Publishing Series in PROJECT | Essays and Researches
Possible and Preferable Scenarios of a Sustainable Future
Towards 2030 and Beyond
vol. 05 | 2021 | paper 7 | pp. 108-123

ISSN (print): 2704-6087
ISSN (online): 2704-615X
ISBN (print): 978-88-5509-209-8
ISBN (online): 978-88-5509-232-6

THE SUSTAINABLE PROJECT
Requirements and design strategies

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section
ARCHITECTURE

typology
ESSAYS & VIEWPOINT

DOI
doi.org/10.19229/978-88-5509-232-6/572021

ABSTRACT
Although sustainability has become a key concept in many fields in recent years, its definition is possible for various misunderstandings that have fuelled 'specialisms' on issues of ecology and the environment. The emergence of a systemic vision of sustainability and an approach anthropocentric/global that place the psycho-physical-social well-being of the user and the ecological-environmental well-being of the planet at the centre of the transformation processes, has led to a convergence between Sustainable Design and Healthy Design. The paper, therefore, wants to argue that sustainable design can be defined as appropriate participation (salutogenic) in the process of social, ecological, and environmental development of a particular place. Starting from these considerations, the paper identifies tactical macro-requirements at the methodological/theoretical level as drivers/vectors of sustainability and the tactical/operational level families of project actions.

KEYWORDS
biocentric approach, anthropocentric approach, bio-psycho-social approach, psycho-physical-social well-being, environmental well-being

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Sustainable is one of the most abused adjectives in contemporary culture and, more generally in mass communication, which finds a multiplicity of misleading interpretations in architecture and development policies, sometimes excessively unbalanced on the performance capabilities of individual interventions and on the application approaches based on the philosophy of the Performance-Based Design (LCA, UNI/EN-ISO, protocols, LEED certifications, BREEAM, ITHACA), and little rooted in the social and human factors which form the support fond active (User-Centred approach, Universal Design, Inclusive Design, Design for all). The first position on sustainability open to socio-economic issues was taken by Shaler in 1905, when he emphasized the moral obligations of each generation towards the future and linked the sustainable urban environment to a built environment process that promotes economic development while safeguarding the health of individuals, society and the ecosystem without wasting resources, or rather a collective process through which the built environment reaches new levels of socio-ecological balance (Shaler, 1905).

If despite these reflections have opened to a more mature sustainable architecture season that explores the space we inhabit as a habitat in which interacting components – ecological, social, technical and economic able to improve the livability, the inclusiveness, the psycho-physical well-being, the health of its people and ultimately the quality of built environment – this more comprehensive view of sustainable design seems, however, seems to show a less effective within urban contexts in which it could play a strategic role. The consolidated city, while continuing to attract population, continues to lose healthiness: 1) in the collective spaces often unable to cope with the phenomena of environmental vulnerability (problems related to the impermeability of the soils, urban heat islands, etc.); 2) in enclosed spaces (often disabling in the face of the vulnerability of user needs and to the evolution/involution of his skills); 3) in social relations (considering the users as simple ‘consumer’ and not active ‘participants’ in the processes of transformation of the built environment).

The paper starting from a reading of the evolution of the theoretical approaches to sustainability outlines a possible convergence of Sustainable Design and Healthy Design. According to this integrated model of ‘sustainability-health-well-being’, the object of sustainable design is, therefore, the human-designed system-environment interactions, whose relations with the conditions of economic, social and environmental vulnerability can favour or hinder conditions of anthropo-dimensional and psycho-physical well-being, anthropo-dynamic and social well-being and ecological-environmental well-being. Compared to these three classes of requirements intended as the main objectives sustainable design, the paper aims to identify tactical macro-requirements at the methodological/theoretical level as drivers/vectors of sustainability and families of project actions (that they act at the scale of the public space and at the scale of the building) at the tactical/operational level. The requirements and families of actions identified constitute some first indication not to describe all possible lines of intervention to reorient project interventions in urban areas towards the healthiness and sustainability.

Approaches to sustainability | The concept of sustainability is today – as to quality has been about twenty years ago – vague and difficult to define but crucial to the development and competitiveness. In recent years, sustainability has become a key concept in many fields: this term summarizes the tone and meaning of the experiences that take place in the sphere of economics, finance, production, advertising and architecture. The broad consensus has not prevented the issue of sustainability to be the centre of many debates, because its definition can be the object of various misunderstandings and this lack of clarity background has fuelled numerous disputes on the subject (Engelman, 2013). Misunderstandings that can occur: 1) at the level of communication, since the communication (for its persuasive and evocative nature) has simplified and trivialized the concept of sustainability by identifying it with a hypothetical 'environmental value' which calls for a correction of the dynamics of economic development (greenwashing marketing, sustainable production, sustainable market, sustainable building); 2) at the interpretative level of the term, linked to the different definitions and translations in the individual languages. Relevant is the difference between the English term 'sustainable', the German 'nachhalting' and French 'durable' (lasting), generally used to describe the same concept. While the ideals of sustainability can historically be traced back to a harmonious balance among people, nature and society (Gottlieb, 1996), the modern concept of sustainability has evolved according to two approaches: biocentric and anthropocentric approach.

