

The design of the walking environment

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Abstract

This paper refers to the issues of the EC COST Action n. 358 Pedestrians' Quality Needs and deals with the re-design of the public space at the project level, referring mainly to Comfort/Well-being requirements, and to the activities that pedestrians perform in it.

A valid indicator to measure the quality of a public space is the development of relationships between people. Although necessary activities can also be performed in an unattractive space, without minimum spatial standards and without well-being characteristics, it is clear that optional activities depend to a significant degree on what the place has to offer and how it makes people behave and feel. Squares, street closures and shared spaces are an opportunity to revive entire urban areas, sparking the development of new recreational and/or commercial activities and attracting new pedestrian flows. These spaces have to be a part of a seamless pedestrian network, created with traffic calming measures which, for the maximum efficacy in reducing vehicular speed, should be implemented all together.

In this meaning to re-design the walking environment at the project level signifies to answer to all the requirement classes, because an urban space of quality is the one determined by people's fundamental needs and expectations: accessibility, related to transport, means and network, and to infrastructure; safety, related to the use of the urban spaces and to the interference with other transport modes; security, related to lighting, presence of activities, morphology of the path, and its maintenance; usability, related to the presence of facilities that make a place full of activity; appeal, related to aesthetics; sociability, related to the liveliness of the urban space; management, related to cleanliness and upkeep; integrability, related to flexibility and possibility of change.

But, in our consideration, Comfort/Well-being play a more actual role than the others requirements, aiming to solve the problems related to urban pollution and climatic changes, and it is closely related to environmental sustainability issues. The environment safeguard is a must, since in designing an urban space appropriate to pedestrians' requirements is imperative to follow principles and criteria of sustainable development, in order to obtain safer, healthier, more friendly and appealing cities.

The suggested design strategies that answer to this requirement are aimed at increasing the space devoted to pedestrians and the quantity of green, both linear and surface; at enhancing the appeal, meaningfulness and legibility of the urban environment interpreting and respecting its values; at using materials and components that are durable and easy to upkeep.

Referring to this last strategy the most suitable materials to satisfy the pedestrian requirements of Well-being will be listed, as a matter of fact that the design and re-definition of a pedestrian area play an important role not only from a formal point of view but also from a material one.

Biography

Chiara Tonelli, PhD in Architectural Technology, is Lecturer at the Faculty of Architecture at the University of Roma 3 since 2007 and member of EC COST Action n. 358 on Pedestrian's Quality needs. Her research interests focus on the relationship between a sustainable development of human activities and architecture.

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Strategies to increase urban comfort in the Mediterranean area

Chiara Tonelli

Summary

This paper refers to the issues of the EC COST Action n. 358 Pedestrians' Quality Needs dealing with the design of the walking environment at the project level, referring to the activities that pedestrians perform in it and considering mainly the requirement of Comfort/Well-being. Of course all the main requirement classes are important, such as accessibility, related to transport, means and network, and to infrastructure; safety related to the use of the urban spaces and to the interference with other transport modes; security; usability; appeal, related to aesthetics; sociability, related to the liveliness of the urban space; management, related to cleanliness and upkeep; integrability, related to flexibility and possibility of change.

But Comfort play a crucial role, aiming to solve the problems related to urban pollution and climatic changes, and is closely related to environmental sustainability issues and environment safeguard, in order to obtain safer and healthier, more user friendly and appealing cities.

The meeting of these requirements considers solutions that are studied taking into consideration "with awareness" the context - both built and natural - in which the design proposals are devised.

Activities in the walking environment

To design the spaces devoted to pedestrians in such a way as to meet their requirements, it is important to understand the activities they wish to perform in such spaces.

Gehl¹ distinguishes between necessary/functional activities, optional/recreational activities and social activities in public spaces (see Figure 1).

The first, associated with job, study or daily lives, are mainly performed by movement.

The second are ones of *choice*. They are performed in one's free time and in a pleasant environment and, normally, without movement.

The third, a consequence of the second, depend on the *co-presence* of people in the space.

While necessary activities take place regardless of the quality of the physical environment, optional activities depend to a significant degree on what the place has to offer and how it makes people behave and feel about it.

Much has been written on this subject from a dimensional point of view and the dimensional range required by a pavement to provide space for various activities is known. This approach primarily considers the minimum space required to carry out an activity, taking into account that spatial characteristics have little effect on necessary activities.

