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## Assessment of the Environmental Quality through Users' Perception in Guelma city, Algeria

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### Abstract

Since the early 1960s, an interdisciplinary field of environmental perception has been developed, with earlier urban researches have focused on how people perceive their urban environment. Our study aims to assess the environmental quality through user's perception, so to explore the way people perceive the outdoor spaces in Guelma we have conducted a survey questionnaire in three outdoor spaces, Martyr's square, El Horia public garden, and Bou El mokh square. The assessment is based on a set of scientifically valid assessment criteria and indicators linked to the principles of sustainable development. The results of this study indicate that the outdoor spaces must play several roles in cities dynamics and functioning, depending on the local context and on the neighbourhood. The intensity of use and the frequency of outdoor spaces differs from one place to another, so it is necessary to avoid generic assumptions and to encourage local perceptual assessments.

**Keywords:** Environmental Quality; users' Perception; Perceptual assessment; Outdoor spaces.

### 1. Introduction

An analogical approach (CLAIRE & MICHEL, 1982) considers that the set of functions outdoors is only a reproduction of the functions inside dwellings. According to this approach urban outdoor spaces play the role of stays in the urban environment; hence their proper functioning represents an index of high quality of the urban environment. Urban outdoor spaces present a diversity of forms and environments that can be studied from different angles (Caymaz & Hamameh, 2020), aesthetics, morphological, perceptual, social, visual, and functional.

Since the early 1960s, an interdisciplinary field of environmental perception has developed, from which there is a large research corpus on user's perception of urban outdoor spaces. The interest in the perception of the environment has also been reinforced by a set of research works focused on the urban environment quality and the use of outdoor spaces.

Perception is to see, to hear and to feel a variety of simultaneous sensitive phenomena. The physical environment can evoke strong emotional reactions in users, thus several approaches of environmental perception; Physical, Philosophical and Psychological exists. According to (Jalili et al., 2015) perceptual assessment is a process that transforms a user's mental image into attitudes and then to behaviours.

Obviously, outdoor spaces are physical spaces with a certain arrangement and density of volumes in various shapes. Urban outdoor spaces encompass any land use mode linked to the city or to its proximity, not only built space but also non-built space: green spaces, airports, stadiums, square, square.... etc.

Psychophysical perception has been widely used to describe urban outdoor spaces (Black & Street, 2014). This approach seeks to determine the quantitative relationships that exist between a physical element and the perception that we have of it. Of which the important physical criteria to be perceived are: readability, space representation, furniture, landscape, character, atmosphere and insertion.

The mental image of outdoor spaces is made up of a set of sensations relating to its perceived components. For example the study conducted by (Sayad & Alkama, 2020b), where the authors have studied users behaviour in outdoor spaces as a reaction to perceived climate. Another study was carried out to explore children's perceptions and experiences of outdoor spaces (Talug, 2015). Children, as an important category of users of outdoor spaces, prefer spaces with educational character, this perception was expressed by their desire to stay close to their school environment.

Environmental quality assessment of outdoor spaces is generally based on the evaluation of the physical qualities felt by users, which are at the origin synonymous with architectural and urban atmospheres. Material atmosphere (light, colours, smells, noise, wind, etc.), aesthetic or social of a place or an agglomeration as it is perceived.

## 2. Material and Methods

The main purpose of this study is to assess the environmental quality of outdoor spaces through user's perception. Three outdoor spaces located in Guelma city have been selected to explore the way users perceive the physical environment.

- **Martyr's square:** a structuring square that dates back to the French colonization, mainly composed of low-rise buildings around and it covers a total area of about 2060 m<sup>2</sup>, a dense vegetation cover and a fountain in the centre.
- **El Horia public garden:** a rest area with several accesses located in a housing area, mainly composed of buildings of medium height and it covers a total area of about 4000 m<sup>2</sup>, with a low vegetation cover and a large fountain in the center.
- **Bou El Mokh square:** an amenity space located in an urban area with administrative character, mainly composed of buildings of medium height and it covers a total area of about 4000 m<sup>2</sup>, a sparse plant cover and a large fountain in the centre.

