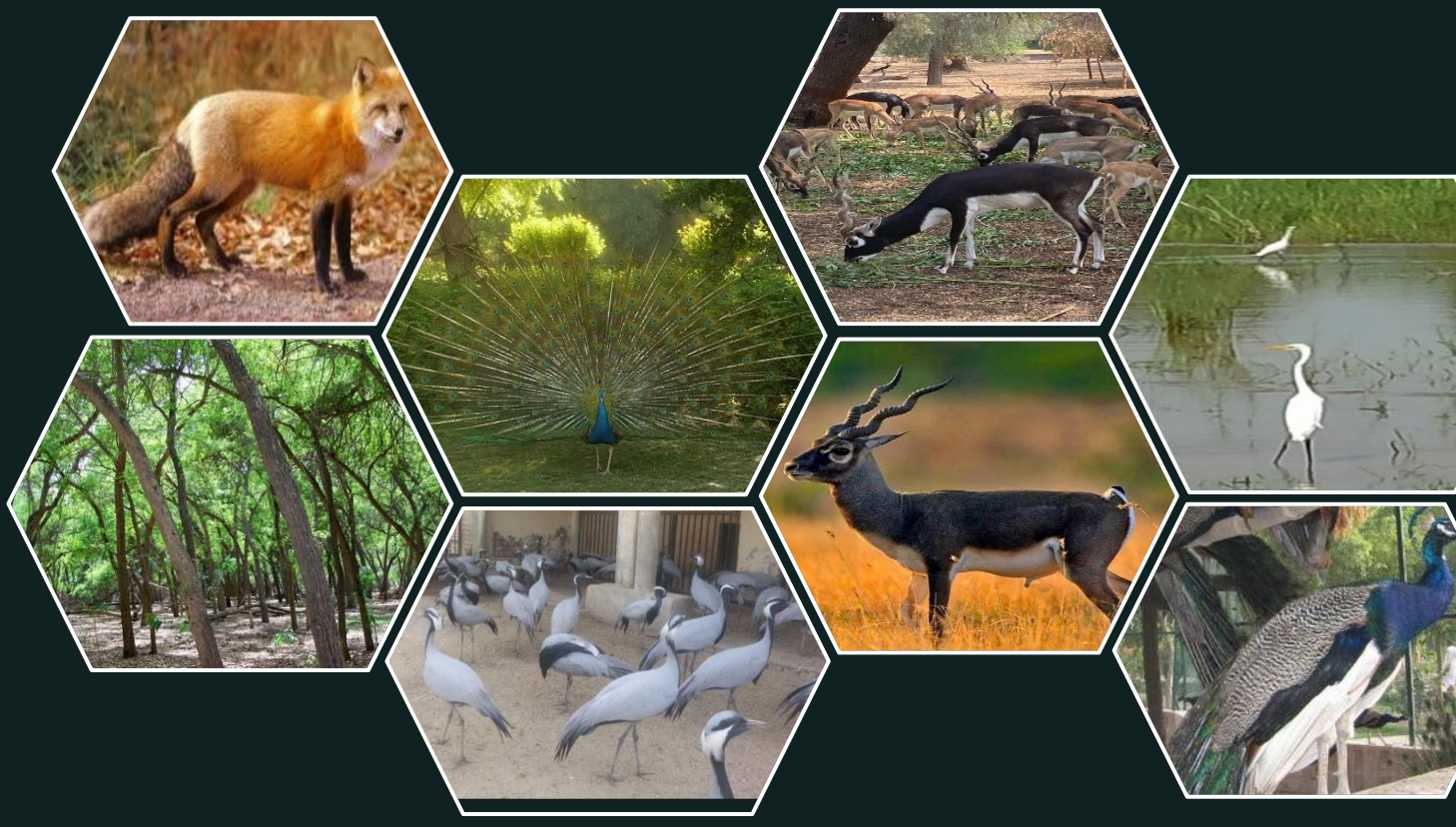
10 YEARS
OF NATURE
CONSERVATION



LAL SUHANRA NATIONAL PARK
MANAGEMENT PLAN

The Urban Unit

Lal Suhanra National Park

Management Plan

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1. Setting the Stage

1.1. CONTEXT

Lal Sohanra was formerly the hunting grounds of the Nawab of Bahawalpur, and it was declared as a game reserve in 1968. Lal Suhanra National Park (LSNP) is one of South Asia's largest national parks, having been established in 1972 and designated by UNESCO as Pakistan's first Man and Biosphere Reserve in 1977. Lal Suhanra is located in the District Bahawalpur, on the north-western edge of the Cholistan Desert. The Previous Nawab of Bahawalpur established the Lal Suhanra National Park in response to the threat of less flowing water from India's River Sutlej to Bahawalpur for drinking and irrigation needs. As a result, he built three enormous ponds to store water during periods of low water flow. The Forest Department began using the running ponds for irrigated plantation (1/3 of the area) and retained the remaining acreage as the ponds gradually silted up and the resulting flow decreased. Lal Suhanra National Park receives its water from the Desert Canal Branch and the ponds in LSNP were well supplied. The third pond covering 4,780 acres (1934ha) was good for wildlife and fisheries (Ahmad.,2005).

LSNP spreads over an area of 162,568 acres that covers irrigated plantation, Patisar lake (pond area), and Cholistan desert (Asad *et al.*, 2020; UNESCO.,2016). It is considered as an oldest protected area of Pakistan.

> *By definition and aim, biosphere reserves assist local people economically and socially, but they also have importance in demonstrating sustainable development related to conservation in the broader bio geographical area*
>
> UNESCO, 1984

The Lal Suhanra National Park protects the best of our natural heritage: amazing wildlife, splendid forests, and spectacular landscapes, Along with other protected areas, they make the basis of our communal and frugal welfare, captivate millions of visitors per annum, and help to protect wildlife by acting as a harbour for threatened species. It is famous for its fauna diversity that includes Blue bull, blackbuck, and Chinkara.

Lal Suhanra National Park as an inimitable heritage of Southern Punjab attracts visitors not only from nearby surroundings but also from other cities of Pakistan. LSNP is a varied and beautiful landscape where there is a harmonious and vibrant relationship between nature and humans, where nature itself thrives with swathes of natural and cultivated forest. Within the Park people of all ages can enjoy outdoor activities and quiet tranquillity.

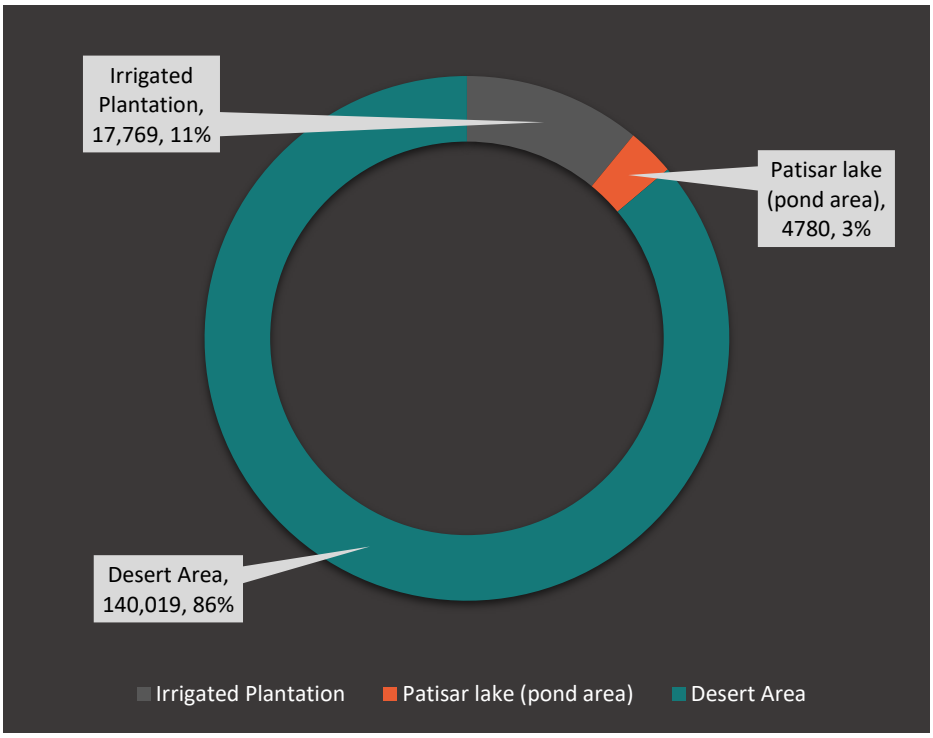


Figure 1: Area Distribution of Lal Suhanra National Park

1.2. NEED STATEMENT

One of the key recommendations from UNESCO is that that biosphere reserves need to have their management Plan and it must be conveyed with spatial planning, local socio-economic development planning, as well as the program development and planning in other areas. The management plan also needs to support and inherit existing management plans of core zones areas (national parks/protected area) (UNESCO, 2013a).

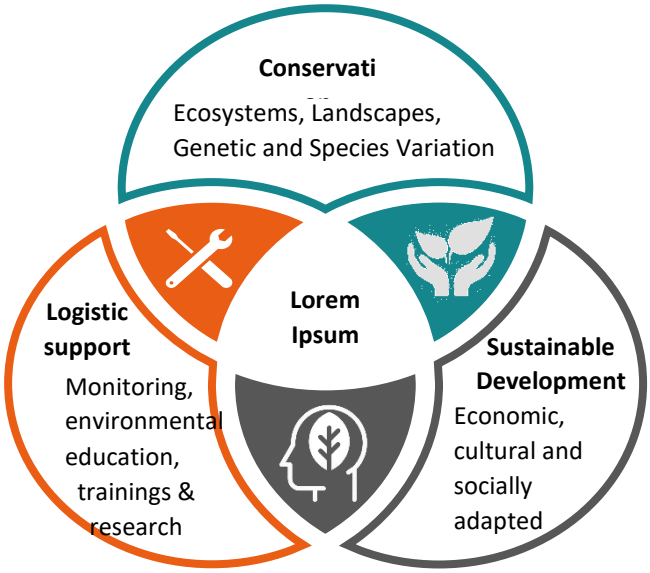
To meet the goals of socio-economic and sustainable development with multi-sectors and multi-sectoral coordination mechanism, the effective implementation and the integration of approved plans, projects into the management objectives for Lal Suhanra National Park is very necessary.

Since Integrated Master Plan of Cholistan Development Authority is in the making, it is important to develop and integrate a management plan for Lal Suhanra National Park with this regional plan. This management plan focuses on identifying the priority activities and mobilize resources effectively and maximize the effectiveness of cooperation between stakeholders, thereby contributing to the socio-economic development of local and capacity building to cope with climate change.

1.3. SCOPE OF MANAGEMENT PLAN

The Lal Suhanra National Park Management Plan establishes guidelines and policies for decision-making and planning to protect and maintain representative examples of regional ecosystems in the Punjab.

The scope management plan includes all three zones (core, buffer and transition zone) of LSNP, which covers a total area of 162,568 acres. This scope of management plan is strengthened upon three intertwined functions.



National Park management plan Scope includes;

SCOPE

- Evaluate the current conditions of Lal Suhanra National Park Biosphere Reserve.
- Understand the local, national and international legal as well as institutional framework, linked with biosphere reserve.
- Conduct the SW0T analysis, identify issues, values, challenges and importance of biosphere reserve.
- Evaluate the previous and existing development and progress paradigm of LSNP.
- Prepare a management plan which focuses on objectives by tackling issues and challenges through scientific as well as participatory approach to achieve the long-term plan.
- Identify and prioritise the future development plans.

