Geospatial data in the World Network of Biosphere Reserves

Huangshan Dialogue on UNESCO Designated Places and Sustainable Development – Application of space technologies for WH, BRs and Geoparks

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Secretary, Man and Biosphere (MAB) Programme
1. Biosphere Reserves – basics
The Biosphere Reserve Concept

A tool for interdisciplinary work with a triple function:

- Conserve biological and cultural diversity
- Propose innovative approaches to sustainable development – working with people
- Promote research, monitoring, education and training
Zoning – means to ensure biodiversity management in multi-use areas with the objective of sustainable development.

Organizational/governance arrangements – enabling involvement of all actors in management-making processes.

New forms of institutional cooperation and links between different levels of political, economic and scientific decision making.

Engagement of all the relevant stakeholders
A Biosphere Reserve is:

1) Area for the conservation of the environment (to maintain biological and cultural diversity)
Science and research
Studies on antelope population dynamics in Mujib BR (Jordan)
A biosphere reserve is:

2) Area to demonstrate sustainable (economic) development
Sustainable development:
Organic agriculture in Luberon-Lure BR (France)
3. Area of **scientific interest** to study human-environment interrelations, and sites for education and learning
Aya BR (Japan)

One of the first towns in Japan to develop a recycling policy – a green city
621 Biosphere Reserves in 117 countries
12 transboundary Sites
2. Geospatial data needs
Geospatial data: essential for BR identification, functions & management

- Location, topography, land use, land cover...
- Madrid Action Plan (MAP) on zonation/site management
- MAP Target 2: ISPs cooperation
- MAP Target 3 (3.1, 3.2, 3.3): Integrated information and communication
- MAP Target 24.1, 24.2, 24.4: Learning sites for research, adaptation, mitigation in relation to climate change
- MAP Target on monitoring and TBR
A Classification of the Biogeographical Provinces of the World

By Miklos D. F. Udvardy

Prepared as a Contribution to UNESCO's Man and the Biosphere Programme Project No. 8

Biogeographic Province:
1: Malabar Rainforest
2: Ceylonese Rainforest
3: Malayan Peninsula Rainforest
4: Burma Rainforest
5: Indochinese Rainforest
6: South Chinese Rainforest
7: Malayan Rainforest
8: Burma Monsoon Forest
9: Thailandian Monsoon Forest
10: Anaman and Nicobar Island
11: Java
12: Lesser Sunda Islands
13: Celebes
14: Borneo
15: Philippines
16: Indomalayan Biogeographical Realm
17: M. D. F. Udvardy, 1975

IUCN OCCASIONAL PAPER NO. 18
INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES
MORGES, SWITZERLAND, 1975
# EuroMAB BRIM: Meta data on 72 Most Common Databases

## BASIC RESOURCE INFORMATION

<table>
<thead>
<tr>
<th>X = EXISTING PROGRAM</th>
<th># = NUMBER OF YEARS OF RECORDS</th>
<th>a = PRIORITY AREA</th>
</tr>
</thead>
</table>

## BIOLOGICAL INVENTORY

<table>
<thead>
<tr>
<th>INVERTEBRATES</th>
<th>MAMMALS</th>
<th>BIRDS</th>
<th>NONVASCULAR PLANTS</th>
<th>VASCULAR PLANTS</th>
<th>VERTEBRATES OTHER THAN MAMMALS</th>
<th>BIOLOGICAL SURVEY AND COLLECTIONS</th>
<th>AIR QUALITY</th>
<th>CLIMATE</th>
<th>FRESHWATER ECOSYSTEMS</th>
<th>GROUNDWATER HYDROLOGY</th>
<th>MARINE ECOSYSTEMS</th>
<th>PALEOECOLOGY</th>
<th>PRECIPITATION CHEMISTRY</th>
<th>SURFACE HYDROLOGY</th>
<th>VEGETATION DATA</th>
<th>WATER QUALITY</th>
<th>GEOLOGICAL LAND USE</th>
<th>REGIONAL LAND TENURE</th>
<th>SOILS</th>
<th>TOPOGRAPHIC VEGETATION</th>
</tr>
</thead>
</table>

