

Tackling eco-urbanity: Housing and placemaking at the urban edge

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Abstract:

With more than half of the world population is now living in urban settlements, urban growth is almost inevitable. But our cities are not growing in healthier and ecological ways, they are 'sprawling'. Much of this sprawl is a result of new housing developments and constructions for their related services, occurring rapidly one after the other at urban peripheries. There are several principles and guidelines offered for 'ecologic' urban planning and 'eco' or 'green' building design. However, most of these guidelines are rigid, contemporary market-driven and global 'checklists' with no ability to inform local urban design and interdisciplinary practice and polarizing the differences in design disciplines with their incompetent content that is far from addressing the symbolically, ecologically and functionally powered interrelations between built environments and nature. This paper addresses ecological housing design and planning at urban edges by proposing an updated urban design strategy –the placemaking strategy- and testing its role in monitoring eco-urban development with actual case studies on two ecological settlements at the urban edge of Linz, Austria. The study investigates and highlights the importance of architecture and landscape combined comprehensive urban design strategy to preserve land, prevent consumption in all terms, to utilize the on-site resources, and use of renewable energy sources, to improve functional and social performance of urban contexts at urban edges and maintain healthy living conditions for the inhabitants for longer term goals of livability and sustainability.

Keywords: *Urban design strategy, placemaking, ecological housing, eco urbanity, architecture and landscape design, livability.*

Introduction: On eco-urbanity and placemaking strategy

Today, many architects who are interested in shaping cities as well as buildings face a contradiction: on the one hand, planned urbanism simply materializes the existing political apparatus, while on the other, architecture tends toward the market-driven production of fashion objects, removed from wider urban and social concerns. If formalism does not lead to invention, then how does the next generation of architects begin to think about a new kind of operative architectural

and urban design practice that leads us closer to the goal of promoting human life over form?

Pasquarelli, G., 2003:24

The ecological context in which we operate goes beyond global warming to entire planetary destabilization -ecological, social, political- and the destruction, or at least massive disruption, of ecosystems (Ripley et.al. 2009:6). The ecological networks and the relations of the built environment with these networks and their processes are the main challenges architects are confronting with. Urban growth is inevitable in our rapidly globalizing world. But our cities are not growing in healthier and ecological ways, they are *sprawling*. Much of this sprawl is a result of new constructions for housing developments and their related services, occurring rapidly one after the other at the urban peripheries where the ecological balance is most fragile.

One of the leading solutions offered for overcoming the widespread problems created by sprawl is 'ecological' or 'green' urban planning and 'eco' building design. There are several principles and guidelines being blown out for their application. However, there are also clear dangers in this *ado* on 'eco planning and design' that may support the patterns of sprawl instead of terminating them: first one is the 'specialist' approaches to *eco-building* where the architect's design responsibility is not going further than the building envelope; the second one is the rigid, contemporary market-driven and global 'checklists' for *sustainable urban planning*. The former is offering *innovative* and almost perfect *eco-objects* where the site is functionally disintegrated from the buildings with the well-insulated building envelopes; the latter, checklist driven 'sustainable' or 'green' urban planning, is polarizing the differences between design disciplines with their overly schematic and incompetent content which is far from the understanding of complexities and interdependencies of urban elements and actors. They both fall short in addressing the complex nature of urban problems and in informing interdisciplinary processes and practices of local urban design.

Faced with the complexity of the problem of ecologic urban design -eco-urbanity as called here- architects are -if not yet, then should be- reconsidering their role within the critical forces that will shape our human future. As Genevro puts forward: "What architects can offer, what they must offer are visions of fundamentally new arrangements for new ways of life. Architects must take on the big questions of land use patterns and transportation and space standards and hyperconsumption and waste, and challenge themselves to create positive visions of ways of living that protect the planet and still offer opportunity and comfort. ...What is needed now is a new sort of utopian thinking: not utopia as set-piece, but interrelated and far-reaching visions for the built future that can be tested, discussed, rejected, improved, and embraced as part of a society-wide discussion. Specifically skilled as they are at understanding, influencing, imagining, and creating physical frames for ways that people want to live, architects can contribute ideas and forms to make visible the possibilities of a reinvention of our way of life" (Genevro, 2005:5).

According to Radovic, there are two concepts which 'make' eco-urbanity: 'ecological sustainability' and 'sustainability of urban cultures'. Environmental sustainability and social sustainability, located in an urban node, make *eco-urbanity* (Radovic, 2009:14). He further argues that 'good definitions of sustainability tend to be composite and complex, and they

always remain incomplete. I find them at their best when they generate fields of forces that are only represented and captured by words, and that can and should frame concrete actions and give concrete results. The common question of how to implement such broad definitions can be answered only through action' (Radovic, 2009:13). As Radovic underlines, there is a need for design and practice informing generative strategies in order to 'concretely' realize the ecological urban design and to provide the spatial conditions for longer term sustainability. Such a strategy requires integration of disciplines in eco-centric ways, rather than defining their *labor divisions* and supporting the *specialist* approaches.

It has always been the architects' responsibility to think in complexity, produce operative strategies and apply them into local contexts. To understand ecologic urban design 'eco-urbanity' as new to architectural design would be to ignore the history of architecture and human habitation on earth. It is my argument that eco-urbanity or ecological urban design is not the dream of visionary or utopist architects; rather, it represents their common sense and awakening from a long term 'amnesia' of viewing architecture and landscape as different and separate practices. This paper is based on a part of long term research on linking architecture and landscape for place informed urban design and practice with guiding concepts that supports ecological settlement design and planning at urban edges. It is representing an update on the strategy in the light of a recently completed research project focusing on investigations on utilization of renewable energy sources and creation of microclimatic spatial organizations in housing environments. The main focus of the study is the role of this placemaking strategy in monitoring the possibilities of eco-urban development with actual case studies on two eco city settlements at the urban edge of Linz, Austria.

Updating the placemaking strategy: An urban design strategy

It is the idea that counts. The concept, whether an explicit statement or a subjective demonstration, establishes an order, a field of inquiry, and a limited principle. An organizing idea is a hidden thread connecting disparate parts. An architecture based on a limited concept begins with dissimilarity and variation but ends up illuminating the singularity of a specific situation. In this way, concept can be more than an idea driving a design; it can establish a miniature utopian focus.

Holl, 2003:27

*The relationship between landscape and architecture might be imagined over and over again, in such a way that **each is defined less as a quantifiable object and more as an idea, a way of seeing, act of making**, and a way of engaging culture and society.*

Spellman, 2003: 10

The 'placemaking strategy' (first offered by the author in 2006) is a sustainable design and planning strategy informing settlement development at urban edges (rural urban development) which is founded on essential criteria to preserve land, to provide spatial structures for maintaining human-nature continuum for longer term sustainability goals, and to form livable settlements. The idea behind forming such a strategy derived from the author's passion on integrating the site, its surrounding landscape (both urban and rural - artificial and natural) context and wider ecological networks

into building and settlement design task as the main responsibility of an architect.