1.4. METHODOLOGY

For development of Lal Suhanra National Park Management Plan the following steps were used;

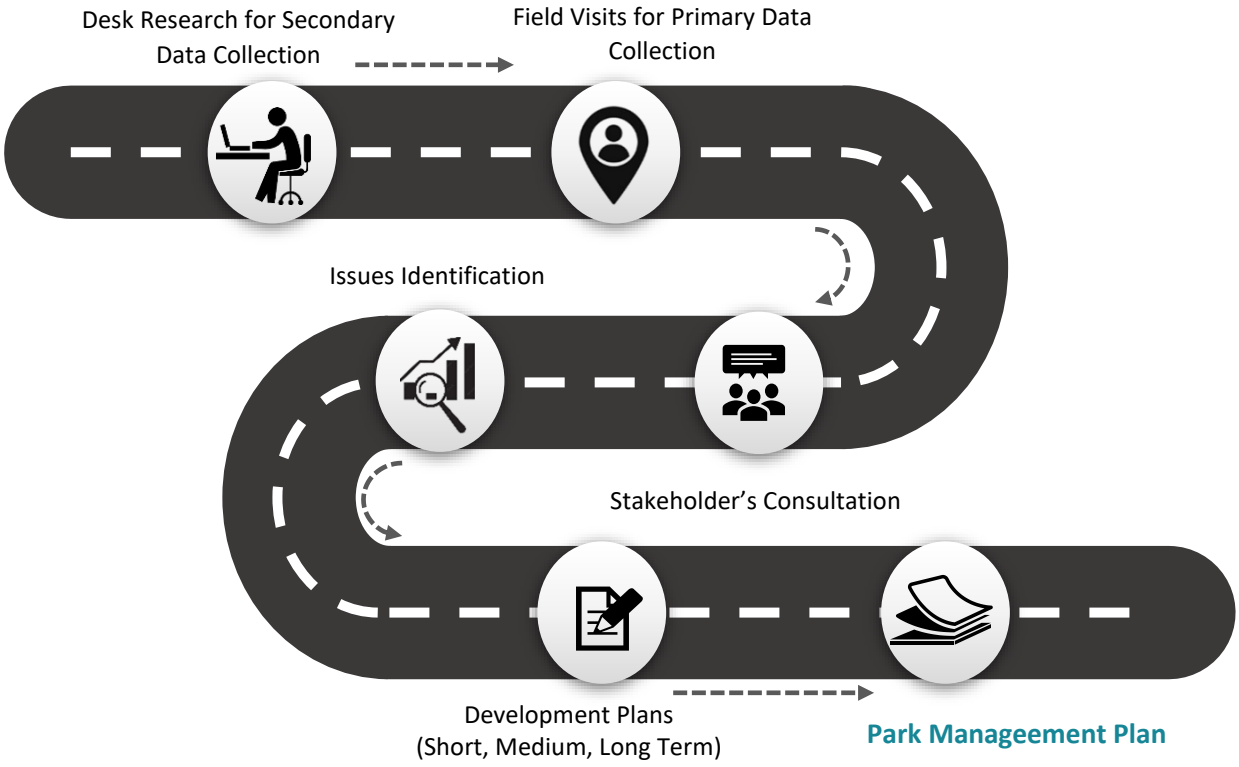


Figure 2: Methodology Road Map

1.4.1. LITERATURE REVIEW

For better understanding, literature review based on existing studies, policies, laws, research papers, reports, plans and other related documents were studied. These documents and reports are taken from government departments and from internet. These documents are very useful in understanding the context and defining the scope of this management plan.

1.4.2. FIELD VISIT

A number of field visits were conducted in August and October, 2021 with a team of environmentalist, biologist, GIS expert and other sector experts. The purpose of the trip was to gather Information about attitudes, activities, aspirations and knowledge pertinent to the LSNP biosphere reserve. The team visited all the habitat and collect baseline information, make observations, identify issues and challenges, make important sites, understand the development paradigm in biosphere reserve and discuss solutions with the field departmental staff and local community.

1.4.3. STAKEHOLDER CONSULTATION AND DISCUSSION

Initially the Urban Unit team had a discussion with the Director General, Forest, Wildlife and Fisheries department and take guidance on LSNP. He explained in details the important of biosphere reserve and provide key notes on issues and challenges.

During the field visit the Urban Unit team meet couple of times with the Conservator/Administrator Forest, Divisional Forest Officer, Deputy Director, Wildlife Department, Block Officer and local community. Discussion were made on field issues and challenges faced by the department in the conservation and protection of natural value of biosphere reserve. The first-hand information provided by key stakeholders form the foundation of this management plan and the interventions proposed in the upcoming sections.

1.4.4. IDENTIFY ISSUES AND CHALLENGES

Based on above three steps major issues and challenges were identified. These challenges were linked with operational problems, capacity constraints, social interaction, conservation practices, development paradigm and climate change. The management plan focuses on finding appropriate actions that will help bridging the gap to resolve these issues and challenges.

1.4.5. PRIORITY BASED DEVELOPMENT PLANS

Another important step is reviewing the previous and existing development portofolio to understand the type of development works performed in the LSNP biosphere reserve. This coupled with existing issues provides a good insight for defining need-based priority (short term, medium term and long term) of development project.

1.4.6. DEVELOPMENT OF PARK MANAGEMENT PLAN

All the above steps provided input that formed a comprehensive document of **Lal Suhanra National Park Management Plan.** The park management plan is presented in following chapters;

1. The Context
2. Legal Landscape
3. Long Term Vision
4. Current Status of LSNP
5. Issues and Challenges
6. Stakeholder Consultations
7. Management Plan of LSNP
8. Institutional Framework for Implementation of the EMP
9. Monitoring and Evaluation
10. Cost Estimate

2. Policy, Legal & Administrative Framework

The constitution of Pakistan has substantially altered the allocation of legislative powers between the National and Provincial Assemblies, resulting in more Provincial autonomy. Powers have been assigned to provincial Environmental Protection Agencies/Departments (EPAs/EPDs) Some of the key International/national/local regulations that are considered related to the Integrated Master Plan of Cholistan is briefed below whereas list of important laws is mentioned in Box 2.1;

Table 2.1: List of Relevant National and Provincial Laws

National Framework	Provincial Framework
▪ Pakistan Climate Change Act, 2017	▪ Punjab Environment Protection Act, 2017
▪ Forest Act, 1927	▪ Policy on Controlling Smog, 2017
▪ Pakistan Environmental Protection Act, 1997	▪ Punjab Environmental Protection (Delegation of Powers for Environmental Approvals) Rules, 2017
▪ National Climate Change Policy, 2012	▪ Punjab Hospital Waste Management Rules, 2014
▪ Framework for Implementation of Climate Change Policy, 2013	▪ Punjab Environmental Protection Motor Vehicle Rules, 2013
▪ National Sustainable Development Strategy, 2012	▪ Punjab Environmental Protection Administrative Penalty Rules, 2013
▪ National Disaster Risk Reduction Policy, 2013	▪ Regulation of Disclosure of Environmental Information and Citizen Engagement, 2020
▪ National Forest Policy, 2015	▪ Environmental Sampling Rules, 2001
▪ National Rangeland Policy, 2010	▪ Pollution Charge Rules, 2001
▪ Review of IEE / EIA Regulations, 2000	▪ Environmental Tribunal Rules, 2012
▪ National Conservation Strategy, 1992	▪ Punjab Environmental Quality Standards (municipal and liquid effluents, drinking water, motor vehicles, ambient air, noise, treatment of liquid and disposal of biomedical waste and Industrial gaseous emission), 2016.
▪ Biodiversity Action Plan for Pakistan, 2000	▪ Punjab Forest Policy, 2019
▪ Guidelines for sensitive and critical areas, 1997	

2.1. INTERNATIONAL CONVENTIONS/TREATIES

Pakistan has signed multiple multilateral environmental agreements. There are several MEAs that Pakistan is signatory to and the same has to be rectified by each province as environmental matters fall in the domain of provinces as per the Concurrent Legislative List. Major agreements relevant to the current project are United Nation's convention to combat desertification and Stockholm convention etc. Convention on desertification is relevant to the given project. The team will also assess guiding documents on Man and Biosphere (MAB) Reserves including MAB Strategy (2015-2025) and technical guidelines.

Sustainable Development Goals (SDGs) recognize climate action and environmental management as an essential component to sustainable development and has a list of dedicated goals to combat them. Being signatory of 2030 Agenda for Sustainable Development, provinces need to ensure that its laws, policies, strategies and plans/programs should be aligned with the SDG goals.

2.2. PAKISTAN NATIONAL CONSERVATION STRATEGY

The federal cabinet of Pakistan approved the National Conservation Strategy (NCS) in March 1992.and serves as the country's main environmental policy document. The NCS provides country's main strategy for promoting sustainable development, protecting natural resources, and enhancing natural resource management efficiency.

The NCS includes 68 particular projects in 14 major areas where policy action is considered critical for Pakistan's natural and physical environment to be preserved. Pollution control and abatement, rangeland restoration, increased energy generation, biodiversity conservation, forestry and plantation support, and cultural heritage protection are all important aspects of the planned project. The national conservation strategy's principles are as follows:

- Achieve better public partnership in management and development
- Integrate environmental and economic considerations into decision-making

Concentrate on long-term improvements in Life quality. The following are the projected areas where NCS must be implemented first.

- Crop land's soil condition.
- Deploy and develop renewable resources.
- Protection of water bodies and sustain fisheries.
- Preserve cultural heritage.
- Protect watersheds areas.
- Integrate environmental and population agendas.
- Restore range lands areas and improve livestock.
- Support institutions for the use of mutual resources.
- Conserve biodiversity.
- Increase irrigation efficiency.

- Support plantations and forestry.
- Increase energy efficiency.
- Abate/prevent pollution.
- Manage urban wastes.

2.3. NATIONAL LEGAL FRAMEWORK

2.3.1. NATIONAL WILDLIFE POLICY, 2021

In a recently approved National Wildlife Policy, with the aim of promoting sustainable wildlife utilization to serve present and future generations, by maintaining and improving the diversity and health of wildlife heritage, including species, habitats, and associated protected areas, in the country.

2.3.2. NATIONAL CLIMATE CHANGE POLICY, 2021

In a recently approved National Climate Change Policy (NCCP), the government has taken an integrated strategy to building resilience in various climate-sensitive sectors and ensuring a substantial response at both the national and subnational levels.

2.3.3. NATIONAL FOREST POLICY PAKISTAN, 2015

The National Forest policy basically governs the planning and economic coordination on forests between provincial governments.

The aim of this policy is to promote the long-term development of Pakistan's Renewable Natural Resources (RNR) by preserving and restoring these vital resources, as well as improving the sustainable livelihoods of populations in the rural area, mostly children, women, and other deserving groups.

2.3.4. PAKISTAN TRADE CONTROL OF WILD FAUNA AND FLORA ACT, 2012

This Act defines the rules for the export, re-export, and import of any wild fauna and flora into Pakistan. Such a transaction must be conducted at a custom point of entry or exit and shall be subject to any other regulation relating to import and export controls in effect at the time. Any individual who attempts or aids in the commission of a crime which is prohibited by this Act.

2.3.5. CANAL AND DRAINAGE ACT, 1873

The Canal and Drainage Act of 1873 forbids corruption to contaminate or foul water in canals (which includes channels, reservoirs, tube wells, and watercourses), as well as to hinder drainage. This Act will apply to the proposed project's construction and operations and maintenance (O&M) activities.

2.3.6. FOREST ACT, 1927

The Forest Act, which was ratified over eighty years ago, maintains the foundation for forest management. The Forest Act of 1927 has been in effect in many parts of the country since independence. Forests in Punjab and other provinces are still managed under the Forest Act of 1927, with a few amendments.

Existing forestry laws are intended to manage the use of forests and plant resources, but they make no explicit provisions for long-term usage or conservation.

This Act aims to safeguard forest lands while also regulating forest products. The Forest Act allows governments to create different types of forests, reserve state-owned forest property, take control of privately-owned forest land, and designate any government-owned forest land as a protected area. In reserved and protected regions, the legislation prohibits hunting, grazing, clearing for the cultivation purpose, quarrying, removing forest production, and falling or lopping branches and trees.

2.3.7. CUTTING OF TREES ACT, 1975

Without the consent of the Forest Department, tree cutting or chopping is prohibited under this Act. For illegal tree cutting, the statute sanctions a fine or jail, or both, but it makes no provision for compensatory afforestation.

