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Traditional knowledge of the Brazilian Atlantic Forest: environmental history, current status, and policy challenges

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Abstract: The history of conservation of the Atlantic Forest is paradoxical. While, on the one hand, it is one of the richest and most important biomes for the conservation of planetary biodiversity, on the other hand, it is one of the world's biomes most threatened by anthropogenic erosion. In this context, the relations established between traditional human societies and the forest, as well as the ethno-knowledge it produces about biodiversity can be an important foundation for the Atlantic Forest's conservation. This work aims to summarize aspects of the Atlantic Forest's environmental history, considering the historic use of the landscape and the multiplicity of uses and traditional knowledge about vegetation from the perspectives of subsistence, economics and cultural heritage. It also addresses aspects of legal protection of this traditional knowledge and presents alternatives, mediated by environmental health and landscape ecology, for the conservation of the Atlantic Forest's biodiversity in the face of the expansion of urban areas.
Keywords: Atlantic Forest; biodiversity conservation; traditional knowledge; environmental history; natural heritage.

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Resumo: A história da conservação da Mata Atlântica é paradoxal. Se, por um lado, tem-se um dos biomas mais ricos e importantes para a conservação da biodiversidade planetária, por outro lado, tem-se um dos biomas mais ameaçados do mundo pela erosão antropogênica. Neste contexto, as relações estabelecidas entre as sociedades humanas tradicionais e a floresta, assim como o etnoconhecimento por ela produzido acerca da biodiversidade podem ser um importante alicerce para a conservação da Mata Atlântica. Este trabalho objetivou sintetizar aspectos da história ambiental da Mata Atlântica, considerando o uso histórico da paisagem e a multiplicidade de usos e saberes tradicionais sobre a vegetação nas perspectivas da subsistência, economia e do patrimônio cultural. Aborda também aspectos de proteção jurídica desse conhecimento tradicional e apresenta alternativas, mediadas pela saúde ambiental e pela ecologia da paisagem, para a conservação da biodiversidade da Mata Atlântica frente à expansão das áreas urbanas.
Palavras-chave: Floresta Atlântica; conservação da biodiversidade; conhecimento tradicional; história ambiental; patrimônio natural.

TIMELINE OF THE LANDSCAPE USE

There is a coevolutionary process between human languages – especially the exclusively oral ones – and ecosystems. Over time, people adapt to and modify the environment in the process of carving out a living, while necessarily developing specialized knowledge and ways of speaking. Language and economy are mutually constitutive: doing or even being is little different from saying. Marx and Engels (2004) argued that human language is "practical consciousness," that is, a consciousness of the sensitive-material relationships into which humans enter in the process of producing their own livelihoods. Thus, it might be argued that, by encoding productive practices and transmitting them intergenerationally, local languages function as cultural repositories shaped by and adapted to local ecosystems. Gorenflo et al. (2012) showed a significant statistical correlation between linguistic diversity and biodiversity on a global scale. They conclude that "it may be impossible to achieve large-scale conservation of species and the ecosystems that contain them without incorporating resident languages and the cultures they represent into biodiversity conservation strategies" (GORENFLO et al., 2012, p. 8037).

The Atlantic Forest is one of the planet's terrestrial biomes with the greatest biological diversity. It has about 20,000 species of plants, 850 species of birds, 370 species of amphibians and 270 species of mammals. The rate of endemism reaches 40% of the plant community. The place where Pedro Álvares Cabral landed in April 1500 and, more generally, the entire southern region of Bahia have one of the world's highest woody plant diversity levels. In just one hectare of forest (10,000 square meters, equivalent to a football field) in the Uruçucá county, researchers found 2,530 individuals with five centimeters or more DBH, belonging to 458 species and 67 families (THOMAS et al., 2008). The regional biological wealth probably stems from a relatively stable climate history. Together with a small region in Pernambuco, southern Bahia seems to have been less affected by the temperature and precipitation fluctuations that characterized the Atlantic Forest in the last ten thousand years (CARNAVAL; MORITZ, 2008).

