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## Design and Layout Factors Influencing User Participation in the Management of Public Urban Green Spaces in Jijel -Algeria

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### Abstract

Currently, the participation of users in the management of urban public green spaces is one of the challenges of urban policy in the world. According to Lewin's equation, this participation as a human behaviour is affected by many factors, including those related to the space itself. This study aims, through an exploratory hypothetico-deductive approach, to discover the design and layout factors that influence, either motivate or prevent, user participation in the management of these spaces in Jijel. Moreover, it aims to identify the biophilic behaviour of these users from a corpus of analysis consisting of three gardens in Jijel. The different applications are carried out by the SPSS ® 21.0 software. The results show that physical and visual access, well-being, location and morphological characteristics are all factors that influence this participation and lead them to different behaviours towards these spaces. It is therefore recommended to adapt a biophilic design for these spaces, i.e. to give great importance to these elements in the design and layout of these spaces in order to enhance the biophilic behavior of citizens on the one hand and to encourage their participation in the management of green spaces on the other.

Keywords: *Biophilic behaviour; Design and layout; Green space management; Jijel; User participation.*

## Introduction

With the emergence of the trend towards sustainable development, modern urban planning is mainly focused on the role of the city in the search for effective sustainability initiatives with a particular focus on environmental aspects (Baycan & Nijkamp, 2007). Indeed, this latter concern is manifested repeatedly and in various forms. Public urban green space appears to be a major issue related to environmental aspects in the context of urban sustainability. Consequently, these bits of nature in the middle of the urban space are currently at the centre of city strategies, those of thinking and rethinking the question of « living in the city », but, also « living the city ». These spaces are considered as one of the main factors that enhance the quality of life of citizens in different spheres; this has been demonstrated by many researches in landscape architecture, urban planning, environmental psychology, etc. These spaces have the potential to provide a diverse range of benefits: climatic, environmental and social (Russell, 2011; Pinto et al., 2021). The latter is important as it promotes attachment, community cohesion (Abu Kasim et al., 2019; van den Berg et al., 2019) as well as the involvement of the population to actively participate in the design and management of public urban green spaces (Bryant, 2006).

Therefore, given the challenges posed by the prerogatives of sustainability, the management of public urban green spaces appears to be an important niche to explore in order to ensure the quality of these spaces and benefit from their services (T. Mattijssen, 2018). The focus here is on operational management, which includes regular maintenance and upkeep of these spaces (Randrup & Persson, 2009). However, when it comes to their management number of factors come into play causing the qualitative and quantitative deterioration of urban green spaces, among which we mention: population growth and unbridled urbanization (Klemm et al., 2017). In addition to insufficient funding (Rosol, 2014; T. Mattijssen et al., 2017) and the lack of cooperation between the different actors (Dempsey et al., 2014).

However, low or limited citizen participation in the management process is also another factor behind this decline (Baycan & Nijkamp, 2007; Buizer et al., 2015) which is currently emerging as a major element of the issue at hand. However, successful management must be based on the principle of participatory management of vegetation in cities (Fors, 2018). It must emphasize the integration of different stakeholders, especially citizens, in the different phases of its decision-making and implementation process, either in the form of civic or physical participation (Fors, 2018; Rosol, 2014). The latter also represents operational management. In other words, in addition to local authorities, citizens through maintenance and daily manage these spaces (Azadi et al., 2011; Fors et al., 2019; Randrup & Persson, 2009). Through the daily practices of public urban green spaces, users are empowered to act by acquiring a good knowledge of the condition and issues that link these spaces to their living environment. This allows them to move from being users of the space or beneficiaries to being actors.

Local participation is crucial, at the level of local environmental policy, it is a tool to improve the quality of these spaces (Fors et al., 2019; van der Jagt et al., 2017). Also, it allows not only the local management of these spaces (T. Mattijssen, 2018), but also the valorisation of various resources, notably financial (Jausus & Said, 2014). Socially, it aims to strengthen democracy and the sense of belonging, satisfaction, well-being and social cohesion (Enengel et al., 2011; Fors, 2018; T. Mattijssen, 2018). In this respect, citizen participation has been highlighted and consolidated through various action plans and agreements such as: the European Landscape Convention (Council of Europe, 2000) and the Aarhus Convention (Stec et al., 2000).

Algeria, a North African and Mediterranean country characterized by a diverse climate ranging from Mediterranean, semi-arid to desert. The prevailing situation in Algeria in terms of design and protection of urban green spaces is certainly worrying (Ali-Khodja & Khenoucha, 2017) as the contribution of these spaces to the quality of life has been largely underestimated. However, Algeria is trying to remedy this situation through the National Territorial Arrangement Scheme for 2030. This scheme represents a spatial planning instrument reflecting the vision and orientations of the state on the national territory, and its desired development in terms of layout and balanced and sustainable development over a period of (15 years). Where this scheme also emphasizes the need for citizen participation, which requires good governance to encourage citizen participation in the preservation of natural capital. On the other hand, Algeria has included many decrees and laws such as law 07-06 relating to the management, protection and layout of green spaces, and law 06-06 on the orientation of the city. The latter law strongly supports this participation. Nevertheless, the reality on the ground hardly reflects this legal-decisional wealth, i.e. the state management that prevails in Algeria, and the participation of citizens in the management of these spaces has not yet been well embodied in accordance with the conditions of the various schemes and regulatory texts.

