ECOSSISTEM SERVICES AND HUMAN - WELL BEING IN THE SÃO PAULO CITY GREEN BELT BIOSPHERE RESERVE

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INTRODUCTION

- Cities are one of the global main social phenomena. Half of the world's population and over 80% of Brazilian's inhabitants live in cities, which are both drivers and victims of environmental degradation, compromising ecosystems and their services.
- The São Paulo City Green Belt Biosphere Reserve – GBBR – is the biggest UNESCO biosphere reserve in an urban context, encompassing 78 municipalities.
- The São Paulo Green Belt Sub-global Assessment seeks to bring to the knowledge of society and decision-makers the extent to which São Paulo megalopolis depends on its surrounding ecosystems to ensure the well-being of 24 million people and the economic health of a region that produces 18,4% of the Brazilian GDP.
- The São Paulo Green Belt Sub-global Assessment is in the process of publishing the book "Ecosystem Services and Human Well-Being in the São Paulo City Green Belt Biosphere Reserve", which involved 70 researchers from 35 institutions. Below are some of the main messages concerning 11 ecosystem services preliminarily assessed.

Caipira* Folklore

- The ecosystems provide cultural services to the caipira traditional communities, expressed by their folkloristic cultural rituals. The caipira traditional culture was once present throughout the GBBR.
- The folkloristic cultural rituals are represented by the manufacture of artifacts/tools, rites, myths, cooking and religiosity, all influenced by the features of their natural environment.
- The dynamics of urban-industrial society nearly extinguished the natural and cultural caipira heritage around São Paulo.
- Deforestation, urbanization, infrastructure development, intensive agriculture and the creation of protected areas are the main drivers for the decrease of natural ecological and traditional agricultural systems in the Green Belt.

*Caipira is a traditional community in the GBBR

Sustainable Tourism

- The Green Belt urban and peri-urban ecosystems boast expressive biodiversity and scenic beauty and are host to leisure and tourism sites that provide the living means to local populations, rest and health to visitors and educational opportunities to all involved.
- The GBBR is of large potential to sustainable tourism modalities like ecotourism, rural tourism and adventure tourism, that depend on the existence and conservation of natural ecosystems.
- Just 4 of the 78 GBBR municipalities do not hold potential for eco, rural or adventure tourism;
- In 2008, the "São Paulo Trails" Program was set up to stimulate visitation to 40 trails spread over 19 protected areas in 23 cities of the State of São Paulo; 9 of those trails are in the GBBR. Besides, a number of tourism circuits with natural, cultural and historical features take place in the GBBR area.

Food

- Food provisioning ecosystem service in São Paulo Green Belt can be defined as urban and periurban agriculture (vegetables, fruits, poultry and cattle raising inside and around the cities).
- Agriculture is directly associated with human well-being, ensuring food and nutritional safety that impact people´s health conditions.
- The São Paulo City Green Belt Biosphere Reserve use and cover is host to natural vegetation (32%), pastures (32%), temporary cultivation (24%) and permanent cultivation (12%). Agricultural production is diversified and basically supplies the regional internal market.
- Generally speaking, the São Paulo Green Belt agricultural water use is inefficient and generates soil erosion and contamination by inadequate use of pesticides and fertilizers.

Forestry

- Brazil is a leading forestry country, with significant contribution to the world's pulp and paper market; besides, Brazilian forestry is relevant for timber, fiber boards, firewood and charcoal production;
- Foresty cover with exotic species for commercial purpuses (mainly Eucalyptus spp and Pinus spp) in São Paulo Green Belt sums up 120 thousand hectares or 6.6% of its surface;
- While commercial forestry may have impacts on biodiversity and the landscape, it generates important ecosystem services like soil and water conservation, ecological corridors and storage of some 23 million tons of CO2 equivalent;
- Land speculation poses enormous pressure on forestry lands. Hypotetically, if all forestry areas were replaced by urban uses, the Green Belt urban areas would grow by 50%.