On the eve of Cabral's landing the Atlantic Forest was home to dozens of indigenous groups whose languages, although related, differed significantly from each other (RODRIGUES, 2005). In those societies, wisdom was deposited "in the living body rather than in the book" (MIGNOLO, 2003, p. 112). Native inhabitants such as the ancient coastal Tupi organized their societies according to principles of domesticity, reciprocity, and redistribution, thus having no need for record-keeping technologies like alphabetic writing,

which was brought to their territories by the Portuguese and other early-modern Europeans (CABRAL, 2017). Myths, taxonomies, tales, and songs were poetic guides of how to identify the various species of plants and animals, how to light and control fire, how to plant and harvest, etc. "Without writing," Abram (1996, p. 120) remarked, "knowledge of the diverse properties of particular animals, plants, and places can be preserved only by being woven into *stories*, into vital tales wherein the specific characteristics of the plant, [for example], are made evident through a narrated series of events and interactions." Here is an example of a Tupinambá narrative, recorded by the French clergyman André Thevet in the 1550s:

> Sumé, a great shaman, had two children, Tamendonare and Ariconte. During an argument between the two, Tamendonare was outraged by his brother's insult and struck the ground so hard that the earth split, and a fountain started gushing water – so much water that it flooded all the land. To save themselves the two brothers went to the highest mountains along with their wives. To wait for the waters to recede, Ariconte and his wife climbed up a genipap tree. At the top of the tree, Ariconte gave a genipap fruit to his wife and told her to tear the fruit up and let it fall to the ground. That done, they concluded they could not go down just yet because the waters were still high. (THEVET, 1575, p. 914).

This myth stored knowledge about the relationship between rainfall seasonality and genipap's dispersal ecology. Probably domesticated in the Guyana region (CLEMENT et al., 2010), genipap was a tree species (*Genipa americana*) widely used by Atlantic Forest peoples to make a black dye with which the indigenes painted their bodies for adornment and ritual purposes. The rainy season coincides with the abscission of the fruit, when its density increases and its buoyancy decreases. This is the period when the fruits start to fix themselves in the soil: with decreased rainfall, the waters recede to the riverbed and the shattered fruits complete the dispersion process (CRESTANA et al., 1992). Through this kind of story, the Tupinambá made sense of their ecosystems, particularly the species that were most important for their livelihood. The mythical actions and metamorphoses were always linked to the shapes, colors, textures, sounds, and tastes of the environment and its creatures.

Since orally performed language and knowledge cannot survive without speaking communities, colonial and postcolonial depopulation bottlenecked the historical continuity of the native cultural heritage. It has been estimated that since the beginning of Portuguese colonization, the native languages of Brazil have been disappearing at a rate of two per year (COUTO, 2014). However, some virtually extinct ethnic groups have been able to reinvent themselves in a process that anthropologists call "ethnogenesis." This has been observed most often in the Northeast, the region that Europeans first occupied in Brazil. In the 1950s, there were only ten indigenous ethnicities in the region; more than forty years later, in 1994, the list had expanded to include 23 ethnic groups. Amid processes of state-led territorial reordering, newly-shaped ethnicities emerged through the recovery and resignification of their traditions (OLIVEIRA, 1998). To varying degrees, such ethnicities emerged out of biological and cultural miscegenation. Also engulfing the millions of Africans brought to Brazil as slaves between the 16th and 19th centuries, miscegenation produced an array of mixed-blood rural populations which, especially in economically peripheral regions, developed ecological knowledge-intensive livelihoods.

