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SUMMARY FOR POLICYMAKERS

ENVIRONMENTAL POWER OF BIODIVERSITY:
AN INNOVATIVE PATH FOR BRAZIL

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ABOUT THE SUMMARY FOR POLICYMAKERS

This summary for policymakers (SPM) objectively summarizes the Thematic Assessment “Environmental Power of Biodiversity: an innovative path for Brazil,” a joint enterprise of the Brazilian Panel on Climate Change (PBMC, in Portuguese) and the Brazilian Platform on Biodiversity and Ecosystem Services (BPBES)¹. The Assessment analyzes scientific literature, especially from the Fifth Assessment Report of IPCC, the reports of the PBMC², the IPBES and the BPBES on the impacts on biodiversity and Brazilian ecosystems and the resulting socioecological vulnerability. Furthermore, from the revision of strategies and actions of mitigation and Ecosystem-based adaptations to climate change, this Assessment discusses proposed innovative pathways to sustainable development for the country.

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1. www.bpb.es.net.br

2. www.pbmc.coppe.ufrj.br

3. Ministry of Science, Technology, Innovations and Communications

4. www.fundacaogrupoboticario.org.br

5. www.biota.org.br

1. CONTEXT

- The direction taken by the interaction among biodiversity, climate and socioeconomic development will change over time, in a manner either more or less favorable to Brazilian society, depending on the rate of transformation of the current development model into a more sustainable model. The sustainable model demands the incorporation of the conservation of and sustainable use of biodiversity as a central part of the socioeconomic development process. The persistence of a business-as-usual scenario, where the country continues to develop based on power originating from fossil fuels, with continuous expansion of farming on our biomes, without taking any measures to adapt to climate change, will imply the decline of natural systems of life support, acceleration of climate change and negative impacts on human well-being.

- In a 'business-as-usual' scenario of emission of greenhouse gases, by 2070 there is a 90% probability of a temperature increase of 3-4°C, which can grow even larger by the end of the century in Brazil. The temperature increase, associated with changes in rain distribution can cause large changes in the distribution and functioning of Brazilian biomes. For example, in Amazonia, there is a potential for savanization as a consequence of droughts and temperature increases of up to 4-6 °C in an RCP8.5 scenario by 2100.

- Brazil has an important role globally in relation to the biodiversity-climate-development nexus, but it shows conflicting positive and negative indicators. On one hand, the country counts on the large extents of its protected areas, a good framework of policies and plans for conservation and adaptation to climate change, and relative success in the reduction of deforestation rates in Amazonia in the recent past. On the other hand, the country shows alarming figures relating to climate change, including rates of deforestation that are increasing again in Amazonia and very high deforestation rates in the Cerrado biome, each with its corresponding impacts on sustainability.

2. CATAclysms AND RISKS: IMPACT AND VULNERABILITY

- Climate change in Brazil may lead to irreversible damage to species and ecosystems, reducing their capacity to provide human systems with goods and services and jeopardizing the well-being of Brazilians

in the coming decades. Healthy ecosystems are fundamental to mitigating the negative impact of climate change on nature and to assuring human well-being. The effects of climate change on biodiversity have also been associated with loss of services provided by the ecosystem. Biomes, ecosystems and species frequently have economic and cultural importance for society, and assure our life style and wellness. Risks include reduction in agricultural production, reduction in fish stocks, increases in the occurrence of diseases previously restricted to specific regions, and water shortages, among others.

- **Temperature increases, alterations in periods of drought and of precipitation and increases of consecutive dry days are examples of impacts that impose risks on biodiversity and on human populations and that are becoming more frequent in Brazil.** These impacts, especially when associated with the transformation of natural environments by our societies, can cause, and have already caused irreversible damage and losses. In coming years, an increase in potential impacts of climate change on biodiversity is expected, bringing direct and indirect consequences for human well-being, and especially for the vulnerability of the poor.

- **The reduction/displacement of areas occupied by species are the most studied and predicted results of the impacts of climate change.** Such responses may have consequences that include the increase of disease vectors, as well as impacts on food production in the country.

- **All Brazilian biomes are vulnerable to climate changes, especially those with less native cover, or those already impacted by human action, or having a scarcity of protected areas.** The expansion of the network of protected areas, restoration of degraded environments and monitoring of biodiversity responses are mid-range actions potentially efficacious in mitigating the effects of climate changes. For the immediate future, the tools and institutions dedicated to identification of risk have a fundamental role in protecting anthropic systems against the increase in the occurrence of natural disasters.

