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# Urban Socio-biodiversity: Ethnoecology of Cities

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## ABSTRACT

The process of urbanization experienced by mankind over the past several decades creates new scenarios for ethnoecology research. Not only has the urban population already exceeded the rural population in numbers, but material and symbolic urban-industrial elements have also spread over the earth's surface. This article seeks to reflect on new ways in which to investigate ecological knowledge within this novel scenario. To do so requires going beyond the dichotomies of natural/artificial, rural/urban that currently hinder our comprehension of this field of study.

**Keywords:** hybrid spaces, urban ecology, urbanization, urban sociology

## CONTENTS



## INTRODUCTION

If we could see a field notebook of an anthropologist who has just visited the Earth from another planet, we would probably find that ethnographic descriptions of cities, especially large cities, occupy much of the text. We live on a blue planet, finite and urban. To some extent, the advancement of urban-industrial production and its sometimes devastating effects, justify the need for ethnobiological studies to record and preserve the ecological knowledge of traditional populations.

Because ethnoecology is the study of ideas, knowledge, beliefs and actions of a given society over nature (Ellen *et al*. 2000; Toledo 2002; Nazarea 2006; Berkes 2008; Nabhan 2009), it must also include inquiry about urban places and societies. The field of ethnoecology has made great advances during the last 40 years and currently, according to Reyes-Garcia and Sanz (2007), there are four main fields of study: (i) local systems of ecological knowledge, (ii) relationships between biodiversity and cultural diversity, (iii) the management systems of natural resources and (iv) the relationship between economic development and human welfare. Most studies are still concentrated on traditional populations, which might also represent a race against time given the accelerated process of change and loss experienced by these populations and their cultural systems (Ellen *et al*. 2000). However, cities, especially large cities, are home to a diversity of human knowledge still poorly understood.

Urban ethnobiology is not simply the investigation of knowledge of traditional peoples living in urban areas, city dwellers and their descendants. Cities, ecosystems like forests, savannas and deserts – represent a myriad of factors and socio-ecological processes and meanings to be understood by human populations. In a world where most people live in large cities, it is urgent that we address the urban reality from an ethnoecological perspective. This endeavor would contribute significantly to building ecologically viable and socially fair cities. The intent of this article is to provide a reflection on the possibilities of such an urban ethnoecology. Here I neither attempt to write an ode to the city, disregarding all its social and environmental problems presents, nor do I propose that demonizing urban-industrial society will help us overcome the current socio-environmental crisis that humanity faces today. Taking into account the specificities of the new global context, I first review the theoretical discussions on the urban phenomenon and indicate some fields of research that can generate significant advances for etnoecology research not only in cities, but also in so called natural ecosystems.

I first review the historical aspects of the urbanization process, and place this discussion in conversation with those addressing the dichotomies of natural *vs.* artificial, rural *vs.* urban. Thus, by working with the assumption that

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cities are highly complex socio-ecological systems, this paper thereby launches a reflection of the field ethno-ecology in urban areas.

## THE URBAN ECOSYSTEM

### The city in history

Throughout history the construction of cities served several purposes, fulfilling religious, political, economic and aesthetic needs (Mumford 1998). The city represented and still represents a way of combating the uncertainties of life and the chaos and unpredictability of nature. Henri Lefebvre (2008a), in his book *The Urban Revolution*, summarizes the progression of cities as a change from the political city to the commercial city and finally the industrial city. Following this logic, at the present time, we would be living in a moment of transformation, where the urban logic or this industrial city has spread over the whole surface of the entire planet. The metropolis as we know it today is just one of the phases through which the city has been reinvented. Hence, what is of interest is discussing an urban phenomenon, in which the process of urbanization is an important step. According to Castells (2009), one of the leading thinkers of the urban question:

> "*The term urbanization refers both to the formation of specific spatial forms of human societies, characterized by significant concentration of activities and populations in a restricted space, as well as to the existence and spread of a particular cultural system, the urban culture*." (2009, p. 46)