In this context, like many Algerian cities, Jijel, à Mediterranean city, is a very representative case of this reality, as the management and preservation of public urban green spaces in this city have always been considered the task and responsibility of local authorities. Moreover, the physical participation of citizens in the management of these spaces is limited and usually takes the form of formal involvement (in an association or neighbourhood committee) or informal involvement, which places it at the heart of the dilemma currently facing the management of these spaces. Although today, this concept is widely present in the discourse of city managers!

Thus, this paper will attempt to understand the phenomenon of limited participation of citizens in Jijel, particularly physical participation, while presenting a draft reflection on the solutions to be undertaken to encourage them to collaborate. However, the article will focus only on the physical stimuli of user participation, as the first hypothesis of this work considers that the design of residential or public green spaces affects the participation of users in various activities related to their management in Jijel.

This hypothesis is supported by the heuristic formula proposed by the psychologist Kurt Lewin (Lewin, 1936), participation is considered as human behaviour (B). It results from the combination of internal factors related to the person and other factors associated with the environment, including the characteristics of the social environment and the physical environment represented in the factors of design and layout.

Finally, the present article aims to improve knowledge while identifying the factors associated with the design and layout that affect, either motivate or prevent, the participation of the users in the management of public urban green spaces in Jijel, and to deduce the typology of behaviour generated towards these spaces.

### **User participation and biophilia. A behavioural track to explore**

The relationship between the individual and the natural environment is one of mutual influence. Indeed, if a person acts in the environment that surrounds him, their perceptions and behaviour are also affected by the environment itself. The effect of green spaces on the user generates different behaviour towards them, and this is reflected in the concept of human biophilic behaviour. According to (Wilson, 1993), biophilia is a theory that human beings carry in their genes the behaviour of attachment to nature or the love of nature. In 1993, Kellert developed a

typology of experiences reflecting this behaviour and in 2014 changed it into eight nature values ( Djouad, 2021, 2022; Kellert, 1993, 2014) (Table 1).

*Table 1 : Typology of Nature's experiences according (S. Kellert, 2014; S. R. Kellert, 1993).*

Experience	Description
Utilitarian	The exploitation of nature's vast resources, including food, clothing, tools, medicine, and shelter.
Naturalist and aesthetic	A contact characterized by a fascination, wonder, and admiration for the beauty and complexity of nature and its diversity.
Ecological science	Motivation to study biophysics systematically models, structures, and functions of the natural world.
Symbolic	Refers to the use of nature's symbols to Communicate.
Humanist	A deep emotional connection with the sensitive aspects of nature and its individual elements.
Moralist	A strong sense of affinity and a sense of ethical responsibility for the natural world.
Dominionist ic	The desire to master and control the natural world, often associated with destructive tendencies.
Negativistic	The negative affect associated with nature, including fear, aversion, and disgust.

*Note: Reproduced from «City–Nature Relationship in a World-Renowned Nature Reserve: The Case of El Kala National Park in Eastern Algeria», par Djouad, F. Z. (2022). Journal of Urban Planning and Development, 148(1), 05021067.*

### **User participation and physical environment factors**

The distinctive physical characteristics of the space are all the material attributes related to its physical form, from its location, size, access and safety attributes to its infrastructure and even its biodiversity. All of these factors appear to impact in some way on user participation in its management (Adinolfi et al., 2014; Dennis & James, 2016 ; Jorgensen et al., 2002; Rasidi et al., 2012) . These characteristics also seem to be influencing the presence of people in these places (Goličnik & Ward Thompson, 2010). This idea reinforces the term affordance (Gibson, 1979), which refers to the set of environmental features that an individual can use to initiate activities such as managing of these spaces, in order to benefit from the services it provides, or to improve its quality and desired functions (Young, 2011).

Indeed, residents tend to prefer green spaces close to their homes, which means that proximity increases the use of these spaces (Dennis & James, 2016; Elfartas et al., 2019; Jorgensen et al., 2007). In this context, according to the European Environment Agency (EEA), green spaces should be accessible within a 15 minute walk and within 300 meters of the house, especially, for people living in cities (Barbosa et al., 2007) . Furthermore, many studies insist on the relationship between the physical attributes of space and the behaviour of users, in which some cases will be mentioned in the following.

