Challenges to Monitor and Forecast Biodiversity Loss in Brazil

Braulio Ferreira de Souza Dias
Director, Department for Biodiversity Conservation, Ministry of the Environment, Brazil

“Modelling Biodiversity Loss in Brazil with the GLOBIO3 Model” March 24-26, 2009 Rio de Janeiro
RELATIONSHIP BETWEEN THE THREE OBJECTIVES OF THE CBD

CONSERVATION

VALUE ADDED & FUNDING

INTRINSIC BENEFITS

ECONOMIC BENEFITS

VALUE ADDED TO PRODUCTS

GOODS & SERVICES

REDUCTION OF PRESSURES

SUSTAINABLE USE

BENEFIT SHARING

“Parties commit themselves to a more effective and coherent implementation of the three objectives of the Convention, to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth.”
HOW MANY SPECIES ARE THERE IN OUR PLANET? 1, 10 or 100 millions?

INSECTS
TYPES OF BIODIVERSITY

- Number of different biological types [RICHNESS or COMPLEXITY]
- Relative abundance of biological types [EQUITABILITY or HETEROGENEITY]
- Degree of difference between biological types [ex.: TAXONOMIC DISTANCE, BETA DIVERSITY or COMPLEMENTARITY]
- Mixture of biological types [COMPOSITION]
- Number of interactions among biological types [ex.: PLEIOTROPIC EFFECTS, ECOLOGICAL WEB]
DETERMINANTS OF BIODIVERSITY

DISTURBANCE

LOW

PRODUCTIVITY

HIGHEST

LOW
DETERMINANTS OF BIOLOGICAL DIVERSITY

- Productivity or Availability of Resources (energy, water, substrate and nutrients)
- Disturbance Regime and Perturbation (cosmic, tectonic, climatic, biological, anthropic)
- Intensity of Biotic Interactions (competition, predation, mutualism, symbiosis)
- Sexual Reproduction (recombination)
- Original Stocks and Dispersal Opportunities (history, barriers, distances)
- Socio-economic Factors (land use and urbanization/industrialization)
CHALLENGES FOR SCIENCE AND TECHNOLOGY

• REDUCE UNCERTAINTIES

• MAKE PREDICTIONS

• OFFER SOLUTIONS
DISTURBANCE and PERTURBATION are dependent of time/space scales

DISTURBANCE refers to any change that alters the current state of a system

PERTURBATION refers to changes outside the NORMALITY of a system

[=stress new to the ecosystem or stress beyond normal range, for a given time/space scale]
Map of Continental Biomes of Brazil

Escale: 1: 5,000,000

IBGE & MMA
Map of Ecoregions in Brazil (Source: IBAMA, 2003)
The Brazilian National Biodiversity Strategy and Action Plan – recent policy instruments

- Principles, general guidelines, components and goals – Decree 4339, of August 22, 2002
- Structure, composition and mandate of PRONABIO & CONABIO – Decree 4703, of May 21, 2003
- Biodiversity Priority Areas for the Brazilian Biomes – Decree 5092, of May 21, 2004 and MMA Instruction 126, of May 27, 2004, updated by MMA Instruction 9, of January 23, 2007
- Priorities and Guidelines for the Action Plan to implement the National Biodiversity Policy – CONABIO Decision 40, of March 2006
National Biodiversity Policy
Decree 4339, of August 22, 2002

• 19 principles,
• 10 general guidelines,
• 7 components,
• 27 major goals and
• 285 specific goals
National Biodiversity Policy - Components

• 1 – Biodiversity Knowledge
• 2 – Biodiversity Conservation
• 3 – Biodiversity Components Sustainable Use
• 4 – Biodiversity Monitoring, Evaluation, Prevention and Impact Mitigation
• 5 – Access to Genetic Resources and to Associated Traditional Knowledge and Benefit Sharing
• 6 – Education, Public Awareness, Information and Publicity about Biodiversity
• 7 – Legal and Institutional Strengthening for Biodiversity Management
Guidelines and Priorities of the Action Plan to Implement the National Biodiversity Policy (PAN-Bio)

2006
National Biodiversity Program and Commission – Decree 4703/2003

- National Biodiversity Program – PRONABIO, revised objectives and biomes: Amazon, Pantanal, Cerrado, Caatinga, Atlantic Forest, Pampas, Coastal & Marine Zone

- National Biodiversity Commission – CONABIO, mandate: to coordinate CBD and PNB implementation

- National Biodiversity Commission – CONABIO, composition: 10 government & 10 non-governmental members (meets regularly every two months)
Biodiversity: the unknown

- Currently about 200,000 species are known from Brazil
- A conservative estimate suggests this represents less than 10% of the total species richness of the country
- Current estimates put the total number of species on earth ranging from 1 to 100 million - an uncertainty of 2 orders of magnitude
- A recent study on the bacteria found on the forest canopy of our Atlantic Forest discovered that only 3% is known to science
Assessment of the Scientific Knowledge on the Brazilian Biodiversity
[updated edition]
MMA, 2006
RICHNESS OF BRAZIL’S BIODIVERSITY
Source: Lewinsohn & Prado, 2000

