Environmental tools to design urban spaces: are they effective?

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Abstract

This research examines the nature of environmental tools used in the design of urban spaces. The goal is to identify whether architects transfer the existing environmental tools to practice, to real projects and the perception of these. The analysis draws on interviews with practitioners in the urban planning field.

The interviews sought to understand how feasible and transferable to the practice environmental tools are. Key concepts, theories and methods from architectural and urban environmental design were consulted and summarized in a matrix, compiling the most important variables concerning the environmental quality in urban spaces.

These parameters were presented in a matrix to the interviewees for consideration. Presumably, the use of environmental tools such as guidelines and parameters improve environmental performance in architectural design. But are architects using these tools? How effective and likely are they to be translated into design? What are the reasons for the use or lack of use of environmental tools?

1 Introduction

The paper addresses at the applicability and practicality of environmental tools in the architectural field. It evaluates the parameters affecting urban design and their implications in environmental performance. The interviews explored how viable is in practice the use of environmental tools, and whether the academic and theoretical materials are really being used in practical architecture.

Architecture embraces different criteria from art and science to business and marketing. It is seen as a holistic practice, which takes into account several issues. The importance of considering the relationship between architectural form
and its effects prevent architecture to become only a field of application and experimentation of concepts and methods. This would be far away from the realities of the architectural practice [1].

This research shows a wide variety of opinions. Some architects have environmental strategies whilst many have very little interest in a scientific or methodological approach of architectural design. Interviewees’ opinions are presented to explain the possible reasons and justifications, as well as the difficulties that architects find in the application of environmental methods and concepts in their projects.

This paper justifies the necessity to create a convergent system, reflecting the relationship between the architectural practice and the environmental concerns. It is therefore suggested that an “environmental priority matrix” for urban spaces can be developed. This matrix allows articulate the different design principles, guidelines and standards from professionals in the field. It can be considered a tool to achieve the highest architectural environmental quality. An attempt of this approach is showed at the end of this paper based in the output of the interviews.

2 What does an environmentally friendly project means for architects?

Environmental quality in architecture is a difficult notion to define: how green is a project? It has different values for each architect who tries to evaluate this in his or her own practice. There is a difference between those architects who are willing to take environmental issues as part of their priorities or design checklist, and the others who see architecture constrained by environmental aspects.

Before an environmental matrix is considered in design, firstly it is important define what is an “environmentally friendly project” means. Architects express what this term means for them as showed in the following quotations:

- “The whole trust in environmental considerations, is to reduce impact on the environment, in terms of how much energy does it take in each stage in the construction of the building, how much disruption elsewhere.” DB.
- “This is a kind of definition nobody knows what really means, this is metaphysics, but the important thing is to define the environmentally considerations in measures that allow us to know exactly what are the saving and profits from the architecture one is doing.” TgdL.
- “I do not believe a EFP is one that is all singing and dancing with bells and every piece of new technology being through in it for the sake of it.” ChW.

Despite different conceptions about this term, most of the interviewees agreed that more than a definition is important to establish the measure instruments that show how green a project is.

3 Environmental considerations in urban spaces design

Key concepts, theories and methods from architectural and urban environmental design were consulted and summarized. Then they were presented to the interviewees in the form of an environmental matrix for their consideration.
Figure 1: Initial aspects considered in the design of the environmental matrix.

The first part of the study was the development process of an environmental priorities matrix (pressures, concerns, etc.) taking into account the theoretical perspective. This exercise was supported in the consultation of many references. In order to obtain the more concise information the matrix was arranged according to the constant parameters, which were appearing repetitively in the different sources consulted. The main idea was to compile the most important variables concerning the environmental quality in urban spaces. Organising the information of the literature I aimed to make a connection between different variables. The resulting variables are shown in the following table (figure 1).

The analysis of these environmental aspects drove me to keep only those susceptible to be shared and common with a strong architectural as well as environmental implications. The aspects taken into account were those that were congruent with definition of an environmental friendly project: a project that harmonises with nature, taking the human being as a design scale to obtain functionality and efficiency balancing the domains of architectural design. It is important to clarify that any of the references consulted have been evaluated as better or worse than the other. All of them have important points and are based in the academic and experimental knowledge of the authors. This exercise had as main aim only to complement the general matrix with the most important points found in these guidelines, standards and matrix.

