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From “The limits to growth” to systemic design: Envisioning a sustainable future

*Original*
From “The limits to growth” to systemic design: Envisioning a sustainable future / Peruccio, P.P., Vrenna, M., Menzardi, P., Savina, A.. - ELETTRONICO. - Cumulus Conference Proceedings Wuxi 2018 - Diffused Transition and Design Opportunities:(2018), pp. 751-759. (Diffused Transition & Design Opportunities Wuxi Oct. 31st - Nov. 3rd 2018).

*Availability:*
This version is available at: 11583/2716897 since: 2019-03-26T12:12:10Z

*Publisher:*
Wuxi Huguang Elegant Print Co.

*Published*
DOI:

*Terms of use:*

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15 November 2026

# Cumulus Conference Proceedings Wuxi 2018

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**Cumulus Conference Proceedings Wuxi 2018**
***Diffused Transition & Design Opportunities***
31st October-3rd November, Wuxi, China

**Editors**
Zhang Linghao, Lam Yanyan, Xiao Dongjuan, Gong Miaosen, Shi Di

**Art Director & Designer**
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**Layout Designer**
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All content remains the property of authors, editors and institutes ISBN: 978-952-60-0092-3
Printed in Wuxi, China. October 2018
Printed by Wuxi Huguang Elegant Print Co.,Ltd
ISBN 978-952-60-0092-3 (print)
ISBN 978-952-60-0091-6 (pdf)
ISBN 978-952-60-0093-0 (ePub)

# From “The Limits to Growth” to Systemic Design:envisioning a sustainable future

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**Abstract**

Globalization has led to the creation of a complex worldwide network. Thus, understanding the impact of our actions on the natural environment is not immediate. Responding to threats with conscientious visions is even more challenging. On this basis, where are we and where will we go? In 1972 a group of researchers from MIT published a report for the Club of Rome, entitled “The Limits to Growth” aimed at gaining insights into the finiteness of our world system. The publication was a warning about the negative repercussions of our business as usual and a call to action on the necessity of a complete paradigm shift. The purpose of this paper is to investigate the role of present-day designers, in a moment in which we should address global problems with a deep ecological literacy. Socially responsible designers should use their skills and know-how to facilitate the transition towards environmentally, socially and economically viable futures. This can be achieved through the embracement of a systemic strategy, founded on qualitative relations. Transitions should no longer generate uncertainty, because through powerful design tools, we will be able to shape every step of the time ahead, for the sake of present and upcoming generations.

**Keywords**

Sustainability Envision, Paradigm Shift, Systemic Design.

## 1. Introduction

The 20th century was an astonishing moment in the history of humanity, dominated by a series of events that heralded significant metamorphoses in our cultures, societies and economies. An increasing exchange of goods and ideas between nations and businesses, has given origin to a complex and constantly evolving relational network of intertwined actors. These radical transitions, glorified within a globalizing and capitalist pattern, have been both beneficial and disrupting for many. Nevertheless, in the name of a myopic progress and of the insane pursuit of economical returns, the implications of our past and current actions on natural environments have not been properly taken into account. Business as usual, inefficient production processes and consumerism are leading to the damage of natural resources at an exponentially fast pace. Climate destabilization, air and water pollution, limited resources and food production are hence just few of the main challenges that present and future societies have to face.

Understanding the impact of our development on the global environment is a complex task. A study from the Stockholm Resilience Centre introduces the concept of nine Earth system processes which have interlinked planetary boundaries (Rockström et al., 2009). According to this study, three out of nine boundaries have already been overreached, with potential and

unpredictable disastrous consequences for humanity. In the light of this situation, concrete efforts from individuals, societies and institutions are urgently needed. Action is becoming inevitable rather than an opportunity than can be grasped. A radical paradigm shift would help to fill the gaps, while dealing with uncertainty and discontinuations. Therefore, envisioning a sustainable future is the first necessary step to plan and design resilient, self-sustaining prospects.

The sections that follow provide an overview on the book “The Limits to Growth” and its great impact on scientific, political and public opinion. Moreover, the debate is opened on the emerging role and responsibilities of present-day designers while illustrating the systemic design approach and methodology that can be used to deal with complex, non-linear systems.