Starting with the effect of security and access on volunteering, a trend that was clearly confirmed in the work of (Dennis & James, 2016), where a comparison was made between 'private' and 'public' access sites, and large and small sites in terms of area. Lower levels of volunteering were associated with 'public' access and large sites. Whereas, higher participation was associated with sites surrounded by secure perimeter fencing (Dennis & James, 2016).

With regard to physical and visual accessibility, several studies show that this is affected by tree height and forest edge type. Indeed, while the spatial layout was the most important factor in determining the feeling of safety. Semi-open or open 'forest-like' green spaces convey a feeling of safety, a good sense of space and legibility and therefore good visual and physical

accessibility (Gundersen & Frivold, 2008; Iqbal, 2021; Jorgensen et al. 2002). Another important physical element that helps to feel safe is the design of street furniture (benches, litter bins...), which should be strong enough (resistant materials) to withstand not only intensive use but also vandalism (Iqbal, 2021).

Passing a priori to the direct relationship between safety-related attributes and the effective involvement of users in the management of green spaces. The study by (Ding & Guaralda, 2013) found that high-density planted landscapes, with a partially enclosed spatial layout offer a private and comfortable space for small groups, while soft landscapes with a central open space allow for physical and visual communication that appeals to a wide range of users. This study also found other design elements such as colour and lighting that influencing user behaviour and orientation in public spaces, these factors also have a very important role in engaging space users in the management of these green spaces from (Ding & Guaralda, 2013). In addition, the longitudinal study of (Fors et al., 2019) indicates that a low probability of participation in 2010 was associated with a visually closed space (from a physical perspective). Whereas the increase in participation between 2010 and 2015 was favoured by the type of edge and semi-open edges with adequate tree height.

## Materials and methods

### Case studies

Jijel, a Mediterranean city, is a municipality and chief town of the province of Jijel, located in the northeast of Algeria (Figure 1), covering an area of 62.38 km<sup>2</sup> and hosting 162,055 inhabitants as estimated by the Directorate of Budgetary Policies and Syntheses (DPSB) in 2018. This city represents a flagrant paradox between a natural environment richly adorned by unique landscape, and natural features and the flagrant deterioration of the very limited number of public urban green spaces (47 urban public spaces). This means a very low ratio of 2.16m<sup>2</sup>/inhabitant, instead of the 10.8 m<sup>2</sup> stipulated by the inter-ministerial circular of 15 November 1984.



Figure 1 : Geographical location of Jijel city. Source: Google maps.

According to the classification of green spaces mentioned in law 07-06, out of the total number of public urban green spaces, the city of Jijel contains about (16) public gardens as the most widespread typology of spaces, in particular of the type «gardens» (6), squares (5) and places (5). We have selected a heterogeneous study corpus composed of three (3) out of six gardens. These three gardens are located in the city centre of Jijel (Figure 2).



Figure 2 : Situation of three gardens in Jijel city. Source: uMap

These gardens represented in the municipal garden (Figure 3), El quods garden (Figure 4) and El salam garden (Figure 5) were selected according to their different morphologies and vegetation layout (Table 2).



*Figure 3 : Panoramic view of municipal garden. Source: Author, 2022.*



*Figure 4 : Panoramic view of El quods garden. Source: Author, 2022.*



Figure 5 : Panoramic view of El salam garden. Source: Author, 2022.

Table 2 : Selection criteria for the gardens included in the study.

	Municipal garden	El quods garden	El slam garden
Location	City centre	City centre	City centre
Opening/closing of the space	Closed space(fenced)	Open space	Open space
Area	1200 m <sup>2</sup>	44413m <sup>2</sup>	5750m <sup>2</sup>
Topography	Flat	Flat	Flat
Height and density of vegetation	- Remarkable height - High density	-Average height -Low density	-Average height -Average density
Distribution of vegetation	- Central distribution of vegetation	- Distribution of vegetation in the edges of the space	- Distribution of vegetation in the edges of the space

Source: Author .2022.

### Collected data

In order to characterize the relationship between physical attributes and the degree of participation of the users in the management of urban green spaces in Jijel, we opted for a questionnaire survey of users of these gardens. The questionnaire is composed of closed questions on the socio-demographic characteristics of the respondents, the distinctive features and the safety of these spaces. The questions are presented in the form of a measurement scale, where we adopted the five-point Likert scale (strongly disagree, somewhat not agree, neutral, somewhat agree and strongly agree). The advantage of this type of scale is that it is easier for the respondent to understand.

### Sample size

To determine the sample size of users, we calculated the average of the total number of users of the space during the four observed weekdays in March 2021 in each garden (two weekend days and two normal days), via an observation grid of the intensity of use from 8am-7pm. This intensity was relatively low in view of the epidemiological context related to COVID-19. We obtained a total sample of 148 users (see Table 3).



