The Technological Design of Resilient Landscape
Il progetto tecnologico del paesaggio resiliente

Filippo Angelucci, Rui Braz Afonso, Michele Di Sivo, Daniela Ladiana

Initially employed by the material sciences and successively applied to ecological and cognitive disciplines, the notion of resilience was also defined by debate on complex systems of settlement. This introduced the first discussions of urban resilience, landscape resilience and even the resilience of buildings. The definitions attributed to the term as resilience of complex socio-ecological systems also suggest a shift in content and significance linked principally to the development of projects that take into account the conservation and regeneration of landscape values. In the short to medium-term, the acceptance and specific socio-ecological definition of the concept of resilience in the field of landscape design will undoubtedly comport a re-orientation, if not a true evolution in relations between inhabited space and building technologies, beginning precisely with new methodologies and the systemic theoretical-applied foundations of this new paradigm. The design of the landscape, with its diverse territorial environments and its technical components, in relation to the paradigm of resilience, must be reinterpreted increasingly more as a process of technological-environmental transformation of inhabited space in its entirety and its consistency as a complex system of interaction between man, nature, artefacts and society.

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Il termine resilienza, utilizzato inizialmente nell'ambito delle scienze dei materiali, dopo aver trovato una sua applicazione nelle discipline ecologiche e cognitive, è stato declinato anche all'interno del dibattito sui sistemi insediativi complessi. Si è iniziato così a parlare di resilienza urbana, paesaggistica e anche di una resilienza degli edifici. Le accezioni attribuite al termine, nel senso di resilienza dei sistemi complessi socio-ecologici, fanno intendere per il concetto un salto di contenuti e significati particolarmente legato agli sviluppi progettuali per la conservazione e rigenerazione dei valori paesaggistici. L'accoglimento e la specifica declinazione socio-ecologica del concetto di resilienza nell'ambito del progetto del paesaggio comporteranno certamente, nel breve e medio periodo, un riorientamento, se non una vera e propria evoluzione, dei rapporti tra spazio abitativo e tecnologie costruttive, a partire dalle aperture metodologiche e dai fondamenti sistemici teorico-applicativi di questo nuovo paradigma. Il progetto del paesaggio con i suoi diversi ambiti territoriali e componenti tecnici, alla luce del paradigma della resilienza, dovrà quindi essere reinterpretato sempre più come un processo di trasformazione tecnologico-ambientale dello spazio insediativo nella sua totalità e nella sua consistenza di sistema complesso in cui interagiscono uomo, natura, artefatti e società.

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Architettura e Innovazione
Built Environment Technologies and Healthy Architectures

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La presente pubblicazione raccoglie i risultati della ricerca *Il paradigma della resilienza nello sviluppo delle tecnologie per l'ambiente costruito*, svolta dal 2014 con fondi ex 60% di Filippo Angelucci, Michele Di Sivo e Daniela Ladiana presso il Dipartimento di Architettura dell'Università degli Studi "G. d'Annunzio" di Chieti-Pescara e della ricerca internazionale *Landscape in Translation – For the government of the transition*, svolta in collaborazione con Rui Braz Afonso e il Centro de Estudos de Arquitectura e Urbanismo della Faculdade de Arquitectura da Universidade do Porto.
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Technological Culture and the Resilience of the Landscape

Michele Di Sivo

There is now an urgent need to identify new approaches to the government of the landscape to contrast the phenomena of abandonment generated in recent decades in the wake of powerful territorial processes of socioeconomic transformation; processes that, by interacting with one another, have led to the uncontrolled growth of the city, the disproportionate utilization of land, practices of illegal construction, the banalisation of the diversity of the agricultural landscape, imbalances in hydrogeological conditions and the depopulation and abandonment of rural areas.

Unfolding against a backdrop of generalised indifference to reciprocal relations and their possible implications, these actions are responsible for the extensive and deep scars destroying the landscape and compromising not only its aesthetic, historic and cultural values, but in fact determining new conditions of risk for the territory and the local communities inhabiting it.

The urgency of implementing methods of government focused on a more efficient protection of historical-cultural and productive values, on preserving ecological-environmental balances and rehabilitating long-abandoned and compromised territories may find a key ally in the adoption of *resilience* as a fundamental characteristic that allows for the integral and integrated conservation of the quality of landscape systems.

Initially employed by the material sciences and later successively applied to ecological and cognitive disciplines, the notion of resilience was also defined by debate on complex systems of settlement. This introduced the first discussions of urban resilience, landscape resilience and even the resilience of buildings. The definitions attributed to the term by the school lead by Holling and Walker, a notion of the *resilience of complex socio-ecological systems* witness to the interaction between artifice and nature, also suggest a shift in content and significance linked principally to the development of projects that take into account the conservation and regeneration of landscape values.