### 2.1. Assessment Methodology

The environmental quality assessment is based on a set of scientifically valid assessment criteria and indicators linked to the principles of sustainable development. The perception of the physical environment is done through the five human senses, it is subject to a set of exogenous parameters that are related to the physical environment and that indirectly influence user's perception of the urban outdoor spaces. However, the perceived environment is synonymous with the physical environment in the minds of users.

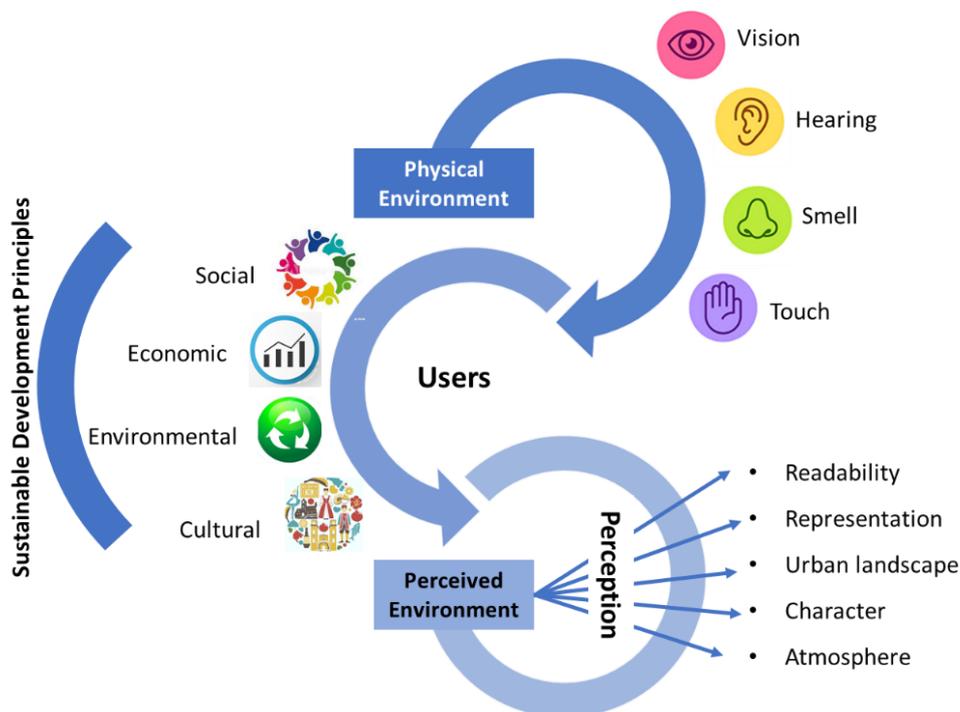


Figure 1. Perceptual assessment framework.

### 2.2. Data Corpus

Data corpus was obtained through a questionnaire survey administrated in three outdoor spaces: Martyr's square, El Horia public garden, and Bou El mokh square, located in Guelma City- Algeria. A sample of forty-five (45) respondents were questioned face to face, in French or in dialectal Arabic on a weekend day (September 15<sup>th</sup>, 2018) from 9 a.m. to 1 p.m.

The questionnaire covers several types of question under three headings, Interviewee identification, Use and attendance of outdoor spaces, and Assessment of the environmental quality. The evaluation criteria are taken from the evaluation grid for public spaces (Hadji, 2012), the detailed criteria of which are visual, olfactory, sensory and hyrothermal quality. For the question type is multiple choice on a rating scale of 3 to 5, with one open question for each criterion.

