

Sun&Wind Model for the City of Toledo.

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Abstract

Empresa Municipal de la Vivienda de Toledo participates in the project Sun&Wind under the framework of the Community Initiative LIFE firstly to learn through other different experiences how to improve the city sustainability and secondly to develop a series of recommendations that make possible, on one hand, the better preservation of the extraordinary urban and architectural heritage of the city and, on the other hand, the improvement of the citizens' life quality.

The city of Toledo is experienced an immersion process of design of the city of the future that is intended to be developed thanks to its Urban Ordination Plan (Plan de Ordenación Urbana - POM). On one hand, this plan has the aim of defining the most important architectural and housing guidelines of the city. On the other hand, it is intended to preserve the historic heritage through a series of building regulations compiled in the document Plan Especial del Casco Histórico (PECH) de Toledo (Special Plan for the Historical Centre). This work emerges in the middle of this complex situation of preservation and development with the purpose of analysing, discussing and drafting a series of recommendations for the future city development according to the main guidelines established in the Charters of Aalborg and Lisbon.

This article presents briefly the main lines of this work and the technical criteria taking into account to develop the Sun&Wind Guide for the city of Toledo.

The Sun&Wind Project has meant an extraordinary opportunity for knowing, discussing and drafting a lot of recommendations for the sustainable development of our cities.

Introduction

The city of Toledo embraces one of the biggest historical centres of Europe. Fortunately, the city has not suffered important deteriorations –excepting the fortress El Alcazar- during the Modern and Contemporary ages that is the reason why the city conserves a big and extraordinary Medieval, Renacist and Baroque architectural whole, without forgetting other important construction belonging to other historical periods.

The development of the city of Toledo should be structured taking into account two complementary aspects and some requirements difficult to conciliate: on one hand, its cultural heritage and, on the other hand, the citizens' demands – from both, citizens and visitors – under the framework of a growth model based on environmental respect and sustainability.

The elaboration of the POM allows to rationalize the process of the city growth and its integra-

tion within the existing architectural whole, but it is important to learn from the sustainability experiences posed in the project Sun&Wind to create a work guide that allows us to evaluate the efficiency of the solutions proposed for new building actions as well as for the restoration and remodelling actions of old city zones.

This guide takes as reference the models of the Mediterranean architecture and urbanism since these models have historically achieved an important environmental and human quality by adapting their main principles to the current and new environmental and construction requirements.

Nowadays, the building sector in Spain must observe some quality and sustainability criteria established in the “Technical Code of Edification” (Código Técnico de la Edificación - CTE). This Code embraces a whole of documents which define the basic compulsory criteria for new housing actions and for restorations depending of the kind of preservation of the zone.

As far as this work is concerned, the most important aspect is the following:

- DB-HE: Energy Saving.

This regulation requires the introduction of solar energy saving systems and the use of construction materials and techniques contributing to energy saving.

Nowadays, the regulation determines the basic compulsory level and this project intends to develop guidelines and recommendations to achieve this energy saving. Some of them will be developed by the own Empresa Municipal de la Vivienda de Toledo in the housing actions that this institution develops.

Mediterranean Architecture

The Mediterranean climate is featured by its dry and warm summers and its humid and mild winters. Its name comes from the Mediterranean Sea, but this kind of climate exists in other zones of the planet such as South Africa, California or Chile.

Toledo is featured by its Mediterranean continental climate with moderate rains, warm temperatures in summer and very cold in winter with frequent frosts.

This climate has favoured typical architectural elements as the creation of shadow zones, houses with interior courtyards (patios) and gardens which favoured air flowing, the typical urban structure featured by narrow streets and, finally, the orientation and the thermal inertia to achieve the best inhabitability conditions with the lowest energy consumption.

This architecture, which has prevailed during the last two thousand years, is suffering nowadays a strong pressure because of the new territory ordination plans as well as by the new construction materials. The main process is determined by a reduction of the houses size that has two consequences: on one hand, the natural processes necessary to create well ventilated architectural spaces are excessively expensive and, on the other hand, the materials and the mass construction necessary for the reduction of costs provokes an homogenization of the territory and the disappearance of the singular adaptation of the building to the existing space and its needs. Taking into account this situation, it is necessary to foster the development of new mechanisms that favour the recovering of the architectural philosophy of the Mediterranean construction, but by achieving production costs similar to the current ones.