The biocentric approach was undoubtedly dominant in the evolution of the concept of sustainability, starting with Malthus's essay titled 'Essay on the Principle of Population' (1798) and in subsequent studies, by David Ricardo (1772-1823) and Kidd (1992), it states the complementarity between 'human capital and natural capital' which is the basis of the theories on 'limits to growth', on the 'scarcity of resources' on the salvific role of 'technical innovations' to compensate for any imbalances (Kidd, 1992; Meadows et alii, 1972; Ordway, 1956). This approach leads, in more recent times, to an interpretation of the relationship between man and environment, generating products (of the green economy which is replacing brown economy) and currents of thought/movement (the environmentalism, ecology, ecosophy, the bio-architecture, green building; Valle, 2011), unbalanced, in general, on environmental issues, particularly in construction on the efficiency of individual devices (energy-efficient buildings entities) and little on the effectiveness of the measures taken (increase in built-up space in the face of a demographic decrease). In the words of Ian McHarg (1989), this type of attitude leads to 'misunderstand the map with the territory' and to describe through empirical and normative data (LCA, UNI/EN-ISO standards, protocols, LEED certifications, BRE EAM, ITACA) only a part of a much more complex reality.

The first anthropocentric position was taken by Shaler in 1905, when he emphasized the moral obligations of each generation towards future generations, anticipating the more commonly accepted definition of sustainable development, formulated many decades later (WCED, 1987). Other scholars have extended this line of reasoning by

emphasizing the role of man not only in consuming resources but also in degrading them (Kidd, 1992), juxtaposing humanity's 'ethical duty' with the scientific observation of its negative impacts. With 'the principle of responsibility' (Jonas, 2009) the need to consider the future consequences of his choices for each human gesture is underlined. In several studies (Schumacher, 1973; Kidd, 1992; WCED, 1987) sustainability becomes inclusive not only of environmental objectives but also of economic and social issues, passing from a specialized approach to an anthropocentric/global approach that positions user at the centre of transformation processes. In 1978, Sachs provides the most comprehensive view of sustainability and sustainable development (which he calls 'eco-development'), arguing that social, economic and environmental values are intrinsic elements of sustainability (Kidd, 1992) understood both as a descriptor and as an objective of sustainable development (Bell and Morse, 2008). The Brundtland Commission adopts Sachs'definition (1978) of ecological development to define sustainable development as «[…] is development that meets the needs of the present without compromising the ability of future generations to meet their own needs» (WCED, 1987, p. XXXII).

The expansion of the concept of sustainability has led to a diversity of views and 'specialisms' on the issues of ecology and the environment rather than considering the environment as an organism and its functioning as that of a system, in which every single part participates to global equilibrium and interferes with it. With the affirmation of a systemic vision of sustainability and the awareness that the changes imposed by sustainable development have a material (biophysical and ecological) and immaterial (psychosocial and conscious) dimension, it emerges how the complexity of psychological, social and ecological problems, that interact dynamically and drive the growth of an unsustainable human civilization, cannot be properly understood or resolved by fragmented and specialized thinking. It materializes the need to define interpretative models that help to formulate a synthesis of meta-level in that they draw insights from a wide range of disciplines and connect theory and practice. In this compound, the Integral Theory (Wilber, 2001) and the Integral Ecology (Hargens, 2007; Zimmermann, 2007) is the first attempt to multidimensional approach that considers in their mutual interdependence four perspectives (objective, inter-objective, subjective and intersubjective) that must be consulted when trying to understand and remedy environmental problems (Fig. 1a). The prospects correspond to four quadrants: the inside and the outside of the individual and collective realities – representing the intentional aspects (I), cultural (we), behavioural (it) and social (its) of ecological issues (Fig. 1b) – supported by un multidimensional approach (Fig. 1c) that integrates subjective (e.g. psychology, art, phenomenology), interpersonal (such as religion, ethics, philosophy) and objective realities – e.g. behaviour, science, systems analysis (Fig. 1d).

A new biopsychosocial approach to sustainability emerges which, if applied to building and urban design, leads to consider the designed systems (open, closed and

produced spaces) as dynamic/complex organisms, in which each part is related to everything, according to a holistic model with respect to which each design action on such systems produces an echo or a cascading effect on the well-being of users and the health of the planet. In conclusion of this reading on the evolution concept of sustainability, a synergy emerges between sustainable planning and planning for the well-being of man and the health of the planet, so that what we try to 'support' is the underlying model of health, resilience and adaptability. Therefore, sustainable planning activity, both in its more experiential (physical and perceptive) aspects and in its performative (Ryff, 1989) and formal (Olgyay, 1963; Arnheim, 1977), and finally in operational/participatory terms (Friedman, 1971), it aims to explore, understand and systematize 'human experience' and user expectations; adopting design solutions based on inputs referring to a plurality of disciplinary sectors (anthropometry, ergonomics, proxemics, physiology, sociology, psychology, etc.) to ensure the best living conditions and well-being for users. Systemic health is a property of complex dynamical system and because the complex systems on which our lives depend – ecological systems, of community, economic and our bodies – they all have emergent properties, one of which (the first) is health and well-being, the theoretical contribution that this paper wants to support is that sustainable design can be defined as appropriate (healthy) participation in the social, ecological and environmental development process of a given place.

Design for human and planetary health for the transition towards sustainability | Well-being and health represent a key objective of sustainable development to achieve a good quality of life for all people as underlined by the World Health Organization, which highlighted the conceptual transition from health as the absence of disease to that of psycho-physical and social well-being (WHO, 1998, 2007) and the central role of design in making the physical/social/economic environment favourable to health (WHO, 1991; Fig. 2). The health not only of the individual but the ecological/social health allows diversified cultural expressions (Norton, 1992), facilitates the development of a healthy and learning community to co-create modes of interaction and of sustainable relationships within the limits and the opportunities established by the local ecological and social conditions of a context. There is a powerful synergy between health, environmental protection and sustainable use of resources. «Individuals and societies who share the responsibility for achieving a healthy environment and managing their resources sustainably become partners in ensuring that global cycles and systems remain unimpaired» (WHO, 1992, p. XXX).

