

**Periodic Review Process of Lal
Suhanra Biosphere Reserve,
Bahawalpur-Pakistan**

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Evolutionary Aspects of Periodic Review Process

- In 1971, UNESCO established MAB programme.
- Greatest success and current focus **Development of the concept of BRs**
- Initially formulated concept (70s) had two major Objectives:
 - **Conservation**
 - **Ecological research**

Also opportunities for education and training
- **Two Zones:**
 - ❖ **Core zone:** zone of Conservation significance
 - ❖ **Buffer zone:** Management and research on ecological resources, Education and Tourism

Reformulation of BRs Concept (80s)

- **Tow Major Conceptual Changes:**

1- Involvement of Local people in Conservation Process

2- Strengthening links between Conservation and Development

Both these concepts were endorsed by:

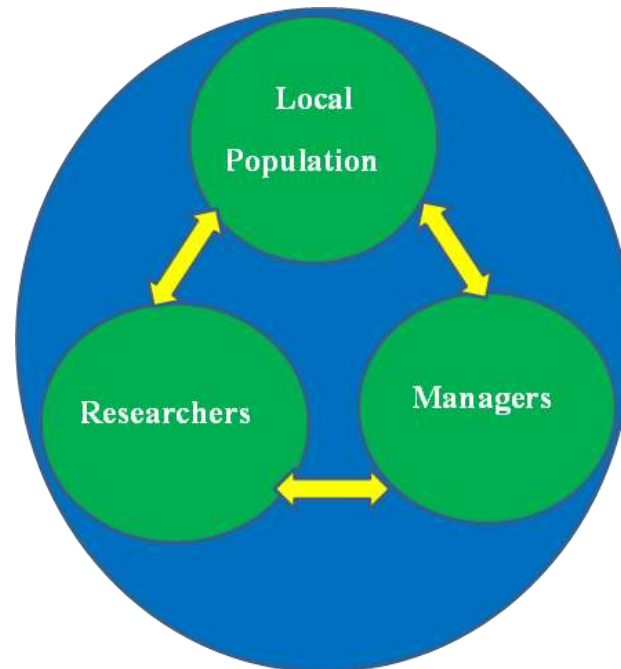
- World Conservation Strategy (IUCN/UNEP/WWF), 1980
- First International Biosphere Reserve Congress in 1983

The Action Plan of the this Congress states:

- “People should be considered part of a biosphere reserve”.
- “biosphere reserves should be demonstration sites of harmonious, long-lasting relationships between man and the natural environment”

Three Functions-Three zones

- **The concept of three current functions emerged**
 - Conservation
 - Logistic support and
 - Development
- **Three Zones to accommodate the three functions**
 - Core zone
 - Buffer zone
 - Transition Zone



Divergence between concept and reality

- In 1986, it was realized that if all of the recommendations of 1984 Action Plan were observed, the BRs might become the most important component of the world's protected-area system.
- However, there was no **mechanism** to ensure that they fulfilled their intended functions.

Divergence between Concept and Reality

- **By 1995, there were 324 sites within the WNBR.**
- **Many had been proposed and approved without full consideration of their potential for achieving the objectives of even the earlier versions of the concept.**
- **It was noted that there was no built-in way of evaluating performance and no standardized measure with which to evaluate the economic, social, and ecological progress made.**
- **There was, therefore, a considerable gap between concept and the reality**

The Solution- the Periodic Review

- Recognition that the potential of the WNBR could only be realized if its constituent sites conformed as closely as possible to the current version of the concept
- It became the background to the Seville conference.
- Two major documents resulted from this meeting
- The Seville Strategy providing 92 recommendations, each with implementation indicators.
- The second was the Statutory Framework of the World Network of Biosphere Reserves

