

**PROCEEDINGS**  
of the  
**INTERNATIONAL CONFERENCE**  
on  
**CHANGING CITIES IV**  
*Spatial, Design, Landscape & Socio-economic Dimensions*

Department of Planning and Regional Development, University of Thessaly  
Laboratory of Urban Morphology and Design

**in collaboration with**  
School of Architecture, Technical University of Crete and Regional Authority of Crete.

**Under the aegis of**  
THE GREEK MINISTRY OF ENVIRONMENT AND ENERGY

Editor:  
**Professor Aspa Gospodini**  
*University of Thessaly*

*Chania, Crete Island, Greece • June 24-29, 2019*

Title: Proceedings of the International Conference on Changing Cities IV:  
Spatial, Design, Landscape & Socio-Economic dimensions

ISSN: 2654-0479

ISBN: 978-960-99226-9-2

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**PUBLICATION**

**University of Thessaly, Department of Planning and Regional Development,  
Laboratory of Urban Morphology & Design,  
Volos, Greece**

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Chania, Crete Island, Greece ● June 24-29, 2019*

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ISBN: 978-960-99226-9-2

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ISSN: 2654-0479

ISBN: 978-960-99226-9-2

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*of the International Conference on **Changing Cities IV:**  
Spatial, Design, Landscape & Socio-economic Dimensions  
Chania, Crete Island, Greece • June 24-29, 2019*

ISSN: 2654-0479

ISBN: 978-960-99226-9-2



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**Proceedings**

*of the International Conference on Changing Cities IV:  
Spatial, Design, Landscape & Socio-economic Dimensions  
Chania, Crete Island, Greece • June 24-29, 2019*

ISSN: 2654-0479

ISBN: 978-960-99226-9-2

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## **The use of green in changing cities.**

### **An integrated approach to planning the urban landscape with green technologies**

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#### **Abstract**

The growth of the world's population is a central topic in the international political agenda and subject of intense attention for associations and research institutes involved in pursuing sustainable development on the planet.

The UN informs us that by the year 2100 the world population will reach 11.2 billion and it points out how more than 50% of this amount will be amassed in urban agglomerations.

These forecasts though should be accompanied by those related to the constant worsening of climatic conditions and the consequential effects on the territory, as urban areas are the part of the planet where most of the social costs of global warming will be paid and so it seems increasingly urgent to approach the issue of adapting to climate change [1].

Given these worldwide growing Megacities and overpopulation the need for a rise in the percentage of green space in cities is beyond question for various reasons - regarding ecology, city climate, energetic and social considerations.

The physiological and psychological connection between the human being and natural elements – be it plants, water, sunlight or animals – is a topic still to be researched in depth. A lot of scientific surveys from the last few decades deal with buildings physics or morphologic properties of plants. In times of rising importance of efficiency and productivity the impact of said elements as an asset perceived as an improvement of the quality of life [2], on behaviour and health and therefore on the individual and social wellbeing of a city's inhabitants is of utmost importance for the development of a thriving sociality. The possibilities of implementations in order to reach this aim are manifold in nearly every scale from the urban landscape up to technological solutions in buildings. In order to achieve sustainable and practical solutions, an approach from these two opposite sides is taken, searching for possibilities of interlacing, overlapping and enhancing planning structures on the whole. This contribution intends to discuss the possibility of an integrated approach of urban planning and architecture technology, considering the use of greenery to be an indispensable element for the requalification of urban landscape suffering from the effects of climate change. A comparative analysis of several case studies will be proposed in order to define sustainable design actions that are capable of increasing urban resilience, as well as the quality of public space through the definition of "best practices".

#### **Proceedings**

*of the International Conference on **Changing Cities IV:**  
Spatial, Design, Landscape & Socio-economic Dimensions  
Chania, Crete Island, Greece • June 24-29, 2019*

ISSN: 2654-0479

ISBN: 978-960-99226-9-2

Keywords: megacities, urban landscape, building technology, city climate, recreation, sustainability, health

## 1. CLIMATE CHANGE IN CHANGING CITIES. A NEW URBAN ISSUE

For at least two decades there has been a significant increase in the world population, as specified by the *World Population Prospects 2017*, official estimations and projections of the population updated every two years by the *Department of Economic and Monetary Affairs of the United Nations Secretariat*, which highlights numerical data on the rise compared to the 2015 predictions [3]. In fact, it goes up from 8.5 billion expected for 2030, to an estimated 8.6 billion for the same time frame, a trend that is also increasing in the predictions for 2050 that go up from 9.7 to 9.8 billion; however, both the 2015 and 2017 editions agree on the figure for 2100, according to which the world population will reach 11.2 billion people<sup>1</sup>.