The health of people and the planet depends on the ability to understand and manage this interaction between human activities and the physical/biological environment, «[…] we have the knowledge for this but we have failed to act on it although we have the resources to meet current and future needs sustainably» (WHO, 1992, p. XIV). Such inability of humanity to engage in healthy planning (generating health)

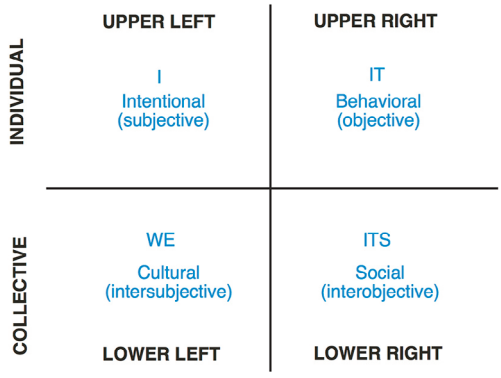

fig. 1a The four quadrantes

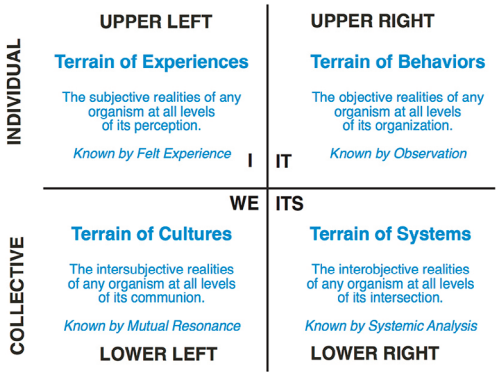

fig. 1b The four terrains

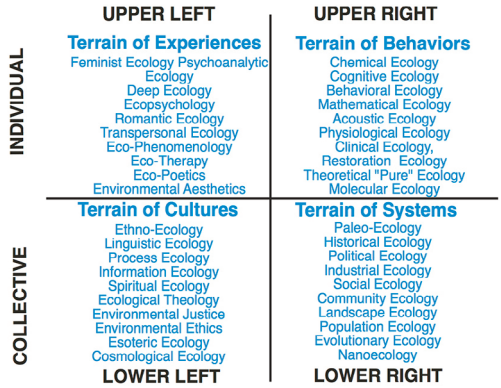

fig. 1c . Some schools of ecology organized by the four terrains.

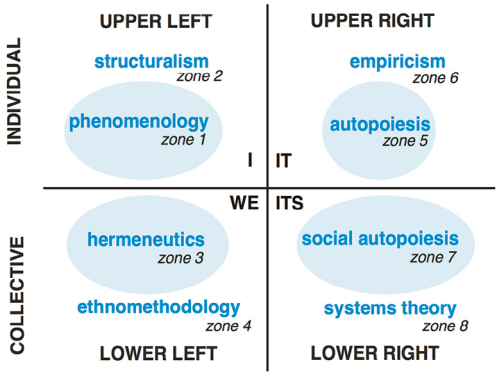

fig. 1d . Eight methodological zones.

Fig. 1 | Integral Ecology Approach by Sean Esbjörn-Hargens and Michael E. Zimmerman, 2007 (credit: reworked C. Cellucci).

and to cooperate globally and locally, aimed at the development of a sustainable civilization, is mainly due to the prevalence of 'the individual' over the 'collective', to quantitative rather than qualitative growth, to the lack of participatory and co-creative involvement of users in the complex design process. This challenge appears necessary above all in the urban environment where the balanced development of People/Planet/Profit must, more than anywhere else, deal with the change, vulnerability and fragility that characterize today: people (the ageing of the population, the crisis of the family structure, the temporary use of the city and living spaces, the socio-cultural mix and the change of needs and priorities); the planet (urban heat island effect, air pollution, landslides, drought, water scarcity, violent and short-term rainfall); and the profit (changes in employment relationships, labour market crisis, the

advent of new low-cost and increasingly mobile communications technology rapidly on a global scale).

More generally, sustainable design can be defined as appropriate participation in the social, economic and ecological process, the adequacy of which should be judged on the extent to which a given project guarantees flexibility, adaptability, health and ultimately the resilience of the system as a whole. From this perspective, which aims to integrate social and economic realities into their wider ecological context, the notion of sustainability and the idea of maintaining and restoring a healthy and therefore resilient environment – at the community and ecosystem level – are inextricably linked (Fig. 3).

Design requirements | The object of sustainable design is, therefore, the human-designed system-environment interactions, where the designed system can be a technological system, a building component, a domestic tool, a service, and the environment is a place or a situation in which it takes place the activity. These relationships depend on a series of factors, some of a subjective nature that are difficult to control, and others that can be influenced by the project. We can identify two groups of variables that influence these relationships: 1) Internal variables: the uncertainties regarding the social and economic context, relating to the variability of user needs and the satisfaction of cognitive and functional needs; 2) External variables: the uncertainties on system performance about the vulnerability of the context (environmental disasters such as earthquakes, floods, hurricanes, effects of climate change).

The set of relationships that develop between these two groups of variables can favour or hinder the conditions of: 1) Anthropo-dimensional and psycho-physical well-being understood as an attitude of a system designed to facilitate the use, through sensory perception (visual, olfactory, tactile and acoustic) of the environment by the user in the performance of activities and through the aspect anthropo-dimensional space and its equipment to ensure the ease of use of the designed systems; 2) Anthropo-dynamic and social well-being understood as an attitude of systems designed to become a privileged place of social exchange or 'healthy environment' as places that support healthy lifestyles and behaviours; 3) Ecological-environmental well-being understood as an attitude of system designed to develop maintenance capability, systems mitigation and regeneration continuous of biotic components even in the presence of variations (extreme and/or extraordinary) induced to the system from internal and external factors/agents. From these considerations, it is possible to define a methodological/theoretical level of macro-tactical requirements as drivers/carriers of sustainability articulated compared to three main categories of needs. In the classes of requirements of anthropo-dimensional and psycho-physical well-being the relationship between the following macro-requisites can be placed:
– Usability, Universality, Adaptability for Identification – Aptitude of a system designed to allow the carrying out of activities as it is appropriately sized (ergonomics, anthropometry), usable by an increasingly wider user (Universal Design, Design for