From the beginning, the research focused on developing a theoretical base for design and planning of sustainable new developments at the urban edges that reflect and respond to the land and the ecosystem into which they are being built. The content of the strategy is then informed by twelve essential leading concepts, which act as informing guides, each concept leading to an operative phase of habitat creation at the urban-rural interface. The twelve leading concepts of the strategy, in a sequential order, were as follows: grounding; transects and sectional hierarchy; open bounding; diversity and individuality; passage and thresholds; domain and community spatial order; sustainable building typologies; residual space utilization; authenticity, materiality and detailing; scaling and critical multiplication; continuity and connectivity; constellating urbanism.

The placemaking strategy, with the universal values of its leading concepts, is enabling the flow of ideas between theory and real-life experiences. It is informing the planning and design process of physical contexts that ensures spatial necessities both for individual comfort and community relations, and supports the most efficient and effective use of local energy, natural and economic resources (....., 2006).

The main aim of the placemaking strategy in practice at the context of urban edges is to inform the design and planning process of making places while allowing for growth and preventing sprawl. It transcends theoretical knowledge through helping to develop and to envision solutions for informing practice. The conceptual content of the strategy is also open for modifications upon their application for varying sites and practice projects. Hence, the deeper placemaking concepts of the strategy form an interactive process between theory and practice. The strategy has short, middle and long term goals:

- The short-term goal is deriving from and influencing the decision-making process of design and planning.
- The medium-term goal monitors, with an on-going process, the results of the application of design intentions and their success as actualized in the projects.
- The long-term focus and goal is to achieve the maximum results for livability, health and sustainability.

In the light of a recent research project conducted by the author, on utilization of renewable energy sources in urban contexts and housing environments, the concepts of the placemaking strategy has been revised and developed for informing future eco-settlements and housing environments, with a particular focus on ensuring renewable energy utilization and healthy living conditions. The concepts are revised and updated according to the following criteria: (i) full integration of architecture and landscape, both conceptually and in act of making; (ii) on-site utilization and use of renewable energy; (iii) creation of microclimatic and healthy indoor and outdoor living spaces; (iv) use of land in ecologically and socially sensitive ways. The following table is presenting the revised concepts of the placemaking strategy and their design informing content (Table1).

Table 1. The revised concepts of the placemaking strategy

Concepts	Contents
Grounding	Grounding, as the premise of building, refers to forming a <i>local</i> point to define our location in the world. At the settlement scale, grounding refers to determination of a particular center, which can reconnect daily routine of its inhabitants, such as working, shopping and community gathering with basic sources of life. To make life more stable and secure, this center also needs to provide sources for <i>production</i> and establishment of local economy by utilizing local assets and resources for its potential inhabitants to settle down
Density and sectional hierarchy	Low-rise, high density housing development is aimed for healthy growth of an ecological settlement. Sectional hierarchy determines, defines and enhances the density of built forms within the dwelling context in vertical directions. That is a spatial creation, which determines a new topographical condition on a particular piece of land. Together, they form an infrastructural system, which regulates the spatial organization of the settlement morphologically.
Open bounding	The idea introduced by open bounding is about creating containment in a community settlement where the character of its outline is not determined and emphasized with physical barriers, but it is, nevertheless, present enough to create coherence and identity. Open bounding forms an outline to prevent massive growth.
Diversity and individuality	Architectural design and planning with diversity supports personal freedom of choice and individuality by offering integration of critical non-residential land uses, as well as varying plot sizes, housing typologies and population densities.
Passage and thresholds	Bounding of a settlement needs to be regulated by <i>passages</i> which address open flow between inside and out with their structural organization and orientation patterns. Passages can be formed with open circulation systems and experimental development structures to set up an <i>interaction pattern</i> between the exchange of inside and out. For a sustainable settlement development at the <i>edge</i> , which is the <i>threshold</i> between urban and natural areas, it is particularly important for any design attempt to introduce spatial experiences of transition and ecological interactions. Articulated passage contributes to community identity.
Domain and community spatial order	While <i>domain</i> refers to qualitatively defined areas which are divided by paths, as indicated by Norberg-Schulz (1971), <i>domain order</i> refers to the system of spatial organization within these defined areas. It is a territorial organization as stated by Doxiadis (1976), at a specified time and site. The domain order is the <i>oriented order</i> of the <i>enclosure</i> with alignment of axes of circulation network and organization of spatial structures like social institutes, commercial center and residential units. This order also suggests the pattern of living activities, which differentiate each settlement with its individual character of spatial organization on its chosen site while allowing for diversity of forms and functions associated with its spatial structures.
Sustainable technologies and building typologies, energy and settling strategies	The building types achieving high levels of energy efficiency, functional diversity, individual and public comforts are necessary components for sustainable and livable settlements. Sustainable building typologies and energy strategies for the settling reflect the land and the ecosystem into which they are being built. Utilization of on-site renewable sources for energy is the ultimate aim. In the long term, they all support the increased productivity and health of their occupants and the community at a larger scale.

Table 1. Continued.

Landscape design strategies with in-between space utilization and microclimate creation	The creative utilization and use of in-between spaces is important in adding further diversity, utility and use within the urban fabric of a place. The interplay between building volumes and open spaces is an important issue. Using residual spaces prevents consumption of left over land at the margins, the need for additional space and the decline of in-between spaces that occurs at the settlement centers. Typically the in-between residual spaces can be used for creating microclimatic comfort spaces, recreation, community gardens, sitting and gathering places, etc. Often neglected and unconsidered spaces between the buildings -the in-between spaces-, when considered as living parts of the larger surrounding landscape, could contribute to the achievement of livable urban contexts and energy efficiency through utilization of on-site renewable energy sources; the main purpose should be to transform the neglected in between spaces into multi potential landscapes (....., 2010). Together, the in-between space utilization and spatial patterning of landscape for microclimate creation according to energy flow and hierarchy becomes an added value to the community as developed over time.
Authenticity, materiality and detailing	The rural urban authenticity is an honest planning and architectural language born from contemporary needs seeking real, practical, sustainable and livable solutions. This is an authenticity through necessity rather than capricious appeal.
Scaling and critical multiplication	This concept assumes an optimal size, density, and set of internal land uses that are relatively sustainable according to the laws of critical mass of a given population and allowable area of land. It introduces an operational strategy for scaling and intelligent physical expansion of a sustainable development. What is desired with this intelligent physical expansion is a <i>critical multiplication</i> , which is a careful proliferation process through the organic living patterns determined by the site, size, density, and configuration. Growth occurs through this process of multiplying when the settlement has reached optimum size rather than simply adding process until the settlement must rely on the automobile.
Continuity and connectivity	Continuity and connectivity introduces the conception of how individual settlements interact both ecologically and systematically with transportation webs and an equitable distribution of all resources. Each community settlement is viewed as a microcosm of the larger group of settlements. And the whole group of settlements is the product of a holistic system, which relies on interdependence, interconnectedness and interactivity. The indicators of livable places and healthy lifestyles are rooted in the quality of the relationships within and among the settlements. The network architecture refers to a relational structuring between people and nature.
Constellating eco urbanity	Presents a healthy development strategy, also including social organization strategy and institutionalization. Critical multiplication of development can emerge with ecological between-place measures for the longer term goals of livability and sustainability. Among these measures is the concept of constellating this physical expansion, which takes on a <i>higher order unity</i> that is supported by greater levels of <i>intermodal connectedness</i> and meaning. The overall pattern, or the constellation, presents the opportunity for systemic coherence, <i>inimitable identity</i> as well as diversity in use and character. The primary aim is to achieve a healthy interconnectedness between these places, which joins them together to provide access and communication creating a greater meaning.