Together with the above-mentioned predictions of demographic growth, the same institution, draws up the *World Urbanization Prospects*, estimations and projections of urban and rural populations of all the countries in the world and their main conurbations. The latest version, updated to 2018, brings to light that more than 50% of the world's population is currently living in urban areas [4]. It is estimated that this percentage will increase substantially by 2050 and that again, by this date, the expected population growth could lead to an approximate increase of 2.5 billion people living in urban populations<sup>2</sup>. These numbers clearly show how the crisis factor, linked to the population growth and to the increase in population density in urban centres, foreseen for the near future, emerges in a predominant manner. Therefore, public administrations and private operators are being urged to question the social, economic and environmental repercussions that this phenomenon will involve in the long term.

These predictions are associated with those related to the constant and abrupt aggravation of climatic conditions and the repercussions on the territory, which emphasize the need to guarantee a safe habitat, even in the face of a considerable increase in population density in urban centres.

The fifth IPCC, Intergovernmental Panel on Climate Change<sup>3</sup>, report of 2013 represents the current state of knowledge of climate change and its potential environmental and socio-economic impact. Man's responsibility for these changes is now undeniable; the constant increase in the concentration

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<sup>1</sup>Data collected in the Total Population - Both Sexes (XLSX, 2.42 MB) Excel files, in the Standard Projections (Estimates and Projections variants) section, and in the Total population (XLS, 660 KB) Excel file, in the Probabilistic Projections (including prediction intervals) section of the *World Population Prospects 2017*. The Excel files are downloadable from the dedicated section of the United Nations website.

<sup>2</sup>Data collected in the WUP2018-F02-Proportion Urban.xls Excel file, in the Urban and Rural Population del World Urbanization Prospects 2018 section, which is downloadable from the dedicated section of the United Nations website.

<sup>3</sup>Scientific group formed in 1988 by two United Nations bodies, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) with the specific aim of studying the world's global warming and, more in general, climate change.

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ISBN: 978-960-99226-9-2

of greenhouse gases in the atmosphere is the main cause of the planet's global warming. One of the most direct and tangible consequences of this phenomenon is undoubtedly represented by the constant and abrupt sea level rise [5].

Following the data on the increase in the population, it is easy to deduce how the effects of climate change are set to worsen and that it is necessary to adopt a bottom-up approach to the issue, based on two fundamental criteria: public awareness raising and preventive risk management of the crisis factor.

In this regard, over several years, governmental bodies, research institutions and academics have undertaken to develop renewed strategies aimed at raising awareness both among the population and local authorities on issues related to the phenomena of Climate Change. The aim is to progress towards a sustainable urban development of the territories, as indicated by the European Environment Agency (EEA) in the report "Climate change, impacts and vulnerability in Europe 2016". This document expresses the necessity for European countries to define territorial adaptation strategies and plans at a national, regional and local level for the climate crisis risk prevention and management [6].

Indeed, «le aree urbane sono la parte del Pianeta dove si pagheranno i costi sociali maggiori del global warming e dunque appare sempre più urgente assumere la questione dell'adattamento ai cambiamenti climatici nella pianificazione territoriale e urbanistica» [7].

Therefore the awareness of the vulnerability and fragility of the territory implies the ability to govern the territory in the light of an integrated ecological approach [8], which is interdisciplinary and interscalar, able to adapt both to the vast area and to the local one. [9].

It should be noted that the principles of energy-environmental sustainability have been, for a long time, the prerogative of individual architectural objects, as a consequence of a rediscovered ethics in building; this contribution wants to focus on the need to extend the field of investigation also to urban planning, a necessary step to achieve an ecological vision of the city as a whole.

Ecology is the science that considers as its object the study of the relationship functions between man and the environment and implies a bodily and emotional involvement of man towards the physical transformations of his own context [10], opening the reflection on a possible aesthetic value of urban regeneration interventions devoted to the principles of ecology [11].

