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# TOWARDS A NEW ETHICS IN BUILDING

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# EDITORIAL
## TOWARDS A NEW ETHICS IN BUILDING

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Crises, which are overwhelmingly destabilizing the most established references with increasing frequency, are no more situational but systemic: therefore, responses to these crises require actual paradigm shifts. This assumption, as a non-casual coincidence with the 50th anniversary of the publication of the founding text *The limits to growth*, moved the Journal TEMA to launch this call for papers: *Towards a New Ethics in Building*. Thus, the goal was to capture the features and implications of paradigm shifts and transfer them to our research and scientific interest areas. This process has been accomplished both through *overviews*, helping to grasp the main relational and systemic aspects and *insights* into operational tools and methods and case studies specifically related to the built environment. This organization of essays is effectively reflected in the manuscripts that compose the presented thematic issue.

The three-year period 2019-2021 was not only the *bearer of global crises* but also, fortunately, a pivotal moment of responses at the level of top political-institutional decision-makers. In fact, contextually, Europe led a great project, at once political and socio-economic, namely the *Green Deal*, intending to transfer knowledge, proposals and solutions on the level of major strategic projects. The scientific-technological area of the *building sector*, in particular, immediately recognized itself in the *Renovation Wave Strategy Directive* (14.10.2020). For the first time, after decades of directives dedicated to issues of enormous impact (i.e., transport, energy, environment, etc.), nonetheless still conceived in a sectoral way, the issues of the *built environment* were being prioritized. More importantly, strategies were also being institutionally placed at the proper level of complexity. It was a matter of converging green goals in the city, construction and performance (according to a *circular approach*) with social cohesion and new welfare, having the quality of life and work as the main content and goal. Indeed, the three keywords of the Directive are: *greening our buildings*, *creating jobs*, and *improving lives*. Certainly, on the application level, inconsistencies and contradictions have already manifested themselves; the Italian NRRP (National Recovery and Resilience Plan), for example, with its bonuses, has so far failed to be up to the premises. However, at least on the level of legitimacy and support for a set of new theoretical and practical experiments, the *Green Deal* and *Renovation Wave* seem to have already actually made their mark. The research has taken note of the shift that the ethical dimension entails: an increasingly intersectoral/multidimensional approach, a growing contamination between society and science, and an orientation of the latter to seek responses more and more oriented to emerging social and environmental needs.

In its opening, this issue presents three introductory essays, constituting three broad *overviews*. The authors all pertain to the field that we can still call polytechnic, i.e., Engineering and Architecture, although they belong to different areas, sectors, and generations, and above all being bearers of seemingly distant cultures and research profiles. For this reason, too, reading the different declinations and emphases on principles, the different narrative styles with which they illustrate their theses and viewpoints on the *paradigm shift*, gives a grasp of the value of the differences but also the (wholly unplanned) mutual cross-references and many substantial and significant convergences.

In the first essay, *The ecological transition of cities*, the author, emeritus professor Federico M. Butera, widely known for his committed call to *deal with complexity* while identifying cities as the core of the problem and

also the solution, poses the question in terms of urban and environmental metabolism. The use of the term and the concept of urban metabolism itself goes far beyond the metaphorical dimension and becomes a pregnant analogy between systemic entities (i.e., eco-biosphere superorganism and urban or territorial organism). Entities in which flows of matter and energy realize complex dynamics affecting and continually modifying the initial systemic arrangements. These modifications, however, have come to be measured by an ecosystem in which there is no longer an *elsewhere* in which to converge waste. It is worth noting how China has become the world's true manufacturer and how yet still the emissions that come from factories located in China's territory are almost always blamed on China itself, which, nevertheless, operates in the service of that great global city, that is the European and North American West. Butera clarifies that this is not merely a matter of accounting and production. Consumption is influenced, mainly and above all, by *lifestyles* and related social status, without taking into account that even virtuous actions, such as energy efficiency in buildings, can produce counterintuitive outcomes. Against a reductionist view and the underlying *purely linear* logic, whereby problems are addressed and solved more efficiently by optimizing emerging sectoral aspects, for Butera, it is a matter of designing the future adaptively as a complex and largely unpredictable ecosystem.