The interrelated and sequential set of concepts constitute the backbone of this operative strategy. The translation of these concepts into action is of critical importance. The strategy works with its complex set of concepts for starting with the contextual situation, using design as a way of exposing the conditions, forces, and potentials that might become activated.

With its revised leading concepts the proposed strategy is informing the development of sustainable ecological urban development, particularly at the rural-urban edges where the ecological balance is critically fragile and yet the context has innumerable potential for utilization of renewable energy sources and creation of healthy living environments. Instead of top-down planning decisions and practices, the strategy provides specific, localized opportunities to intervene in the existing urban contexts and guide the design of new ones.

In order to test its liability, the strategy has been previously applied in 2005 (on-site analysis) and 2006 (publication of the research) to the local context of Serenbe Community located at the outskirts of Atlanta, Georgia. With the first construction started in 2004, the community development still continues and promising to be one of the leading eco-settlements in the USA with its lower density mixed used development, preserving the %80 of the land and reducing dependence on the use of automobiles with alternative pedestrian and bicycle routes within and between the community settlements. This case study provided initial information on the effectiveness of the strategy, particularly its short term goal which is deriving from and influencing the decision-making process of design and planning.

Since the leading concepts of the placemaking strategy are based on universal values, as stated from its beginning, the strategy has the flexibility to be modified and applied to different sites and locations under varying circumstances, and promises to inform future settlements. The following case studies were conducted by the author in the summer of 2009 at two housing developments located at the urban edge of Linz, Austria. The intention was experimenting with the updated placemaking strategy through on-site analysis, particularly by utilizing its medium-term goal which monitors the results of the application of design intentions and their success as actualized in the projects.

Two case studies: Garden city Puchenau and solar city Linz

The value basis of true sustainability is a philosophy of action and its ultimate test is always in its local relevance.

Radovic, 2009:13

The full integration of architecture and landscape in creating potential interfaces for ecological design and innovations in housing at the urban edge is the focus of the critical analysis and evaluations of the case studies that is going to be presented here.

Garden city Puchenau

Nothing more distinctly shows the loss of "space" than the development of the multifarious garden into the "green zone" which is computed in terms of pre caput figures or area percentages.

Rainer, 1972:109

In his pioneering work and book on livable environments, Rainer (1972) points out to the 'environmental crisis – urban crisis' from the beginning

where he views the problems of metropolitan areas and the emerging uncontrolled urban sprawl mainly as landscape problems: as the 'selling out of landscape' under the program of an economic growth that is 'not concerned with the exhaustion of natural resources and the destruction of the environment by heaps of refuse'.

The much discussed population explosion has inspired the most varied designs for megalopolitan superstructures, but it is also encouraging all the other trends towards concentration and excessive height of urban constructions. This includes those high-rise residence blocks which shoot up in villages and small towns suffering from no lack of space, the objects of building and real estate speculation. (Rainer, 1972:7)

The unhealthy conditions created by excessive use of technology in the handling of the landscape our cities are located in is also what Rainer is pointing out:

The total elimination of nearly all natural elements by technical ones, the canalization of waterways, the monotony of street plans, the housing of people in barrack-like residence blocks in anonymous flats, bureaucratic regulations of building with methods that are based mainly on security and at best hygienic considerations that ignore the decisive social, psychological and, above all, biological standpoints, all these things determine the total character of the city and of its architectural units (Rainer, 1972:226).

Rainer further argues and makes a timely critic on two big faults of his time: handling of landscape separate from architectural practice and the offerings of 'public green zones': The important cultural significance of landscape architecture should be borne in mind with reference to our current problems; these problems are by no means resolved by computing so much "green" area *per caput* of population or by public outlays for "public green zones". The public green zone has only become necessary in the unhealthy conditions of overly dense, mechanized great cities of the industrial age; they are a substitute for private open space that has been lost and for the natural landscape that has been encroached upon by the city, and they are intended to compensate the mass of urban dwellers for their unnatural, unlivable environment. (Rainer, 1972:116)

Lack of space cannot be overcome by furnishing playgrounds with technical apparatus. The overcrowding of open spaces around big apartment blocks dating from the turn of the century is a consequence of excessively high housing density; it is comparable to the desolation of the vast cemeteries of that period, and is a characteristic symbol of "mass culture", which can be corrected not by "surrogate green zones", but by an entirely different urban structure in which housing and neighborhoods possess their own open areas and in which the mass effect is avoided by articulation of separate parts. (Rainer, 1972:126)

Rainer's understanding of a healthy and livable environment is best exemplified in his planning and design of the Garden City Puchenu which is located along the Danube river, at the urban edge of Linz, Austria. The ideas shaping the planning and the design process of this eco city were already laid out in his book on livable environments:

In a healthy urban structure the "public" and the "private" green zones must run through the entire urban built-up area in a highly differentiated fashion;



Figure 1. Pathways between the courtyards, Puchenau (author's archive)



Figure 2a, 2b. Walkways at Puchenau (author's archive)

moreover, if the essential landscape is protected from building and technical development, there will be less need for “public parks” or “public green zones”. (Rainer, 1972:138).

The ideas used in the planning and design processes of the garden city Puchenau relies on Rainer's long term observations and research on the traditional oriental urban fabrics in Iran, Turkey and Balkans. The living patterns characterized by human scale, pedestrian orientation, security, privacy and quiet, neighborliness, clearly shaped public realm and most importantly the courtyards which are ‘promoting a personal life style extended into the outdoors and freed of all prestige considerations’ are at the heart of his design inspirations (Figure 1).