In the short to medium-term, the acceptance and specific socio-ecological definition of the concept of resilience in the field of landscape design will undoubtedly comport a re-orientation, if not a true evolution in relations between inhabited space and building technologies, beginning precisely with new methodologies and the systemic theoretical-applied foundations of this new paradigm. The design of the landscape, its diverse territorial environments and its elementary technical components, in relation to the paradigm of resilience, must be reinterpreted increasingly more as a *process of technological-environmental transformation* of inhabited space in its entirety and its consistency as a complex system of interaction between man, nature, artefacts and society. This reinterpretation must embrace the problematic nodes of the processes of the ideation, realisation and management of an inheritance, not only the landscape – in a dynamic and intersystemic manner – based on a broader and more balance relationship between ecosystemtic capacity, climatic-environmental factors, the needs and behaviour of users, organisational-managerial procedures and know-how in the fields of technology and construction.

The concept of resilience is thus presented as a new framework of reference for initiating considerations intent on establishing a useful relationship with the theme of landscape quality, based

above all on the pursuit of an efficacious balance between man and nature.

The centrality of technological culture in the construction of the landscape and its levels of reactivity (resilience) is at the core of the considerations presented in this publication.

The direct relationship between resilience and the technological culture of designing the built environment, what is more, is nothing new. The first hints of the concept of resilience were already present in the 1970s, in some of the considerations advanced on the central role played by technology in the transformation of the spaces of dwelling; important implications were sensed at the time in reference to at least two fundamental nodal issues:

- the need to reinterpret the process of ideation, construction and management of actions transforming the built environment as a set of "integrated and integrating" technical activities belonging to an organic approach to design, in which to recompose or search for the coherence between resources, restrictions, needs and solutions brought into play by the transformation of habitats. In this direction there was already a sense of the central role of the technological building culture in rebalancing potential drifts in the technological domination of nature[1] through architecture, the city and *adaptive landscapes*, aimed at compensating the shortcomings accumulated over the years in the various physical dimensions of the system of settlement;
- the importance of governing the cohesion between strategic, political, cultural and informative actions as an unavoidable step in the management, maintenance and regeneration of the quality of the built environment. In this second direction, technological design culture pointed toward the central role of approaches,

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methods and tools for revealing, generating and nurturing over time the *reactivity* of actors, societies, organisations and procedures, necessary to reactivate the vitality of systems of settlement in the face of what were then the first environmental crises.

Without a doubt the first problematic node can be tied to the intuitions of Giuseppe Ciribini whose studies of architectural technology focused on the need to channel reflections on building technologies into the vaster dimensions of nature, society and the individual; in particular, investigating the pairings of nature / technology, society / technology, individual / technology[2].

In particular terms, investigating the categories that would later constitute the principal fields in discussions of environmental sustainability though, in reality, anticipating with these same couples the original elements of a reconsideration of technology as something adaptive and evolving.

In truth, these considerations link the Italian debate on architectural technology to developing international considerations (for example in the work of Erich Jantsch) on the evolving relationship between technological innovation, individuals and socio-economic dynamics[3]. The identification of the concept of the "degree of artificiality" or the technological "threshold" as the point of potentially irreversible transformations is very close to the condition of the limit equilibrium referred to the resilience of socio-ecological systems. With respect to these thresholds, Ciribini considered it necessary to reorient the very design of our habitat, concentrating on themes such as adaptation to the physical environment (natural and artificial) and to the psycho-social environment[4]. With respect to the role played by technologies in the process of producing, using and managing the system of settlement linking man-nature, it is worthwhile recalling that when dealing with the transitory phase that architectural technology had entered into at the end of the 1960s Ciribini asserted: "technology, from an element of imbalance, must be converted into a balancing element in natural contexts, some made possible for the human race by the opposition between the notions of *weak technology* and *strong technology*" [5], in this manner identifying a soft, informational and non-prescriptive concept of the technology of the very elements underlying theories and experiences founded on principles of resilience[6]. For Ciribini building technologies aim at "ecological stabilisation or the conservation of their reproductive capacities, the use of natural elements, physical adaptation of the natural environment, the constitution of a biological landscape or the reconstitution of relations between man-nature, truncated by industrial society" [7].

The adaptability and reactivity of a habitat thus emerge as the fundamental characteristics of a necessary change in technological thinking and the very consistency of building technologies, in order to confront the new and old elements of the system of settlement.

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With respect to the technological implications inherent to the process of orienting and managing the dynamics of cohesion between actions of transformation, the reflections offered by Giovanni Ferracuti on the relationship between nature and technology are also proposed in critical terms, affirming the necessity of "saving Nature, or its friendly part, by making it the object of a project" in order to "insert it within our processes of production, and provide it with an economic and non-ideological dimension"[8]. These processes emphasise the importance of maintenance.

