

PAPERS

Universal Design as an instrument for sustainable reuse of buildings

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THE COMMITMENT TO SUSTAINABILITY IN REHABILITATION

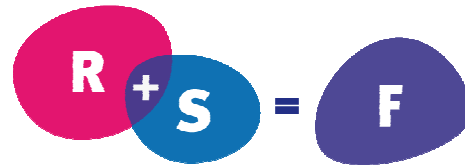
Introduction

The relationship between a settlement and the surrounding environment has always been governed by specific rules whose respect is the main condition to survive inside the “man-nature” system. Cyclical processes of extraction, use and reintroduction of materials in the ecosystem are necessary to achieve the balance between limited resources and human needs. Historically this process was encouraged by the continuous recycling and reuse of materials and buildings. The construction of settlements is the main cause for the use of land, raw materials, energy (about 50% of materials and 40% - United Nation Environment Programme - “Global Environment Outlook 3” - of energy are used for and in buildings) and it produces bulky and sometimes dangerous waste (about 50% of solid waste).

The path towards a sustainable development – often defined as “a development that can meet the needs of the present generation without compromising the ability of future generations to meet their own needs” – passes through the design and the definition of building interventions that are in harmony with the surrounding environment. The impact of human activities on the environment in the last 50 years has been disturbing due to the increased speed with which the humans have used natural resources. During this period, a nine-time larger land surface has been urbanized in Italy than over previous periods. This has decreased the “carrying capacity” of land, i.e. its capacity to absorb the waste products of the construction sector.

As the global energy requirements increase annually by 2% - United Nation Environment Programme - “Global Environment Outlook 3” - it is necessary to plan a sustainable energy production to reduce the emissions of carbon dioxide and other greenhouse gases and to increase the use of renewable resources, but especially to change behaviour in order to protect the environment. The significant impact of the construction sector on the global energy balance validates the increase of reuse of existing buildings. These interventions can meet the building performance requirements through the use of appropriate technologies and design criteria. It is evident that the core of the problem is the design for the reuse of built heritage in a way which enables everyone to use it.

The aim of this research is to develop guidelines and planning strategies for reuse of buildings that respect ecosystems (through the conservation of natural resources) and provide a high quality built environment that can be easily used by all the occupants. The proposed concept is an open, developing system which considers the changing situations related to the environment, buildings and users.



PAPERS

The idea of sustainability in building

In the last few years, the interpretation of the concept of sustainable development has evolved towards a dynamic model which is influenced by different synergistic and complex actions related to the economic, social and environmental issues. It is possible to identify the elements that characterize these actions, for instance, the interconnection between the physical and socio-economic parameters through the possibility to achieve economic development similar to the current one by using production strategies based on reduced consumption of materials and energy.

The equity trend in the worldwide wealth distribution and the need to achieve an international agreement between industrialized and developing countries stimulate the investment in “clean” technologies and renewable energy that have a low environmental impact. Another way to reduce the environmental impact of human activities is to prevent the gradual loss of some resources of raw materials and energy that are highly utilized. At the same time, economic development models based on renewable sources and recycling need to be developed.

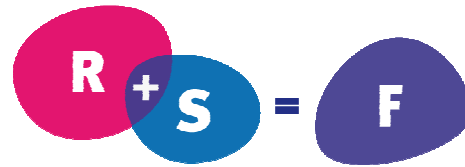
The above aims help in defining an approach to the design of more sustainable buildings. This approach is based on three paradigms that characterize the “environmental” aspect of sustainability. They are: (a) the integration between space, nature and architecture through the bioclimatic approach, (b) the application of energy efficient technologies and (c) the reduction of environmental impact in the life cycle of each building component. These paradigms are considered in the design of more sustainable buildings through holistic and systematic planning in order to satisfy the requirements of environmental sustainability in an integrated way regarding spatial and temporal dimensions.

The spatial integration implies the development of an assessment methodology for the expected environmental impact of design choices in a given context. The temporal integration is based on the life cycle approach which entails the analysis of environmental impact of the construction processes and building components.

A “sustainable” reuse

The statement contained in the Brundtland Report (1987) that “sustainable development is one that meets the needs of the current generation without compromising the possibility for the future generations to meet their own needs” reminds us of John Ruskin’s words in “The Seven Lamps of Architecture” (1849): “The world that we have received from our father, it is not our possession.” At the origin of the need to reuse and preserve the existing buildings is the conviction that the prudent use of natural resources, repair, maintenance, care for the inherited environment and a careful consideration of the consequences of our actions represent the best way to achieve the welfare of human settlements. The cultures of reuse and sustainability have common roots. Recently, we have seen an acceleration of their convergence regarding intent, instruments and methods.