The loggias closed in by wooden shutters in Turkish houses permit ventilation and a view outside, but at the same time provide protection against excessive sun and guarantee privacy. ...The disposition of living rooms around an open terrace, taken for granted in traditional Turkish houses has recently been discovered by modern architects: terrace houses in Finland by Aalto; multi-family house by Aalto at the Berlin ‘Interbau 1953’. (Rainer, 1972:80)

The urban fabric of the Garden City Puchenau is mainly shaped by housing units with atriums and inner gardens. In Rainer's words he aimed to create ‘houses or flats with supplementary private outdoor areas’ ‘in a wide variety of shapes, sizes and situations, possibly on numerous different levels’ constituting ‘a building complex that, albeit with high overall density’ gives in detail ‘the effect of a loosely textured, airy and sunny, milieu composed of many different kinds of clearly distinct residential cells on the human scale’ with respect to topography and culture. (Figure 2a, 2b)

Garden City Puchenau, located towards the West of Linz, is still exemplary for future urban settlements. The planning and construction of the settlement was realized gradually. It was planned in the years 1962-1965, 1972, 1977-1990, 1994-1998, and constructed in the years 1965-1967, 1973, 1978-1992, 1998-2000 (Rainer, 2003:205). (Figure 3, Figure 4)

The settlement layout, mainly consisting of single family units, is formed as a band along the shore of the Danube river. At the southern edge of the settlement the building height is lower (1 to 2

storey housing) than the Northern edge where the building heights raise to 4 to 5 storeys in order to form a *barrier wall* to protect the settlement from the noise of the railroad and the main motorway, also functioning as a visual barrier in order to maintain the privacy of the residential area (Figure 5a and 5b). With the main streets lying on the south (main pedestrian and bicycle route along the Danube river) and north (main motorway) of the settlement, all the openings of the living rooms and bedrooms are organized to face the southward directions. On the west edge, the settlement is ending in a plastic form with a steep cliff reaching to the shores of the Danube river.



Figure 3. Urban plan, Puchenau (Rainer, 2003)

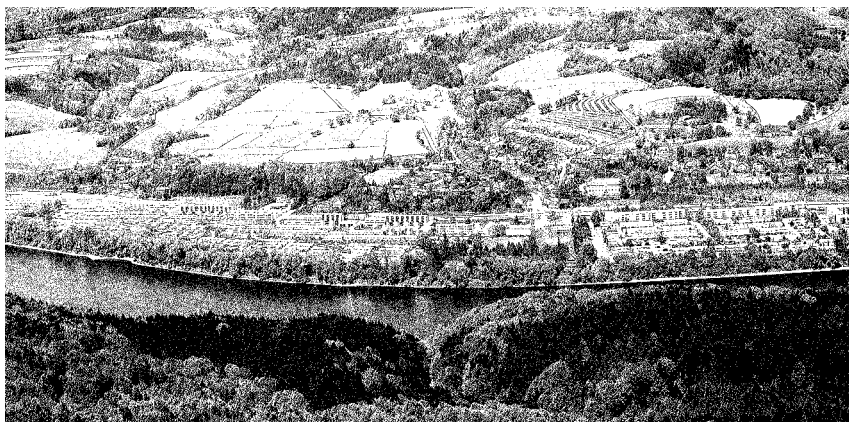


Figure 4. Garden City Puchenau along the Danube river (Rainer, 2003)

The research, planning and development studies also involved the public participation and support of both the local and the central government. In 1965, before the construction started, six type of full-furnished housing units with their complete garden design and layout were exhibited to the public in Linz in order to get their opinion. After this, the Puchenau I started to be constructed and completed with 229 housing units in 1969. The inhabitants were interviewed between 1965-1967 by Dr. Kühberger and Prof. Guttman from University of Vienna and the results of this research was published in 1974. The positive results of this research fostered the start of the construction for Puchenau II in 1978 (Rainer, 2003:205). In the year 1976 a kindergarden, youth halls, a state-school with eight classrooms and a senior citizens' place were built.

In Puchenau II, underground auto parking places were constructed with the supporting funds of the government. Therefore, a more continuous surface of land on the ground level was able to be preserved for the use and joy of the inhabitants. The service roads, providing access to the car parking places in the Puchenau I were not needed here. So, a totally traffic free and more livable environment was created in Puchenau II. The series of green rooftops in Puchenau II, with their optimal orientation towards south, also

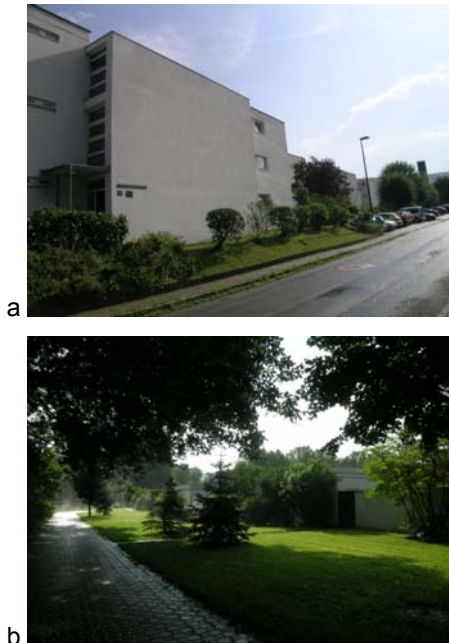


Figure 5a. Northern edge of the settlement, **5b** Southern edge of the settlement, Puchenau (author's archive)

contributed to the creation of a natural barrier towards north and maintaining the interconnected and continuous chain of green spaces used by the inhabitants as playgrounds and free-time exercises.

The ideas and the concepts used in the planning and construction of Puchenau I and II are also based on the architect Rainer's former experience on a housing settlement, with the prefabricated construction system, he realized in 1953 in Mauerberg, Vienna. The Building Ministry of Austria conducted another research on Puchenau in the year 1984, investigating the optimal use of land and its connections with the other surrounding neighborhoods, the efficient use of energy supported with solar energy used in hotwater heating and space heating, social structure and relations, spaces for free time for the use of senior citizens and other inhabitants.

The main idea of the research conducted in Puchenau was for answering the following questions:

- the optimal use of the site;
- interconnectedness of the neighborhood in the best possible and economic ways with narrow, stabilized pedestrian paths and parking places in close connection to the housing units;
- south orientation for the passive solar use and obtaining hotwater and heating from the solar collectors;
- optimal protection from street noise;

like in Puchenau I, in Puchenau II also Ifes-institute realized the interviews (Rainer, 2003:205).

