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ENVIRONMENTAL ETHICS AND SUSTAINABILITY OF TECHNIQUES. FROM HYPER-SPECIALISATION TO MULTIFUNCTIONALITY FOR A RESILIENT INHABITABLE SPACE

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Abstract

Crises represent crucial global dynamics events, which were predictable and have been with us for some time. In the new context caused by epidemic and pathogenic conditions, not only must it be reaffirmed that planetary society is an integral part of nature, but that the production processes of anthropogenic metabolism are part of the more general metabolism of nature. Climate change, a significant element of the contemporary environmental crisis, will orient living conditions within the global ecological crisis in a different way.

The concept of habitable space, which is, above all, a space of correlation between society and the environment, considers technology as a factor in the reconstitution of a process that is symbiotic and no longer of exploitation of environmental resources. Recently, there has been a renewed awareness of place consciousness and of inhabitants/producers who, through a co-evolutionary principle, are called upon to develop "neo-ecosystems" according to a territorial identity principle.

Rather than representing levels of identity that nevertheless express borders, the "local" category constitutes what is discussed and argued in common through a measure of involvement and intensity. So, the relationship between transition cities and urban resilience is part of the governance of the new phenomena of non-linearity. In metropolitan areas, the spread of new urban polarities evolves the concept of resilience towards a multi-scalar and multi-sectoral condition of adaptation and mitigation of anthropogenic and environmental risks.

Inside this scenario, hyper-specialisation still represents the tendency of a technical character that induces the development of deep competencies but loses the critical sense of technique in its ethical and socio-economic interactions. Inhabiting and building evolved scenarios of society need a multifunctional thought that can develop and critically manage the choices and uses of technology in a design scenario capable of coherently integrating its contributions.

Keywords

Climate adaptive design, Risk management, Urban ecodistric, Resilient habitat, Environmental design.

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1. ECOLOGICAL LIMITS AND ENVIRONMENTAL ETHICS. FROM RELATIONSHIP TO THE INTERACTION BETWEEN MAN AND ENVIRONMENT

The roots of the multiple crises that are straining the planet – climate, energy, pathogenic crises, etc. – are mainly found in an economy that does not respect ethical limits and is based on the inexhaustibility of resources, causing inequalities and clashing with the ecological limits of the planet [1]. Thus, ecological crises cannot be separated from the economic and social systems that support them [2], as the interference of human actions with natural phenomena has reached thresholds of no return, with heavy social and economic as well as environmental and ecosystem impacts. On the other hand, the significant problems of our time cannot be understood in isolation because they are systemic, interrelated, and interdependent problems, non-linear in nature, as they are representative of the connotative aspect of networked patterns of living systems [3].

During the recent pandemic, environmental concerns have long been overshadowed by events at the UN-sponsored Conferences of the Parties (COP). COP 27 in Sharm el Sheikh in November 2022 highlighted the need for compensation of poor countries that have suffered loss and damage from anthropogenic climate change, while at COP 26 in Glasgow in November 2021 – within a more robust integration between adaptation and mitigation goals – the link between environmental crises and ecosystem balance was pointed out. As Slavoj Žižek points out, it is necessary to reaffirm the substantial unity of the two spheres, as the epidemic has exploded due to the unbalanced relationship between the economy, society, and the environment [4].

The crises represent crucial moments in the dynamics of global capitalism, which were not only predictable but have been with us for some time. In the new context brought about by epidemic and pathogenic conditions, it must be reaffirmed that planetary society is an integral part of nature. Moreover, the realisation of production processes that represent anthropogenic metabolism is part of the more general metabolism of nature. Climate change, a major part of the contemporary environmental crisis, will have to orient living conditions within the global ecological crisis differently.

It will be necessary to recognise the human-environment correlation within broader connections between the living and physical worlds. If, in pathogenic conditions, humankind struggles against external agents, ecological mutation gives rise to a tragically reversed situation in that the agent that has altered the living conditions of all the planet's inhabitants is not a virus at all but human society [5]. Suppose the ecological footprint has exceeded the planet's capacity to withstand the production and consumption processes of the entire Anthropocene society. In that case, the emission of climate-altering agents can be controlled by combining the efficient use of energy with the reduction of the production volume of materials and their flows within the entire environmental system [6].

