

# Space Use: Effect of Outdoor Comfort on Human Behaviours

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## Abstract

Urban geometry and the characteristic of built environment play an important role in outdoor comfort, they affected microclimate: air temperature, solar radiation, and wind speed, thus human behaviors and exactly people's use pattern will be directly affected by the microclimate. The understanding of this mutual relationship between outdoor comfort and people's use is a complex issue comprising both climatic and behavioral aspect.

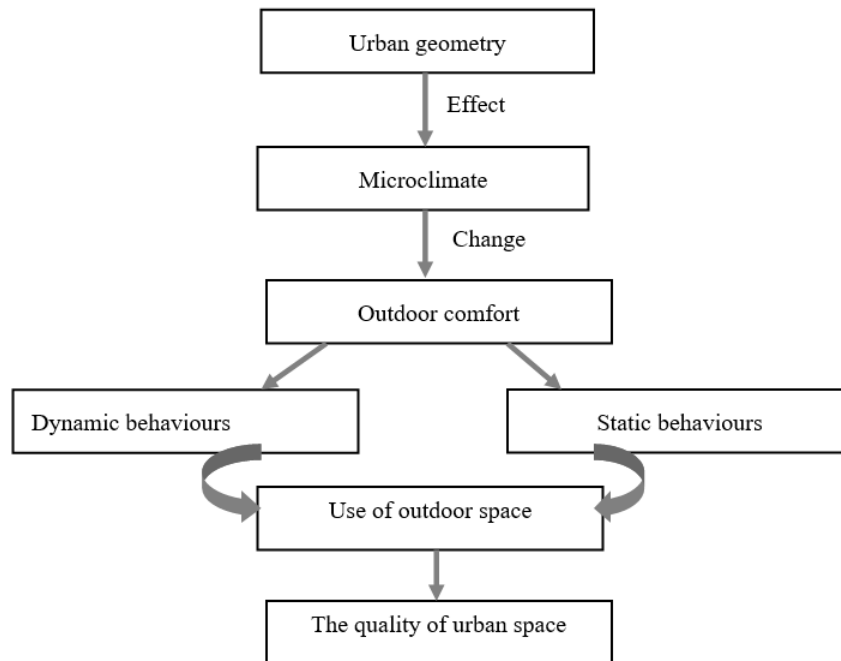
In this sense, the main aim of this paper is to present a literature review about the correlation between outdoor comfort and the use of outdoor space and discussion how people and why they use space according to environmental condition, also this paper is summarized the several studies and take into consideration the different approaches used to investigate the quality of outdoor space. Therefore, increase the quality of urban life.

**Keyword:** space use; outdoor comfort; human behaviour; microclimate; outdoor space.

## 1. Introduction

Outdoor space are important to describe the quality of urban space and contribute on the quality of urban life, however the climate change and the environment condition have a significance effect on the use of space .In the global context the built environment outdoors by itself is a modification of the environmental conditions of urban open space which can increase or decrease the environment condition. There are many studies investigates the colorations between urban geometry and microclimate, According to Ok 1988, the investigation of the influence of urban geometry on microclimate basing on the study of street canyon (H/W)which means the ratio between the height of buildings ( H) and the distance between them ;width (W) and their effect on environment conditions. In some studies F. Steemers K, Nikolopoulou M, Crowther, Dubiel, Baker (1998),Bourbia H.B.,Awbi(2003), Farid Al-Qeeq 2008, Nastaran Shishegar 2013,A.Andreau 2014,researchers used H/W to assess the relationship between street geometry and solar access. Other researches Johansson 2006, Emmanuel et al 2007,Ali-Toudert F, Mayer H 2007, Badia Masoud, Benoit Beckers, Helena Coch 2016 used the orientation of street and the measurement of street H/W to discussed shading effect on thermal environments. This studies area common concern, they investigated the relationship between urban geometry and microclimate without address how microclimatic conditions influence

the human behaviours, therefore the quality of urban life. The present work is a literature review about the correlation between outdoor comfort and the use of outdoor space. In author words how microclimate influence people 'use in urban open space. The figure 1 is illustrated the correlation between urban morphology, microclimate and human behaviours therefore the use of urban outdoor space.

