

FROM URBAN BIODIVERSITY TO BIODIVERCITIES

RECONCILING SOCIETY AND NATURE IN CITIES

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This chapter narrates the transformation of the link between society and nature in urban spaces. It starts historically with recognizing the city as a threat to biodiversity and moves on to understand the importance of managing these built environments for human well-being and the close relationship with the regional perspective. In this journey, it becomes evident how the original views of intrinsic values of nature and the notions of management focused on human threats gave way to the consideration that the quality of life of urban communities depends on those spaces that contain biodiversity and provide ecosystem services.

With a changing conceptual approach to nature and city, the creation of protected areas in urban environments, the planning of ecological connectors, and the management of specific elements of biodiversity advanced. In parallel, schools

of urban ecology documented nature and urban biodiversity, understanding them first as the exceptional species and natural spaces that occur in a gradient from the wild and then as spaces that emerge from design in urban interventions.

Thus, concepts such as urban landscape, design and renaturalization, co-production of contributions from nature to people, governance, and environmental justice emerged in urban environments. BiodiverCity emerges in this context as a conciliatory concept of some of these paradigms, as well as an opportunity for reconciliation between nature and the city, in the pressing context of global change.

THE CITY AND BIODIVERSITY

The city emerges and grows as a phenomenon of negation of what is natural, and civilization is also a concept that expands in parallel with urban expansion.

Thus, what is urban has historically developed at a conceptual and practical level as the opposite and primary threat to conserving biodiversity perceived as abstract and remote. Today, however, elements are being sought to build a new relationship -which here is called conciliation - based on a historical view of the concepts and practices that converge in what is urban, especially when, amid a global environmental crisis, most humans live in cities (United Nations, 2014).

Conciliation must be understood in the context of evolving the very ideas of nature as well as the approaches for its conservation, which have been linked to changing the concept of biodiversity and its relationship with society (Mace, 2014). Thus, there has been a shift from the idea of biodiversity being untouchable, with an exclusively intrinsic valuation in which humans are presented only as a threat, to a conception of biodiversity as a source of ben-

efits for people as well as an essential part of a system of nature and people interacting in a coupled manner.

Thus, in the growing global urbanization, the idea of the biodiverse city, as we know it today, has taken root. However, the biodiverse city is one in which this concept is transformed into a melting pot of interactions between human beings and other living beings in the built habitat. The city, in this sense, is not unnatural but has a new identity, in which the concept of the human in nature and nature in the human changes in a reciprocal manner.

Urban biodiversity as a concept is an open and evolving category. With this notion, we do not intend to describe only the wildlife that is distant or adjacent to the city, but the wildlife that persists there without human agency and, in turn, what happens there deliberately through management. In other words, it is a category of agency that must be understood

with a transdisciplinary view that deals with several knowledge systems of knowledge that interact. From this basis, a conciliatory concept such as BiodiverCity has emerged.

WHAT IS URBAN AS A THREAT?

The narratives that emerged in the modern idea of conservation in the mid-20th century led to the adoption of the Convention on Biological Diversity (CBD). As the first global legal agreement, the CBD captured the prevailing conservation ideas at the time, emphasizing the need to preserve the values of nature that persist "despite of people" and the threats their activities generate to it (cf. Mace, 2014). In this early formulations of conservation biology (Soulé & Wilcox, 1980), it is evident that urban spaces are implicitly conceived as a destructive factor of those considered natural. Such a position becomes apparent when it is suggested that, unlike ar-

reas that are considered natural, cities retain very few natural elements.

Thus, the initial strategies for biodiversity conservation in the face of the urban environment were aimed at isolating what is considered artificial from what is natural, creating physical or legal boundaries for this purpose. However, this vision, which only finds what is human as part of the problem, was evidently a barrier to the appropriation and social valuation for those life forms that coexist with humans in cities.

In this context of separating what is natural from what is urban, those wild spaces that persisted in proximity to the city appear exceptional. Wild nature as a landscape adjacent to the city is presented in protected areas in cases such as the Avila in Caracas or the Eastern Hills in Bogotá (Mejía, 2016). The images of the large fauna of Nairobi National Park against the backdrop of the city are also evidence of this. The

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city highlights the character of these spaces, which would otherwise maintain their own identity.

The city-nature tension in this vision of what is urban as a threat is also manifested in the occurrence of protected areas that are trapped within the urban fabric. Perhaps the most notable cases in this sense are the Table Mountain National Park, surrounded by the urban fabric of the city of El Cabo, or the Tijuca National Park as an island in the middle of the city of Rio de Janeiro (Mejía, 2016). Likewise, regional metropolitan natural park Cerro El Volador, as a protected area in the middle of the urban fabric of Medellín, presents us with a new nature as a green island in the middle of the city. The recognition of protected urban areas as “protected areas located on the edge of large population centers” (Trzyna et al., 2014) by the International Union for Conservation of Nature (IUCN) accelerated this integration of protected areas with urban life.