## **2. CONNECTING THE HUMAN BEING TO NATURE**

### **2.1 Technology vs nature**

Due to the rapidly increasing technological and digital developments of the last decades, the term "technostress" [12], created in 1984 by the American clinical psychologist Craig Brod, has become ever more important. This concept is based on the fact that nowadays the sympathetic nervous system is no longer activated by physically dangerous situations as evolutionarily intended, but by emotionally challenging situations that are potentially provoked by technology such as traffic systems or digital accessibility.

If the condition of permanent tension is not relieved by the compensatory parasympathetic nervous system, it can lead to serious diseases [13]. Technology-induced new addictions and clinical pictures

are becoming ever more common in major cities. The "nature deficit syndrome", so coined by the journalist Richard Louv in 2005, is an effect observed especially in children in the last decades. It is a phenomenon that has its roots in the lack of direct contact with nature and it manifests itself in different symptoms such as attention deficit, obesity and depression. It occurs with higher frequency in the ever-growing megacities, where an understanding of biological relationships by direct experience is hardly ever possible. A number of surveys on children that are conducted on a regular basis today, show a low level of knowledge in the field of nature – one only needs to think of the "Bambi syndrome" or the "yellow duck" - but instead a greater understanding of global natural and climate problems [14].

Furthermore, "Children who spend a lot of time with activities in nature increase their self-esteem, their ability to solve problems, their motor skills and learning skills." [13, p.90]

## **2.2 Health via nature**

Not only greenery but all things nature have always been a favoured element for the surroundings of humans. Besides deliberately designed recreational gardens, murals and mosaics as well as decorative elements of ancient structures often display plants or other natural phenomena. In order to understand the benefits of these elements for the city and such on the individual citizen, it is important to understand in which way they influence or stimulate human behaviour. Since Edward Wilson coined the term "Biophilia" in 1984 [15], the concept of a deep connection of the human being to nature has been cause for an increasing amount of studies on that topic in recent years (i.e. [16]. While the actual immersion into nature has been proven to have beneficial effects to physical health in many ways like improvement of heart rates, blood pressure, obesity and hormonal balance [13], the psychological effects seem to be even more distinct. Not only the colour green itself is a possible factor for wellbeing (thus often being used in psychiatric wards in hospitals), but also geometrical forms like biofractals found in nature seem to have that effect [17]. The study conducted by Ernst Ulrich in 1984 regarding patient recovery time when having a window view of an overgrown green wall showcased the immediate connection quite impressively [18].

Recent research show that the data perceived in human experience via the self conscious cognition, can be calculated being about 16 bit/second, while the over all bodily perception, including the nervous system, the unconscious and the sensual experiences amount about 4 000 000 bits/second [19]. In light of that, while most of the results mentioned above are based on the visual system, it seems logical that a perception of the surroundings via the other four classical senses of the human being would elicit similar reactions on their wellbeing.

The Japanese concept of "Shinrin-yoku" (English: "forest bathing") to enhance a persons wellbeing involves being surrounded by a forest, seeing plants, green, the play of light and shadow, but also sensing the rays of the sun (which enhancec the production of the "well-being hormone" serotonin), or hearing water running in a creek, in short – a full immersion of all senses.

Interestingly enough, this involuntary reaction of a person can be provoked already by small elements like indoor plants [13] or even artificial or nature simulating objects [16, p.119], which explains the above mentioned traditional use of nature in decoration and the studies this regarding conducted in the area of health care [20].

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ISSN: 2654-0479

ISBN: 978-960-99226-9-2

### 2.3 Natural elements on the human scale

When talking about integrating nature into cities, it is interesting to reflect upon which elements are already part of today's city planning and in which way they are connected to the citizens.

A study by Arup, conducted in 2016 [21], lists 10 categories of benefits of green building envelopes for cities and their inhabitants, putting well-being on the first position, followed by aesthetic quality, placemaking, air quality, urban heat, acoustics, stormwater, biodiversity, energy and urban agriculture. While many of them are connected to the human senses as described above and therefore have an immediate impact on the individual, others help creating an environment in which the structure of a traditional city works more in tune with natural elements while also confronting problems that develop with the rise of the world's population or its effect on the environment.

