

Nature-Based Cities

Belém do Pará

The relationships between nature and its inhabitants

Nature-Based Cities in Belém



Belém do Pará has been chosen to host the COP 30 - World Climate Conference in 2025. The city is one of the most important state capitals in Brazil and in the Amazon, a biome that is home to 10% of the world's biodiversity and has the largest tropical forest on the planet. For the first time, an Amazonian city will host the event.

Belém's approval to host the COP and the extensive 2030 preparatory calendar made it essential for the city to develop more robust environmental commitments. In this context, the project Nature-Based Cities: Biodiversity and Climate Resilience on Urban Development (NBCities) comes to life to promote biodiversity conservation and climate action agendas within Belém's local policies.

The project is financed by the Global EbA Fund and implemented by ICLEI América do Sul in partnership with the City of Belém. NBCities provides technical support to improve the city's access to green financing, tools to develop participatory governance, and evidence-based planning, such as ecosystem services and climate change risk and vulnerability analysis. It also promotes cooperation with biodiversity-leading cities from Colombia to expand positive impacts.

This material presents the Diagnosis of Ecosystem Services Map and the Critical Climate Risk Map, which results from the Climate Risk and Vulnerabilities Analysis (ARVC) of Belém.

These maps offer the primary results of the two studies. They are based on technical evidence and knowledge exchange with local actors about the city's current scenario and should be used to complement the understanding of the technical maps.

Ecosystem Services and Climate Risk and Vulnerability Analysis for the city



The Diagnosis of Ecosystem Services (DSE) offers understanding of nature's benefits for human well-being (the Ecosystem Services), as well as of the main threats to these services in the city. Such a diagnosis contributes to creating efficient strategies against the territory challenges and for promoting equitable, resilient, and sustainable development.

On the other hand, the Climate Risk and Vulnerability Analysis (ARVC) assesses key climate risks according to the methodological guidelines of the United Nations' (UN) Intergovernmental Panel on Climate Change (IPCC). Thus, the ARVC is an important material for effective risk management and to increase long-term urban and local climate resilience capacity.

The studies' results are complementary: the areas most prone to climate risks are precisely those with the lowest Ecosystem Services contribution. The Diagnosis indicates the potential of ecosystems to strengthen local climate action. The studies' recommendations were essential in creating the Climate Action Plan of Belém, which seeks not only to mitigate environmental impacts but also to promote climate justice, social inclusion, and sustainable economic development, ensuring a more balanced and secure future for all the inhabitants of Belém.

Between the rivers and the forest



The rivers and the forest are essential for environmental balance, as well as for the quality of life, culture, and leisure of Belém's population. The forest is crucial for regulating the water cycle: it absorbs rainwater and gradually releases it into the soil; it supplies groundwater and contributes to avoiding floods. Furthermore, the trees release water vapor, which contributes to the formation of rain. They also protect rivers and lakes from soil erosion and water pollution. Thus, they help maintain water availability and environmental quality and even serve as homes for various species.

However, the forest depends on the continuity of rain for its own survival. In fact, it is a great cycle in which each element and being has its role! Therefore, it is essential to think about integrated solutions that follow nature's logic and value socio-biodiversity - this is a guiding principle of the so-called Nature-Based Solutions.



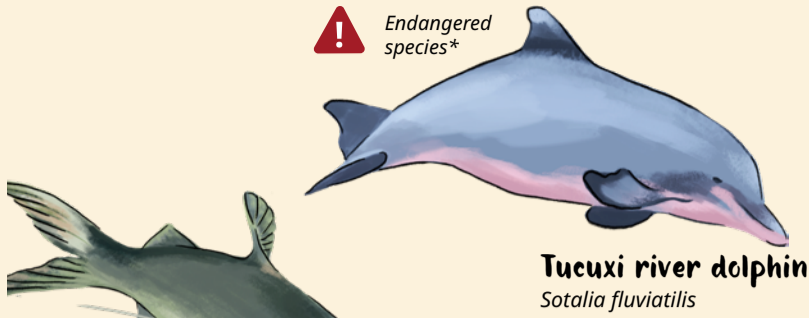
Since all organic matter from the forest goes to the rivers and decomposes in their beds, the waters in Belém have shades closer to brown. However, they are portrayed in blue in this material's maps as they follow the "cartographic convention" (rules for maps' representation) to facilitate understanding by all people anywhere in the world.

