Innovating sustainable building design and built environment processes

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Abstract: In this paper, we propose the concept of reliability as a way to introduce innovation in sustainable building design and built environment processes. For us reliability of agents and actions represents a new perspective for a radical restructuring of sustainability evaluation; in fact, reliability catches interactions between buildings and built environments, contextualising design solutions and stimulating the regenerative capacities of a context.

The paper highlights the much potential that reliability shows. It can be considered an operative tool to practice the regenerative approach; it can be a strong stimulus to innovate design activities; it can be a catalyst element of multiple stakeholders’ perspectives. In the attempt to address sustainability drawing on the regenerative approach, reliability stimulates the use of new conceptual tools, implies the application of new ways of acting, and challenges our knowledge and current technologies thus promoting innovation and experimentation.

Keywords: Reliability, regenerative sustainability, evaluation, design activity

Introduction

The built environment has an enormous potential for contributing to sustainable development, but the efforts engaged for its sustainabilisation during last decades have not produced results as rewarding as expected at any level. Climate changes testify the adverse human influence on natural systems and the need to still reduce greenhouse gas emissions. At the same time, neither the economy nor society has sustainably improved in terms of viability and equity. The greening process of the built environment, which has been interpreted as the major way to pursue a sustainable development, is essential but also shows limits.

A major reason for this situation resides in having placed the main focus of the attention to products rather than processes. Buildings and urban environments are mostly seen as static and passive objects, subjected to more or less ‘sustainable’ construction and re-construction activities, rather than interacting components of a dynamic development process evolving during time and including natural and human systems. Therefore, there is a strong motivation to innovate the conceptual design tools which we use at present to address the multiple challenges of sustainability [1].

On this line, we propose the concept of reliability to develop an alternative methodology of evaluation to support sustainable design of the built environment. We have been studying its applicability to the evaluation of sustainability of the built environment and exploring its potential in pursuing more significant operative results than before in the design process of buildings and cities. We are almost persuaded that reliability offers a sensible perspective to
improve knowledge, learn innovation, and foster processes of co-creativity and co-evolution as required by the regenerative approach, acting as a catalyst element of multiple stakeholders’ point of views.

**The regenerative approach for the built environment**

Recently, some scholars have drawn attention to theory and practice of regenerative design and development [2], which offers a suitable perspective to go a step forward towards sustainability. Following such theory, human and natural systems are strictly interrelated, and their enduring life on the planet can be assured only by a proper partnership between the two systems. In this way, we can reverse the present trend, going beyond the idea of a sustainable development mainly aimed at saving natural resources and diminishing environmental impacts, and directing instead towards a regenerative development interpreted as a continuous process based on a co-evolutionary partnership between ecological and socio-cultural systems [3]. Thus, we shift from the influence of humans on natural systems to their cooperation, and re-assign to sustainability its systemic and dynamic character.

It the light of the regenerative approach, developmental processes –actions– implemented in the built environment are more important than single components –agents– constituting it; in fact, the co-evolutionary partnership necessary to produce a regenerative sustainability cannot be applied to a single building [3]. Moreover, strategies must be developed to generate co-creativity in partnership with nature, which for instance du Plessis [4] recognises in adaptation, resilience, and regeneration for an alignment of human development with the effort of nature. The built environment considered in its whole and a new way to learn and produce cooperative knowledge, evolutionary and creative, to use in practice become the urgent challenge for architects and engineers as well as all the other actors of the building process.

Then, the regenerative approach requires a profound cultural change, the only one capable of reversing the present trend of development still unsustainable despite all efforts made. Such a change is a priority, but like any other cultural modification process it needs time to mature and produce effects at both theoretical and practical levels. Meanwhile the built environment continues to be the test bed of sustainability policies and practices; therefore, an open question is whether we can improve sustainable building design and built environment processes moving from the weak sustainability of today towards a more effective regenerative sustainability.

**Reliability to evaluate sustainability**

According to Mang and Reed [5], different approaches and practices of sustainability are interrelated and interdependent rather than alternative or competing, and work on differentiated levels of a hierarchic structure with regeneration at the highest level. In this light, we propose the concept of *reliability* to support theoretically as well as operationally the transition of sustainability approaches and practices from bottom up in such a hierarchy. *Reliability* is referred to both agents and actions in the built environment and expresses their
abilities to use strategies of adaptation, resilience, and regeneration. **Reliability** becomes a tool to practice the regenerative approach transversally from products –sustainable buildings– to processes –built environment development– improving the sustainability of a place (fig. 1).