## 2. The Limits to Growth

Where are we and where will we go? Such an elaborate question for societies, governments, communities and individuals deserves careful analysis and a comprehensive response. It cannot be decoded with a simplistic and static investigation. An attempt was made in 1972, when a group of researchers from MIT published a report entitled “The Limits to Growth”. The report was commissioned by the Club of Rome, an organisation of individual scientists, economists and high level civil servants with the mission to promote understanding of the global challenges facing humanity and to propose solutions through scientific research[106]. The intention was to examine the predicament of mankind through computer simulations of exponential economic and population growth with a finite supply of resources. The MIT research group managed to gain insights into the limits of the world system and identify the dominant elements and their mutual influential long-term interactions. The system dynamics model that was generated was based on five variables: population, food per capita, resources, industrial outputs and environmental pollution. The final remarks were unexpected and not encouraging. If the current growth trends continued unchanged, planetary limits would be reached within the next one hundred years, with a sudden decline in population and industrial capacity. A state of equilibrium could be achieved by altering the trends and striving for common equal opportunities in the interest of the global community (Meadows et al., 1972).

The publication was not only a warning about the negative repercussions of our business as usual, but was intended as call to action on the necessity of radically changing our ingrained production and consumption models. Decidedly, The Limits to Growth had a wide mediatic resonance. Criticism from academics and business was immediate, mainly condemning the methodology, the conclusions and the rhetoric behind the research. Nevertheless, it broadened the debate on environmental issues, boosting the awareness of the necessity of acting with a greater sensitivity to ecology. Several revisitations of the book have been published, confirming the deleterious trends that emerged in the first work and proposing predictions of what may happen in the next forty years (Randers, 2013).

After decades of discussions, a sustainable vision has not yet been embraced. Uncurbed individualism, yearning of possession and consumerism, are leading to the complete

[106] Since 1970 the cyberneticist Hasan Özbekhan, co-founder and first director of The Club of Rome together with Aurelio Peccei, an italian entrepreneur and maecenas, applied System Theory to global issues, inspiring scientists, planners and academics to join the Club. Although his proposal was neglected, it defined global issues as an interconnected system of 49 continuous, critical problems (CCP), today recognized as persistent and increasingly arduous challenges. Özbekhan, H. (1969). The Predicament of Mankind: A Quest for Structured Responses to Growing World-wide Complexities and Uncertainties. New York: Club of Rome.

destruction of ecosystems, through an overexploitation of natural resources, actually reflecting a serious lack of qualitative, long-lasting relations among people, nature and societies. According to the philosopher and writer Ulrich Beck, today we are living in a risk society in which the production of goods and services aimed at increasing welfare, became directly proportional to the generation of environmental and societal risks. The introduction of polluting and toxic substances into soil, air, water and food, have even been legitimated by some acceptable maximum limits, which are dangerous strategies that will lead to irreversible consequences. The reasons of these unsustainable behaviours have to be found within the complexity of the world ecosystem, the natural environment and societies. System theories may provide insightful models to understand and discuss complex issues and systemic problems.

## 3. Sustainability as a complex problem

Understanding the impact of greediness and persevering actions perpetrated by humanity and their global implications on the future is a complex process. This is especially due to the fact that the scenario in which we live is lacking of linearity, therefore it is necessary to predict the steps in order to act correctly and to design more sustainable prospects.

The concept of sustainability is an intrinsically elaborate topic, not only because it involves the fields of economics, environment and society, interdependent and articulated microsystems, but also and above all because it is an overlapping element, subordinated and anchored to the tortuosity of the reality in which the Man lives. Therefore, complexity, dynamism, changeability and the consequent difficulty of forecasting, are the main aspects to be metabolized and faced. These elements directly influence the actions that will be undertaken for an indispensable change of paradigm, a key factor to minimize the great global challenges that have suffered a progressive and rapid expansion. It is good to start from a fundamental premise: when acting in the field of sustainability, in its broadest sense and global implications, we deal with problems that cannot be tackled with the usual problem-solving techniques. Climate change, depletion of soils, scarcity of resources and socio-political violence emerge from multiple causes, becoming increasingly interconnected over time, reinforcing their initial conditions and causing only partially conceivable consequences.

The field of action immediately moves from a set of distinct issues to a reticular system of underlying problems, each of them symptom of the others, regulated by multiple relationships and constantly governed by feedbacks. The limits of the system become difficult to understand for the mind of the observer who wishes to describe, face and resize it. This cluster of issues is unstable, permeable and with tentacular borders: it is identified by a set of wicked problems (Rittel and Webber, 1973) and as such deserves a specific approach and methodology of action. Wicked problems are based on the concept of unresolvable complexity, only partially mitigated through strategic analyses and processes. Their causes are interconnected, their long-term visible consequences cannot be seized by the limited human perception, therefore the solutions that are designed are various, uncertain, but especially difficult to verify in terms of effectiveness. This scenario turns into a multifaceted challenge, to be confronted not as individuals but as a collective entity.