DEPENDENCE AND INTERDEPENDENCE

An important step towards constructing a new concept of urban biodiversity was the Millennium Ecosystem Assessment (MEA, 2005), which proposes understanding the relationship between biodiversity and society from its human benefits through the concept of ecosystem services. This paved the way for the initiative to manage urban ecosystem services (TEEB, 2011), one of the first approaches to address the relationship between the city, human well-being, and biodiversity, including the definition of guidelines for its management.

The dependence on nature of what is urban became evident as a predominantly long-distance relationship, due to the usually remote location of the water sources of numerous aqueducts, especially in

mountainous cities. This dependence becomes very notorious, for example, in cities located on the dry slopes of the Andes, where water comes from ecological systems situated at great distances. Such is the case of Trujillo, Lima, La Paz, or Santiago, whose need for nature is also threatened by global climate change.

In line with the development of conservation sciences, elements began to slowly appear within urban spaces that made it possible to maintain or recover ecological connectivity and, with it, the flow of biodiversity and its ecosystem services. Landscape ecology thus appeared in the urban context.

The conceptual and practical arrival of concepts such as ecological structure and ecological networks to maintain or recover biological connectivity stands out (Bennett, 2003). This vision followed the first global impulses on the possible role that biological nodes and corridors can play in connectivity at the landscape scale, a perspective that could not remain alien to conservation efforts in urban environments. (Andrade et al., 2013).

However, the urban landscape matrix continues to receive almost no persistent attention in terms of landscape ecology. Therefore, the connectivity required for the persistence and flow of biodiversity and its ecosystem services within urban spaces is still an unresolved issue. Various conflicting social, economic and political interests converge and are assumed to be at odds with each other.

Beyond these nodes and connectors, urban growth goes beyond the managed city and manifests itself as a regional phenomenon. Forman (2008) speaks of urban regions, where the built matrix dominates the landscape. It is an expression of what Zepp et al. (2021) propose as the “end of the city” as an enclave, which has led to what is urban being considered

a regional and global phenomenon. Luis Inostroza makes this explicit in this same book on the importance of this link in the very emergence of the concept of BiodiverCity.

Beyond the protected areas and the connecting elements that relate biodiversity to the city in adjacency or at a distance, the interdependence between urban areas and nature takes on greater importance when analyzing the biodiversity that occurs amid these built environments and its true relationship with those who live there. It is not only present in urban protected areas but as a variety of green structures associated with purely urban typologies. For many citizens, this urban greenery represents the opportunity to experience what is perceived as natural and makes up for the lack of a sense of nature.

URBAN ECOSYSTEM SERVICES

Over time, cities began to consider that they not only consume ecosystem services provided at a distance but also produce them. Gómez-Baggethun & Barton (2013) propose a typology for some of these so-called urban ecosystem services (UES). Thus, cleaner air, meso or microclimatic regulation, reduced risk of natural disasters, or the very presence of wildlife in the urban environment, which is positively valued, constitute a narrative of reconciliation amid the city's ongoing divorce from nature.

Inostroza et al. (2014) propose the concept and indicator of “technomass,” which arises from the interaction of urban ecology, metabolic studies, and urban planning. Their approach understands the city as an ecosystem where matter accumulates and energy flows. It tends to design forms of social control of urban development that guide the structural and functional evolution of the city. In this way, it would be possible to improve the quality of urban life and mitigate its growing

environmental problems. In this line of thought, the balance of biomass and technomass would determine the future of a city. Therefore, talking about urban ecosystem services implies recognizing the existence of benefits co-produced precisely due to the interaction between society and nature, according to IPBES (Díaz et al., 2015).

The concept of UES cannot be approached similarly in cities that function as enclaves in wild areas and those amid landscapes profoundly transformed by agribusiness. The central issue is not only the existence of spaces that provide flows of benefits to society but also the way these are valued, which is neither unique nor uniform.

Some urban conformations, in fact, confront the concept of UES since nature manifests itself as a set of benefits and disservices. The presence of pathogens or predators in urban environments, for example, is a subject of study in urban ecology and sociology. Similarly, the contradictory valuation of urban wetlands is a notorious case when they collect sewage and untreated water in cities and at the same time provide spaces in which nature recreates itself. An interesting case is Nairobi, where water purification areas have become highly valued for bird watching.