The Agenda 21 for sustainable construction includes the key elements for promoting the sustainability of urban settlements and buildings activities. These elements include the reuse and the requalification of built heritage, the reduction of free land consumption, the maintenance, the prevention of the urban and housing decay, the “sustainable” management, the protection of historical heritage and the design of durable buildings and constructions. The durable buildings are able to be flexible and adaptable to future needs.



PAPERS

This is an important issue for the contemporary debate on the reuse. The debate has produced theories, methods, instruments and techniques which have been deduced from the references from many disciplines. These references have contributed to the development of the idea of the “design of the existing city” that is based on the systematic consideration of different settlements. The idea of replacing an inherited city with completely new developments, promoted by some urban planners, has been proved impossible.

The future urban environment includes the built heritage that needs to be repaired, reused and recycled. The literature on sustainability assigns a great importance to cultural and architectural heritage. The sustainability issues in the architectural heritage protection and conservation, especially in Italy, can be related to the evolution of the discipline in last decades and can be synthesized in the expression “conserving means using”. This assertion is the main requirement and a necessary precondition of contemporary conservation theories on built heritage, including the heritage of historical and cultural significance. It follows that a restoration project, as a single construction or an urban complex, has to be elaborated through an in-depth technical and scientific analysis of the whole intervention and its components, and through an analysis of its values.

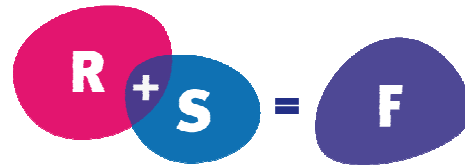
It is necessary to identify the potential of built heritage to meet the users’ requirements regarding function, performance and “usability” (according to an Italian standard - UNI 8289/81 norm). In this way, the intervention becomes an “act of culture” through “integrated reuse” that aims to meet the users’ needs and the material, technological, urban and ecological requirements. The conservation is planned as a “controlled transformation”, a less schematic and more flexible approach to adapting the architectural heritage to the users’ needs. Practically speaking, there is no an irreconcilable conflict between conservation/preservation of architectural heritage and the users needs. In the design for reuse of buildings, the conservation/preservation should be included as any other design consideration such as, for instance, the structural stability.

The above approach accepts a progressive and critical idea of the reuse intervention as an “act” of the current times and not as a “freezing” action. The reuse looks to the future and not at the past. The “integrated reuse”, defined by analogy with the “integrated conservation” (Amsterdam Charter, 1975), points out the impossibility to realize a reuse intervention that is an end in itself and emphasizes its close connection with a suitable function. This function represents a “new life” which is fully suitable to the historical and technological nature of building, and open to the requirements of the contemporary lifestyle. In this way, the building function becomes an instrument (but not an object) of the conservation; it is the conservation instrument par excellence.

The change from refurbishment to conservation through reuse was also defined as a passage from aesthetics to ethics. The protection of architectural heritage cannot ignore the issues concerning the environmental suitability, the durability, the energy conservation and the harmfulness of some materials. That is the context in which the sustainability of reuse is considered. The conservation intervention is a long-term process which needs to realize strategic policies on sustainability. The social, economic and environmental issues overlap to form a structured “*unicuum*”. The above explains how “the science of conservation” is defined nowadays - as a combination of history, function and architecture.

Universal Design as an instrument for the conservation

The reuse intervention, as well as any other planning and design approach, starts with an analysis of the brief and performance required from each building. This particular type of intervention becomes an instrument to improve or, in some cases, to guarantee the usability of buildings through an adaptation to the different and changing needs of its users. The solutions used most often follow two main trends: (a) the change in physical and volumetric aspect of the



PAPERS

building and (b) the space change through the design of solutions that allow the modification of each component and of the mutual relationship between the different spaces. These processes can substantially reshape the space, but in both cases it is essential to undertake an analysis of the needs expressed by the current users and consider any potential future needs.

The potential needs can be expressed by the new and/or different users. This leads to a new design approach that considers the space in its dynamic dimension, enabling a transition from a strict (sometimes almost crystallized) static reuse idea to the one that considers the temporal (“fourth”) dimension of architecture. The dichotomy involves the preservation of the building character and usability, and the transformation of some of its components to meet the performance requirements.

