

Carlos Borrego and Ana Margarida Costa
Institute of Environment and Development
Campus Universitário 3810-183 Aveiro, Portugal
cborrego@ua.pt

ART NOUVEAU: A VISION OF URBAN SUSTAINABILITY

Abstract

The Art Nouveau movement was a response to the radical changes caused by the rapid urban growth and technological advances that followed the industrial revolution. A common feature of Europe's different Art Nouveau movements was the identification with nature, an approach that went much further than the use of forms and materials, because it was in fact a firm commitment to the quality of life and health of citizens.

Despite new technologies which were introduced at the time, there was a wise balance between a respect for nature and the use of cutting-edge technologies. The Art Nouveau movement was pioneered sustainable construction by promoting energy efficiency through natural ventilation mechanisms and enhanced indoor environmental quality with the use of natural light, natural raw materials and the increase of ventilation rates.

Questions of energy efficiency and indoor environmental quality enhancement should be taken into account in modern sustainability initiatives new construction as well as in the retrofitting of existing structures. Therefore it is important to guarantee that the implementation of retrofitting measures in Art Nouveau buildings follow sustainable practices.

Cities in the 19th century

One of the most profound effects of the Industrial Revolution was the quick growth of cities and increasing of population. Throughout Europe, only 17% of the population lived in cities in 1801. By 1851, the percentage increased to 35%, and by 1891, it was 54%.

The rate of growth was so rapid that city services could not keep pace. Cities faced the lack of sanitation, accumulation of sewage, high rates of disease, high rates of crime, and desperate poverty. Extensive use of coal led to accumulations of dirt and grime. Streets were mostly unpaved and rubbish was accumulated in piles.

Pre-industrial cities were small, adapted to pedestrians. People lived and worked in the same place. After the industrial revolution, which attracted rural population into cities, living conditions in the cities changed considerably and The majority of the newcomers lived in filthy, overcrowded, damp houses. Moreover, the industrial factories created a suffocating atmosphere for living.

A sustainability perspective of the art nouveau buildings

The Art Nouveau movement was a response to the radical changes caused by the rapid urban growth and technological advances that followed the Industrial Revolution. It appeared in the early 1880s and was gone by the eve of the First World War.

Art Nouveau was predominantly an urban style, created to decorate the streets and interiors of modern industrial cities, which had expanded rapidly during the last third of the nineteenth century.

Some artists welcomed technological progress and embraced the aesthetic possibilities of new materials such as cast iron. Others deplored the shoddiness of mass-produced machine-made goods and aimed to elevate the decorative arts to the level of fine art by applying the highest standards of craftsmanship and design to everyday objects (Greenhalgh, P., 2000).

A common feature of European Art Nouveau movement was the identification with nature, an approach that went much further than the use of forms and materials, because it was in fact a firm commitment to the quality of life and health of citizens. This is particularly evident in architecture, where natural light and the possibilities of natural ventilation were maximized in each building and room.

New technologies which were introduced at the time, such as gas, electric lighting, elevators, running water and sewage systems, etc. remained in a wise balance with nature. The respect for nature can be considered as the first vision of sustainable construction.

The Art Nouveau movement foreran the idea of sustainability by promoting energy efficiency through natural ventilation mechanisms and enhanced indoor environmental quality with the use of natural light, natural raw materials and the increase of ventilation rates.

Sustainable practices in retrofitted buildings

The efficient use of energy and other resources, as well as the enhancement of indoor environmental quality and efficient use of materials are key issues in the development of sustainable buildings.

Due to its energy saving capabilities, natural ventilation is seen today as a strategy for sustainable development. Naturally ventilated buildings have several benefits over mechanically ventilated ones, including reduced energy consumption, lower maintenance and capital costs, less space requirements, increased occupants' satisfaction when given local control over indoor conditions, high productivity and fewer sick building syndrome complaints (Allard and Santamouris, 1998).

On the other hand, ventilation is considered a major condition of air quality in indoor environments since it promotes the dilution of concentrations from indoor sources and works as a transport mechanism for outside pollutants to be brought inside.

To ensure an acceptable indoor air quality it is essential to have sufficient air supply, it is also mandatory to guarantee that the outdoor air which enters the building has enough quality to be used as ventilation air, especially in polluted urban areas (Borrego *et al.*, 2006).

In this sense, it is of primary importance to study and develop strategies for the optimization of acceptable indoor air quality conditions combined with low energy demand in order to conceive the sustainable building of the future.

These strategies have been studied for the Museum of Aveiro, Portugal (IDAD, 2011). Museum spaces are often inserted in historic buildings, located in the center of large cities, subject to various pressures and impacts, including those related to traffic and air pollution. Museums ensure the preservation of our cultural heritage, which means that these spaces are of great historical and cultural value and must be preserved and enhanced.

Numerical simulations of the Museum energy consumption were conducted for different operation scenarios of heating, ventilation, air conditioning (HVAC). Moreover, measurements of ambient air quality were carried out in the vicinity of the Museum, as well as the assessment of the Museum indoor air quality through continuous measurements, during several days.

As the result of the environmental and energy Museum diagnosis, measures for operation and best practices have been suggested, which would allow the management of the building based on the principles of sustainability.

The analysis of the energy consumption in the Museum proved that the optimization of the HVAC management and the use of more favorable energy tariffs during different periods of the day, , can represent significant energy savings, without compromising the environmental conditions. This change, combined with other interventions, could represent a potential saving of about 25% in the annual energy costs for the Museum without large investments

Air quality measurements show the influence of outdoor concentrations on the air quality inside the Museum. For the optimization of natural ventilation conditions of the building associated with energy saving strategies, it is important to guarantee that the outdoor air which enters the building has enough quality to be used as ventilation air.

Conclusion

Questions of energy efficiency and indoor environmental quality enhancement should be taken into account in modern sustainability initiatives to both new construction and in the retrofitting of existing structures.

Therefore it is important to guarantee that the implementation of retrofitting measures in Art Nouveau buildings follow sustainable practices assuring building's energy efficiency and indoor environmental quality.

Bibliographical references

- Allard, F. and Santamouris, M., 1998. Natural Ventilation in Buildings: A Design Handbook. European Commission Directorate-General XVII for Energy, ALTENER Programme. James & James, United Kingdom, 356 pp.
- Borrego, C.; Tchepel, O.; Costa, A.M.; Martins, H.; Ferreira, J. and Miranda, A.I., 2006. Traffic-related particulate air pollution exposure in urban areas. Atmospheric Environment, Elsevier, Vol. 40, pp. 7205-7214.
- Greenhalgh, P., 2000. Introduction to Art Nouveau. National Gallery of Art - Anatomy of an Exhibition: Art Nouveau 1890-1914.
- IDAD - Instituto do Ambiente e Desenvolvimento, 2011. Gestão Ambiental e Energética do Museu de Aveiro. Relatório de Diagnóstico. IMA 79.11-11/06.04, 122 pp.