Based on the new conceptions of nature and humans, in the reciprocal dependencies between agents, knowledge and actors, environmental ethics simply relocates man and his activities within nature, allowing people to look at the world feeling part of it and abandoning anthropocentrism that has lost its legitimacy. Environmental ethics is based on the idea of the ecosystem, in which all living beings are part of complex and mutually interacting life forms in both the biotic and abiotic environment. In contemporary times, the focus on living beings as organisms to be safeguarded is shifting to preserving the entire earth system, understood in its overall physical components and habitats that are home to living species.

The underlying theme of an evolved perspective for environmental ethics is no longer to transform the environment in a compatible manner or to preserve it but to understand what point of view to adopt and what actions to ensure the continuous interaction between human activities and the environment without compromising the ecosystem balance.

2. IN THE AGE OF TECHNIQUE: PROMOTING REGENERATIVE PROCESSES FOR HABITABLE SPACE

Bruno Munari relates the meaning of inhabitable space to research carried out in the period of outstanding youth

cultural ferment around 1968 and oriented towards the future by proposing a lifestyle that would make the economy of space and resources its strong point for greater flexibility in housing. B. Munari, L. Forges Davanzati and P. Ranzani presented the *Spazio Abitabile* project at the 14th Triennale in Milan in 1968, looking at the young people who would inhabit the future with a view to enabling them to obtain a comfortable home without high costs. Within the problems of number and quality, the reference to "modulated blocks" would have made it possible to integrate the indispensable furnishings, leaving the inhabitants free to intervene with their personal choices [7].

The notion of habitable space was thus born on the basis of a forward-looking perspective. While Munari placed the concept in the indoor space, a few years later – in 1973 – Eduardo Vittoria implemented an extension to the entire "empty space of the habitat", extending the concept to the space of human interactions with the surrounding environment. Research on habitable space represents the outcome of several technological possibilities capable of conceiving and modelling artefacts in an innovative manner, establishing a bi-univocal relationship between people and the environment considered in its various physical, biological and cultural components [8].

While being closely interconnected components, it was not possible to enucleate artefacts from the environment itself, conceived as an integrated system between the natural and the built environment. This concept of habitable space, which is, above all, a space of correlation between society and the environment, considers technology as a factor in the reconstitution of a process that is symbiotic and no longer of exploitation of environmental resources. It should be recalled that in those years, Tomás Maldonado emphasised overcoming the legacy of idealism. He suggested considering the value of the city as an existential operating territory, in which the inhabitants were actors that operate and live in the city and not spectators of an aesthetic landscape. According to this consideration, a scientific approach to the order/disorder dichotomy was advocated, whose polarisation was inseparable from the simplicity/complication pair [9].

Recently, there has been a renewed awareness of place consciousness and of inhabitants/producers who, through a co-evolutionary principle, are called upon to develop "neo-ecosystems" according to a territorial identity principle. The place is not understood according to a relational meaning but as an identity factor capable of generating innovative communities, behaviours, cultures and ecological techniques of living and producing [10]. By grouping, human express a capacity to situate themselves and be localised by making an evolved sense of the conception of the "local". Rather than representing levels of identity that nevertheless express borders, the category of "local" constitutes what is discussed and argued in common through a measure of involvement and intensity, according to a controlled logic of reduction of the relationship between "small" and "large" [11].

In the ecological crisis, we are aware of the ever-increasing contribution of technology and its risks, as economic and productive forces and great socio-technical development require a constant reorganisation of production processes and urban systems. Directing technology towards levels that are functional to sustainable development and capable of interacting with environmental ethics today represents the relevant challenge to be implemented through a fair and sustainable development model, capable of guaranteeing the survival of ecosystems and the environment in all its complexity.

The outcomes of transformation processes and all the products of anthropisation are placed within the horizon of technology, in which every project is part of the production. «With metaphysics, nature has been measured by human design»: thanks to science and technique, man has no longer considered nature as his home but as raw material for his production and consumption [12]. Bruno Latour points out how habitat and inhabitants represent a continuum since defining one is equivalent to specifying the others. Consequently, the city is nothing more than the exoskeleton of its inhabitants since nothing on Earth is entirely natural since everything is the effect of the actions performed by living organisms [11]. In this way, we can understand how today, the crucial condition is represented by overcoming the short circuit according to which «it is no longer ethics that chooses the aims and entrusts technique with finding the means, but it is

a technique that, taking the results of its procedures as aims, conditions ethics, forcing it to take a position on a reality that is no longer natural but artificial» [12].