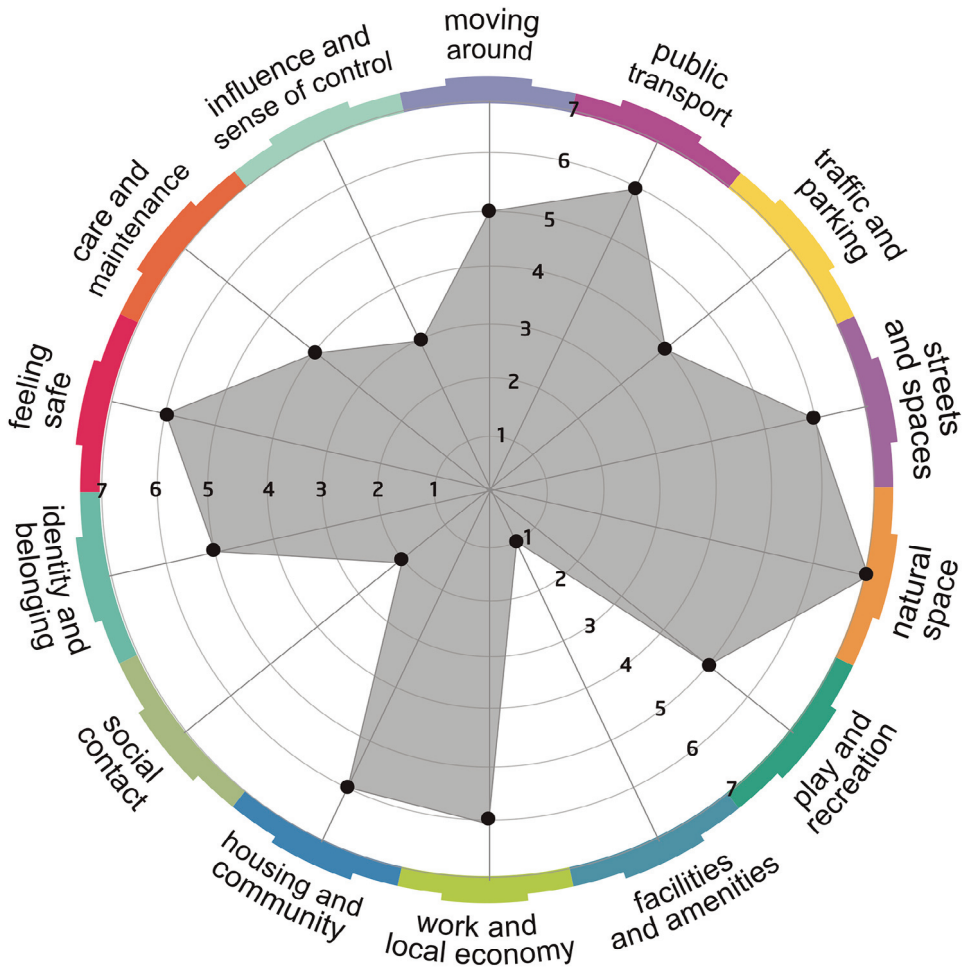

Fig. 2 | The Place Standard tool used to evaluate the quality of a place (credit: www.placestandard.scot).

All, Inclusive Design) and adaptable over time to the variability of user needs and consequent changes of use (Flexible Design, Adaptive Design); the correlation between these requirements allows the affirmation of the principle of identification by which the user recognizes the system of object spaces as an expression of his own identity and culture;

– Well-being, Safety and Liveability for the Centrality of the User – Attitude of a system designed to enable the performance of activities in conditions of the comfort environmental desired independently of the variation of the external factors, through the consideration of the physical and psychological reactions consequent to environmen-

tal stimuli of luminous nature, aural, spatial and biological investing subjects in the use of the built spaces, in order to guarantee psycho-physical well-being, the protection conditions (safety of use and perceived safety) with respect to the incidence of particular external factors and ultimately the liveability of the spaces; the correlation between these requirements allows the emergence of a user-centred design capable of dealing with the 'human scale', understood as the ability of the physical elements to relate to the user not only in proportional and metric terms but also in metabolic and physiological terms (User Centered Design).

In the classes of requirements of anthropo-dynamic and social well-being, we can place the macro-requisites of:
– Correlation, Flexibility and Evolution for Creativity – Attitude of a system designed to allow programming of its life cycle and its degrees of transformability to adapt it to any living dimension, from the individual to the collective one; this involves the provision of spaces that can be used for different functions over time and the preparation of plants and technical systems compatible with the variability of the possible distribution structures, the alley relations between equipment and spaces, the redefinition of surfaces within the limits of structural constraints through phases of extension and contraction of the space designed according to the variability of user needs; The correlation between these requirements favours the user's creativity, therefore, the ideation, experimentation, development and implementation of new organizational forms, procedures and production processes to face the change (the concept of prosumer formulated by Marcel Mauss);
– Co-creation, Co-responsibility, for Co-design and Co-production of value – Attitude of a system designed to allow the development of forms of co-creation with collective actions through which citizens transform the space in which they live to adapt it to their needs by sharing responsibilities, through Self-Help actions (small interventions promoted by the local community), Partnership (collaborations with public institutions), Consultation (mild participation in the decision-making process); the correlation between these requirements favours the co-design and co-production of value.