However, when "social" is required in urban areas, the dimensional aspect becomes just a necessary, but insufficient, element. What is more important is the need for special equipment and specific environmental conditions associated with comfort, such as microclimate, sound, visibility, smells, etc..

In other words, the organisation of space no longer involves just the pavement, but the entire pedestrian network including its adjacent areas – roads closed to the traffic, squares, gardens and city parks. These kind of spaces, to favour social life, require more elements, such as water, vegetation, elements of attraction, furnishing,

¹ Gehl, J. (1987); Gehl, J. & Gemzøe L.(1996); Gehl, J. & Gemzøe L. (2001).

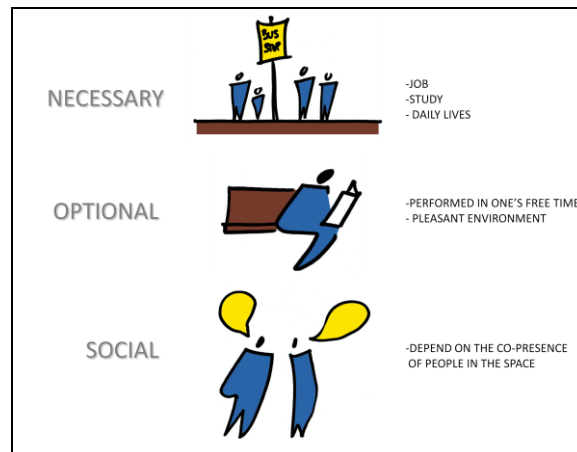


Figure 1. Pedestrians' activities in the public space

The better a place, the more optional activities occur and the longer necessary activities last. Social activity is the fruit of the quality and length of other types of activities, because it occurs spontaneously when people meet in a particular place. Social activities include children playing, greetings and conversations, communal activities of various kinds, and simply seeing and listening to other people. Communal spaces in cities and residential areas become meaningful and attractive when activities of all types occur in combination and supply each other.

The type of activities that should be included in a comprehensive vision of pedestrian requirements are therefore the following: walking, stopping and sitting, looking, listening and talking.

As regards walking, we can satisfy these needs by considering the impediments involved in moving from one place to another. Stopping and sitting is a basic activity that exploits urban space. Even though there are many reasons for stopping or sitting, the three primary ones are:

- the need to rest,
- the need to wait (for a means of public transport, a person or an appointment),
- the desire to look at the city or meet other people.

All our senses are employed in the perception of the environment, but sight and sound are the most important: when what we see and hear is not perceived as irritating, then this creates the minimum conditions of acceptability for active listening and observation. There are many ways in which conversation in public spaces can take place: between friends or between a mother and her child, during causal encounters between acquaintances or strangers: this proves how the possibility to converse is important as an indicator of the quality of the pedestrian space, whether walking or stopping/waiting.

In the light of what is above mentioned, we believe it is useful to carefully study several "Comfort" requisites and performances that play a key role in the creation of a sustainable urban space, usable by pedestrians.

In general it is imperative to guarantee more green and friendly areas without smog, noise and risks in order to favour people's interaction more than the actual urban areas do. To obtain this environmental quality it is necessary to work on aspects that give added value to the urban areas such as the increase of vegetation, both linear and surface, creating a green network, as well as the use of materials, components, and urban furniture, durable and easy to upkeep, that are congruent with local architectural features.

Comfort of the walking environment

There are many kinds of sensorial comfort: thermal, visual, acoustic, tactile, olfactory, respiratory and hygienic. It involves active and passive adjustment to different environments. The perception of the environment can be quantitatively measured (physiological response) but it is a subjective and cultural element that is difficult to measure.

Although all these parameters contribute to the overall well-being of the pedestrian in space, microclimatic parameters² determine the use of urban spaces. In fact, reactions to the microclimate can be unconscious, but very often induce a differentiated use of open space depending on climatic conditions.

For this reason, comfort is considered as:

- physical well-being, involving climatic factors and microclimatic conditions, caused by forms and functions of the urban environment (buildings, green areas, water, type of mobility, spaces, uses, ...);
- psychological well-being;
- convenience when moving or stopping, while using space in different ways.

The variables that characterise the microclimate at different times of the day and the year are:

- solar radiation,
- air temperature,
- relative humidity,
- wind speed.

