The Interpretation of Landscape
Strategies Towards Smarter Cities

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Abstract: In recent years we have seen a gradually increasing concern for the urban landscape and the way it is designed and evaluated. This concern, a result of the emergence of digital technologies and convergence of different scientific disciplines, is based on the ability of design tools to support and reinforce the discussion on urban landscape as an open process for action. But, how do we design a new urban space employing these design tools? So far the discussion on the design and form of the city placed emphasis on the creation of a communication platform that functions either through the development of interpersonal and interactive relationships of the users, or as an entity for configuring and displaying visual messages and communication to society. The term "smart city", has been linked with digital applications, sensors, and software to produce the city of the future. However, the real challenge is to develop a "smart city," that starts from the city of today and enables the combination of these smart practices by activating infrastructure that may reform the spatial structure of the urban morphology. This paper will introduce a "reformer," the *natural landscape,* based on which a new methodological approach shall be established, in order to manage the urban landscape. This will help create a "smarter city," which may find applications in various fields that start from today's city, instead of trying to compose an ideal image of the city of tomorrow, that can bridge the gap between digital, natural and urban environment. The main theme of this paper is part of the extended scope of *Landscape Urbanism*, according to which the urban landscape can be redefined / designed through the remedial procedures of the urban landscape.

1 A BRIEF INTRODUCTION ON SMART CITIES AND INNOVATIVE ENVIRONMENTS

Before tackling the main issue of the research presented in this paper, it is necessary to present the broader context of this research, as this constitutes the basis, which feeds the research interests, produces general questions and directs research methods. This research is being conducted at a time when the focus of architectural activity shifts from its perception as a form or (and) operational organisation, which responds to a given architectural program, to its perception as composition of elements, their properties and relationships. At the dawn of our late capitalist era, we are witnessing a paradigm shift that encourages a new relationship between design and object, which, according to Michael Hays (Hays, 1998) is nothing other than the passage from a "critical history" to a "theory" of architecture.

To this end, the term "smart city" was introduced, which covers a wide spectrum of research and development applications. The concept of smart city involves an emerging market, therefore identifying and examining the term "smart" is still going on. Consideration of the particular characteristics of the smart city is best understood by interpreting its main conceptual features (Vianna et al., 2004; Hollands, 2008). Accordingly "Smart cities" are created by the convergence of two major currents: on the one hand, the redefinition of the city through its communication technologies, digital networking and representation, and, on the other hand, through the understanding of the city as an environment of creativity and innovation. Despite the clear link between *society of creativity* and *information society*, the concept of "smart city" is still controversial. This occurred because term

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"smart" is often associated with digital functions, and the terms "digital city" and "cyber city" (Mitchell, 2006) are used alternatively and equivalently. However, it is certain that, providing a digital platform or a digital representation of the city does not adequately justify the description of an urban system as innovative. In the following sections, the main framework of the research presented in this paper elaborates on the above questions and proposes a new method for a *smarter* city.

1.1 Research Framework

Digital applications, sensors, and software often interact towards the creation of the *city of the future*. However, the real challenge in contemporary reality is to develop a "smart city", which starts from the city of today and enables the combination of smart practices. As part of this research that attempts to define the concept of a smarter city that is based on the structure of an existing city, the parameter of the natural landscape is introduced, which, in the proposed method acts as a key reformer of the urban fabric.

Accordingly in this work the notion of "natural" is no longer defined as an external feature and a representational structure but participates and supports the urban fabric and becomes part of the broader approach to urban technology that combines artificial and natural systems (Neuman, 2006). This synergy between natural systems and urban infrastructure systems, in this paper, will be the basis of a new methodological approach to design with emphasis on the landscaping component.

2 THE STATE OF THE ART

2.1 The Science of Landscape Urbanism

Landscape Urbanism is a neologism, introduced in 1996 by Charles Waldheim that attempts to describe the landscape as an urban phenomenon, on an effort to reduce the conflicts between the man-made and natural environment of the cities. Landscape Urbanism is today a thriving interdisciplinary practice that emerges as a renewed perception for recording, dealing with, and strategically examining, or designing, towards contemporary problems of the structure of the urban landscape.