A line of action for the future is oriented towards the transition of "regenerative" cities, capable of implementing the development of circular metabolisms and processes that progressively replace conventional and essentially linear processes to support efficient and low-waste projects and processes. Every action of urban and environmental conservation or transformation requires to be seen as a process of ecosystem reactivation through the use of appropriate strategies and technical and design solutions of rebalancing. These should be directed at bridging gaps in biodiversity mixite, efficiency and effectiveness of processes and life cycles, favouring approaches for a new ecology of the artificial and natural environment [13].

Within this reactivation pathway and alongside the sustainable use of resources, managing processes and projects should ensure that simultaneous environmental regeneration creates conditions favourable to life for all biotic and abiotic components. A regenerative approach provides the proper interactions between the anthropised environment and the natural environment, guaranteeing well-being and minimising the use of energy and matter in all phases of production and consumption cycles, with reuse, repair, restoration and recycling. Regenerative factors help to maintain a balance through the resilience of contexts that can counter and react to the impacts of environmental, natural and anthropogenic hazards.

Regenerative logic for urban contexts can become the basic code for innovative actions that modify the metabolism of cities in which resources are introduced into the urban system by separating inputs from outputs without considering the origin of the former nor the destination of waste at the end of transformation processes. Instead, by pursuing process efficiency, the reduction of resource consumption or the use of renewable resources, the circular process model emphasises how much one must act in the direction of keeping products, components and materials as long as possible at the highest level of performance. This fact orients industrial production for the built environment towards durability, simple replacement and long life of products within the environmental system.

In interventions at different scales and in the architectural field, technological solutions are required to support new organisations of urban districts and buildings to progressively reduce the impact due to technological cycles that are incompatible with natural cycles. The logic of buildings that are not very durable and require progressive and substantial maintenance will have to give way to building concepts that, by design and construction prerogatives, can minimise maintenance in favour of affordability and durability.

The role of transition from urban districts to eco-districts becomes central in transforming the living space of entire urban areas and buildings in which every activity aims to regenerate the natural capital according to harmonised times and modalities. A regenerative city is not only a green city that interacts with nature but is, above all, an example of the reconversion of urban activities according to a strong interaction between technology and the environment, between urban systems and the ecosystems in which they are embedded.

3. INTERACTIONS BETWEEN TECHNOLOGY AND ENVIRONMENTAL ETHICS: MULTIFUNCTIONALITY VS HYPER-SPECIALISATION IN THE PERSPECTIVE OF THE RESILIENCE OF HABITABLE SPACE

In its general meaning, the concept of resilience represents the capacity of a system to regenerate and reorganise itself after adverse events, proportional to the amount of disruption the system can absorb as well as its ability to self-organise, learn and adapt [14]. In resilient terms, architecture relates to forecasting and prevention strategies, adaptation to impacts, reduction of vulnerabilities and programming of measures for risk mitigation. The resilience of territories, cities and buildings, therefore, represents the new challenge in today's "risk society", in which it is necessary to combine design and innovation with reference to conservative, adaptive, reactive and regenerative capacities aimed at reducing vulnerabilities and minimising the impacts resulting from extreme and unforeseen events.

The topic of resilience concerning natural and anthropogenic hazards is connected to functional-spatial and

environmental conditions, processual and governance aspects, and technical-constructive ones, which require the implementation of forecasting and prevention strategies [15]. The relationship between transition cities and urban resilience is part of the governance of the new phenomena of non-linearity. In metropolitan areas, the spread of new urban polarities evolves the concept of resilience towards a multi-scalar and multi-sectoral condition of adaptation and mitigation of anthropogenic and environmental risks. Finally, the hazard-specific and site-specific situation of resilience is addressed by identifying and constructing integrated scenarios for its measurability and for developing projects, products and processes aimed at reducing both resource requirements and environmental impacts [15].

