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Sustainability and Cultural Capital: An Opportunity to Improve the Built Environment

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Abstract
The quest for sustainable development in the building sector has greatly improved the sustainability of buildings through energy efficiency and use of renewable resources. However, green buildings are not the only objects in the built environment, and environmental sustainability is not the only aspect to be pursued for sustainable development. The author claims that, to improve an overall real sustainability, we need to introduce the cultural capital, which is now disregarded, in the interpretation of the built environment so that physical and temporal scales can be reconnected and continuity of the process of development can be ensured. Starting from this premise, the paper is organised into three main sections: the first represents two key interpretations of the built environment; the second discusses the limits of such interpretations through the example of sustainable buildings; the third explains why the cultural capital can be considered an opportunity to improve sustainability of the built environment.

Keywords: Overall sustainability; Built environment; Cultural capital; Sustainable buildings.

1. Introduction

The built environment is the main field of application of sustainable development policies and implementations all over the world. So far, the basic policy used, supported by technical advancements as well as a growing awareness of environmental concerns, has been to focus primarily on greening processes of the built environment, this generating some cascading effects.
Supranational, national and local governments have issued laws and rules for promoting the eco-improvement of buildings and infrastructures (Krigsvoll et al., 2010); they have defined sustainability criteria –for greening–, indicated to what –objects in the built environment–, when –newly built or renovated– and how –aiming at bettering performances– applying them, and set threshold values of performances to be pursued. Such goal has been also enhanced by a policy of incentives, like volumetric bonus in buildings, planning charges reduction, tax deductions, economic incentives for renewables, etc. Consequently, plans, projects and designs of buildings and infrastructures have been elaborated for following legislations and taking advantages from incentives; professional, technological and managerial competencies in the construction field have been addressed with the main aim to reduce the environmental load of artefacts in the built environment. People have been involved in this process both passively, as end users of the built environment, and actively, as promoters of green behaviours in the built environment; positive outcomes are usually referred to the improvement of human health, indoor and outdoor, and the increasing of environmental awareness. All this sustainability action scenario has both favoured and been favoured by

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the so called green economy, referred to as the essential way for practicing the economic development and also exiting from the recent economic crisis (Bina, 2013).
The three pillars of sustainable development, environment, society, economy, have therefore considered as respected in the implementation of sustainability in the built environment. The question is whether such eco-based and self-nourished approach, which is basically scale-centred since the greening process is addressed to 'objects' in the built environment, has been beneficial or not for its sustainable development. The current status of our world testifies that this approach has not been effectively enough assured (Rees, 2014), seen that environmental recovery is not significant yet, social inequality persists even enlarged and intensified, and economic stability is not assured.
The author assumes that without taking into account the complex system of relationships that shapes the built environment and without using a temporal perspective, results of implementations aimed at sustainable development remain confined to isolated improvements of single objects –a green building or infrastructure– and to short-term benefits –for example, meagre CO_2 reduction–, contributing little to a durable development. A reinterpretation of built environment seems necessary so that physical and temporal scales can be reconnected and continuity of the process of development can be ensured; introducing in it the cultural capital which is now disregarded can help to pursue an overall real sustainability.
Starting from this premises, the paper is divided into three main sections as follows: section 2 represents two key interpretations of the built environment; section 3 discusses the limits of such interpretations through the example of sustainable buildings; section 4 explains why the cultural capital can be considered an opportunity to improve sustainability of the built environment. Conclusions highlight that reinterpreting the built environment can stimulate the reconstruction of knowledge which is at the basis of cultural capital maintenance.

2. Interpretations of Built Environment

The notion of built environment is often used by a plethora of actors and approaches to find a common framework for communication and elaboration (Moffatt & Kohler, 2008) in order to discuss and manage the development of our world. The literature generally refers to two significant contributions, rooted in anthropological and socio-behavioural researches, as originating the meaning and the definition of the term built environment, particularly in relation to architecture (Vis, 2009). However, "both the term and its reach and implications are evasive, more comprehensive, and far-reaching than most of us realise, even though we live in it every day" (Bartuska, 2007, p. 5).
For the purposes of this paper, two key interpretations of the built environment emerge as significant: one is related to human artefacts, and the other to non-natural environment. For the first interpretation, the built environment is made by a system of several components, mainly individuated in buildings and infrastructures which allow people to live, work and enjoy free time indoor and outdoor, conducting their activities safely, healthy and comfortably. In this light, the built environment has a strong influence on the quality of life of citizens. Such interpretation is shared, among others, by many scholars not only involved in the construction field but also in health

sciences/environmental health (for example, see Srinivasan et al., 2003). For the second interpretation, the built environment is the whole set of objects built by humans for their settling in the natural context of a place; hence it contrasts with the natural (non-built) environment. In this light, the built environment has a considerable influence on the quality of life of the natural world. Such interpretation is usually preferred by those whose thought is motivated by ecological concerns and asks for environmental ethics (for example, see King, 2000).