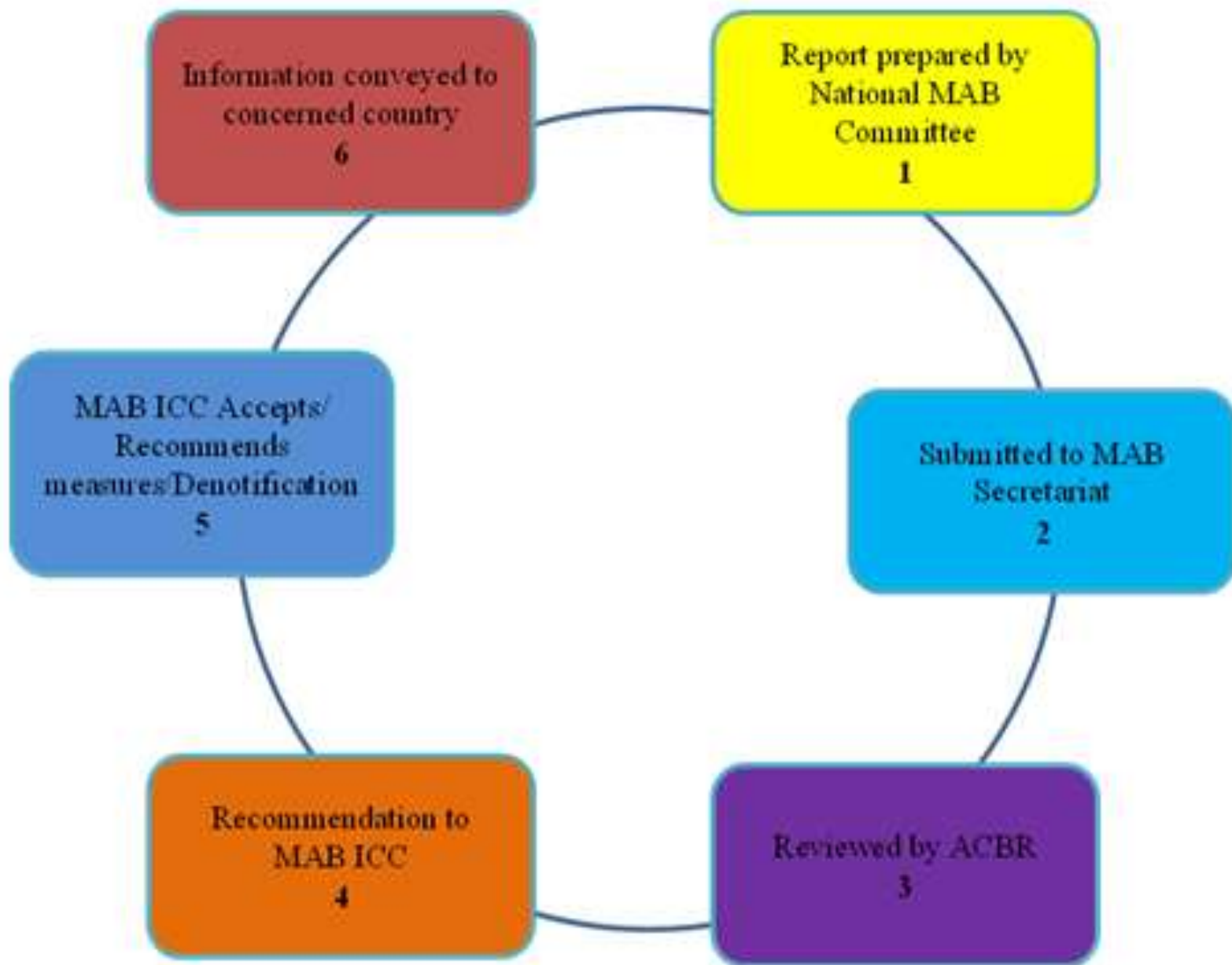
The Solution- the Periodic Review

- **The Statutory Framework provides a mechanism to keep ‘up-to-date’ with the evolving concept.**
- **Article 3 states that “biosphere reserves should strive to be sites of excellence to explore and demonstrate approaches to conservation and sustainable development at a regional scale”.**

The Solution- the Periodic Review

- The periodic review process given in Article 9 is a means for ongoing evaluation of the degree to which individual sites do strive to attain the goal of being such a ‘site of excellence’.

The Process of Periodic Review



PERODIC REVIEW OF LAL SUHANRA BIOSPHERE RESERVES



Biosphere Reserve Location Map



Lal Suhanra National Park Biosphere Reserve Zone Map

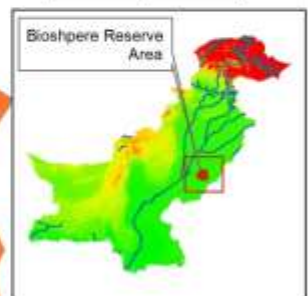
Total Area : 162568 Acres
 Irrigated plantation 18013 Acres
 Dry Land (Desert Area) 139775 Acres
 Wet land (Pond area) 4780 Acres

Legend

Zones

- Core Zones
Area 60 Sq. Km
- Buffer Zone
Area 291 Sq. Km
- Transitional Zone
Area 750 Sq. Km
- Towns
- Water Passage
- Roads