2.3.8. NATIONAL ENVIRONMENTAL QUALITY STANDARDS (CERTIFICATION OF ENVIRONMENTAL LABORATORIES) REGULATIONS, 2000

The provinces have been assigned the authority to certify environmental laboratories under section 6(1) (k) of the PEPA 1997, and they can continue to do so. As previously stated, any changes to these Regulations can only be implemented if Provincial EPAs have been officially authorised in this regard by Provincial Assembly Acts. For laboratories located within the ICT, the Pak EPA will continue to wield these authorities.

2.3.9. NATIONAL ENVIRONMENTAL POLICY, 2005

The National Environment Policy gives federal, provincial, and local governments broad guidelines for resolving environmental issues and maintaining effective environmental resource management. The Policy's key goals are environmental resource conservation, restoration, and efficient management. Furthermore, by raising public awareness and mobilising communities, international commitments are met, and demand for the environment is created. Sectoral guidelines on forestry, water supply and management, poverty and the environment, and climate change are all included in the national environment policy.

2.3.10. GUIDELINES FOR SENSITIVE AREAS

Biosphere reserves Archaeological sites, and natural parks, wildlife sanctuaries and preserves include in environmentally sensitive areas.

2.4. PROVINCIAL LAWS

After the 18th amendment, the provincial department has promulgate various laws, policies, regulations and guidelines that helps towards better environmental governance that results in protection and conservation of natural environment. Some of these important laws that are relevant to CDA are as under;

2.4.1. PUNJAB PROTECTED AREAS ACT 2020

In this new act, the Government of Punjab defined various types of protected area and also brief the purpose of notifying these protected areas. The act purpose management board and outline functions for implementation of this act. It also empower department to lay down standards for management and development of protected areas. This act presented management authorities, offences and penalties for better enforcement of this act.

2.4.2. PUNJAB FOREST POLICY 2019

This policy gives information on how to develop, manage, and optimise forest resources in a way that is scientifically environmentally and environmentally sustainable, ecologically stable, commercially viable, and socially acceptable.

2.4.3. FOREST ACT, 1927 (AMENDED 2016)

This Act provides rules and regulations for the protection of forests, village forest and social forestry control of timber and other forest-produce transit. This Act establishes rules and regulations for forest protection, timber and other forest-produce transit control, rural forest management, and social forestry.

2.4.4. PUNJAB PLANTATION AND MAINTENANCE OF TREES ACT, 1974

This law was enacted by the provincial government in 1974 to control tree plantations and to enact measures to protect tree plantations in the province.

2.4.5. PUNJAB IRRIGATION AND DRAINAGE AUTHORITY ACT, 1997

This Act aims to carry out the Punjab Government's strategy for rearrangement of the Irrigation and Drainage System; to change prevailing administrative procedures and setup with more approachable, transparent, and efficient arrangements; to attain efficient and cost-effective operation and maintenance of the province's irrigation, drainage systems; and flood control to make the drainage and irrigation network long-term sustainable by introducing latest technologies.

2.4.6. THE PUNJAB WILDLIFE (PROTECTION, PRESERVATION, CONSERVATION AND MANAGEMENT) (AMENDMENT) ACT, 2007

This legislation establishes a wildlife department and ensures that wildlife is protected.

The purpose of this legislation is to protect, maintain, conserve, and manage wildlife in the Punjab Province. The act is known as the Punjab Wildlife Act of 1974, and it covers the entire province of Punjab. It was updated in 2007. This act creates a wildlife department and ensures the protection of animals.

2.4.7. PUNJAB ENVIRONMENT PROTECTION ACT, 1997 (AMENDED, 2012)

The Federal Ministry of Environment was dissolved after the 18th Constitutional Amendment of Pakistan's Constitution, and the topic of environment was delegated to the provinces. Punjab's EPA has drafted its

own legislation. The act's main content is identical to that of PEPA, 1997. The Act deals with a wide range of concerns. Penalties have been established for individuals who violate the Act's requirements.

2.4.8. PUNJAB ENVIRONMENTAL QUALITY STANDARDS (2016)

Punjab has established environmental standards for ambient air, drinking water, industrial emissions, motor vehicle exhaust, noise, municipal and industrial effluents, and bio-medical waste treatment and disposal by incineration, microwave, autoclaving, and deep burial. All of this is pertinent to the CDA project.

2.4.9. PUNJAB LOCAL GOVERNMENT ACT 2019

Under the Punjab Local Government Act 2019, environmental protection is becoming a more important topic. Local governments may execute the authorities set out in the Punjab LGA 2019 Fifth Schedule.

2.4.10. PUNJAB SPATIAL STRATEGY 2047

The vision of the Punjab spatial strategy emphasises the importance of a clean environment, which has an impact on the community's liveability and public health. Cholistan is one of the key areas of the spatial strategy that needs to be addressed as part of the environment component. Furthermore, for a clean, green, and climate resilient Punjab, a consistent effort to mainstream environmental issues is critical.

2.5. LOCAL LAW AND POLICIES

2.5.1. CHOLISTAN DEVELOPMENT AUTHORITY ACT, 1976

This act is necessary to form a body for abrupt development and administration of the Cholistan area of the Bahawalpur Division. It specifies the functions, authorities, responsibilities, organisational structure, and business conduct. The statute also empowers the CDA to enact new regulations.

2.6. INSTITUTIONAL ARRANGEMENT

From environmental point of view, Forest, wildlife and Fisheries (FWF) department has a well-established institutional presence with special positions designated for Lal Sohanra National Park. All the activities linked with the protected areas comes under the ambit of FWF department.

Environmental Protection Agency (EPA) also have their district offices in all three districts, major responsibilities of EPA is the enforcement of Punjab Environmental Protection Act 1997 (amended 2017) through environmental approvals, inspections and monitoring.

Cholistan Development Authority is the special authority that operates under the functions and responsibilities delegated through Cholistan Development Authority Act, 1976. As per the act, all kind of development in its jurisdiction including preservation of forests, conservation, multiplication natural vegetation and wildlife and exploration of mineral resources in Cholistan is the responsibility of Cholistan Development Authority.

3. VISION & OBJECTIVES

Lal Suhanra National Park is one of the spectacular biosphere reserve areas, recognized internationally as a place with features of national botanical and zoological significance, cultivated and natural forest, Patisar Lake and desert area.

3.1. VISION

> "Prepare and adapt a participatory management approach to maintain and improve the natural ecosystems and cultural diversity of Lal Suhanra National Park by addressing the needs of eco-conservation, protection, sustainable development and scientific research at Lal Suhanra National Park Biosphere Reserve"

3.2. MANAGEMENT GOAL

To protect, conserve and retain the ecological values as well as the scenic beauty of Lal Suhanra National Park for current and future generations, predominantly as a derivation of glory, inspiration, education, recreation and enhance the local community's livelihood.

3.3. OBJECTIVES OF LAL SUHANRA PARK MANAGEMENT PLAN

To achieve the long-term vision, this management plan set the following objectives;

OBJECTIVES

- Protect the ecological integrity of all three habitat (desert area, irrigated plantation and Patisar lake) of LSNP Biosphere reserve for present and future generations.
- Conservation and protection of cultural diversity.
- Plan for introducing key species in core zone of LSNP Biosphere reserve.
- Address key challenges of eco-conservation through proper management interventions.
- Provide nature-based recreation activities in a remote landscape setting.
- Maintain the integrity of Indigenous and non-Indigenous cultural heritage values.
- Foster and maintain community partnerships and participation in park management through multisector cooperation approach.
- Promotion of sharing benefits and ecosystem services with local people living in the biosphere reserve.
- Contribution in scientific research and environmental awareness /education.

4. CURRENT STATE OF LSNP

4.1. ADMINISTRATIVE BOUNDARY

The Lal Suhanra National Park (LSNP) is located in the Yazman Teshil of Bahawalpur district in Pakistan's Punjab province, on the northwestern fringe of the Cholistan Desert. It covers an area of1,62,568 acres and is located between 29°12' and 29°28' N latitude and longitude at an altitud e of 125-140 m above sea level.[1]

The LSNP covers a section of Lesser Cholistan's northern margins, located about 36 kilometers east of Bahawalpur on the main Bahawalpur-Bahawalnagar highway in Punjab Province, Pakistan

The Bahawal Canal, which originates near the Islam Head Works, flows on the Plantation's Northern outskirts from RD-215 to RD-238, preceding diverging into Desert Branch.

Desert Branch along with Kudwala-Yazman interface Road (Which is additionally the Service Road of the Desert Branch from Head controller to RD-80) defines the Plantation's Western Boundary and serves the Children's Park, Lion Safari, Black Buck Enclosure and the "Whispering Hill" Rest House."
Ladamsar –II Range is located on the right side of the Desert Branch.

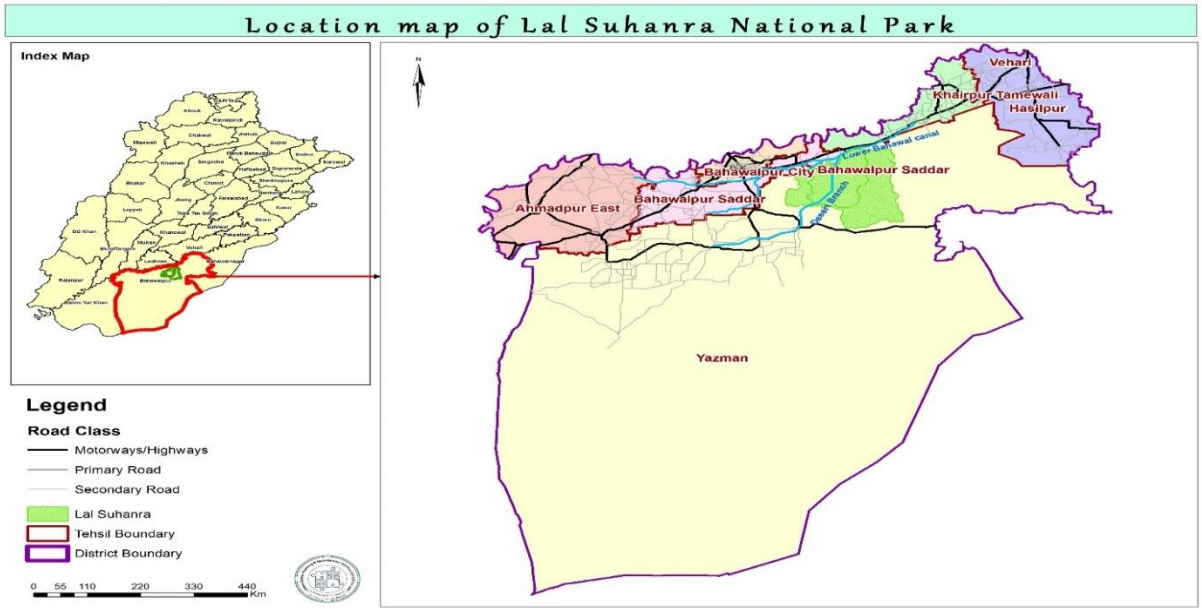


Figure 3: Location Map of Lal Suhanra National Park

[1] "Lal Suhanra National Park". Forest, Wildlife and Fisheries Department, Punjab. Retrieved 28 December 2016.