**Table 1.** Criteria and indicators used to assess the environmental quality.

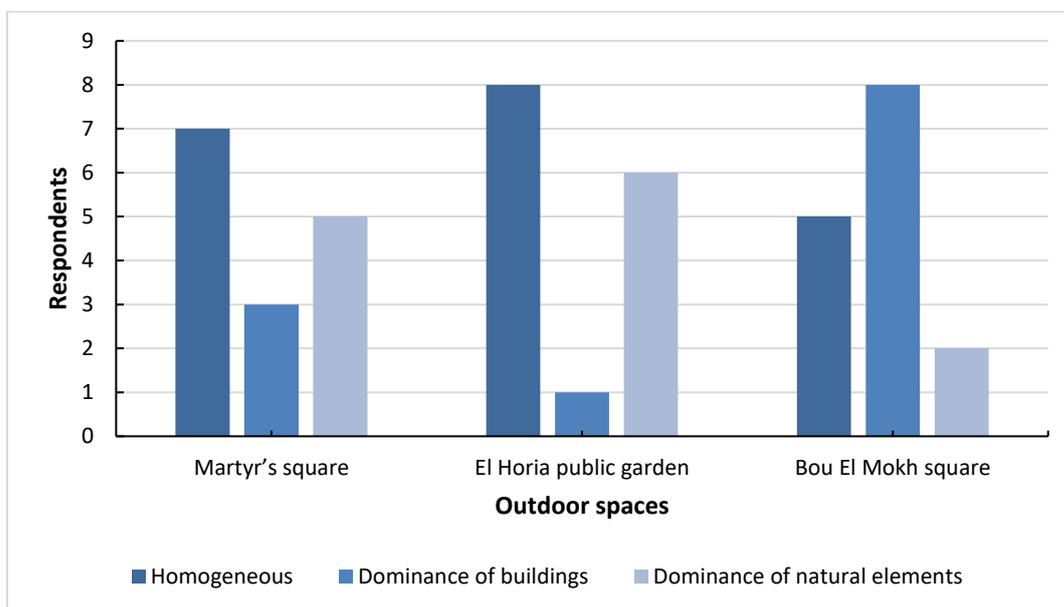
Criteria	Questions	Indicators
Visual Quality	-How do you see the quality of the landscape in this space? -Do you have a mental representation of this place?	✓ Perception of aesthetic occurrences of vegetation ✓ Psychological dimension
Sensory Quality	-How do you find the degree of calm in this space? -Do you have a sound that reminds you of this place?	✓ Perception of noise and calm ✓ Psychological dimension
Olfactory Quality	-How you find the smells in this place? -Do you have a specific smell that reminds you of this place?	✓ Perception of good odors due to vegetation ✓ Psychological dimension
Hygrothermal Quality	-How do you feel about thermal comfort level in this space? -Do you think that summer temperatures are cooler in this space? -What do you think of water bodies and vegetation?	✓ Perception of microclimatic conditions. ✓ Awareness of the regulatory function of natural elements (vegetation and water).

### 3. Results and Discussion

#### 3.1. Visual Quality

The visual quality has been apprehended through the homogeneity of the surrounding landscape as well as the user’s mental representation of the physical environment. Three response options were used to describe the quality of the urban landscape in the three outdoor spaces as shown in the figure below.

In contrast of Bou El Mokh square, the landscape quality in both spaces; Martyr’s square and El Houria garden was mostly voted as “homogeneous”, where natural elements are dominant. This initially indicates that users perceive the aesthetic occurrences of natural elements, especially vegetation which represents the most important landscape element in user’s imagination of outdoor spaces. These results were confirmed by (BELLARA, 2013), the author has studied the impact of vegetation on visual quality.



**Figure 2.** Assessment of the visual quality in Guelma’s outdoor spaces.

#### 3.2. Sensory Quality

In order to explore the sensory quality, we have focused the degree of calm in the three outdoor spaces using four response options “Very calm, Quiet, Harmful and Very Harmful”. The results are presented in Figure 3.

The answer variation within each outdoor space indicates that Martyr’s square is the most harmful, from which users have widely used the option “Very Harmful” to describe the degree of sensory nuisance. Most of users describe sensory quality of the outdoor spaces as calm or quiet. Hence, 73% of respondents perceive nuisances as part of the general atmosphere of the outdoor space. User’s perception of the sensory quality outdoors can be defined as a

symphony of music resulting from several sounds that can be both harmful and amusing; people talking, pip, foot percussion, passing cars ...etc.