The city is a space of technical and cultural domination over natural processes. In the city, human rhythms and time are imposed over those of nature (Santos 2008a, 2008c). But couldn't this humanized nature of the city be understood as a new nature? There is actually a gradient of artificiality of spaces, from the virgin forests to those managed to rural and peri-urban areas of large cities to their hypercenters. To Lefebvre (2008b) "the city, since the dawn of the agrarian age, was a human creation, the work par excellence" (p. 81). The city's history is not just the dominance of urban-industrial society over nature, but urbanization can also be understood as a natural phenomenon, given that humanity, the result of evolutionary and biological processes, constructs this "second nature" (see Mumford 1998). The cultural dimension of the dichotomical conception, which establishes the boundaries between society and nature, and also supports the idea of the city as "non-nature", has been extensively debated (Descola and Pálsson 1996; Latour 1994; Levi-Strauss 2008). Milton Santos (2008a) gives us a valuable interpretation of the relationships between elements of the city and what he calls "first nature":

> "[...] *The infrastructures make up and become attached to the ecological environment, and actually become an inseparable part of it... Would it be violence to consider them as distinct elements? Moreover, in each stage of social evolution, man finds means of work already established upon which he operates, and the distinction between what we would call natural and unnatural becomes artificial... The term ecological environment does not have the same meaning as that given to savage nature or cosmic nature, as it is sometimes assumed... So what happens in reality is a new addition to the use of work, creating a new environment from that which already exists: what is commonly called "first nature" to counter the "second nature" is already second nature... First nature, as a synonym for "natural kind" only existed until the time that immediately proceed the time when man became a social man, by means of social production... From that moment on, everything which we consider as first nature has been transformed... This process of transformation, continuous and progressive, is a fundamental qualitative change today*." (p. 19)

To understand the socio-environmental reality of this new century it is essential to consider how urbanization shapes socio-ecological relations, both impacting them and also generating these relationships. In 2005, the world's urban population became, for the first time in history, bigger than the population living in rural areas. The urban population has taken some millennia to reach 3 billion people, but according to UN figures, it will take approximately 50 years to double and will absorb almost all population growth worldwide over the next three decades (Crane and Kinzig 2005).

Urbanization has gained widespread focus as an object of study in academia, especially in the field of ecology. In the 1990s, there was a growing interest of city ecologists, strengthening and bringing new elements to the urban ecology field of study (Botkin and Beveridge 1997). According to Grimm *et al*. (2008):

> "*Urban Ecology integrates theory and methods of social and natural sciences to study the patterns and processes of urban ecosystems... The conceptual bases of ecology in developing urban areas include cities as heterogeneous, dynamic, and social-ecological systems, complex and adaptive, in which the distribution of ecosystem services connects both society and ecosystems at various scales... [.....] Cities offer real-world laboratories for ecologists to understand these fundamental patterns and processes, and work with city planners, engineers and architects to implement policies that maximize and sustain biodiversity and ecosystem function... With an ever increasing fraction of humans living in or near the cities, these are the biological communities that man experiences - human connections and encounters with nature have supplanted urban experiences with natural biodiversity*. "

The first studies of urban ecology were related to the current Chicago School of Sociology in the early decades of the twentieth century, which has carried out important and controversial studies, proposing models and principles of analysis of human relationships as ecological relationships in cities (Park *et al*. 1925; Theodorson 1974). Such studies have a sociological approach, to which the city is a specific form of association between human beings, but not necessarily an ecological system (Bettini 1996). In contrast, current studies in Urban Ecology cover various topics, beyond sociological approaches (see Mcintyre and Knowles-Yánez 2000), including topics such as richness and patterns of species' distribution, nutrient cycles, and political dimensions of environmental management in urban areas (Botkin and Beveridge 1997; Pavao-Zuckerman and Coleman 2007; Tratalos *et al*. 2007; Kühn *et al*. 2008). This diversity of approaches to Urban Ecology remind us of Lefebvre's statement (2008a), in which 'the urban phenomenon, considered in its breadth, does not belong to any specialized science "(p 55).

The modern city is a representation of the desire for "domination" of nature by society. Urbanization leads to profound changes in the organization and development of space. The rural sphere is the site of local food and material production for the maintenance of the city (Santos 2008b). Cities, on the other hand, are filled with elements of modernity, both manufacture goods (electronics, automobiles, processed food) and those intangible (values, lifestyles, arts). Residents of urban areas are thus alienated most acutely in relation to the means of production of goods necessary for survival.

Despite this process of domination and an apparent homogeneity, cities are places of immense richness in the

spatial form and the lives they sustain. Both nature and human populations are mixed and redeveloped in the transformation of urban life.