4.2. ZONING SYSTEM OF LAL SUHANRA BIOSPHERE RESRERVE

Biosphere Reserve zoning framework is an incorporated system to classifying natural habitats based on their ecosystem and cultural resource protection needs[2]. The zone concept is meant to be adaptable, and it can be used in a variety of ways to meet local needs and situations. Traditionally, biosphere reserves are categorized into three inter-linked zones;

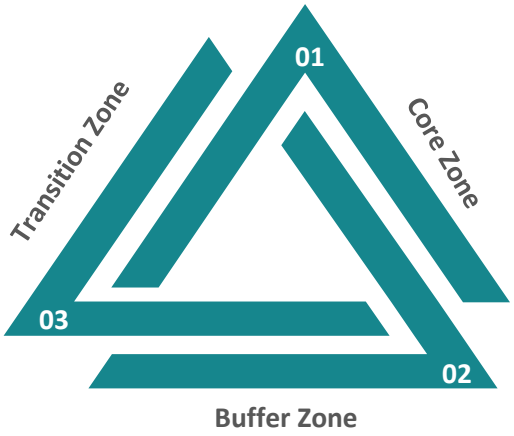


Figure 4: Zoning System of Lal Suhanra Biosphere Reserve

4.2.1. CORE ZONE

The core area(s) comprises a rigorously ensured ecosystem that contributes to the landscape conservation, ecosystems, genetic and species variation. This zone is legally protected area of biosphere reserve where human intervention is strictly prohibited. Information from this core zone can be utilized to assess activities sustainability, the long-term viability of operations or environmental quality maintenance in the adjacent areas, as well as to establish projects with communities, businesses, and other biosphere reserve partners.

The Core Zone of Lal Suhanra Biosphere Reserve according to the definition comprised of Ladamsar- I Forest Range that spreads over an area of 107,019 acres in desert habitat (Lesser Cholistan). The area is arid which complement the sub-tropical thorn forest vegetation. The core zone which is the eastern part of the Biosphere Reserve falls in between Qaimpur Kale Pahar to Kudwala Fortabbas Road. The area supports and excellent habitat for Black Buck and Chinkara. The prime objective of this management plan is to protect the core zone so that locally breaded black buck and chinkara may be released in the open desert.

[2] https://www.pc.gc.ca/en/pnnp/nt/aulavik/info/plan/plan2/sec6

4.2.2. BUFFER ZONE

The buffer zone encompasses or connects the core zone areas and is utilized for activities that support scientific study, monitoring, training, and education while adhering to acceptable ecological practices. It could include methods for managing natural vegetation, land, agricultural, forests, fisheries, and deserts in order to improve overall production quality while preserving natural processes and biodiversity.

The Buffer Zone consist of Lal Suhanra Forest Sub Division, Ladamsar- I Range & Ladamsar- II Range irrigated plantation areas which is well laid out on conventional irrigation plantation patron consisting of khals parcels and trenches on which successful plantations have been raised. It covers an area of 19,761 acres. The irrigated plantation areas of buffer zone is fed from Desert Branch and it's a good habitat of Bluebulls and other wildlife and birds which are spotted occasionally. This management plan will propose action plan for introduction of hog deer in this zone during the plan period.

New planted forest plan inaugurated by Prime Minister Imran Khan under 1000 billion tree tsunami project (Moringa, jaran, Bairi, neem, Amal tas, Anjeer, Sukhchain trees) is part of this, Snakes, rabbits, wild cats, lizards, and jackals would be encouraged to breed naturally in this area.

4.2.3. TRANSITION ZONE

Transition zone is the portion of the biosphere reserve where the maximum activity is permitted, supporting socio-culturally and environmentally sustainable economic and human growth.

Transition Zone spreads over an area of 35,788 acres that includes Portion of Ladamsar –II Range, Patisar Lake area and Children Park. In this zone, extensive development activities have been executed by Government of Punjab that includes improved facilities/capacity of Children Park; dirt tracks to reach Patisar Lake; provide facilities i.e. parking, toilets, and rest house, bird watching tower. With these upgraded facilities, tourist will now have access to Patisar lake, an important spot for migratory birds spreads over 4,750 acres.

The transition zone of Lal Suhanra Biosphere Reserve is closer to Bahawalpur city, Islamia University Bahawalpur and the Solar Park, Bahawalpur. The transition Zone will also support promotion of local cultural / crafts.

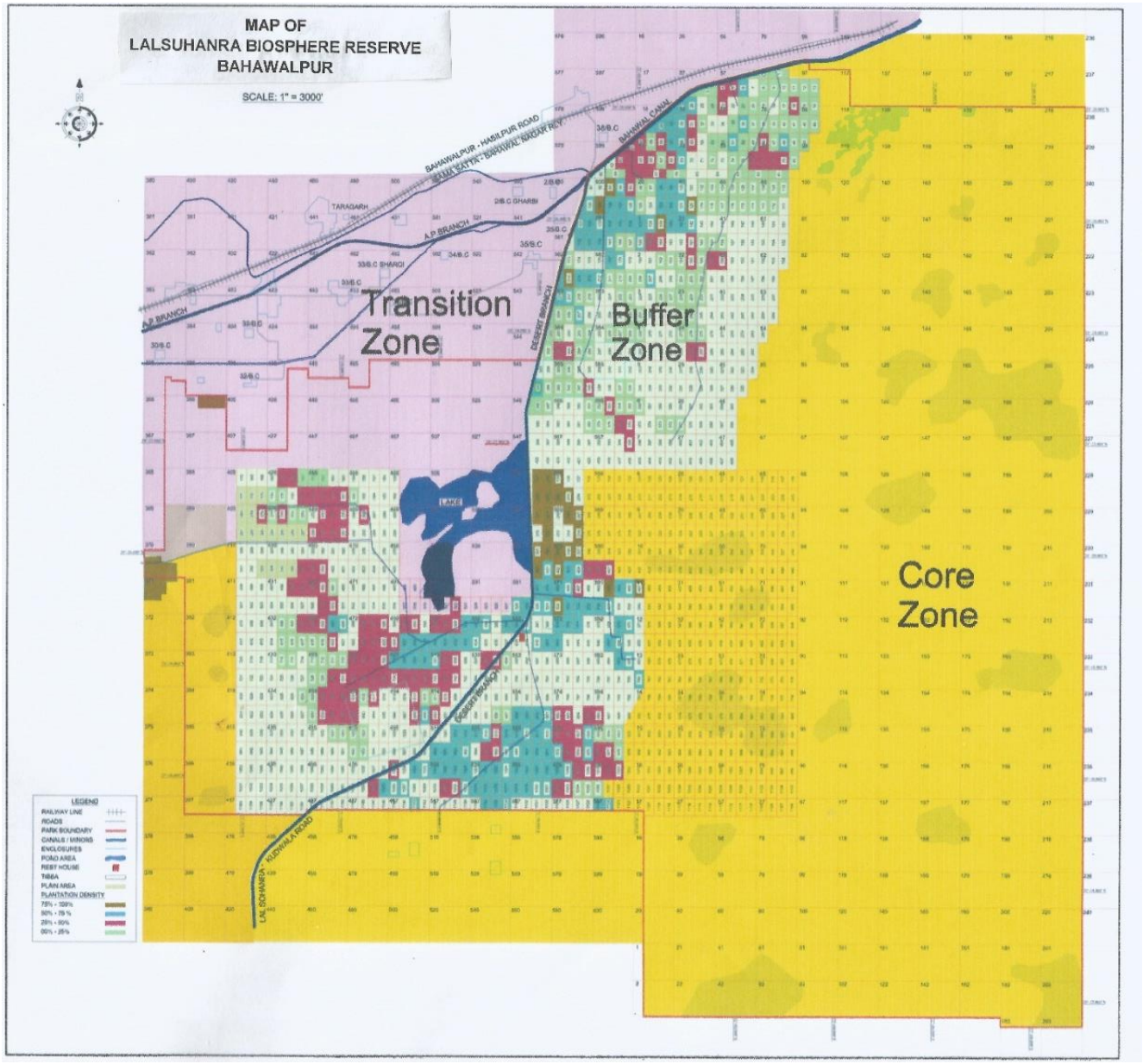


Figure 5: Zones of Lal Suhanra Biosphere Reserve

4.3. NATURAL CONDITIONS

4.3.1. CLIMATE AND METROLOGY

Lal Suhanra National Park falls in semi to warm desert ecosystem. The climate is arid to semi-arid, sub-tropical, scorching hot, with seasonal monsoons influencing monsoon rainfall. With the increasing rate of evaporation, the relative humidity is extremely low.

This segment of land is one of driest and hottest regions in Pakistan. In summer, the temperature is as high as 51.6 °C and in winter goes down freezing point (Khan et al., 2003). It is hot hyper sandy desert with May and June are the extremely hottest months of the

Due to the small amount of rainfall, scarcity of water is quite common which leads to meteorological droughts in this area, which can extend few months to little year time. year.

In the desert area the mean annual precipitation is minimal, erratic and variable. The annual precipitation varies between 100 and 250 mm. During the summer monsoon season, most of the precipitation receives in the months of July, August, and September. (Arshad *et al*., 2002).

Dry years in clusters, i.e., for 4-6 years at a time, are one of the most remarkable features of the Cholistan desert.

Wind direction is prevalent from south-western during summer and north-eastern in winter. Average wind speed ranges from 9.5 km/h in January to 20 km/h in July with high temperatures causing abrasive effects on tender branches and leaves of desert vegetation. Wind speeds range from 9.5 km/h in January to 20 km/h in July, with high temperatures producing abrasion on desert vegetation's fragile branches and leaves. Summer winds can cause sand dune shifting, which might result in the burying of the area's dwarf vegetation. (Arshad *et al*.,2008; Ali *et al*., 2009).

4.3.2. TOPOGRAPHY AND GEOMORPHOLOGY

Lal Suhanra National Park area is arid and flat with sand dunes rising to a height of 4 metres. Soils of this area are classified as saline-sodic or saline, with pH levels ranging from 8.2 to 8.4 and 8.8 to 9.6, respectively.

The Cholistan Desert can be divided into two geomorphic zones based on terrain, soil, and vegetation:

- **Lesser Cholistan** is the name given to the northern region, which is bordered by canal irrigated areas covering roughly 7,770 km^2;
- **Greater Cholistan** is the name of the southern area, which covers 18,130 km^2.

Lal Suhanra National Park majorly falls in Lesser Cholistan; however some portion extends across the other ecotone. Lesser Cholistan in the north is characterized by large saline compacted areas with alluvial flats, low sand ridges and dunes, which are generally stabilized to semi-stabilized, or less frequently shifting dunes. Large saline compacted areas with alluvial flats, low sand ridges, and dunes, which are generally stabilized to semi-stabilized, or less commonly shifting dunes, characterize Lesser Cholistan in the north. The Greater Cholistan region in the south, on the other hand, is covered in large sand dunes. (Arshad et al., 2003, 2007).

4.3.3. GEOLOGY AND SOIL

Soil in the Lal Suhanra National park is made of alluvial deposits having various proportions of sand, silt and clay at different places. Generally, the layers of soil formation are generally uniform varying in depth from 15-120 cm. The soil strata are generally consistent, ranging in depth from 15 to 120 cm. Soil pH varies between 7.70 and 8.50. Being a part of the Cholistan Desert, salinity is a typical occurrence.