It is important for biodiversity conservation policies to coordinate efforts with territorial policies regarding the demarcation of reserves. The Atlantic Forest has roughly a third of the number of Indigenous Lands in the Amazon, and its total demarcated area is over 150 times smaller. Improving these numbers is key for turning the biome into what Scarano and Ceotto (2015) called a biodiversity "hopespot," a regenerative socio-ecological region that helps alleviate vulnerability to climate change. The cognitive relations between

people and biological diversity must be supported by the establishment of protected areas and territorial reserves for indigenous and other traditional populations such as *quilombolas* (descendants of marooned slaves) and *ribeirinhos* (riparian communities), thus enhancing the value of the knowledge constructed by those human groups with deep historical conviviality with local and regional ecologies.

TIMBERS AND PEOPLES: SUBSISTENCE AND CULTURAL HERITAGE

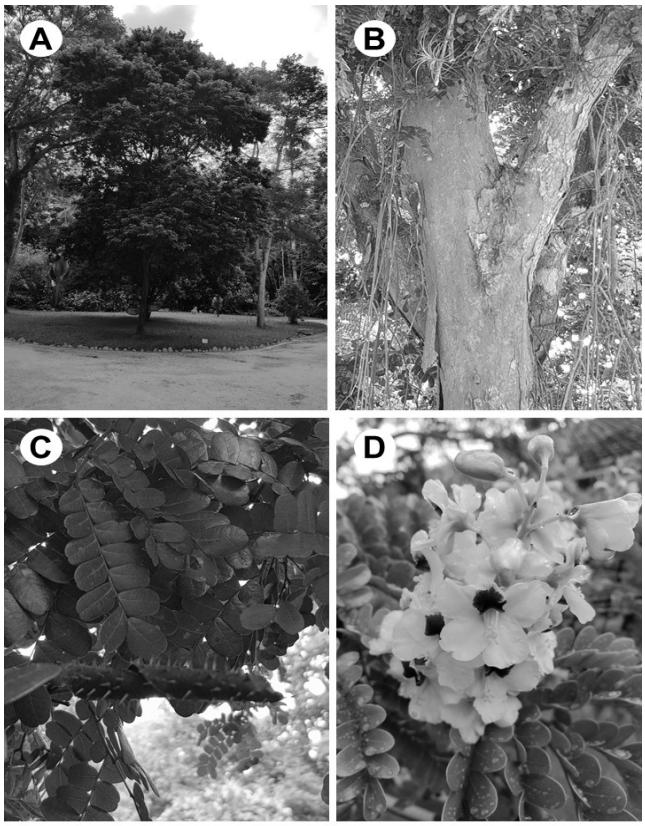
Outstanding among the multiple relationships between traditional communities (e.g. indigenous, *caiçaras*, *quilombolas*, riverside dwellers, *jangadeiros*, fishermen, *cipozeiros*, root workers etc.) and the forest is the appropriation of trees. It is estimated that the tropical Americas hold the world's greatest diversity of tree species, housing around 40 percent of all the species catalogued so far; Brazil is considered the single most biodiverse country on Earth with about 8,715 tree species (SLIK et al., 2015; BEECH et al., 2017). Considering the area covered by the Atlantic Forest, the third largest biome in the country with an original coverage of 1,350,000 km² (SOS MATA ATLÂNTICA, 2020), a large portion of Brazil's tree diversity occurs within the biome's confines. As a good deal of the traditional communities' livelihoods is the result of the appropriation of woody biomass, it is important to understand the cultural uses and meanings that these peoples attach to trees (MELO JÚNIOR, 2012).

The physical-chemical and structural properties of wood make each tree species unique, and these attributes have been explored by traditional communities over time in the process of ecological adaptation. Understanding the use of each type of wood comes not only from accumulated knowledge about the forest over the course of many generations, but also from the exchange of information between different traditional communities that encoded and decoded the forest throughout history relying on their own classification systems based on popular knowledge, generating, through trial and error attempts, a systematic base of technological knowledge that allowed them to manage the forest's resources with precision and sustainability.