## Urban nature

After the possibility of studying urban ecosystems is recognized and its characteristics and properties of its components are uncovered, it is then necessary to scan these components and establish their correlation. On central question we might ask is: what is unique about urban ecosystems in relation to natural environments? An obvious answer is the dominance of artificial elements shaping the landscape. Moreover, a rich and complex network of relationships among species and among the numerous social groups in cities is observed. As noted by Eric Swyngedouw, in his description of the cities as hybrid spaces or *cities-cyborgs*:

> "*Looking closer, however, the city and the urban process are a network of interwoven processes, at the same time, human and natural, real and fictional, mechanical and organic... There is nothing "purely" social or natural in the city, and even less antisocial or unnatural, the city is both social and natural, real and fictional... In the city, society and nature, representation and being are inseparable, mutually integrated, infinitely connected, simultaneous, this hybrid socio-natural "thing" called city is full of contradictions, tensions and conflicts*." (2001, p. 84)

Another attribute of urban ecosystems is their significant variability of socially constructed environments – from spontaneous occupation of places like villages and slum areas, as well as areas with a high degree of planning. There is also a variation – daily and seasonal – of how urban areas are occupied. On a daily basis, people migrate in a pendulum between the peripheries and the centers of large cities. Even more evident is the spatial segregation of urban spaces by socio-economic and even racial factors in some cases.

Urban areas are formed by a mosaic of individual places with different levels of artificiality (Park *et al*. 1925; Bradley 1995; Alberti 2005). Even where it appears that nature has been entirely dominated to its limit, nature resists and invents new ways of living on the concrete. Trees growing on the river banks, migratory birds living in urban parks, wasps building nests in buildings, ruderal plants (many medicinal and comestible) stubbornly germinating and proliferating on the sidewalks are all examples of this resistance.

In terms of energy terms, cities are the main drains on the planet. Odum (1971) describes the city as heterotrophic ecosystems, with high demand of energy input obtained from wide and distant surrounding areas. The absolute majority of the materials required to run a city lies outside of their physical limits. The cycles of local materials were replaced in the cities by linear, one-way flows, with large amounts of pollutants being released out of the urban system. The energy dependence indicates the need for studying urban ecosystems on a regional scale because the life of the city goes beyond its limits.

Despite an apparent subordination of nature, cities are built on the foundations of natural and ecological processes – the basis for their functioning (water cycling and geomorphological processes, for example). In the process of occupation and modification of space, we leveled the landscape, channeled streams, replaced the native vegetation with ornamentals, most exotic species in parks and gardens. When permitted and provided for, the expansion of natural spaces in the city is usually the result relations of power between two parties.

The process of urbanization in countries on the periphery of the global capitalist system has also been accompanied by agricultural modernization since the 1950s. A drastic consequence of this period of change was rural migration to urban centers, which occurred when millions of families that could not longer socially reproduce themselves in their places of origin due to new working relationships and changes in the means of production. People who migrated to urban areas also brought a myriad of plant and animal species, including a whole diversity of parasites. Thus, there is a constant flow of social and biodiversity to urban areas. Cities harbor a diversity of cultures, people from diverse backgrounds, and their "urban tribes" (Pais and Blass 2004). In the same neighborhood we find different groups of people, religious, alternative and homeless people, – as well as many social movements, faith based healers, families from various socio-cultural realities. All of this forms a mosaic of urban socio-biodiversity. These different groups have different experiences and perceptions of cities conditioned by their history and ways of using space, leading to the construction of highly differentiated ecological knowledge. It is from this complex context, where different time and cultures overlap that we must seek to understand the ecological knowledge in cities.

## URBAN ETHNOECOLOGY

There are numerous definitions of ethnoecology with emphases that vary according to the approach of the researcher. For this reflection on is the nature of ethnoecology in urban spaces, we will use the concept of “broader ethnoecology” proposed by Marques, in which:

> "*Ethnoecology is the study of interactions between humankind and the rest of the ecosphere, through the pursuit of understandings, feelings, attitudes, knowledge and beliefs about the nature and characteristics of a biological species (Homo sapiens)—that being highly polymorphic, phenotypically plastic and ontogenetically dynamic”* . (2001, p 49)

For Marques, the study of ethnoecology can be described as the scientific understanding of the connections between humans and the environment. Five main connections are proposed by the author: 1) human/ mineral, 2) human/ plant, 3) human/ animal, 4) human/ human being, and 5) human/ supernatural. It is from this approach, a comprehensive ethnoecology, that we reflect on the ecological knowledge in urban areas.