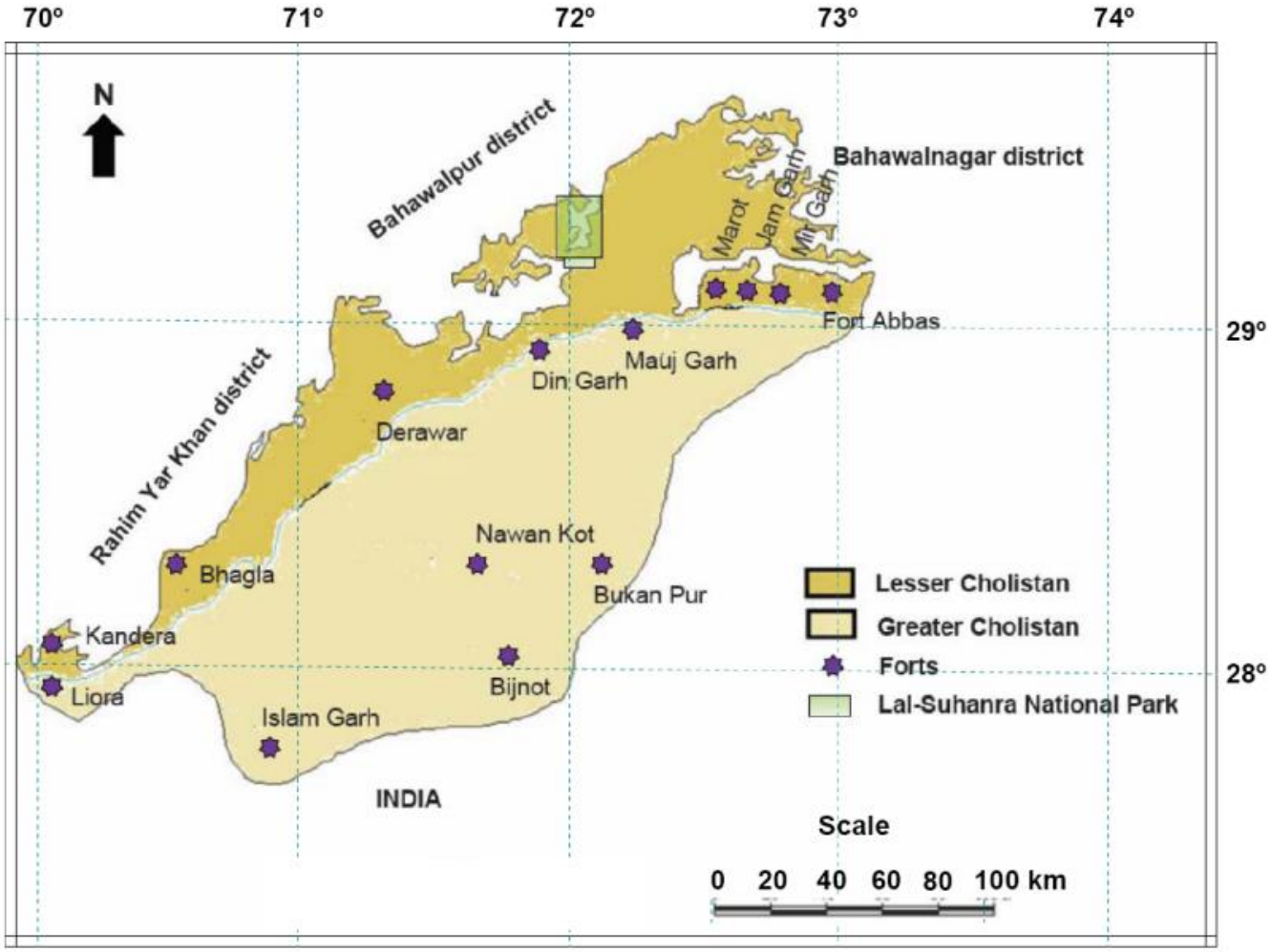


Figure 6: Geomorphology of Cholistan and Lal Suhanra National Park

4.3.4. PROTECTED AREA HABITAT

Lal Suhanra National Park was set up to ensure protection of existing wildlife vegetation; reintroduce extinct species; rehabilitate wildlife habitat; generate education/research facilities for nearby and foreign tourists, to provide recreational opportunities for the local population.

In addition to the declaration of Wildlife Sanctuary by Forest, Wildlife and Fisheries Department, the Cholistan Desert also host a very unique habitat declared as Lal Sohanra National Park. The park aims to conserve indigenous fauna and flora of Cholistan predominantly Chinkara, Blue bull, Blackbuck, and others. The Lal Sohanra National Park represents generally three types of habitats i.e. irrigated forest plantations, desert wetland and Cholistan Desert area.

IRRIGATED PLANTATIONS

It consists of a mixture of planted area and natural cover. Plantation consists of shisham, kikar, jand, eucalyptus, simal blocks and mesquite natural cover. It is good habitat for blue bull, black bucks and chinkara. Other species of wildlife are jackal, wild bore, snakes cobra, russels wipers, porcupine etc.

DESERT AREA

Presently the desert area which is part of Lal Sohanra National park is more than 1.0 lac acres and called as lesser Cholistan. The main forest type is subtropical thorn forest with

Trees, Shrubs and Grasses. Although the major portion of Cholistan desert is a high conservation area due to its unique habitat and distinct biodiversity.

Within the desert, a wildlife sanctuary of 6,533 square kilometres has been established, which is home to some of the rare animals in this area, including the Desert Wolf, Indian Fox, Red Fox, Saker Falcon, Black-backed vulture, and Saw Scaled Viper.

WET LAND

Patisar lake is a well wetland and a great site for birds sighting during winter. It covers an area of 4750 acres. In the past it was desilted and the current government has decided to revive it to its original shape as that existed 100 years back its rehabilitation is under process. A lot of migratory birds visit this wetland each year in winter.

Figure 7: Protected Area Habitat in LSNP

4.3.5. WATER RESOURCES

Since rainfall in Cholistan desert is the lowest and is one of the major sources of water resources that is the reason water scarcity is one of the most important issues for sustainability. There are two main types of water;

Underground water at depths of 30-90 m is usually brackish and unfit for drinking or agriculture because it includes total dissolved salts between 9000 and 27,000 ppm mg/l, (Khan et al.,2002). In some areas, there is a thin lens of fresh water linked to Hakra River bed but that resource is very limited.

Surface water referred to fresh water resource is mostly linked with rainfall. These fresh water resources are very important to sustain life in desert ecosystem. Two systems of fresh water is available in Lal Suhanra National Park;

- **Tobas** are fresh water ponds on hard surface in the desert area that collect waters from rainfall and is a major lifeline for humans and biodiversity in the desert environment. Rain water is collected in "Tobas" which are man-made ponds or natural depression. During the month of July and August (i.e. rainy season) the water qualities in Tobas remain quite fresh and suitable for the human and livestock consumption. If there is no rain in the next months, the water in Tobas will be depleted due to high evaporation rate, seepage, and human and livestock usage. Many small Tobas dry up until October, when nomads are relocated to larger Tobas where water and fodder are available.

  Tobas also have a socio-economic and cultural importance as each toba has a registration number and are linked to specific tribe which pay minimal amount of tax to the government for its ownership. Recently low rainfalls due to climate change has severely affected the centuries old fresh water system and need a conservation plan.

- **Canals** are the other source that passes from the Lal Suhanra National Park and provide fresh water for plantation, municipal and irrigation purposes. Two canals pass from the LSNP;
  - **Desert Canal** that intersects the LSNP from the north east to south west.
  - **Bahawal Canal** that passes from the northern side of LSNP.
  - Other canals including **Fordhwah**, **Qaim**, **Panjnad** and **Abbasia** also fresh water resources in the area.

4.4. BIOLOGICAL DIVERSITY

4.4.1. FLORAL DIVERSITY

The floral diversity of Lal Suhanra National Park represents the vegetation in Cholistan. Desert vegetation consists of xerophytic and halophytic species, which include bushes, grasses, shrubs, and a few drought-resistant trees that have evolved to a various environmental factor, including extreme aridity, high temperature, and poor nutrient availability.

The eastern part of the desert, which is a relatively high precipitation zone, receives up to 200 mm of precipitation per year, so more dense vegetation cover is present here than the southern portion (the hyper-arid region), which receives less than 100 mm per year. (Hussain et al., 2019).

Box 1: Floral Diversity and Composition of LSNP[3]

Families - **49**	Genera - **161**	Species - **229**

- Out of 49 families only 2 families (Papilionaceae and Poaceae) have 62 species (21 and 41 respectively).
- Out of 229 species, 73 have medicinal properties. (Mansoor et al.,2011; Ahmad et al., 2017)
- 20 major Families of LSNP which have 180 species includes: *Aizoaceae, Amaranthaceae, Asclepidadaceae, Asteraceae, Boraginaceae, Brassicaeae, Chenopodiaceae, Convolvulaceae, Cucurbitaceae, Capparidaceae, Caryophyllaceae, Euphorbiaceae, Malvaceae, Mimosaceae, Poaceae, Papilionaceae, Polygonaceae, Solanaceae, and Zygophylaceae.*

9%
Shisham/Tahli
(*Dalbergia sissoo*)

5%
Kikar
(*Acacia nilotica*)

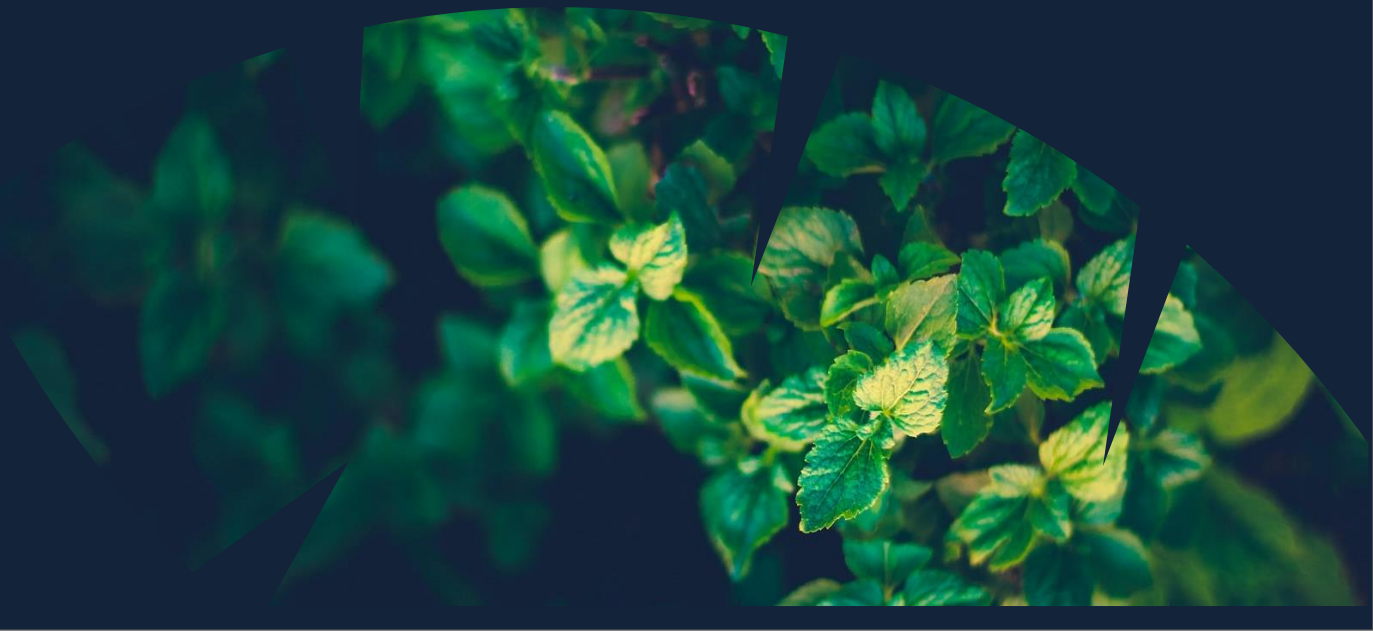
3%
Sufaida
(*Eucalyptus camaldulensis*)

83%
Frash (*Tamarix aphylla*),
Beri (*Zizyphus jujuba*),
Wan or Jal (*Salvadora oleoides*),
Jand (*Prosopis cineraria*),
Phog (*Calligonum polygoonides*)

[3] (Long Term Management Plan of Lal Suhanra National Park, Bahawalpur, Government of Punjab).

