SUSTAINABLE ARCHITECTURE AND TRADITIONAL RURAL ENVIRONMENT: MORATALLA (MURCIA, SPAIN)

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ABSTRACT

This paper attempts to demonstrate the relationship between sustainability and vernacular architecture, being focused on a specific research carried out in the old part of Moratalla, a town in Murcia (Spain). This study has been possible thanks to the collection of 265 field records with in situ data so that quality and quantity can be measured. All these are distinctive parameters of vernacular architecture of the centre in the Middle Ages, what teaches us an important lesson of how traditional construction is environmentally friendly and sustainable, thus leading to more practical bioclimatic architecture. The current study relies on an agreement between the Catholic University of Murcia (UCAM) and the town council of the aforementioned town (Moratalla), what gives an idea of its importance. Some recommendations have been included at the end of the paper to be taken into account by municipal legislation so that our building heritage can be preserved and maintained.

Keywords: Moratalla, Architecture, Sustainable, Vernacular.
1.- Introduction
The town of Moratalla can be found in Murcia, exactly in the Northwest part and, because of its old area and its archaeological sites, it is recognised as one of the most significant historical centres in the region. Furthermore, due to the amount of sheltered areas all over its extensive municipality, it has always been the perfect scene for settlements.

One of Moratalla’s most significant cultural and historical values is undoubtedly its traditional architecture; it is important to mention here its streets, which are winding and perfectly adapted to the hills under them, leading to picturesque and charming squares. At the same time, the beauty of Moratalla is enhanced by different temples and noble houses distributed everywhere.

Nowadays, all its rich history, which remains reflected on buildings and streets, monuments and other archaeological sites, is bound to become a defenceless and silent landscape with the process of gradual abandonment of traditional ways of life and the passing of centuries. In this way, this research attempts to make Moratalla more known and popular, while, at the same time, its purpose is to contribute to perpetuate the area.

Concerning issues related to sustainability, it is relevant to refer to the current concern for this aspect in the present model of urban development, nowadays committed to the amount of resources involved in the process. The study of traditional architecture leads to sustainability criteria that exploit the characteristics, called passive, of the elements constructed so that the excessive consumption of resources and power sources are damped in the building process. Thus, highlighting and discovering the bioclimatic aspects of these traditional buildings may help to improve building criteria and, in this way, the consequent outcome.

![Fig.1 “Panoramic view of Moratalla. Murcia. Spain”. Source: The author.](image)

2.- State of the art
The most widely accepted definition of sustainable development appeared in 1987. From that day, sustainability means meeting the needs of the present without compromising the capacity of future generations to satisfy their own needs [1].

The extensive spreading of the concept of sustainability highlights in a clear way the crisis of the conventional concept of development to the extent that the
unsustainability of the current process of development and modernization is acknowledged [2].

The purpose of this research is to throw light on these key elements, inherent in the part of the old town centre of Moratalla and, at the same time, in other historical centres of the Mediterranean. A good way to contribute to these sustainability criteria that society demands nowadays is by explaining, defining and spreading them.

Today, the present development trend, more committed to an excessive use of the available resources by means of the industrial and technological development, has forgotten the importance of their respectful and rational exploitation, being still more present in traditional architecture.

Thus, overall sustainability could be defined and understood as the increase in social and economic capital, in a way that the consumption of natural resources is minimized [3].

As Casado points out (1996), construction materials’ main effects on environment are: energy consumption, solid waste production, depletion of the ozone layer and the greenhouse effect, as well as other environmental factors that lead to destabilization [4].

The employ of sustainable techniques and materials could be linked to a more and more desirable localism, reducing carbon dioxide resulting from transportation pollution [5]. Therefore, the development of small and medium enterprises in local or regional areas and the promotion of culture are so important in order to reduce transport distances. In this way, for the benefit of sustainable construction, decentralization in the production of raw materials and finished products is a desirable strategy.

At the same time, it is also worth highlighting at this point that the construction sector, for the sake of greater sustainability, must encourage refurbishing, entire areas or smaller ones, such as buildings and neighbourhoods [6].

There can be little doubt that the large park built adds value to our society and, under the demographic stagnation that afflicts our country, it is an opportunity as well to stop the extensive urban growth undergone by peripheral districts and suburbs of our cities and towns. They are further and further from city centres and services, what leads to longer distances among development dependent centres and greater need to travel as a consequence. The result is, thus, that our city centres are usually forgotten and empty, often relegated to marginal and slum neighbourhoods or tourism.

In our opinion, refurbishing can add value to obsolete buildings which in most cases are located in central points of towns and cities, what is a powerful weapon in favour of sustainability.