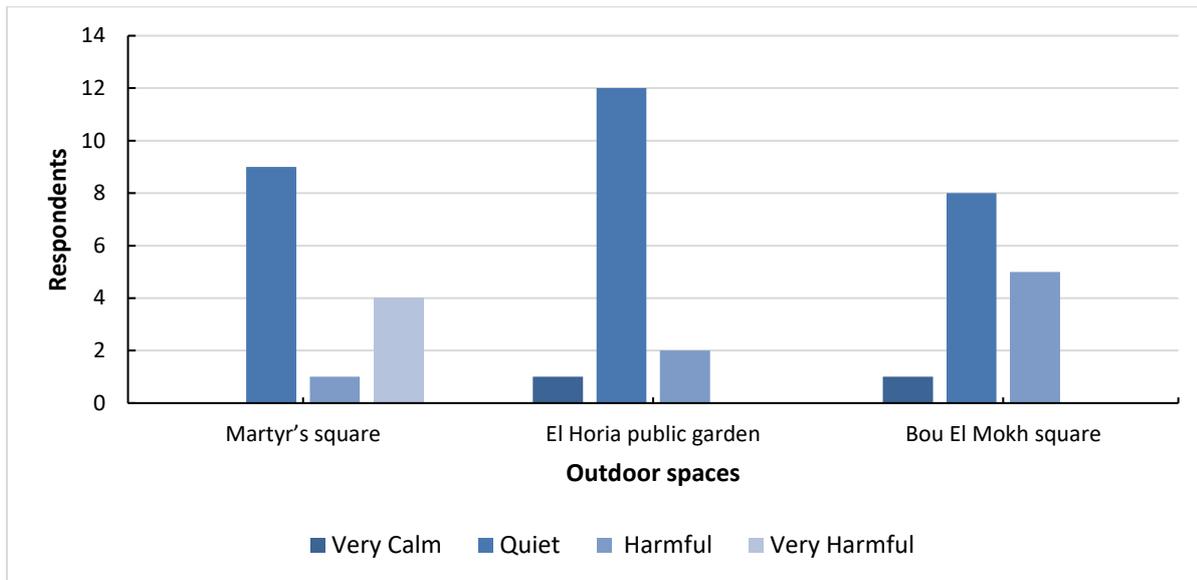


Figure 3. Assessment of the sensory quality in Guelma's outdoor spaces.

### 3.3. Olfactory Quality

The olfactory quality has been explored by testing the degree of agreeability to the existing odours, as well as the specific smells that remind users of the outdoor space. Four response options were used by users to describe Olfactory quality in the three outdoor spaces as shown in the Figure 4.

Most of users (66%) perceive the olfactory quality of the outdoor spaces as pleasant and very pleasant. While few of them have shown the unpleasantness of exist odours, again they make the link with the waste management and the type of vegetation. However, users recommend flowering vegetation to improve the odours outdoors giving the example of the jasmine implanted in other outdoor spaces of the city.

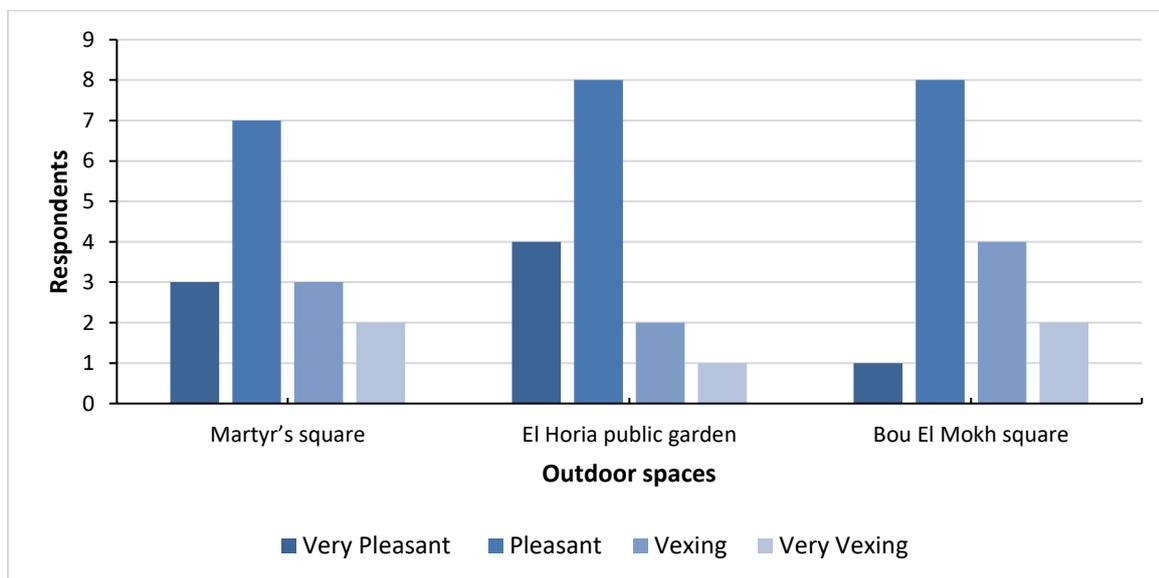


Figure 4. Assessment of the olfactory quality in Guelma's outdoor spaces.