The different colors, textures, scents and densities make wood extremely dynamic when it comes to applicability. The multiple uses of wood as a raw material developed and shaped the way of life of traditional communities, but also gave the forest the status of a heritage to be preserved. Studies based on the material produced using wood from the Atlantic Forest have shown a wide environmental awareness concerning its employability ranging from making simple objects such as bowls and spoons to more complex ones such as boats, carts and machinery. They also reveal an imbricated link between the materiality of heritage and the immaterial dimension present in the know-how of different human cultures.

Historical records show that trees were already considered one of Brazil's main assets by settlers due to their extensive use by indigenous populations. Because of its widespread use among indigenous peoples inhabiting the Atlantic Forest of northeastern Brazil, **ibirapitanga** (from Tupi, red wood), also called by Portuguese settlers **pau-brasil** (*Paubrasilia echinata*), constitutes the species that gave the country of Brazil its name, and it was widely used by indigenous people to manufacture bows and arrows and red dye (ROQUERO, 2002). The uses of wood by traditional communities can be grouped into distinct categories, such as: i) adornments and handicrafts; ii) dyes and pigments; iii) constructive elements; iv) machinery and tools; v) means of transportation; vi) ritual objects; and vii) household items (Figure 2). Each category comprises a significant number of tree species, which combine physical-chemical and structural characteristics conducive to its purpose.

Figure 1. Species *Paubrasilia echinata* (Fabaceae). Caption: A - tree, general view. B - detail of the red trunk. C - detail of the spinous leaves and branches. D - flower detail. (Credits: Kruel, V. S. F.).

