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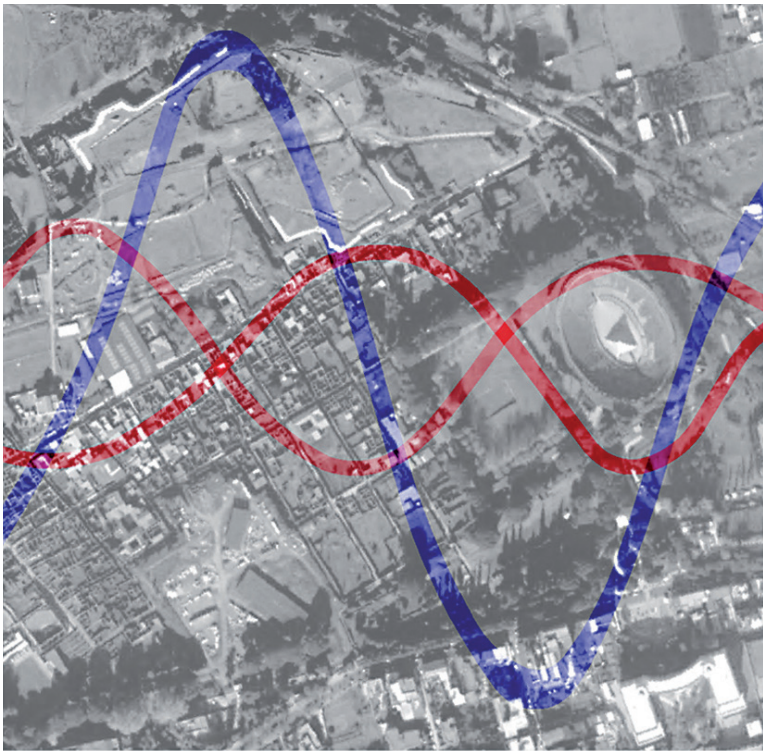
Carmine Gambardella

XVII INTERNATIONAL FORUM

Le Vie dei Mercanti



WORLD HERITAGE and LEGACY

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Culture | Creativity | Contamination

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Carmine Gambardella

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A Multi-criteria analysis tool for rethinking cultural heritage in evolving cities – naturalistic approach

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Abstract

Collective memory and individual identity in society are increasingly losing their importance in contemporary cities. Both material and immaterial heritage has to become a strategic element by which a citizen can recognize himself in the spaces of his everyday life. In 2018, the municipality and universities of Barcelona provided a moment of international consideration - using the instrument of a hackaton. This reflection was focused on the infrastructural heritage represented by the "Rondas" – originally developed as a connective element while today being seen as separating structure. The question was how this ring road might evolve during the next twenty years, forming new patterns between citizens and transportation. The transdisciplinary approach by a team of the Sapienza PDTA department has produced a multi-criterial analysis tool, based on economic, functional and social indicators use, which reconsider the infrastructure as connective element. Using "Ronda" as a model case looking at one of two alternatives, the naturalist approach proposes a neighbourhood future vision by inserting naturalistic-technological, urban-planning and territory-identity solutions. The aim of the paper is to demonstrate how the developed methodology can be reproduced in other heritage evaluation scenarios, adapting variations of indicators in the analysis, *focusing especially on how green infrastructure and technology can be inserted effectively while keeping alive the values of the cultural and aestetic heritage of a city.*

Keywords: methodology, urban heritage, matrix, green infrastructure, nature

1. Introduction

When thinking about the historical signs elements of today's cities, there is no question about how difficult it is to even outline a design strategy to control and direct all of them. The redevelopment of existing infrastructures, for example, is a practice that in recent years has become widespread in European metropolitan landscapes and has become a fundamental theme for rethinking limited road space, which is in contest between citizens and vehicles. In October 2018 Barcelona CTPA, an association composed of professors and students from six Catalan architectural schools (ETSAB, ETSAV, La Salle, IAAC, ETSA Reus and the UIC Barcelona School of Architecture), organized a hackaton [1] for rethinking the Barcelona city's ring highway as an urban public space. This hackaton was an event where a large number of architecture students, traffic engineers, university professors and citizens of Barcelona met to engage in collaborative urban planning. Each participant had to collect photos, videos, and other elements in an effort to encourage new suggestions and ideas.
The CTPA aims to work annually on a topic of general interest with the intent of bringing architecture to society and to citizens. With the "Des-cobrir Les Rondes", title of the initiative, Barcelona tried to promote creativity and reflection around an urban infrastructure that from its construction, has become the backbone of the metropolitan city. With this initiative, Barcelona joins the discourse on the future of circular highways already being developed by other cities such as Paris and Amsterdam.