- **Ecosystems such as high-altitude fields, aquatic ecosystems, wetlands, coastal areas and urban areas, are particularly sensitive to climate change.** The effects of climate change on coastal ecosystems

BIODIVERSITY, CLIMATE & DEVELOPMENT

include impacts on the coastal dynamics, such as erosion and floods. Biodiversity in high-altitude environments is sensitive to temperature increases. Urban ecosystems are among the most vulnerable due to the general reduction of natural cover, both inside urban centers and on the outskirts. The recent impacts on the water supply of large cities such as Rio de Janeiro and São Paulo are possibly related to a synergy between loss of vegetation cover and climate change. In scenarios of more severe climate change (scenarios RCP 6.0 and 8.5), marine biodiversity will be affected more significantly than that estimated for the period between the last glacial maximum and the present period.

- **Among the taxonomic groups, endemic species, or those more sensitive to alterations in climate variables, are already suffering the impacts and consequences of climate change.** Some invertebrates, amphibians, and specific groups of birds, mammals, plants and species already threatened in general, are particularly vulnerable to climate change. For example, mammals may face high exposure to climate changes, and protected areas of Amazonia will probably not be sufficient to prevent these impacts. In this biome, 85% of species are susceptible to being exposed to non-analogous climates in over 80% of their area of distribution by 2070. Moreover, climate change also impacts the growth and productivity of plants, which affects the ecosystem's natural functioning, food chains, oxygen supply and food and energy production.

3. HOPE AND ACTIONS: MITIGATION AND ECOSYSTEM-BASED ADAPTATION

- **Protected natural ecosystems make biodiversity and society more resilient to the impacts of climate change and present more capacity for resistance and recovery when affected by extreme climate situations.** Natural ecosystems and biodiversity contribute significantly to mitigation and adaptation to climate change, besides providing a wide range of benefits upon which people depend – ecosystem services. Despite this preponderant role, studies relating climate change to adaptation alternatives based on natural ecosystems in Brazil are still scarce.
- **The main mitigation options related to land use that have a positive effect on biodiversity are the reduction of deforestation, forest mana-**

gement, reforestation and forest restoration. This finding is based on sources of emission of greenhouse gases (GHG) that are presently enumerated in the Brazilian inventory of emissions of GHG. These options are directly linked to land management strategies and policies, where the variety of uses and soil types determines mitigation opportunities. Reduction of deforestation may be associated both with strategies promoting the reduction of factors putting pressure on forests, and also with opportunities resulting from biodiversity protection or sustainable exploitation of forest resources. In area of realization of forest economic value, the strengthening of supply chains that make sustainable use of biodiversity is key to increasing the resilience of these territories.

- **The adaptation to climate change based on ecosystems, or Ecosystem-based Adaptation (EbA), has an enormous unfulfilled potential to combat climate change and at the same time stimulate sustainable development in Brazil.** This strategy, seen in the National Plan of Adaptation to Climate change, is in its initial phase in Brazil. It has the potential to reconcile preservation of nature with reduction of poverty, while combatting climate change. Well-managed ecosystems have greater adaptation potential, resisting and recovering more easily from the impacts of extreme climate events, besides providing a larger range of ecosystem services upon which people depend.

- **International commitments signed by the country and supported by national policies and legislation have potential value for mitigation and adaptation based on nature, if effectively implemented.** The Paris Agreement (UNFCCC), the Aichi Targets (CBD), and the Sustainable Development Goals (SDG) are nationally well- anchored in policies and laws such as the Law of Native Vegetation Protection, the National System of Conservation Units, the National Plan of Adaptation to Climate Change and the National Plan of Native Vegetation Restoration. Taken together, these several mechanisms provide robust legal and political support to what, if appropriately applied, could probably be the greatest program of Ecosystem-based Adaptation in the world.