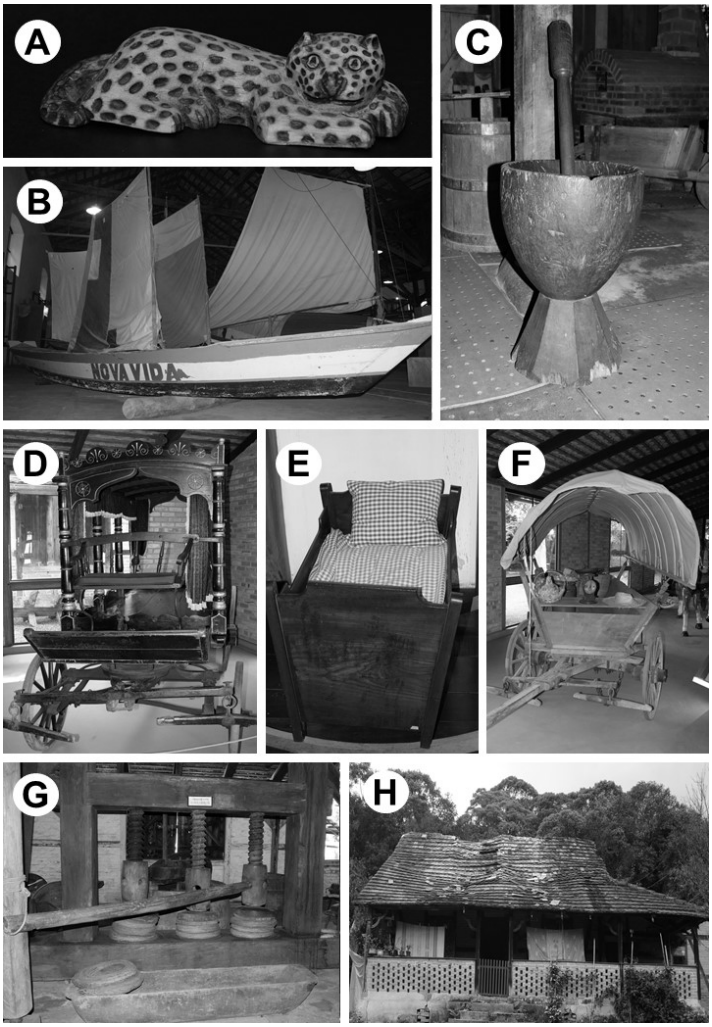


Fast-growing and low-density woods, such as **pau-mandioca** (*Didymopanax morototonii*) and **tapiá** (*Alchornia triplinervia*) woods were identified as raw materials in the manufacture of Guarani Mbya zoomorphic craftsmanship in the state of Santa Catarina, southern Brazil (MELO JÚNIOR et al., 2013). The production of construction elements, used in different types of buildings and shelters, required heavy wood, with high density and high resistance to biodeterioration and also the effects of bad weather. Wood known as **pinho** (*Aaraucaria angustifolia*), **peroba** (*Aspidosperma* sp.), **ipê** (*Handroanthus* sp.) and **cedar** (*Cedrela fissilis*) were used as structural pieces in historic buildings during the 19th century in the south of Brazil (MELO JÚNIOR; BOEGER, 2015). **Copaíba** (*Copaifera trapezifolia*) and **cinnamon** (*Ocotea* sp.) wood were used in the production of crossing paths due to muddy soils because of their great mechanical resistance (RODRIGUES; MELO JÚNIOR, 2015). Woods with physical properties similar to those used in buildings were used in the construction of machinery and tools related to the cultivation of plants for food in the same period, such as **ariribá** (*Centrolobium microchaete*), **jequitibá** (*Cariniana estrellensis*) (MELO JÚNIOR; BOEGER, 2015), **peroba** (*Aspidospema australe*), **marmeleiro** (*Dalbergia brasiliensis*), **ipê** (*Handroanthus chrysotrichus*) and **imbuia** (*Ocotea porosa*) (MELO JÚNIOR, 2017). The manufacture of means of transportation required woods with different physical and structural characteristics depending on the type of transport in question. Carts and ox carts used high density woods, such as **marmeleiro** (*Dalbergia* sp.) and **canela** (*Ocotea* sp.) (MELO JÚNIOR; BOEGER, 2015). In naval carpentry, traditional wooden boats were produced that combined resistance and buoyancy, allowing navigation in marine and river environments. **Pau-jangada** (*Apeiba tibourbou*) was used in rafts of northeastern Brazil (MELO JÚNIOR; BARROS, 2017a). Woods of **amarelinho** (*Apuleia leiocarpa*), **guaritá** (*Astronium graveolens*), **conduru** (*Brosimum gaudichaudii*), **jacarandá** (*Dalbergia nigra*), **jatob**á (*Hymenaea courbaril*), **maçaranduba** (*Manilkara dardanoi*), **aroeira** (*Myracrodruon*

urundeuva), **pau-brasil** (*Paubrasilia echinata*), **louro-rosa** (*Sextonia rubra*), **ip**ê (*Tabebuia aurea*) and **pequí** (*Terminalia glabrencens*) were used in boats in the northeastern Brazilian states of Sergipe and Alagoas (MELO JÚNIOR; BARROS, 2017b). **Pinho** (*Araucaria angustifolia*), **peroba** (*Aspidosperma* sp.), **canela** (*Ocotea / Nectandra*), **orelha-de-macaco** (*Enterolobium contortisiliquum*) and **cedro** (*Cedrela fissilis*) were used in canoes for whaling on the coast of Santa Catarina (MELO JÚNIOR; BARROS, 2017c). **Figueira-brava** (*Ficus organensis*) and **garapuvú** (*Schizolobium parahyba*) were used in canoes embroidered with a stick only intended for artisanal fishery off the coast of São Francisco do Sul, Santa Catarina (MELO JÚNIOR; BARROS, 2018). Low-cut wood, such as **cedro** species (*Cedrela odorata* and *Cedrela fissilis*), were used in the production of religious statuary (ONO et al., 1996), while **pinho** (*Aaraucaria angustifolia*) was used for household items (MELO JÚNIOR; BOEGER, 2015).

In this way, traditional knowledge involving the use of wood species from the Atlantic Forest shows not only the relationship established with biodiversity, but also the technological knowledge developed along with it.

