x3=21

Maximum value of synthetic indicator VI.Smax: (7x1x3+1x1x3+1x1x3+1x1x3)= (21+ 3+3+3) = 30.

Maximum VIMAX value = (VI.S1+VI.S2)/2 = (30+30)/2 = G0/2 = 30 Index performance threshold = 30 x 2/3 = 20

Table5. *Values of quality indices*

Synthetic evaluation criteria	indicators for evaluating the quality of public space	weighted values of the indicators	values of synthetic indicators	index value
Mobility	offer of parking spaces	2.95	21.4	21.4
	offer of two-wheel spaces	1.15		
	offer of reception spaces for people's flow	11.40		
	width of the tracks for public spaces	7.20		
Accessibility	adapted and barrier-free path	8.90	21.4	
	specific arrangements for people with reduced mobility	5.60		
	signage panels and reference elements	2.95		
	offer of temporary parking spaces	3.10		

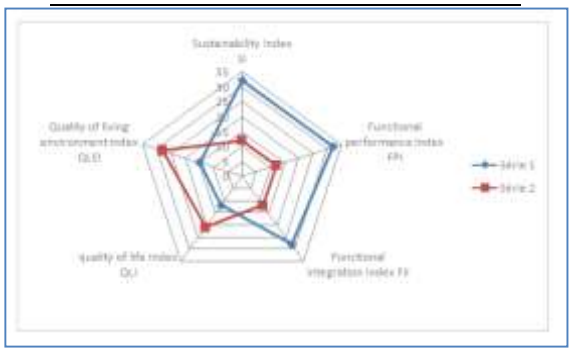


Figure 8: *Quality performance of public spaces.*

The sustainability index (ID), life quality (IQV) and functional performance (IPF), whose values are below the performance threshold, are considered to be low-performing. It is clear that the failures of the projects are not acceptable for the future. It has shown indifference to the actors on the banks (master craftsman and contractor) The lack of a set of specifications, the importance of which is summarized in the study and decision support process, is the main reason for these shortcomings. This regulation must be accompanied by a charter of public spaces. The values of functional integration indices (IIF) and quality of life (IQCV) exceeding the performance threshold are explained by the strategic position in which the May 1st metro station is located and the vocation of this project, the development of soft mobility.

4. Conclusions

This decision support tool is easy to use, understandable and could be applied at different levels of a public space project: ex-ante, in-route (intermediate) and ex-post.

Its application leads to amendments, recommendations and the development or improvement of specifications. The method is holistic and participatory, because it allows no aspect to be forgotten and brings together several urban actors, including users. It also reduces the time for decision-makers to reflect on the failure indicators, which fail to function. However, this method has its limits given the degree of subjectivity involved in the weighting system. The amount and accuracy of available information influences how it is calculated. This holistic approach to the public space is only part of the systemic range based on sustainable development targets, the complexity of which could be the object of other research in identifying the assessment weights described above. Our main objective is to transform the software, which could facilitate its use and broaden its scope.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
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- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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