Fauna and flora of Belém

The Diagnosis of Ecosystem Services Map presents 29 species that inhabit Belém, 15 from the city's fauna and nine from its flora. These are not only ecologically but also socially relevant animals and plants.

The Piramutaba and dourada species are among the largest migratory catfish in the Amazon and are key to local fishing. There is also the agouti or cutia, which acts as a seed disperser for the chestnut tree, a relevant species in Belém's food culture. The production of açaí, another crop of immense importance for the socio-bioeconomy of the Amazon, would not be possible without the action of pollinators such as the abelha olho de vidro ("glass-eye bee"). Some species are part of the city's daily life, such as the great egret and the squirrel monkey. There's also the black vulture, sometimes unwanted but with a significant ecological role: they are true nature cleaners, contributing to carcasses elimination and the spread of diseases. There are also species that were absent from Belém for a long time that are now returning to naturally exist in the city thanks to conservation actions, such as the golden parakeet or ararajuba.

Endangered species*



Tucuxi river dolphin
Sotalia fluviatilis

Piramutaba Catfish
Brachyplatystoma vaillantii

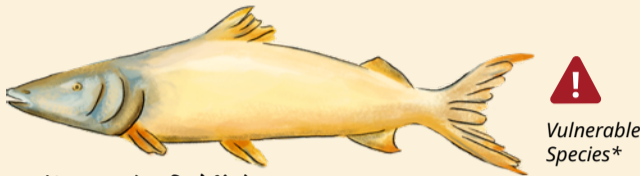


Amazon river prawn
Macrobrachium amazonicum



Embaúba
Cecropia concolor Willd

Brown-throated sloth
Bradypus variegatus



Dourada Catfish
Brachyplatystoma flavicans ou
Brachyplatystoma rousseauxii

Vulnerable Species*

Exotic Species



Mango Tree
Mangifera indica L.



