

Towards Sustainable Building

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Towards Sustainable Building

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**To Mary, my wife
my life**

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Preface

This volume contains the extended versions of selected papers presented at the first Mediterranean Conference “Sharing Knowledge on Sustainable Building” held at the Polytechnic of Bari in December 1999, supported by the National Research Council of Italy.

The publication of this book was made possible through the efforts of the contributing Authors. Other people have provided invaluable support for the conference and for the preparation of this volume; in particular, I wish to thank Antonella Lerario for providing support in the final editing of the text and images.

As reported in Boonstra and Rovers (2001)¹, people spend a great deal of time inside buildings; therefore, decisions about design, construction, use, maintenance, renovation, demolition, reuse and recycling of buildings have a huge impact on the sustainable development of our society. Technical aspects, however, should be supported by adequate policies, developed with appropriate tools and driven by meaningful challenges.

For people involved in sustainable buildings, the conceptual frameworks, studies and experiences collected in this volume, organized into three parts – “Policies”, “Tools” and “Challenges” - will help to advance knowledge allowing them to adopt and more efficiently implement such innovations sooner.

Borri, in the first paper of this volume - Part One, “Policies” - depicts the planners’ role in the light of effective Local Agendas 21; even if new forms of environmental practices based on ethics and scientific approaches different from the past are emerging among communities, planners’ resources remain fragile, exposed to hybrid and nomadic processes and are often defeated in the confrontation with strong economic and technological powers. However, this fragility warns and incites planners to follow their own new ‘green’ route.

Moreover, housing policies in a city may be a productive experimentation field for really sustainable building practices, considering the triple aspect of community, construction, and technology; Conte and Monno expose the roles the various actors play in the process of constructing housing management policies, in particular the role that institutions and technicians could play to encourage participation practices and to promote production of knowledge.

Van Bueren underlines the implementation gap - between policies and successful testcases - and presents some conclusions on its nature (often related to the controversial nature of sustainable building) and possible directions to bridge it.

One of these directions is the environmental labelling of buildings, but self-determined labels declaring a building (product) to be “ecological”, “environmentally friendly” or “sustainable” often appear largely arbitrary or highlight only single aspects of the

overall environmental impact of a building. Blum, Deilmann and Neubauer agree therefore for the development of a common label at the European level, ensuring compatibility with international schemes and regulations.

Improving both the cultural and technical level of information, in order to obtain higher environmental quality in modern buildings is, however, a basic qualification, according to the results of questionnaire processed by Cardinale, Francese and Ruggiero.

Indeed, basic knowledge on bioclimatics (involving climate, natural sunlight orientation, wind, trees, natural ventilation and solar contributions) is often disregarded, so Raulin and Flahaut identify ten actions towards professionals and artisans to improve the use of bioclimatic techniques as well as the quality of the orders.

The above topic introduces “Tools” - Part Two of this volume -: it was recognized that a set of tools could be of relevant assistance to designers and confirms that environmentally-compatible solutions are possible and available.

Van Keeken presents an overview, based on literature survey, of existing Dutch environmental impact assessment methods for building activities.

Klunder describes the method used in her research for environmental impact assessment (Eco-Quantum), discusses the environmental impact of Dutch traditional housing by analyzing three reference dwellings typical of current construction practice and focuses on a number of Dutch sustainable demonstration projects.

De Grassi and Naticchia describe ENVPad, a tutoring and coaching system to support natural ventilation modeling of buildings in the preliminary stage of design, using a method conceived from an “engineering” point of view rather than a physical one.

Flourentzou, Genre and Roulet illustrate EPIQR software, aiming to help professionals to make building diagnosis that covers building deterioration, energy performance, indoor environment quality and compliance with standards and regulations.

The success of sustainability in general and sustainability in the built environment in particular, is very much dependent on educating people and overcoming professional barriers by sharing tools and knowledge; in the paper of Lerario and Maiellaro support measures (processes, benchmarks, software, information and training), mainly available on the Internet, are reported.

Papers in Part Three - “Challenges” - focus on the future of sustainable buildings.

Esposti summarizes the guiding concepts, pointed out by the CIB (Conseil International du Batiment), which will affect the scientific research and innovation production in the construction field in the coming years.