The disservices become more evident in environments lacking public services, where the positive valuation of urban biodiversity conflicts with issues such as cultural diversity, lack of urban sanitation, insecurity, and the lack of evidence for the nature benefits for the people's well-being. For example, a less recognized disservice of nature in an urban environment in the public perception is the relationship between wildlife and risk in aerial operations. The above is just one of several situations in which some manifestations of biodiversity, which tend to be valued in generic terms, may be undesired.

URBAN BIODIVERSITY AS A POLITICAL OBJECT

Biodiversity in urban environments has emerged as a presence and as a purpose and political object of territorial planning. A large part of the environmental citizens' movements has emerged in the cities around the spaces of nature that are recognized. These are new citizenships (Kowarick, 1991), ready to defend these environments in the political arena. These social struggles have led, for example, to the creation of urban protected areas (Quimbayo, 2012) or the protection of wetlands in a city like Bogotá (Galindo, 2003).

Thus, the first urban biodiversity management policies were aligned with the levels of separation-integration between society and nature posited by Mace (2014) and now recreated in the collective social imagination. This more diverse and complex way of understanding urban biodiversity has, of course, direct implications for its management. Some elements acquire relevance from the citizen's perspective, even with contradictions. This is the case of invasive exotic species or predators within the urban habitat, as well as the staunch defense of green spaces with preservation arguments that do not recognize the fact that these are the product of human interaction with nature, as occurs with the urban wetlands of Bogotá (Van der Hammen, 2003). Examples of this complex valuation are creating urban habitat for wild species, the diversification of flora managed in the city, or the urban trees themselves, which usually arouse empathy and suspicion when they need to be managed.

In this sense, tropical cities have the potential to contribute not only species through horticulture but also typologies of spaces and forms of management. Urban greenery amid housing presents an in-

teresting evolution in “young cities” although the recent origin of their inhabitants is rural, this attribute does not persist due to the tremendous economic value that urban space is acquiring. Green spaces become community spaces and places to meet where there is feedback on social acceptance.

With the advent of a complete concept of biodiversity as spaces and species, the equation changes: we no longer speak only of dependence but of interdependence. It is not the benefits of nature for people, but the benefits of people for nature. Thus, urban biodiversity management goes beyond the disciplinary agendas derived from conservation sciences and becomes an object for social entrepreneurship in areas such as architectural design, gardening, urban vegetable gardens, landscaping, tree planting, eco-efficient vertical gardens, and green roofs.

EVOLUTION OF URBAN ECOLOGY

The evolution of the concept of biodiverse cities has been taking place under other notions that come from disciplines such as urban ecology. The re-creation of the city's identity in its relationship with nature has been primarily driven by this discipline, which emerges with historical roots and differentiated emphases.

However, just as there is no single discipline of ecology (Drouin, 1991), neither is there a single urban ecology. The paradigms under construction emerge imbued with unique and special cases because the differences between the knowledge and practice of biodiversity in the world are still vast. Particularly relevant in this context is the integration proposed by Dramstad et al. (1996) of the principles of landscape ecology (applied to wild or rural spaces), landscape architecture (used as a complement to urban planning), and

land-use planning that, with their distinct professional strands, have not yet met harmoniously.

Most of the world's schools of urban ecology have their origins in Europe and North America, in the absence of an obvious systematization of their evolution in the rest of the world. The first root that can be identified is the large urban park designed for human benefit, whose inspiration in North America was Olmsted (1822-1903) based on the "ecological approach to understanding the city" of the Chicago School. This initiative takes an analogical view of social systems as ecological systems that enable "the set of relationships between city dwellers and their living environment" (Joseph & Grafmeyer, 1990).

In urban planning, some precedents are more relevant today. Le Corbusier, for example, proposed networks of urban green spaces similar to what today we would call green infrastructure "for the recreation of the body and spirit". Thus, the design of large urban parks came to life in cities such as Bogotá, Santiago, Mexico City, etc. In fact, it is interesting how the concept of the human benefit came to these spaces first, and later that of biodiversity, contrary to the recent conceptual construct of biodiversity-services and human well-being.

The systemic ecology approach, focusing mainly on urban metabolism and describing the organizational functions of nature, also allowed for a new interpretation of the city. In this case, ecology has been used as an instrument to explore the analogy of the city as an ecosystem through the flows of energy, materials, and metabolism. We talk about the machine city, the entropic city, and the city interpreted through the paradigm of ecology (Camargo, 2005).