Although urban ring highways can be found in many European cities, they are being put into question as they no longer solve the problem of traffic congestion. This is due to their inability to absorb the traffic in the central area, and because many have simply been designed exclusively for private vehicles, not for public transport.
At 37 km in length, the hackaton path was structured with various stops in different parts of the Barcelona highway, where the participants tried to reflect, discuss, and propose new visions for this infrastructure, which was originally designed for the 1992 Olympic Games. The hackaton aimed to experiment with the urban ring as also being a walking space for pedestrians, and not only restricted to private vehicles. Citizen health and quality of life is the new city model to achieve. That implies moving toward sustainable mobility and re-formulating certain spaces to achieve a redistribution of public space. Although Barcelona “Rondes” streets were built with the intention of formalizing the margins (its name meaning “round”, as it is a circumferential road), in recent years the Rondes has become part of the very fabric of contemporary cities. It is our intention to rethink the idea of Rondes’ to not only reduce carbon emissions from private vehicles, but also to better understand the potential of Rondes’ as a fully integrated element of the current metropolitan city. As green spaces and public parks make it possible to reconnect citizens' identities with the surrounding territory, all of the event’s stops were in green spaces and public parks to see the potential in its physical and identity recovery.

1.1 The Papers approach to “green heritage”

The link between green spaces and territorial identity hints that green ideologies can be applied effectively while keeping the cultural and aesthetic heritage of a city alive.
Starting from the Barcelona experience, this paper aims to investigate how green infrastructure can be a tool for protecting the existing urban heritage, while allowing habitants to freely live their urban lives. This paper describes one of the project variants "Metabolista" and "Naturalista", two perspectives with extremely opposite viewpoints that were chosen exactly for that reason for a study project of the architecture students of the University UIC (Universitat International de Catalunya) in Barcelona [2]. The work-strategy developed in an interdisciplinary working group [3] for the development of an area of an existing urban structure is explained here by means of the alternative "Naturalista".
In this way, the work presented does not represent the project of an implementation for the planning of the "Naturalista" version of the Ronda, it does not even claim to be a complete listing regarding the analytical indicators, tools or planning elements. It is rather the presentation of an instrument for the research of (urban) planning tasks. One of the basic tools for this approach, the so-called morphological box, has been developed already in the second half of last century by the Swiss physicist Fritz Zwicky [4].

2. The Background for the Green Matrix

Before creating the "Naturalista" matrix that is presented here, it is essential to ask the question what aspects of nature the term is actually referring to. In view of the fact that almost no area in Europe is untouched by human civilization due to centuries of cultivation and exploitation [5], and more importantly the fact that the site in question is an important inner-city area, the possibility of "returning" to nature, even a renaturation [6] - in the sense of it being recaptured by nature - is out of the question.
However, answering this question is of major importance for the function of the developed matrix. The analysis-based objectives have to be described precisely, be it on the basis of needs analysis, design principles or self-imposed priorities. Only then the indicators used lead to strategies for the respective objectives (as for example technological solutions used in architectural planning). The more precise the analysis - which can include both quantitative and qualitative aspects - the clearer the results that can be reflected in the matrix. However, a narrowing down of the factors analysed that result in the “indicators”, is to be applied just as deliberately as the following selection of strategies [7]. Already at this point an emphasis or exclusion regarding topics could be effected which can be detrimental for possible innovation. This gives way to another important aspect: For innovative developments it is imperative to ensure that no possible solutions are already given in the analysis or in the collection of possible strategic "tools". Wherever possible, the question or task itself should be formulated independently of already known solution strategies. This is one reason that makes interdisciplinary working groups so valuable [8]. The possibility of seeing the same objective from different professional perspectives qualifies the immediate search for a solution.

