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The regenerative approach to model an integrated urban-building evaluation method☆

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Abstract

In this paper we focus on crucial issues concerning the effectiveness of evaluation of sustainability in the built environment. The paper argues that we need to rethink the evaluation of urban-building sustainability from an integrative perspective. It advances a theoretical and methodological model based on the regenerative approach, which opens up a new way to deal with the sustainability of the built environment. An enlarged definition of urban metabolism is used to carry out the integrated evaluation.

Central in it is the concept of *reliability*, which expresses the ability of products and processes in the built environment to be adaptive, resilient and regenerative. We use *reliability* in a transversal manner through the process of making the built environment sustainable, referring it both to buildings and the regenerative process triggered by sustainable actions addressed to buildings. Holistic indicators allow assessing it quantitatively or qualitatively.

Through *reliability* we bring regenerative thinking from a theoretical to an operational level. When referred to buildings, *reliability* allows considering sustainable performances not usually assessed in current evaluations. When referred to processes, it helps to understand directions of change in relation to sustainability of the built environment. Our method can be easily associated to current evaluation systems exceeding their boundaries.

Keywords: Regenerative sustainability; *Reliability*; Urban metabolism; Integrated evaluation; Holistic indicators

1. Introduction

During last centuries, the increase in knowledge and the associated technological advancements have determined an evolution of human societies superimposed on nature, with the results of jeopardizing natural systems. Becoming aware of natural resource depletion and environmental pollution is at the basis of the need to draw attention to a sustainable development, as defined in the Bruntland Report (WCED, 1987). This is considered a starting point of a major concern for the natural environment, which has

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to be interrelated with social and economic development, inter and intra generationally. Then, in recent years, the sustainability paradigm has been the leading guide for development at any scale of thought and action, pervading policies as well as practices of intervention in any field of application (Hecht et al., 2012).

The built environment is the most significant field of action for several reasons, both quantitative and qualitative: it uses natural resources and impacts the natural environment in a very relevant manner; it constitutes the socio-cultural identity of a place; it expresses the economic capacity of a society. Therefore the built environment has increasingly become the test bed of policies and practices of sustainability, the terrain for experimenting sustainable paths of governance and design so that buildings and cities have been focused subjects of interest and experimentation (Lewis et al., 2013) and sustainable buildings and cities the output of such commitment.

Now, after more than 25 years of investments in sustainability, the question is whether sustainable development is indeed sustainable (Blowers et al., 2012). The answer is arguable: it could be almost positive, if we refer to sustainability as the paradigm originating from the sustainable development definition above cited; it could be rather negative if we refer to sustainability as the ability to re-establish cooperation between the natural and the human worlds for a mutual beneficial development. The central difference resides in the approach used, which at the end defines a substantially different goal: in the first case, the sustainable development approach is aimed at reducing the natural resource depletion and the environmental impacts; in the second case, the approach is regenerative, i.e. aimed at reversing the present and persistent trend of consumption for regenerating the natural environment, indispensable for the human life (Cole, 2012a).

2. The regenerative approach to evaluate sustainability

Both approaches are concerned with a healthy development of natural and human systems, but the sustainability traced by the sustainable development approach, even improved by adding a fourth or more dimensions to the first original three of environment, society and economy, proves to be a discrete process, made by step-by-step improvements, with a distant temporal horizon but still limited. It calls for a development more sustainable than before, but still insufficient for assuring the enduring life of natural and human systems. By reducing the effects of consumption, we can delay the deadline of life on the planet, but not preserve it (Singer, 2010). This approach is still in line with the belief that man is able to manage and control both natural and human systems, superimposing the last on the first.

On the contrary, the sustainability traced by the regenerative approach appears as the result of a continuous process based on a co-evolutionary partnership between ecological and socio-cultural systems (Cole et al., 2013). The evolutionary character of such sustainability assumes it is a never-ending developmental process, able to re-determine itself during time. Moreover, the evolution in partnership reflects an ability to interrelate systems, responding to the need of a systemic view that seems the only way to really assure the enduring life of natural and human systems reversing the present trend. Sustainability reinterpreted by the regenerative approach can reactivate a human development aligned with the effort of nature (du Plessis, 2012).

The sustainability paradigm traced by the sustainable development approach is then disputable; in fact, many scholars are discussing its limits and pitfalls (Ahmad et al., 2012; Ahn et al., 2013; Kissinger and Rees, 2010), particularly in the light of the regenerative approach (Cole, 2012b). Nevertheless, it has permeated the way of thinking and acting of almost all the actors involved in development processes of any type, increasing the consciousness of each of them in contributing to sustainability. In the built environment, the learning, technological and economic investments in sustainability have been increasingly relevant during years, stimulating the public and the private sector, building industries and companies, building managers and agencies, designers, politicians, and citizens.

A clear demonstration of such investment is the effort engaged in the evaluation of sustainable buildings, neighborhoods, or cities. Evaluation methods translated into assessment systems have become the common tool of communication among actors in the building and urban development process for dealing with sustainability (Kajikawa et al., 2011). Then, at present, evaluation is considered as the guideline of a development process, and the assessment criteria have become the benchmark to measure the rate of sustainability of buildings, neighborhoods, or cities. As for the sustainability paradigm, also evaluation methods and assessment systems based on the sustainable development approach show limits and pitfalls, which however are not in the aim of this paper (see, for instance, Giama and Papadopoulos, 2012; Kumar Singh et al., 2012; Magee et al., 2013; Komeily and Srinivasan, 2015). Rather, we recognize their usefulness in stimulating sustainability processes and therefore we propose to evolve theory and practice of sustainability evaluation toward the regenerative approach.

We focus on two aspects of the regenerative approach that sustainability evaluation and assessment methods should include: the systemic view and the continuity of the developmental process, in order to pursue the required co-evolutionary partnership between ecological and socio-cultural systems, as cited above. The conceptual framework we propose for sustainability evaluation of the built environment integrates different spatial scales and considers reciprocal influences between constituent parts of the built environment. According to Cole et al. (2013), in fact, co-evolution is inapplicable to a single building, rather the