*Table 3 : Determining the size of the study sample.*

	El slam garden	El quods garden	Municipal garden
Total intensity of use	2560	388	238
Average intensity of use	640	97	59,5
Sample size adopted in each case	We adopted a 10% representative sample, because the population is a few hundred elements (Angers, 1996, p. 244)	We adopted a representative sample of 50%, because the population is less than one hundred elements (Angers, 1996, p. 244)	
	64	49	35
Total intensity of use		148	

*Source: Author .2022.*

### Questionnaire distribution

The study was conducted in spring, the season associated with the highest intensity of green spaces use in Mediterranean countries (Lafortezza et al., 2009). In order to ensure the clarity and simplicity of the questions, to estimate the duration of the questioning, and the effectiveness of the chosen quantitative survey method, we previously distributed the questionnaire to a sample of 30 respondents distributed over the three gardens. The final questionnaire was distributed over a period of 21 days from 15 to 29 May 2021 in Arabic and French because Algeria is a multilingual country where Arabic is the national and official language, and French retains the status of the second most used language inherited from the French colonization of Algeria.

### Data analysis

The results were analysed using SPSS ® 21.0. We used averages and factor analysis (Principal Component Analysis - PCA). Indeed, PCA aims to synthesize quantitative variables (sub-dimensions in our case) by constructing a small number of new variables called «principal components» (Stafford et al., 2006, p. 58). These components can then be used to identify the most important factors influencing user participation.

## Results

### Descriptive characteristics of the study sample

Men in the El quods garden represent the majority of respondents (65.3%) compared to women (34.7%). All respondents were men in the garden of the town hall and garden El salam. This is due to the lack of culture of use of these spaces by the female gender due to the traditions of Algerian society, which are characterized by the monopoly of men of the public sphere in the city. The majority of respondents are residents of the city centre in the case of the garden of the town hall and El salam while in the garden El quods the respondents of the city centre represent (51%), the periphery (28.6%) and other commune (20%). While the largest percentage of users in the three gardens estimated the distance to reach the area < 300 m. In addition (10.7%) of users in the garden El quods estimated the distance to reach this garden >900 m compared to the other gardens (Table 4).

*Table 4 : The characteristics of the study population.*

	Municipal garden	El quods garden	El salam garden
<b>Gender</b>			
Male	100 %	65.30%	100%
Female	/	34.7%	/
<b>Residence</b>			
City center of Jijel	82.9%	51%	75%

The outskirts of the city	17.1%	28.6%	20.3%
Other municipalities	/	20.4%	4.7%
<b>Distance to reach the space</b>			
<300m on foot.	79,0%	56,4%	72,2%
300m-600m	16,8%	14%	16,3%
300m-900m	4,2%	18,9%	11,7%
>900m	/	10,7%	/

Source: Author by using SPSS ® 21.0.

### Descriptive data analysis

In order to analyse the data, the mean of each variable was determined and in order to know the direction of the means, i.e. to determine the directions of the respondents' answers, the weighted mean for each number of the Likert scale was also calculated. Then the degree of agreement for each item was clarified, ranging from «strongly disagree» to «strongly agree» (Alonazi et al., 2019; Pimentel, 2010). The results can be interpreted to show whether the variable is motivating or not inspired (Table 5 and 6).

Table 5 : Weighted mean of the Likert scale.

Likert scale (five points)	Weighted mean	Results	Results Interpretation
1	[1-1.8)	Strongly disagree	Not at all motivating
2	[1.8-2.6)	Somewhat disagree	Not motivating
3	[2.6-3.4)	Neutral	Neutral
4	[3.4-4.2)	Somewhat agree	Motivating
5	[4.2-5]	Strongly agree	Very motivating

Source: Author, inspired by (Alonazi et al., 2019).

Table 6 : The mean of the users' responses in the three gardens.

	Municipal garden	
	Mean	Test value = 3 The direction of the responses
Dimension I : Distinctive physical properties	3,8095	Motivating
Sub-dimension 1 : Location	3,8095	Motivating
Indicator 1 : good location	3,6286	Motivating
Indicator 2 : proximity of space	3,8571	Motivating
Indicator 3 : physical and visual access from outside	3,9429	Motivating
Sub-dimension 2 : Morphological characteristics	3,9283	Motivating
Indicator 1 : form	3,7429	Motivating
Indicator 2 : area	3,8857	Motivating
Indicator 3 : topography	4,1429	Motivating
Dimension II : Security	2,0426	Not motivating
Sub-dimension 1: Physical and visual accessibility	2,0590	Not motivating
Indicator 1 : absence of high vegetation height	2,2000	Not motivating
Indicator 2 : absence of high vegetation density	1,8198	Not motivating
Indicator 3 : absence of central distribution of vegetation	2,1571	Not motivating
Indicator 4 : openness of space	2,2429	Not motivating
Sub-dimension 2 : Well-being	1,7972	Not motivating
Indicator 1 : psychological well-being	1,8429	Not motivating
Indicator 2 : social well-being	2,1857	Not motivating