Therefore, in pursuit of this direction a path of reasoning that is undressed by the reductionism and rigidity of past methodologies is indispensable. It cannot be distinct and limited to different and autonomous sectors. In order to invigorate the approach to a system of hard and reshaping problems, a new, various and multidisciplinary direction of the project is in urgent need. The role of the designer goes through extraordinary revolutions, implying the involvement in

heterogeneous domains. This interpretation, which is no longer univocal but rather systemic, embraces a collective orientation, overcoming individual understanding and stepping away from early hasty judgments. It is in this context that the systemic design culture comes into play, not only as a reading tool for complexity, but primarily as a disciplinary mediation, construction, systemic integration and resolution tool (Buchanan, 1992) towards a flexible and sustainable action strategy.

## 4. Emerging role of designers

The role and the function of design have always been objects of discussion and investigation, simultaneously to the evolution of the outlines and of the dynamics that rule the world and its life on it. Design, born and spread as industrial design and strictly related with the imposition of mass-production industry in the first half of the last century, has lived and it is currently going through great changes towards a conception of design which refers and increasingly abides by the culture and its forms. The rising of complexity as existing and decisive component of the world's phenomena, pushed it gradually away from the modalities and the scopes pertaining to its earliest stages. In this way design has been conducted to something that may seems even very distant, sometimes ascribable with difficulty to its area of expertise. The industrial context instead slightly dissolved except in influential market segments like furniture, automotive and textile, where it still holds a leading role.

As Victor Papanek already suggested, designers' work requires a continuous analysis and a fair conformity to its own principles, in respect of which it has been found to be often distanced from, in an incoherent position. The consciousness arose from the comparison among the complex features of the reality, comes as a result of the will to liberate itself from the reductionist logic according to which design was an operator of industry, of its trends and its needs. Due to these origins, the design term mainly induced a short-sighted and incomplete vision. At the 29th General Assembly of World Design Organization in 2015, the Professional Practice Committee has unveiled a renewed, much wider practice-oriented definition of design, asserting that it is not only addressed to economic and market realms, but even and with priority to social and environmental spheres[107].

Today, more than ever, the focus is pointed to the effectiveness of a responsible design that can lead to wealth, ethical benefits and especially driven by the most determining goal, that is urgently responding to binding actual needs. Ecologically literate design is a mean to respond to environmental problems and has to become a pedagogic priority in design education. Such responsible design is the only viable way to confront environmental problems, transitioning from the Anthropocene towards the Ecocene[108] (Boehnert, 2018). A dematerialization of doing design but also a conceptual opening and a growth of the subject is happening. This process is aimed at embracing as many variables of context as conditions on which designers are incumbent to act. Assuming a guiding position in the global shifting scenario is an increasing responsibility of design, taking on a role that has to be performed by working for information,

[107] Design definition has changed many times since 1959 when the first Icsid Congress and General Assembly were held in Stockholm Sweden. In 1969 a further definition was described by Tomas Maldonado before the last one was revealed at the 29th General Assembly in Gwangju (South Korea) in 2015: "Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences".

[108] The concept of "Ecocene" has been coined by the design theorist Rachel Armstrong in 2015. He opposed the excess of Anthropocene and Capitalocene to new ways of conceiving and managing social and ecological relations, suggesting Ecocene as a curative catalyst for the cultural change needed for the human survival.

dissemination of thoughts and orientations, in leading the direction among different stakeholders and knowledges. Design community has to make itself conscious that it has come the time to talking less within design on behalf of a more fruitful dialogue with other disciplines, broadening the gaze to complexity as a world-shaping force and trying to help explain it as such (Fry, 2009). The evolutionary phase that has invested design in the last decades, as well the framework in which all the sciences act consequently to the modifications of the reality, demands an upgrade of design which provides possible medium to long-term scenarios. The manner of carrying out these moves is bringing to a great change at the methodological-operational levels. The designer born as a sole and independent author, close to the material creation, has gradually abandoned his despotic and absolute aura to assume the identity of who proceeds and looks for collaborations, as interacting part with other figures (Celaschi, 2017).