Schmid gives some examples of how sustainable, healthy, environmentally-sound architecture could exist and look like, underlining that the complexity of the Life Cycle of Buildings makes it not easy to apply the already-found principles and requirements; in order to help the process of becoming aware as well as to apply the insights, two conditions have to be fulfilled, namely “collaboration” (e.g. by the Method Holistic Participation – MHP) and the proper choice of building materials (for example: the Straw Panel System and the Light Metal System).

Bon examines the concepts of sustainable development and sustainable construction and reviews recent refereed papers dealing with these concepts in the domain of

construction management and economics in order to understand economic topics better².

The last paper by Huovila exposes the sustainability of buildings over their life span as part of the real estate and construction cluster and as part of the built environment; some examples show that the concept of sustainable building may be different in different societies and diverse measures can be taken to meet the challenge.

Notes

¹ C. Boonstra and R. Rovers (2001). Sustainable Building 2000, Maastricht, *Sustainable Building*, n.1, 2001.

² While 93 % of U.S. consumers worry about their home's environmental impact, only 18 % are willing to pay more to reduce the impact, according to a survey of 3,600 consumers in 9 U.S. metropolitan areas... To satisfy their customers, manufacturers and designers need to develop and select building products with an attractive balance of environmental and economic performance. (B. Lippiatt, BEES 2.0 Technical manual and user guide, [on-line]: <http://www.bfrl.nist.gov/oa/software/bees/registration.html>)

PART I
POLICIES

1 PLANNING IN EVOLUTION

Dino Borri

1.1 Planning scenarios

Contemporary planning and planners face many challenges. With many other professions and professionals (agronomists, anthropologists, biologists, chemists, economists, physicists, geologists, historians, etc.) planners have to prepare plans - increasingly in the form of theories-in-action- for realities which are dramatically changing; the global integration, the political and environmental conflict which is spreading in the planet in between the North and the South and the poor and the rich, the emergence of a diffuse city with its peculiar economy and quality of life in the most developed countries and the appearance of underdeveloped megacities in the rest of the world, the strong re-emergence in the global age of so many local identities, the dramatic environmental and landscape change, the contradictory impact of the information technology, the delays of most of the medium and large sized cities in competing with those challenges are primary issues at hand (Harvey, 1989; Beck, 1992; Lepietz, 1992; Adams, 1994; Castells and Hall, 1994; Sassen, 1994; Castells, 1996; Clark, 1996; Douglass and Friedmann, 1998; Sandercock, 1998; Scandurra, 1999).

Both in rich and poor countries, planners have to deal with cities and rural areas which show great but also deteriorated functions and landscapes, crowded urban environments where fragments of precious naturalness still resist. They are probably responsible for allowing that huge and amorphous peripheries could surround those cities whose architectures and squares come from ancient masteries and communities, that poor preservation and conservation policies could threaten the stone and living hearts of those cities; they probably did not sufficiently oppose regional and local policies too much invasive and disruptive of natural eco-cycles, for instance because of the high levels of building activities and in general the artificialization of the natural environment (Rodwin, 1981; Friedmann, 1987).

But, face to these threats, an environmental consciousness is spreading in the planet, made of many known and unknown resistances to private and public abuses. Communities are reconquering important spaces within plans, witnessing an increasing

diffusion of the participative-communicative planning approaches and a merge in planning of expert and common sense knowledge which improves environmental care: in fact, even the most powerful technologies now available suffer from limitations in their solving abilities and their integration with local knowledge and potentials appears beneficial (Forester, 1989, 1999; Healey, 1997; Khakee et al., 2000; Scandurra, 2001). In these cognitive and listening practices, new planning abilities and professional skills emerge.

The implementation of effective local Agendas 21 is difficult everywhere in the planet, with no regard to the different levels of development of the different countries and localities striving for them: to be sincere, high concentrations of richness and technology, with their typical high resource consumption and their 'advanced' life and production styles, per se prevent from efficacious implementations; on the other side, the 'underdeveloped' communities understandably maintain their social and economic development priorities often importing exogenous models which hamper correct environmental policies (Borri, 1999).

So, we are almost at the beginnings. In Italy and Europe, and a glance at the rest of the planet would not allow more optimistic visions, terrible contradictions affect the local environmental policies.

Regarding the environment, what emerge are too simple and not integrated policies, conflicts among different political and economic competences and powers, negative impacts of financial plans and projects, prevalence of trivial legal rules.