Though the two interpretations overlap in considering the built environment as man-made for human purposes, they differently address development decision-making and affect consequent development actions. For the first, the built environment has to be developed for guaranteeing human well-being, i.e. safety, health, comfort and pleasure; for the second, the built environment has to be developed for guaranteeing the well-being of natural world. For the first, development implementations are human driven; for the second, they are nature driven. This does not mean that the two human and nature driven visions ignore each other; rather, each of them is continuously searching for forms of development that can assure a balance between environmental quality and human well-being (van Kamp et al., 2003), between nature and human health (Younger et al, 2008), however they start from conceptual opposite poles.

Another essential consideration has to be taken into account when discussing the built environment: common people frequently and instinctively refer to the first, human driven, interpretation of the built environment placing their own well-being before protecting nature. Of course, the introduction of sustainability discourse in the late Eighties of the Twentieth Century has changed this attitude, rising awareness of environmental degradation and its effects on humans. However, the vision still remains anchored to human activities and how they can be continuously assured despite natural resources depletion and environmental pollution. An evident example of this situation is waste recycling: no one can nowadays deny that recycling is necessary; however, reducing waste is even more essential for environmental recovery as well as a necessary change in human habits favourable to preserve nature (Ebreo & Vining, 2001). But, what still happens today is to promote selective waste collection, also by means of incentives.

After all, the human driven vision is expression of the consumeristic society (Crocker, 2016), which has been and still is supported by the dominant approach to development impelled by economy, characterising all the developed countries from the time of the industrial era and more recently assumed also by developing countries. The narrow focus on individuals explains why, notwithstanding sustainability demands for intra and intergenerational respect, implementations have been mainly concerned what to do 'here' and 'now'. And this approach is also defended by the urgency of recovering from the environmental degradation, as well as supporting a way out from the economic crisis pressing the developed world during last years (Spencer at al., 2012). Greening the built environment has become the major commitment of all the actors involved in sustainable development. Such way of thinking and acting poses fundamental questions –policy, governance, technological innovation, etc. (for example, see Al-Saleh & Mahroum, 2014)– beyond the purposes of this paper. Instead, the interest here is on if and how it has influenced sustainable development of the built environment.

3. Sustainable Buildings: Limits of an Approach

First the buildings and later on the infrastructures have been the main focus of sustainability practices and the privileged test-bed of greening processes in the built environment. This exactly reflects the human driven interpretation of the built environment: people spend most of their time in buildings, and infrastructures serve people for utilising buildings and open spaces around. Since buildings and infrastructures are big consumers of raw materials and energy, and producers of soil, water, air pollution and waste, they have been seen as the most convenient 'objects' in the built environment for experimenting sustainable practices and solutions, while also promoting the construction sector (Hamelin & Hauke, 2005).

Sustainable buildings, for example, have gained the attention of all actors in construction processes since late Nineties of the last Century (CIB, 1999). A series of international conferences on Sustainable Buildings (see http://www.sbe-series.org/) have brought together hundreds of researchers, professionals, and manufacturers from all over the world to discuss advancements and prospect for future development in the field. To summarise the development of sustainable buildings and how they have evolved over time, it can be reported that the new buildings and existing buildings more recently have been enhanced in their design, construction and functioning primarily aimed at energy efficiency for two essential reasons: to lower energy demand, in particular from conventional non-renewable resources of energy, and to reduce environmental pollution, in particular CO_2 emissions responsible for greenhouse effect and hence climate change. This has been interpreted in two main directions: improvement of building envelope insulation and increase in use of renewable resources of energy.

The first direction has determined the development of insulation materials and thermally insulated solutions for the building envelope (Jelle, 2011), ranging from traditional to innovative products, expanding possibilities of layering walls, roofs and floors and using thermal doors and windows. Along the same direction there has also been a focus on thermal bridges in buildings and opportunities to insulate them in order to minimise energy dissipation. This commitment has thus prompted a renewed interest in passive building envelope solutions and building design criteria of bio-architecture. Also in this case, innovative materials and solutions have been placed side by side traditional ones. Related to such first direction of development, it is important to mention also the focus on natural or synthetic insulation materials, recyclable/recycled or not, as well as breathable or airtight building envelope, this implying an in depth analysis of building envelope behaviour also in relation to human comfort and health requirements.

