Architectural Heritage, Resilience and Urban Renewal:
The courtyard house as resilient architectural model
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Foreword
Cities are high-complex living organisms and are subjects to continuous transformations produced by the requirements that vary from the political, economical, cultural and above all changing climate factors. More than 50% of the world’s population lives and works in the cities and this percentage keeps increasing each year. The stress that is created by urbanization and climate change brings undesired results, which threaten to have unprecedented negative impacts upon quality of life, and economic and social development. At the same time, the concentration of human capital, infrastructure, industry and culture, could make cities a force for social and economic good, and drive innovation in both the effort to reduce the required energy and greenhouse gas emissions, as well as developing strategies for communities and systems to adapt to the impacts of climate change.

In this sense “urban densification” becomes an important approach in order to make cities more resilient, in contrast with “urban sprawl”, which causes land consumption and provides low urban quality to its inhabitants.

Urban design principles for Resiliency
Climate change and social change requires a paradigm shift in urban planning and architectural design toward a dynamic sustainability, a resiliency of urban systems.
The term of “resilience” derives from the Latin word “resilire”, which means “bounce, “jump back” and it refers to the ability to withstand shocks and impacts and still maintaining the basic characteristics.
The resilience of an urban system can be defined as the capacity of the cities’ to absorb shocks and perturbations without undergoing major alterations in its functional organization and in its economic, physical and social infrastructure systems. The most important characteristic which distinguishes resilience from sustainability, while enclosing it, is that resilience is not linked exclusively to the maintenance of natural resources but also the transmission of these resources, acquiring the ability to compensate them in different ways.

Action levels to resilience
As it’s mentioned at the beginning, cities are high-complex systems; in particular, they are composed by two main sub-systems; the first one is the physical system, which is generally pointed out by the morphological characteristics. The second main sub-system is the social system (inhabitants) that is mostly constituted by cultural habits of living, producing and building in the urban area. The degree of resilience of this complexity tightly depends on how strong the connection is between its two sub-systems. A well-connected sub-systems can deal with given shocks and stresses more quickly and effectively. In this context there are various levels of action to take to the resiliency at socio-cultural and physical level. For example the traditional architectural culture, and the related intensive use of local materials, can be effective for improving resilience of an urban area, as the cultural and the physical resiliencies are in a continuous interaction.

Our research focuses on the contribution of the local building cultures and the traditional building typologies to the urban resilience. In the building tradition, planning of settlements is the result of a deep understanding of the place with its geography, climate and resources available, and the ability of the community, to translate the social, cultural and protectional needs, in the construction of their habitats. The existing local construction systems and the urban organizations should explore in themselves their resilient capacity. The methods learned from architectural heritage should be transmitted and reinterpreted in order to develop new strategies for the growing contemporary cities.
For an efficient planning of densification
Urban densification is one of the common methods used in the history for different reasons. In medieval times cities appear in an enclosing, densified morphology limited by city walls for security reasons, while the cities of today need to limit themselves to avoid urban sprawl and the land consumption. The concept of “enclosing” by a physical element (built or not built) can be a solution about giving a limit to the increasing land occupation of the urban areas. Good planning of urban nature is necessary to reduce the heat island effects created by the building surfaces. For example an intense urban core surrounded by a green ring can ensure a better environmental comfort as well as a good canalization of the fresh air towards its centre. Urban sprawl is extremely expensive when it’s considered the amount of land, road, transportation and the infrastructure requirements in comparison with the compact cities, however, it doesn’t imply a monolithic city. The urban pattern needs to be optimized by the selection of the most adapted and efficient building typology to obtain high energy efficiency and a resilient urban form.

An urban design strategy from Mediterranean architectural heritage: the resiliency of the courtyard house
We hold that reflecting on the way that traditional ingenious solutions have proved useful for local communities in the Mediterranean region throughout centuries, may enable developing environmental friendly design proposals and appropriated solutions for specific communities. Compared to the buildings in line and the tower buildings, typology of courtyard performs more capacity and more flexibility of aggregation as the courtyard provides natural illumination from the internal apertures of the rooms, allowing high-density housing

Bioclimatic aspects of the patio house
Courtyard houses prevail in hot climate as open central courts that act as cooling resources during hot seasons. Its morphology ensures natural ventilation of living spaces thanks to air convention property, based on a simple principle: warm air is less dense than cool air and therefore will rise; if a heat source exists below, cooler air replaces hot air, it warms and rises up, generating a continuous air current. Thermal inertia of the walls keeps interiors cool. Sunrays do not penetrate the courtyard until noontime when the sun reaches the cenit. During late afternoon they start to release the stored heat. In the evening, the air of the courtyard which has been heated directly by the sun and indirectly from the walls, rises up while nocturnal cool air gradually replaces it.
Two traditional patio houses in Tissergat, Draa valley, Morocco. Credits: L. Dipasquale

Chimney effect in this phase accelerates, pulling upwards indoor air, expelling it and allowing cool air to penetrate the courtyard to cool down the surrounding rooms. Hot currents that flow into the house during daytime do not fall on the courtyard but simply create interior air vortices. Another key role in the temperature control in the Mediterranean area is achieved by the building techniques and the properties of the materials used. In fact, wall thickness has the dual function of isolating and restraining it in a high degree due to its thermal inertia, allowing to loose it slowly during night, partly towards the outside and also to the inner rooms which will eventually become cooled down during the hotter hours, restarting the cycle again.

Contribution of the traditional patio house to contemporary architecture

The courtyard house as a passive energy cooling system, has a validity in contemporary architecture, as it constitutes an important reference for nowadays dwelling design. Its benefits and the quality of environments it helps create are not to be overenounced, particularly for hot climates. Emphasized with elements such as vegetation and water, it generates a microclimate within itself and for the rest of the house in particular. If surrounded by a gallery or portico, as in many traditional architecture courtyards in numerous countries, it offers a transitional space solution between the open space of the courtyard and the living rooms to where the portico leads. When connected with another opening in the house such as a door or window, it helps create a wind current that adds coolness to the inner spaces. A dwelling courtyard outlay leads to more efficient housing design lowering down the cooling cost as it is energy saving. At the inner space of the courtyard, the family can find leisure, play outdoors and perform private activities without disturbing the neighbours. The rising popularity of the courtyard is tied to the growing desire for indoor/outdoor transitional living activities as well since it can constitute an open or semi open space where family can extend its daily life activities.

Conclusions

Local and traditional architectural culture, tested by a continuous interaction with natural environment as with social and climate change, can enhance strategies for resilience of urban areas. We can identify elements of a cultural and physical resilience which can be effective for designing the regeneration of our cities. Smart and consistent use of local resources as building materials, architectural typologies and building elements employed in architectural heritage of Mediterranean cities are inherently low energy consuming and resilient. Among them courtyard houses are suitable solutions for a diversity of climates and when repeated in an urban pattern, they actually offer environmental improvement for the urban scale. Observing and analysing with a scientific systemic understanding of architectural heritage can help us to improve resilience of cities and of their inhabitants facing social and climate change.

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