## RESOURCE MAPS

### RUSSIAN FEDERATION

| ASTRAKHANSKIY | 65 | 65 | 65 | 65 | 65 | X | 4 | 47 | 41 | 12 | 41 | 65 | X | X | X | X |
|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KAVKAZSKY | 62 | 62 | 62 | 62 | 62 | X | 5 | 60 | 10 | 60 | 5 | 60 | 62 | 15 | X | X | X | X |
| KRONOTSKY | 7 | 10 | 7 | 10 | 10 | X | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| LAKE BAikal: BAikalSkiY | 7 | 10 | 7 | 10 | 10 | X | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| LAKE BAikal: BARGUZINSkiY | 13 | 3 | 8 | 13 | X | 2 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| LAPLANDSKY | 50 | 30 | 50 | 10 | X | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| OKA RIVER VALLEY | 15 | 40 | X | 40 | 40 | X | 50 | X | 50 | X | 50 | X | 50 | X | 50 | X | 50 | X | 50 |
| PECHORO-ILYCHSKY | 20 | 20 | X | 20 | 20 | X | 20 | X | 20 | X | 20 | X | 20 | X | 20 | X | 20 | X | 20 |
| SAYANO-SHUSHENSKY | 10 | 10 | 10 | 10 | 10 | X | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| SIKHOTE-ALINSKIY | 50 | 50 | 50 | 50 | 50 | X | 3 | 40 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| SOKHODINSKIY | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| TSENTRAL'NO-CHERNOZEMNY | 40 | 50 | 50 | 50 | 50 | X | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| TSENTRAL'NO-LESNOY | 50 | 50 | 50 | 50 | 50 | X | 2 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| TSENTRAL'NO-NOSIBIRSKY | 2 | 2 | 2 | 2 | 2 | X | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| VORONEZHSKIY | 10 | 40 | 50 | 50 | 50 | X | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 |

### SLOVAKIA

| EAST CARPATHIANS | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| POLANA | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| SLOVANSKY KRAS | 10 | 35 | 35 | 35 | 35 | X | 50 | X | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| TATRY | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
La Selle Biosphere Reserve, Haiti
BR nomination of Nino Konis Santana NP - Timor Leste

• Conducting mapping of vegetation cover using high resolution imagery
• Data collection:
  - Initiate ecosystem and species mapping
  - Data collection - biophysical, socio-economic, cultural
  - Preparation of BR nomination dossier
Mapping of the existing conditions in Nino Konis Santana NP, Timor-Leste
Examples of analysis carried out by UNESCO Jakarta

Remote Sensing Analysis of Ecological Restoration Area in Gunung Leuser National Park

Vegetation Cover Changes
Restoration Area, Sei Serdang GLNP

Before Restoration (2008)

After Restoration (2013)
Tropical Rainforest Heritage of Sumatra

**Draft Decision:** 33 COM 7B.15

**Encroachment: current situation**

Page number: 7B.Add 29-30

WHC-09/33.COM/7B  SOC - Properties inscribed on the World Heritage List
Industrial accidents may cause huge damage to conservation.
GLOCHAMOST Project (Global Change in Mountain Sites – Elaboration of Adaption Strategies for Mountain Biosphere Reserves; since 2009)

→ implements GLOCHAMORE Research Strategy, in:

• Mount Arrowsmith BR (Canada)
• Changbaishan BR (China)
• Berchtesgaden BR (Germany)
• Nanda Devi BR (India)
• Huascaran BR (Peru)
• Katunskiy BR & Teberdinskiy BR (Russian Fed.)
• Sierra Nevada BR (Spain)
• Swiss National Park BR (Switzerland)
Exhibition and High Level Panel session during the 37th General Conference of UNESCO