In the essay *Environmental ethics and sustainability of techniques. From hyper-specialization to multifunctionality for a resilient inhabitable space*, Mario Losasso recalls the human-nature unity, reminding the reader as the techniques and productive and social arrangements that result from them are also part of the overall ecosystem. The new environmental ethic consists precisely of the critique of a model based on the domination of nature by a *rational-to-the-purpose* technique, which is contrasted with a co-evolutionary vision. Through this, human communities are called to develop neo-ecosystems of which they recognize themselves as an integral part: thus, they do not have a position of passive protection but a role in the regenerative co-design. This position invokes the theme of city and settlement life as an evolved form of metabolism. The organicist metaphor means that much of the investment in the human habitat of the future will consist of a regeneration of the existing building stock aimed at converting the current linear production-consumption-waste sequence into circular procedures with minimal waste, as the *Renovation Wave Strategy* states. This vision is equivalent to saying that the project must structurally place itself in terms of *ecosystem reactivation* by introducing the operational category of habitable/livable space, referring to the fruitful research of the 1960s and 1970s. Munari, Maldonado, and Vittoria, among others, in that historical passage, posed to architecture and technology the question of how to rethink and design habitable space in symbiotic terms and not in terms of resource exploitation. A concept already half a century ago pointed to a multifunctional alternative to sectoral hyper-specialization.

In the third essay, *Innovation and knowledge-based growth for two low carbon transitions in the built environment. Challenges and open research questions*, Massimiliano Manfren moves from similar premises:

- radical innovation (corresponding to the paradigm shift horizon);
- decoupling of social and economic growth from resource consumption (sufficiency);
- decided orientation toward complex and interscalar approaches;
- centrality of social and cultural factors over the reductionist hyper technological approach.

The author interprets them by placing the topics first and foremost from the knowledge-based development perspective (knowledge-based growth perspective). Of this perspective, meanwhile, the essay examines the complex relationships between technological innovation and policy directions because of the decisive role that decisive issues of a deeply social and cultural nature, such as lifestyles and consumption patterns, play with respect to the ultimate goal of minimizing global emissions. For the author, *sufficiency* in transforming the circular economy into behavior opens a relevant perspective to new trades for new forms of space use in a multifunctional and shared approach. Equally relevant is the critical argument about the risk of *wishful thinking* about replacing obsolete and increasingly marginal jobs with more

skilled activities that constitute the new and more fulfilling factor of social cohesion. Sharply identified are the structural constraints to the emergence of types of innovation diffusion that do not result, as is increasingly the case, in expanded inequality and exclusion. Moreover, it is pointed out that the new goal of the *knowledge economy* seems to have been decisively downsized: no longer the increase in the number of employed people, but at least the non-reduction compared to traditional jobs. Only mass co-interest in the challenge of sustainable innovation creates the social cohesion required to avoid disaffection with democracy. New innovation ecosystems must therefore be fostered and supported in public and corporate governance, and decision-making processes should be supported by data-driven procedures defined by the use of Artificial Intelligence (AI) and Machine Learning (ML) applied to building-generated big data. In conclusion, the author asks crucial research questions: Is the human dimension considered and properly accounted for? (e.g., all aspects related to behavioral change, which can, directly and indirectly, impact carbon emissions)? In this regard, it would be essential and urgent for a review of Italian policies related to the 110% bonus to ask the question and answer it correctly.

The pandemic has overwhelmingly brought out a new social demand for quality of life in inhabited spaces, highlighting the accumulated delays in the architectural sciences. This is the thesis of the paper *COVID-19, design and social needs: an investigation of emerging issues* by Vito Getuli, Eleonora D'Ascenzi, and Saverio Mecca. Consequently, innovation must be based on a radically transdisciplinary approach between social, health and spatial sciences. A multidimensional analysis of texts in the scientific literature highlights central concepts and their relationships, showing the new centrality of socio-psychological and health issues for design at all scales.

In the essay *Towards a technical sentiment lexicon for the maintenance of human-centred buildings*, Marco D'Orazio and Gabriele Bernardini tell us about the paradigm shift affecting the human-building relationship, starting from the Cognitive Building concept nevertheless reworking it in light of Natural Language Processing (NLP) systems. The experimental case study proposes an innovative way of relating to the data produced *at capacity* by the pervasive digitization of buildings, particularly by Computerized Maintenance Management Systems. In the problematic Artificial Intelligence (AI) era, human behaviors return to the center through systems that model themselves in adaptive and interactive terms to produce *sensible* knowledge, programming and governance.

Natural Language Processing (NLP) is also the core topic of *Fostering the consensus: a BERT-based Multi-label Text Classifier to support agreement in public design call for tenders*, where Mirko Locatelli, Giulia Pattini, Laura Pellegrini, Silvia Meschini, and Daniele Accardo discuss the use of the method in the pre-design phase, which is at the moment an unexplored field of application, despite its wide use in the design and construction. The pre-design stage, heavily reliant on natural language, aims at connecting stakeholder needs and design proposals, opening the vision to co-design and community participation. The research presents a method to develop, assess, and evaluate an NLP tool, using the BERT language model, that translates quality needs and objectives into an assessment hierarchical grid.