In the classes of requirements of ecological-environmental well-being, we can place the macro-requisites of:
– Reversibility, Maintainability, Disassembly, Recycle, Reuse for Environmental Compatibility – Attitude of a system designed to allow its disassembly, through the use of constructive solutions and innovative-sustainable building components that can be easily modified, upgraded or replaced at cost and in a short time and ready to vary in their structure to redefine dynamic conditions of equilibrium with the environment and with the needs of the user; the possibility to disassemble the component at the end of its operating phase, using the minimum amount of work and energy and generating the maximum amount of reusable and/or recyclable materials and the minimum amount of heterogeneous waste involves the possibility to activate new cycles use, through natural functional cyclical processes and to favour supply chains/cycles

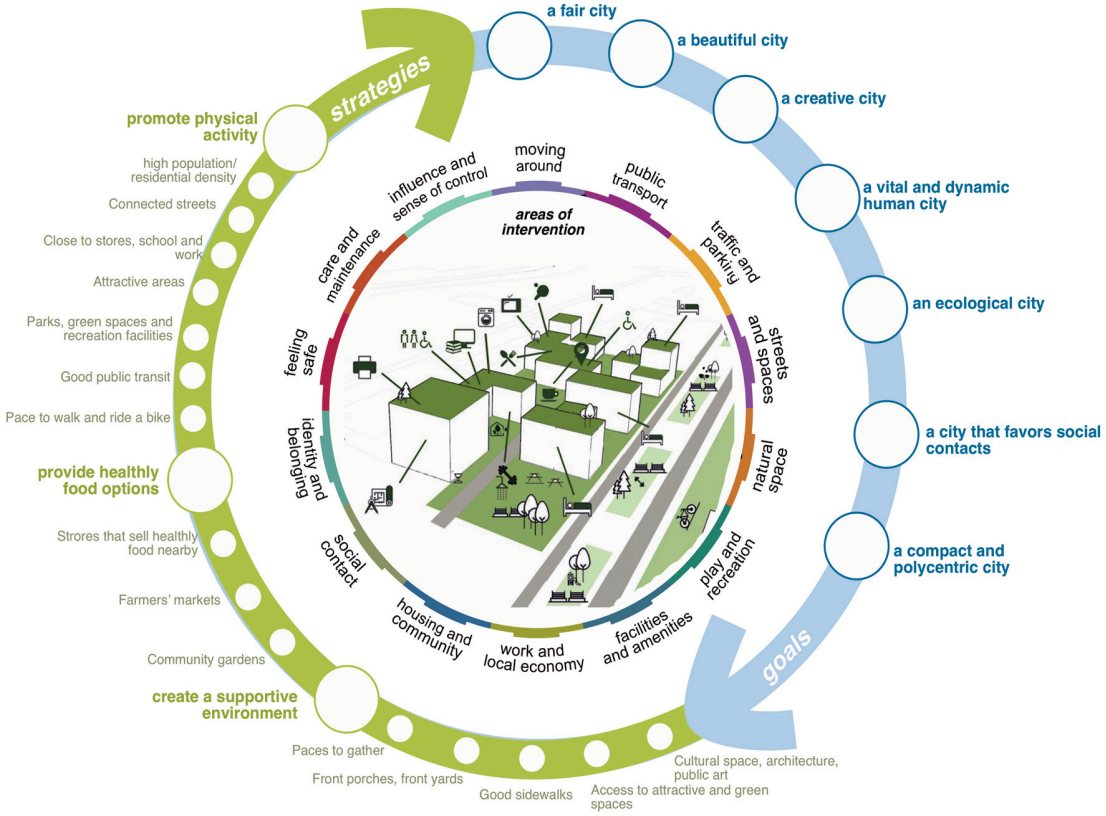

Fig. 3 | Relationship between goals/strategies/areas of intervention for a sustainable/healthy design approach (credit: C. Cellucci).

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Fig. 4 | Diagram of design actions at the urban and building scale (credit: C. Cellucci).

of reuse, recovery and recycling of materials and energies in artificial processes; the correlation between these requirements favours the protection of the environment as a function of sustainability that goes from energy saving to control the reuse cycle (Bologna, 2002; De Capua, 2002);

– Connectivity, Heterogeneity, Mitigability, Coevolution for Reactivity – Attitude of a system designed to establish a dynamic interaction between natural/artificial components and systems to ensure on the one hand the maintenance of biodiversity and structural complexity of natural components and systems through actions to mitigate external vulnerability phenomena and on the other hand evolution collaboration of natural/artificial components of the urban environment able to guarantee processes and organizational forms to face changes; the correlation between these require-

Anthropo-dimensional and psycho-physical well-being

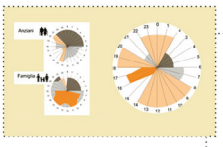
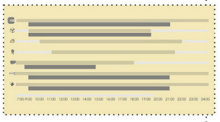
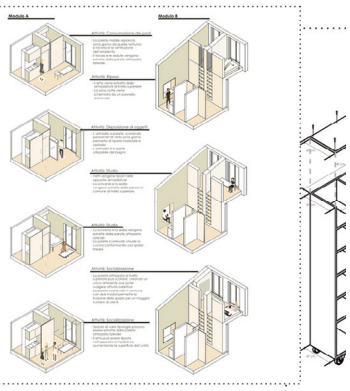
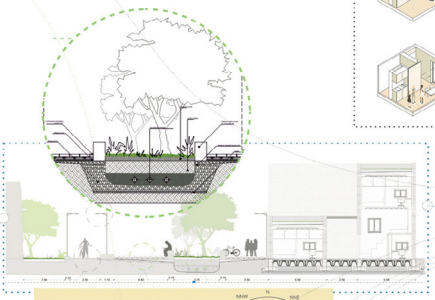
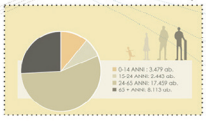
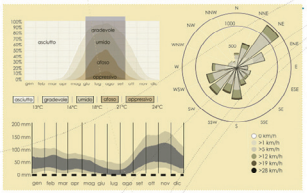
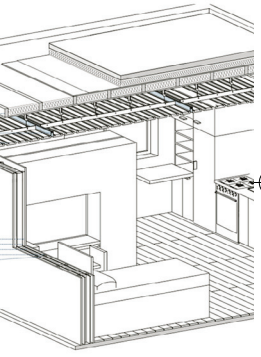
- Usability
- Identification
- Universality
- Adaptability
- Well-being
- Centrality of the user
- Safety
- Liveability