Waldheim, through a presentation of two projects from the 1930's and 40's, presents the early emergence of an "organic urbanism" which can be viewed as early versions of landscape urbanist principles. His account in these projects becomes the basis for a brief look into the rise of this *organic* way of thinking – that is the rise of landscape urbanism.

The Universities of Pennsylvania, Harvard and Toronto between 1999 and 2010 functioned as vibrant workshops studying and researching applications of this interdisciplinary field. Proponents of Landscape Urbanism agree that traditional dichotomies between the urban and natural landscape are now powerless in the face of today's urban reality. The new strategic design enhances the participation of the natural factor focusing on the specific dynamic processes and changes inherent in a place. Temporality, variation, gradual evolution and adaptation to ecological parameters, are derivatives of a renewed understanding of the correlation between urban environment and natural space at a conceptual level.

At this point, it is worth-mentioning some additional definitions of Landscape Urbanism. According to Waldheim (Waldheim, 2006) Landscape Urbanism appears to describe a disciplinary re-alignment, in which landscape replaces architecture as the basic building block of contemporary urbanism. For many researchers and theoreticians across a range of disciplines, landscape has become both the lens through which the contemporary city is represented and the medium through which it is constructed. Discussions regarding Landscape Urbanism as a synthesis of natural and social processes, which are contained within the broader context of the urban component, gives rise to a new urbanism grounded in ecological literacy, where even people are viewed as part of nature (Steiner, 2006).

Another interesting conception of landscape urbanism is Corner's three surface strategies, namely "open-ended," "indeterminate," and "catalytic," which suggest as a way of developing design strategies, as opposed to formal compositions and master plans (Corner, 2003). These three surface strategies refer to his perception of the contemporary city as a horizontal surface constructed in three layers: construction surface, infrastructure, and affiliation. As Corner states: "Land division," "allocation," "demarcation" and the "construction of surfaces" constitute the first act in staking out ground; the second is to establish services and pathways across the surface to support future programmes; and the third is ensuring permeability

to allow for future permutation, affiliation and adaptation (Corner, 2003). This framework integrates both conceptual approaches and research proposals, with potential real world applications. This generally stems from a conviction that landscape is emerging as a model for urbanism.

In the same framework, Stan Allen, states that "Landscape has traditionally been defined as the art of organising horizontal surfaces". Departing from this observation, he elaborates saying that landscape bears an obvious relationship to the extended field of the contemporary city, as well as to the newly emerging interest in topological surfaces. By paying careful attention to surface conditions, including or involving, not only configuration, but also materiality and performance, designers can activate space and produce urban effects without "the weighty apparatus of traditional space making." (Allen, 2002)

2.2 Defining the Idea of a *Smarter* City based on the Landscape

As mentioned earlier, the natural landscape, on the one hand, is the lens through which we can describe and visualise the smarter city, while on the other hand, the appreciation of the natural landscape is linked to a search for the landscapes dynamic capabilities as a design standard. Therefore, the landscape comes into the public scene as an indicator of the sustainable growth of the urban fabric, and as an indicator of sustainability to the extent that it can control the delicate dynamic balance between the natural space and the urban fabric. This renders landscape an attractive intervention environment worthy of a smarter city. In this paper, we will try to outline methods and strategies that can manage the dynamic conditions of the natural landscape. Specifically, the aim of the presented research is to propose a method for managing the landscape in the form of a diagram, and an approach, which will be linked with the concept of a smarter city, that is based and builds on the city of today.