0 2.5 5 Km

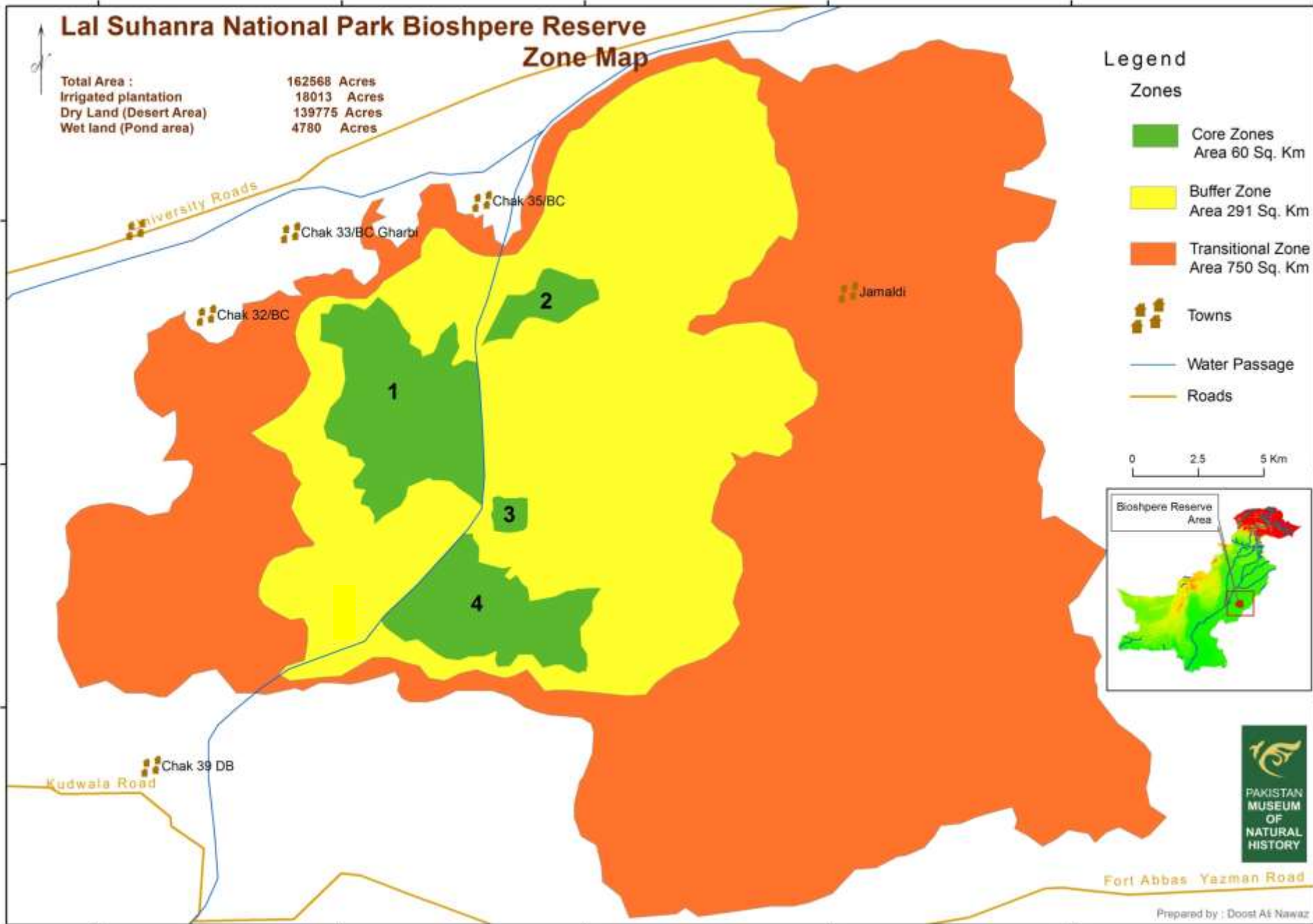


Fort Abbas Yazman Road

Prepared by : Doost Ali Nawaz

29°25'0"N
29°20'0"N
29°15'0"N

71°50'0"E 71°55'0"E 72°0'0"E 72°5'0"E 72°10'0"E 72°15'0"E



General Introduction



- **Has been Hunting Reserve of Nawabs of the former state of Bahawalpur**

- **Subsequently declared as a Game Reserve in 1968.**



- **Declared as a National Park in 1972**

- **Designated as Biosphere Reserve by UNESCO in 1977**

Location and Ecosystem



- **The reserve is located in the Cholistan Desert, 36 km east of Bhawalpur.**
- **The area is flat and arid with sand dunes reaching up to 4 m in height.**



Location and Ecosystem



- **Area is a warm desert to semi-desert ecosystem.**

- **Average annual rainfall ranges from 100 to 250 mm.**



- **The wetland, Patisar Lake, has been an important habitat for waterfowl in winter.**

Process Adopted

- **Meetings with the concerned Stakeholders**
- **Data collection on Biodiversity**
- **Literature search at various Research Institutions**
- **Frequent Visits of the Biosphere Reserve and adjoining areas**
- **Discussion with the local management staff**
- **Record views of the local influentials/ politicians**

- **Record views of the local influentials**
- **Community meetings**
- **Record of Community mobilization by NRSP**
- **Preparation of GIS maps**
- **Presentations**

Stakeholders Involved

Following stakeholders were involved:

- **Punjab Forest Department**
- **Punjab Wildlife & Parks Department**
- **Conservator of Forests, Bahawalpur Circle**
- **Divisional Forest Officer, LSNP**
- **Staff of Lal Suhanra National Park, Bahawalpur**
- **Deputy Director (Wildlife) Bahawalpur**
- **Assistant Director (Wildlife), LSNP**
- **Pakistan Museum of Natural History, Islamabad**

Stakeholders Involved

- **Punjab Forest Research Institute, Faisalabad**
- **Punjab Wildlife Research Institute, Faisalabad**
- **Botany and Zoology Departments of B.D. Z.U., Multan**
- **Cholistan Development Authority, Bahawalpur**
- **Cholistan Institute of Desert Studies, Islamia University, Bahawalpur**
- **National Rural Support Programme Bahawalpur**
- **WWF Pakistan**
- **Local NGOs**
- **Local Community Organizations**
- **Local population**