One of the very important outcomes of the Puchenau is that ;the net building costs of single storey atrium houses, which is mostly preferred by the inhabitants to live in, are never more than the high-storey multi-family

housing units - let alone high rise blocks' (Rainer, 2003:205). That was a very strong evidence for the preference of low-rise, high-density use of the land and the main urban fabric organized with the courtyards though which landscape and architecture is fully and truly intertwined. (Figure 6)



Figure 6. Wall bordering one of the pedestrian walkways, Puchenau (author's archive)

Solar city Linz

In 1990 Linz City adopted a policy to develop a substantial stock of low energy social housing. At the end of 1991 Roland Rainer presented his master plan for the lakes district of Linz-Pichling. A functional, coherent concept that would open the entire area in terms of housing, work, public

facilities, transport and recreation. In July 1992 he was commissioned to plan the 'Linz-Pichling lakes district', a new urban district that would provide areas for housing, work, education and recreation. The scope of the planning was laid down in three plans, one each for development, transport and green spaces, organized into four planning phases. These three plans were the "urban planning outline concept", the "urban planning measure concept", and the "design concept for the new housing area Pichling, including a design study for the areas at the tram stops Ebelsberg and Pichling." (Rainer, 2008:24)

The concept planning stage for the development of this new urban district at the urban edge started in 1990s including well-known architects Foster and Partners, Richard Rogers Partnership, Herzog + Partner, Renzo Piano Building Workshop (presented by A Giordano, worked with engineer Norbert Kaiser under the name READ) and local architects. Office of Latz and Partner designed the open spaces.

After an energy study in 1993, Linz City signaled that it was willing to partly finance the planning and development of a solar city at Pichling, to create a model estate of low energy flats. World class architects Norman Foster, Richard Rogers and Professor Thomas Herzog then agreed to design the first 750 flats, working closely with German energy engineers Norbert Kaiser under the name Renewable Energies in Architecture and Design (READ) grouping. By 1996 the commitment to solar and low energy construction for residential and public buildings in the plans for Pichling had won support from the European Union's DG XII to the tune of 600,000 ECU for research and development. By this stage some 9 different contractors had also joined the project. The scheme had also expanded to include 1500 flats on an area of around 34 hectares with Viennese architect Martin Treberspurg, a specialist in solar architecture for social housing, designing the second set of 750 flats. (Reinthal, 1999)

The area was originally planned for 25,000 inhabitants. The Roland Rainer's master plan was modified during the development stages for the priorities given to buildings and open spaces for the extensive use of solar energy (Figure 7a, 7b). A radial concentric plan is applied for the settlement layout and the entire development was restricted in height to prevent the need for the use of elevators.

Comprehensive use of solar power and compact design mean the buildings largely face to the south (Figure 8a), have intelligent facades (Figure 8b), natural ventilation and large amounts of natural lighting as well as optimal heat storage and an overall heating requirement of less than 40kwh/m² per year. Different possible ways of utilizing solar energy were applied (i) individual use to increase the a feeling of well-being and comfort that relate

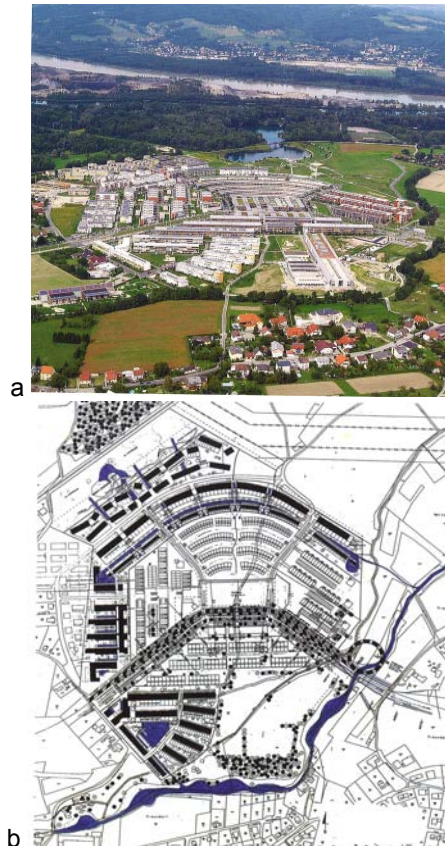


Figure 7a, 7b. Solar City Linz aerial photo and urban plan (Treberspurg (ed.), 2008)

to the quality of daylight, the view, and the integration of sunny areas (ii) technical use: the physical or biological utilization of sunlight to produce energy and to relieve strain on the environment; (iii) social use: outdoor areas are created that receive plenty of sunlight, thus making them more pleasant to use and plant growth is stimulated (Kaiser, 2008).



Figure 8a, 8b. South facing large facades, intelligent facades, Solar City Linz (author's archive)

The goals were to achieve maximum permissible density, variety, possibilities of mixed use and subsidized social housing at a low overall cost. The technical, functional and social effects of solar energy were also be implemented. (Herzog, 2008:32)

The main task of the planning of the Solar City is social housing with the goal of solar urban planning and the method was to build sustainable buildings that allow innovation. The main focus of the urban development project: low-energy construction, a future oriented approach to energy supply and waste disposal, the issues of building biology, local recreation and leisure time, the creation of a modern socio-cultural, family oriented infrastructure, as well as joint, group specific marketing campaign, all formulated in a project agreement. All construction was completed between 2001-2005. Each building in the settlement context has an urban planning concept, building design concept and energy concept (Figure 9 a, b, c, d, e, f). (Figure 10)



Figure 9 a,b,c,d,e,f. Various social housing typologies at Solar City Linz, (author's archive)



Figure 9 a,b,c,d,e,f. Continued.



Figure 10. Central square, Solar City Linz, (author's archive)

Monitoring eco-urbanity in Garden City Puchenau and Solar City Linz through the placemaking strategy

The journey towards the sustainable city demands a compass in the form of a solid set of guiding values, which themselves remain open to rethinking and adaptation. ...And as there is no end to that journey, there is neither stasis, nor some definite, achievable ideal sustainable city. ...At every moment, the sustainable city has to be a just, fully lived city. ...A sustainable city has to be confident about its own past, exist in the present time, and project a multiplicity of trajectories towards possible, desirable futures.

Radovic, 2009:16

The guiding urban design concepts of Garden City Puchenau and Solar City Linz are compared here highlighting the integration of architecture and landscape and demonstrating their development characteristics. The common to both settlements are that they are both designed, planned and realized step by step in time.

The following matrix is prepared to show the comparisons between these two settlement patterns in regard to the concepts of the placemaking strategy (Table.2).

The gradual and comparably slow developments of the both settlements are therefore open for research, experimentation and learning from their own previous operations and applications.

Puchenau is based on intense research, planning and development work lasting more than several decades; its construction lasted more than 30 years. As a result, the optimum use of land and density, with the most economic use of on-site sources is achieved. The inhabitants of Puchenau, who prefer and continue to live there for more than three generations, is the best proof of the success of this ecological urban development.

At the Solar City Linz, the construction and settling process is still ongoing. Therefore, with the increasing number of inhabitants in the coming years and carefully detailed on-site researches will prove the success or the failure of this new settlement in ecological terms.