### 3.4. Hygrothermal Quality

In this study, we have tested the way users perceive the hygro-thermal quality outdoors through two main aspects; thermal comfort and natural elements contributions in both seasons winter and summer. Five response options were used to explore the thermal comfort level outdoors, with the option "Neutral" to express an average satisfaction level with the thermal conditions.

In winter, the most of outdoor spaces users feel unpleasant and uncomfortable, with a minority that feels neutral to comfortable. According to previous studies (Sayad & Alkama, 2020b) winter discomfort situations took place in the

early morning and the evening hours. It can be warp up that user’s perception of the thermal quality depends on the visiting hours of the outdoor spaces.

In summertime, the thermal quality was highly voted by users as “Unpleasant” in both spaces; El Horia garden and Bou El Mokh square. While, the perception of the thermal quality in Martyr’s square was voted almost equally as “Pleasant, neutral to unpleasant”. Feeling comfortable in summer is mainly due to various contributions of natural elements as demonstrated by (Sayad & Alkama, 2021a, 2021b).

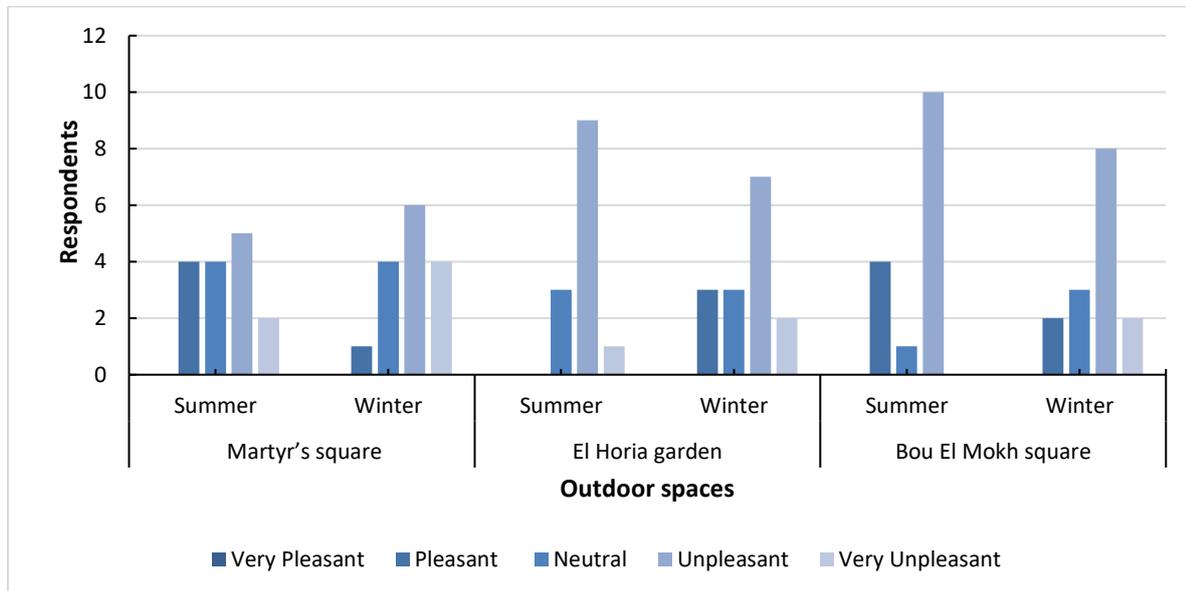


Figure 5. Assessment of the hygrothermal quality (Thermal Comfort) in Guelma’s outdoor spaces.

The answer to the question "Do you think summer temperatures are cooler in this area?" makes a good articulator for exploring the perception of thermal quality and the role of natural elements to improve it.