**CHANGES OBSERVED IN BR DURING
THE LAST 10+ YEARS**

New Regional MAB Committee

- **Chief Conservator of Forests (southern Zone)
Multan**
- **Conservator of Forests (LSNP) Bahawalpur**
- **Head of Zoology Department, Islamia
University Bahawalpur**
- **Divisional Forest Officer, Bahawalpur**
- **Rep. of Commissioner, Bahawalpur Div.**
- **Rep. of Cholistan Dev. Authority**
- **Deputy Director Wildlife Bahawalpur Div.**

Latest Coordinates

Cardinal points	Latitude (dd)	Longitude (dd)
Most central point	29.3295805	71.982499
Northernmost point	29.479702	71.982499
Southernmost point	29.179459	71.982499
Westernmost point	29.3295805	71.822849
Easternmost point	29.3295805	72.142149

Total Funding of Forest and Wildlife Departments

Year	Development	Non -Development
2008-2009	10,261,336	33,206,625
2009-2010	5,247,100	36,359,474
2010-2011	3,832,168	38,054,614
2011-2012	6,546,851	44,584,720
2012-2013	4,278,252	57,758,054

Change in the Area

Previous report (nomination form or periodic review)	Changes in the original area (additional areas transferred)
Nomination form 31,368 ha 1977	50,000 acres in 1984
	34,110 acres in 2000
	977 acres in 2000

Cooperation/management policy/plan for current or for the next 5-10 years

Following Policy guidelines have been prepared for the Management of the Reserve:

- Ensure the conservation of biological diversity**
- Safeguard the functioning of ecological processes in the Reserve**
- Preservation of selected examples of different biotic communities**
- Populations estimation of rare, endemic and threatened and species of special concern.**
- To protect and preserve selected sites or areas of scenic beauty or of special interest.**

Cooperation/management policy/plan for current or for the next 5-10 years

- **Protect environmental quality against erosion, water catchment degradation, deforestation and desertification**
- **To provide a basis for conservation education and research, including maintaining undisturbed environments as a baseline for measuring environmental change.**
- **To provide a sustained wildlife base for developing and diversifying recreation and tourism, consumptive and (in game reserves) non-consumptive.**
- **To contribute to the economic and environmental well-being of local populations.**

Communications strategy for the Biosphere Reserve towards the Communities/ General public

- Implementation of a community relations programme to maintain constant contact with communities living around and within 5 km of the park through:
 - ❖ Regular public meetings
 - ❖ Organised visits to the park by community representatives
 - ❖ Debate on proposed developments and management activities
 - ❖ Education on purposes for which the biosphere reserve / national park exists
 - ❖ Publicity of the benefits that accrue to local people
 - ❖ Foster support to reduce the incidence of illegal activities

Communications strategy for the Biosphere Reserve towards the Communities/ general public

- **Investigate ways in which local people may derive tangible benefits from the park.**
- **Implement visitors' information service**
 - ❖ to inform visitors about the park
 - ❖ its natural resources and facilities
 - ❖ to give guidance regarding their visits
 - ❖ to encourage wider travel within the park.
 - ❖ publicize ethic of humane treatment for animals

Strategies for fostering networks of cooperation in the Biosphere Reserve among diverse groups of the community

- **Implement a tourism promotion programme for BR**
- **Print guide maps for general public**
- **Implement safety procedures for of visitors and staff**
- **Training of staff to counter the events of emergency**
- **Construct sites for bird watching.**
- **Design a systematic routine for maintenance needs of BR.**

Strategies for fostering networks of cooperation in the Biosphere Reserve among diverse groups of the community/ General Public

- **Promote Adaptive management for problem solving**
- **Adaptive management for law-enforcement and public relations.**
- **Urge outside institutions to carry out research in the park**
- **Development of a systematic method of gathering, reporting on and storing information and data**
- **Monitoring surface area, vegetative cover and water quality of the water bodies**
- **Surveys of flora and fauna in desert habitats.**
- **Research on development of economic activities**

Research and monitoring activities undertaken in the Biosphere Reserve

Extensive Studies have been undertaken by:

- **Islamia University, Bahawalpur**
- **Cholistan Institute of Desert Studies**
- **Baha-ud-Din Zakariya University, Multan**
- **University of Agriculture, Faisalabad**
- **Pakistan Museum of Natural History**
- **Arid Agriculture University Rawalpindi**
- **Other Institutions of the country**

ECOSYSTEM SERVICES BEING PROVIDED BY BR

Ecosystem Services provided by Each Ecosystem and their beneficiaries

1- Forest Ecosystem

Ecosystem Function	Ecosystem Services	Beneficiary
Supplying function	Timber, fuel wood, wild vegetables/ food, grasses/ fodder for livestock, medicinal plants, gene pool	All stakeholders
Regulating function	Water conservation, Soil conservation, Carbon fixation, and Oxygen release, climate regulation, hazard regulation, noise regulation	All stakeholders
Cultural function	Leisure, appreciation, eco-tourism and education	All stakeholders
Supporting function	Soil forming, nutrient cycling and animal habitant, pollination, primary productivity, nutrient cycling	All stakeholders