Table 2.





Case studies Concepts	Garden City Puchenau	Solar City Linz
Grounding	<ul style="list-style-type: none"> - The settlement layout is formed as a band along the shore of the Danube river - The urban fabric consisting of private and shared courtyards provide a multi-centered settlement pattern - Inner gardens and courtyards within and between the single family and multi-family units provide gathering places for the inhabitants. 	<ul style="list-style-type: none"> - A radial centric plan was applied for the settlement layout. - A central square forming the functional and spatial link between the different parts of the city, shopping market, the central tram station. - Around the central square a multi-functional complex for social and cultural facilities (including a library, a senior citizens' club, branches of adult education service, music school, seminar room, multifunctional Volkshaus, event halls), stores and restaurant facilities, sheltering roofs for open market 
Density and sectional hierarchy	<ul style="list-style-type: none"> - Low-rise high-density housing settlement is realized. - The settlement is rising on the Northern edge to 4 to 5 storey height and lowering down towards the southern edge to 1 to 2 storey height. The western edge is defined by a steep cliff that meets the settlement water in a plastic form. 	<ul style="list-style-type: none"> - The surrounding natural space allowed to dictate the scale. - The maximum building height is two upper floors and a roof level that is forming the upper floor of the maisonette. - Sectional hierarchy only within the separate housing developments for best solar orientation. - A density of 0.6 to 0.8 was aimed at the master planning phase. 

Table 2. Continued.










Concepts	Garden City Puchenu	Solar City Linz
Open bounding	<ul style="list-style-type: none"> - The main motorway and the railway are along the Northern edge, running parallel to the settlement. Only three service routes to the parking places at Puchenu I, with no gates. - Pedestrian paths are lying on the north-south axes, and several are lying on the east-west axes connecting in and out of the settlement, with no gates. - A pedestrian and bicycle path lying on the south edge, along the Danube river shore, is being used for free time activities. Inner pathways, lying on the north-south axes reach to this main path, provide defined entrances into the residential area with no gates. - No constructed border elements (fences, etc.) between the surrounding context and the settlement area. 	<ul style="list-style-type: none"> - The main boulevard crosses the settlement in the east-west axis with the tramway in the middle lane. - Partial open bounding at the northern edge. - The excavated material from the enlargement of the Wikerlsee lake was used to form the hilly landscape between the lake area and the settlement. - Pedestrian paths run between the housing blocks, also extended paths connect the residential area to the surrounding landscape with no gates. - Green strips reach to the agricultural landscape and provides transitions to the alluvial meadows of the Traun and Danube rivers. - No constructed border elements (fences, etc.) between the surrounding context and the settlement area. 
Diversity and individuality	<ul style="list-style-type: none"> - Varying housing typologies from single storey atrium houses to low-rise multi-family housing units - Variety in use of the housing units (public-sector housing, rented apartments, condominiums, private residences are all available) creating a diverse user profile from different ages and income groups. - High-quality of private spaces (through enclosed atrium houses) - Inner gardens between the housing units create gathering places and playgrounds in varying sizes and level of privacy.  	<ul style="list-style-type: none"> - Varied housing typologies from townhouses to single storey apartments - Variety and mix of users from non-family user groups to larger housing units, intercultural housing, solutions for multi-generation families, apartment-sharing, working-living units. - Variety of plant species providing biodiversity. - Variety of materials and typologies are creating diversity and giving identity.  
Passage and thresholds	<ul style="list-style-type: none"> - Within the residential area there is no vehicular traffic - Main pedestrian paths lying on the north-south axes are made of concrete, having loose ends where they reach to the Danube river shore. Inner paths and courtyards are softly or not covered. - Varying sizes of pedestrian paths determine the privacy levels. - Some of the main pathways between connecting multi-family units to the single storey atrium houses are protected from sun and rain, providing passages and also play areas for children along the north-south axes.  	<ul style="list-style-type: none"> - The sealed surfaces reduced to a minimum and the paving has open joints. - Within the housing developments vehicular traffic is restricted to a central access route and service routes reaching to the car parking areas among the different housing developments. The residential paths are reserved for pedestrians, cyclists and playing children. - A pedestrian and bicycle path leads to the two lakes and to the alluvial meadows. 

Table 2. Continued.

Concepts	Garden City Puchenu	Solar City Linz
Domain and community spatial order	<ul style="list-style-type: none"> - Spatial order of the settlement is a band along the Danube river. A flexible layout and varying types of spatial organizations around the courtyards are created. The building height is increasing towards the northern edge, protecting the residential area from the noise of the motorway, and lowering towards the south, allowing natural ventilation and connecting with the river. - Building heights vary between single to three storeys with differing architecture, but with overall sense of uniformity. 	<ul style="list-style-type: none"> - Spatial order of the settlement is organized with a radial concentric plan. The central boulevard crossing the settlement in the east-west axis, the secondary road crossing at the north-south axis and the building heights restricted to 3 to 4 storeys are the major organizing devices. - Low building masses with compact forms, generally oriented to south. 
Sustainable technologies and building typologies, energy and settling strategies	<ul style="list-style-type: none"> - Use of passive solar energy through south oriented siting, height and design of living units. - Solar collectors predominantly used for hot-water heating, some used for space heating. - Rooftop gardens created in Puchenu II for insulation and increasing the vegetated areas also used as playgrounds and free time spaces. - Refuse separation, semi-central collection areas, partly decentralised composting. Since 1994, organic waste has been collected through special containers (Biotonne). 18 collection centres have been established for gathering separated recyclables.  	<ul style="list-style-type: none"> - Solar City Linz is two of the first passive social housing units in whole Europe. The energy concept is to exploit all possibilities of using energy in a careful and conscious way. Low energy building systems is a standard; housing units are either passive houses or almost passive houses (energy demand of the units should not exceed 44kWh (m²a) (the actual average is 36 kWh) - The energy concept is also applied to the school, the day nursery and the multi-functional center buildings; the volumes of the buildings, their orientation, circulation and dimensions played a significant role; three planning offices developed a differentiated repertoire of building types that clearly expands earlier standard architectural solutions for the use of solar energy. - At least 34 % of the hot water to be obtained from solar energy was planned and 50% was gained. - District heating system is used.  

Table 2. Continued.