For a collection of possible strategies in the field of "nature" that can respond to corresponding indicators from the analyses, first of all the above-mentioned question of the kind of nature and thus also the idealistic background and significance for the heritage of this city has to be looked upon [9]. Due to todays intensive agriculture, the biodiversity of plants and animal immigrants is often higher in cities than in rural areas. This fact though depends heavily on the green environment surrounding the city and the interconnection of green structures as a whole, while the creatures affected are mostly

small animals such as birds, insects or small mammals [10]. In big cities the personal experience of the origin of food, the growth of plants or a natural handling of natural ecological systems including freely living animals is hardly possible anymore. This results in a lack of understanding of biological relations, which not only leads to ignorance about destruction or pollution of the environment, but ultimately also feeds the negation of the nature of man himself [11].
This is where one of the differences of the method presented can be found: Having determined the need for green space and the rededication of an available urban space as a possibility, there is not only the obvious solution of a city park as a recreational area.
In thinking that way it might be possible to create (even possibly required) free green space, but this could at the same time enhance the contrast between city and nature even more. Instead, the implementation of nature and nature-based technologies as part of the citizens daily life could be further developed, maybe even including elements previously unknown or perceived as separate from human life [12]. This way, the permanent inclusion of a concept in the development of a society is ensured.

The history of Ronda, its emergence and creation for the Olympic Games could already answer part of the question of its value as cultural heritage [13]. The procedure of a city's planning, and thus the ideological background, is always a mirror of socio-cultural development and thus could already be seen as a part of the cultural heritage *per se*. The special element in this case is the combination of the search for a conversion of an existing structure, which in its present use is considered obsolete in the future, into an element or a symbol of something inherent to humans - nature. Another noteworthy fact regarding this aspect is that natural elements have always been a desirable part of the environment of human dwellings [14]. Nature has always been a popular theme for people's immediate surroundings. It has often been attempted to artificially reproduce the calming effects - whatever they may be based upon in their particular context. Besides deliberately designed recreational gardens, murals and mosaics as well as decorative elements of ancient structures often display plants or other natural phenomena. [15]

Building physics or ecological aspects such as the improvement of the urban climate through regulation of temperature, retention of rainwater, reduction of noise and particulate matter pollution, or also a possible improvement of the carbon dioxide balance, have already been researched a lot and are still topic of ongoing studies. According to the study "Cities alive: Green building envelope" - performed by Arup in 2016 - covering many of these technical issues [16], the "most important" finding is that "green infrastructure, irrespective of where it occurs or how much space it covers, always elicits positive responses from people, because it is an aesthetic asset and an asset perceived as an improvement of the quality of life." [17]

3. The Naturalistic approach

The latest approaches to urban planning look very carefully at the "natural presences" in the urban environment, which is not just limited to parks and gardens, but extends to a general idea of the green system. The features assumed by the design of green spaces in the contemporary city, are the architectural-cultural products of past eras, where modernity and post-modernity have left strong residuals in a framework of unconnected and divergent approaches. Parks and urban gardens can be used as tools for the reorganization of abandoned land, former agricultural areas, residual areas, and in general, as a resource of redeveloping the city and recomposing its environmental balance [18]. Nowadays, with the affirmation of the new values of green in ecological culture, it is necessary to shift the focus of attention from the individuality of the 'interventions' of environmental requalification, to the overall picture of the different natural systems as a synthesis of physical and formal representation of places [19]. Linking green infrastructures to the other infrastructures of public space (blue and grey), means that they can either overlap, generating tree-lined avenues or green castings, or determine nodes of connection among different public spaces (for example a complementing pattern of green, blue and grey textures in public space).

3.1. Pillars and indicators

Urban analysis recognizes three main pillars as essential points of view, for identify the opportunities and vulnerabilities of urban areas. This is according to the sustainable development goals announced by the Urban Agenda of the European Commission [20]: Environmental System, Social System and Economic System. Far off from a standard urban analysis, the methodological approach puts into effect a complex procedure of investigation, partly being a deductive and partly an inductive process. The purpose is formulating a general rule, highlighting the complexity of the discipline of urban planning. This is followed by an application of the method, in an abductive phase, in the specific case of the Ronda. The method follows four different steps: the first step is to observe each individual