2- Scrub Vegetation

Ecosystem Function	Ecosystem Services	Beneficiary
Supplying function	Fuel wood, food, grasses/ fodder for livestock, medicinal plants, gene pool	All stakeholders
Regulating function	Water conservation, Soil conservation, Carbon fixation, and Oxygen release	All stakeholders
Cultural function	Leisure, appreciation, eco-tourism and education	All stakeholders
Supporting function	Soil forming, nutrient cycling and animal habitan pollination, primary productivity, nutrient cycling	All stakeholders

Ecosystem Services provided by Each Ecosystem and their beneficiaries

3- Irrigated Forest Plantation

Ecosystem Function	Ecosystem Services	Beneficiary
Supplying function	Timber, fuel wood	All stakeholders
Regulating function	Soil conservation, Carbon fixation, and Oxygen release, climate regulation, hazard regulation, noise regulation	All stakeholders
Cultural function	Leisure, appreciation, eco-tourism and education	All stakeholders
Supporting function	Animal habitat primary productivity, nutrient cycling	All stakeholders

Ecosystem Services provided by Each Ecosystem and their beneficiaries

4- Aquatic Habitat

Ecosystem Function	Ecosystem Services	Beneficiary
Supplying function	Human and Live Stock consumption, Fish production	All stakeholders
Regulating function	Improvement of the ground water table, air and water purification, carbon fixation and oxygen release	All stakeholders
Cultural function	Leisure, appreciation, eco-tourism and education	All stakeholders
Supporting function	Nutrient cycling and Habitats for aquatic animals, animal habitant, primary productivity	All stakeholders

Changes in indicators of ecosystem services used to evaluate the three functions (Conservation, Development and Logistic)

- **Ecosystem service functions of BR have been enhanced over the years**
- **Positive changes seen in some indicators**
 - ❖ **Reduction in timber and fuel consumption due to increasing trend in use of natural gas.**
 - ❖ **Forest land increased due to inclusion of more area in the Reserve and due to Various new afforestation schemes**
 - ❖ **The increased forestland may absorb more carbon dioxide**
 - ❖ **Release of more of oxygen**
 - ❖ **Quantity and quality of lake water quality improved greatly due to renovation of the Pattisar Lake**
 - ❖ **Aquatic organisms and birds are expected to increase**
 - ❖ **Fish production is expected to increase**

Changes in indicators of ecosystem services used to evaluate the three functions (conservation, development and logistic)

- ❖ More plantations will increase timber production and other environmental services.**
- ❖ With the improvement of environment quality and landscape beauty, will attract more tourism related activities increasing the income of local people.**
- ❖ With improved services of the ecosystem such as carbon fixation, oxygen release, water conservation and rainfall, the ability to withstand natural disasters is likely to be strengthened.**
- ❖ New water resources development schemes will enhance the overall biodiversity of the area**
- ❖ Quality of Life of the people has improved due to new water development projects**

Life Before Water Schemes



Migration-Life Before Water Schemes



Change in Quality of Life



Ponds having system of hand pumps for human drinking water and livestock by donkey pumps

- SPECIALLY DESIGNED AND INSTALLED TUBEWELLS BY PCRWR



Change in Quality of Life

- R.O. PLANT INSTALLED AT DINGARH BY PCRWR



Description on Biodiversity involved in the provision of ecosystems services

A- HABITATS:

Two basic biotic communities occur within Lal Suhanra Biosphere Reserve:

- 1- Greater Cholistan Desert, characterized by large dunes, absence of clay flats, and vegetation consisting of shrubs, herbs and grasses but no trees.
- 2- Lesser Cholistan desert area is characterized by low sand dunes, clay flats and the presence of trees, shrubs, herbs and grasses.

The park extends across the ecotone between the two

Biodiversity in BR

B- FLORA

Two basic biotic communities occur within Lal Suhanra Biosphere Reserve:

- Tropical thorn forest (to the north)
- Desert scrub mainly found in the Lesser Cholistan desert
- Both communities, especially Tropical thorn forest, have been obscured over large areas by man-made features that have produced four broad types of Reserve habit:
 - ❖ Tropical thorn forest
 - ❖ Desert scrub
 - ❖ Irrigated forest plantations; and the
 - ❖ Wetland.