The triad KCP (kosmos-corpus-praxis), proposed by Toledo (1992) can also be applied to studies of ethno-ecological city. The resident of the city builds its space and operates in its ecological environment through the knowledge they acquire in their everyday experience and through the mechanisms of transmission of knowledge. Such knowledge and practices are embedded in the collective imagination of cities, in some urban cosmology (Grange 1999), which can explain and give meaning to (dis)order of cities.

While traditional populations can generally be characterized by their direct use of natural resources and patterns of social organization based on kinship relations and oral traditions, for urban populations the scenario is quite distinct. Large cities are composed of different embedded places, and in general relations are mediated by logic of the market. The direct use of natural resources is highly limited and the feeling of belonging to a community is rare. Nevertheless, as discussed earlier, the city, while an ecosystem, has ecological dynamics of its own, and the residents of urban areas routinely construct local knowledge about this space. Therefore, the role of urban ethnoecology is to analyze and understand ecological knowledge in cities. Urban studies represent a vast field of study for ethnoecology and we can find various examples or such studies and approaches.

In regards to the human/plant connection, since the 1980s, van den Berg (1984) has conducted interesting surveys of the famous market *Ver-o-Peso*, Belém, Brazil, and points out the need for market studies that account for processes of acculturation and migration. Several other studies

in Brazil investigated the sale, use and knowledge of plants at markets and fairs (Albuquerque 1997; Azevedo and Silva 2006; Albuquerque *et al*. 2007; Maioli-Azevedo and Fonseca-Kruel 2007; Leitão *et al*. 2009), and in the periphery, especially in home gardens (Lamont *et al*. 1999; Winklerprins 2002; Vendruscolo *et al.* 2006; Lee *et al.* 2007; Emperaire and Eloy 2008; Eichemberg *et al*. 2009; Oliveira *et al*. 2010).

The term urban ethnobotany (Balick *et al*. 2000; Balick 2001) has been used by several authors to describe the investigation of relationships between humans and plants in urban areas. A significant number of studies have been conducted regarding the use of traditional medicinal plants by migrants in cities like New York and London (Balick *et al*. 2000; Ceuterick *et al*. 2008). These studies seek to comprehend how knowledge associated with a species has been retained or modified in the new environment. In *Traveling Cultures and in Plants*, Pieroni and Vandebroek (2007) compiled several studies on this topic. In fact, the study of migrants, indigenous populations in rural and even urban areas is new frontier and great possibility for the development of urban ethnoecology.

Moreover, relationships between animals and humans were investigated by Marques and Guerreiro (2007). Santos and Marques (2001) analyzed the human/animal connection, or more specifically the use of reptile species in popular fairs in the city of Feira de Santana, Bahia, Brazil. Alves and Rosa (2007) investigated the use of animal-based remedies in urban areas in the north and northeastern regions of Brazil. In Colombia, Salcedo (2002) and Tovar (2002) conducted studies on domesticated animals in urban environments, unraveling the threads of social and affective relations in which these species are embedded. Salcedo (2002) describes the complex relationships between homeless dogs in Bogota. According to the author:

> "*Speaking of stray dogs implies a relationship with human beings who inhabit the asphalt or those who are simply bystanders or users of public and private transportation... It connotes a relationship with the streets, where the dog goes, roams, and stays ... And binds equally a bodily relationship with other dogs, with urban furniture and objects from the material culture of the asphalt, which is also represented by waste/garbage, a reference to social organization that serves as shelter and food to the dog.*" (2002, p. 217)

Addressing a more loving relationship between animals and humans, Tovar (2002) examines the relationship between the world of pets and their owners, using unusual examples such as the creation of artificial pets, such as the already extinct Tamagotchi.