To address the continuous and quick evolution of demographic and social phenomena, the flexible and adaptable spaces need to be planned at the initial stage of a project. The answer to this problem is the design of an inclusive environment that considers human diversity, social inclusion and equality by applying the principles of Universal Design which aim to meet the needs of as many users as possible. The Universal Design is different from the concept of a barrier-free design because it does not only aim to eliminate and/or overcome something, but represents a more radical change. The concept is also different from the ‘Design for All’ concept because it does not mean that everything has to be usable by all, but that spaces can be usable by as many people as possible, without forgetting the complexity of the real world.

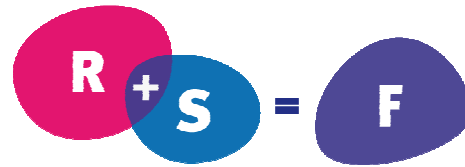
To design means to plan and structure a system that allows human beings to satisfy their needs. In the assessment of various options, the designer should aim to select the best one. The evaluation of design options is regularly undertaken in relation to a large number of actions, from those of a very simple nature to more complex ones. This process model is defined as “ideal” because it does not only refer to the optimal selection conditions, but also to an “abstract” user, i.e. a healthy, adult and perfectly able-bodied human being. The concept of a standard project seems limited and limiting for a very complex human reality, risking to create spaces that are not completely usable by everyone.

A transition is proposed from a standard design concept to the design for disability, a design that also takes into account temporary or/and permanent physical or/and sensory impediments which can affect anyone. In the evaluation process, the assessment criteria should not only include aesthetic and/or economic aspects, which are an important part of a project, but also address the usability of designed spaces by analysing the real and potential needs of the occupants.

A special attention should be given to the preliminary project definition stage. Although this model, defined as “design without barriers”, does not dialectically question the design method, it identifies “architectural barriers” as the principal obstacle to be overcome in order to guarantee accessibility to people affected by temporary or permanent physical and/or sensory disability. However, this is a non-inclusive, “ghetto” approach in terms of setting disability against an ordinary condition of “normality”, which effectively banishes the people with different abilities to the margins of society.

In this way the concept of Universal Design was born, emerging from a deep reflection on the binomial “design-disability” which from the 1970s involved the design world into a debate regarding the need to provide adequate solutions for the needs of people who have physical or/and sensory difficulties.

Universal Design aimed to be an answer to the complexity of the real world. It is not a closed, but an open, developing system, which considers possible options within a process of dialectical confrontation with usage. This is a system of performance requirements for satisfying objective



PAPERS

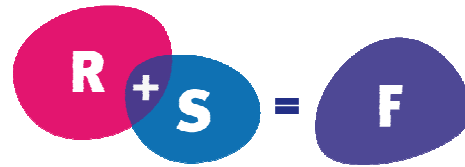
and “equal” needs for everyone with a subsequent identification of requirements directly related to “genius loci”. Roland Mace developed the concept of Universal Design and used this expression for the first time in 1985. Mace described a concept which re-established a fundamental objective of a good design practice: responding to the needs of the largest number of possible users. His approach highlighted a tension within the objective of evaluation, which should not consider only the dimensional requirements. He challenged the designers to think beyond compliance with the codes and to focus on the special needs of specific users aiming to find solutions which address the needs of various occupants. Universal Design defines the user in a broad way and does not focus only on people with disabilities. It suggests that all the building components and spaces should be accessible and usable by people in the optimum way. It does not imply that everything will be completely usable by everyone: the term refers more to the methodological approach than to a strict and dogmatic proposition.

In 1997 the seven design principles according to Universal Design logic were proposed:

1. Equitable use (equal, non discriminatory usage)
The design is useful and available to people with different abilities.
2. Flexibility in use
The design is adaptable for a wide range of needs and individual abilities.
3. Simple and Intuitive Use
The use of the design is easy to understand, regardless of the user’s experience, his/her knowledge, language or level of concentration.
4. Perceptible Information
The design effectively communicates necessary information to the user, regardless of the environmental conditions or his/her sensory capacity.
5. Tolerance for error
The design minimises the risks and negative consequences of accidental or non-intentional actions.
6. Low Physical Effort
The design can be used in an effective way, comfortably and with a minimum of force.
7. Size and Space for Approach and Use
The design provides ample space for approach, communication, manipulation and use of an object regardless of the physical size, posture or mobility of the user (Mace, 1998).

After a few years, a transition was made from Universal Design to Inclusive Design. This started from the following fundamental assumption: if the social integration of disability were to be achieved, then the physical environment in which this could occur should be “inclusive”. After the first international convention on this topic, organised by UKIID (United Kingdom Institute for Inclusive Design) in London in 2000, a greater sensibility towards the problem and a gradual involvement of other European Union countries have been achieved. This led to the Stockholm Declaration in 2004 in which, for the first time, the definition of Inclusive Design was provided as “design for human diversity, social inclusion and equality” (Stockholm Declaration of EIDD - 9 May 2004).