All this where a need should instead be acknowledged for a rapid move towards environmental preservation and recovery of diffuse cities by integrating local and self-reliant environmental wisdom and transformation with careful deployments of available technologies and professional expertises, a need of promoting approaches more multi-disciplinary than those implied by our current practices, of preparing plans characterized by new cognitive frames and instruments that is real environment-oriented projects of cognition consistent with environmental demands.

The importance for these purposes of scenario analyses able to integrate qualitative and quantitative, expert and common-sense knowledge and methodologies to take our looks a little bit further than we ordinarily do and to make traditional planning forecasting adequate to the current challenge is more and more clear (Khakee, 1999; Puglisi, 1999). A renewed interest for planning models and the spread of a new generation of intelligent GISs are also evident (Birkin *et al.*, 1996; Nijkamp, Scholten, 1999).

Nowadays we master efficacious methodologies and technologies, which are often built at the intersection of different techniques and use different wisdom backgrounds: these are more and more used by planners in peculiar forms and from peculiar viewpoints: promoting a dialectics between comprehensiveness and particularity and trying to coordinate those policies which are assumed as spatially relevant for the settled communities and their own environments in an increasingly plural vision. Current professional practices diffusely take benefit from these innovations, enriching theories through experimentation and moving toward the elaboration of pragmatic theories-in-action.

The historic deepness of changes we are witnessing, the shift from great narration to fragments and the possibility to build on it original training paths for planners (Secchi, 1999) the dramatic detachment of planning from rational paradigms of normal science under the challenges of socio-environmental systems typical complexities and uncertainties and the imperatives of the new ethics and morality which is needed to confront them, is an important corollary of this insurgent environment-oriented commitment of planners.

Theories and practices for preserving-conserving and transforming cities and related environments are rapidly changing throughout the planet, under the push of the technical and moral challenges implied by the ever spreading environmental crisis and new citizenships and governance dilemmas (Borri, 2000).

The planners' approaches become more and more communicative and flexible, and enriched by new scientific and ethical dimensions. They look with less illusions but at the same time with more efficiencies and efficacies than in the past at the new technologies and design abilities now available, in a pragmatic evolution of theories-in-practices.

Great and small stories and narrations lead planners to pluralistic contexts which are intrigued by different cognitive and governmental levels.

However, planners' resources remain fragile, exposed to hybrid and nomadic processes, and are often defeated in the confrontation with strong economic and technological powers. But this persistent fragility, frankly clarified by the so many narrow and contradictory implementations of local policies for environment preservation, warns and incites them to follow their own new 'green' and moral route.

1.2 Planning paradigms

Is science producing innovative practices in the field of proper environmental management? What does proper environmental management mean? What do innovative practices mean? Are new paradigms emerging in environmental science and if yes what about their experimental side? Many questions which seemingly do not have easy answers by the community of scholars arise (Bateson, 1972; Nicolis, Prigogine, 1989; Schuster, 1997; Severino, 1998; Damasio, 1999; Galimberti, 1999; Gargani, 1999).

The term environmental management clearly relates to human interventions and transformation in the 'natural' environment: so artificiality -the production of artifacts by humans- is at the very core of that process and a problem arises both about the 'limits' artificiality should accept if basic natural cycles have to be maintained and about the dual conceptualization of natural and artificial (Simon, 1981).

What are the attributes of 'properness' as regards environmental management? Do these attributes relate to a moral or a technical domain?

Are these attributes even conceivable in a domain -the environmental one- whose structure and dynamics still remain largely unknown and unpredictable because of their self-organization and complexity?

Who decides -and on what, on behalf of whom, and in which ways- about this 'properness'?

Are innovative environmental management practices at the same time paradoxically conservative, in the sense that the agents of those practices have to return to behave according to their old style of agents of incremental change, adaptation and symbiosis between themselves and the objects of change? On the contrary, do innovative environmental management practices imply full acceptance of the outcomes of progress in science and technology?

Because of the vagueness and amplitude of its object, is environmental science even definable in its meaning and scope, manageable according to scientific theoretical and experimental standards?

Are new scientific paradigms emerging in environmental science or the relative novelty of this science and its structural ambiguity prevent it from being so radically innovated?

While these challenging basic questions are posed, a common sense is spreading about the increasing physical deterioration of the planet because of its intense use and transformation by human activity: where these activities are more rich, powerful, and assisted by modern science and technology, mostly because of a huge capacity of use and transformation, the environment seems to be more and more under risk of dramatic collapse, and the enhanced capacities of political and technical organization and of control do not equal the enhanced amounts of pollutants of different forms and gravity which are generated.