![Strategies of Adaptation, Resilience, Regeneration](image)

**Figure 1: Transversality of reliability through the process of improving sustainability**

For us **reliability** constitutes a new perspective to structure a spatially sensitive method to evaluate the sustainability of the built environment. During last two decades, actors involved in the building process have learned the importance of sustainability evaluation. The proliferation of assessment systems and indicators to measure sustainable buildings and urban environments testifies the role played today by evaluation [6]. Objections can be raised concerning different interpretations of sustainability at the basis of evaluation methods and the related assessment systems, which decisively orient design choices in order to get a high sustainability score [7]. But, it is evident that they have contributed to disseminate a working mode to put sustainability into practice although in the absence of its unambiguous theorising. Therefore, opportunities exist to improve sustainability evaluation and assessment in the light of the regenerative approach, overcoming limitations of current methods and systems.

Through **reliability**, we take the opportunity of this improvement. The evaluation of **reliability** is seen as a way to challenge or push further well-established sustainable design choices and stimulate the creative dimension of the process itself. If the urban and building design is an experiment carried out under uncertainty and in the absence of experience, then it is clear from our point of view that evaluation should enlarge its horizons: from being a sort of accounting and judgment system, it should be used as a tool for thinking critically and experimenting solutions. To play this role, we rethink the conceptual fundamentals of evaluation in relation to the regenerative perspective and its underlying idea to adopt a more realistic way to see how human and natural world interact.

On the theoretical level, instead of considering buildings as passive and isolated objects in an urban environment, we consider them as evolving agents interacting with and shaping the built environment. Basing on the socio-ecological system conceptualisation [8], for us the built environment is a system characterised by a specific metabolism determined by social and ecological relationships and flows which connect agents in it. In order to get interactions between buildings and the built environment, we use the **reliability** concept. On the
operational level, the assessment of reliability is carried out at different levels considering on
the one hand sustainability of buildings –agents– and on the other hand variations that
sustainable buildings produce in the urban metabolism –actions–.

Agents –sustainable buildings– and actions addressed to make buildings sustainable are
reliable if they express abilities of adaptation, resilience and regeneration [9], and convert the
regenerative potential of a place into regenerative capacities, supporting the transition of
sustainability towards the highest level in the hierarchy [5]. The assessment of reliability is
based on holistic indicators, which we consider suitable for grasping relationships between
buildings and the built environment. These indicators may allow quantitative as well
qualitative assessment depending on reliability referred to agents or actions, and depending
on what performances have to be assessed.

Sustainability evaluation is improved when using reliability since it integrates spatial scales
and exploits the story and potential of a specific place, thus favouring the contextualisation of
design choices as well as the identification of significant performances to be assessed.

**Reinterpreting the design activity**

Applying sustainability evaluation since the initial phase of design allows comparing different
design choices producing more effective results in terms of sustainable performances.
However, while on one side simulation and evaluation have been refined on individual
performances, on the other side integration of sustainable design choices lacks the right
attention. On the contrary, with its complexity and uncertainty, sustainability calls for multi-
competences to be integrated in design solutions for a building or an urban environment
considered as a whole. From this point of view, much is still needed in order to overcome the
current trend to consider sustainability related to individual performances, and even more to
introduce interactions between buildings and the built environment instead of considering
single objects. Through reliability, the authors offer a contribution in this direction promoting
innovation in sustainable building design and built environment processes.

Focusing on reliability as defined above, the activity of designing sustainable buildings and
activating built environment sustainable processes is aimed at supporting a learning process
crossing boundaries between disciplines and perspectives towards a transboundary
competence intended as “the ability to communicate and collaborate across traditional
boundaries, while working in interaction with actors/stakeholders” [10: p.125].

Reliability shifts the focus of interest from products to processes and introduces
contextualisation and temporal dimension into design and evaluation activities. Thinking
about strategies –adaptation, resilience, and regeneration– more than solutions, architects,
engineers and decision-makers as actors of sustainability processes are invited to learn and
share stories about the place, and recognise its regenerative potential. Then, aims and
aspirations [5] of a sustainable project will be related to that specific place and tend to
translate its regenerative potential into regenerative capacities, fostering processes of co-
creative and co-evolutionary partnership between human and natural systems as the regenerative approach requires.