The second direction of development that helps to make buildings more energy efficient and less polluting, is to maximise the use of renewable resources for energy demand, even if it is minimised by a well-insulated building envelope. Along this direction thermal and photovoltaic (PV) solar panels have been affirmed (Kalogirou, 2015), with outcomes ranging from discovering new materials and technologies to increasing panel performances, from roof to façade integration, from rigid to curve shape as well as from transparent to coloured PV panels. Accompanying the evolution in solar panel technology, heating systems operating with low temperatures have gained interest, particularly radiant heating systems –placed on floor, baseboard, wall, ceiling. While the

sun, through the use of passive and active solar systems, remains the principal renewable resource to draw from in order to satisfy the energy requirements of buildings, even wind and geothermal energy have been considered, by developing solutions such as mini wind turbines and geothermal generators. Though such devices have technologically evolved in terms of efficiency, their use remains strongly dependent on wind and geothermal characteristics of the specific place in which the building is located.

In the framework related to sustainable buildings briefly sketched here, another thing deserves to be mentioned; it concerns the recent growing consideration of summer condition, for both the design of the insulation of building envelopes and the use of renewables (Ascione, 2017). This adds value to the project over the winter condition, initially considered almost the only critical case to be designed. Of course, the criticality of summer situation depends on local climate of the specific place where the building is located and is increasingly influenced by global warming that is happening lately.

Aiming at energy efficiency, a focus on the performances of the building has been considered a way to demonstrate the content of sustainability in buildings (GhaffarianHoseini et al., 2013); arising from this, there has been an increasing development and promotion worldwide of performance-based criteria and methods of evaluation of building sustainability, accompanied by assessment systems as the operative tools of evaluation (Zuo & Zhao, 2014). A proliferation of sustainability indexes and indicators for buildings as well as principles to weigh sustainability criteria in order to obtain a total score of building sustainability, have been proposed and studied; they express the different approaches used in evaluation and allow adapting evaluation methods and assessment systems to specific places and different buildings. Therefore, evaluating and assessing sustainable buildings both on voluntary basis or because required by regulations, has become an essential activity to address design, obtain incentives and compete on the market.

Efforts made to improve sustainability in buildings have determined several consequences affecting many actors –architects, engineers, clients, constructors, manufacturers, users, policy makers, researchers– and concerning all phases of the building process, from policy to design choices, from research to production, from construction to management, from maintenance to demolition. There is no doubt that this engagement has generated new knowledge, improved production processes of building materials and components, bettered energy performances of buildings, along with other advantages. However, the approach practised so far suffers from two substantial limitations: the scale-centred perspective and the finalisation of sustainability actions in the built environment almost exclusively aimed at its greening, which has characterised linear processes of intervention, i.e. the green building (or the green infrastructure). This situation shows that all actors involved have not been able of accepting the challenge posed by sustainable development for turning the point in reinterpreting the built environment so to effectively improve the durable coexistence of natural and built worlds on earth.

The scale-centred perspective at the basis of sustainability practices reduces the focus of attention on isolated objects in the built environment (Conte & Monno, 2016); the aim of greening buildings and infrastructures narrows the action field of sustainability implementations to environmental aspects. Both things reinforce the attitude to think the

built environment as a sum of physical artefacts, superimposed on nature, which have to be built or renovated for a more 'ecological' behaviour –energy saving, CO_2 reduction, decreasing use of raw materials, drawing upon renewable vs non-renewable resources, etc.– at the same time guaranteeing and even improving human well-being and local economy, seen respectively as social and economic aspects of sustainable development. Moreover, such scale-centred and eco-based approach also influences the temporal perspective of sustainable development implementations, confining them to short-term results (Marsden et al., 2012). In fact, the goals of energy saving and CO_2 reduction, chased by more than 20 years now, have not actually brought a significant contribution to reverse the trend of depletion of non-renewables and climate change (Friedlingstein et al., 2014). The reasons for such limited results are diverse, but certainly an approach strongly based on separate scales of action –a building, an infrastructure, a neighbourhood– and focused on a primary type of action, i.e. greening objects, has not helped to introduce a systemic vision when tackling physical and non-physical aspects as well as short and long-term objectives of sustainability, thus weakening actions for sustainable development of the built environment.