However, although the environmental parameters influencing the conditions of external thermal comfort are similar to those of building inner spaces, they are more numerous and variable. In fact, design solutions compatible with the context in which the measure has to be implemented must be based on the study and interpretation of the buildings and natural (morphological and material) elements of that context as well as on their relationship with adjacent open spaces and urban surroundings.³

The evaluation systems developed for different geographical areas allow assessment of the microclimatic behaviour of a place. It is therefore possible to use certain factors to modify the effects and interactions they cause to the thermo-hygrometric, acoustic and atmospheric environment. However, a thorough examination or assessment of these methods is not part of this paper.⁴

The following paragraphs therefore focus on several design strategies that can be generalised for temperate climates, concerning the Mediterranean area in particular, and be used to support some design choices.

Some comfort design strategies for the walking environment

In temperate climates, requalification and redesign of urban space contribute to enhancing environmental comfort as regards thermo-hygrometric, acoustic and air quality factors as well as reducing annoyance factors.

However, generalised solutions to the problem will only affect certain choices, because it is the design and analysis of the specific characteristics of a place that can establish the actions best suited to solve the problem. In fact, the objective of the requirements, indicators and measures is to support the drafting of the project in a performance-oriented rather than prescriptive manner. The strategies are therefore illustrated only to exemplify possible solutions to the more common problems.

One should also remember that the solution to one problem might lead to other problems. For example, although a light-coloured and solar reflective material for a floor is an excellent solution for the summer months because it limits absorption and ensuing release of heat, the glare can be

² The urban microclimate is an atmospheric situation within the urban framework that causes inhomogeneous conditions for a person at a distance of 150 m.

³ See Grosso, Peretti, Piardi & Scudo, (2005), pp. 109-128.

⁴ For more information about how to measure the urban parameters that influence the microclimate, see Nikolopoulou, M. (editor), (2004); Grosso M., Peretti G., Piardi S. & Scudo G. (2005); Dessi, V. (2007).

visually uncomfortable. Only by reviewing and examining all these aspects it is possible to identify the strategy that best meets all the requirements. An interaction between the different strategies is very important, in order to affect the microclimate conditions of an urban area dedicated to pedestrians.

The following paragraphs deal with some strategies to enhance the urban microclimate concerning air quality and thermo-hygrometric comfort including wind control, employing vegetation, water and materials.

Vegetation in the walking environment

The vegetation plays a crucial role in controlling several aspects of the urban space.

First of all the appeal of an urban space is increased by the presence of trees.

But vegetation is the most important thermo-hygrometric control system. Trees in particular could act as mobile screen, preventing overheating during the summer and increasing winter irradiation (Figure 2). However, the amount of the summer shadow depend on the form and size of the tree, but comparing to plastic, wood or metal screenings the quality of the trees shadow is much better.

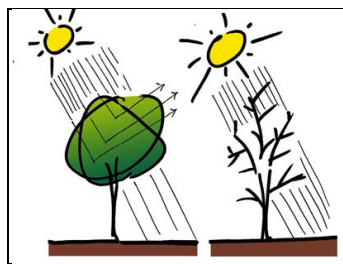


Figure 2. The vegetation role preventing summer overheating and increasing winter irradiation

The vegetation subtract from the environment a big amount of thermal energy, transforming the solar radiation by photosynthesis and evapotranspiration (Figure 3).

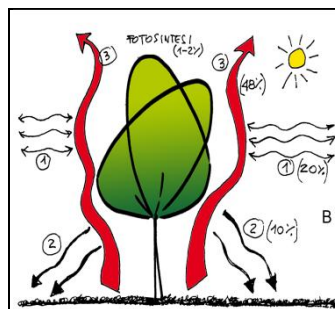


Figure 3. Energy exchanges, aside photosynthesis: 1. Infrared radiation; 2. Reflected radiation; 3. Evapotranspiration

During the summer it regulates direct, diffused and reflected solar radiation (Figure 5), create air flows acting as natural deviator, channelling summer winds especially towards outdoor spaces normally used in the afternoon (Figure 4).

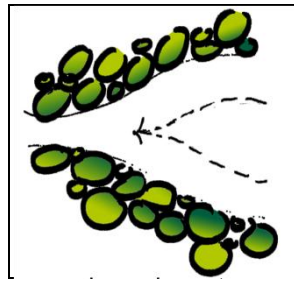


Figure 4. Summer wind channelling effect

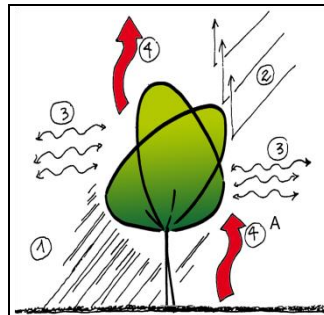


Figure 5. Shielding effect: 1. Shading; 2. Reflecting; 3. Air convection; 4. Evapotranspiration

On the contrary, in the winter sunlight should be available and natural or artificial barriers should help to defend against the wind (Figure 2 and Figure 6). Concerning the climate control vegetation provides shade and coolness thanks to evaporation, by and by acting as a barrier for winter winds.