Squirrel monkey
Saimiri sciureus



Anhinga
Montrichardia linifera
(Arruda) Schott



Green Anaconda
Eunectes murinus

Espécie vulnerável*

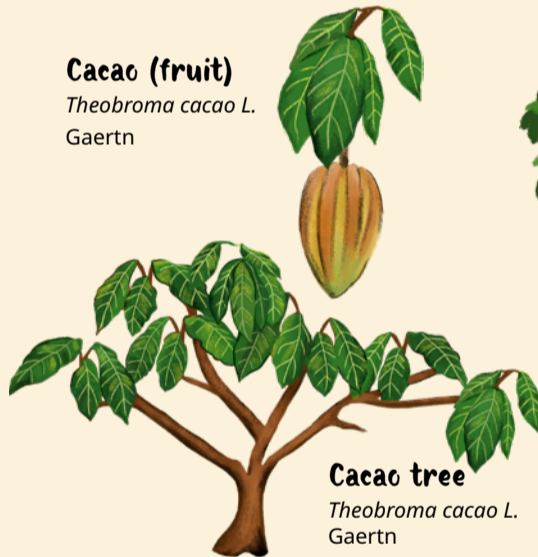


Golden parakeet
Guaruba guarouba



Agouti
Dasyprocta Leporina

Cacao (fruit)
Theobroma cacao L.
Gaertn



Cacao tree
Theobroma cacao L.
Gaertn



Brazil nut tree
Bertholletia excelsa Bonpl



Great Fruit-eating Bat
Artibeus lituratus



"Olho de vidro" bee
Trigona pallens Fabricius



Açaí tree
Euterpe oleracea Mart

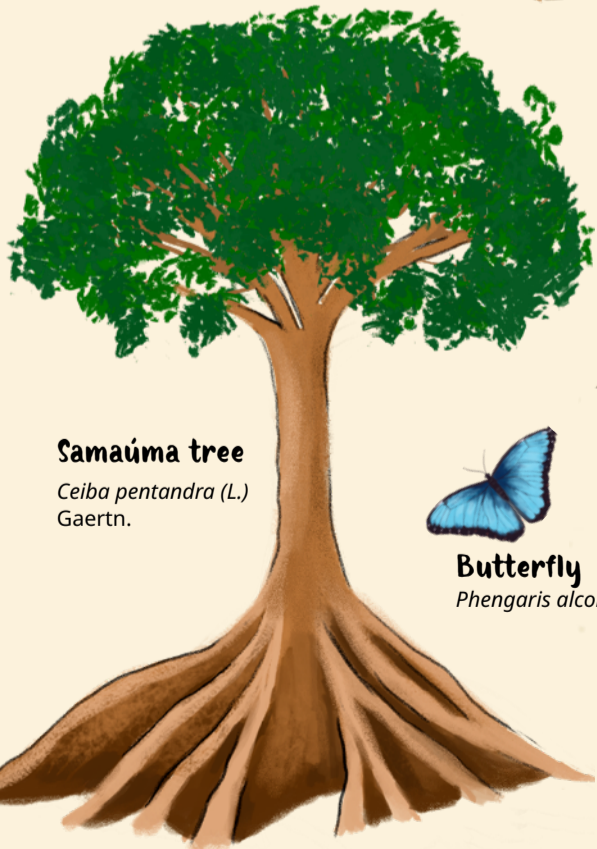
Jararaca or Common Lancehead
Bothrops atrox



Black vulture
Coragyps atratus



Curió or Chestnut-bellied seed finch
Sporophila angolensis



Samaúma tree
Ceiba pentandra (L.) Gaertn.



Butterfly
Phengaris alcon



Great White egret
Casmerodius albus



Andiroba tree
Carapa guianensis Aubl.

Biodiversity also populates the imagination and names spaces - as in the Curió-Utinga neighborhood, named after the chestnut-bellied seed finch known in Portuguese as Curió. Belém itself is known as the "City of the mango trees", although this species actually came from Asia, brought by Portuguese colonizers, unlike trees that are native to the region, such as the Brazil nut tree, the samaúma, the embaúba, and the andiroba. That is just a small sample of Belém's immense biodiversity.

Furthermore, there is a high degree of endemism - when species only occur naturally in a specific region. The Endemism Center of Belém (CEB) is one of the richest in terms of diversity in the Amazon despite being one of the most threatened, especially due to urbanization. Therefore, it is essential to advance policies and actions to put cities in harmony with nature and protect this incredible biodiversity.

*According to the IUCN Red List of Threatened Species.

CLIMATE RISK MAP FROM BELÉM DO PARÁ



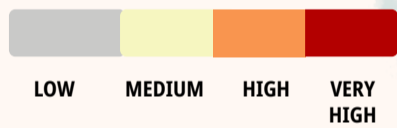
This map summarizes the risks analysis for the climate risks of flooding, coastal erosion, and heat islands phenomenon in Belém. The overlap and integration of this three-piece information indicate a critical risk, which makes it possible to identify areas where the impacts of risks accumulate. These places are seen as more vulnerable to such risks because they have less capacity for adaptation and resilience. Determining these areas broadens the perspective on strategic regions of the municipality for allocating research, policies, and resources for climate and urban adaptation actions.

MAPPED RISKS



CRITICAL RISK LEVEL

Observe the city's critical risk areas, where overlapping climate risks have been identified. The color bar indicates the risk level considering this overlap.