Concepts	Garden City Puchenu	Solar City Linz
Landscape design strategies with in-between space utilization and microclimate creation	<ul style="list-style-type: none"> - Use of native vegetation in vegetation in both private and public spaces and courtyards. Inclusion of the Danube water meadows into the settlement concept; - Natural rainwater drainage; two open streams within the settlement (can be used for water play). - Resource-efficient services concept; bundling the services together and laying them only under walkways. - Residential areas are all vehicle free and pedestrian scaled and oriented. - Noise barrier and visual privacy from the main street by raising the building height towards the northern edge. - Main pedestrian walkways running between north and south edges create natural ventilation corridors allowing breeze between the river and the hill side. - Special interior climate in atrium houses. 	<ul style="list-style-type: none"> - Landscape is not overly articulated, loosely designed with lakes and alluvial meadows and agricultural land surrounding. - The smaller Weikerlsee was extended towards residential area and the excavated material was used to make small hills that were then covered by the native plants of the alluvial meadows. Blending of the landscape with its natural surrounding one. - The separate disposal of waste water and the separate treatment of grey water is planned and achieved. A natural plant-based water filtration system is created. - A part of the rainwater cycle is made visible through open gullies and small retention basins, wet hallows and cleansing filters, thus presenting the natural water cycle in a visible and understandable way. 
Authenticity, materiality and detailing	<ul style="list-style-type: none"> - Selection of building materials (in part). - Space and resource-efficient architecture with widespread integration of regional specifics. 	<ul style="list-style-type: none"> - Selection of building materials from contemporary options. - Low-energy building construction in the entire urban district is obtained with compact construction and optimal thermal insulation. 
Scaling and critical multiplication	<ul style="list-style-type: none"> - The boundaries of the settlement is defined by natural features on the west (with the steep cliff) and south (with the Danube river) edges. Each phase of the settlement by the specific site elements and the obsession for the pedestrian-scaled and oriented placemaking. - Within the settlement, the multiplication of the housing units show great variety in type and spatial organization. - Settlement scale multiplication is made in step by step, and each step relying on the successful aspects of the previous one. Thus the critical multiplication as a result. 	<ul style="list-style-type: none"> - A radial concentric plan is applied that ensures a maximum 300 m. walking distance to the center from the apartments, thus, limiting the need for automobile. - The parking spaces are easily accessible on foot and a maximum distance of 100 m. from the apartments. - The multiplication of the settlement is envisioned in the master plan for the lakes area of Pichling. The Solar City is the first phase and aimed to be the center of similar size settlements that may be realized in the near future in the surrounding area. 

Table 2. Continued.

Concepts	Garden City Puchenu	Solar City Linz
Continuity and connectivity	<p>-Settlement is a traffic-free zone (access is only given for services and refuse disposal vehicles)</p> <p>-A well designed system of walkways for pedestrians and cyclists provides a high degree of interconnectedness between the private and public areas and the different parts of the whole settlement and surrounding nature.</p> <p>-There is a fast railway connection between Linz center and Puchenu.</p> <p>-There are social clubs for senior citizens, young people and activities for children.</p> <p>-Cooperation with the city of Linz and public administration institutes still continue.</p> <p>-Ifes institute is continuing to make research and interviews with the inhabitants to record their living experiences in Puchenu.</p> 	<p>-Residential area is traffic free zone with underground and ground level parking areas provided; but between some housing blocks are divided by access routes to the parking areas.</p> <p>-Tramline and two buslines provide public transport to the Linz city center.</p> <p>-Continuity and connectivity is also provided by institutionalization by 'urban district management' with non-project empowerment of the residents (3000 at the Solar City, 4000 at Pichling district) to determine various needs of the residents, local businesses, associations, administrations and political authorities, to coordinate and organize them and mediate between conflicting parties.</p> <p>-Cooperation with the City of Linz, future developers, private social services and an expert on women-oriented planning in planning and realization processes still continue.</p> 
Constellating eco urbanity	<p>- The urban fabric of Puchenu is the result of an intense research, planning and construction that lasted for decades; also inspired and formed by the architect's past experiences in traditional urban settlements of the orient. Therefore the urban patterns present at Puchenu are the cumulation of both the spatiality created by past experiences and the places made by the inhabitants who has been living there since its foundation. The level of interconnectedness between the different phases of the settlement is high.</p> <p>- The human nature continuum in the urban settlement is well established.</p> 	<p>- The Solar City is providing Pichling a center that is fostering the development of the entire southern part of Linz and an experimental model as 'low-energy social housing'.</p> <p>- Process of change and growth are allowed both in constructional and social standards.</p> <p>- The future development of the Solar City is planned to be step by step and will depend on the success and continuation of actual measures.</p> 

Conclusions

The future of the countryside will depend in future on how the city, the city man, comes to terms with it. The city-dweller cannot avoid this task by declaring the country in some kind of "original" form to be taboo. He will, then, have to deal very profoundly with environmental questions, questions of his vital habitat – from this confrontation it will be decided whether our world can continue to survive.

Rainer, 1972:218

As stated by Radovic, 'it is already obvious that the simple act of bringing sustainability into the media focus is not going to produce significant results.

The overall value system remains unaffected. Many high-quality projects are being overshadowed by even more initiatives and undertakings that operate with a mindset that does not reach beyond the fast dollar' (Radovic, 2009:10). In an age of critical ecological and economic challenges, we must more seriously explore the possible ways to sustain human-nature continuum.

Instead of top-down and descriptive character of the 'guidelines' for 'eco' urban planning and design, what is offered here is a more operative strategy informing ecological urban design, particularly for housing developments at the urban edge. With its updated concepts, the placemaking strategy starts with the contextual situation of any given site and re-defines it by using design as a way of exposing the conditions, forces, and potentials that might become activated. With short term, medium term and long term goals, the ultimate aim of the placemaking strategy is to inform, monitor and achieve ecologically conscious urban design to conserve and enhance the health of its inhabitants, provide and improve human-nature continuum and support livability in the long term.

In this research, Garden City Puchenau and Solar City Linz provided remarkable examples for making research on the ecological urban development at the urban edge and testing the medium-term goal of the placemaking strategy that is monitoring the results of the application of design intentions and their success as actualized in the projects. The following are some of the conclusions to this research:

- Starting from the conceptual phases and during the planning and application stages of both Garden City Puchenau and Solar City Linz, the architectural and landscape design strategies are taken as one and fully integrated into the processes in order to achieve the most efficient and effective use of local renewable energy, natural and economic resources.
- The natural surroundings and the local topography determined the general layout of the both settlements. At Puchenau, the climatic comfort is generally obtained through the utilization of local features through ventilation corridors (walkways), green roofs and courtyards to create special microclimatic places; indoor and outdoor spaces created healthy and continuous living places for all seasons. At the Solar City Linz, priority is given to utilization and use of solar energy and related contemporary technologies.
- At both settlements, land is used in ecologically and socially sensitive ways.
- Both settlements prove that low-rise, high-density housing is a healthy form of urban development, particularly at the urban edges where the urban and rural ecologies confront and the balance is the most fragile.
- The social structuring, governing and institutionalization at both settlements are exemplary and contribute to the longer term goals of livability and sustainability of the urban developments.