4. Cultural Capital as an Opportunity

By such approach, among three types of capital, human-made, natural and cultural capital (Berke & Folke, 1994), only the natural and human-made capital are considered while the cultural capital is neglected especially in its intangible aspects. On the contrary, it is precisely the intangible cultural capital that has the strength of establishing feasible interactions and multi-temporal visions necessary for a continuous evolution and sustainable development of the natural and built environment together. Considering the cultural capital as the interface between natural and human-made capital (Hassler & Kohler, 2014), through its intangible aspects we can recognise the current built environment as the result of the development from the past and the starting point for the future development, so to reconnect not only physical but also temporal scales (Moffatt, 2014) and give continuity to development processes in the built environment. It is the physical-temporal space which configures the built environment; by including time in interpreting the built environment allows considering the relationships between nature and humans, whose artefacts become expressions of the cultural capital. As such, buildings and infrastructures are not important as isolated objects which, added together, constitute the built environment; on the contrary, they are very important if acknowledged as a complex system of interactions, nested at different levels of the physical-temporal space (Conte & Monno, 2016). Interpreted in such a way, the built environment is able to represent the nature-human connections over time, becoming the only suitable terrain on which basing decisions for its future development.

There are buildings and infrastructures hundred and even thousand-years old (Fig. 1), and they still function and are utilised for their original or reinterpreted use: what better expression of cultural capital than them? They were built by civilised societies for human purposes, but adapting them to the natural environment –the climate, water resources, local raw materials; and the same approach with respect to nature-human interactions is used when they are renovated.

Figure 1: On the left, Trulli, vernacular architecture in Alberobello, Italy; on the right, Pont du Gard, Roman aqueduct, Vers-Pont-du-Gard, France. Both are UNESCO World Heritage Sites (Photos licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license).

At the same time, there are buildings and infrastructures usually but unfairly referred as less advanced, whose value is not a long lasting but rather their short life and cyclical rebuilt (Fig. 2); they are also a significant expression of the cultural capital. At the two extremes of a long or short lifetime, such examples of buildings and infrastructures show the ability of man-made objects to exist in and shape a built environment evolving during time: they make the built environment resilient, and the resilience is given by the cultural capital that generated and continuously revitalises them. The material aspects of such capital are embedded in objects and determine their physical form, which is generally recognised immediately; the intangible aspects of the cultural capital, "made by knowledge, ideas, beliefs, collective memory, ways of doing and working, as well as art, music and literature" (Hassler & Kohler, 2014, p. 163), add to the objects a temporal value so determining spatial configurations of the built environment and conferring capacity of resilience upon it, which is evidently recognised over time.

Figure 2: On the left, a Ger -traditional tent of Mongolian nomad population- on the Steppes near Mandalgovi, Mongolia (Photo licensed under the Creative Commons Attribution-Share Alike 2.0 Generic license); on the right, Bamboo bridge and Mangroves at Bakhawan Eco-park and Research Centre, Kalibo, Philippines (Photo licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license).

Into the built environment interpreted as a complex multi-level system of interactions, buildings and infrastructures are physical objects but also temporal entities, since they narrate the story of a place where nature-human coexistence has occurred. Build or renovate a building, for example, involves the use of natural and human-made capital

and this means bringing into play the cultural capital resources everywhere and every time. It does not matter if the construction is simple or complex, if traditional or innovative technologies are employed, if costs are low or high, if the intervention represents an element of continuity or discontinuity with the pre-existing structures; in any case, once built, the building contributes to define the built environment in its functioning. The unchanged, worsened or improved status of functioning of the built environment due to that building, demonstrates the ability, or inability, of the cultural capital of a place to connect humans to nature and to interpret their more or less suitable coexistence that evolves over time. This coexistence relies on physical aspects –natural resources, impacts, pollution, etc.–, but also on intangible values for humanity: sense of identity, respect for the place and common goods, responsibility towards the other, desire to increase knowledge, appreciation of tradition together with aspiration to innovation. Ultimately, it determines the quality of life that is dependent on the place, time and cultural capital.

Buildings and infrastructures narrate the story of a place just because of the cultural capital embedded in them. In such narration, however, it is much unlikely that a single object even though it might be symbolic, completely represents a place and all aspects of the cultural capital related to it (Fig. 3, left side). Rather, it is the whole set of buildings and infrastructures with their multilevel interactions that gives sense to a place, making it recognisable for its community and for all the others (Fig. 3, right side).