Indicator 3 : absence of social ills	3,8095	Motivating
<b>El quods garden</b>		
		Test value = 3
	Mean	The direction of the responses
Dimension I : Distinctive physical properties	3,6598	Motivating
Sub-dimension 1 : Location	3,8877	Motivating
Indicator 1 : good location	4,1224	Motivating
Indicator 2 : proximity of space	2,5680	Not motivating
Indicator 3 : physical and visual access from outside	3,6531	Motivating
Sub-dimension 2 : Morphological characteristics	3,7619	Motivating
Indicator 1 : form	3,8776	Motivating
Indicator 2 : area	3,4286	Motivating
Indicator 3 : topography	3,9796	Motivating
Dimension II : Security	3,5231	Motivating
Sub-dimension 1: Physical and visual accessibility	3,5444	Motivating
Indicator 1 : absence of high vegetation height	3,5245	Motivating
Indicator 2 : absence of high vegetation density	3,6531	Motivating
Indicator 3 : absence of central distribution of vegetation	3,4898	Motivating
Indicator 4 : openness of space	3,5102	Motivating
Sub-dimension 2 : Well-being	3,5017	Motivating
Indicator 1 : psychological well-being	3,5102	Motivating
Indicator 2 : social well-being	4,4541	Very motivating
Indicator 3 : absence of social ills	2,5408	Not motivating
<b>El salam garden</b>		
		Test value = 3
	Mean	The direction of the responses
Dimension I : Distinctive physical properties	3,4786	Motivating
Sub-dimension 1 : Location	3,4052	Motivating
Indicator 1 : good location	2,4406	Not motivating
Indicator 2 : proximity of space	4,1281	Motivating
Indicator 3 : physical and visual access from outside	3,6469	Motivating
Sub-dimension 2 : Morphological characteristics	3,5521	Motivating
Indicator 1 : form	3,7656	Motivating
Indicator 2 : area	2,3313	Not motivating
Indicator 3 : topography	4,5594	Very motivating
Dimension II : Security	3,4152	Motivating
Sub-dimension 1: Physical and visual accessibility	4,2886	Motivating
Indicator 1 : absence of high vegetation height	4,0125	Motivating
Indicator 2 : absence of high vegetation density	4,1906	Motivating
Indicator 3 : absence of central distribution of vegetation	4,1881	Motivating
Indicator 4 : openness of space	4,7638	Very motivating
Sub-dimension 2 : Well-being	2,5418	Not motivating
Indicator 1 : psychological well-being	2,5684	Not motivating
Indicator 2 : social well-being	2,5874	Not motivating
Indicator 3 : absence of social ills	2,4696	Not motivating

Source: Author by using SPSS ® 21.0.

**Principal component analysis (PCA)**

It can be seen that the total Alpha cronbach in all three cases is greater than (> 0.6) (Stafford et al., 2006, p. 99) which indicates a high validity rate of the questionnaire. The KMO test in all three cases is higher than (> 0.5), the statistical significance of Bartlett's test is lower than (<0.05) (Carricano et al., 2010, p. 57; Stafford et al., 2006, p. 80-81) and the extraction rate of the variables is higher than 0.5. The principal component analysis is finally feasible (Table 7).

*Table 7 : Principal component analysis validation for the three gardens.*

	Alpha cronbach	Kaiser-Meyer-Olkin test	Bartlett's test	Representative quality « extraction rate »
Municipal garden	0.725	0,634	0.002	Between 0.753 and 0.769
El quods garden	0.656	0.613	0.010	Between 0.505 and 0.802
El salam garden	0.650	0,557	0.003	Between 0.518 and 0.702

*Source: Author by using SPSS ® 21.0.*

**Municipal garden**

The factorial analysis extracted two components, the first component explains nearly 45% of the internal variance (Table 8), and this component called «the feeling of physical and visual security and well-being» groups together the variables of physical and visual accessibility and well-being. These variables of component 1 are well associated with the horizontal axis and they are strongly and positively correlated (Table 9) and (Figure 6), i.e. if one increases, the second one also increases. They are therefore variables that have a strong effect on participation according to these users. The second component called «spatial-morphological properties of the space» combine the variables of location and morphological characteristics. These variables of component 2 are well associated with the vertical axis and they are strongly and positively correlated (Table 9) and (Figure 6). This second component explains 30.643% of the effect on user participation (Table 8). The two dimensions explain more than 75.934% of the total variance (>60%), i.e. they explain the phenomenon well (Hair JR et al., 2006, p. 108).