The notion of the smarter city as a hybrid field between the natural and the urban fabric permits the exploration of processes that will lead to the effective management of the properties of both systems (natural and urban). According to Herbert Simon (Simon, 1996), the dominant directions in landscape management are the following two: a) prevision and b) the homeostatic and feedback adjustment. Prevision presupposes understanding the initial conditions, the selection of appropriate variables, and decoding of the relations between them. On the other hand, homeostasis refers to the flexibility of a system to absorb environmental changes remaining unchanged, while feedback presupposes a kind of dynamic adjustment of the system. Departing from Simon's approach, we will try to outline a strategy for the hybrid development of smarter cities based on these two basic directions.

2.3 What Does the Landscape Urbanism Means in Practise?

Francois Dagognet referring to Landscape design strategy, he describes it as a method where one finds less in it, than through it. *But how can landscape function as a method*? Corner admits that landscape urbanism contains many uncertainties concerning its practical application. Though he promotes new concepts and representation techniques and suggests ways on how these can be applied.

However, Corner believes that the current state of landscape urbanism is not able to deal with this complexity. Instead he claims that one should focus on the development of techniques and methods (Corner, 2006). The activities listed by Corner are quite abstract. Thus, in this paper we will try to describe a design methodology that will lead to the development of a broad variety of tools and design process approaches.

3 MEASURING AND MINING URBAN DATA

3.1 Analysis: *A Dual Conduit System*

In this section we attempt to define a methodology in which the urban landscape is shaped through a complex diagrammatic entity capable of operating through feedback. The integration of *metabolic processes of the natural landscape*, as defined by Corner, in the production of the urban landscape also involving material and geometrical parameters, requires a management. In the proposed methodology natural landscape is broken down into two distinct parts. Each part is functioning as a *conduit* that conveys fluxes through it. The use of the term flux in this paper is based on the following rational: In the initial meaning of the term "Flux," that derives from the Latin word fluxus, both flow and change are included. This perfectly describes both a main functionof natural landscape that is able to convey *flows*, and the effects that *flows* have on