The identity of what is natural in the city, a manifestation of the wildlife in the urban intervals of un-built or abandoned spaces, acquires

an identity of its own for Clément (2004)¹. With this proposal, the urban landscape is widely developed as a space for integrating conservation. Clergeau's (2007) in his "urban landscape ecology" brings a conservation biology approach to the functioning of the urban landscape, seeking to overcome the vision of the city as irreconcilable with the principles

of ecology. This author concludes with the approach of a green mesh (maillage vert) that applies the concepts of connectivity to the city. In the same vein, Wu Jiango (2014) develops a school of applied research on the city as a multi-scale phenomenon, pointing out the challenges of constructing urban settlements that effectively address sustainability

and global environmental change (Grimm et al., 2008).

Nonetheless, landscape and aesthetic approaches, and the contribution of the humanities, which are fundamental in the practice of what is urban, there is still a distance in the construction of knowledge about the relationship between society and nature in the city. The perspective of

Patricia Johanson's projects, for example, invites us to link art and survival, proposing the design of the built with the forms and functions present in nature (Kelley, 2006). Therefore, the evolution of urban ecology is not only an academic matter but a process that has been accompanying new forms and purposes for its management. (Details for the diversity of approaches

to address the relationship between nature and society in Figure 1).

BIODIVERCITY AS A SPACE FOR RECONCILIATION

The new attributes and recognized dimensions of urban biodiversity are now driving new paradigms in city management. Thus, urban landscape



design now involves the need to preserve, conserve, restore and sustainably use biodiversity, an approach that will be fundamental to sustainably transforming the territory.

Some emerging concepts that accompany this change of mentality are urban landscape design, renaturalization, contributions of nature to people, and regeneration. The compilation of experiences around the concept of urban nature (Mejía, 2016) constitutes a step on which to develop the conciliatory concept of BiodiverCities, which has the potential to encompass a new way of seeing what is urban with a different purpose. Thus, in a BiodiverCity, urban biodiversity is linked to the purpose of understanding, conserving, or improving it.

The new concepts mentioned above also call for a multidisciplinary approach. Ecological structures and networks become not only the space for the practice of conservation sciences but also the scenario par excellence for a multi-scale and interdisciplinary encounter in which the "pieces" of a new landscape can be "assembled" (Andrade et al., 2013).

A representative example of the evolving concepts of urban biodiversity and the emergence of the BiodiverCity is given around water spaces, not only in the landscape management of "waterfronts," where urban design and landscaping converge (Franco, 2011) but also in the search for a city that harmonizes with the hydrological cycle, creating new balances between what is natural or naturalized and what is artificial. These water spaces integrate aquatic species, protected areas, the blue network, and sustainable urban drainage. The urban river emerges as that place where past management engages and invites us to recreate the new future.

At the core of the concept of BiodiverCity is the need to bring about a transformative change that can promote deep and lasting transformations. Therefore, beyond conceptualiza-



Photo: Leonardo Centeno



WHAT CAN BE UNDERSTOOD BY URBAN PROTECTED AREAS FROM A LANDSCAPE POINT OF VIEW?

It is a vision of the city that, on the one hand, considers the structuring elements: the mountain range, the tutelary hills, the hydrological system, etc.; and on the other, finds opportunities for biodiversity in the urban fabric: green corridors, wetlands, parks, and gardens (Montoya et al., 2018).

tion and the recounting of examples, this proposal's challenge lies in its social practice, including public policies. In the BiodiverCity, interactions between humans combine learning and innovation, that is, reflection on the human experience and the imagination of better futures. Thus, the city is no longer just a threat, a green network, and a gray matrix, but a socioecological system in which human activity is the agency of new processes.

KEY MESSAGES

➔ **Conciliating city and nature.** Civilization and city are concepts that have grown parallel but antagonistic to what is considered natural. The disciplines that address these concepts in practice have persisted in approaching them from the perspective of a relationship mediated by threat. Today we are looking for elements to build a new relationship based on the

close link that truly unites city, biodiversity, and human well-being.

➔ **Transforming the vision of what is natural in the city.** What is urban has moved from primordial visions of a threat to biodiversity to the recognition that the quality of life in cities depends on spaces that at local or regional scales contain biodiversity and provide ecosystem services.

➔ **BiodiverCity as an emerging concept.** The BiodiverCity emerges as

a conciliatory concept resulting from the main paradigms that have defined the way in which human beings have related to nature in the framework of urban areas. The BiodiverCity is an opportunity for reconciliation between nature and the city, of great relevance in the pressing context of today's global environmental change.

➔ **BiodiverCity as an opportunity for transformation.** Given the expansive growth of ur-

banization on a global scale, it is urgent to bring about a profound and persistent change in the unsustainable tendencies of this process. In this context, the city is no longer just a threat to biodiversity or a dichotomous green network or gray matrix system. It is a socio-ecological system in which human activity is the agency of new processes that combine learning and innovation.