On this line, involving communities into the activation process of regenerative sustainability is essential. In fact, a major reason for scarce results of sustainability applications in buildings is due to people: though the increasing environmental awareness, our lifestyle is not changed much. It is still largely diffused the feeling that consuming less means less comfort and well-being, even less freedom of living choice. Therefore, we look for solutions that let us consume as much as we like, but in an environmentally compatible way. So far, this approach has generated no sensible outcomes in terms of recovering from environmental depletion and pollution, and enduring human and natural life on the planet.

Designing new buildings or improving existing buildings and urban environments in a sustainable way has not been counterbalanced by the way in which we live buildings and cities. Again, it is evident that the interaction between buildings and the built environment is essential and that the behaviour of users is crucial. Beyond green performances of a building, it is then important that the building activates interactions indoor and outdoor, with both infrastructures and users. In this way we cross the scales of sustainability evaluation and implementation and give importance to connections between agents –both human and non-human– in the built environment.

Concerning indoor infrastructures, interactions must be considered for instance in terms of rapidity of response to changing situations outside the building –temp, humidity, wind, sun radiation, rain, sounds, air pollution– as well as to uses of resources by inhabitants inside the building –heating, cooling, ventilation, water use, waste production–. In this direction, design choices should be addressed to solutions which increase the reliability of buildings; so that, they result as ‘relative’ solutions for a contextualised sustainable behaviour rather than ‘objective’ solutions for a context independent operation of the building.

The positive outcomes of such approach are related to many aspects. A first aspect concerns integrated design, so that the best performance of the building derives from the global functioning of the building as a whole system, with its subsystems that cooperate. This invites architects and engineers to design integrated solutions that focus on the overall behaviour of the building, avoiding design choices sustainable per se and separated from each other, in favour of solutions which are consistent internally and with place and people. A second aspect concerns the measurements, which can be still based on physical variables we are used to evaluate; but, the time variable can be added during the assessment process to represent the behavioural dynamics of the buildings. A third aspect concerns a shift of importance on building management for improving its evolving sustainability since only a complex, dedicated system of management may guarantee an effective cooperation between indoor infrastructures and their users in a specific place.

Concerning outdoor infrastructures, interactions must be considered for instance in terms of improving sustainability of other buildings, roads, open spaces, activities around a sustainable
building, and the way communities use natural and built infrastructures. In this direction, architects and engineers have to think and implement design solutions at the scale of the building itself. But, at the same time they have to stimulate a cooperative process of planning and design with other actors/stakeholders in order to intervene in the built environment with consistent and context sensitive actions aligned with efforts of nature. In such way, sustainability solutions of one building are interdependent from sustainability solutions of other buildings and urban infrastructures, and this will favour the reliability of actions improving both the environment and people well-being, while introducing an evolving process of cooperation suitable for turning the regenerative potential of a place into regenerative capacities.

Such an action scenario shows how a reinterpretation of design activities of buildings and built environments can be a turning point towards upper levels of sustainability, particularly on the basis of the regenerative approach. The role of architects and engineers with transboundary competences is essential in this process in order to activate cooperation stimulating co-creativeness, which can express innovation and can address technological advancements experimentation.

**Conclusion**

To address the multiple challenges posed by complexity and uncertainty characterising sustainability, we must innovate the conceptual tools which we use at present. In this paper, we propose the concept of reliability as a way to introduce innovation in sustainable building design and built environment processes. Evaluating reliability is a destructuring process which is rooted in the idea that the design activity needs certainties and doubts and also capacities to transgress conventions. Thus imagined, the evaluation process becomes a companion to a creative design which opens up its routines to incorporate the whole process of production of space.

For us reliability of agents and actions represents a new perspective to structure a spatially sensitive method to evaluate the sustainability of the built environment. In fact, reliability catches interactions between buildings and built environments, contextualising design solutions and stimulating the regenerative capacities of a specific context. In the attempt to address sustainability drawing on the regenerative approach, reliability stimulates the use of new conceptual tools, implies the application of new ways of acting, and challenges our knowledge and current technologies thus promoting innovation and experimentation.

The paper describes the conceptual model we propose, defines reliability and highlights the much potential that reliability shows. It can be considered an operative tool to practice the regenerative approach; it can be a strong stimulus to innovate design activities; it can be a catalyst element of multiple stakeholders’ perspectives. Reinterpreting the design activities of buildings and built environments can be a turning point towards upper levels of sustainability; the role of designers and projects become fundamental in order to offer and/or catalyse specific ‘positives’ of a place [11].
References