Climate change impacts on mountain regions of the world

Impacts du changement climatique sur les régions montagneuses à travers le monde
Natural Resource Database Management Systems (NRDMS)

• Department of Science & Technology (DST), Government of India under its Natural Resource Database Management Systems (NRDMS) programme, Bio Geo database, has taken up the spatial quantification of ecosystem dynamics in select biosphere reserves

• UNESCO New Delhi has partnered with the Indian Institute of Information Technology (IIIT) Trivandrum to set up an eco-informatics programme with focus on Western Ghitas and Nilgiri Biosphere Reserve.
INVENTORISATION AND MONITORING OF BIOSPHERE RESERVES IN INDIA USING REMOTE SENSING & GIS TECHNOLOGY

THE PROJECT

Biosphere Reserve programme in the country emphasizes India's commitment for the implementation of Man and Biosphere (MAB) programme towards achieving the long term conservation and sustainable development goals enshrined within the concept of Biosphere Reserves (BRs). An urgent need has been felt to develop a coordinated programme to strengthen research on critical issues and to formulate a 'Perspective Plan' for intensive management of BRs in the country. In this context, with the funding support of National Natural Resource Management System (NNRMS) programme of the Ministry of Environment & Forests, Govt. of India, the G.B. Pant Institute of Himalayan Environment & Development, along with partner institutions, has supported a country wide project to:

1. Create Natural Resources and social database using latest Remote Sensing (RS) images of existing BRs in India with a focus on Landuse Land Cover maps.
2. Study temporal changes in the land use dynamics (at 5 year interval starting from 1990 or from the date of notification) as result of BR management.
3. Make recommendations for effective management of BRs for redefining the zones/boundaries.

The National Natural Resources Management System (NNRMS) programme of the Ministry of Environment & Forests, Govt. of India, supports the national requirements of natural resource management and developmental needs by generating a proper and systematic inventory of natural resources. Over the past twenty years the NNRMS programme has steered generation of spatial information using remote sensing data from various IRS missions.

EXPECTED PROJECT OUTCOMES

1. Formulation of comprehensive Management Plan w.r.t. each BR
2. Decision support system through GIS based Resource Mapping
3. Ecological simulation of natural resources for prediction and scenario development
4. Monitoring indicators for effectiveness /impacts of various Schemes/Programmes

Following the UNESCO's guidelines and criteria, the Indian National Man and Biosphere (MAB) Committee identifies and recommends potential sites for designation as Biosphere Reserves. As on January 2012, eighteen Biosphere reserves have been designated in the country.
Effort in Africa

• An interactive web-based map of 30 out of 58 BRs - including 2 transboundary BRs - in 27 countries in Subsaharan Africa: unique learning sites and global network for sustainable development

• Designed and developed through collaboration between the Regional Center for Mapping of Resources for Development (RCMRD), Nairobi, and biosphere reserve managers with support from UNESCO