Actually, vegetation was perceived equally as “Satisfying and littlely satisfying” in Martyr’s square with dense and large trees, which clearly indicate that urban trees have contributes to the thermal comfort. Indeed, the majority of the respondents are aware of the regulating function of vegetation and water in outdoor spaces, and they demand the lack of water areas. These results are consistent with those of (Sayad & Alkama, 2020a), where authors have demonstrated the role of natural elements in reducing summer temperatures.

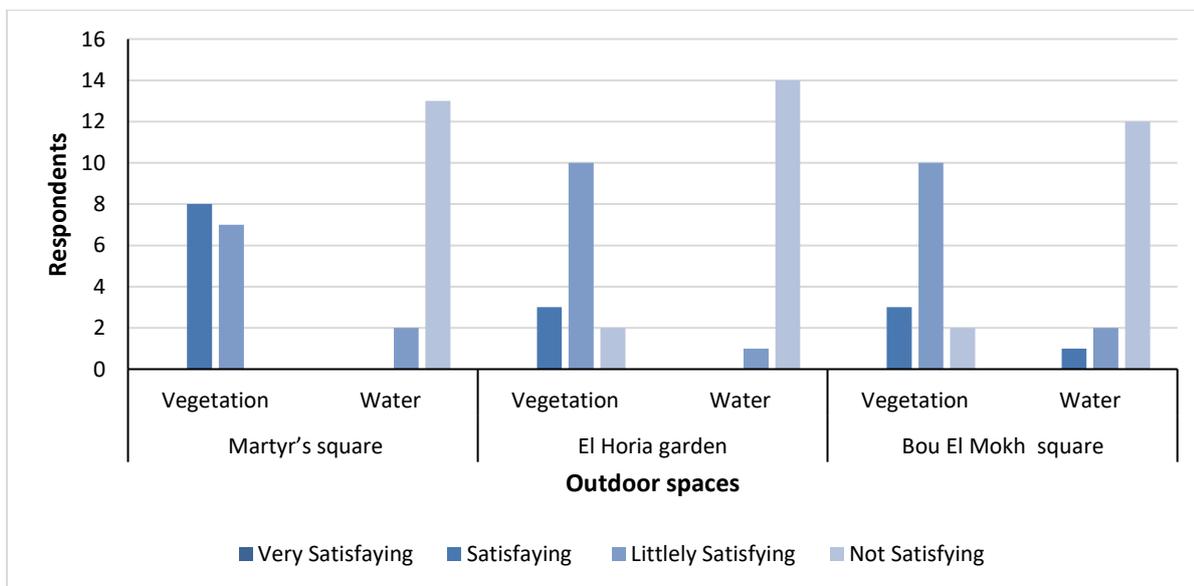


Figure 6. Assessment of the hygrothermal quality (Natural elements) in Guelma’s outdoor spaces.

In general, user’s psychophysical perception of the environmental quality outdoors depends on the physical environment features. In our study, the geographical location is the most influential parameter in the environmental quality. However, the visual and the sensory quality of El Horia garden are better perceived and described by users,

due to its situation away from nuisance and high-rise buildings. The footprint and vegetation ratio are important influential parameters in the environmental quality. Thus, users in Martyr's square perceive vegetation as the basic element that builds and gives aesthetic and hygro-thermal value to outdoor spaces.

#### 4. Conclusions

This study contributes to a new understanding of the environmental quality assessment as well as the whole atmosphere of outdoor spaces based on user's perception.

The results indicate that user's psychophysical perception of the environmental quality of outdoor spaces depends on the physical environment features, such as location, surrounding buildings, vegetation ration .... etc. However, the psychological dimension persists during the assessment and users were influenced by certain psychological feelings that create a certain belonging to outdoor spaces.

The perpetual assessment reveals that certain characteristics of outdoor spaces are similarly devalued, such as the presence of water and the treatment of green areas.

In sum, Outdoor spaces have to play several roles depending on the local context and neighbourhood, hence the use and occupancy of outdoor spaces differs from place to another, it is necessary to avoid generic assumptions and to encourage local perceptual assessments.

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#### Conflict of Interests

The authors declare no conflict of interest.

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