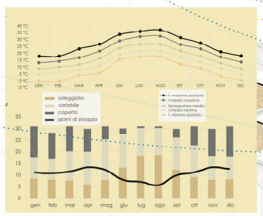
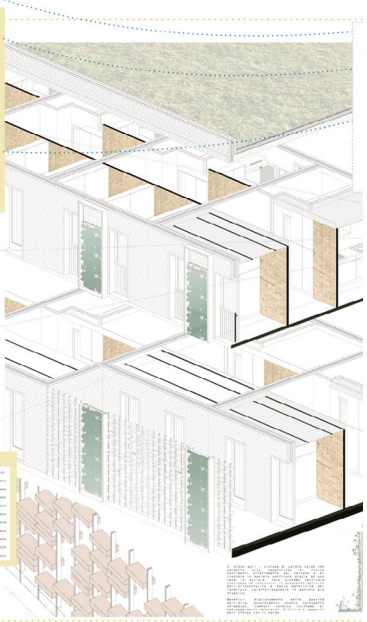
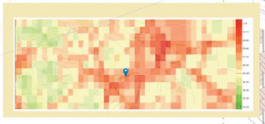
Anthropo-dynamic and social well being

- Co-relateability
- Creativity
- Flexibility
- Evolutivity
- Co-creation
- Co-design Co-production
- Co-responsibility

Ecological-environmental well-being

- Reversibility
- Reuse for Environmental Compatibility
- Disassembly
- Maintainability
- Recycle
- Reuse
- Connectivity
- Reactivity
- Heterogeneity
- Mitigability
- Coevolution

Results

facilitate the transformability of the space according to the different users

hinder the processes of technological obsolescence through the replacement / updating of components

absorption of fine dust, oxides and nitrates, carbon and other harmful gases

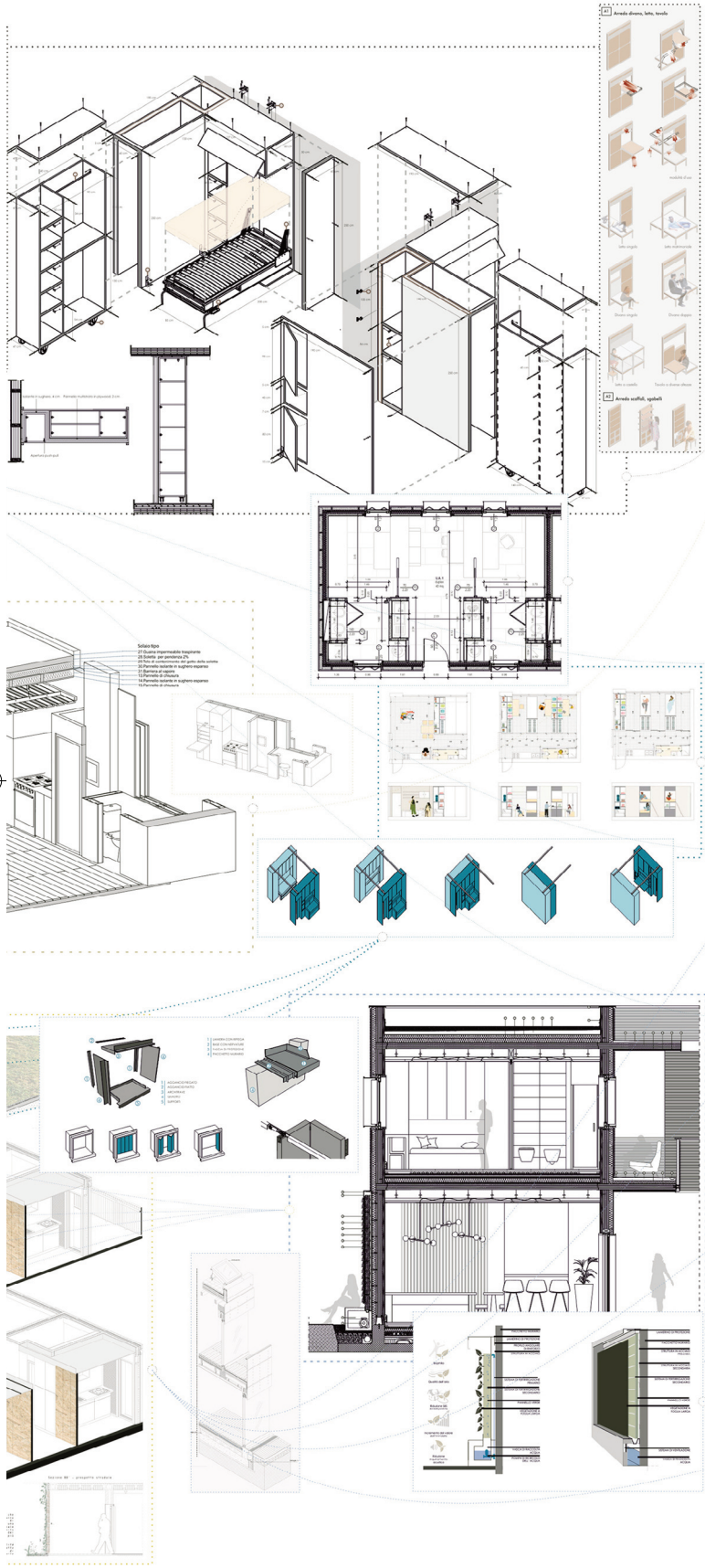
storage and drainage of excess rainwater

compensation of solar radiation

alteration of the albedo of surfaces

attenuation of the wind speed on external surfaces and consequent reduction of heat losses

improvement of thermal resistance



ments favours the development of reactive systems to ecological, social and economic changes.