The selected parameters for each of the key aspects are related with the environmental aspect, meeting and being common in different elements of the matrix (see table 1).
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Table 1. Key and specific aspect included in the urban environmental.

<table>
<thead>
<tr>
<th>Key aspects</th>
<th>Specific aspects / Example actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental</td>
<td><em>Optimise energy conservation</em>: optimal site situation, arrangement of buildings, use of efficient material.</td>
</tr>
<tr>
<td>aspects</td>
<td><em>Climate and physical analysis</em>: air quality, water quality, geologically and topographical environment, biodiversity, noise less exposure.</td>
</tr>
<tr>
<td>Urban aspects</td>
<td><em>Site/landscape quality</em>: open spaces, landscape plan, analyse and preservation of native vegetation.</td>
</tr>
<tr>
<td></td>
<td><em>Urban location</em>: proximity to the city, energy efficient transport, building orientation, and surrounding elements.</td>
</tr>
<tr>
<td></td>
<td><em>Design of physical exterior</em>: site inventory and analysis, design on-site transport, design of exterior features.</td>
</tr>
<tr>
<td>Architectural</td>
<td><em>Analysis of the plot</em>: analysis of adequate area, arrangement of buildings.</td>
</tr>
<tr>
<td>aspects</td>
<td><em>Environmental friendly construction</em>: prevailing wind flow and solar orientation, material selection, physical context integration (natural and built environment).</td>
</tr>
<tr>
<td></td>
<td><em>Physical and aesthetic properties</em>: scale, rhythm, colour of material, building façade, cultural heritage, and screening.</td>
</tr>
<tr>
<td>User aspects</td>
<td><em>Accessible facilities</em>: functions, attributes, and interactions.</td>
</tr>
<tr>
<td></td>
<td><em>Well-being</em>: spaces that do not affect physical and mental health.</td>
</tr>
</tbody>
</table>

4 Overview of interviews

From the interviews several point of views were collected. The group of interviewees was varied, 14 Mexican and 11 English architects. This group was comprised by architects from the former school of architecture to the modernist and technological tendency in advanced architectural design, and from large corporative to freelance architects. These variables gave the research a variety of responses and perspectives towards the topic. There were different answers and reactions when they saw and explored the matrix.

First of all, there was an apparent difference between architects’ ideas but at the same time they agreed that most of the elements or aspects of the matrix are important. A. Krenz argues that the society of the modern world (developed) can be divided into 3 groups – deep ecologists, shallow ecologists and those, who do not know enough to care [2]. In the particular case of the interviewees for this study (which interestingly came from a developed and a developing country),
their postures concerning the use of environmental tools can be divided in three main categories.

Firstly architects who considered that the use of a matrix such as the one showed to them contains very important information for architects and it is very useful.

- "If you want to improve the environmental performance of your building you have to measure it, whether is good or bad, because otherwise you do not know how it works." PW.
- "It is important to classify the information. There are great categories; we are creating an artifice for giving an order to the complexity and to understand all that have profundity and then to create these great sections that help us to focus attentions and interests." SA.

Secondly, architects who consider that it is important to look at the environmental issues but not as a checklist.

- "It (matrix) is fine but very methodical, it is interesting for remembering when you are designing Design goes beyond the fact that you can have something written, very methodical or trite, it goes more towards architect feelings." MR.

Thirdly, the last group that consider that architecture can be constrained by environmental aspects and they believed this methodology is far from have a relationship with architecture.

- "Design is not methodical, who follows methods to design ruins his/her career, simply he/she cancels his/her imagination, and that's it." TGdL.
- "It is (design) like learning to be a carpenter, it is more about a craft skill than a scientific undertaking… what you are trying to do it is what architects hate, it is to actually break down design in its component. And we will fight that because we see, we look at the building holistically, I know it sounds pompous but we do not tend to solve, today I am going to look at energy conservation of the building and tomorrow we are looking to do something else, everything it is coming at the same time, so we do not like it." PG.