The above approach is used to assess an object regarding its importance in relation to the historic, aesthetic, symbolic, religious, social and economic values developed by each culture on their scale of priorities. The above concepts express a methodology for the conservation and reuse of built heritage. They are also a context in which the conditions for adaptation to the needs of users are defined. These principles do not represent a strict dogmatic concept. They can be included within the Universal Design which becomes an instrument for the reuse of the built heritage and the implementation of “sustainable” interventions, where the only objective is to leave to our descendants a heritage equal or better than the one that we inherited.



PAPERS

The methodology for a “sustainable” reuse

The importance of the reuse has been acknowledged following the social and cultural changes which have affected the relationship to architectural heritage. As the reuse includes the conservation of architectural, technical and material characteristics of buildings, the difficulty arises regarding their reconciliation with the norms and standards of building regulations. This problem calls for a critical assessment of the normative instruments for monitoring and management of built heritage. It is necessary to move from a model that applies indiscriminately the same intervention rules to all buildings and ignores the relationship of different buildings. There is a need for a more flexible approach that considers a distinctive character of each building. Greater flexibility will allow planning of an integrated reuse and controlled transformation, aimed at as many users as possible, while preserving typological, technological and formal qualities of built heritage. The proposed performance approach will enable the reuse intervention and free it from the rigidity imposed by current Italian standards. It will become an instrument for controlling the project quality.

Then, to realize interventions that can be defined as “sustainable” means also to design “flexible” spaces, that can be adapted to the different needs of its users.

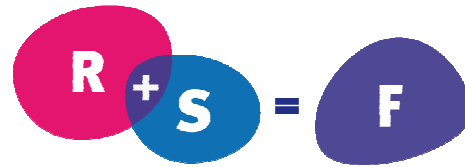
Universal Design principles can serve as guidelines for the reuse interventions along with the guidelines on how to respect the traditional, compositional and constructive, character of buildings. They enable the design of spaces that can be used by as many users as possible. The reuse of buildings contributes to a more sustainable development because it saves raw materials and energy through the reuse of “construction energy”. It also reduces the land use.

The reuse tools also include the typological, compositional and technological aspects that enable a high flexibility of reused spaces. The first aspect concerns the formal context and the space geometry which need to meet different functional needs through a reorganization of internal and external building layout. An easy access to each space should be provided. The movement through between spaces should be as uniform as possible. The incidental direction changes can be highlighted through the use of technological components. The technological aspect is concerned with the optimal organization of space, its modification and optimization of performance characteristics of the building envelope or, in the case of a reuse, intervention, its restoration .

The identification of new performance and functional requirements that address the changing social and cultural needs should not define the intervention through a strict cataloguing of spatial and compositional relationships between spaces and their functions. The proposed design approach is not based on a static concept of intervention, but considers its dynamic aspects. It starts with an analysis of the relationship between different spaces through the consideration and design of a technical and technological equipment that is necessary to guarantee the use of the environments in a safe and autonomous way by each user. To create a flexible space, the technological components assist, even without causing significant spatial and/or volumetric changes in most of cases, the creation of spaces usable by everyone. They also enable meeting the requirements of building transformation without compromising the structural stability.

Conclusions

The research aims to show how the integrated reuse, which combines the technical quality of the intervention with the possibility to completely use the building, becomes an instrument for a more sustainable design through which a built heritage, that could otherwise be severely compromised, can be transferred to the future. All interventions on existing buildings need to



PAPERS

start with their careful assessment and identification of the users' requirements. Through the reuse of buildings, the aim is to transfer to our descendants the built heritage that is not less than what we inherited.

The reuse of the built heritage needs to take into consideration its qualities and to avoid any changes of the heritage character. It is possible to achieve this through the integration of the tradition and the innovation by emphasising the original architectural, typological and morphological aspects and by optimizing the performance. The challenge is to apply the Universal Design principles in new buildings and in the built heritage to provide the functionality and accessibility of spaces. The challenge is even bigger when these principles are applied on the built heritage that has universally recognized cultural values.

The research aims to show how these principles, apparently dichotomous in relation to the architectural heritage, become tools that can enable the revitalisation of built heritage that would otherwise be subject to neglect and decay. This is an attempt to study, identify, apply and subsequently validate a unique and universal model for an integrated design that ensures both the conservation and the reuse as part of the project Sustainable Reuse.

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