UNESCO Man and Biosphere Reserves in Sub-Saharan Africa
## BRs involved

<table>
<thead>
<tr>
<th>Biosphere reserves by country</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub Saharan Africa</strong></td>
<td></td>
</tr>
<tr>
<td>Benin</td>
<td>1</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>1</td>
</tr>
<tr>
<td>Cameroon</td>
<td>3</td>
</tr>
<tr>
<td>Central African Republic</td>
<td>2</td>
</tr>
<tr>
<td>Congo</td>
<td>2</td>
</tr>
<tr>
<td>Ivory Coast</td>
<td>2</td>
</tr>
<tr>
<td>Democratic Republic of Congo</td>
<td>3</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>2</td>
</tr>
<tr>
<td>Gabon</td>
<td>1</td>
</tr>
<tr>
<td>Ghana</td>
<td>2</td>
</tr>
<tr>
<td>Guinea</td>
<td>4</td>
</tr>
<tr>
<td>Guinee Bissau</td>
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</tr>
<tr>
<td>Kenya</td>
<td>6</td>
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</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madagascar</td>
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</tr>
<tr>
<td>Malawi</td>
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</tr>
<tr>
<td>Mali</td>
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</tr>
<tr>
<td>Mauritius</td>
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</tr>
<tr>
<td>Niger</td>
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<tr>
<td>Nigeria</td>
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<tr>
<td>Rwanda</td>
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</tr>
<tr>
<td>Senegal</td>
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<tr>
<td>South Africa</td>
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<tr>
<td>Togo</td>
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</tr>
<tr>
<td>Uganda</td>
<td>2</td>
</tr>
<tr>
<td>United Republic of Tanzania</td>
<td>3</td>
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<tr>
<td>Zimbabwe</td>
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</tr>
<tr>
<td>Transboundary Benin/Burkina/Niger</td>
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</tr>
<tr>
<td>Transboundary Mauritania/Senegal</td>
<td></td>
</tr>
</tbody>
</table>

**Total**: 56 + 2
For ecological integrity: Giant Panda cluster WH/BRs, linked by corridors – a process over 20 years: now 14 sites of approx. 950,000ha
Protected Areas of Northern Iran
Caspian Forests
A sustainable development field observatory of UNESCO designated Biosphere Reserves

The Biosphere Smart Initiative promotes the transition to green societies and sustainable futures by facilitating networking and information sharing of smart knowledge gained in UNESCO Biosphere Reserves through the use of new information and communication technologies.

The Biosphere Smart Initiative includes a global observatory and information facility, the *Biosphere Smart Information Platform* created to facilitate sharing of ideas, best practices, and experiences among UNESCO designated Biosphere Reserves on challenges and smart solutions related to climate change, green economies, and sustainable development at large.
Shennongjia
1992
China (People’s Republic)
70,467 ha.
Temperate and subpolar broadleaf forests or woodlands; mixed mountain and highland systems
Population 8,370.
Visit BR Map Zonation MAB
My Biosphere Reserve becomes smarter
BRs as tools of learning

GLOBAL
World Network of Biosphere Reserves
Biosphere Smart Information Platform

LOCAL
Smart Biosphere Reserves
BR Digital

www.biospheresmart.org
4. Moving forward: **challenges** and opportunities

• Very limited technical capacity at site level for most developing countries
• Very limited technical expertise and human resources at the Secretariat
• Initiatives are many, but are project specific and lack technical coherence
• Lack of access to available work and results
• Organizational issues
New form of partnership required

- For Africa, the interactive web-based map was developed with the Regional Center for Mapping of Resources for Development (RCMRD) – a high-performance regional partnership, funded by UNESCO.
- To ensure sustainability, a win-win partnership has to be set up.
- This is also the case for the Secretariat – must rely on partnerships.
GLOBAL TERRESTRIAL OBSERVING SYSTEM (GTOS)
Indicators – lessons learnt (cont)

- Indicators must reflect changes at spatial and temporal scales of relevance to management and what needs to be measured
- Need differing indicators for site level and system level

- Think of your audience when developing indicator
  - ‘Traffic light’ approach for simple depiction

- Ecological goals, socio-economic and governance goals are not mutually exclusive; but they do need different evaluation criteria/indicators.
Opportunities

• Growth of UNESCO category II institutes
• Existing agreement for support from leading space agencies
• UNESCO’s Open Access Policy
• Strong interest from many research institutions and some private sector companies
• Rapid development of ICTs and internet-based services
• Possible use of common platforms such as Google Maps
Conclusion

• An *geospatial data and service consortium* is needed for the WNBR and for WH and Geoparks – MAB would like to bring this forward

• HIST and other committed technical institutions can be very instrumental in developing this new mechanism

• A partnership will be needed with UNEP-WCMC, GBIF – and others