5 Exploring the urban environmental design matrix

5.1 The most important environmental considerations

Interviewees were asked to run through the matrix, which was presented in three levels. The first level contained the four key considerations, and then the matrix broke down in more detail, presenting the second level with the specific considerations and lastly the third ends with the example actions. The study sought to find which are the strengths of the actions presented in the matrix. That is, how transferable are these concepts to practice and which were the most important factors for architects. It also sought to identity if there were missing elements in the matrix according to their perspective.

The interviewees confirmed that all of these aspects enclose the environmental priorities relevant for design. However, the results in this domain are divided in different opinions. Most of the architects agreed that the study of
environmental conditions (climate, water, air, geology, and topography among others) and energy conservation are the principal environmental considerations. This suggests that these are the most important environmental requirements in the design of urban spaces.

After this the answers descend in the level of importance. Bearing in mind that all of the considerations are important, the scale is measured from important to most important. As shown in figure 2 the environmental considerations were classified in 5 groups, considering the number of respondents that chose each aspect in the matrix.

Despite the different perspectives about the matrix, architects coincided with the fact that the considerations pointed out in the matrix are those that architecture takes into account in design. However some of them affirmed that the presentation and execution of these considerations has to be intuitive, and not a scientific or methodical undertaking.

5.2 Missing aspects from the urban environmental design matrix

According to their experiences, architects commented on the original matrix and also observed if there were some missing aspects or important considerations to add. It is very important to take into account not just the theoretical perspective regarding environmental design in architecture but to realise the practical issues are very important in the execution of greener approaches.

![Diagram showing environmental considerations in urban design](image-url)

Figure 2: Most important environmental considerations in urban design.
Many of these issues were mentioned by architect and from there the original matrix was changing. The following section explains the additional considerations that would be important to consider.

5.2.1 Ecological economics
The economic aspect, as defined by most of the interviewees, is one of the main drivers in design. Ecological economics is essential to have if a matrix for environmental design is to be followed. Architects affirmed that a project to be environmentally attractive has to be economical attractive. The greener proposal needs to present the benefits and profits. In other words, how much a green project is going to pay?
  - "If somebody finds a particular good economical way to make environmental projects, it is interesting how quickly it is picked up by everybody, it gets in the magazines and everybody starts to say: "ah... I see, lets try to do it"." PG.
  - "It cannot be environmental issues, unless you can convince that it is... you know it comes down to the economic issue, you have to convince that it worth." PW.

Sometimes there tends to be a conflict between the economic-physical-environmental relationship. Particularly in economic, because people would say that things well designed, performing well are expensive. Therefore it is an important factor.

5.2.2 Urban and spatial and context
The conditions in every project are different, consequently sometimes the application of environmental considerations in terms of transport or building orientation can be very limited by the spatial conditions.
  - "Transportation is difficult. We can encourage the owner to have a greener transportation. We can't do a lot in air pollution." DTh.

Architects mentioned the constrains when they have no choice in the orientation of the building, maybe they have a plot in the middle of a very difficult urban area where working with wind modelling, passive systems or just orientation strategies is very difficult.

Another point stated by architects was to look at the legibility of the space. In terms of Kevin Lynch this is the apparent clarity of the cityscape, in this case of the urban space. This means the ease with which its parts can be recognised and can be organised into a coherent pattern [3].
  - "If the project worth an analysis this would start with, in terms of our use, legibility: understanding the city." DW.

5.2.3 Environmental consciousness of client and user
Environmental culture and consciousness are important aspects in design. Architects argued that people do not just live the city and its spaces, but also understand how it works. In some cases, clients do not go for greener options because they do not know enough to care about them. Therefore architects have
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to let them know about these options and if possible convince them to pursue them.
  ▪ "I have to educate my clients to be enthusiastic about this approach and why we are doing it. The approach needs to be practical, to obtain the balance we are trying to create." CHW.
  ▪ "Architecture is as good as the client or the people who commission the work, because they clearly have huge control of what happens." BS.