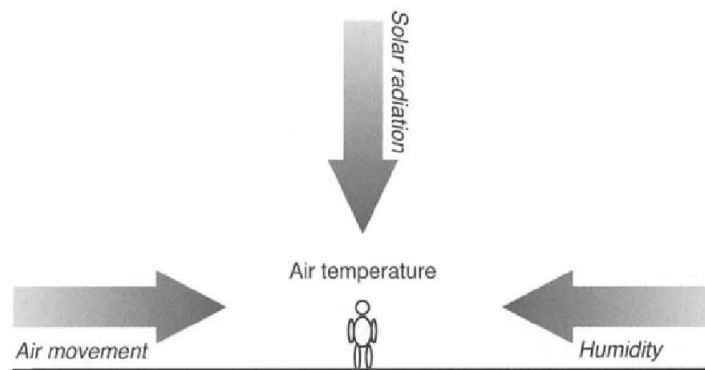


**Figure1.** Relationship between urban geometry & microclimate & space use (Developed by Author).

## 2. Effect of outdoor comfort on human behaviours

The outdoor Thermal comfort is one of the factors influencing outdoor activities in urban open space they depending on particular combination with the environment condition: air temperature, humidity level, solar radiation and wind speed. For example. In the cities with hot and arid climate and exactly in the warm season, people staying outdoors exposed to much sunlight, this is may discourage them for staying outdoor and use the urban open space; streets, plazas, urban parks etc, However the availability of shaded areas in outdoor space increase the attendance and the use of open space by the public. In a similar way, in a cold region, a given combination of wind speed and air temperature, or the obstruction of the sun in shaded areas, may discourage people from staying outdoors while the provision of sunny areas protected from the prevailing winds may encourage public activities in that outdoor space.

Thus, confirm that the outdoor comfort effect the people ‘use, and the minimizing of outdoor discomfort may enhance the vitality and the attendance of people in open space during periods of extreme temperatures (low in winter and/or high in summer), also the modification of the environment condition in a particle location by the design detail of outdoor space my enhance the quality of space and animate the urban life.



**Figure2.** Climate Factors and Human Comfort (Beer, Higgins, 2000)

## 2.1 Outdoor activities and quality of space

According to Gehl in his book “*life between buildings1971*” the Outdoor activities in public spaces can be divided into three categories dependent on different conditions of the physical environment: necessary activities, optional activities, and social activities.

**Necessary activities:** include those that are more or less compulsory – going to school or to work, shopping, waiting for a bus or a person, running errands, distributing mail – in other words, all activities in which those involved are to a greater or lesser degree required to participate.

**Optional activities:** – that is, those pursuits that are participated in if there is a wish to do so and if time and place make it possible – are quite another matter. This category includes such activities as taking a walk to get a breath of fresh air, standing around enjoying life, or sitting and sunbathing.

**Social activities:** are all activities that depend on the presence of others in public spaces. Social activities include children at play, greetings and conversations, communal activities of various Kinds, and finally – as the most widespread social activity – passive contacts, that is, simply seeing and hearing other people.

When outdoor areas are of poor quality, only strictly necessary activities occur. When outdoor areas are of high quality, necessary activities take place with approximately the same frequency though they clearly tend to take a longer time, because the physical conditions are better.

### 3. Method to investigate human behaviours in outdoor space

The study of human behaviour in outdoor urban spaces can be divided into three sections:

- Studies about the human behaviour in outdoor space “study of urban life”
- Studies about the correlation between human behaviour and outdoor comfort.
- Studies about the correlation between human behaviour and environment condition.

#### 3.1. Studies about human behaviour in outdoor space “study of urban life”

The Study of human behaviour in outdoor urban spaces date from the 1970’s. According to Nasar & Yurdakul (1990) the studies of human behaviours studies were conducted by registering user activities by hand on paper, time lapse photography, motion pictures and video tapes.

One of the pioneers in observing and mapping people’s preferences, activities and interactions was William Whyte In the book ‘Rediscovering the city centre’ (2009) The work conducted by Whyte (2009) was mainly focused on the streets of New York From 133 conversations mapped, 57 were recorded in the busiest areas evaluated, Whyte found that seating availability highly influenced the presence of users since “People tend to sit most where there are places to sit” (Whyte, 2009, p. 115).

-Other pioneers on the field of human behaviour outdoors , Jan Gehl & Birgitte Svarre in their book *How to Study Public Life 2013*, the Urban life is looked at in quantitative terms: how many?/ who?/ where?/ what? How long? The authors propose understanding urban life through counts, mapping, records and from historic perspective. Abdulkarim & Nasar (2014) investigate the user of public space by using a qualitative study ,the study based also on the perception of users with regards their urban space .