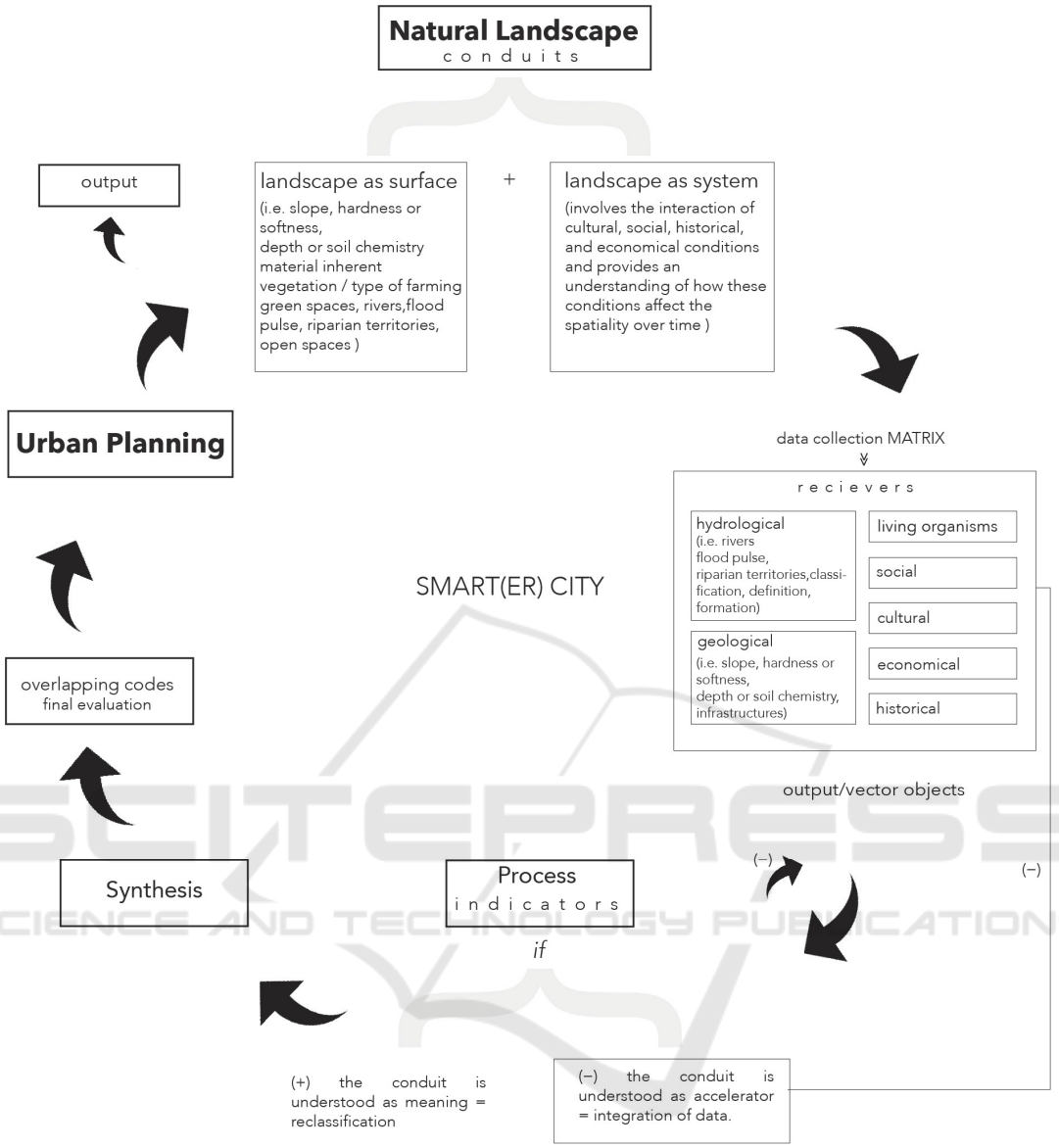

Figure 1: Fundamental Components of Smarter City.

it, which may cause changes to it. The first conduit requires reading the landscape *as a surface,* and the second conduit *as a system.* Hence, landscape, described as a surface, can be perceived as an heterogeneous field which functions as a main infrastructure of the city. Interpreting the landscape as a system may be used to emphasise the interaction of historical, cultural, economical and social processes, as well as to provide an explanation of their effect on the spatiality of a city over time.

The output of the two conduits, are included in a *matrix,* which will be used to further contextualise the developed strategies. The matrix consists of multiple *receivers*. The output data transferred through the conduits of the matrix are subsequently organised in different receivers according to set quality parameters. The receivers can be combined; and, in this manner, the matrix itself can be read as a palette of landscape urbanism strategies and can be adapted to a given instance of an urban landscape. In other words the matrix facilitates contextualisation and can serve as a framework for the application of the proposed landscape urbanism methodology.

3.2 Landscape as a Surface

The idea of landscape as surface means seeing the

landscape surface as being active and operational, rather than as a thin passive board (Allen, 2002). At this point, the landscape as surface is not understood as a flat lifeless plane, but rather as a set of behavioural characteristics. Soil has permeability and plants have height and growth rate – characteristics that make the surface a living carrier of flows and processes. The idea of the surface includes the performative aspects of the landscapes surface. Slope, hardness or softness, permeability, depth, or soil chemistry are all variables that influence the behaviour of surfaces such as their tendency to shed or hold water, or their ability to support traffic, events, or plant life (Wall, 1999). Thus, the surface of the landscape with its wide range of properties, can affect program and organisation, and contribute to the creation of a valid strategic model for a contemporary urban condition.

In the proposed method, all the first conduit's data are transferred to the matrix that incorporates two distinct receivers: a hydrological receiver and a geological one.

3.2.1 Hydrological Receiver

The hydrological receiver addresses water as a living mechanism, which can create a resilient, yet productive ground, for the social and morphological prosperity of the landscape. This can generate a water management system. Accordingly in this method "water" is not addressed merely as a basic necessity for everyday life; it becomes a central element for a new urban social ecology.