A similar approach, based on a use case, is applied by Gianluca Maracchini and Elisa Di Giuseppe in the paper *Building energy consumption under occupants' behavior uncertainty in pre and post-renovation scenarios: a case study in Italy*. The authors center on a topic of pressing relevance: the gap between consumption predictions made in deterministic terms and behaviors that escape the model. Again, an experimental case study that, on the one hand, starts from real data to calibrate models and, on the other, develops new approaches to *governing uncertainty* from a sustainable transition perspective.

The importance of defined instruments and certified procedures for the green transition is relevant in the paper of Stefano Cascone, *Ecological transition for the built environment: natural insulating materials in green building rating systems*, where the author shows how the ecological materials for improving the thermal performance of the buildings and thus reducing their environmental impact are critical decision support issues. The document discusses and demonstrates how chemical products and traditional materials for refurbishment are not able to be included in the virtuous palette of sustainable interventions for the energy retrofit stressing how

the NZEB approach (Nearly Zero Energy building) is going towards the evolutionary, the however not completely new, concept of LC-ZEB (Life Cycle Zero Energy building), including the embedded energy as a crucial energy amount to be reduced for the real inversion of the degradation of the global resource.

In the contribution *Testing and comparison of an active dry wall with PCM against a traditional dry wall in a relevant operational environment*, Marco Imperadori, Nicole Di Santo, Marco Cucuzza, Graziano Salvalai, Rossano Scoccia, and Andrea Vanossi analyze traditional wall (Dry Wall) and the false-wall with PCM (Active Dry Wall) to show the improvement on thermal performance of advanced insulation materials testing the solution in an experiment testbed. The case study and the monitoring of the thermal conditions of the envelope support the technological investment towards ZEB promoted by the national authorities and experimented by the test facilities of the polytechnic circuit. The energy and economic advantage is clearly demonstrated in winter, while future research on cooling needs and durability of the system could be beneficial to promote the diffusion of such advanced materials.

An innovative modelling approach that uses IFC (Internet Foundation Classes) not as commonly promoted as an information exchange format but as a data model, where standardized relations between building ontologies can be simulated, is proposed in the paper *Digitization of building systems using IFC to support performance analysis and code checking: standard limits and technological barriers. A case study on fire safety* where Carlo Zanchetta, Maria Grazia Donatiello, Alessia Gabbanoto, and Rossana Paparella aims at demonstrating how IFC ISO Standard can be used as a reliable data model to support Performance Analysis (PA) and code checking for construction disciplines using Fire Safety Engineering (FSE) as a challenging test field. The methodology consists of checking a digital approach to Performance Analysis based on information classes that can express users' requirements and performance specification of technical elements to develop computational code checking. This method is developed by creating virtual classes representing built systems and using relation classes and performance attributes to check if technical elements fulfil users' requirements.

A further innovative approach which is, in this case, focused on the evaluation of the compliance of school buildings with the measures to prevent and control the spread of Coronavirus, is presented by Carmine Cavalliere, Guido Raffaele Dell'Osso, Francesco Iannone, and Valentina Milizia in the contribution *Preventing COVID-19 spread in school buildings using Building Information Modelling: a case study*. The innovation relies on the methodology proposed to create a customizable and scalable rule-checking method for pandemics or other crises that invest in space management and users' safety. The methodology has been tested on school facilities as educational buildings are crucial in the continuity of the cultural progress of our communities, and societal protection can be supported by verification workflows based on digital technologies and Visual Programming Language (VPL).

To conclude, just as the Journal's call was being published, the two *topical* crises of the three years 2019-2022 (pandemic and climate change) were joined by a third: the eruption of armed conflict between major world powers, only seemingly confined to Ukraine, which radically alters the consolidation of a system-world (globalization). War and pandemics synergistically alter the process of global optimization of the economy and production, which had appeared unstoppable until the late twentieth century, downsizing the prospects of *inclusive prosperity* and replacing it with new resilient or *antifragile* approaches. The 11 contributions collected in this thematic issue are opening up the reflection on new visions that can be synthesized as follows in two main core topics:

- to restore the centrality of places and their specificities, meanwhile radically contradicting the postulate of hyper-specialization (and consequent productive de-localization). If the economy and its space are no longer guaranteed and secure on a planetary scale, local productions turn out to be preferable, both if referred to as strategic products or more trivial goods;
- to include an increasing factor of uncertainty and unpredictability in all planning and design processes. For example, the lean and material economy paradigms in structural calculations are revealed as factors of fragility.