'Less' developed countries follow the same path of environmental errors and failures followed in the past -when irrelevant consciousness and control of the problem dominated- by their 'more' developed fellows of today, with the outcome of an ongoing degradation of the planet irrespective of differences in wealth and organization through different latitudes.

Dramatically, socio-economic development mostly means disruption of the environment and its eco-systems while new socio-political disequilibria and new forms of poverty and subalternity occur.

At the same time the new mystique which is emerging in some circles of thinkers about the natural environment and those small communities who still appear as living according sustainable eco-systemic dynamical equilibria, sometimes with its corollaries of pre-scientific attitudes, does not appear to the many in the North and the South of the world as a plausible way to cope with the current socio-environmental challenge and needs.

A debate on human settlements cannot nurture the ambition of answering these complex questions; this is particularly true when the aim is to avoid theoretical debates to explore and focus on any experimentation of alternative ways to deal with socio-environmental improvement and democratization (Sandercock, 1999).

Up until now, especially in developed countries, the battle for a better environment has been conducted on the basis of regulations: socio-economic activities have had to gradually conform to more sustainable environmental standards while, at the same time, firms have been allowed to pay for continuing to pollute. The idea has been that of

pushing agents-of-pollution towards more stringent responsibilities for their environmental behaviour but outcomes have been contradictory as many of these agents were able to externalize the costs of such regulations, to find ways to escape from regulation enforcement, to move to developing or less regulated countries worsening socio-environmental conditions in those countries. It is plausible to assume that this mainly behavioural and gradual orientation of the environmental policies has contributed to prevent science and technology from being forced to work on a more active search for innovative solutions of environmental problems (Shiva, 1993; Regge, Pallante, 1996).

Where new practices of environmental sustainability are emerging they are largely oriented to a principle of cautiousness, as the complexity of environmental processes, on one hand, and the idea of a chance in the near future of coping with environmental degradation via the attainment of new solutions or new technological substitutes for it, on the other, make people and scientists convinced of the usefulness of behaving cautiously and avoiding too much rapid changes.

A conviction is also diffuse about the paradoxes of environmental budgets on the basis of which, for instance, the next few decades of XXI century could register favourable climatic changes in the North of the planet in opposition to the unfavourable ones in the South: a quite cynical position of detached observers which in the end makes ineffective the current sharing by most of those observers of the idea of a dramatic ongoing climatic change because of the heavy environmental impacts of human activities around the planet.

In addition to these contradictions, socio-economic and technological progress is often seen as defending the environment: a good example for this could be the argumentation against traditional environmental practices of local communities living out or at the margins of modernization for their lack of care for resource saving as in the case of criticisms raised by some scientists against traditional deforestation practiced in developing countries by communities for self-sustenance (heating or cooking).

Loss of natural biodiversity is also supported by the search of increased productivity to be obtained via genetic refinement of species: also on this terrain a debate is open about the positive and/or negative outcomes of such a practice while seemingly most scientists argue in favour of free experimentation as a key factor of progress of human beings.

In fact, impressive advancements in many fields of science coexist with diffuse concern among scholars and lay people for the future of the environment and its ecosystemic and dynamic equilibria. More and more complexity and chaos theories aimed at a sounder modeling of reality support a search for effectiveness of practices at the same time allowing the discovery of further levels of complexity which seem to undermine any investigation.

Distributed intelligence and multi-agent approach to complex tasks in computer science and control engineering provide a seemingly sound artificial simulation of living organization. At the same time the cognitive and operational convergence of these multi-agencies in problem-solving and problem-setting is hard to obtain, and this gives

room to sceptical positions arguing for substituting a new individualism to pluralism (Nagel, 1979; Jackendorff, 1987; Flanagan, 1992; Searle, 1992; Kihlstrom, 1994; Penrose, 1994; Wheeler, 1994; Shear, 1997).

This dialectics of positions and perspectives drives to new concepts and practices which provide control mechanisms and ensure partial sustainability and resiliency to the human organization.

New forms of environmental practices based on ethics and scientific approaches different than in the past are emerging among communities at large, but their relevance is mostly argued in generic terms preventing from a sound understanding. This even if a new harmony in many cases is taking place between science laboratories and the scientific community, on one side, and the political arenas and the civil community, on the other side, under the big push of advancements in environmental knowledge and consciousness.

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