Many experiments, studies and research projects work on finding technical or structural solutions for an improvement "in air quality, urban heat island reduction, noise reduction, stormwater attenuation and urban biodiversity" [21]. For the development of these solutions alone interdisciplinary approaches are in order, all the more so for their correct implementation in the urban context. Add to that psychological and social elements that include the direct contact to things formally excluded in a city's texture, like agriculture or mixed farming, and the need for an ample spectrum of knowledge - and with it an integrated design of the urban layout - becomes obvious.

The forming of a healthy society starts at the basis, the education of its children. "The development of cities has limited children's access to nature. A number of other factors have also been attributed to this decline. Fear and safety issues have been highlighted as a major factor, particularly parental fears about traffic and stranger danger" [22]. If children grow up in surroundings that allow them to form an awareness of the structure of the environment they are living in, they develop a self-evident respect for it.

The increasingly popular application of green facades for their shading properties in summer while enabling heat gain in the building in winter is a good example for a symbiotic coexistence between man and nature. The immediate perception of its capacities via its closeness to the residents "third skin", as buildings are often referred to by architects, creates an involuntary matter of course that benefits the above mentioned goals in the development of modern cities.

Comprehending ecological systems, creating a connection to living things and understanding the benefits as well as the challenges they provide therefore serve a long way to accepting and integrating these elements in the daily life in a city.

## 3. THE CITY AS ORGANISM. AN INTEGRATED APPROACH

In light of what is expressed in the previous paragraphs, it becomes clear that cities should be intended as a living organism, and that urban quality should be sought in the sum of the individual components that compose it. Therefore, the goal of this contribution is to accentuate the importance of an integrated and multi-scale approach to the city, incorporating the urban planning point of view and



the technological one, considering natural elements, the urban green, as common thread for all interventions that aim to transform the space, regardless of the scale in which they are carried out.

Regarding this, the example of the New Rome Master Plan comes to mind, which is increasing the urban standard of public green areas, thus overcoming the 9 sqm per inhabitant.

Reflecting on this, it becomes clear how similar interventions that do not have the common intent of a guideline regarding a sustainable development of the city, would represent initiatives that are an end in themselves.

From this perspective, designing with greenery takes on great importance both on the scale of the city and in interventions on the local scale, for example in terms of technological design. It should be held in mind that the different modes of argumentation in architecture and nature have always facilitated a vast field of exploration enabling the inherent rapport and the transformation processes of the human habitat.

For a long time, the architect applied a twofold interpretation to this interaction: on one hand attributing the task of humanizing the artifice via the natural element trying to naturalize the human creation; on the other hand manifesting the atavistic desire to govern it, to contain it, to orient its growth and development within pre-established and planned schemes [23] (Dorfles, 2003).

An anthropocentric view of the world that has led to a dichotomous research in continuous tension between acceptance and competition: the first, based on the recognition of the resources conveyed by the natural elements in terms of improving the quality of public space, of environmental comfort that can also favour social interactions [24] (Perini, 2013); the second, on the human propensity to imitate nature, setting the limits of the possible and of the achievable always beyond the known.

Regarding this topic, scientific texts offer us many stimulations; the term "Archinatura" [25], for example, is emblematic for the consolidated tendency in combining natural and anthropic elements in order to transform space in such a way that it resembles us.

Over the years, the relationship between architecture and nature has undergone influence deriving from socio-economic factors that have moved the research axis from the mere formal exercise to the development of a sustainable model of space design, deriving from the consciousness that man is running out of land resources.

To that effect, in the following paragraphs some case studies will be examined that are in line with the "green turn" of the city, and which highlight the clear goal of increasing the resilience of urban centres to the effects of climate change.

#### **4. ENGHAVEPARKEN, A RESILIENT URBAN PARK**

A great example in which green design plays a major role in increasing resilience to the effects of climate change is represented by "Enghaveparken", a public park in the center of Copenhagen, Denmark, in which the neoclassical style that characterizes it, has been revisited with technological

devices that have made the area more performing in terms of functionality, in the presence of extreme climatic phenomena, above all abundant rainfall, an increasingly frequent phenomenon.

The climate adaptation interventions, by the Danish firm Tradje Natur, implement technological solutions that are able to adapt the park to the effects of climate change, making it possible to diversify the use of the same area in different climatical conditions.

For example, a large paved square turn into an artificial lake in the event of heavy rain thanks to a channeling system, which, on one hand allows the management of water excess ensuring the safety of the area, on the other hand characterizes the park as a masterful example of adaptation of the anthropic space to the effect of climate change.