In addition to relations with other species, the study of the connections between urban populations and waterways and other landscape elements can also be extremely interesting (see Duarte 2006). Leite (2009), by producing a documentary, describes the various emotional and social relationships established between the population of a small village on the outskirts of Belo Horizonte, Minas Gerais, Brazil, and the streams and natural springs of this locale. Residents of this village (called "Acaba Mundo") display feelings ranging from disgust of the waterways, due to the presence of garbage and sewage, to great affection and care, perceiving the streams as a central element in the creation of their identity and important because of their multiple uses.

Besides the challenge of understanding the connections between human beings and the urban ecological environment, in recent years, there has been a marked increase in the number of discussions regarding traditional communities in cities. A number of Quilombo communities have been recognized in urban areas, such as the Quilombo dos Silva in Rio de Janeiro, and the Quilombos of Luizes, Arturos and Mangueiras, in Belo Horizonte. Also significant are indigenous populations living in urban centers; for instance the indigenous population reached 32.912 in the metropolitan region of Sao Paulo, 28.399 in Rio de Janeiro and 23.006 in Salvador (IBGE 2005).

The processes of transformation of traditional knowledge in urban areas are well exemplified by the new uses and meanings of hallucinogenic plants in these spaces. For example, Labate (2000) conducted a study on the use of Amazon drink, ayahuasca, describing not only how plants circulate in this space, but also how the knowledge associated with their preparation is inserted into new religious ritual systems. Likewise, studies on the use of plants in African-Brazilian religions, extremely widespread in urban areas, have attracted the attention of many researchers (Verger 1995; Albuquerque and Chiappeta 1997; Voeks 1997; Pacheco and Barreto 2000; Pires *et al.* 2009). In addition, the transformation of traditional practices such as "*benzeção*" (a sort of blessing or traditional ritual in healing based in Catholic, indigenous and African religious beliefs) and midwives practicing in urban areas deserve our attention. Informal conversations held with some healers in Belo Horizonte revealed the use of plants in traditional rituals and practices in contemporary therapeutic and religious practices such as *new age* and *reiki*.

Although still scarce when compared with studies of traditional populations and rural areas, existing research on ecological knowledge in cities point to the need for an ethnoecology that considers the "real" ecological context of the world marked by urban materiality.

## Hybrid knowledge and spaces

The process of economic and cultural globalization has led to a widespread dissemination of scientific knowledge under positivist thinking perspectives (Porto-Gonçalves 2006). Even in research on ethno-ecological communities living in remote areas, we find traditional knowledge influenced by new scientific information received through various sources (Alexiades 2009). Also in cities – hybrid spaces – traditional elements mingle with modern elements, as a form of resistance and reinvention of lifestyles. Ecological knowledge in the cities is marked by the reinterpretation and reinvention of traditions from modern elements.

The Green Revolution began in the year 1950, (updated more recently with the use of genetically modified organisms) and was based on the mechanization of farming practices, adoption of technological packages and the creation of large estates. The great shift caused an exponential increase in the rural exodus and consequent swelling of urban centers in Latin America. According to Porto-Gonçalves (2006), the population living in slums in the world (924 million) is greater than the population of developed countries (Canada, USA, Japan and Europe). The millions of families who arrived in the slums on the outskirts of cities brought with them traditional ecological knowledge, and thus the legacy of numerous indigenous ethnic groups and peoples of African origin merged with those of European background. Despite the difficulty of cultivating plants and the disruption of kinship based relationships, many values and practices typical of rural areas remain intact, especially in slums and peri-urban areas of large cities. In the metropolitan area of Belo Horizonte, more than 500 "congado" groups – displaying rituals based in Catholic and African religious traditions, are thought to exist. Often rural songs and games and religious rites are silenced in the opulent cities. Despite the invisibility of these practices, elements of rurality remain and are perpetuated in the cities; these practices are essential to understanding the uses and occupation of urban space, particularly in regard to what is known as "Urban Agriculture" (Santandreu *et al.* 2004; Moreira 2008; Coutinho 2010). Why do people grow and raise livestock in urban areas, despite the devaluation and marginalization of these practices? In some situations, the creation of community gardens in public spaces facilitates access to food by poor urban populations, taking into account the promotion of Food Safety and Nutrition. On the

other hand, what factors explain the number of families who, even in small spaces in apartments and shacks, grow and raise rosemary, basil, chicken, flowers and ritual plants? Why do these elements of rurality persist and endure despite the absence of traditional livelihoods? Research indicates that growing plants and animals is a reference to a way of life (that of rurality), viewed as "good" and “pure”. Rural areas, or the country, are often seen as a space where relationships are based on "strong values" in contrast to the chaos of the city (Mendras 1978; Thomas 1989). The act of planting can alleviate the brutality of the concrete space of the city.