Despite some pessimistic tendencies towards this emerging environmental problem, some positive aspects should be highlighted, such as greater predisposition towards the sustainability in our model of Mediterranean compact city, since its configuration fits better inside a more sustainable prototype following the corresponding modifications [7].

3.- Methodology

This research is limited to the historical centre of Moratalla, and more specifically to an area whose first city planning refers to an expansion which took place between the 6th and 14th centuries. While the study is being developed for the entire old centre of the town, at this point, the partial results obtained for his sector are shown, being this a relevant area for future research.
After a first step of literature review, it was concluded to use several real examples as a method of study in order to analyze construction features. Therefore, this would lead to draw conclusions applicable to the field. This method stands out for direct observation of the studied phenomenon. In this sense, the chosen town is sufficiently representative of traditional architecture linked to rural environments in our region and even within the Mediterranean.

For the analysis of the area, 56 field records with in situ data have been used (fig.2).

Fig.2 “Model of field record”. Source: The author.

The record has two clearly differentiated parts. In the first one, general architectural data of the studied buildings are reflected such as UTM coordinates, location with postal address, type of property, preferred use, number of floors, date of planning implementation, existing facilities, sidewalks, finishing material, location maps, aerial and front pictures, etc.

In the second part, a series of starting hypotheses (based on Neila´s book mentioned in the references) are suggested, dealing with the characteristics of the sustainable architecture in that area, such as proposed vegetation, walls of high thermal mass, arrangement adapted to topography, façade in light colors, cooling by vegetation and water evaporation, interior courtyard space, spatial sustainability (based on the overlapping of spaces within a same place), type of roof and materials, etc.

In order to identify and organise data, a research was developed in the municipal archive and the Alcabala Excise of 1566 (fig.3) can be highlighted as the first historical document, where the names of some of the oldest streets of the town centre are shown.

Fig.3 “Extract of the Alcabala Excise of 1566”. Source: The author.
These findings allowed us to differentiate four zones within the old town centre, among which those expansions carried out around the 6th century and until the 14th century are highlighted.

It must be also pointed out that the records do not collect the whole of the buildings present in the field of study, but a selection of them has been chosen according to their importance in the environment.

**4.-Data Analysis**

The data analysis reveals clearly and concisely the starting hypotheses in the buildings studied. The characteristics studied in this paper are based on Neila’s book and they refer to constructive, compositional, distributional and finishing characteristics.

<table>
<thead>
<tr>
<th></th>
<th>EAST</th>
<th>SOUTH</th>
<th>WEST</th>
<th>NORTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>15</td>
<td>15</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>Minimum</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td>Maximum</td>
<td>30%</td>
<td>20%</td>
<td>40%</td>
<td>19%</td>
</tr>
<tr>
<td>Average</td>
<td>15,73%</td>
<td>15,30%</td>
<td>14,52%</td>
<td>14,71%</td>
</tr>
</tbody>
</table>

Box 1 “Facade exposure and apertures in them”.

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>With Protection</td>
<td>41</td>
<td>73,24%</td>
</tr>
<tr>
<td>Without Protection</td>
<td>15</td>
<td>26,76%</td>
</tr>
</tbody>
</table>

Box 2 “Protection in apertures”.
Chapter VI - The study of the city as a strategy for sustainability

<table>
<thead>
<tr>
<th>Apertures with reduced dimensions</th>
<th>Units</th>
<th>Porcentaje %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32</td>
<td>57,14 %</td>
</tr>
<tr>
<td>Apertures with non reduced dimensions</td>
<td>24</td>
<td>42,85%</td>
</tr>
</tbody>
</table>

Box 3 “Percentage of apertures with reduced and no reduced dimensions”.

Therefore, the relationship between environmental architecture and nearby rural buildings is shown, what contributes to a first and necessary knowledge of the situation, meaning a previous step for its spreading and subsequent maintenance.

![Fig. 5 “Panoramic view of Castle street”. Source: The author.](image)

<table>
<thead>
<tr>
<th>With interior courtyard</th>
<th>Units</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
<td>26,78%</td>
</tr>
<tr>
<td>Without int. courtyard</td>
<td>41</td>
<td>73,21%</td>
</tr>
</tbody>
</table>

Box 4 “Interior coutyards”.

<table>
<thead>
<tr>
<th>With spatial sustainability</th>
<th>Units</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>22</td>
<td>39,28%</td>
</tr>
<tr>
<td>Without spatial sustainability</td>
<td>34</td>
<td>60,71%</td>
</tr>
</tbody>
</table>

Box 5 “% Spatial sustainability”.