Main Study Criteria

The city of Toledo is placed on a hill surrounded by the Tagus River. This place was an important crossing point of the North-South routes of the Ibe-



rian Peninsula, easy to protect and with access to the water of the river.

The legend prays that the city was founded by Hercules, though the most prosaic archaeology does not show settlements in the Bronze Age (-2500-1000 a.C.) in the zone known as Cerro del Bú. The Roman Empire conquered the city in the year 193 a.C. and over the next seven centuries becomes one of the most important cities of this empire in Hispania.

It is still possible to observe the circus and some remains of ancient thermae and of the aqueduct that crossed the Tagus River.

The evolution of the zone occupied by the city has suffered many changes over the centuries. The city high and well-protected has prevailed in insecurity periods less changed. On the contrary, the population has occupied the two huge valleys of Toledo during more pacific periods (the high valley -up the river- and the low valley –down the river- along the old city centre).

The move of the Royal Spanish Court in the XVIth century from Toledo to Madrid and the lack of communication infrastructures developed in the zone of Toledo during the XIXth and XXth centuries caused the decadence of the city and the population reduction till the beginning of the XXth century. Nowadays, the growth of the city in 2025 is expected to reach 150.000 inhabitants. As far as this study is concerned, the work is based on the national and regional norms that regulate the territory development –supervised by the regional government- and on the construction regulations contemplated in the national document known as CTE-Código Técnico de la Edificación.

Some of the most important aspects dealt in this work are the following:

1. Sustainability and Ecologic Footprint.

In this section all the different sustainability approaches taken into account for the development of cities are studied. Special attention is given to the analysis of the ecological footprint calculation as the first method of numerical approximation to the city impact on the environment.

It is also analysed the relevance of the project Sun & Wind in the development of a model elaborated with other cities under the project framework that allows to unify work criteria and methodologies.

2. Urbanism and Sustainability

It is studied the current situation of the city of Toledo, particularly, two work lines that the EMV has developed: on one hand, the preservation of its architectural heritage (PECH of Toledo – Special Plan for the Historic Centre) and, on the other hand, the ordination of new demands by means of the POM (Plan of Municipal Ordination) of Toledo.

Apart from these two plans, the city of Toledo has signed with FEMP-CLM (Federación de Municipios de Castilla La Mancha) an agreement for the development of the Agenda 21. Thus, collaborations with other municipalities of the region for the development of sustainability practices are being considered.

3. Architectural Models and Typologies

One of the most important aspects in sustainable development is the adaptation of the architectural typologies to the environment features by making a better use of the light, the wind and the water and reducing the energy and water consumption.

The main problem posed is how to develop the new houses, which are smaller and smaller due to the reduction in the number of the family members, according to the space requirements needed by the natural ventilation and energy saving systems.

4. Construction Materials and Space Organisation

Other main aspect for the development of energy efficiency is the use of construction materials and their special organisation in order to improve the energy efficiency in buildings.

Materials must be evaluated as a whole during their life cycle. It is important to understand this

concept because most of the solutions posed are not completely quantified, they are just analysed in their very best moment, but their manufacturing processes and their recycling at the end of their exploitation period are not taken into account.

It is also of utmost importance to take into account the relation of the construction materials with the construction of an inhabitable environment that favours public spaces well-adapted to the well-being of the persons.

5. Mobility and Transport Systems

The transport systems play an important role in the energy consumption and in the calculation of the ecological footprint. Nowadays, transport models have been developed which are not very efficient for mobility.

The city is defined as a meeting place. High mobility is a requirement for the city development and the citizens' life quality. It is also important to foster the use of means in scale by developing pedestrian zones, cycles and skate lanes and the use of collective transport means for city journeys. In this framework it is important to mention the huge urban space occupied by private vehicles. This problem has not been usually evaluated, but is one of the most meaningful factors to be taken in to account in the cost of the soil.

The proposal is to orientate the concept of mobility according to the different transport means with the aim of making each transport system more efficient in each kind of journey. This would reduce the energy consumption and the urban spaces devoted to private cars and would improve the citizens' life quality.