Urban farmers maintain knowledge and practices that are little understood and researched. One central question remains: do these farmers simply reproduce knowledge that they brought with them from rural areas? Or do they already have a specific set of practices and knowledge of urban agriculture? Finally, what native seeds and plant varieties can be found in cities?

Urban Agriculture is important because the cultural knowledge of these producers can significantly contribute to the promotion of food security in urban areas, partially subverting the dependence of the flow of food from farm to city. The search for active ingredients in medicinal plants that occurs primarily in rural areas and among the peoples of the forest, can also occur in cities – in urban gardens and backyards. Man healers and midwives reside in cities and these men and women are reservoirs of knowledge and wisdom. Thus, the practices that remain in the city, as a result of the mixing of knowledge deserve ethnoecological investigation; these studies will enhance ecological knowledge and serve as a means of promoting human welfare in cities.

## Ethnoecology and topophilia

The meanings and emotional relationships with the biophysical environment, termed biophilia as proposed by Wilson (1984), and defined as the innate interest of human beings and other life processes, can also be applied to urban areas. The Chinese geographer Yi-Fu Tuan (1980) proposes the term topophilia to designate the specific manifestations of human love to place. Tuan makes an interesting distinction between space and place that will prove useful for the discussion that follows. For the author, when space is entirely kept within the family it becomes a place (Tuan 1983). Place is space experienced and referenced or the result of relationships and a sense of history. A city that used to be a strange place to a tourist slowly becomes welcoming because of his/her experience. From this experience, emerge classifications of environments according to symbolic references of the individual or community. Just as traditional communities make up categories and types of classification of species and physical elements of the environment (Alves *et al.* 2005; Bautista and Zinck 2010; Johnson and Hunn 2010), so do city dwellers. For the residents of shantytowns and slums, for example, there is a clear distinction between the asphalt and the hill. Apart from a socio-economic classification, this distinction is also based on ecological criteria. Not only does the “buying power” distinguish the asphalt from the hill, but so do the structural properties of environments: the degree of soil impermeabilization, tree density, the presence of pets in the streets, and the incidence of vector-borne diseases.

Furthermore, individuals differ in how they move through the city. For the residents of affluent neighborhoods, shanty towns, slums and peri-urban areas are for the most part experienced through the media. On the other hand, domestic workers, or other residents of the “hill” are well award of the different urban realities that exist – often going between the two extremes on a daily basis, (Kowarick 1979).

The relationship with forests and other natural elements, such as streams and rivers, also needs to be better understood by urban ethnoecology. In the case of peripheral communities living in areas prone to flooding, we would not expect their emotional relationship with the water sources to be positive. On the other hand, those who live near a spring, and are not in danger might develop a more emotional relationship with water, strengthening the collective care for the environment. A square or a particular tree can also be the object of symbolic significance for a city. Affective references are essential for the construction of ecological knowledge of urban communities.

## The construction and transmission of the ecological knowledge in urban areas

The ecological knowledge of an individual depends on his/her direct experience with the environment and of the processes of learning with other community members (Ruddle 1993). In urban areas, oral traditions and the inter-generational transmission of knowledge are limited. The lifestyle of the city makes contact and learning between the generations difficult (Simmel 1976). Thus, information received from schools and the media are more important to the construction of ecological knowledge as compared to rural and traditional populations.

Oliveira *et al.* (2010) has recently examined the effect of training people to use medicinal plants as compared to the knowledge of subjects who received their knowledge in a more traditional form. Those authors found significant differences in the relative importance of species as well as uses; these findings were attributed to the differences between systems of traditional knowledge and those trained. This study brings us interesting elements for reflection as it indicates the uncertainty of the process of reworking of knowledge in urban areas. In the example given earlier about *Grupo Semear*, one realizes that in the cities the mechanisms of transmission and construction of ecological knowledge is marked by its hybrid nature, containing local elements as well as traditional elements often reinvented. Moreover, a survey of three neighborhoods on the periphery of Belo Horizonte showed that most knowledge about medicinal plants was gained from family members (Ferreira *et al.* 2004).