Biochemicals, Pharmaceutical Products and Natural Medicines

- Medicinal plants market generates US$ 25 billion / year globally (2008); in Brazil, estimates are around US$ 160 million / year
- The São Paulo Green Belt Biosphere Reserve has a total of 2.256 plant species (BIOTA-FAPESP). Out of those, preliminary surveys indicate that 277 plants are source to biochemicals, natural medicines and pharmaceutical products
- From those 277 plants, 20 integrate the list containing 74 medicinal plants adopted by the National Health System (2006

Fresh Water and Human Well-Being

- The water basins in the São Paulo City Green Belt Biosphere Reserve (GBBR) are ranked "critical" or "very critical" considering the relationship between water availability and demand.
- The central water basin in the GBBR, Alto Tietê, with 19 million inhabitants and a density of 10,232 inhabitants/Km2, is the most critical in Brazil, with demand exceeding availability in 100%.
- The water availability in this basin is 200m3/people/year, way behind the World Organization Health critical index of 1,500 m3/people/year..

Landslide, silting and flood regulation

- Forest conservation is an utmost factor for natural disasters risk reduction in São Paulo Green Belt, especially in hilly areas; official data report 423 flood events and 176 landslides events in the Green Belt municipalities in the 2000-2008 period;
- Elimination of ecosystem regulation features implies in human well-being decrease (increase in deaths and diseases, decrease in water dams storage capability).

Co2 Sequestration and storage

- Carbon storage in the Green Belt vegetation is approximately 450 million tons of CO2 equivalent; this nearly matches one decade of fossil fuel CO2 emissions of the whole São Paulo State, the most industrialized and populated state in Brazil with 42 million inhabitants;
- Annual vegetation regeneration and growth in the Green Belt territory surmounts 28 million tons of CO2 equivalent, which corresponds to 36% of São Paulo States' yearly fossil fuel emissions.

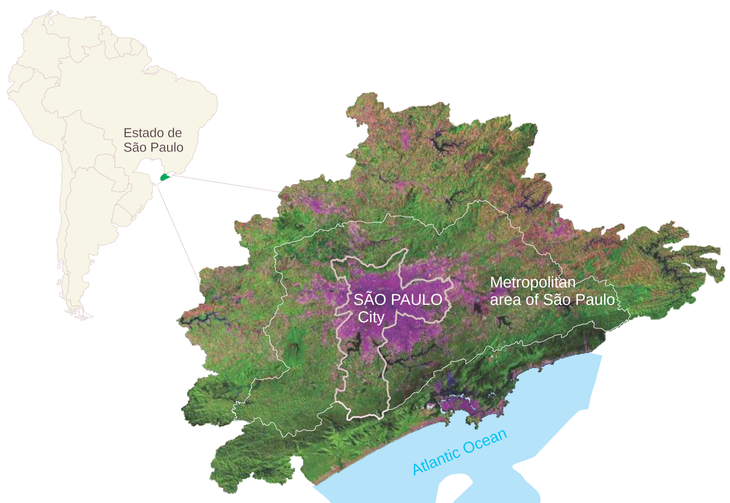
Air quality regulation

- Air pollution became one of the main environmental and public health problems in cities.
- Studies around the globe demonstrate that urban trees and forests can reduce air pollution by between 1% and 70%.
- Vegetation density in cites directly influence people's quality of life due to the reduction in particulate matter and ozone, one of the main causes of cardiorespiratory and lung cancer deaths.
- A research project conducted in 5 urban parks within São Paulo City, using tree barks as biomonitors, demonstrated that there was higher pollutant concentration in the park borders than in their cores, showing the trees role in reducing gases and particulate matters.
- The Green Belt is potentially beneficial to people's health, but green areas in the urban core must increase to allow this ecosystem service have more remarkable impacts on air quality.