system using quantity data on the existing conditions; the second is creating different assessment ranks belonging to each type of pillar; the third is to choose two evaluation assessments suitable and common to all the three main pillars; the final step defines these steps, rules and guidelines regarding the "where" and "how" to develop urban projects must be established. This translates into a set of coherent operations aimed at enhancing the green spaces and together with the redevelopment of the landscape, promote the public space (streets, squares, parks, gardens), improve circulation and accessibility between newer neighbourhoods, and ensure the continuity of agricultural land [21]. The goal is to develop a "green armour" that structures the landscape from both a morphological and functional point of view; the continuity of agricultural land, for example, makes the historical settlement organization apparent, while preserving the formal and visual balance between full and empty, especially in correspondence with the lines of expansion of the metropolis. In contrast, wooded areas, the linear plant formations arranged along the watercourses or in support of the agrarian plot, are elements of landscape diversification and if they maintain a certain degree of internal connectivity, perform the function of ecological networks. The network of agricultural and natural open spaces on the one hand defines the form and operation of the territory on the regional scale. On the other hand, it configures the limits of the metropolitan city [22]. To realize such a network, it is fundamental "to guarantee the coherence of the regional open space system" for each element of the system (green plots, green belt, rural crown, green band), some intervention strategies [23].

The common denominator of the strategies aimed at making all the elements of the environmental system coherent, is constituted by the reticular ridges of the urban infrastructures (the threads that make up the great rope of infrastructures). The infrastructural lines can become, in fact, the great public spaces of the future as dynamic elements, fundamental for the city, whose ductility is necessary to the urban system. With this in mind, a new perspective on infrastructures is fundamental; current uses give them an important value: they are accumulation basins where human traces and collective memories are stratified over time; it is the city's facilities that need to be integrated into a new urban concept, rather than being judged to be inadequate to the city. Hence the idea of exploiting the green (naturalistic system), blue (water system) and grey (street system) infrastructures as tools at the basis of green planning. Compared to traditional infrastructures (grey infrastructures) conceived with a single purpose, green infrastructures have many advantages [24] (as is described in the PHENOTYPE project where preventive as well as therapeutic effects of contact with the natural environment. In fact initial results of the study show beneficial effects of green space on cardiovascular mortality and disease and mental health in adults, obesity, asthma and cognitive function and behavior in children and birth weight). The use of green infrastructure can provide social, economic and environmental benefits, such as the absorption of excess water caused by heavy rains and the reduction of floods, the mitigation of the phenomenon of heat islands in urban areas, energy savings, the creation of spaces and habitats for wild flora and fauna, and the spread of places for outdoor relaxation with consequent improvement of health and well-being of citizens [25] offered in the matrix below. [Fig. 1,2]

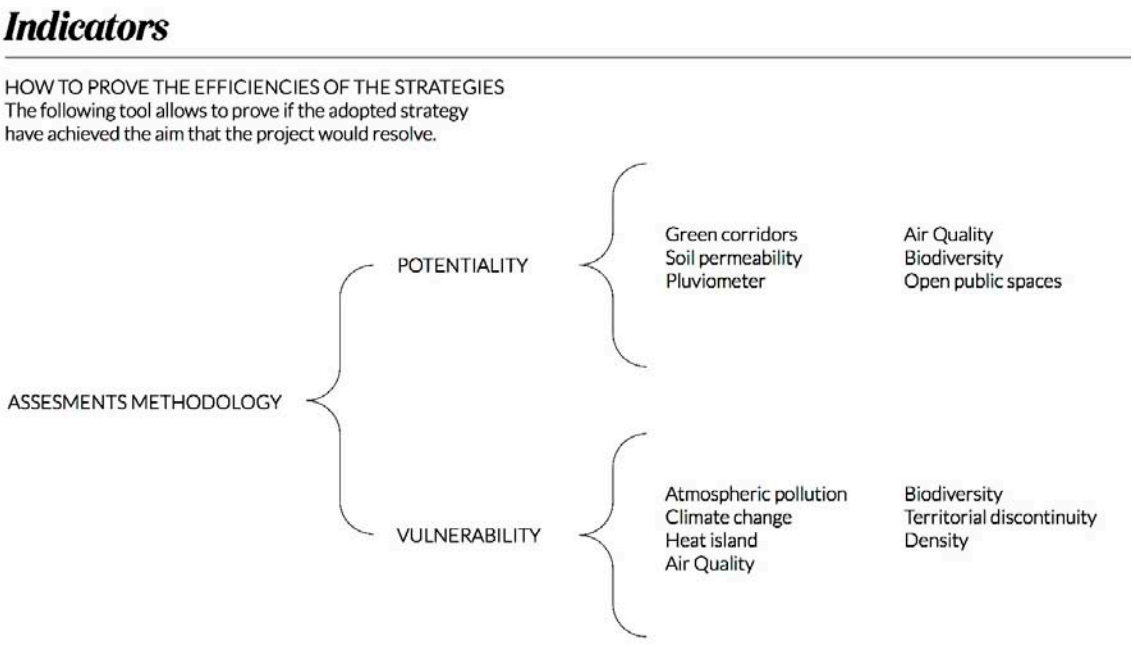

Fig. 1: Indicators (image © research team)