CLIMATE CHANGE IMPACTS

AMAZON

85% of species can be affected

SAVANIZATION
and fire increase

FRAGILE
regeneration capacity

CHANGE in forest
DYNAMICS
and **DIVERSITY**

CAATINGA

High **SOCIAL VULNERABILITY**

SCARCE protected areas

FRAGILE regeneration capacity

CERRADO

VULNERABILITY
due to the high land use conversion

KEY SPECIES
displacement to the South of Brazil

Decrease in
NATIVE SPECIES
distribution

ATLANTIC FOREST

High vulnerability to
EXOTIC SPECIES INVASION

LAND USE CHANGE
intensification

Increase in the cost of
WATER TREATMENT

Human losses associated with
EXTREME CLIMATE EVENTS

PAMPA

Increase in
EXTREME RAINS
and **FLOODS**

REDUCTION
of "Campos Sulinos"

PANTANAL

Change in the
FLOOD regime

Change in the distribution of
LOCAL ECOSYSTEMS

BRAZIL

90% chance of
TEMPERATURE INCREASE from
3-4°C by 2070

Change in the
DISTRIBUTION
of terrestrial and marine
SPECIES

52% of municipalities will suffer
from **FLOODS**
and **LANDSLIDES**

Protected areas will be
unable to stop the
SPECIES EXTINCTION

The **LOSS OF POLLINATORS**
will compromise **100%**
of crop production

4. ENVIRONMENTAL POWER OF BIODIVERSITY: AN INNOVATIVE PATH FOR BRAZIL

- **Despite the good base of existing global agreements and national policies, what is still predominant in Brazil is the sectoral drawing of environmental policies (e.g. biodiversity policies and climate policies) and development policies (e.g. agriculture, energy, cities), which frequently do not dialogue.** Cases of policies that do reconcile concerns about pro-environment bias with the interests of productive sectors, as in the case of livestock farming, as well as in some of the examples shown in, can also inspire integration with other sectors.
- **To integrate sectoral policies, or at least to create policy mixes combining environmental policies with developmental policies** will therefore be essential to building a more sustainable development trajectory. Actions of Ecosystem-based Adaptation, previously mentioned, may result from policy mixes or integrated policy designs.
- **The risks of biodiversity loss and global warming will be important vectors for the sustainable development of the country, provided that there is a search for scientific progress and innovations, technology-based or not, combined with behavioral changes.** New products, new processes and new practices do not appear suddenly. They are based on innovative applications of scientific principles, original conceptions and collective efforts. Therefore, a country aiming for progress and development needs to provide this creative multi-, inter- and transdisciplinary environment, that allows innovation to exist.
- **For Brazil to succeed, economic systems need to aim at better overall conditions of life and well-being instead of the mere growth in the flow of goods and services in the short-term, impairing future sustainable prosperity.** This transformation implies incorporating environmental costs, both arising from supplies used in production process, in the process itself, and the final use of products and services. A country with a robust scientific basis is more resilient, has greater productivity, better jobs and more wealth, especially in the sustainable utilization of its land-based and water-based biodiversity potential
- **The importance of decarbonization and the maintenance of biodiversity has already been perceived worldwide and the incorporation of these concerns into the model of development and industrialization of each country is just a matter of time.** Decarbonization will probably be the most rapid technological transformation of the last few cen-

turies; even the digital revolution itself is aligned with it. Brazil must decide if it wants to have a major or secondary role in this process, as these changes go forward at an ever-increasing rate. Thus, the speed with which we act can place Brazil in a leading world position, given its enormous comparative advantages as being the most biodiverse country in the world, abundant in natural resources, including those directly associated with the necessary decarbonization, such as renewable energy; or, it can stagnate in its current position as an importer of goods and services of high added value.

- **Brazil is a country with challenges as large as its potential.** Due to its large territory and abundant natural resources, the country is a central player in the global production of food and bioenergy, besides generating commercial-scale power from several sources of renewable energy (solar, wind, hydroelectric). On the other hand, environmental problems such as biodiversity loss, and air and water pollution need to be resolved.

- **In the twenty-first century, a greater biological and biomimetic understanding of the plant and animal species has an incalculable economic value.** The Fourth Industrial Revolution is in progress, and with unprecedented speed, digital, biological and physical technologies are being incorporated into biotechnologies, nanotechnologies and automation. This integration should be a central element for obtaining economic value for this new model of sustainable exploitation of tropical biodiversity. Brazilian rural development should benefit from the emergence of new technologies from this revolution.