<table>
<thead>
<tr>
<th>TAXON</th>
<th>KNOWN</th>
<th>ESTIMATED</th>
</tr>
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<tbody>
<tr>
<td>VIRUS</td>
<td>350</td>
<td>55.000</td>
</tr>
<tr>
<td>BACTERIA</td>
<td>400</td>
<td>136.000</td>
</tr>
<tr>
<td>FUNGI</td>
<td>13.000</td>
<td>205.000</td>
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<tr>
<td>ALGAE</td>
<td>10.000</td>
<td>55.000</td>
</tr>
<tr>
<td>PLANTS</td>
<td>47.500</td>
<td>52.000</td>
</tr>
<tr>
<td>PROTOZOANS</td>
<td>3.500</td>
<td>27.000</td>
</tr>
<tr>
<td>ANIMALS</td>
<td>132.000</td>
<td>1.337.000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>207.000</td>
<td>1.867.000</td>
</tr>
</tbody>
</table>
Distribution of plant specimens in Brazilian Herbaria

Source: SHEPHERD, 2000

Acervo total de exsicatas por estado

Herbaria

Source: SHEPHERD, 2000

Distribution of plant specimens in Brazilian Herbaria

Source: SHEPHERD, 2000
DENSIDADE DE COLETA DE PLANTAS
Fonte: Nelson, 1991

Plant Sampling effort in the Brazilian Amazon
no. de espécies e densidade de coletas

$y = 668,52 \ln(x) + 2414$

$R^2 = 0,6602$

Amazon = 0,13

Brazil = 0,44

Minimum effort needed

$\text{Exsicata/km}^2$

$\text{exsicata/\text{km}^2}$
Monitoring of Coral Reefs in Brazil:
Current Situation and Perspectives

MMA, 2006
Brazilian Bibliography on Pollination and Pollinators

MMA, 2006
Pollinators Management Projects supported by MMA in the years 2004-2006

Norte:
AC – Acre
AM – Amazonas
AP – Amapá
PA – Pará
RO – Rondônia
RR – Roraima
TO – Tocantins

Nordeste:
AL – Alagoas
BA – Bahia
CE – Ceará
MA – Maranhão
RN – Rio Grande do Norte
SE – Sergipe
PB – Paraíba
PE – Pernambuco
PI - Piauí

Centro Oeste:
DF – Distrito Federal
GO – Goiás
MS – Mato Grosso do Sul
MT – Mato Grosso

Sudeste:
ES – Espírito Santo
MG – Minas Gerais
RJ – Rio de Janeiro
SP – São Paulo

Sul:
PR – Paraná
RS – Rio Grande do Sul
SC – Santa Catarina

1 Subproj. Paraná
1 Subproj. São Paulo
1 Subproj. Rio de Janeiro
2 Subproj. Minas Gerais
2 Subproj. Bahia
2 Subproj. Pernambuco
1 Subproj. Maranhão
1 Subproj. Mato Grosso
1 Subproj. Amazônia
1 Subproj. Pará
BRAZILIAN BIODIVERSITY

ASSESSMENT AND IDENTIFICATION OF PRIORITY AREAS AND ACTIONS FOR CONSERVATION, SUSTAINABLE USE AND BENEFIT SHARING OF THE BIODIVERSITY IN THE BIOMES OF BRAZIL

MMA, 2002

www.mma.gov.br/ biodiversidade
Priority Areas for Conservation, Sustainable Use and Benefit Sharing of Biodiversity in Brazil

MMA, 2003

Wall Map + interactive CD
Biodiversity in the Brazilian Amazon

ISA & Estação Liberdade, 2004
Priority Areas for Conservation, Sustainable Use and Benefit Sharing of Biodiversity in Brazil - update

CONABIO Deliberation n° 39, of December 14 2005, approved the methodology for the revision process:

- Map of Brazilian Biomes (IBGE, 2004);
- Systematic Conservation Planning:
  - objectivity and efficiency;
  - memory keeping of the priorities identification process;
  - broader stakeholder participation and consensus building;
  - all existing Protected Areas (SNUC) were considered as priority areas;
- Technical meetings in each Biome (11 meetings)
  - definition of conservation and sustainable use targets;
- Data Processing (Conservation Planning Software C-Plan & MARXAN)
  - generation of maps of biological importance;
- Regional consultation meetings in each Biome (13 meetings)
  - identification of priority areas and actions, and urgency;
Targets used for the Savannas biomes:
128 landscape units & 6 unique ecosystems
51 areas for keeping ecosystem services

+1022 endemic or threatened species targets
Map of areas of biological importance
Map of Priority Areas for Conservation, Sustainable Use and Benefit Sharing of the Brazilian Biodiversity.