TYPES OF VEGETATION

Vegetation along sand dunes	Lal Suhanra Forest plantation	Lal Suhanra Desert Area Planation	Patisar Lake and Desert Canal Planation
A few tussock-forming grasses make up the vegetation cover on the sand dunes, including *Panicum turgidum*, *Cenchrus ciliaris,* and *Lasiurus scindicus*, along with perennial shrubs *Leptadenia pyrotechnica, Calligonum polygonoides, and Aerva javanica*	Irrigated forest plantations are categorized by monocultures and mixtures of mainly E*ucalyptus camaldulensis, Dalbergia sissoo, Prosopis cineraria* and *Acacia nilotica*. The majority of ground cover flora are grasses including *Desmostachya bipinnata, Dichanthium annulatum, Imperata cylindrica* and annual dicots including *Alhagi maurorum, Achyranthes aspera, Heliotropium crispum, Diclyptera bupleuroides,*.	Major desert plant species include *Calligonum polygonoides, Calotropis procera, Capparis decidua, Prosopis cineraria, Tamarix aphylla, Crotalaria burhia, Zizyphus mauritania, Haloxylon recurvum, Aerva javanica* etc. common cultivated crops along desert margins are some cereals (wheat, maize, barley, sorghum and oats) and legumes (chickpea). Dominant species among grasses and sedges are *Cynodon dactylon, Echinochloa colona* and *Cyperus rotundus*, while herbaceous weeds mainly include *Amaranthus viridis, Euphorbia prostrata, E. hirta, Eclipta alba,* and *Phyla nodiflora*	The vegetation along Patisar Lake and desert canal is completely dominated by *Cynodon dactylon* on the banks with small patches of *Phyla nodiflora On the banks of Patisar Lake and the desert canal, Cynodon dactylon dominates the vegetation, with minor areas of Phyla nodiflora.*. Tussocks of tall grasses (*Saccharum bengalense* and *S. spontaneum*) along with *Calotropis procera* are also part of the dominant vegetation Interdunal flats are dominated by grasses, mainly *Cymbopogon jwarancusa, Sporobolus ioclados, Panicum antidotale* and *Ochthochloa compressa*, and tall shrubs *Calligonum polygonoides* and *Capparis decidua*. Vegetation in saline patches is specific, halophytes are dominated from family *Chenopodiaceae.*



4.4.2. FAUNAL DIVERSITY

Lal Suhanra National Park is famous for its animal and bird diversity which includes black buck, Nilgai antelope, Chinkara and Houbara Bustard and other migratory birds. In the Cholistan Desert, blackbuck went nearly extinct, but the species has been reintroduced in LSNP, along with Chinkara gazelle, Nilgai antelope, and Hog deer, in big enclosures. The Houbara Bustard is well-known during hunting season, despite the fact that it is endangered in Pakistan (vulnerable worldwide), according to the IUCN Red List.

Patisar Lake which is a large body of water in the Center of the LSNP, is ideal for birds watching especially migratory birds. Lake is visited by large numbers of ducks and water fowls in mid-winter. Patisar Lake, a significant waterbody water at the Lal Suhanra National Park, is ideal for bird watching, particularly for migratory birds. In the middle of the winter, a huge number of ducks and water fowls flock to the lake. Common fauna of LSNP includes:

Mammals include:

> Long-eared Hedgehog	> Blue bulls	> Chinkara gazelle	> Wild Boar
> Black buck Hog deer	> Bengal Fox	> Moongoose	> Honey Badger
> Indian Wolf Red fox	> Porcupine	> Jungle Cat	> Little cavet
> Saw scaled viper	> Golden Jackal	> Smooth-coated Otter	> Caracal cat

Reptiles Include: (Arshad et al., 2003)

> Cobra	> Wolf Snake	> Monitor Lizard	> Spiny Tale Lizard

Birds Include: (Akhtar et al., 2006; Khan et al.,2010; Malik et al., 2017)

> Houbara Bustard	> Griffon Vulture	> Lagar Falcon	> Henharrier
> Crested Honey Buzzard	> Peregrine	> Kestrel	> Eurasian Sparrowhawk
> Marsh Harrier Falcon	> Egyptian Vulture	> Lark	> Shrike

4.5. SOCIO-ECONOMIC AND CULTURAL CONDITIONS

Lal Suhanra National Park - A biosphere reserve that spreads the dried bed of the Hakra River and encompasses Patisar Lake, irrigated plantations and desert area. There are about 20 villages which lies in vicinity of Lal Suhanra Area in which about 6,000 people mostly follow their traditional nomadic lifestyle. Throughout the desert, this pattern of settlement can be found in the form of small hamlets or semi-settlements. One of the most significant factors which affects the location and size of settlements is the availability of water in the area. The people of Lal Suhanra are pastoral nomads. The nomadic way of life has been adopted from centuries and perhaps this nomadism is the demand of regional climatic and topographic characteristics. These nomads own large herds of camels, cattle, sheep and goats. They move within the desert area with their large livestock herds according to the availability of water and fodder.

Animal rearing is common practice in the entire area. Natural grazing ground is the current land use in desert areas. Apart from cattle farming, the biosphere reserve offers few other options for livelihood. Aridity, sporadic precipitation and highly brackish subsoil water all combine to limit traditional agricultural operations on a large scale in the area; however, periphery areas where canal water is available allow for more traditional agricultural practices. (UNESCO, 2019).

5. ISSUES & CHALLENGES

5.1. SWOT ANALYSIS

The SWOT analysis was done based on the information collected from the stakeholder consultations during the three visits of LSNP during July, September and October months to access the strengths, weaknesses, opportunities and threat of Lal Suhanra National Park (biosphere reserve) in a participatory manner. The given below table present the result of analysis;

STRENGTH

- Black Bucks and Chinkara Enclosure for eco-conservation/protection.
- Patisar Lake habitat (Wetland Area) for migratory birds.
- Wild and Cultivated Forest.
- Desert habitat declared as core zone of biosphere reserve.
- Children Park for tourism attraction.
- High biodiversity resources for researcher.
- Forest environmental and ecosystem services.
- Designated DFO and Block officer of forest and wildlife department for LSNP. Unique cultural diversity of Cholistan desert.
- Potential for natural tourism.
- Desert and Bahawal canal for irrigated plantation.

WEAKNESS

- Loss of biodiversity in open area.
- Inadequate institutions capacity and policies.
- Overgrazing in protected forest (Ladamsar I & II) and desert area.
- Exploitation / overuse of resources.
- Shortage of field staff.
- There is absence of proper zoning and border fencing around the park parameter.
- Lack of Community awareness and involvement in biosphere reserve.
- No proper management for protection and conservation of Patisar Lake.
- Lack of basic infrastructures and fundamental facilities for natural tourism (i.e. accommodation, travel and ecotourism agencies, public transport etc.)

OPPORTUNITIES

- There is great potential for utilization of ecosystem services.
- Improved resources for development investment.
- Potential for re-introduction of wildlife in the core zone through proper protection.
- Development of opportunities for research through collaboration with academia.
- Potential of natural tourism by providing appropriate facilities.
- Great potential of international collaborations for biosphere reserve and implement international best practices.
- Potential of community involvement in protection and management of Park.
- Designated Institutional mechanism for management of Lal Suhanra National Park (biosphere reserve).
- Great opportunity for Natural Sustainable Development.

THREATS

- Boundary delineation
- Illegal hunting of important species
- Climate Change impact on water and livelihood
- Water Scarcity and poor water quality is a serious threat affecting wildlife and local community.
- Unmanaged commercial activities in the national park
- Browsing and overgrazing by native and non-native animal species continues to adversely affect the park's native vegetation recovery.
- Lack of Participatory approaches in park management will be a continuous threat to protection of park and its sustainable development.
- Cutting down of trees for fuelwood collection.
- Limited understanding of ecosystem service.

5.2. MAJOR THREATS IDENTIFIED FOR SUSTAINABLE MANAGEMENT

Lal Suhanra National Park is a tough natural ecosystem that is facing serious challenges in managing environment and natural resources. Significant deterioration in environmental conditions over the past few decades is highly visible. Some of the key issues and environmental challenges identified during the inception phase through field visit and stakeholder consultations are listed below. These will be further explored and addressed during the course of consultancy.

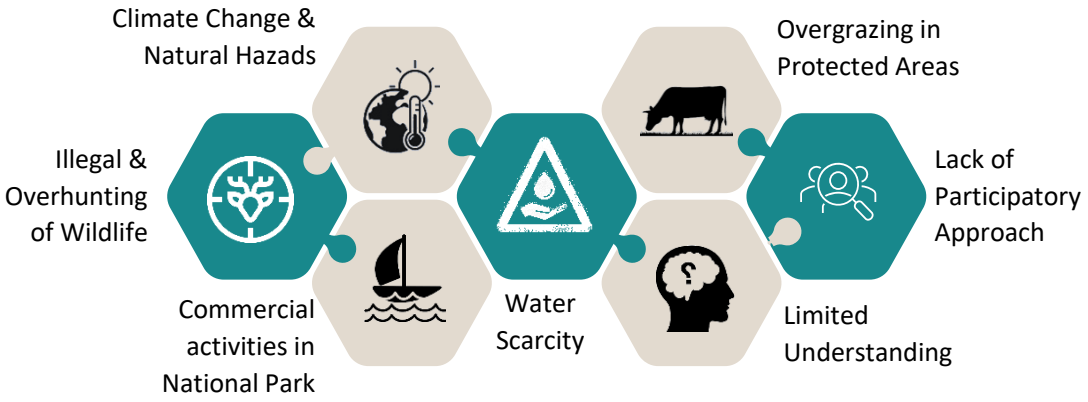


Figure 8: Threats identified in Lal Suhanra National Park

5.2.1. ILLEGAL AND OVER-HUNTING OF WILDLIFE

Illegal and over-hunting of important species of wildlife (i.e. Chinkara, Asian Houbara and Indian Caracal etc.) is one of the serious threat wildlife is facing in Lal Suhanra National Park and other areas of Cholistan4. Although forest guards and wildlife watchers have their presence in the field and also travel in the field to protect these species, still the issue is yet to be properly managed in order to conserve and improve the population of wildlife in wilderness areas. Forest, Wildlife and Fisheries Department has established enclosures for Chinkara, Black Buck and other key species. However, these animals remain in the captivity due to uncontrolled hunting.

5.2.2. CLIMATE CHANGE AND NATURAL HAZARDS

Climate Change is the one of the key challenges which Lal Suhanra and rest of Cholistan is facing. The changing metrological conditions and shifting rainfall patterns including low rainfalls in the monsoon season has severely affected the vegetation cover and also resulted in water scarcity.

[4] B. N. Khan, R. Ahmad, Z. Ali, R. Yasmeen, M. Azhar, F. Abid, S. Mehmood and H. Raza "Study of Vertebrate Diversity at Lal Suhanra National Park, Pakistan" *The Journal of Animal & Plant Sciences*, **28**(6): 2018, Page: 1725-1734 ISSN: 1018-7081

Because to the occurrence of extremely variable and low, intra and inter annual precipitation, as well as a high rate of evaporation, the Cholistan desert is highly vulnerable to meteorological and hydrological droughts. It was found that during major part of the year, the region remains extremely arid and meteorological droughts occur frequently. Repeated threats of droughts make the floral, faunal and human life extremely hard in the desert habitat. Nomadic life is seriously disturbed and nomads are forced to migrate towards relatively safe places to save their animal wealth.

5.2.3. WATER SCARCITY

Water scarcity is one of the biggest challenges of Cholistan desert, a biggest habitat of Lal Suhanra National Park which is getting more intense due to climate change. Chlolistan desert falls in the area which has the lowest rainfall of monsoon and the only source of fresh water especially in the desert area. Disturbance in metrological conditions have farther reduce rainfalls in the desert. This has resulted in drying Tobas and other surface water (natural or man-made) reserves which provides fresh water to not only human beings but also to wildlife and livestock. Water scarcity has resulted in the form of droughts, changes in movement patterns of Nomads, drying of Tobas, lowering of underground freshwater, decrease in vegetation cover and threat to wildlife. Improvement in design and low investment in Tobas and surface water ponds has farther deteriorated the water situation.

5.2.4. COMMERCIAL ACTIVITIES IN NATIONAL PARK

During the field visit of Lal Suhanra National Park, it was observed that various commercial activities (i.e. fish contract in Patisar Lake, wood cutting activities, honey bee farms etc.) are executing in the National Park areas. Some of them are in the reserve forest (Ladamsar I and II Reserve Forests) area, posing a major threat to not just the National Park's key species, but also the sensitive ecosystem that hosts migrating birds and other vital species.