Fig. 2: Indicators (image © research team)

3.2. Vocabulary of green solutions

The various forms of green in the contemporary city influence their morphology and functionality, as well as having an important multi-functional role in improving life and the environment [Fig.3]. In fact, green spaces control pollution (including noise pollution), water conservation, soil erosion, the reduction of bacterial impact on humans and animals, purification of the atmosphere, mitigation of the urban climate (reducing the island of urban heat, as well as aridity and pollution) as well as psychological and physical improvements in the quality of life [26]. Depending on their size and the activities carried out within their perimeter, the new forms of green areas can be divided into different categories:

- green corridors ("Urban Greenways") are a network of linear spaces designed, planned, and managed for multiple purposes, including recreation and conservation of biodiversity. At the same time, they have an aesthetic and cultural role;

- blue corridors include all the natural and/or anthropogenic waterways that cross the urban areas. They can become branches that penetrate the city, creating a real environmental hydrogeological system;

- blue-green corridors can be used as tools for the integration of water with surfaces and green areas, as part of a strategic spatial planning of urban environments, with the intention of protecting flood-prone areas and maintaining the biodiversity of fauna and flora. This concept applies mainly to cities that are crossed by rivers or to those that lie near waterways or canals (such as Amsterdam or Sankt Petersburg). In addition to the benefits for the ecosystem (oxygenation, humidification, habitat for various species, etc.), these corridors reinvigorate urban aesthetics and harmonize people's needs with those of nature (see, for example, the Rheinuferpromenade river park in Düsseldorf);

- green belts are delimited areas around large cities, built with the purpose of protecting the elements of the natural environment. At the same time they aim to prevent uncontrolled urban expansion, to preserve precious traditional landscapes, and to guarantee additional areas for recreation. Such belts can greatly improve the metropolitan areas of large cities, as in the case of the green belts of London, Paris, Vienna, Berlin, Frankfurt and Barcelona. An alternative to green belts are yellow-green belts, which combine forest and agricultural vegetation;

- urban forests are a very important component of the green city. In general, trees in and around cities are manifested in the most varied forms: from isolated trees in private gardens to those that line the streets, from small "cluster" trees around residential buildings and parks to remains of natural forests. Urban forests are areas with natural, semi-natural or artificially planted arboreal masses in cities or suburbs. As green masses, they compensate for the enormous anthropological pressure thanks to the oxygen production in these areas. An example is the urban forests of Vienna, which exploited the proximity to the old Wienerwald, a foothill hill on the northern Prealps; or Frankfurt, which includes the largest urban forest in

Germany, namely the Forest of Frankfurt (about 4,800 hectares) [27]. Another city worth mentioning is Katowice, located in southern Poland, where the long extraction and processing of coal in Upper Silesia has had a negative impact on the health of plants, animals and humans. Although the polluted soil was not suitable for growing plants, the forestation efforts produced such impressive results that Katowice Forest Park became one of the best examples of forest revitalization in Europe;

- urban agriculture is a green practice emerging in modern cities and is defined as "plant growth and animal breeding for food and other uses, and related processing and marketing activities, in and around cities" [28]. Urban farms are born from the idea of favoring natural cultivation techniques, in order to obtain fresh and natural products. The tracts of land that could be converted into urban farms are free land or land occupied by abandoned infrastructure which could be turned into authentic green oases;

- green squares and pocket parks are green areas combined with public spaces. The square, which has always been a place of rest and meeting, is linked to the green ideas, which brings new natural materials to the urban scene (water, light, etc.), in order to create spaces for use with a dynamic and aesthetic character. Even small unused urban gaps, anonymous areas, indifferent and unidentified spaces can constitute an intimate and collective space at the same time (see the London case with the London's Great Outdoors program or the Eco-Metropole program in Copenhagen);

- green walls, vertical gardens and green roofs are green areas incorporated into new planning concepts, connecting buildings with green areas and aiming to make an internal-external flow, to give continuity to the systemic structuring of urban green spaces. In addition, a green building can help increase comfort by bringing the benefits of urban green spaces closer to the user. Compared to conventional roofs, which for example are easily overheated, green roofs can be an effective alternative since they reduce thermal contrasts and give a pleasant appearance to the urban environment.