Figure 2. Cultural goods created from wood species from the Atlantic Forest in Brazil. Photo captions: A - Guarani Mbya indigenous zoomorph; B - northeastern raft; C - pestle; D - buggy; E – cot; F - bread cart; G - flour mill; and H - German type house with half-timbered construction technique. (Credits: Melo Jr., J. C. F.).



NON-TIMBER FOREST PRODUCTS IN THE ATLANTIC FOREST: FROM SUBSISTENCE TO ECONOMIC AND CULTURAL HERITAGE PERSPECTIVE

For many centuries there has been widesprread local knowledge on the use and management of wood species from the Atlantic Forest. However, this biome still has valuable non-timber forest products (NTFPs), products managed and used by human beings, such as fruits, seeds, medicinal and ornamental plants, resins, essences, fibers, oils, honey, and wood products; and also non-logging goods (such as wood for fuel) (SHACKLETON et al., 2011). Until the 20th century, NTFPs were seen as low-income products, associated with the livelihood of the local human population, but in the 1980s/90s, it was highlighted in the context of economic development and nature conservation discussions, especially for nutrition and health value (FAO, 2013).

In the Brazilian Atlantic Forest there are NTFPs with recognized socioeconomic value both nationally and internationally, such as: **piassava** (*Attalea funifera*), a multi-purpose palm that can be found in *restinga* vegetation, whose long fiber is used for making brooms, ropes, hats, mats, and is one of the four most commercialized NTFPs in Brazil (PIMENTEL; MENEZZI, 2020). Historical reports describe the cultural heritage of the **Tupinambá and Tupiniquim** Indians as they had used piassava ropes, and navigators at the beginning of the colonization who had a preference for these ropes for mooring boats (BARRETO, 2009). In addition to fiber, the piassava fruits are used for cooking, crafting and seedlings for planting in order to recover damaged soil; *quilombola* and indigenous areas in Bahia continue to practice the traditional management of these species (PIMENTEL; MENEZZI, 2020). *Euterpe edulis* (**juçara**) is a palm tree whose heart has been extracted since centuries as food for humans. It is considered a key species of the biome, with an important ecological role, due to the high production of fruits (which ripen in the period when food is scarce in the forest), supplying food for countless species of birds and mammals (REIS et al., 2000). There are other uses, the mature stipe is used in construction, the leaves are used for temporary coverings and foraging, and from the fruits a drink can be made - **açaí** (*Euterpe oleracea*), encouraged for sustainable management (REIS et al., 2000). *Ilex paraguariensis* (**yerba mate**), a species native to the southern region of Brazil, has a great potential in the world market, as its leaves are used in the production of drugs, tinctures, cosmetics, drinks (mate tea), and its industrialization process and commercialization have risen exponentially (SEOANE et al., 2019).

As the Atlantic Forest retains a wide diversity of species, studies in the field of ethnobotany and ethnopharmacology have mainly reported species and their potential for nutrition, contributing to the issue of food safety and medicinal use (LIPPORACCI et al., 2017). Several studies highlighted native food species, present in limited areas but with potential, as functional foods and for income generation, such as Arecaceae fruits (*Astrocaryum aculeatissimum*, *Attalea dubia*, *Bactris setosa*, *Butia catarinenses*, *Euterpe edulis*), Fabaceae (*Hymenaea courbarilil*, *Inga* spp.); and Myrtaceae (*Eugenia brasiliensis* - **grumixama**; *Eugenia selloi* - **pitangubaia**; *Eugenia uniflora* - **pitanga**; *Myrciaria floribunda* - **cambui**; *Plinia cauliflora* - **jabuticaba**; *Psidium cattleyanum* - **araçá**), with records of current and past uses of native species found in fishing communities / *caiçaras*, *quilombolas* and rural areas (HANAZAKI et al., 2000; FONSECA; PEIXOTO, 2004; CHRISTO et al., 2006; PILLA; AMOROZO, 2009; CREPALDI; PEIXOTO, 2010; CARVALHO et al. 2018; SOUZA et al., 2018). Other species have emerged in studies on the importance of food and medicine, such as: *Schinus terebinthifolia* (**aroeira**), whose extracted fruits, used as a condiment, have been highly valued in national and international trade (NEVES et al., 2016) and their recognized medicinal properties in traditional medicine. They have been been scientifically validated as anti-inflammatory (ROSAS et al., 2015) and antimicrobial (SILVA et al., 2017) adding value to the species, which is already included in the Brazilian Pharmacopeia (ANVISA, 2011) and in the National List of Essential Medicines; the leaves of *Pereskia aculeata* (**ora-**