It is true that in the decision making process the client has a crucial part, but being architecture a medium to express, architects can be the messengers of new tendencies, raising environmental awareness and care in architectural design.

5.2.4 Spatial experience

The relationship between the observer-user and the space is a basic consideration in the creation of an environment. The observer has a great adaptability to the spaces, which may lead architects to miss the creation of a healthy and agreeable spatial experience.
  ▪ "You do not talk about the spatial requirements, the spatial experience. Spatial life ness! It is absolutely crucial a big category for that." KG.

The relationship between user and space has to be close, with free-moving accessibility not just physically, but intellectually that allows he or she to have orientation and sense of such as space. The space has to be functional and efficient. But equally important is to be well structured and purely creative.

5.3 Convergent approach: output of the exercise

After an analysis of the interviews the matrix was amended with the extra considerations explained above. This gave the exercise a theoretical and practical approach. The output is shown in figure 3, underlining the added elements based on the interview responses.

6 Conclusions

Despite some of the interviewees consider the scientific method of the environmental matrix as constrain of their creativity, architects have the knowledge that every environmental aspect is important. They recognise that design is a holistic approach, but sometimes the priorities are not the same for each project. Therefore, they consider that an environmental matrix cannot suit every single project. I agree with this approach, but I also believe that having a consensus in which the environmental factors could be taken into account in a urban project, it would be easier to translate environmental quality into architectural quality.
Environmental aspects

<table>
<thead>
<tr>
<th>Optimise energy conservation</th>
<th>Climate and physical analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site and landscape design</td>
<td>Urban location</td>
</tr>
<tr>
<td>Environmental friendly construction</td>
<td>Analysis of the plot</td>
</tr>
<tr>
<td>Environmental consciousness</td>
<td>Accessibility</td>
</tr>
<tr>
<td>Budget for a greener proposal</td>
<td>Losses and benefits of the project</td>
</tr>
<tr>
<td>Design of physical exterior</td>
<td>Physical and aesthetics properties</td>
</tr>
<tr>
<td>Urban and spatial context</td>
<td>Spatial experience</td>
</tr>
<tr>
<td>Architectural aspects</td>
<td>User/Client aspects</td>
</tr>
<tr>
<td>Economic aspects</td>
<td></td>
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</tbody>
</table>

Figure 3: Improved aspects considered in the design of the matrix.

There is the necessity of new models to replace the random hierarchy of environmental process. So until architects have a better consensus in this respect it would be easier for them to qualify how green are their works.

Architectural process is complex and sometimes contradictory. Every architect expressed that even when they know these environmental requirements, it is not that simple to apply them in practice because it depends on the “real factors” that affects such a design process. Unfortunately, the environmental aspect suffers a major segregation when they have to decide which criteria come first.

The environment is something that architects always have to work with. Peter Manning considers that environmental failings may happen because of design: the innumerable interacting factors and variety of design professionals involved in the decision-making process [4].

Architects complained that they have “to educate” a client in environmental issues, but as was mentioned before, Is not an architect a messenger and a medium to express the new tendencies in art, technology and environmental issues? It is difficult to establish the line between the professional ethics and the client’s expectations. There is no single answer to this issue; however is important to analyse what is the role of the architect, is he a follower or is he a leader?

- “A designer has always been also a teacher, in a position to inform and influence the client. With the present environmental mess it is even more important than we help to guide the intervention of design with nature and mankind” Victor Papanek [5].
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Why architects argue that a tool such as an environmental matrix breaks down architecture and does not let them to develop their creativity, and is considered as a limitation in design? Maybe this is influenced by the way they are schooled and the way architectural discourse is addressed.

Steven Szokolay considers that the increasing importance of sustainability should have brought an increasing reliance on scientific thinking but it did not. His observation of recent history and the alternating influence of science and art on the practice and discourse of architecture generate this conclusion [6].

The question is: If art and technology are in continuous evolution and change, and new buildings with very vanguard technology and styles are being built, why are architects not exploring and carrying out greener projects?

Architects have to synthesize their ideas and priorities and it becomes a critical evaluation of the objectives, cost, preferences and necessities of clients, and other limitations.

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References