The emergence of groups and social movements related to environmental issues in cities is another example of the diversity of ways that ecological knowledge is transmitted and learned by urban residents. These networks serve as privileged spaces for trade and exploitation of knowledge. In Minas Gerais, since 2004, the Metropolitan Articulation for Urban Agriculture (AMAU) has united and worked in the metropolitan area of Belo Horizonte. This organization brings together representatives from NGOs, research institutions and grassroots groups involved in the practice of urban agriculture; it is also a space for political articulation. AMAU has been dedicated to strengthening and recognizing ecological knowledge of urban farmers and to sharing and searching for new technologies for food production in the city (see Coutinho 2010).

## Ecological knowledge and urban planning

Currently there have been several initiatives to incorporate traditional ecological knowledge into biodiversity conservation programs (Huntington 2000; Becker and Ghimire 2003; Diegues and Viana 2004; Naidoo and Hill 2006; Nesheim *et al.* 2006). These discussions have been followed by debates regarding power relations between traditional and scientific knowledge (Agrawal 1995, 2004; Nadasdy 2005; Toledo and Barrera-Bassols 2008). However, the incorporation of local ecological knowledge into urban policy to date is practically inexistent. From the standpoint of sustainability, Antweiler (2004) emphasizes the need to understand local knowledge in urban areas as a way to improve the planning of cities, especially in poor countries. Starting from a case study on the intra-urban residential mobility in Indonesia, a country where urbanization is soaring, Antweiler seeks to understand how local knowledge relates to the processes of migration within the city of Makassar. In the same vein, we

might ask ourselves what makes families removed from risk areas to again return to these places. In addition to socio-economic reasons, it is necessary to examine how these groups construct knowledge in the city and how this intersects with the mechanisms of life choices.

Yli-Pelkonen and Kohl (2005) argue for the incorporation of local ecological knowledge in urban planning, based on their experiences in Finland. According to these authors, through participatory methods, it is possible to incorporate local ecological knowledge into public policies, thereby enriches scientific knowledge with city dwellers everyday ecological and historical knowledge. From the survey conducted among the various stakeholders (lay residents, naturalists, organizations, experts), the authors indicated three elements that compose local ecological knowledge:

1. Observations of local species and biotopes (patterns of nature) and their functions (natural processes), including spatial and temporal variability.

2 Single local nature entities, such as objects that are familiar and valuable to participants.

3. "Emotional matters" such as opinions, feelings, or aesthetic values that can also result in silence or hidden appreciation of local nature, or lack of appreciation.

Regarding the first element, we can also typically add urban ecological processes. For example, in a more radical sense: the flow of cars, people, goods in the city, and ecological phenomena, such as recycling of organic matter and the distribution of species in a tropical forest. Knowledge of street rhythms, distribution of markets for particular products, and the characteristics of a particular neighborhood in terms of air and noise pollution levels are part of urban ecological knowledge. The thousands of families living in areas of geological risk (i.e. on high slopes or along riverbanks) are aware of the seasonal effects of weather patterns on their homes. Paper collectors and those of other recyclable materials also know when and where to find resources and even organize these materials according to their profitability and viability in sale. These types of knowledge systems constructed by people regarding the everyday function of cities should be taken into account in political decisions. Promoting opportunities for dialogue between governments, experts and lay people could create more effective political policies and actions to increase the socio-ecological sustainability and resilience of cities (Holling 2001; Folke 2004).

In Brazil, a particular law (Medida Provisória 21.186-16/2001) was created to establish measures for the protection of traditional ecological knowledge related to biodiversity. This relatively recent phenomenon in Brazil illustrates the potential for inclusion of urban ecological knowledge in public policy. One of the groups that participated in the discussions around that law was a community group, experts in medicinal plants called *Grupo Semear*, located at the outskirts of Belo Horizonte. Most of the group members are from rural areas, but much of their knowledge about the collection and use of medicinal plants is routed in the exchange of knowledge, in part through educational courses, with healers and faith healers in various parts of the biome "Cerrado" (Brazilian Savannah). This group conducts plants extraction in urban areas of Belo Horizonte and participated actively in the development of the newly established "People's Pharmacopoeia of the Cerrado". The existence of plant collection practices in urban and peri-urban areas also has implications for the preparation of master plans of cities and for the creation of conservation units. The above example demonstrates the potential of urban ecological knowledge to contribute to the conservation of socio-biodiversity, both in rural and urban areas.