Urban Layout Matrix				Data taken from Analysis Urban structure regarding i.e.	Recommended improvement
				Environment	
			Strategies	Morphology of the territory, private and public open spaces, use of open spaces, Water, Pollution (heat, Air, Smog, CO_2), Density	
Environment	**Open Private spaces**		Garden		
			Courtyard		
			Rooftops		
	Open public spaces		Plazas		
			Pedestrian street		
			Sport fields		
	Green landscape	**Community open spaces**	Playground		
			Neighbourhood Parks		
			Regional Parks		
			Event Landscapes		
			Art-scapes		
			Urban Meadows		
			Trails/Greenways		
			Forest garden		
			Cemeteries		
			Urban Gardens /allotment gardens		
			Grow street/ edible park		
		Ecological landscapes	Nature Parks		
			Industrial Parks		
			Reforestation		
			Nature connecting roads		
			Remediation Field or Forests		
	Blue + Green infrastructures		Large Lake		
			Retention pond		
			Infiltration Park		
			Road side Pond		
				of no concern	
				0 – not existing	0 – implementation not necessary
				1 – very little amount	1 - possible implementation
				2 – adequate amount	2 - recommended implementation
				3 – sufficient amount	3 – implementation strongly recommended

Fig. 3: Environment Matrix (image © research team)

Fig. 4: **The Naturalistic Approach (image © research team)**

4. Creating the Matrix

Once the importance of integration has been recognized as such, there are a number of ways to bring about the presence of green or nature in the city. They are based on three “pillars” [Fig.3], environment, social life, and economy, which are then subdivided according to the subject area at hand – in this case with the focus on mobility and green infrastructures. In this example, various variants of public and private green spaces, environmental or urban climate influencing elements were included as well as didactic, productive or transport related aspects. Depending on the desired scale or level of detail in planning, these strategies can then be further developed with the help of qualitative as well as quantitative assessment and with the same principle of sequential interdisciplinary analysis. When the strategies found are confronted with actual technologies, the options on new combinations grow, enabling innovation and thinking outside known paths. This step is greatly improved by the development of a suitable graphic design that helps transport intentions and eases perception of correlations.
If desired and for a further deepening of the topic, an optimized and especially adapted use of technological possibilities for the site can be found such as an application of the various variants of roof or facade greenery, rain-, gray- or blackwater management, the countless and currently daily evolving possibilities of urban farming and distribution, or novel modes of mobility solutions, to name just a few.

Repeated use of this system of analysis and strategy development can ultimately be related to the principle of a so-called feedback loop [29] that often occurs in nature: a cycle in which a gap is made between the information shared between the elements, and thus implementing the recurrent and constant adaptation of the parameters generated within the system.

Conclusions

The reorganization of the city is a consequence of urban structuring. Green is one of the few malleable elements able to fit the various urban plots and to be configured in the rearrangements of the empty and abandoned spaces of the contemporary city. It is the material of ecological rebalancing of the territory and a connector for the system of urban spaces. Green spaces are becoming more and more an opportunity for experimentation od new paths of redevelopment of the city, especially in situations where traditional forms of public spaces are lacking.

It can be said that in the relationship between green infrastructure and the city, two new objectives are emerging [18]:

- The development of a new relationship between the new forms of green and public city spaces, leading to the enhancement of the great naturalistic systems (river parks, urban forests, etc.);
- The sequential construction of urban patterns that link open spaces with each other and create continuity with the surrounding territory. This allows the combination of all the elements of the naturalistic-environmental space, focusing on the system of collective spaces, road systems, and empty surfaces.

An objective analysis of the circumstances is essential, especially for the development of innovative solutions in areas with a large number of influencing factors. Combining this analysis with potentially relevant known strategies in a clearly structured and graphic way can help the discovery of new combinations and solutions. New values can evolve while existing quality is maintained, all the while allowing the transfer of knowledge in a comprehensible way. The working-method developed was successful in the field in which it was applied and should be usable in many other areas due to its generic basis.

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