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pro-nobis), highly nutritious, were considered a non-conventional vegetable by Brazilian government and they been used in regional dishes in Minas Gerais (BRAZIL, 2010). Its leaves contain hydroxycinnamic acids and their derivatives present antioxidant activity (GARCIA et al., 2019). *Varronia curassavica* (**erva-baleeira**), the whaling herb, gave birth to the first herbal medicine developed and produced in Brazil, due to its anti-inflammatory properties (already listed in traditional medicine) (CALIXTO, 2005); and the root extract of *Piper umbellatum* (**pariparoba**) has been patented for pharmaceutical and dermocosmetic purposes, to prevent and treat cell damage caused by exposure to UV rays and the aging process (BIAVATTI et al., 2007).

TRADITIONAL KNOWLEDGE, LEGAL PROTECTION AND BRAZILIAN PUBLIC POLICY

Traditional knowledge is built from collective memories (CANDAU, 2011), passed on generationally, from its interaction with the territory, environment, biodiversity and the community. Hence the importance of public policies and protection laws in order to balance the relationship and interests on the subject of biodiversity.

An important milestone when it comes to the protection of biodiversity and associated traditional knowledge occurred in the 1990s, within the scope of the United Nations Environment Program (UNEP). Through this Program, the United Nations Conference on Environment and Development (UNCED) was held in 1992 in Rio de Janeiro. On that occasion the Biological Diversity Convention (BDC) was launched. It was the result of three (3) decades of negotiations by the movement for the "New International Economic Order" (BARBOSA, 2003). Its objectives are outlined in its art. 1, which deals with the protection of biodiversity, the sustainable uses of its components, access to genetic resources and the transfer of relevant technology (including biotechnology) and the sharing of benefits (BRAZIL, 1998).

Brazil started the implementation of these BDC commitments in two ways: a) a broad and macro policy regarding these resources; b) protective legislation for access, use and benefit sharing.

Concerning policies, in 1994, Brazil launched the National Biodiversity Program (PRONABIO) to coordinate its commitments to the BDC, which is now known as the National Commission of Biodiversity (CONABIO) (BRASIL, 2003). Among the thematic components of PRONABIO are those related to traditional knowledge linked to biodiversity and its proper approach (BRASIL, 2003, art. 3).

Another important measure was the publication of the "Guidelines and Priorities of the Action Plan for the Implementation of the National Biodiversity Policy" (PAN-Bio), in 2006. Among the plans proposed there was the fourth guideline that aimed to research the traditional knowledge of indigenous and *quilombola* peoples and other points within the biodiversity knowledge component. Such an inventory would be important to support the definition and operationalization of the benefits to be shared based on the economic exploitation of genetic resources and associated traditional knowledge (BRASIL, 2006).

The second way to implement such commitments was based on laws that mainly regulate access to genetic heritage, protection and access to associated traditional knowledge, benefit sharing and access to technology and technological transfer for conservation and use of biodiversity. This happened in 2001, through Provisional Measure 2,186, of August 23rd, 2001, reissued 16 times and enacted as a law only in 2015, through Law no. 13,123, of May 20th, 2015, which is a subject of controversy.