Updated 2007

Obs.: Not including areas already protected
Ministério do Meio Ambiente
Secretaria de Biodiversidade e Florestas - SBF
Departamento de Conservação da Biodiversidade - DCBio

“Seminário para Definição de Metas Nacionais de Biodiversidade para 2010”

20ª Reunião Ordinária da CONABIO
Brasília, 24 e 25 de outubro de 2006
National Biodiversity Targets Seminar

Issues covered by the Roundtables:

- Pressures on the Brazilian Biodiversity (deforestation, fires, fragmentation, alien invasives)
- State of the Biomes (vegetation)
- State of the Fauna and Flora (threatened and overexploited species)
- Responses for Conservation (protected areas, species & genetic resources conservation)
- Responses for Sustainable Use and Benefit Sharing
National Biodiversity Targets Seminar
Information requested to all invited speakers to provide on their theme/parameter:

- sources of information available in Brazil (their geographic and temporal coverage, data quality and limitations);
- status (quantified) of the theme/parameter in Brazil in 2002 (baseline), biome by biome and total;
- average annual increment/reduction of the theme/parameter in Brazil at the turn of the millenium (baseline), biome by biome and total;
- indicate probable/possible targets for the theme/parameter in Brazil in 2010 under three scenarios (pessimistic, intermediary/business-as-usual and optimistic), considering the global target adopted by the CBD for the theme/parameter.
National Biodiversity Targets for 2010 (CONABIO Resolution 3/2006):

- The National Biodiversity Committee – CONABIO adopted, as Resolution 3/2006, a set of 51 National Biodiversity Targets for 2010, including 14 targets for conservation, 13 targets for sustainable use, seven targets for impact mitigation, eight targets for access and benefit sharing, three targets for research, three targets for education and information and three targets for financing and technology transference.

- Available at www.mma.gov.br/PortalBio
Mosaico de Imagens 2002
Biodiversity: Vegetation Cover

• The Brazilian Ministry of Environment commissioned a wall-to-wall mapping of vegetation cover of all the Brazilian biomes for the baseline year of 2002 at the publication scale of 1:250,000 based on Landsat images (PROBIO Project in partnership with Brazilian research institutes and universities) – all the 610 maps produced are freely available online for download at www.mma.gov.br/PortalBio
Mosaicos
117 cenas Landsat (ano-base: 2002)

172 cartas 1:250.000
Cobertura Vegetal do Bioma Cerrado em 2002 (MMA 2007)
Monitoring the Brazilian Biodiversity

- MMA is supporting the establishment of a National Center for Biodiversity Monitoring and Forecasting at the Chico Mendes Institute for Biodiversity Conservation
- MMA is supporting IBAMA to monitor deforestation in all of the Brazilian continental biomes outside the Amazon (to complement INPE’s work)
- MMA hopes to establish a National Network for Biodiversity Monitoring involving the main institutions operating in Brazil
- MMA hopes such a network will be part of a global network on biodiversity monitoring, such as the GEO BON
MMA needs better scientific tools to support decision making processes

• How much biodiversity might be lost with continuing land use change and climate change?
• What is the potential impact of public policies on biodiversity loss?
• Where are the most vulnerable areas to biodiversity loss?
• Are we making progress to implement national and global targets in Brazil?
• Are conservation policies effective?
GEO BRASIL 2

- Explore main environmental agendas (water resources, forests, biodiversity, etc.)
- Consolidate information on environmental policy instruments
- Consolidate information on the relevance of the environmental agendas to sustainable development
- Generate potential future scenarios

- MMA is preparing a White Paper on Biodiversity
The objective of this workshop:

- Assess the feasibility of using the GLOBIO3 model to generate scenarios for Brazil and its biomes.
- Can GLOBIO3 be an useful tool to help support decision making in Brazil?
- Do we have the necessary data sets in the right format to run the GLOBIO3 model for Brazil?
- Can we use the GLOBIO3 model to assess progress towards the 2010 Biodiversity Target in Brazil?
- Can we use the GLOBIO3 model to assess the potential impacts of major infrastructure projects and the expansion of agriculture, pastures and biofuels in Brazil?
- Can we use the GLOBIO3 model to assess the potential impacts of climate change and land use change in Brazil?
The objective of this workshop:

- Do we have enough biodiversity data in Brazil to calibrate the GLOBI03 parameters to our conditions?
- Can we validate the (current and past) scenarios produced with GLOBI03 in Brazil with biodiversity data collected in the field?
- Are there Brazilian institutions and researchers willing to be our partners to implement GLOBI03 modelling in Brazil?
- Do we have sufficient standardized data to run the GLOBI03 model for all of Brazil or should we run it on a biome by biome approach?
- What should be the next steps to implement the GLOBI03 model in Brazil?
The Structure of this Workshop:

- Day One – WCMC (UNEP’s World Conservation Monitoring Centre) and PBL (Netherlands Environmental Assessment Agency) introduce the PROBIO3 model and provide context
- Day Two: Roundtables of Brazilian institutions on existing data and modelling experiences in Brazil
- Day Three: Conclusions and next steps
Obrigado!

www.mma.gov.br/PortalBio