The interplay is not only an internal necessity, but a peremptory condition of its current being and of the responsibilities that design is tied to. Design becomes an intermediary among fields and disciplines for which new modalities of dialogue and common continuous knowledge are turned out to be essential in order to deal with the complex challenges of today and tomorrow. Designing is shifting from being an elitarian practice, to a common tool that everyone can use to modify, improve, forecast and create within a living world. Acting in design thus implies conceiving it as capable of systematizing worlds and strategies, considering the relations that influence and determine aspects, phenomena and mechanisms. The transition that is affecting design world is the detailed expression of dynamics that more widely concern the mutations of the system of knowledge. Signals of fluidifying processes among disciplinary boundaries are recognizable along with increasing multidisciplinarity and interdisciplinarity, indicators of a developing trend placed on a transversal and permanent contamination among the branches of knowledge.




Figure. 1. A systemic designer plays an interrelational role between disciplines and eterogeneous professionals, fluidifying boundaries while creating new connections.

## 5. Systemic Design

A changing of operational modalities is not only recognized to design in the strict sense of methodologies and expected outcomes. Design plays a decisive role in the transition towards sustainability and an ecological future. The responsibility to which it is called is due to its pivotal position that holds in tightly relation with the processes of use and consumption but even earlier with the arrangement of the production, directly depending upon it (Boehnert, 2018).

Design, as it was in the very early stages and mature of what new choices are needed, implies a considerable extension of own judgment and its actions regarding the strengthening of sustainability on the vast scale. An environmental analysis centered on the downstream effects of design, that is about the ruinous consequences of consumption, has to be substituted with a forward-looking and critical approach aimed at restating the production, its course and its outcomes. The studies on complexity in the margins of the earliest system theories, entailed also a new way to intend design, what it would have been later defined as systemic design and spread among several academic circles all over the world[109].

Once the finite nature of available resources to humankind was recognized, as well the impossibility to protract a development trend based on boundless consumptions, it is the responsibility of design to strongly accelerate the periods of reaction and intervention, to let a diverse design order flourish. Systemic thinking in design lies on the assumption that a reformulation of the political-economical system is indispensable. This paradigmal reorientation, reachable by stabilizing its focal point, is based on a set of indicators that are evidence of a perceived, experienced non material wellbeing. Qualitative development revolves around environmental and life quality, educational attainment and affordability of services (Bistagnino, 2009). The systemic reasoning resides in converting the processes or in realizing new ones starting from two key elements, input and output, materials and resources in entry and discards or wastes in exit. Design intervenes to minimize their fluxes in terms of extraction, exploitation, usage and simultaneously to extend their qualitative properties with the intent to reach zero emissions and wastes. The objective which design is demanded to actualize, calls for the delineation of a relational structure, the system, able to maintain itself by the transition of resources, and not their refusal. What is considered as a scrap for a specific subject or supply chain, is evaluated accordingly to the qualitative properties it owns in order to be reintroduced as diverse resourceful good in a different process. Man, that occupies a central position with regard to the project and on whom it is tailored, is the measure through which advantages and goals are assessed (Germak, 2008). The modus operandi that systemic design suggests, originates from and tries to imitate the mechanisms that are innate in nature, adopting metabolic and autopoiesis principles among its behaviors. Current design is the bearer of an enhancing movement recognisable within systemic thinking, just like the broader area of design for sustainability. All these approaches boost towards new visions not only related to industrial production, but even to economical and social infrastructures in their entirety. Relationships can arise from existing activities as additional ones. Simultaneously, novelty conditions of the system are crucial to provoke a consequential and reinforced impact on stakeholder engagement, employment rate, territorial revitalization. Once again, a multidisciplinary action results as a fundamental condition to look further ahead, with design that contributes through the contamination and the support of other disciplines.

[109] Systemic theories has been developed within heterogeneous scientific fields since the beginning of the 20th century. Debates occurred and diverse teachings were born to explore this subject from different points of view. Many universities have been involved worldwide, the main ones among the others were: Yale University, University of Jena, Stanford University, Hochschule für Gestaltung, MIT Boston, Santa Fe Institute, Berkeley, Politecnico di Torino, NISP University of Hull, Lund University.