Project actions | From a tactical/operational point of view, the requirements are applied in design actions aimed at achieving a condition of comparison, on several scales, between physical elements and users, acting not only in a spatial-three-dimensional sense but also in metabolic and physiological terms, through enhancement and improvement of psychophysical relationships between the bright environment, sound, spatial, biological, social and people (Schiaffonati, 2011; Friedman, 2014). Concerning the consolidated city that is increasingly the object of loss and in terms of health it is possible to identify families and project actions (Fig. 4).

At the building level, the project actions will concern: a) Respond to the variability of user needs. Working through flexible, extensible and integrated to the building scale, favouring planning actions to promote the 'adaptability and supporting extensibility, extension/reduction of the living space according to the evolution of user needs, giving back all at present an organizational 'spontaneous luxury' (Druot, Lacaton and Vassal, 2004); b) React to the variability of external conditions by welcoming regulatory solutions (brise soleil customizable) and modular components that can be easily maintained, replaced and integrated with the changing needs of users, internal functions and external climatic conditions, according to an idea of mass customizable building and self-help building that allows users to directly manage the housing assembly and the shielding.

At the urban-territorial level, the project actions will concern: i) Mitigate the potential impacts of climate change through integrated solutions (agro-geo-hydraulic, landscape) to compensate for the effects exceeding the performance capabilities of the built environment through 'green infrastructures' (with structured ground, maturbanism, drosscape, thick infrastructure, old operations, machine landscape, synthetic surfaces) and Water Sensitive Urban Design systems, to re-integrate the water cycles in the urban landscape – these actions allow you to restore the natural- hydrologies and activate new ecological cycles of biodiversity and productive chains, combining the well-being improvement with the adoption of styles of life more acts will; ii) Reactivate the traditional alliance between components of natural and human as forces co-agents through rebalancing strategies between densification and greening as new holistic thinking that produces a Capitalism 4.0 able to get new value from the processes, re-cyclic the new urban metabolism – start-ups, makers actions, circular economy creativity, reuse, recycle and creative evolutions (Kaletsky, 2010); iii) Encourage participatory processes through the promotion of spaces intended as universal containers adaptable-expandable to the urban scale (incubators of forms of enterprise, collective-intelligence, co-planning and co-production of value; Ratti, 2014) to configure spaces 'open' to the concreteness of living – these actions can involve forms of 'design re-appropriation' of living spaces, in which users become environmental administrators.

To intervene, therefore, to support the adaptability of spaces to upgradeability of the environmental variables and needs, triggering innovations and possible investments (Campioli, 2009). Therefore, adaptability is not considered a reactive capacity but a competitive weapon that allows not only to respond to changes in the current context but also to trigger change by introducing a novelty on the market and consequently setting up a continuous production of innovation (Giallocosta, 2004).

Conclusions | The correlation between the macro-requirements and the project actions identified certainly constitute some first detection not describe of the all possible lines of intervention which have as their goal that to reorient the projects in urban areas towards the healthiness and sustainability. Convergence (between Sustainable Design/Healthy Design) within which to seek a rebalancing technological-environmental approach, as an alternative systemic approach that can be useful in the design experiments in the urban area, within a reasonable perspective of intervention in the short, medium, and long-term. This means moving away from specialized and punctual projects towards a systemic vision of the habitat, which has as their goal to research levels of the balance resilient between objective qualities of the city, measurable and programmable and quality subjective of living the city, expectations and views by users, transforming the design experience into a moment of common commitment and urban quality into the qualities of living together (Zaffagnini, 1980). A further innovative aspect is offered by the possibility to work with systems of macro-requirements of sustainability (levels of sustainability) with respect to which it will be possible to identify PBA and EBD indicators (extrapolated from ongoing experiences/research) and systems of evaluation/control. The paper, still in its initial phase of analysis, can be further developed, by selecting and analyzing other requirements and project actions. Further multidisciplinary researches are encouraged to validate the presented requirements in case studies and empirical settings.

References

Arnheim, R. (1977), *The Dynamics of Architectural Form*, University of California Press, Berkeley.

Bell, S. and Morse, S. (2008), *Sustainability indicators – Measuring the immeasurable?*, Routledge, London.

Bologna, R. (ed.) (2002), *La reversibilità del costruire – L'abitazione transitoria in una prospettiva sostenibile*, Maggioli, Rimini.

Campioli, A. (2009), *Progettare oltre l'emergenza – Spazi e tecniche per l'abitare contemporaneo*, Il Sole 24 Ore, Milano.

De Capua, A. (2002), *Nuovi paradigmi per il progetto sostenibile – Contestualità, adattabilità, durata, dismissione*, Gangemi, Roma.

Druot, F., Lacaton, A. and Vassal, J.-P. (2007), *Plus – La vivienda colectiva – Territorio de excepción*, Editorial Gustavo Gili, Barcelona.

Engelman, R. (2013), "La misurazione della sostenibilità", in Worldwatch Institute (ed.), *State of*

the World 2013 – É ancora possibile la sostenibilità?, Edizioni Ambiente, Milano, pp. 51-52.