Tropical Thorn Forest, Transition zone



Scrub Vegetation in BR



Irrigated Plantation



Wetland



Desert Plants



- **Calligonum polygonoides**
- **Calotropis procera**
- **Capparis decidua,**



- **Prosopis cineraria**
- **Tamarix aphylla**
- **Crotalaria burhia**
- **Zizyphus mauritania,**



- **Haloxylon recurvum**
- **Aerva javanica**

Irrigated plantations



- **Acacia nilotica**
- **Dalbergia sissoo**
- **Eucalyptus camaldulensis**
- **Prosopis cineraria**



- **Tamarix aphylla**
- **Capparis decidua**
- **Salvadora oleoides**

Aquatic Plants



- **Eichornia crassipes**
- **Hydrilla verticillata**
- **Nelumbo nucifera**
- **Nymphaea lotus**
- **Phragmites karka**
- **Typha domingensis.**

C: FAUNA

Desert Bird Species



- The park has around 160 species of birds
- Houbara bustard
 - Quill
 - Black Partridge
 - Grey Partridge
 - Brown Dove



Birds of Prey

- **Laggar falcon**
- **Peregrine falcon**
- **Kestrel**
- **Egyptian vulture**
- **Marsh harrier**



Birds of Prey



- Griffon vulture
- Honey buzzard
- Hen harrier
- Indian sparrow hawk
- Spotted eagle



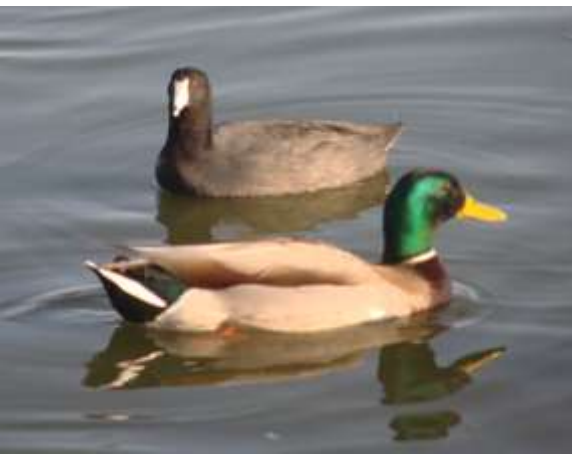
Garden Birds



- Larks,
- Shrikes,
- Wheatears



Migratory Birds



- Patisar Lake regularly holds between 10,000 and 30,000 ducks and common coot in mid-winter.
- Common coot
- Shoveler
- White-head
- Flamingo
- Ruddy shelduck

Introduced Animals



Carnivores



- Red fox
- Bengal Fox
- Caracal cat
- Indian Wolf
- Jackal



Meso-mammals



- **Jungle cat**
- **Indian Civet**
- **Indian Hare**
- **Smooth-coated Otter**
- **Porcupine**



IUCN Status of Important Mammal Species

No	Scientific name	Common Name	IUCN Status
1	<i>Boselaphus tragocamelus</i>	Nilgai antelope	Threatened
2	<i>Antelope cervicapra</i>	Black buck	Threatened
3	<i>Rhinoceros unicornis</i>	Indian rhino (introduced)	Threatened
4	<i>Gazella bennettii</i>	Chinkara gazelle	Vulnerable
5	<i>Vulpes bengalensis</i>	Bengal Fox	Vulnerable
6	<i>Lutrogale perspicillata</i>	Smooth-coated Otter	Vulnerable
7	<i>Caracal caracal</i>	Caracal cat	Rare
8	<i>Canis lupus</i>	Indian Wolf	Rare