6. Energy Saving and Efficiency

The norms established in the CTE (Código Técnico de Edificación) are already in force. The objective is to improve energy efficiency by adopting new construction techniques that achieve levels of efficiency higher to those established by the law and by incorporating new methods such as the use of interior patios, sheets of water and natural ventilation systems by effect of shadow zones (porches, patios, etc). Generally speaking, in our environment the greenhouse effect is only interesting in winter, but during the rest of the year it is necessary to achieve the air circulation and the luminosity reduction to adapt the space to the very best inhabitability conditions.

The ideal objective is the energy consumption of each building unit to be self-sufficient. Nevertheless the achievement of this aim must be reached through a long and gradual process that allows to improve this efficiency by making the construction and maintenance costs similar to the current energy costs.

7. Infrastructures

The city of Toledo has over many centuries two extraordinary bridges: the bridge of Alcántara and the bridge of San Martín that have determined the city development. Nowadays, the development of its fertile valleys determines the development of a new transport network that favours the mobility and communication among new zones of the city. These new axes are defined by new bridges that cross the river and arrange the territory as a new huge area placed in the basin of the Tagus river. It is also necessary to develop a new system of high capacity transports that favour the integration of the city and intercity networks.

The city of Toledo will be extended more than 20 Km along the axe East-West and the belt of municipalities that have grown around this city, in particular those placed within the region of La Sagra, requires a new and complex mobility system.

8. Water use, Xerogardening and Landscaping

Toledo is a city conditioned by the Tagus River. Nevertheless, the river is considered as both an emblematic symbol and a risk.

The fertile plains have frequently suffered flooding and, therefore it is necessary to plan the city

development taking into account this risk and knowing that the levels of rains are low. It is of utmost importance to plan the water efficiency by means of the development of reservoirs, tanks, sheets of water and other resources that allows to take advantage of the natural rains and to reduce the risks and effects of the sporadic flooding of the plains.

Xerogardening in high zones and the preservation of the architectural whole from the point of view of landscaping by fostering visual lines and well-preserved zones are important requirements for urban development.

9. Participation, Urban Spaces and Sustainability

Other important aspect of this Project is the wish of fostering and articulating the citizens’ participation in the city development. The current regulations already establish proceedings and guidelines for the discussion of the different processes of housing and construction, but nowadays they are insufficient. Nevertheless it is possible to reach a greater level of dissemination and participation thanks to the new information and communication technologies.

These subjects will be posed in such a way that both citizens and agents- architects, trade unions, associations, etc- will be able to participate in the city housing processes.

Guía Sun&Wind de Toledo

The work which is being developed now is the creation of a practical guide that will allow the evaluation and measure of a series of objectives focused to sustainability.

The subjects which are going to be taken into consideration for the evaluation of actions are the following:

- Architectural models and typologies.
- Construction materials and structure of the spaces.
- Mobility and Transport Systems.
- Energy Saving and Efficiency.
- Water Efficiency, Xerogardening and Landscaping.

The aspects we are evaluating are shown in the following table:

	Construction	Maintenance	
Architectural model.	10	5	15
Materials.	10	15	25
Mobility and Transports.	15	5	20
Energy Efficiency.	10	15	25
Water, gardening and wastes	5	10	15
Total	50	50	100

The application method of this guide is still being evaluated; nevertheless the implantation of methodologies fostering sustainability is one of the main objectives of Empresa Municipal de la Vivienda in the development of its housing actions.

Conclusions

This article presents the actions developed by EMV Toledo under the framework of the Project Sun&Wind.

The main objective is to make the restorations as well as the new building and housing actions in the city more sustainable and to offer some guidelines for the development of new actions adapted to the environmental regulations and to the society demands by fostering at the same time the citizens' participation.

To conclude, it is of utmost importance to mention that this project has meant a good mean to pose and discuss at European both, the needs for the restoration of cities historical models as well as the possible means that could allow its development under the framework of a sustainable society.

References

The documents taken as reference to develop this study will be the following:

- CTE – “Technical Code of Edification”.
- POM of Toledo. “Municipal Plan of Urban Ordination”.
- PECH of Toledo. “Special Plan of the Historical Centre”.
- “Letter of European Cities for Sustainable Environment - Aalborg Charter” (1994)
- “The Lisbon Charter” (1996).