PREDOMINANCE OF EACH RISK IN THE NEIGHBORHOOD

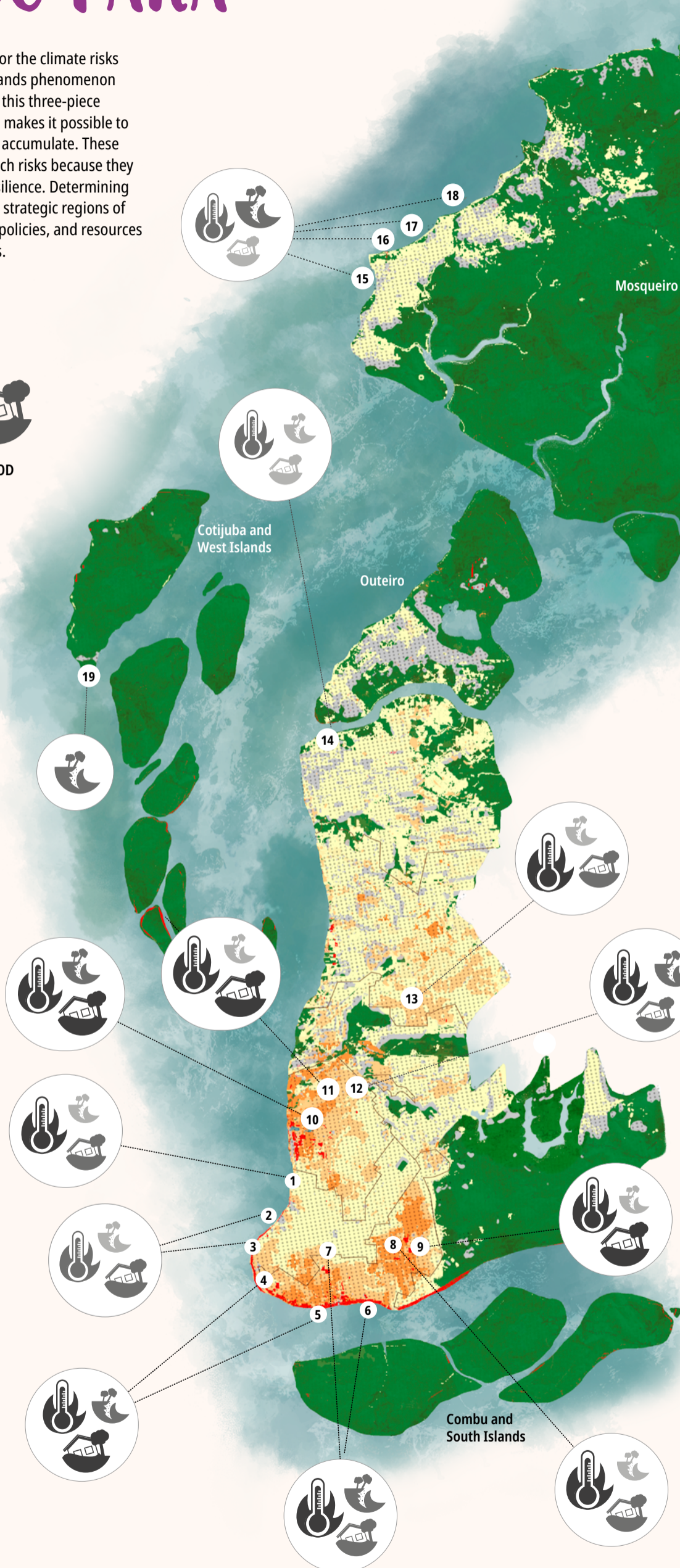


NEIGHBORHOODS

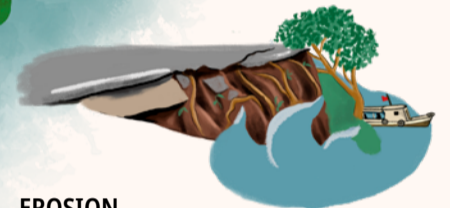
- DABEL - Administrative district of Belém:** 1. Reduto; 2. Campina; 3. Cidade Velha;
- DAGUA - Administrative district of Guamá:** 4. Jurunas; 5. Condor; 6. Guamá; 7. Cremação; 8. Canudos; 9. Terra Firme (Montese)
- DASAC - Administrative district of Sacramento:** 10. Telegráfo; 11. Barreiro; 12. Sacramento
- DABEN - Administrative district of Benguí:** 13. Benguí
- DAICO - Administrative district of Icoaraci:** 14. Ponta Grossa
- DAMOS - Administrative district of Mosqueiro:** 15. Vila; 16. Praia Grande; 17. Farol; 18. Porto Arthur
- 19. Ilha de Cotijuba

LEGEND

- Administrative limits
- Hydrography
- Vegetation
- Urban area



How it happens and the most affected neighborhoods



EROSION

Coastal erosion is the natural process of wearing away and removing sediments (such as sand, soil, and rocks) from coastal areas. It happens due to natural forces such as rain, waves, tides, and winds. This process intensifies when these forces are constantly present and when the slopes lack adequate vegetation or soil containment infrastructure, being unprotected. Erosion can also be influenced by human actions, depending on the forms of land occupation in coastal areas. In Belém, although the erosion risk does not cover large areas in length, it is a significant risk for the city's coastal areas, such as the Cidade Velha neighborhood in the Historic Center, and Porto Arthur and Farol in Mosqueiro.



HEAT ISLANDS