Figure 3: On the top, Arc de Triomphe, Place Charles de Gaulle, Paris (Photo on the left licensed under Creative Commons Attribution-Share Alike 3.0 Unported license; photo on the right retrieved from http://www.paris-paris-paris.com/ paris_landmarks/monuments/arc_de_triomphe# [Accessed 5 April 2017]); on the bottom, The Gherkin, 30 St Mary Axe, London (Photos licensed under Creative Commons Attribution-Share Alike 2.0 Generic license).

Each building or infrastructure has a life because it is linked to other buildings and infrastructures, is made and used by people, and is inserted in a natural setting. Even if a building or infrastructure was built equal in two different places, would never be equal nor would equally behave; in the same way, if it was the first construction built in a place, its functioning would depend on the specific context and users. Moreover, changes affecting natural, human-made and cultural capital influence buildings and infrastructures, depending on this whether or not their life will continue, a new quality of their operation will be searched for, their value in the network of interactions that determine the functioning of the built environment will be reinterpreted. For all these reasons, the way in which nature-human connections and interactions physically happen and temporally evolve, shapes a specific built environment. Buildings and infrastructures as single bodies dissolve into the built environment, which remains the global organism whose development has to be planned, designed and implemented.

The complex system of multi-level relationships in a physical-temporal interpretation of the built environment is influenced by several interrelated factors, from policy choices to people behaviours through projects and designs of buildings and infrastructures. Key factors for sustainable development of the built environment are then: using a strategic approach (Broman & Robèrt, 2017); considering not only short but also, and even more important, medium and long-term goals; working strong on socio-economic aspects of sustainability. The assertion here is that to this purpose we need to reintroduce the cultural capital in the discourse on sustainability; in fact, the situation which generated the need to recall everybody attention to sustainable development can be attributed to a discontinuity in using the cultural capital, particularly its intangible aspects, and it has not yet been offset by investment in sustainability to date implemented. Following Hassler & Kohler (2014): "The main threat to the intangible cultural capital is the loss of knowledge relating to the built environment (both know-how and know-why)" (p. 163); what really happened and still happens in current management of sustainable development is exactly a loss of knowledge particularly with regard to the built environment, from which we need to recover.

5. Conclusions

Development models of the built environment preceding years concerned with sustainability showed all their limits when natural environment degradation, social inequality and economic instability emerged as characterising the modern world, questioning durability of the nature-human coexistence. Whatever the roots of their failure, these models demonstrated the lack of a suitable interface between natural capital and human-made capital, i.e. cultural capital was not able to fulfil its role: a weakening of both tangible and intangible aspects of cultural capital can be observed, proving a discontinuity in producing and applying knowledge of two kinds, know-how and know-why. Similarly, after the definition of sustainable development and its introduction into the built environment discourse, models implemented also show limits since outcomes are scarce, as mentioned above.

However, though insufficiently, the push towards sustainability has stimulated the production of new knowledge, improving know-how and know-why; this can likely be

seen as an encouraging starting point for reconstituting the cultural capital and re-establishing its continuity in order to support a durable nature-human coexistence. Such situation makes evident that the cultural capital requires to be maintained exactly like natural and human-made capital; otherwise, breaks are generated that do not guarantee the coevolution of natural and human systems in the built environment. Without constant maintenance, it is as if nature-human coexistence remains 'frozen' at the previous state, unable to evolve. Based primarily on knowledge, the maintenance of cultural capital requires appropriate time for learning and awareness in the use of such knowledge, and it is usually a slow time. On the contrary, the urgency posed by environmental concerns together with fragmentation of knowledge in today's globalised world have favoured interpretations of the built environment focused only on physical aspects and short-term objectives; this has penalised the maintenance of cultural capital by producing knowledge breaks.

The reinterpretation of built environment can stimulate the reconstruction of knowledge related to it, at the same time paving the way for a continuous, though slow, maintenance of cultural capital. In this perspective, the new interpretation offers a tool by means of which it is possible to overcome the weakness of the current approach to sustainability, so to strengthen the strategic characters of policies, include medium and long-term goals in plans, projects and designs, and improve environmental as well as socio-economic development. This will help to go beyond the simple processes of greening (Wu et al., 2016) in search of a sustainable built environment more closely related to co-evolution of natural and human environment.

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