## Some topics for investigation in urban ethnoecology

Themes for ethnoecological research in the cities are as diverse as the multitude of places from which the city is constructed. Building on the main lines of inquiry for research in ethnoecology described by Reyes-Garcia and Sanz (2007) and already quoted earlier in this chapter, I present below some issues that deserve attention by researchers:

1. *Traditional practices in urban areas*: the city – the place where the modern and the old co-exist – houses a large number of religious practices and rituals of healing. Practices such as "*benzeções*" and rituals of African-Brazilian religions rely on the use of animals and vegetables, and sometimes environments, such as waterways. How do these practices fit in the biophysical constraints of the urban space? How does the process of incorporating modern elements occur in relation to the traditional knowledge of these groups?

2. *Urban socio-biodiversity*: how does biodiversity vary across urban areas according to the distribution of practices and social groups within cities?

3. *Urban cosmologies*: How do different groups (classes, urban tribes, men and women, youth and adults) perceive, use and classify space and urban biodiversity? What kinds of emotional connections do they establish to the city and how do these connections affect the ecological knowledge about the environment?

4. *Topophilia and use of space*: How do the ways in which people use space (related to social, professional, differential mobility) influence the perception of individuals on the urban ecosystem?

5. *Perception and knowledge of natural processes*: What knowledge on ecosystem processes (phenology and migration of species, climate variability and change) of urban populations currently exist? Would poor communities have a more detailed knowledge about these processes, considering their predominantly rural origin, and greater contact with natural elements as compared to urban populations?

## FINAL CONSIDERATIONS

Given the ecological and social crisis we have experienced in this millennium, in which the viability of all human projects are threatened, a growing amount of attention is being given to traditional ecological knowledge, both in academic and political spheres. Unquestionably, it takes all possible efforts to enhance and promote socioeconomic and cultural environments to enable communities and people who have inherited traditional knowledge to continue perpetuating these knowledge systems. We must go beyond a utilitarian dimension (i.e. opportunities for bioprospecting, development of new products and drugs) and avoid wasted experiments (Santos *et al.* 2005), and a fight against the homogenization of lifestyles around the world, which characterize the economic model of urban-industrial capitalism. These sentiments can be summarized as a fight against the monocultures of the mind (Shiva 2001). As Serge Moscovici (2007) warns "only what is diversification is feasible! We must rebuild the urban spaces and among urban spaces the diverse possibilities of life."

From the scientific point of view, cities are still a frontier of knowledge for ethnoecology and related fields (ethnobotany, ethnozoology, ethnoastronomy, etc.). Socio-ecological systems in cities are highly complex, since, despite a relative simplification from the standpoint of biodiversity, there is an exponential increase in the socioeconomic fabric of relationships, in which ecological knowledge are inserted. In this academic challenge, constant dialogue with other disciplines such as urban sociology, anthropology, and urban geography is key.

Also in considering the dissemination of urban lifestyles to rural and traditional communities, we must be alert to how these populations assimilate and reconstruct this new knowledge and these ideas, blending them with existing knowledge, and avoid Manichean interpretations. The arrival of electricity, the internet, television or cellular telephones does not necessarily mean the end of traditions as the only possible outcome. The way these objects of cultural power are inserted into cosmologies and local practice is not predetermined.

An image used by Milton Santos (2008a) is well suited to describe ecological knowledge in the context of a globalized world. According to the author, "The human landscape is a combination of several present times". In fact, landscape and space are always a kind of palimpsest where through accumulations and substitutions, the actions of different generations are superimposed. Space is the matrix on which the new traces will replace those past actions. It is therefore present, for past and future.

Palimpsest, ancient Greek, means scratch again. It refers to parchment or papyrus text of which was cleared to allow a new script. However, the elimination of the previous text is never complete, and this causes the most recent text always be written on what the remains of the old. Could we also say then that there is ecological knowledge, especially in urban areas, resulting in palimpsests encounters of different cultures and learning process in highly diverse socioeconomic and ecological environments? The hybrid condition of such knowledge is a sign of the richness of human experience, central to the reconstruction of utopias and reenchantment of the world. In the city, in the end, not everything is concrete.

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