5.2.5. OVERGRAZING IN PROTECTED FOREST

During the field visit of Lal Suhanra National Park, it was noted that large number of livestocks (i.e., cows and goats) were grazing in the reserve forest areas (Ladamsar I & II) that not only damage the ecosystem sensitive for protected species but overgrazing of these livestock’s were damaging all the efforts of restoring these ecosystem. Usually, local Inhabitants living in nearby villages sent their livestock in the forest area for grazing. The similar concerns were shared by the Conservator Forest, Bahawalpur Division and Divisional Forest Officer, Lal Suhanra National Park during stakeholder consultations.

5.2.6. LACK OF PARTICIPATORY APPROACH

One of the major threats posed in the sustainable management of lal Suhanra Natioanl Park is not engaging community in the protection of park or use of participatory approach while defining any policy/strategy for this Biodiversity Reserve. The Forest, Wildlife and Fisheries Deprtment, which is the custodian of this Lal Suhanra National Park (biodiversity reserve) should devise a comprehensive plan to

engage community in park management and take steps to link their livelihood with the ecosystem services.

5.2.7. LIMITED UNDERSTANDING OF ECOSYSTEM SERVICES

Lal Suhanra National Park ecosystem is quite delicate and the use of this ecosystem without damaging it requires a comprehensive understanding of the socio-ecological system. Take a case of Cholistan desert habitat of LSNP; there is very limited knowledge of using ecosystem as sustainable services for mankind that can be appropriately managed.

Another major gap is that these services are not appropriately recognized in economic marketplaces, government regulations, or land management practices due to a lack of awareness. This has resulted in degradation of these important natural services. Another cause of decline in the ecosystem services are uncontrolled anthropogenic activities and prolonged droughts. This has resulted in lowering the effectiveness of ecosystem services that ultimately affects the quality of standards and wellbeing of Mankind.

6. STAKEHOLDER CONSULTATION

The Urban Unit conducted three field visits in July, September and October, 2021 in which the team had couple of stakeholder consultations to better understand the dynamics of lal Suhanra National Park, identify core issues and challenges in the field related and propose workable solutions for eco-conservation and protection of biosphere reserve.

6.1. CONSULTATION WITH DIRECTOR GENERAL, WILDLIFE DEPARTMENT

An initial meeting was held on 1st July 2021 with the Director General (DG) Wildlife Department (Mr. Sana Ullah) to understand the dynamics of LSNP. He explains the current situation and development interventions in the park and also informed that most of the interventions were done in collaboration with the Forest Department. He highlighted that community participation in conservation and protection of biosphere reserve is minimal. He also advised to visit different habitats of biosphere reserve and enclosures of chinkara and black buck for proposed interventions.

6.2. CONSULTATION WITH CONSERVATOR FOREST/ADMINISTRATOR LSNP, BAHAWALPUR DIVISION

During the field visits, the Urban Unit team met twice with Mr. Muhammad Goher Mushtaq on 30th July 2021 and 6th October 2021 to share field survey findings and proposed interventions related to park management plan. The Urban Unit team also explains how these interventions are detailed in the scope of PC-I "Eco-conservation and protection of Lal Suhanra National Park". The Urban Unit also proposed that the scope of existing PC-I may be revised and incorporate interventions based on field visits and issues highlighted. The conservator forest, agreed with the amended scope of work and said that the same will be reflected in the PC-I along with technical drawings and detailed costing.

Some of the interventions proposed by the conservator forest includes fencing of LSNP, reintroduction of wild animals through special protection, development of new tobas to combat climate change and droughts, promotion of bari tree plantation to cultivate honey bee, rehabilitation of Patisar lake and cultivation of wheat, pearl millets (Bajra) and Sorghum (Jawar) to attract the birds especially grey francolin to provide them natural habitat within the park area.

6.3. CONSULTATION WITH DEPUTY DIRECTOR WILDLIFE DEPARTMENT, BAHAWALPUR DIVISION

Two meetings were held with Mr. Zahid Ali (Deputy Director Wildlife Department) on 30th July 2021 and 1st September 2021 to discuss the existing activities of wildlife department within Lal Suhanra National Park and also in the Bahawalpur Division. He explained that office building is complete at RD-25 adjacent to Black Buck enclosure, where veterinary doctor and field staff will be placed. He agreed that it is

important that animals need to reintroduce in the wild, for which he backed the idea to fence the eastern and southern side. He also asked the team to visit other places in Bahawalpur division to chip in biodiversity protection in the integrated regional development plan.

6.4. CONSULTATION WITH DIVISIONAL FOREST OFFICER, LNSP

Two detailed consultation sessions were held with the Mr. Ijaz Tabbasum (Divisional Forest Officer, LSNP) on 30th July 2021 and 6th October 2021 to discuss main issues and field problems of lal Suhanra National Park. The Urban Unit team also explain findings of field visit and also presented proposed interventions based on field observations. Mr. Tabbasum was of the strong opinion of fencing LSNP area to protect the wildlife. He highlighted those real issues in conservation and protection of LSNP are illegal hunting of wildlife (even from enclosures), less involvement of community in park management and land overgrazing. He also explained that large area requires strict protection, due to lack of field inspected there are serious issues of oversight and patrolling in the field.

6.5. CONSULTATION WITH DIVISIONAL FOREST OFFICER, BAHAWALPUR DIVISION

A discussion with made with the Mr. Fareed (DFO, Bahawalpur Division) on existing activities done in Bahawalpur Division on a regional perspective. He pointed out that the real issues in planting forestation is water scarcity and poor quality of water in this region. Different sites (Shahi wala plantation, Jano Wali, Chak Katora and Lal Suhanra National Park) are currently used for plantation under Ten billion Tree Tsunami Programme, however the sustainability of these plantations are serious challenge due to this poor quality of water.

6.6. CONSULTATION AND FIELD VISIT WITH BLOCK OFFICER, LSNP

Two field visits and consultations were done with Mr. Baber Ali (Block Officer, LSNP) on 30th July 2021 and 6th October 2021 to understand the dynamics of biosphere reserve and visit all habitats of LSNP to identify issues that will be addressed in the park management plan. Mr. Baber accompanied the Urban Unit team in field and guide them regarding habitat settings of biosphere reserve. He showed various facilities in the park and highlighted important issues of conservation and protection. Key issues highlighted are illegal hunting of wild animals, overgrazing of land by cows from nearby community and drying of tobas (fresh water ponds) in the desert habitat.

6.7. CONSULTATION WITH LOCAL COMMUNITIES

Two local villages (Toba Kansar and Toba Chadarwala) were visited during the field visited that were located within the boundaries of Lal Suhnara National Park. During the community consultation, the following infrmatiion were collected.

- **Toba Kansar village** having around 30 to 35 houses are located at the boundary of Lal Suhanra National Park. Water quality is relatively less brackish and used by locals through

hand pumps for drinking and other purposes. Fresh water Toba is available nearby the village. Mostly villages are dependent on livestock. The community told that there are facing issues of livestock grazing as forest department don't allow their animals to graze in the nearby plantation and sometime capture them for entering in their plantation area. The village has pakka houses, mosque, dispensary (closed) and settled there for decades.

- **Toba Chadarwala village** is the settlement of 20 plus houses that is located at the edge of Lal Suhanra National park. The village has poor water quality (brakish) and is not fit for drinking. The community use toba (fresh water pond) for water requirements. During the discussion the community told that plantation sites are getting low day by day in the desert that makes it difficult to facing difficulty in raising their livestock. Similarly, the water availability is also a big challenge. The village has pakka houses and settled for decades.

7. MANAGEMENT PLAN OF LSNP

Management Plan of Lal Suhanra National Park includes following themes:

Figure 9: Management Themes of LSNP

7.1. THEME 1: ECO-CONSERVATION AND PROTECTION OF IRRIGATED FOREST HABITAT

A considerable portion of 17,769 acres of land that constitute around 11 percent of Lal Suhanra National Park is irrigated forest. This area is covered with thick man-made irrigated plantation that includes *Eucalyptus camaldulensis*, *Prosopis cineraria, Dalbergia sissoo*, and *Acacia nilotica*. The dominant components of the ground cover flora are grasses including *Dichanthium annulatum*, *Imperata cylindrica, Desmostachya bipinnata*, and *Saccharum bengalense* and annual dicots include *Achyranthes aspera*, *Alhagi maurorum*, *Diclyptera bupleuroides*, *Heliotropium crispum*. Most of the areas of irrigated forest (Ladamsar- I & II forest range) falls under Buffer zone.

- The main goal of eco conservation and protection of irrigated forest is to prosper, protect, maintain and optimize forest resources in an environmentally sustainable, scientific, ecologically stable (in terms of significant species) and socially acceptable manner. i.e., When selecting species for re-planting the area, special attention will be given to native species of the region that have declined over years of human interference.

7.1.1. ACTIVITIES

- Conserve and protect the viable biotic communities and associated biodiversity through participatory approaches.
- Rehabilitating and restoring the debased forests by shutting them for natural regeneration and new plantation recovery.
- Fencing of Lal Suhanra National Park is required to improve the natural habitat and construct road along the fence area for guarding purpose.
- Improve the degraded areas by seed broadcasting method, planting and reseeding of native species in the irrigated area. The natural regeneration of trees, shrubs and grasses could be enhanced through reseeding of appropriate indigenous trees, shrubs and grasses.
- In irrigated forest areas, there must be some acres plantations of wheat, pearl millets (Bajra) and Sorghum (Jawar) to attract the birds especially grey francolin to provide them natural habitat within the park area.
- In a selected landscape, enhance carbon sequestration in and around high conservation value forests. Apply and validate the Pakistan's REDD-RPP methodology for carbon stock measurement in target areas.
- Frequent intense fires over large areas of the forest lead to the degradation of woodlands, while conversely, an absence of burning has caused the developments of shrub thickets or bush encroachment in certain areas. Proper protective measures may therefore be needed for rehabilitation and/or to limit degradation, and fire may also be used as a management tool to achieve other objectives. These measures include the decrease of fuel loads, early dry-season burning and the control of run-away wildfires. An adaptive fire management

strategy, which harmonizes with the integrated fire management strategy for forest area, must be developed.

- To encourage sustainable forest sustainable forest management, it must be environmentally, economically, and socially sustainable. To achieve ecological sustainability, the forest's ecological values must not be damaged and, if feasible, should be enhanced.
- Strengthen the capacities in biodiversity conservation through training, guidelines, management and enforcement.

7.2. ECO-CONSERVATION AND PROTECTION OF WETLAND

Patisar lake is a potential Ramsar site and a wetland area that spreads over an area of 4,780 acres constitutes around 3 percent of Lal Suhanra National Park. The prevailing condition of Patisar lake is not good due to unsustainable water supply and uncontrolled commercial activities. Rehabilitation of Patisar lake is very important as it act as key habitat for fish and migratory birds. Certain measures are still required to be taken by the department to conserve and protect the lake area as an important habitat and also by fulfilling the requirements to be qualify for the Ramsar site.

7.2.1. ACTIVITIES

- Analyze the quality and volume of the local aquifer in order to build a self-sufficient water supply and high-quality wetland habitat.
- The water supply should be restored and sustained in the Patisar lake by signing an agreement with the irrigation department to regulate and ensure the water supply in the lake up to least acceptable level.
- De-siltation of lake is necessary to increase the water retention capacity of deep and shallow waters, to conserve and revive the aquaculture along with providing a vast resting place to migratory birds during winter seasons. Dredge the deeply silted water bodies create naturalistic borders and restore open water. To stimulate enhanced growth of emergent plants, thin or remove too dense tree canopies
- Livestock grazing must be prohibited in the wetland area as it damages the embankments.
- Certain measures are still required to be taken by the department to make the lake area sufficiently appealing for the visitors and especially for children.
- Continuous effective operation and maintenance is required for the lake to make it functional properly. Special maintenance and care are required for the visitors.
- Remove Eucalyptus spp. as it absorbs more water and lowers the water table resulted to decrease the native flora around it. Local flora and indigenous tree species should be planted around the lake area.
- To attract different birds 'species, in some acres wheat barley should be planted in lake side area.