-A good example in the study developed by Hillier et al. (1987), the study using the space syntax tool and conducted field work to evaluate the movement patterns of people in real life. Space syntax (Hillier & Hanson, 1970) this study presented the relationship between the spatial layout and the human activity generated by this.

**Table 1.** Literature review about human behaviours in outdoor space

Studies about human behavior in outdoor space “study of urban life		
<i>Author</i>	<i>Article &amp; Book</i>	<i>Method</i>
Hillier et al. (1987)	Space is machine	Space syntax
Nasar & Yurdakul (1990)	Patterns of behavior in urban public spaces	Observation & registering user activities by hand on paper, time lapse photography,

William Whyte (2009)	Rediscovering the city center	observation & Behaviors mapping
Gehl & Svarre, 2013	How to study public life'	urban observations
Abdulkarim & Nasar (2014)	Are livable elements also restorative?	Observation and registration

### 3.2 Studies of human behaviour and outdoor comfort

The first study of the influence of microclimate on outdoor activities is by Gehl 1971 in his book *life between buildings*. According to Gehl 1971 this studies focused on the interaction between the physical environment and activities in outdoor public.

Several studies based on the collected observational data of number of people and type of activities, in conjunction with environmental measurements, in public spaces and approached the subjective perspective by applying questionnaires to find users' thermal perception and comfort by measured the Actual Sensation Vote (ASV) using a 5-point scale (e.g.Nikolopoulou & Lykoudis, 2006; Thorsson et al.2007)also used the ASV but with a 7-point scale Thorsson et al.2007; Lin et al (2013) used the ASHRAE 7-level thermal sensation vote (see Table 2).

**Table 2.**The correlation between human behaviour & outdoor comfort

Studies of human behaviour and outdoor comfort			
Author	Behaviours study	City	Method
Nikolopoulou et al. (2001)	Attendance	British city (Cambridge)	Survey method -interviewed people -Actual Sensation Vote (ASV) -Counting
Nikolopoulou et al. (2004)	Various	project RUROS 7European cities	Same method
Nikolopoulou & Lykoudis, 2007	Presence, Sitting	Athens, Greece	Same method
Sofia Thorsson et al 2004	Stay and rest	Swedish city (Gothenburg)	Interview, Questionnaires vote
Sofia Thorson et al 2007	Various	Tokyo in Japan	Interview, questionnaires, unobtrusive observation

### 3.3 Studies of human behaviour and environment condition

In this section, researchers are studied the link between microclimate and use of urban open spaces eg, sitting behaviour and air temperature , the studies are regarding the environmental conditions and focused on the adaptive behaviour and perception of users. See Table 3.

**Table 3.** The correlation between human behaviours & environment condition

<b>Studies of human behaviour and environment condition</b>			
<i>Author</i>	<i>Behaviours study</i>	<i>City</i>	<i>Method</i>
<b>Zacharias, Stathopoulos, and Wu 2001</b> The same methodology of the previous study was used to study seven plazas located in a corporate area of San Francisco ( <b>Zacharias, 2004</b> )	Sitting, standing smoking	Montreal, Canada	Observation -presence counting  -regression analyses  -ANOVA tests
<b>Eliasson et al. (2007)</b>	the number of people (lying, sitting, standing and walking) and activities (eating, talking and reading).	in Gothenburg, Sweden	Interviews Observations measuring environmental conditions
<b>Li (1994)</b>	demographics, time of stay, grouping (alone or in groups)	fifteen squares of New York	observational samples

## Conclusion

The paper presents a literature review about the human behaviours in outdoor urban space in term static and dynamic activities(mobility) , previous studies have approached the assessment of human behaviour from different perspectives:

Objective perspective :by behavioural methods based on observational analyses and mapping user behaviour (e.g. Gehl et al. (2006) and Maruši (2011)) these methods are focused on observing the behaviour of a person or a group in relation to the environment. Thorsson et al., (2007) collected observational data of number of people and type of activities, in conjunction with environmental measurements, in public spaces

Subjective perspective: by applying questionnaires to find users' thermal perception and comfort (e.g. Nikolopoulou & Lykoudis, (2006); Thorsson et al., (2007)) measured the Actual Sensation Vote (ASV) using a 5-point scale; Thorsson et al. (2004) also used the ASV but with a 7-point scale; Lin et al. (2013) used the ASHRAE 7-level thermal sensation vote.

As the result, the increase of the quality of urban life depend on the increase of the quality of outdoor space by the responses to the needs of people 'uses, on another word, the understanding of how people and why they use space according to environmental condition.

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