Snakes



A number of snake species are also found in the park including

- Russell's viper
- Indian cobra
- saw scaled viper
- wolf snake
- sand boa

Lizards



- Monitor lizard

- Spiny tailed lizard

- *Eremius cholistanica*



- *Eumeces cholistanensis*

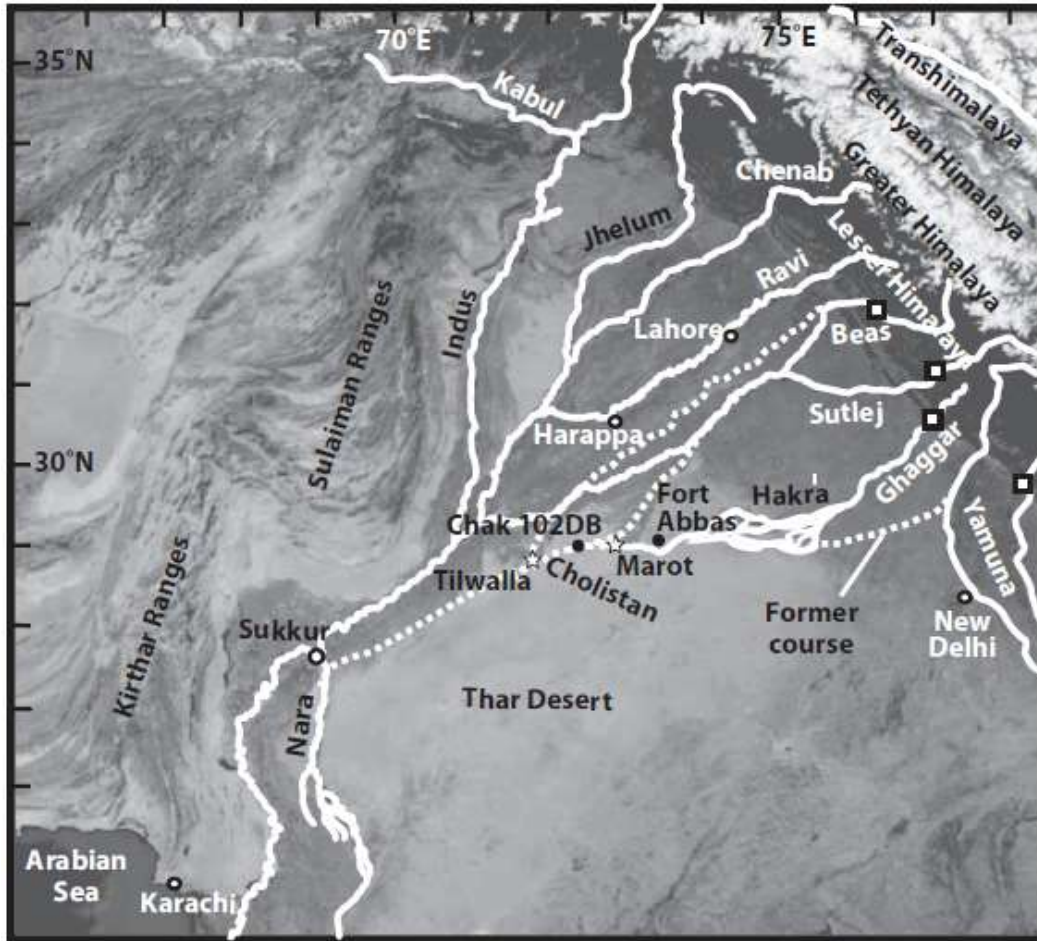


Tourism



According to 1997 statistics, around 1 million national and 50,000 foreign tourist visited the park each year.

Archaeology



**Hakra River bed
which crosses
the park.**

Archaeology



Cholistan is a land of forts. There are around 400 forts which actually guarded the routes of caravans in ancient times



Archaeology



The Punjab University's archaeology department has discovered a rare seal from Cholistan desert along the ancient bed of River Hakra. The seal dates back to 2500-2000 BC.

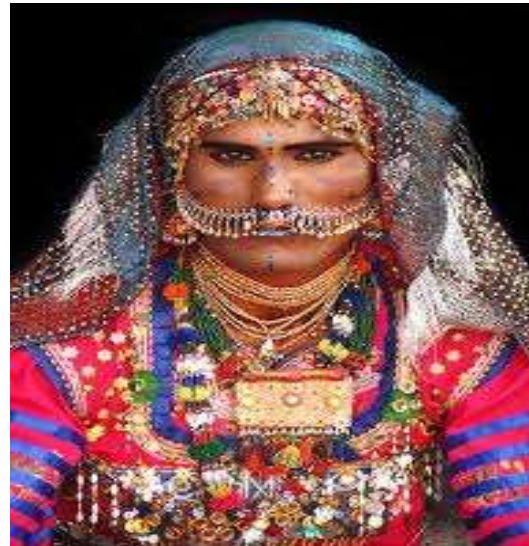
Archaeology



Culture



Culture



Livestock



Livestock



CONSERVATION FUNCTIONS IN BR

Significant Changes in BR

- **No significant changes in the main habitat types.**
- **Structure and functions of ecosystems remain unchanged**
- **No significant changes in, species composition**
- **Area of Biosphere Reserve increased**
- **Aforestation activities increased**
- **Various community development projects in place**
- **Eco-tourism activities enhanced**

Main Conservation Programmes

No s.	Projects	Total Rs. (Million)
1	Development of Patisar Lake and additional Recreational Facilities in Lal Suhanra National Park	125
2	Development of Strategic and Bankable Investment Proposal for Lal Suhanra National Park, Bahawalpur and Zoo Safari, Lahore.	16.52
3	Establishment of Chinkara and Blackbuck Breeding Centre, Lal Suhanra National Park, Bahawalpur.	126.146
4	Mitigation of Desertification for Poverty Alleviation by Integrated Management of Land and Water Resources in Cholistan.	34.44
5	Mitigation of Drought Disaster in the Cholistan Desert by Management of Water Resources	152.5

Main Conservation Programmes

Nos	Projects	Total Rs. (Million)
6	Rehabilitation of Existing Forest Parks in Punjab	163.16
7	Development of Range Lands in Punjab	100
8	Afforestation of Blank/ Mesquit Infested Areas of Irrigated Plantations in Southern Zone.	83.6
9	Establishment of Chinkara and Blackbuck Breeding Centre, Lal Suhanra National Park, Bahawalpur	196.824
10	Afforestation of 400 acres at Lal Suhanra National Park, Bahawalpur	11.5
11	Biomass increase in Lal Suhanra National park, Afforestation of 1200 acres of blank area	23
11	Afforestation of 500 acres at Bahawalpur	100.000

Water Source Developed By PCRWR in Cholistan

Sr.	Items	Nos.	Total Annual Capacity
1	Ponds (each with storage capacity of 15000 cubic meter)	92	1.35 million cubic meter (368 million gallons)
2	Turbine tubewells (each with discharge of 1.0 cusec)	20	7.0 million cubic meter (1405 million gallons)
3	R.O. Desalination Plants	2	0.01 cubic meter (2.16 million gallons)
	TOTAL		8.36 (1,775 million Gallons)