*Table 8 : Total variance explained for the Municipal garden.*

	Component 1	Component 2	% Cumulative
Municipal garden	45,292%	30,643%	75,934%

*Source: Author by using SPSS ® 21.0.*

*Table 9 : Matrix of components after rotation of the Municipal garden.*

		Component	
		1	2
Municipal garden	Physical and visual accessibility	0,867	
	Well-being	0,866	
	Location		0,876
	Morphological characteristics		0,857

*Source: Author by using SPSS ® 21.0.*

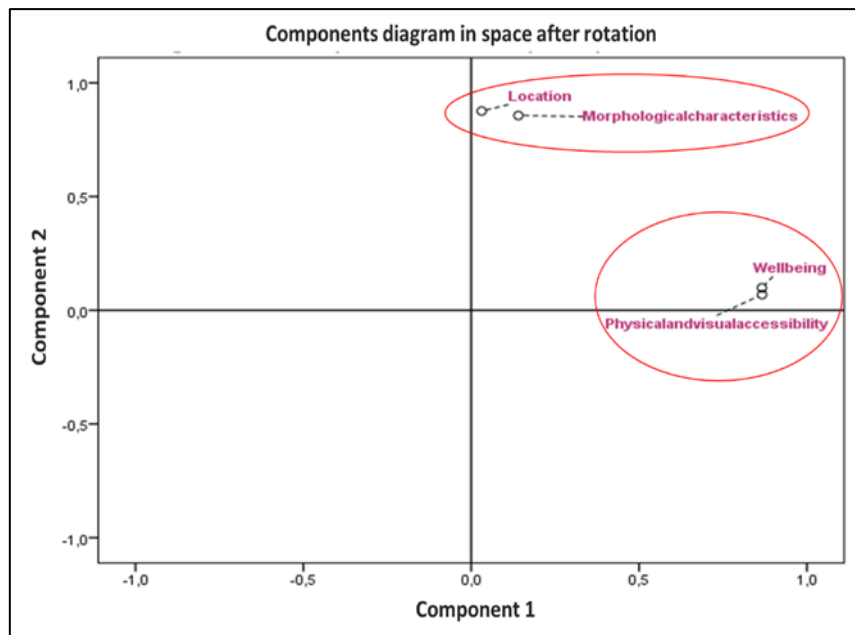


Figure 6 : PCA (Municipal garden). Source: Author by using SPSS ® 21.0.

**El quods garden**

The factorial analysis revealed two components, the first of which explains nearly 42% of the internal variance (Table 10). This component, called « the feeling of physical and visual security and well-being », groups together the variables of physical and visual accessibility and well-being. These variables of component 1 are well associated with the horizontal axis and they are strongly and positively correlated (Table 11) and (Figure 7). They are therefore variables that have a great impact on participation according to these users. The second component called «spatial-morphological properties of space» combine the variables of location and morphological characteristics. These variables of component 2 are well associated with the vertical axis and they are strongly and positively correlated (Table 11) and (Figure 7). This second component explains 25% of the effect on participation according to these users (Table 10). The two dimensions explain more than 66.936% of the total variance (>60%), i.e. they explain the phenomenon well.

Table 10 : Total variance explained for El quods gardens.

	Component 1	Component 2	% Cumulative
El quods garden	41,633%	25,303%	66,936%

Source: Author by using SPSS ® 21.0.

Table 11 : Matrix of components after rotation of El quods gardens.

		Component	
		1	2
El quods garden	Physical and visual accessibility	0,894	
	Well-being	0,731	
	Location		0,846
	Morphological characteristics		0,701

Source: Author by using SPSS ® 21.0.

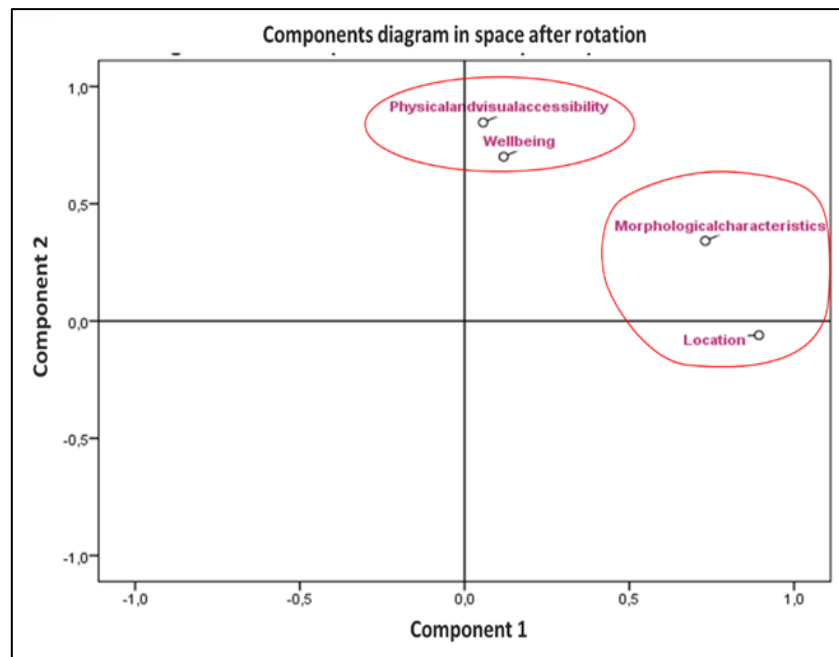


Figure 7 : PCA (El quods garden). Source: Author by using SPSS ® 21.0.