"Limiting attention to environmental phenomena, and more specifically to the physical transformations and means of using space that accompany and concretise the economic and cultural dynamic of society, we must observe that, as the objective of growth presupposed a continuous activity of construction, the objective of an equilibrium must provide an impulse, to a great extent new in its intensity and quality, to the activity of maintenance, intended above all as the conservation of a condition of equilibrium"[9].

Critical of the lasting approach to the unrealistic dominion over nature, Ferracuti hoped for an evolution of design culture toward the capacity to identify and promote a system's inherent abilities to regenerate itself, similar, for example, to 'zero maintenance' gardens; "in these cases, the effort of a project consists less in defining an immutable and crystallised formal structure, into which to force the dynamics of vegetal life, as much as identifying and incorporating the constituent rules of these dynamics, in making them the central element of the design of the garden and constituting the conditions for its development"[10]. What we could now term a resilient garden.

The topicality and breadth of these concepts may have important repercussions on the development of methods and tools for conserving and promoting landscapes, in order to define the parameters of a more mature management of the territory, integrating the conservation of the landscape's intrinsic values with its valorisation. Hence it appears important, in order to favour the conservation or creation of landscape values, to determine within the field of architectural technology a truly integrated approach to design and the use of appropriate technologies; the same actions that resilience would appear to impose in order to guarantee the reactivity, adaptability and transformability of the system of inhabitation shared by man-nature[11].

This publication brings together different contributions on these issues developed as part of two research experiences: *Landscape in Translation – For the government of the transition* (promoted by the Dipartimento di Architettura/Università "G. d'Annunzio" di Chieti-Pescara and the Centro de Estudos de Arquitectura e Urbanismo/Faculdade de Arquitectura da Universidade do Porto); *Il paradigma della resilienza nello sviluppo delle tecnologie per l'ambiente costruito* (in progress research from 2014/Dipartimento di Architettura, Pescara). Employing an interdisciplinary ap-

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proach, these researches focused on defining criteria and methods of intervention for the requalification and promotion of abandoned landscapes. Requalifying the landscape by adopting the theme of the *resilience* of the socio-economic-environmental system as a paradigm of intervention is the structuring axis of these researches. This theme is developed in the following essays through an organic reflection on the development of long-term and integrated strategies of intervention for implementing policies that consent more effective actions of conservation, an increase in existing values and greater protection against threats and pressures exerted by the environment.

There is an affirmation of the need for social culture to evolve toward the themes of *care* and *maintenance* and, locally, the host of *economic, social* and *physical* conditions that have produced actions responsible for the comprehensive degeneration of the landscape and the environment (Di Sivo). Undoubtedly this cannot be implemented through isolated measures, but urgently through a merely selective defence of the key or critical aspects of a strategy of *integrated territorial management*, defining new approaches and instruments of knowledge and decision-making (Braz Afonso). We must operate within thresholds to determine the "carrying capacity" of the territory, considering that in a territorial environment we cannot continue indefinitely to add elements without experiencing a rupture in the equilibrium between physical-environmental resources, the offering of services and infrastructures, productive activities and inhabitation (Braz Afonso).

The conservation and/or promotion of the landscape is a process that does not regard exclusively those landscapes of the greatest aesthetic, environmental or historic value, but *all* landscapes, even those of the *everyday*; the importance of this concept leads suggests that this environment of investigation is important to the immediate future (Ladiana). In determining actions for the requalification and promotion of the landscape it is important to de-

fine conditions of *liveability* at various scales of intervention; liveability referable to a vision that tends to restore the centrality of the user, as well as a more organic definition of the system of needs (Angelucci, Di Sivo).

As a consequence, all of the instruments that can and must be identified in order to improve or recuperate the *safety* and *quality* of the landscape must allow for the *participation* of citizens, whether individuals or members of organisations operating in the territory (Ladiana).

Precisely for the collective and totalising dimension of their fruition, it is impossible to imagine a univocal approach to the preservation and development for landscapes; instead it is necessary to approach them through actions focused on incrementing their specific vocations and necessities. With this intention, particular importance must be assigned to a new conception of *infrastructure* in the territory (Angelucci).

The same territory in which, beginning with those areas in which we more directly confront the human/technological and natural/ecological dimensions, when determining the methods of implementing *resilience* it is now necessary to define an integrated framework of actions for safeguarding exposed elements, intervening not only in relation to physical and built elements, but also working with organisational and social dimensions.

Prefazione/Cultura tecnologica e resilienza del paesaggio

Oggi, un'urgente necessità di nuovi approcci per il governo del paesaggio si impone per contrastare quei fenomeni di degrado che sono stati generati, negli ultimi decenni, a seguito di potenti processi di trasformazione socioeconomica del territorio; processi che, nella loro interazione, hanno condotto all'incontrollata crescita delle città, allo spropositato consumo di suolo, alle pratiche di abusivismo edilizio, alla semplificazione della diversità del pae-