Esbjörn-Hargens, S. (2007), "Integral ecology – The What, Who, and How of Environmental Phenomena", in *World Futures – The Journal of General Evolution*, vol. 61, issue 1-2, pp. 5-49. [Online] Available at: doi.org/10.1080/02604020590902344 [Accessed 11 September 2020].

Friedman, A. (2014), *Planning Small and Mid-Sized Towns – Designing and Retrofitting for Sustainability*, Taylor & Francis, London. [Online] Available at: doi.org/10.4324/9780203107812 [Accessed 11 September 2020].

Friedman, Y. (1971), *Pour l'Architecture Scientifique*, Pierre Belfond, Paris.

Giallocosta, G. (2004), *Riflessioni sull'innovazione – Architettura e produzione edilizia nei regimi di complessità delle fasi storiche di sviluppo del costruire*, Alinea, Firenze.

Gottlieb, R. S. (1996), *This Sacred Earth – Religion, nature, environment*, Routledge, New York.

Jonas, H. (2009), *Il principio responsabilità – Un'etica per la civiltà tecnologica*, Einaudi, Torino.

Kaletsky, A. (2010), *Capitalism 4.0 – The Birth of a New Economy in the Aftermath of Crisis*, Public Affairs, New York.

Kidd, C. V. (1992), "The evolution of sustainability", in *Journal of Agricultural and Environmental Ethics*, vol. 5, pp. 1-26. [Online] Available at: doi.org/10.1007/BF01965413 [Accessed 18 October 2020].

Malthus, T. R. (1798), *Essay on the principle of population*, London. [Online] Available at: esp.org/books/malthus/population/malthus.pdf [Accessed 18 October 2020].

McHarg, I. L. (1989), *Progettare con la natura*, Franco Muzzio Editore, Padova.

Meadows, D. H., Meadows, D. L., Randers, J. and Behrens III, W. W. (1972), *The limits to growth – A report to the Club of Rome's Project on the Predicament of Mankind*, Universe Books, New York. [Online] Available at: donellameadows.org/wp-content/userfiles/Limits-to-Growth-digital-scan-version.pdf [Accessed 11 September 2020].

Norton, B. G. (1992), "A New Paradigm for Environmental Management", in Costanza, R., Norton, B. G. and Haskell, B. (eds), *Ecosystem Health – New Goals for Environmental Management,* Island Press, Washington (DC), pp. 23-41.

Olgyay, V. (1963), *Design with Climate – Bioclimatic approach to architectural regionalism*, Princeton University Press, Princeton (NJ).

Ordway, S. H. (1956), "Possible limits of raw-material consumption", in Thomas W. L., *Man's role in changing the face of the earth*, University of Chicago Press, Chicago, pp. 987-1009.

Ratti, C. (2014), *Architettura Open Source – Verso una progettazione aperta*, Einaudi, Torino.

Ryff, C. D. (1989), "Happiness is everything, or is it? Explorations on the meaning of psychological well-being", in *Journal of Personality and Social Psychology*, vol. 57, issue 6, pp. 1069-1081. [Online] Available at: doi.org/10.1037/0022-3514.57.6.1069 [Accessed 11 September 2020].

Schiaffonati, F., Mussinelli, E. and Gambaro, M. (2011), "Tecnologie dell'Architettura per la Progettazione Ambientale | Architectural technology for environmental design", in *Techne*, vol. 1, pp. 48-53. [Online] Available at: doi.org/10.13128/Techne-9434 [Accessed 11 September 2020].

Schumacher, E. F. (1973), *Small is Beautiful – Economics as if people mattered*, Blond & Briggs, New York.

Shaler, N. (1910), *Man and the earth*, Duffield & Company, New York.

Valle, L. (2011), *Dall'ecologia all'ecosofia – Percorsi epistemologici ed etici tra Oriente e Cristianesimo, tra scienza e saggezza*, Ibis Edizioni, Pavia.

WCED – World Commission on Environment and Development (1987), *Our Common Future – Report of WCED*, United Nations. [Online] Available at: netzwerk-n.org/wp-content/uploads/2017/04/0_Brundtland_Report-1987-Our_Common_Future.pdf [Accessed 18 January 2021].

WHO – World Health Organization (2007), *Workers' Health – Global Plan of Action – Sixtieth World Health Assembly*. [Online] Available at: who.int/occupational_health/publications/global_plan/en/

[Accessed 11 September 2020].

WHO – World Health Organization (1998), *WHO remains firmly committed to the principles set out in the preamble to the Constitution*. [Online] Available at: who.int/about/who-we-are/constitution [Accessed 11 September 2020].

WHO – World Health Organization (1992), *Our Planet, Our Health – Report of the WHO Commission on Health and Environment*. [Online] Available at: apps.who.int/iris/bitstream/handle/10665/37933/9241561483.pdf?sequence=1&isAllowed=y [Accessed 18 January 2021].

WHO – World Health Organization (1991), *Sundsvall Statement on Supportive Environments for Health*, Third International Conference on Health Promotion, Sundsvall, Sweden, 9-15 June 1991. [Online] Available at: who.int/healthpromotion/conferences/previous/sundsvall/en/ [Accessed 18 January 2021].

Wilber, K. (2001), *A Theory of Everything – An Integral Vision for Business, Politics, Science and Spirituality*, Shambhala Publications, Boston.

Zaffagnini, M. (1980), "La lunga strada verso la qualità urbana", in Lombardi, E. (ed.), *Modelli abitativi e utenza – L'esperienza danese – La lunga strada verso la qualità urbana*, BE-MA, Milano.

Zimmerman, M. E. (2007), "Integral Ecology – A Perspectival, Developmental, and Coordinating Approach to Environmental Problems", in *World Futures – The Journal of General Evolution*, vol. 61, issue 1-2, pp. 50-62. [Online] Available at: doi.org/10.1080/02604020590902353 [Accessed 11 September 2020].