**El salam garden**

The factorial analysis allowed us to extract two components, the first component explains almost 41% of the internal variance (Table 12), and this component called «appropriate and comfortable location» includes the variables of location and well-being. These variables of component 1 are associated with the horizontal axis, and they are strongly and positively correlated (Table 13) and (Figure 8). They are therefore variables that have a high influencing on participation according to these users. The second component called «vegetation cover adapted to morphological characteristics» combine the variables of physical and visual accessibility, and morphological characteristics. These variables of component 2 are associated with the vertical axis and they are strongly and positively correlated (Table 13) and (Figure 8). This second component explains 35% of the effect on participation according to these users (Table 12). The two dimensions explain more than 76.213% of the total variance (>60%), i.e. they explain the phenomenon well.

Table 12 : Total variance explained for El salam garden.

	Component 1	Component 2	% Cumulative
El salam garden	41,308%	34,905%	76,213%

Source: Author by using SPSS ® 21.0.

Table 13 : Matrix of components after rotation of three gardens.

		Component	
		1	2
El salam garden	Location	0,785	
	Well-being	0,756	
	Physical and visual accessibility		0,698
	Morphological characteristics		0,673

Source: Author by using SPSS ® 21.0.

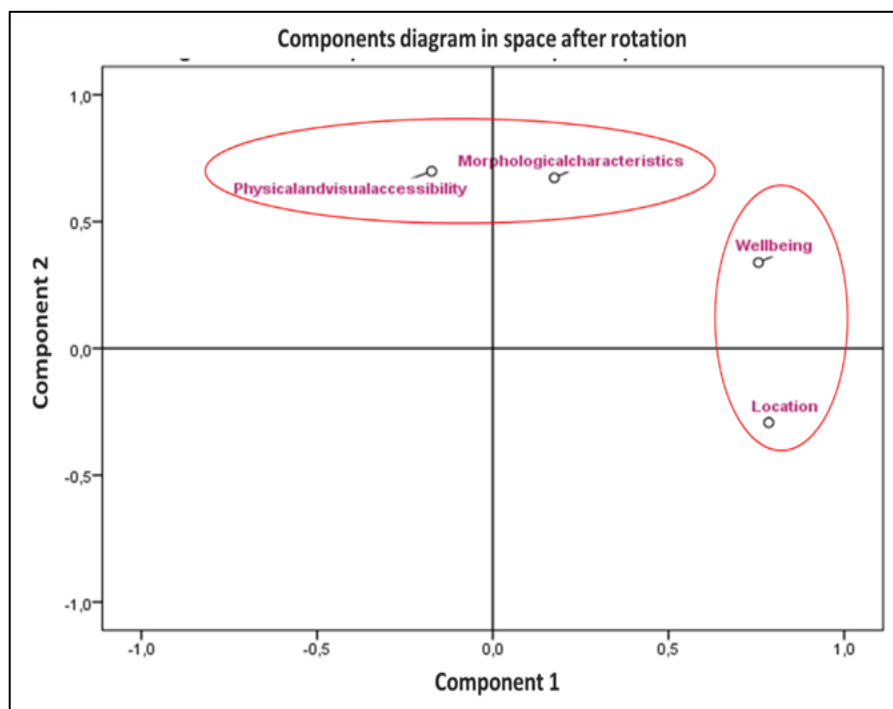


Figure 8 : PCA (El salam garden). Source: Author by using SPSS ® 21.0.

## Discussion

In all three cases, all variables related to the design and layout of the space affect participation in management, which is consistent with several studies.

In the case of both the municipal garden and El quods garden, the most influential factor was the «feeling of physical-visual safety and well-being» consisting of physical and visual access and well-being. The least influential factor was «spatial-morphological properties of space» which is measured by location and morphological characteristics of space.

In the municipal garden, physical and visual access and well-being were barriers to user participation (Table 6). This can be explained by the fact that this space is designed as a closed space with a high height, a high density and a central distribution of vegetation (Figure 3). In addition, there is the psychosocial discomfort and the spread of social ills. This last point can be a real obstacle because the spread of crime, theft and vandalism creates a feeling of insecurity, which leads to a decrease in frequency of use and participation in these spaces (Jorgensen et al., 2007). On the other hand, the location, i.e. proximity and access from outside, as well as the morphological characteristics of the garden, such as a flat space with a relatively small area (1200 m<sup>2</sup>) were motivating factors for participation (Table 6). The proximity of the space directly affects the attendance and consequently the participation of the users which is in line with the scientific literature on the issue (Dennis & James, 2016; Elfartas et al., 2019; Jorgensen et al., 2007).