The system is divided into a series of pipes and drains that bring rainwater into the park, starting from the tops of the roofs of the adjacent buildings. It is then "blocked" in the park, thanks to a dam and a series of valleys suitable for the containment purpose.

Furthermore, the plant species present in the park have been previously protected and enriched with specimens that respond well to the abundant amount of water foreseen by the project [26].



**Figure 1.** Graphic representation of the park "Enghaveparken her ognu" in Copenhagen.  
*Source: THIRD NATURE, Cowi and Platant.* [Picture courtesy of Tredje Natur studio].

## 5. SENSING NATURE

When it comes to planning on the human scale, which in this case is intended as planning regarding the discussed principles of biophilia and the human beings' connection to his surrounding via his senses, there are a lot of possible solutions to find in existing examples. The Enghaveparken

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ISSN: 2654-0479

ISBN: 978-960-99226-9-2

mentioned above represents an implementation of the element of water that at the same time is giving answers to urban scale questions while giving the visitors to see its natural ebb and flow or even actively experience it via touch or play.

An example for the auditory design possibilities of water in big cities is the re-design of the famous Columbus Circle roundabout in New York by the studio Olin Partners [27]. The entire internal area of the big round traffic island is accessible to pedestrians, the monument in the middle is surrounded by a free space and a long circular bench on the outside accompanied by a ring of fountains. When sitting on the bench, the sound of the falling water almost completely obliterates the traffic noise, producing an acoustically pleasant environment. Having a break in the middle of roaring traffic therefore becomes pleasant and this unconventional effect is made perceptible to the citizen by the deactivation of the fountains for short and regular intervals.

Another example for connecting nature to human senses in cities could be the olfactory experience of specially planted specimens (as can be experienced during the period of the jasmine bloom in the inner city of Rome, Italy). The newly booming concept of urban gardening which nowadays can be found in many cities around the globe, is not only a possibility to enhance social structures in a city, but also creates the possibility to reconnect the citizen to the process and importance of growing food, even if it fulfils only a part of the demands. The same principle applies to apiculture or even livestock breeding on city rooftops [28].

## 6. CONCLUSIONS

There are as many ways to approach an integrated way of planning green urban design as there are professional viewpoints in an integrated design planning group. While planning in different scales, one approach can be the integration of urban scale solutions for problems regarding the city climate while at the same time searching for a way to achieve an understanding in the citizen for the inherent logic of the planned process and design elements. This could i.e. be done by creating special areas to facilitate easy and “natural” contact with - or opportunities for observing - different aspects of nature. On the other end of the planning scale could be the objective of implementing more natural elements in the immediate surroundings of peoples’ daily life and that way aiming for a direct connection to human senses. That way the citizens’ experience of nature could be amplified, making it possible to see and appreciate qualities as well as understanding and accepting its challenges. This approach from two extremes in planning scale has the potential to create new and innovative solutions that benefit the city on the urban and on the human level at the same time.

## Acknowledgment

The contribution is the result of a shared reflection of the authors. However, the first, third and fourth paragraph respond to the name of Marsia Marino, while the second, fifth and sixth respond to the name of Lavinia Herzog.

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ISBN: 978-960-99226-9-2

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agricultural and urban spheres. These questions are an opportunity to enrich the urban composition, to decline into a new urban design the issues related to the impacts of climate change.

*Keywords: urban voids; green infrastructures; urban renewal; landscape architecture.*

## **Fertile Grounds: emergent ecologies and commons**

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### **Abstract**

The transformation of the groundbreaking innovation district Poblenou 22@ in Barcelona was halted with the economic crisis. The neighborhood, after 19 years of 22@Plan, is today stalled in a liminal stage between the manufacture activity of its past and the production of knowledge promised for its future, between fully developed mid-rise, high-density fabrics and vacancies awaiting to be transformed.

This paper, based on the reflection and the outcomes of the MAP Intensive International Studio "Fertile Grounds"<sup>14</sup>, takes the district's coexistences and fabric discontinuities as opportunities to

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<sup>14</sup>Fertile grounds took place last July 2018 in the Master of Landscape Architecture, UPC Barcelona-Tech.  
Professors: Sara Bartumeus + TOPIO7 Panita Karamanea, Thanasis Polyzoidis

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