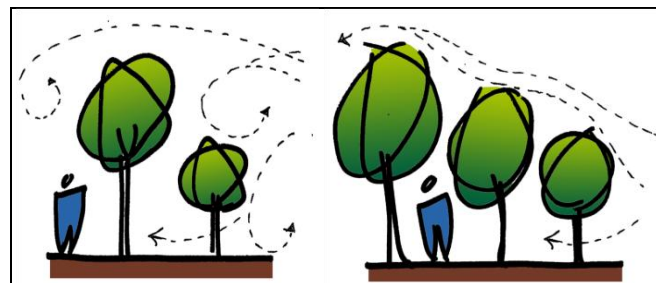


Figure 6 Winter wind vegetation barriers: wind obstruction and wind deviation effects

When comfort depends on air quality and acoustic pollution, possible sources of pollution should be identified - for example, factories, industrial discharge, high density road networks - to assess the possible effect it may have on pedestrian areas. These measures are obviously "passive", i.e., they do not affect the source. They consist in trying to place newly designed pedestrian areas upwind compared to the polluting sources and far from the canals of the polluting agents (after studying the direction of prevailing winds).

Generally speaking, they include the screening of the air flows that could carry polluting substances and noises either by introducing vegetal barriers made of bushes or shrubs – effective in fighting pollution – or artificial barriers.

Instead when car emissions are the main atmospheric polluting agent, it is important to reorganise vehicle traffic, creating a safety zone between the road and recreation areas as well as introducing trees that can act as filters for air pollution as well as for acoustic pollution.

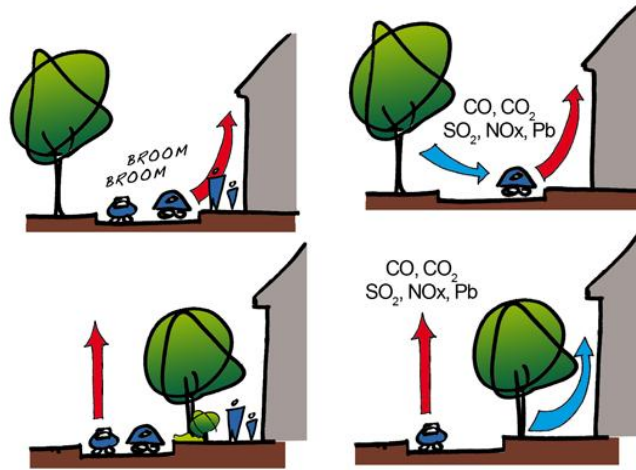


Figure 7 Simple strategies to improve acoustic and air quality comforts

Water in the walking environment



Figure 8. Some water solutions to refresh town areas (www.jmlwaterfeaturedesign.com)

The presence of water in the town helps the relationship between people, during the summer season in particular, giving identity to the areas and providing the occasion for social events. Concerning the climate control all kinds of water– lakes, fountains, cascades – cools down the air, thanks to evaporation and thermal inertia. At urban level, the presence of water could change the temperature between 0,5 to 5 °C, according to the size of the water basins. To spray water jets could refresh the air, but at the same time the water could improve the humidity of the air, not always creating a comfortable ambiance (Figure 8).

Water plays also an important role in mitigating acoustic pollution, one of the main factors of deterioration of urban areas (Figure 9).

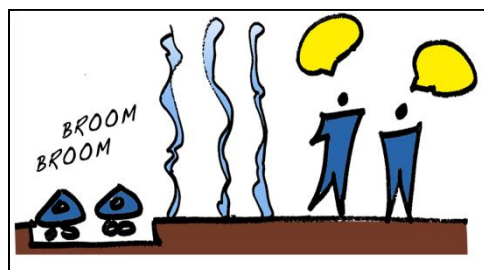


Figure 9. Water controls acoustic pollution

Materials of the walking environment

The materials used for paving, buildings and equipment of pedestrian urban areas contribute to achieve comfort.