It can be checked that the maximum number that can be reached is 40% and the average number goes around 15%. Regarding the existence of solar protection, its presence is also noticed with a percentage of 73%, what shows how well preserved the area is, being the most populated of the old town centre due to its location and access to road traffic around.
Small sized apertures or fenestration in the façades are present around 57%, giving an idea of the importance of this feature, as planning permission for larger apertures was allowed at a later date, having also into consideration the importance of the
street. This parameter also enables to passively con-trol summer solar radiation in the facing walls.

<table>
<thead>
<tr>
<th>Units</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>With cooling</td>
<td>11</td>
</tr>
<tr>
<td>Without cooling</td>
<td>45</td>
</tr>
</tbody>
</table>

Box 6 “Cooling by vegetation and water evaporation”.

Concerning the existence of interior courtyards which help to regulate the temperature of the rooms that lead off from them, it can be noted that there is a presence of 27%, which is quite significant because of the importance that builders in those days gave to this bioclimatic solution. While there is room for improvement, we must say that the old part of the town has the less percentage of this feature.

<table>
<thead>
<tr>
<th>Units</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>70 cms.</td>
<td>40 cms</td>
<td>52,23 cms</td>
</tr>
</tbody>
</table>

Box 7 “Walls thickness in high termal mass”.

<table>
<thead>
<tr>
<th>Units</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptation topography</td>
<td>56</td>
</tr>
</tbody>
</table>

Box 8 “Adaptation topography”.

Spatial sustainability is understood as the over-lapping of different spaces under different ownership in a single plot, traditionally used by the locals to solve their space requirements without increasing the volume. In this area, this figure reaches a percentage of 40%, which is quite high in comparison to other areas in the same old town centre. It is worth emphasizing that this solution of acquiring more space from neighbouring properties to meet one’s needs is considered an important factor in the sustainability of the original building.

<table>
<thead>
<tr>
<th>Units</th>
<th>Porcentaje %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Façades with clear finishes</td>
<td>56</td>
</tr>
</tbody>
</table>

Box 9 “Clear finishes”.

Fig. 6 “Panoramic view environment of the Castle”. Source: The author.
The evaporative cooling using water or vegetation refers to the presence of these agents in traditional construction solution to improve the quality of air. With a rate of 20% in façade solutions, it has been noticed that this feature is present in this area, as well as in squares and public gardens.

Concerning walls construction, it is important to mention that the construction by means of not coordinated wide masonry was the most commonly used solution for two main reasons: to increase thermal insulation and to bear walls, which reach a maximum thickness of 70 cm in some cases.

In general, the simplicity of small plots with interior courtyards becomes apparent in the roofs most commonly used. As box 11 shows, the solution of slanting roof in ceramics tiles occurs nearly up to 100%, what makes the entire old town centre look perfectly adapted to its environment and gives it a special continuity.

Furthermore, all the features that have been mentioned and quantified unequivocally mark the relationship between environmental sustainability and vernacular architecture of the area, certainly adding as well the rational use of available resources in the immediate environment so that construction solutions are achieved.

This shows an absolute respect for the environment, lesson that we should learn in order to reduce pressure on energy costs and the consumption of natural resources (Neila, 2004).

5.- Conclusions

The key findings provided by this study revolve around accurately quantifying and determining the features of environmental architecture related to the vernacular architecture of the area selected.

Its value and clarification should be a tool to better understand and appreciate our built heritage for future actions and intervention.

This paper is a summary of a comprehensive research project that covers the old town center of Moratalla, Murcia, since 265 record with field data are being developed and being assigned to the local council under a collaboration agreement existing with the Catholic University of Murcia (UCAM).

The actions taken have a value in advance of what in the future might be the documentation or background information improvement and comprehensive refurbishing projects taking into consideration the characteristics here defined.

In this regard, it is worth noting that, from this research an Integrated Action Plan could be developed in the old town centre overseeing a comprehensive refurbishing of the area which should take into account criteria of Sustainable Architecture.

Thus, a long way has been started, where the following issues should be taken into consideration:
- Generating and promoting associationism among neighbors in order to determine what actions are needed for their environment, so that they can act accordingly.
- Reconsidering the concept of livability in the area to make it more flexible and more dynamic in favor of a more sustainable refurbishing. Eliminating the presence of substandard housing while slowing down the growth of the city and therefore the use of land. Encouraging the consolidation of the model of compact Mediterranean city instead of the development of scattered building.
- Promoting the use of renewable energy in the area while energy rehabilitation takes place, and facilities and public spaces are improved given the fact that they are not plentiful.
- Adapting the General Plan to this significant cultural and historical area in such way that the criteria are more clearly defined for sustainable architecture
- Carrying out measures so that social and economic rehabilitation of the area is significantly changed from its main residential use, by establishing a clear management and feasibility plan with public-private origin.

Fig. 7 “Panoramic views, Historical Center”. Source: The author.

REFERENCES