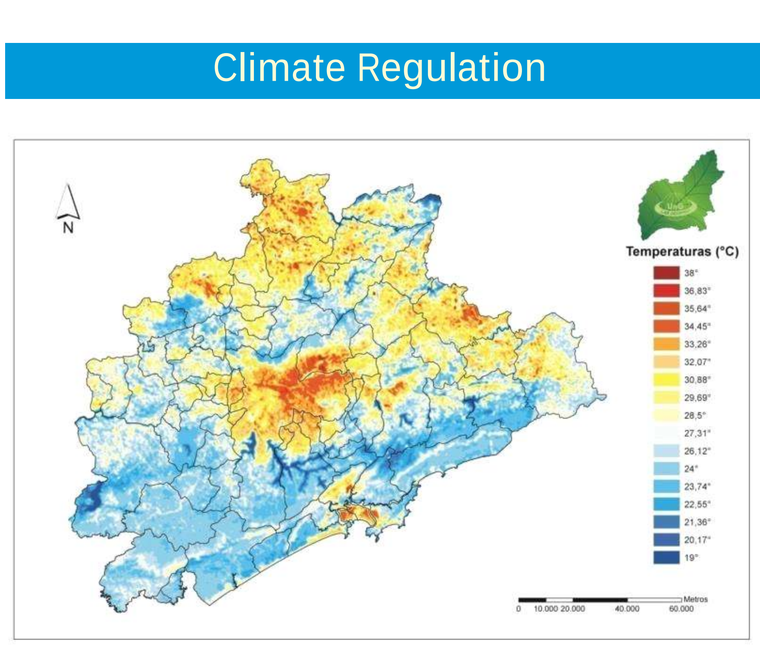
Climate Regulation

- Urbanization in São Paulo altered the drainage network, water cycle and air circulation.
- Degradation, decrease and depletion of natural ecosystems caused the environment to lose its capability to provide ecosystem benefits.
- In the last 75 years the average air temperature in São Paulo City raised 2.1ºC, whereas the planet's raised o.5ºC. In the same period, air humidity decreased by 7%, rainfall raised by 400 mm, wind intensity decreased, daily sunshine hours increased, drizzle decreased and air temperature minimumsincreased.
- In the last years, the combination of urban heat islands and the sea breeze caused 65% of the flood events, which also produce storms with more rainfall, strong winds and electrical discharges over the metro area.
- In the last decades, water vapor in the city decreased due to elimination of urban green areas.
- Areas with higher vegetation density can be 2,14ºC cooler than those with less tree cover, showing the vegetation's role in decreasing solar radiation and altering microclimate.

São Paulo City Green Belt Biosphere Reserve



Climate Regulation



Biodiversity

- The high biological diversity in the GBBR and its contribution to ecosystem services results from habitat conservation, the efficiency of the fauna-flora interactions and the control of the drivers of change that threaten these ecosystems.
- In the GBBR, vegetation types belong to the Atlantic Forest biome and include evergreen rainforests, semi-deciduous seasonal forests, restinga (offshore sandbank vegetation) and mangroves. Savanna enclaves also occur in some areas.
- There are 41,000 plant and fungi species catalogued in Brazil, of which 46.2% are endemic to the country. These account for just 55-65% of the estimated total species. The Atlantic Forest biome is the richest one with around 20,000 species, including many locally endangered.
- The terrestrial vertebrate fauna in the GBBR is rich, corresponding to 58% of the terrestrial São Paulo State's, presenting many endemic and endangered species.
- Endangered terrestrial vertebrate fauna in the GBBR represent 38% of the State's. 68% of the GBBR endemic species are considered endangered.
- The main drivers posing pressure on the GBBR's terrestrial endangered species are habitat loss and degradation, poaching, fishing, illegal collection of species and invasive alien species.

Economic-ecological valuation

- Economic-ecological valuation has been applied to a number of ecosystem services throughout the country, including in the GBBR.
- Payment per Ecosystem Services – PES – schemes are increasing steadily in Brazil, despite the lack of a national regulatory framework.
- PES are recognized and incentivized by both the national and São Paulo State's Climate Change legislations. TEEB - "The Economics of Ecosystems and Biodiversity" – processes are also taking place at both scales.
- Other PES modalities are adopted by São Paulo State, like the "Ecological Tax", through which the State remunerates municipalities that are host to state protected areas; other modalities remunerate private land owners for conserving biodiversity and water resources.

Reserva da Biosfera do Cinturão Verde da Cidade de São Paulo
São Paulo City Green Belt Biosphere Reserve