- **Brazil is faced with the challenge of creating an innovative bioeconomy based on biodiversity.** This new bioeconomy must assure the maintenance of natural systems, starting with appreciation of their cultural valuation, that is to say, the nation must wish to become an “economic power of biodiversity”, a concept much wider — and more difficult to implement — than that of an “environmental power”, this in addition to the matter of the inclusion of the majority of Brazilian poor farmers in the process. As a matter of fact, world history lacks an example of a developed country in the category of “environmental power” or an “economic power of biodiversity”.

- **Public policies for reducing rural poverty in Brazil are intrinsically complex, depending on democratic enhancements of good use of public resources and a new political class that represents the interests of this large population.** Quality education, attention to health, food security, non-degraded environment, and economic incentives are required for sustainable production activities. However, continuing

STRATEGIES FOR FACING CLIMATE CHANGE

MITIGATION

Increase in agricultural systems productivity will prevent the emissions up to **14.3 GT CO₂**

FIRE MANAGEMENT
is an effective mechanism for mitigating greenhouse gas emissions

Avoiding deforestation will **REDUCE** Brazilian emissions by approximately **50%**

PROTECTED AREAS
play a key role in mitigating climate change

RESTORATION VEGETATION of native will remove thousands of tons of carbon from the atmosphere

ADAPTATION

Use of **NATIVE CULTURES** works as an adaptation strategy

ECOSYSTEM based adaptation integrates biodiversity conservation, social well-being and climate protection

GREEN SPACES significantly decrease the occurrence of heat islands in cities

Conservation of **WETLANDS** protects against the occurrence and peaks of **FLOOD** in cities

MANGROVE RESTORATION protects against undertows and sea level rise

to hope optimistically for such enhancements in the still-fragile Brazilian democracy, without aggregating knowledge and efficient practices of extracting value from Brazilian biodiversity, will not easily lead to a flourishing innovative bioeconomy.

- **The civil construction sector is an area that deserves attention due to new options related to the choice of materials for proper building.**

The possibilities for use of biomaterials, such as bamboo, for instance, are innumerable due to their excellent mechanical properties, capable of providing an excellent option for developing building materials.

5. CONCLUSIONS AND RECOMMENDATIONS

This Report summarizes the joint benefits of the maintenance of the still-extensive Brazilian natural systems, maintaining biodiversity, quantifying the ecosystem services that can be provided by these systems both for mitigation of and adaptation to climate changes that have already become inevitable. However, it can be questioned whether or not the value of ecosystem services, such as those related to carbon balance or ecosystem-based adaptation is sufficient to maintain them, i.e., if the increasing valuation of natural capital in the form of ecosystem services may one day be considered a driving force of a national economy with social inclusion.

- **To maintain, connect and expand protected natural areas is the best way to assure that ecosystem services can continue to be offered for the benefit of Brazilian and global society.** *Ecosystem services, such as water and raw material supply, soil protection, sediment retention, carbon sequestration, scenic beauty, and cultural services, among others, are benefits provided by nature that are extremely relevant for the economy and for human well-being.*

- **An innovative look at biodiversity's role is a great opportunity to make it a disruptive factor capable of leading to a more sustainable Brazilian economic model.** *However, the difficulties in implementation of the REDD+ (Reduction of Emissions for Deforestation and Forest Degradation, plus sustainable forest management) mechanism, of the United Nations Framework Convention on Climate Change (UNFCCC), 10 years after its adoption – at a scale sufficient to reduce and eventually end clearing of tropical forests – are in urgent need of resolution.*

- **Ecosystem-based Adaptation (EbA) emerges as an important practice that promotes the adaptation to climate change based on the use of conservation and restoration of natural areas to promote the re-**

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duction of poverty and an improvement in well-being. This practice has been growing worldwide, is present in the National Plan for Adaptation to Climate Change in Brazil, and requires more integration of socioeconomic and environmental policies, as well as a larger number of practical interventions and evaluation.

- **New knowledge and technologies are necessary but not sufficient conditions to assure the success of an innovative model for the national agricultural-bio-industrial sector** and should follow on an equal footing with the public policies of social equity and sustainability.

- **The cost of inaction will be much higher in the near future.** The transition to a national economy based on the sustainable use of its biodiversity will require significant investments. This would need to occur in opposition to the maintenance of the development model currently in progress, largely focused as it is, on the production of low-added-value commodities and which has been destroying its own basis, that is, biodiversity.

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