A resilient system is a system based on an adaptive cycle that has several characterising phases: the first of rapid growth, the second of conservation, and the third of release in which resources are dispersed following an unforeseen impact, while the fourth phase constitutes the moment of reorganisation in which the cycle restarts [16]. Dynamism and diversification are characteristics of resilience, which is based on feedback processes of dynamic reorganisation. Figuratively speaking, resilient systems are diversified at the margins but exhibit simple and effective behaviour at the central "core", ruling out the possibility of one part's vulnerable conditions cascading to others. Resilient systems' regenerative and reorganising capacity manifests itself by operating under variable conditions, reacting flexibly from a predefined state to one that arises unexpectedly.

This characteristic allows a complex system to adapt to new operating conditions and improve its adaptive capacity by maintaining, integrating or replacing some of its own functionalities to preserve an operational life aimed at the system's purpose.

Moving away from the hyper-specialisation inherent in modernisation and relying on a transition that sees the ethical values of the environment and ecology at its centre also becomes a motif of cultural transition. A new ontological definition of the technique and design of habitable space drives its multifunctionality and the multiculturalism that should underpin it. The values expressed by collateral qualities such as flexibility, horizontal integration, circularity and resilience find a foothold in complex thinking, in which the awareness of uncertainty is combined with risk awareness and the application of a prudential principle [17].

It is necessary to realign the project for the built environment to the new perspectives of inhabiting. Edgar Morin recalls how there is always an ecology of action in which every decision, other than being a promise of a result, is also a bet on the effectiveness of the expected result: overcoming abstract logic and the idea of dogmatic reason, there is a continuous need for complex rationality that copes with contradictions and uncertainty without repressing them [17]. The heuristic process of the architectural design, which must be able to take into account unforeseen variables to unfold its path of research, also includes conditions of doubt and uncertainty, fits into this direction.

An interpretation of the change of scenario in the transition from classically understood modernity to the new complexities of the contemporary world must be set out by considering the relationship between space and socio-economic conditions. This consideration highlights the overcoming of modernist ideology and the production/consumption cycle closely linked to spatialisation or functional specialisation, the rational centralisation or decentralisation of functions, the spatial division of labour and the homogenisation of productive activities through spatial segmentation [18]. In the field of architectural design, these data find, for example, clear evidence in neighbourhoods with functional specialisations (residence, directionality, commerce, services and equipment) or industrialised building production in closed cycles, where linear and mechanistic processes are prevalent.

The evolution and transformation of contemporary scenarios respond to a unified spatiality through mixite and aggregation of fragmentations for the constitution of new identities, developing according to the new values and conceptions of spatial integration, diversification and flexibility of urban space as well as the multiple finalisations of spatial proximity [18].

The radical break with the mechanistic, unifying, hyper-specialised and hyper-functionalist horizon of modernisation is implemented through progressive departures from Fordism as ideology. The new scenarios are

outlined by flexible accumulation, new organisational forms of dwelling space, and new production technologies, as in the case of "on-demand" building systems production and the recently digitised "file-to-factory" routes.

The difficulty of long-term planning and the vertical, specialised and hierarchical integration inherent to modernisation is overcome through the adherence to the principles of reticular and horizontal aggregation of functions, decentralisation, and reduction of technological processing times and production cycles, whose characterising concepts become speed, flexibility, uncertainty, volatility planning [18]. Space-time compression, which characterises various aspects of contemporaneity, leads to the tendency to resize space according to the time variable, resulting in significant cultural consequences on the rarefaction of time and space as tangible dimensions of social life [19].

The new references progressively disengage from linear models. Still, the reorganisation of habitable space within reticular and circular processes opens a possible dividing line on the technique that Martin Heidegger had well perceived. It «is not, as is usually believed, an application of science but the soul, the essence of science, because science does not look at the world in order to contemplate it but to manipulate it, so the technical intention is already inscribed in the scientific gaze» [12]. The aspect of multiculturalism and multidisciplinarity in contemporary design research highlights the need to place the heuristic process of design activities on a level of overall understanding and intersectoral convergence of knowledge, overcoming the factors of the identity-based and hyper-specialist involution of knowledge that generates inequality and conflict [20].

Hyper-specialisation still represents the tendency of a technical character that induces the development of deep competencies but loses the critical sense of technique in its ethical and socio-economic interactions. Inhabiting and building evolved scenarios of society need a thought that can critically manage the choices and uses of technology in a design scenario capable of coherently integrating its contributions.

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