On the other side, the users of El quods garden agree that physical and visual access, well-being, location and morphological characteristics of the space are motivating factors for participation (Table 6). Given that this garden is mainly characterized by its good location in the centre of the city, its ease of access, its average size (4413m<sup>2</sup>) compared to the other two. It is also characterized by its openness, the average height and low density of vegetation and its

layout on the edges (Figure 4), in addition to the existence of psychosocial well-being. The only barrier to participation was the prevalence of social ills (Table 6).

As for El salam garden, the most influential factor was «appropriate and comfortable location» measured by location and well-being, while the second and least important factor was «vegetation cover adapted to morphological characteristics» which includes both physical and visual access and morphological characteristics. The motivating elements for participation were physical and visual access, as the space is characterized by openness, the distribution of vegetation on the edges with an average density and height. As well as, the morphological characteristics, with the exception of the surface area (Table 6), which may explain the fact that it is large (5750m<sup>2</sup>) and requires a lot of capacity and effort to manage (Figure 5), and which comes back to the same finding found by (Dennis & James, 2016). In addition, location is another incentive, with the exception of the best location (Table 6), perhaps due to the presence of the garden in the centre of the public market. As for well-being, this was a barrier to user participation (Table 6), which could be due to the lack of psycho-social well-being and the spread of social ills as observed in the study by (Jorgensen et al., 2007).

El quods garden is generally considered a favourable case in terms of design and layout that stimulates participation in the management of these spaces (Figure 4). The strategic location of the space and the well-being, offer a positive effect on participation (Adinolfi et al., 2014; Dennis & James, 2016). Contrary to the study of (Dennis & James, 2016) which found that, fenced spaces are the safest. The openness of the space and the appropriate distribution of vegetation make the garden visible, accessible, safe and positively affect participation as indicated in the studies of (Ding & Guaralda, 2013; Fors et al., 2019; Gundersen & Frivold, 2008; Iqbal, 2021; Jorgensen et al., 2002;).

Finally, the location and morphological characteristics of the space are generally motivating factors in all three cases. By comparing the results (Table 14) with Kellert's typology (Table 1) we can conclude that the users manifest various positive biophilic behaviours for these factors, such as naturalistic and aesthetic, through the admiration of the space, which is associated with a feeling of physical and mental well-being. In addition to, moralist and dominionist, through the sense of ethical responsibility and the need and will to master the natural world which generates the motivation to participate in the preservation of this space. This behaviour becomes negative, resulting in a feeling of fear and aversion for the space, which is linked to the lack of well-being in the case of the municipal and El salam gardens, and to the poorer physical and visual accessibility in the municipal garden being barrier factors.

Table 14 : Human biophilic behaviour.

Gerdens	Design and layout	Results	Beauvoir
Municipal garden	Location	Motivating	Naturalist and aesthetic
	Morphological characteristics		Moralist
	Physical and visual accessibility	Not motivating	Dominionistic
	Well-being		Negativistic
El quods garden	Location	Motivating	Naturalist and aesthetic
	Morphological characteristics		Moralist
	Physical and visual accessibility		Dominionistic
	Well-being		
El salam garden	Location	Motivating	Naturalist and aesthetic



<u>Morphological characteristics</u>	Moralist
Physical and visual accessibility	Dominionistic
Well-being	Not motivating
	Negativistic

*Source: Author. 2022.*

The results of this study can be generalized to green spaces that have the same characteristics as the spaces studied, i.e. safe spaces that are open or semi-open with an average height of vegetation cover and an average or low vegetation density, in addition to spaces that are close and easily accessible and characterized by well-being. These spaces stimulate the participation of their users in the management and give positive biophilic behaviour.

## Conclusion

This study showed the existence of the relationship between physical factors of spaces and user participation in Jijel, This result confirms the effect of the physical aspect of the Lewin equation on human behaviour. A good understanding of the factors influencing participation in the management of urban green spaces in Jijel will not only encourage local participation and infer the nature of their biophilic behaviour. Nevertheless, it will also help to improve the design of spaces by choosing «appropriate and comfortable locations», and arranging «vegetation adapted to the morphological characteristics», in order to meet the needs of users. Notably by increasing visual and physical accessibility, i.e. by creating open spaces with an appropriate height and density of vegetation, as well as by ensuring well-being and combating social ills that in fact create a «feeling of visual physical security and well-being». Factors that prevent participation can also be an important motivation to start participation to improve the quality of these spaces. Future studies can also look further into the biophilic design aspect of these spaces in order to make them more attractive and to sustain the relationship between man and nature, and thus create positive biophilic behaviour.

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