When it comes specifically to the subject of traditional knowledge, the current law proposes that the holders of the aforementioned knowledge have the right to participate in the decision on how access and benefit sharing originating from traditional knowledge will

be used and in which way. Other changes that have been implemented since 2015 involve the very access to genetic resources and traditional knowledge: previously authorization was required for any and all access, and now it is a simplified process; all that is needed is a registration, depending on the objectives of the access and use of biodiversity and associated traditional knowledge (BRASIL, 2015; MOREIRA; PORRO; SILVA, 2017).

Despite these changes, PRONABIO still maintained the same guidelines and action plans. However, on February 11, 2020, Decree. n. 10,235 revealed major and substantial changes involving exclusion and limiting the participation of civil society in the decision-making process of policies and action plans (BRASIL, 2020). Such changes caused the eradication of one of the most important elements concerning the strategic management of biodiversity based on the associated traditional knowledge: the participation of traditional populations in the decision-making process. This, in combination with a breakdown in the Ministry of the Environment (MMA), represents a setback and the risk of losing access to the most valuable genetic resource which is associated traditional knowledge.

STRATEGIES FOR BIODIVERSITY CONSERVATION IN THE ATLANTIC FOREST

Despite the existence of legal mechanisms for the conservation of the Atlantic Forest in all spheres of government, urban areas are expanding at an accelerated pace. It is estimated that by 2050, more than two-thirds of the world population (68%) will be living in cities. In Brazil, this percentage rises to 92.4% (UNITED NATIONS, 2019).

Part of the future urban expansion must occur in biodiversity hotspots, such as the Atlantic Forest (SETO et al., 2012), and in small and medium-sized cities, areas recognized for having low planning and management capacity, which can restrict conservation biological diversity (SCBD, 2012).

In face of the escalating urban expansion and the critical scenario of degradation and fragmentation (RIBEIRO et al., 2009), it is essential that cities located within the biome be planned and managed to assist in the conservation and restoration of biodiversity, thus helping to support the associated traditional knowledge.

With proper urban planning and management, cities can protect native forest remnants (e.g. in the form of parks, reserves, and other types of conservation units, both public and private), and increase and restore connectivity between the remaining fragments (e.g. by ecological corridors, linear parks, watercourse preservation strips, road afforestation, squares, gardens, green roofs, among other types of green infrastructures), mitigating the negative impacts of urbanization and maximizing the countless ecosystem services provided by the forest.

For that it is necessary (1) to strengthen public policies through the integration of normative instruments and mechanisms to encourage the protection and restoration of the Atlantic Forest; (2) to create an adequate administrative structure for territorial planning and management encompassing technical, human and financial resources; (3) to augment environmental surveillance and to expand participation and social control towards the construction and implementation of urban development policies, mainly from traditional populations, which have extensive knowledge about biological diversity, as well as about the environmental services it provides.

Strategies for sustaining quality of life and environmental risk prevention, driven by concerns regarding Environmental Health (EA), arise from such built-up environments where there are exploitation projects and expansion of the anthropized landscape.

In Brazil, EA is planned as a technical expertise which utilizes insights from ecology, epidemiology, sociology, among other disciplines, so as to effectively contribute to the formation of critical thinking, stimulating participation, social control, and socio-

environmental sustainability. It makes use of grassroots movements as an incentive to search for new learning tools and strategies based on dialogue and respect for differences, sharing knowledge, participative action, local planning and decision-making, socio-environmental sustainability, and social inclusion (FUNASA, 2012).

Therefore, EA is a responsive, multifaceted resource for health care and environmental care which utilizes education as an intervention strategy, meeting current needs for the production of knowledge that integrates economic, social, political, environmental, and sanitary dimensions toward development and sustainability.

This developmental stance aims not only at equity in living connections but also in those we build collectively. It recognizes the right of preservation in its cultural multiplicity, qualifying the understanding of the relations between local communities and their environments. In such a way, in the current scenario of search for dialogue, agreements, actions and empowerment, there is clear evidence of the socio-environmental complexity in which we live. Concerns over the use and degradation of the environment and future perspectives must be an integral part of the conservation of Brazil's biological and cultural heritage.

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