It is clear that the placemaking strategy used for monitoring the ecological housing and urban development at Garden city Puchenau and Solar City Linz helps on understanding interrelations or determines the disconnections between their design informing concepts and actual realizations on the site. The placemaking strategy with its updated informing concepts can have broader applications to other contexts and developments at the urban edges. The strategy is open to change and adaptations in time and into

varying contexts to understand the complex system of relationships in human-nature continuum and to more clearly envision livable urban environments.

Within the context of almost unlimited growth of urban areas in our rapidly globalizing world, having a practice based on the ideas addressing the symbolically, ecologically and functionally powered interrelations between built environments, nature and people is a real and big challenge for architects. Yet, this is what is needed. The opportunity remains to develop further strategies to deliver more effective results within the field of urban design. But that will demand the combined and synergetic efforts driven by architecture and landscape as united and one. We should be open and ready for new challenges we will be facing for the future of our human environment. To do that requires a generation of architects, who can take the responsibility of intertwining architecture and landscape again, both in ideas and in practice; and, who can be able to engage the questions and the challenges of their time.

References

- Deviren, A.S. (2010), *Operable Urban Landscapes: Investigations on Utilization of Renewable Energy Sources in Urban Contexts*, **Renewable Energy Research Conference 2010**, Book; Renewable Energy Research Conference 2010 Book of Abstracts, The Center for Renewable Energy, NTNU-SINTEF-IFE, Trondheim, Norway: 203.
- Tabb, P., Deviren, A.S. (2006), *Sustainable Planning at the Urban Edge: The Serenbe Community*, **IAPS 19 Conference, Environment, Health and Sustainable Development, "Appropriate Home": Can we design 'appropriate' residential environments?**, D. Shehayeb, H.Turgut Yıldız, P. Kellet (eds.) IAPS-CSBE Network Book Series 6, HBRNC – Housing & Building National Research Center, DEP: 178822/2006, Alexandria, Egypt: 49-61.
- Doxiadis, C.A. (1976), **Action for Human Settlements**, NY: W.W. Norton & Company Inc.
- Genevro, R. (2005), *Preface*, in **Ten Shades of Green**, Buchanan, P. (ed.), NY: The Architectural League, 4-5.
- Herzog, T. (2008), *Concept*, in **Solar City Linz Pichling, sustainable urban development**, Treberspurg, M. (ed.), Stadt Linz, Wien, NewYork: Springer, 27-35.
- Holl, S. (2003), *Idea, Phenomenon and Material*, in **The State of Architecture at the Beginning of the 21st Century**, Tschumi, B. (ed.), Irene Cheng, NY: The Monacelli Press, 26-27.
- Kaiser, N. (2008), *Comfort, Energy, Environment*, in **Solar City Linz Pichling, sustainable urban development**, Treberspurg, M. (ed.), Stadt Linz, Wien, NewYork: Springer, 36-42.
- Krieger, A. (2006), *Territories of Urban Design*, in **Urban Design Futures**, Moor, M. and Rowland, J. (eds.), London and New York: Routledge, 18-28.
- Pasquarelli, G. (2003), *Architecture Beyond Form*, in **The State of Architecture at the Beginning of the 21st Century**, Tschumi, B. and Cheng, I. (eds.), NY: The Monacelli Press, pp:24-25.
- Radovic, D. (2009), *Eco-Urbanity, the framework of an idea*, in **Eco-Urbanity, towards well-mannered built environments**, Radovic, D. (ed.), NY: Routledge, 9-18.

- Rainer, J. (2008), *Roland Rainer's 1992 Masterplan for Linz-Pichling*, in **Solar City Linz Pichling, sustainable urban development**, Treberspurg, M. (ed.), Stadt Linz, Wien, NewYork: Springer, 24-26.
- Rainer, R., (2003), **Das Werk Des Architekten**, 1927-2003, Wien, NY: Springer.
- Rainer, R. (1972), **Livable Environments**, Zurich: Verlag für Architektur Artemis.
- Ripley, C., Thün, G., Velikov, K. (2009), *Matters of Concern*, **Journal of Arhitectural Education**, ACSA, Volume 62, Issue 4, May 2009, 6-14.
- Spellman, C. (2003), *Foreword*, in **Re-envisioning Landscape / Architecture**, edited by Catherine Spellman, Actar: Barcelona, 9-14.
- Reinthal, E., (1999) **Low energy settlement, Linz, Austria**, Hotspot, issue nine, http://climnet.org/component/docman/doc_view/1616-hotspot-9-sept-1999.html#Best practice (accessed 09.08.2010)

**Eko-kentselliğin üstesinden gelmek:
Kentsel sınırlarda konut ve yer yapımı**

Dünya nüfusunun yarısından fazlasının kentsel yerleşimlerde yaşadığı günümüzde, kentsel büyüme neredeyse kaçınılmaz görünmektedir. Ancak, kentlerimiz, sağlıklı ve ekolojik yollarla büyümektedir; 'yayılmaktadır'. Bu yayılımın büyük bir kısmını, kentsel sınırlarda hızla ve birbiri ardına yapılan yeni konut yerleşimleri ve ilgili servis birimleri oluşturmaktadır. Günümüzde, 'ekolojik' kentsel planlama ve 'eko' veya 'yeşil' bina tasarımı için çok sayıda ilke ve kılavuz sunulmaktadır. Ancak, bu ilke ve kılavuzların çoğu, yerel kentsel tasarımlara ve disiplinlerarası uygulamalara bir altyapı oluşturma yetisi olmayan, yapısal çevre ve doğa arasında sembolik, ekolojik ve işlevsel ilişkiler kurmaktan uzak olan yetersiz içerikleriyle tasarım disiplinleri arasındaki kutuplaşmaları arttıran, katı, kalıplaşmış, güncel piyasaya yönelik küresel 'kontrol listeleri'dir. Bu makale, son dönemde yapılmış bir araştırma projesiyle güncellenmiş bir kentsel tasarım stratejisi -yer-yapım stratejisi- önerisiyle ekolojik konut tasarımı ve yerleşim planlaması üzerinde durmakta ve bu stratejinin ekolojik kentsel gelişimi izlemedeki rolünü Avusturya'nın Linz kenti sınırında yer alan iki ekolojik konut yerleşimi üzerine yapılan alan çalışmalarıyla sınamaktadır. Bu çalışma, toprağı korumak, her anlamda tüketimi önlemek, arazi ve çevresindeki yenilenebilir enerji kaynaklarını işler hale getirmek ve kullanmak, kentsel sınırlardaki işlevsel ve sosyal etkinliği geliştirmek, yaşanabilirlik ve sürdürülebilirliğin uzun dönem amaçları için sağlıklı yaşam koşullarını sağlamak ve korumak amacıyla mimarlık ve peyzajın birleştiği bütüncül bir kentsel tasarım stratejisinin potansiyelini araştırmakta ve ön plana çıkarmaktadır.