It is a phenomenon that occurs primarily due to urbanization patterns in densely populated areas in urban centers that did not consider the climate in their planning. These regions have a significantly higher temperature when compared to other surrounding areas, especially natural and rural areas, as they have difficulty cooling the local temperature. In Belém, neighborhoods such as Condor, Cabanagem, and Telegráfo presented a higher proportion of high and very high risk.



FLOOD

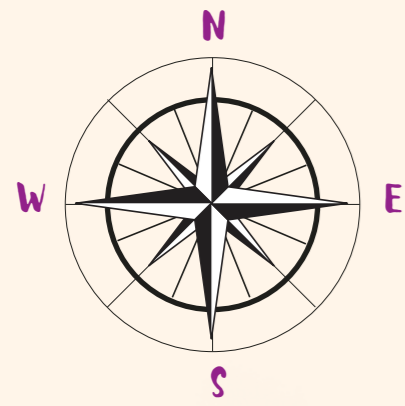
Similar to other large urban centers, Belém grew around and over bodies of water, often occupying areas naturally prone to transient floods. Now, it is known that this form of urbanization has significant consequences for the local population's lives and the city's dynamics. Climate change worsens this scenario with more frequent floods. In Belém, the neighborhoods with the highest proportion of areas at high and very high risk for flooding were Barreiro, Jurunas, and Terra Firme, which are frequently affected during the rainy season.

BELÉM DO PARÁ

The relationships between nature and its inhabitants

Every day, from waking up to sleeping, our daily life is made up of a series of relations with the nature that surrounds us. The way we work and move, where we live, how we have fun and rest, the water we drink, the air we breathe, and how we eat are part of a large ecosystem formed by the environment, and all of us, together with the fauna and flora of the city of Belém.

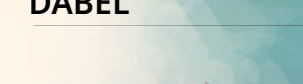
On this map, we will find a sample not only of the diversity of that ecosystem but also of the ways in which we already relate to it on a daily basis. The goal is to understand how nature preservation and original and traditional community appreciation can contribute to the well-being of all forms of life.