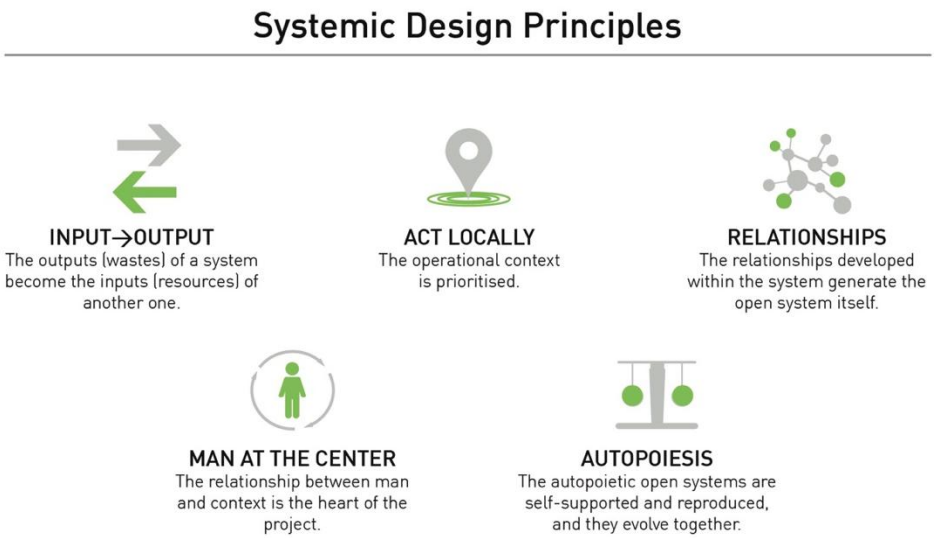



Figure. 2. Fundamental principles of Systemic Design. Methodological principles to approach the project and essential to evaluate the system in its complexity.

## 6. Conclusions

Underlining the responsibilities that designers have to carry out today is more than ever crucial. A systemic holistic vision that exploits the tools and the methodologies of design to tackle more noble issues, healing deep ecological and social injuries, is essential. The evidence of the unsustainable unlimited growth begs for leading figures, who can guide the change of the common shared paradigm, educating in a constructive disciplinary influence for a more complete and honest observation of global dynamics. Redirecting design does not mean denying or overcoming its origins, but rather exploiting the skills of a widened exploration, a fluid conception, structuring and execution that only the activity of designing has developed and consolidated over time, with the mediation of knowledge, an additional essential and inevitable capacity.

Nowadays the world of academics and professionals is invited to multi-sectorial dialogue, to cooperation and to greater ecological sensitivity towards concrete actions. The project of resilient and self-sufficient perspectives for the future of the planet is nourished and sustained by highly qualitative and emerging relational properties between different experiences and knowledge. In this arduous mission, the systemic thinking culture is one among the pioneering disciplines that are trying to respond, with awareness and imperativeness, to the last call[110] of our disfigured planet. Not an opportunity but a necessity.

Ultimately, a diffused interest towards design and sustainability is catching on worldwide. Several research teams and practitioners with different but complementary approaches, are working to achieve meaningful results in this field. The answer is not univocal, nor it is meant to be. Parallel to one other, different institutions are polishing and sharing their studies. Oslo School of Architectural and Design in Norway, Politecnico di Torino and Politecnico di Milano in Italy, OCAD University in Toronto, Carnegie Mellon School of Design in Pittsburgh, as well as Parsons The New School For Design in New York, the Schumacher College in UK, among

[110] The Last Call, Enrico Cerasuolo, Zenit AudioVisive, 2013. The documentary narrates the story of the growing popularity, fall and revival of the book “The Limits to Growth”, through the chronicles of the events of Aurelio Peccei, Jay Forrester, Dennis and Donella Meadows, Jorgen Randers and Bill Behrens. In this controversial document, supported by extraordinary archival material, the authors provide a provocatory vision on the reasons behind the global crisis, while sharing their opinion on the future.

many other organisations in China, Sweden and France. As noted, the debate is particularly complex and characterised by great dynamism. Mapping all the Schools and bodies that are currently investigating the fields of sustainable design is thus worthy of future research. Systemic Design, Industrial Ecology, Industrial Symbiosis, Circular Economy and Blue Economy, are in fact distinct definitions of similarly intertwined topics that are converging to the same direction.

Through a capillary study of these interconnected disciplines and strong international cooperation, it will be possible to define powerful design tools that will assume a pivotal role in the redefinition of problem-solving strategies. As a result, wide and deep transitions should no longer give rise to unsureness and disorientation, but generate welfare in the environmental, socio-ethical and economic dimensions for the benefit of present and future generations

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