In particular, the water receiver may be used to find out the timings, amount of water, extension, etc. to find out the problems and the opportunities the city is facing exactly. Water flows over the surface and software simulates processes of erosion and deposition. This finding allows the model to predict the water dynamics with high resolution.

3.2.2 Geological Receiver

The main purpose of the geological receiver is to provide an understanding of the influence of various parameters, such us grain size of the soil vegetation and slope processes, depth or soil chemistry, material could influence on the formation of a new urban social ecology. The receiver is using data from multiple sources, including data downloaded from online sources, field-collected data, and published map data. For this purpose, geological simulation models can be employed. Such software will help us analyse, store, manipulate and visualize geological information on a map.

3.3 Landscape as a System

The landscape as a system involves the interaction of cultural, social, historical, and economical conditions and provides an understanding of how these conditions affect the spatiality over time. Specifically, landscape as system handles landscape as a dynamic ecosystem, derived from the reevaluation of the synthesis of natural and cultural processes. This interpretation of the system further means a focus on process, synthesis, resilience and contingency.

Lister (Lister N-M, 2007), by reference to Sim Van der Ryn and Cowan, explains that the description and culture could create new hybrid models linking cultural activity and natural systems. To manage the urban fabric, it is not enough to distinctly address the cultural factor and the natural element, but those two, must interact through hybridized forms that are best suited to describe typologies inherent in the modern city.

Summarizing, the landscape as a surface and the landscape as a system contribute to the development of operational strategies aimed at the management of the landscape as a whole. The establishment of the double conduits is the first piece of the methodological tool. The objective of this phase is to collect data, separate them according to their quality into the two distinct conduits, and to transform the data into appropriate forms, vector objects, so as to be used as data of the next phase. The handling of the landscape as a combined surface and system may actively contribute to the dynamics of the city and aims to develop operational strategies towards the city redefinition.

4 PROCESS AND SYNTHESIS

The second phase of the methodological tool introduces specific standards called "indicators". These "indicators" are quantified data that meet specific conditions (simplicity, power, data availability over time, sensitivity to small changes, validity) and allow the system to legislate and monitor the quality of the variables managed. At the point where the "indicators" check the validity of the previous level's data, these conduits are charged with a plus or minus sign. If the sign is minus, the conduit is understood as *meaning*, in which case the system reclassifies the vector objects. If the sign is plus, the conduit acts as *accelerator* and facilitates the encouragement and integration of data.

The third phase of the methodological approach

involves the stage of synthesis of the "indicators", the interaction of vector objects and final evaluation, based on which the landscape is organized.

In conclusion, this paper proposes a new concept of smart cities and a new approach to the natural landscape as reformer of the urban fabric. New conceptual models and strategies are created to interpret the landscape as a surface and as a system, not only as a natural backdrop.

5 EXPECTED PARADIGM SHIFT

To sum up, if today the cultural consideration changes looking for a smarter city, then design strategies should move to manufacturing techniques that manage change through ecological evolving and developing platforms. On an effort to form a smarter city, natural landscape should not be a backdrop on which the urban articulation will be placed, but a dynamic field of study, management and recovery of the urban fabric. On this basis the research presented in this paper a first conceptual approach to a mechanism that may monitor the transformation of natural space, fed with data obtained from its analysis, in order to compose them and redefine the urban space. It could be said that this mechanism acts as a filter which not only receives information but also checks if this information can be changed and also produces connections and forms supported by computer generated programs. Unlike traditional urban fabric design methods, or the digitized form of smart cities, this mechanism aims to produce a smarter city through a renewed perception of convergence of the aspect between man-made environment and natural space.

This mechanism for the design and data management of the hybrid field between the natural and the urban fabric is in a conceptual stage; the aim however is the future development of systems that support its practical operation. Such systems do not involve new hardware, but are mainly platforms coupling already existing software in order to gather real-time data, encode and control the homeostasis or the feedback. In this direction new methods of integrating spatial and related databases can be developed.

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