COTIJUBA AND WEST ISLANDS



DABEL



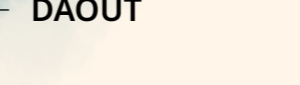
DAGUA



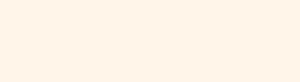
DAMOS



DAOUT



DAICO



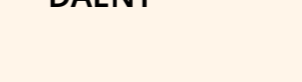
DABEN



DASAC



DAENT



COMBU AND NEARBY ISLANDS



Ecosystem Services: The benefits of nature for people



Supply of food and raw materials

Forests and rivers provide the necessary conditions for food production, raw materials, medicines, and other essential elements for the maintenance of life. In Belém, agro-extractivism, the close relationship between agriculture, especially family farming, and extractive practices, is a form of sustenance and way of life for many families, especially on the islands of Cotijuba, Ilha Grande, Murutura and Combu. Artisanal fishing is an activity of great importance for the city and is also part of the ribeirinho (riverside population) way of life.



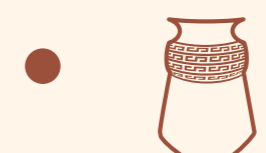
Medicinal plants

In Belém, ancestral knowledge is born from the intimate relationship between its inhabitants and its rivers and forests. This connection is reflected in the use of medicinal herbs, which are commercialized and represent a means of support for families in the urban, quilombola, and ribeirinho areas of the region. They are used to treat various diseases, as practiced by elderly women who use their fingers wrapped in cotton, honey, and andiroba to heal throats. Furthermore, whoever goes to Ver-o-Peso Market, an important commercial and cultural venue in the city, is certainly familiar with the medicinal product stores located next to the Meat Market and the herbal stalls with plants, roots, ointments, and scent baths prepared for any and all illnesses.



Physical and mental health

Green areas offer different benefits for physical and mental health. They reduce noise pollution, mitigate heat, and retain pollutants, contributing to more breathable air and a more pleasant environment. They can provide rest and relaxation, reduce stress, and also encourage a more active and healthy lifestyle. Utinga State Park, for example, is a space where the population can enjoy exuberant nature while practicing sports such as cycling, hiking, and canoeing.



Cultural heritage, social and spiritual relationships

In Belém, the rivers and the city coastline are related not only to socially strengthening leisure activities but also to the ribeirinho culture and African-based religious practices. Círio de Nazaré is the biggest religious and popular festival in Belém, yet another demonstration that Amazonian biodiversity has a strong presence in the local popular imagination. Legend has it that the Boituna snake lies dormant beneath the city, with its extremities in the direction of the two churches that mark the beginning and end of the Círio procession.



Ecotourism

Living in natural environments alongside local communities can raise awareness about the importance of conserving and valuing socio-biodiversity for forests and all forms of life protection. Furthermore, Ecotourism also offers opportunities to strengthen local nature-based development. The Bosque Rodrigues Alves is a piece of the Amazon rainforest in the middle of the city and is known for its ability to create affective memories among children. The Utinga Park and the islands of Combu and Mosqueiro offer tours and trails through the forest for those who enjoy natural landscape immersions.



Water regulation

Rivers, mangroves, floodplains, and forests play crucial roles in water supply and regulation. The soil's ability to retain water is fundamental for all forms of life maintenance. It reduces the risk of droughts and desertification, influences precipitation cycles, helps filter pollutants, and promotes natural river purification. The Conservation Units of the Mosqueiro Municipal Park and the Utinga State Park are Belém's most preserved areas and, as such, offer the greatest contributions to water regulation.