The choice of the paving materials, furnishing and vertical coverings cause significant variations in surface temperature which is influenced by the irradiation of the surfaces and by variations in the emission coefficient as well as by the material and surface colour and the way in which the surface is treated and used.

The ground is particularly important insofar as the air temperature of a place depends on the exchange of heat with the ground. The possibility of the paving material to let the rain enter in plays a crucial role in the towns microclimate: a drainage soil is better than an impermeable surface, not only because avoids water waste, but also because permits – referring to temperature control – the water evaporation that cools the air during the summer.

Due to their luminous radiation, all materials used in an urban area play a role in the perceptive well-being (Table 1).

The thermal properties of materials (such as specific heat and conductivity) and radiometric properties (such as albedo and emissions) normally used in urban areas (concrete, asphalt), effectively induce a substantial change in the energy balance which in turn raises the urban temperature (Urban Heat Island – UHI).

MATERIALS	ALBEDO
Roads	
New asphalt	0,05
Used asphalt	0,20
Shiny grey marble	0,7
Shiny dark marble	0,35
Shiny grey granite	0,2
Shiny light-coloured limestone	0,65
Shiny dark limestone	0,5
Red bricks	0,26-0,3
Light-coloured brown bricks	0,45
Smooth concrete	0,35-0,46
Unpainted wood	0,41
Building walls	
Light-coloured external surfaces of buildings	0,60
Dark external surfaces of buildings	0,27
Surfaces in stone	0,20
Cement	0,22
Roofs of buildings	
Tiles	0,12
Slate	0,14
Undulated sheet metal	0,10
Urban and green areas	
Dry grass	0,20
Green grass	0,26
Dead leaves	0,30
Lakes	0,07
(dark) earth roads	0,04
Different kinds of terrain, clay	0,14
Woods	0,07
Woods in autumn, fields with ripe harvests, plants	0,26
Dry sand	0,25
Wet sand	0,15

Table 1. The albedo range for some of the walking environment materials
(re-edit by the author from Dessi, 2007 and ITACA protocol)

In particular the radiometric properties of emissions and albedo are the values used to determine perceptible and visual comfort and the thermal comfort provided by materials. The former provides the reduction or increase value undergone by direct and diffused solar radiation (short wave radiation exchanges) when it hits coating materials. Instead the latter involves the reduction or increase undergone by the surface temperatures (infrared long wave radiation exchanges) of all urban materials (vegetation, water, pavement materials and vertical coatings).

The materials used in an urban environment also affect air quality due to the harmful emissions they can produce. Therefore it is important to:

- use materials of attested a-toxicity;
- use easy-to-maintain materials and components;
- protect from abrasion and wash-out the materials that can release substances which toxicity has not yet been sufficiently proved;
- avoid using materials that can facilitate the accumulation or formation of dust and vegetal or animal organisms;
- avoid using potentially toxic substances in the maintenance of green areas.

The materials and equipment in urban pedestrian areas also play a role in providing acoustic comfort. In fact, the reverberations of noise have an effect on being able to stand and talk. The roughness of the coatings helps to absorb and disperse high and medium frequency sounds. Outdoor asphalt pavements have a very reflective surface, locally intensifying sound. Instead, paved footpaths provide greater absorption due to the gaps between the slabs.⁵

When automobile traffic is the source of the noise, apart from implementing together speed reduction measures or discouraging the use of private transportation, it is possible to use sound absorbent materials for the roads.

Conclusions

In conclusion to re-design an urban space it is imperative to follow and, then, to satisfy all the requirements, because an urban space of quality is the one determined by people's needs.

A valid indicator to measure the quality of a public space is the development of relationships between people. Optional activities depend to a significant degree on what the place has to offer and how it makes people behave and feel.



Figure 10. Summer and winter view of a redesigned urban area

⁵ Cfr. Grosso (2005).

Squares, street closures and shared spaces have to be a part of a seamless pedestrian network, supported by traffic calming measures which, for the maximum efficacy in reducing vehicular speed, should be implemented at the same time. Indeed, for obtaining the complete pedestrians' satisfaction, the measures that increase safety and accessibility have to be accompanied by others that improve the street legibility and that guarantee comfort and attractiveness. A talented use of vegetation, water and materials could generate comfortable urban areas, agreeable for people's social activities (Figure 10). Only by reviewing and examining all these aspects together it is possible to identify the strategy that best meets all the requirements. An interaction between the different strategies is very important, in order to affect the microclimate conditions of an urban area dedicated to pedestrians.

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