Linkage of conservation activities with sustainable development issues

- **Attraction for more tourism influx**
- **Improved population of key wildlife species like Blackbuck**
- **Rainwater can be utilized efficiently for drinking and irrigating plants.**
- **Now drinking water in the desert is available throughout the year.**
- **Migration of human and livestock due to shortage of water has stopped.**
- **Loss of rupees 6 billion annually caused due to reduction in livestock production in the form of mortality, diseases, loss of meat and milk as well as damage to crops in canal irrigated areas have been saved.**

Linkage of conservation activities with sustainable development issues

- **Micro climate around the reservoirs has been improved.**
- **The water of these ponds is also used for irrigation of nurseries and tree plantation under economical irrigation system**
- **Birds and other wildlife can be seen frequently around the reservoirs as well as more and more frequent vegetation**
- **Tourism has significantly increased**

Tourism Facilities

- **A well furnished Resort consist of 3 acres area**
- **Ten air-conditioned rooms with bathrooms**
- **Restaurant, snack bar and swimming pool with filtered water**
- **Boating & fishing facilities**
- **Lawn Banquet & BBQ Facility**
- **Safari Zoo & desert safari, horse riding**
- **Conference Halls,**
- **Camping Facility**
- **Green area Park for conducting events in open space.**

THE DEVELOPMENT FUNCTIONS OF BR

Trends in economic base of the Biosphere Reserve

- **Total Population of Cholistan 200,000, 130,000 depend on BR**
- **Tourism is the major economic base of the biosphere Reserve.**
- **Live stock grazing, 400,000 livestock in the Cholistan; 150,000 dependent on BR**
- **Sale of fuel wood 80,000-100,000 CFF sold worth of Rs. 7 million.**
- **Non timber products (Honey, Grass, Reed) about 1 million**
- **Sale of surplus Black Buck specimens (15-20 animals) about 2 million.**
- **Solar Energy Project, 100 MW solar plants being installed**



Tourism industry in the Biosphere Reserve

- **Tourism is the major industry in the Biosphere Reserve as:**
 - ❖ **It is the only tourist facility in the southern Punjab**
 - ❖ **Best tourist facilities are being provided**
 - ❖ **It is like an oasis in the desert**
- **Tourism has substantially increased over the over the last few years from 0.7 million in 2010 to 1.4 million in 2015.**

New Tourism Initiatives and Activities

- **A well furnished Resort consist of 3 acres area**
- **Ten air-conditioned rooms with bathrooms**
- **Restaurant, snack bar and swimming pool with filtered water**
- **Boating & fishing facilities**
- **Lawn Banquet & BBQ Facility**
- **Safari Zoo & desert safari, horse riding Conference Halls**

New Tourism Initiatives and Activities

- **Lion Safari**
- **Children Park**
- **Public washrooms**
- **Vast parking area**
- **Camping Facility**
- **Green area Park for conducting events in open space.**



How do economic activities in the biosphere benefit local communities

- 1. Commercial and tourism activities has improved employment opportunities for the local people**
- 2. Natural fish population in the wetland has increased**
- 3. Increased vegetation growth has helped improve the local cottage industry.**
- 4. Agroforestry activities are undertaken as economic development initiatives.**
- 5. Honey bee farming is also advocated in adjoining areas.**
- 6. Tourist industry has developed other line business and entrepreneurs**
- 7. Community support facilities and services have been undertaken in communities in the villages adjoining the boundary of the Reserve through WWF and NRSP, job preparation and skills training, health and social services are provided through training courses.**

THE LOGISTIC FUNCTION

Main institutions conducting research or monitoring in the Biosphere Reserve

**The institutions conducting research in the biosphere reserve
are:**

- **Department of Life Sciences, Islamia University
Bahawalpur**
- **Department of Forest, Rangelands and Wildlife, Islamia
University Bahawalpur**
- **Cholistan Institute of Desert Studies, Islamia University
Bahawalpur**
- **Institute of Biological studies, Baha-ud-Din Zakariya
University Multan**
- **Department of Forest, Rangelands and Wildlife,
University of Agriculture, Faisalabad**
- **Pakistan Museum of Natural History, Islamabad**

Main themes of research and monitoring undertaken over the past ten years

- **Botanical Sciences**
- **Zoological Sciences**
- **Conservation**
- **Biodiversity**
- **Forestry**
- **Livestock**
- **Diseases**
- **Tourism**
- **Development of water Resources**
- **Poverty Alleviation**

Main Research Work in BR

- **Hub of research on diverse fields**
- **11 Ph.D Thesis in the last 10 years**
- **15 M.Phil Thesis**
- **45 Research Papers on different subjects**
- **35 technical reports on different aspects**
- **Numerous training courses on forestry, livestock, wildlife, water harvesting, conservation, afforestation**

Thanks and Good Afternoon