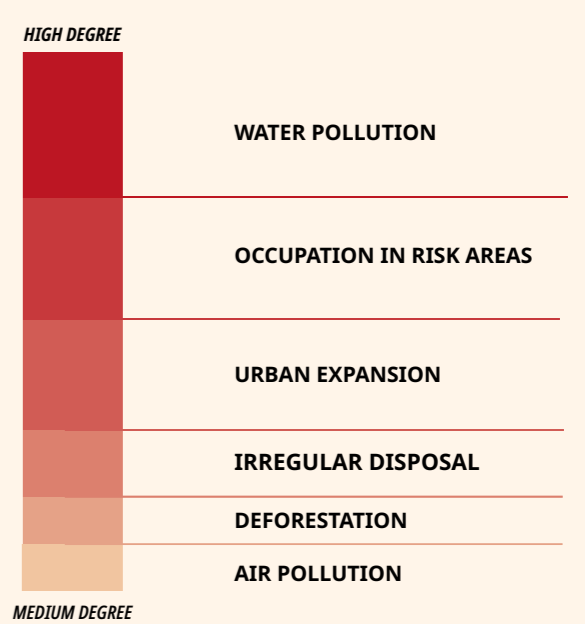


Climate regulation

The feeling that some neighborhoods are hotter than others is directly linked to how forested different regions are. This happens because very green areas contribute to improving local cooling capacity, making temperatures milder. The Bosque Rodrigues Alves, for example, plays this role. Furthermore, natural environments such as forests, mangroves, and water bodies capture and store the atmosphere's carbon dioxide (CO₂), reducing global climate change. The forest areas of Mosqueiro and Combu Islands contribute to this.

MAIN THREATS

Locate the threats and the importance of each one in the context of the city, according to the color scale below:



LEGEND

- Limit of Administrative Districts
- Urbanized Area
- Dense vegetation
- Hydrography
- Water supply area
- Low buildings with open spaces
- Compact low buildings
- Protected area
- Ecosystem services' occurrence

Important city venues by Administrative Districts

- DABEL - ADMINISTRATIVE DISTRICT OF BELÉM**
 - Bosque Rodrigues Alves
 - Museu Emílio Goeldi
 - Nazaré's Basilica
 - República Square
 - Ver-o-Rio
 - Estação das Docas
 - Ver-o-Peso market
 - Forte do presépio
 - Sé Church
 - Mangal das Garças
 - Batista Campos Square
- DAGUA - ADMINISTRATIVE DISTRICT OF GUAMÁ**
 - Portal da Amazônia
 - Ruy Barata Waterway Terminal
- DAENT - ADMINISTRATIVE DISTRICT OF ENTRONCAMENTO**
 - Utinga State Park
 - Gunnar Vingren Ecological Park
- DAICO - ADMINISTRATIVE DISTRICT OF ICOARACI**
 - Waterway Terminal
 - Paracuri craft fair
- DAOUT - ADMINISTRATIVE DISTRICT OF OUTEIRO**
 - Praia Grande (Beach)
- DAMOS - ADMINISTRATIVE DISTRICT OF MOSQUEIRO**
 - São Pedro Island
 - Caruani Island
 - Paquetá Island
 - Mirim Island
 - Urubuoca Island
 - Jararquinha Island
 - Longa Island
 - Barra Island
- COTIJUBA AND WEST ISLANDS**
 - Poeta Antônio Tavernard Waterway Terminal
 - Juruba Island
 - Paquetá Island
 - Mirim Island
 - Urubuoca Island
 - Jararquinha Island
 - Longa Island
 - Barra Island
- COMBU AND NEARBY ISLANDS**
 - Combu Island
 - Murucutu Island
 - Grande Island

ICLEI - Local Governments for Sustainability

A global network of more than 2,500 local and regional governments committed to sustainable urban development. Active in more than 125 countries in South America, the ICLEI network connects members from eight countries in the region to this global movement. We influence sustainability policies and drive local actions for low-carbon, nature-based, equitable, resilient, and circular development.

The City of Belém

The technical staff of The City of Belém collaborated with the project, with direct support from the General Planning and Management Coordination Secretariat, Municipal Environment Secretariat, Municipal Forum on Climate Change, and Civil Defense. Furthermore, had the collaboration of city partners such as the Herbario HF Prof^a. Normélia Vasconcelos from the Federal University of Pará (UFPA), the Federal Rural University of the Amazon (UFRA) and the Museu Paraense Emílio Goeldi.

Global EbA Fund

The fund, focused on Ecosystem-based Adaptation, is financed by the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), and co-managed by the Union International for Nature Conservation (IUCN) and partners.

Financing



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Implementation



Acknowledgements