7.3. ECO-CONSERVATION AND PROTECTION OF DESERT AREA

The Lal Suhanra National Park was established to protect the overall desert biota. The desert area within this Lal Suhanra National Park contains habitats characterized by harsh temperatures, low and unpredictable precipitation, water scarcity, high wind speed and uneven topography. The desert area of Lal Suhanra can be subdivided into two distinct areas sand dunes and saline interdunal-plain areas (dahar). The main goal is to protect the significant natural and cultural resources (species, habitats or biotic communities), values of the Lal Suhanra National Park area including geologic features, and natural processes through monitoring efforts and scientific research.

7.3.1. ACTIVITIES

Following strategic measures are required to conserve and protect desert area of National Park i.e.

- It is important to identify, map and document the key habitats, special sites and invasive alien species.
- Support and encourage research, monitoring and surveys to increase our understanding for socioecological behavior and adaptations of plants and animals in desert habitat.
- Major portion of desert is designated as core zone area of biosphere reserve, it is important to protect the area through fencing, wildlife security and community watch guards so that wildlife can be reintroduced in the core zone.
- Identify (through suitable study), eliminate, or reduce the causes that cause native species extinctions or major population decrease.
- Implement Protected Area Act 2019 Rules and Regulations pertaining to the management and protection of Lal Suhanra National Park.
- Implement legislation to control the illegal hunting within the desert area.
- Improve the degraded areas by seed broadcasting, planting of cuttings and reseeding of the native plant species in the core zone.
- Improve vegetation in desert through different techniques to enhance vegetation where possible (i.e. reseeding of desert plant species).
- Tobas and other freshwater resources that are poorly affected by climate change needs to be replenished and sustain in order to improve life in desert.
- Adaptive management should adopt to coop climate change. (Management of fresh water ponds, study pattern, mapping and forecasting of droughts, preparedness to combat droughts).

7.4. CODE OF CONDUCT/ACTIVITIES FOR DIFFERENT ZONES OF BIOSPHERE RESERVE

The Lal Suhanra National Park is first designated biosphere reserve of Pakistan. All biosphere reserves strive to achieve a balance of biodiversity conservation, sustainable resource use, economic development, research, and education. Furthermore, they constitute "supporting sites for environmental sustainability". Lal Suhanra is divided into three zones i.e. Core Zone, Buffer Zone and Transition Zone.

These designated areas are intended to asses interdisciplinary approaches to understand and manage the changes and interactions, that occur in social and ecological system, including the as well as conflict resolution and biodiversity management. Biosphere reserves comprises three interconnected zones that aim to fulfil the basic functions, which are mutually and complementary reinforcing.

7.4.1. ACTIVITIES

Core Zone: Code of conduct/ activities allowed in the core zone of Man and Biosphere Reserve are:

- Conserve and protect natural ecosystems and biodiversity in the core zone area.
- This area supports excellent habitat for Black Buck and Chinkara, that must be fenced and protected properly so that wildlife can be reintroduced in the core zone.
- Monitoring to ensure minimum disturbance in the ecosystems
- Reduce human interaction to the minimum.
- Do not allow tourists to have picnic in the core zone.
- Grazing should be prohibited in core zone area.
- Involve researchers to study habitat and wildlife of core zones for better understanding and environmental education.
- Improve vegetation in the forest through dry forestation of Keekar and Jand as they require less water for their growth and serve as food for wildlife.

Buffer Zone: Code of conduct/ activities allowed in the buffer zone of Man and Biosphere Reserve are:

- Allow cooperative activities that are in accordance with sound ecological principles and do not damage the core zone area.
- Buffer zone should be used for, recreation, environmental education, ecotourism, and applied and basic research.
- Priority should be given to sustainable income generation programs.
- Control free grazing of the livestock, owned by the people do not allow live stock from adjoining areas.
- Native plantation (including fruit trees) can be planted in some acres of irrigated forest area.

- Conserve endangered, precious, and rare species and genetic resources through development of conservation centers, e.g., botanical gardens and Animal Research Lab.

Transition Zone: Code of conduct/ activities allowed in the transition zone of Man and Biosphere Reserve are:

- Transition zone is the cooperation zone that is used for commercial and economic activities through sustainable management of resources.
- Agricultural activities are allowed in this zone in a manner that don't damage the natural resources of core and buffer zones.
- Human Settlements are allowed in the transition zone, as an integral part of man and biosphere reserve that can promote cultural interaction.
- This zone is used for ecotourism and natural tourism.
- This zone allows interaction of different stakeholders (i.e. local communities, management agencies, scientists, researchers, non-governmental organizations, cultural groups, commercial groups etc.) for sustainable development of the region.
- Establish plant nurseries that can serve as a supply line for other zones as well.
- Distribute plants to communities living around the Lal Suhanra Biosphere Reserve for planting on suitable sites free of cost.
- Encourage vegetation surveys in order to create accurate floristic and structural descriptions of the diverse communities that exist.
- Encourage efficient, effective, and integrated fire and fire-related activity management.
- Rehabilitate and sustainable development of disturbed areas.
- In the wetland area, there must be some plantations of wheat, pearl millets (Bajra) and Sorghum (Jawar) to attract the migratory and local avifauna especially grey francolin to provide them food and natural habitat within the National Park Area.
- In Black Bucks and Chinkara enclosures natural grass should be planted for grazing instead of providing grass.
- Establish and maintain direction signs on roads. Monitor key visitor areas and undertake works necessary for visitor safety.

7.5. BIODIVERSITY PROTECTION AND MANAGEMENT OF SPECIES OF SPECIAL CONCERN.

A species of special concern is any species of wildlife or fish from natural world that doesn't meet the standards of an endangered or threatened species however is especially vulnerable, , could easily become, an , threatened, endangered and extirpated species because of constrained distribution, low or declining numbers, specialised habitat requirements or limits, or different factors. Special concern species are established by policies, not by the

regulations, and are used for informational and planning objectives. The management objective of biodiversity protection and management of species of special concern in Cholistan includes; conservation of native fauna & flora species of Lal Suhanra endangered one e.g., Black Bucks.

7.5.1. ACTIVITIES

Following strategies should adopt to conserve the species of special concern:

- Identify and implement species specific restoration requirements.
- Proper Veterinary Health Facility / Research Lab should establish near Black Buck Enclosure (RD25) and equipped with latest equipment for all wild animals, semi-captive and captive species.
- Illegal hunting should be strongly prohibited through strict penalties and legislation.
- For captive breeding of Chinkara, Black bucks and Blue Bulls, keep sperate enclosures and determine the carrying capacity of enclosures.
- Monitor hunting and shooting, take appropriate action including increased departmental field force and community watch guards.
- Clearly delineate the park boundaries and fence the entire Lal Suhanra area.
- Black Bucks, Chinkara, Blue Bull and other species of interest, should be release in wild area after proper fencing and enhanced security to move and graze freely and provide them natural habitat.
- Increase feeding sites and water ponds in the animal enclosures to allow animals to use the entire area instead of single feeding area.
- Investigate the population size, health, and habitat requirements of Blackbucks and Chinkara within their enclosures, monitor and manage according to expert advice.
- Study the behaviour of blackbuck and chinkara kept in enclosures for many generations.
- Conduct long-term studies on the behaviour of animals translocated from the captive conditions of smaller enclosure into the larger enclosures.
- Proper watch and ward system must be implemented with the hk Bucks elp of local communities.
- Continue to assess and monitor ecosystem values, assets, and threats through monitoring and survey programs.
- Prepare and implement management prescriptions for significant fauna.
- Encourage wildlife surveys on regular basis, particularly in areas previously not surveyed.
- Ensure adequate supply of fresh water for the protection of fauna and flora in the National Park areas.
- Reintroduce key animals like black bucks, chinkara, wild cats, blue bulls in the wild life area.

- Raise awareness of the threats posed by Invasive alien species in order to promote preventative measures i) internally, ii) with visitors and iii) neighboring landowners

7.6. IMPROVEMENT OF WATER RESOURCES

The main sources of water in the Lal Suhanra desert area are precipitation and groundwater which are utilized to satisfy the water prerequisites for people and livestock. Rainfall is sparse and infrequent, and much of the area's groundwater is saline. The average annual rainfall in the desert is low, variable and ranges from 100 to 100. Up to 250 mm. Precipitation water is collected locally in an artificial pond called Toba. Water in Tobas stand for 3-4 months. However, the pond's water storage capacity is small because it is easily affected by extreme meteorological conditions and infiltration Therefore, people are accustomed to migration towards the canal irrigated areas with livestock until the next rainy season runs out of water. In Lal Suhanra National Park, water from the desert canal is used to grow irrigated forest in the adjoining areas and to recharge water level in Patisar Lake. The main objective of improvement of water resources in Lal Suhanra area is to provide potable drinking water to the residents of Cholistan.

7.6.1. ACTIVITIES

Following strategies can apply to improve water resources in the Lal Suhanra area:

- Black buck will not move more than 6 kilometres (3.7 miles) from a water course, thus water points should be set 7.5 kilometres (4.7 miles) apart. This implies a need for approximately seven to eight water points. Although additional water points could be provided, the permanent presence of the central canal should not be overlooked.
- Existing rainwater harvesting ponds (tobas) in desert area must be replenished through water boozers and new tobas must be constructed with improved design in the desert area.
- Install reverse osmosis (RO) plant in the National Park area to desalinise the saline groundwater for drinking purposes.
- Groundwater investigation surveys must be carried out.
- Maintenance of canal, water channels and Patisar Lake in terms of silt clearance, fixation should be done regularly.

7.7. NATURAL HABITAT PROTECTION (INCURSION OF EXOTIC DETRIMENTAL SPECIES, OVER GRAZING AND POLLUTION PROBLEMS)

Conservation of habitat guarantees the long-time period survival of biodiversity at the planet. It permits species to thrive of their environments via unique strategies s and practices relying on the extent and form of degradation/destruction. Along climate change, habitat loss is the it is the most concerning issue in the environmental realm. Habitat loss not only deprives

species of their natural ecosystems, but also destabilizes the world's ecosystems by destroying the complex interactions between interdependent or mutual dependent species that coexist there. As such it undoubtedly poses the greatest threat to the world's biodiversity. Appropriate research-based activities should be carried out to detect and confirm the presence of invasive alien plant species in Lal Suhanra , as well as to assess the health of the biosphere reserve.

7.7.1. ACTIVITIES

- Propose intervention to recover and rehabilitate the habitat of wetland area including maintaining minimum level of water in the Patisar Lake which is proposed for Ramsar site.
- Eliminate or reduce factors that cause local species extinction or a severe reduction in their numbers.
- Protect biodiversity of the Lal Sohanra Biosphere Reserve with focus on wild ungulates, resident and migratory birds and insect pollinators.
- Manage arid and semi-arid ecosystems for long-term diversity, health, production, and climate change resistance and adaptation by preserving connection and minimising overuse of all components, including water, fauna and flora, landscapes, and so on.
- Awareness campaigns should be practiced for the protection of Avian species in the biosphere reserve.
- Awareness campaigns should be practiced for the protection of Avian species in the biosphere reserve also ensure the protection of birds on their migratory passage.
- Unregulated grazing must be prohibited in the park area.
- Areas sensitive to grazing must be identified and marked.
- Protect biodiversity and humans from the harmful impacts of the pesticides.
- Invasive alien species, key habitats and particular sites should be clearly identified and mapped with management guidelines should develop for each.
- The status and health and threats to habitats and species must be reviewed after every five years.

7.8. USE OF SPATIAL PLANNING FOR PROPOSED INTERVENTION

Spatial planning manages and facilitates optimal resources provision, opportunities, threats, interventions, development and reconciles incompatible interests. The key spatial implications of the Biosphere Reserve relate to the impacts arising from and opportunities for development and interventions, including the use of land and also plans for management of ecological systems and provision of ecosystem services, in all three zones under the eco-conservation and protection themes.

7.8.1. ACTIVITIES

- Mapping of ecological systems and ecosystem services is one of the activities that is expected to increase the knowledge of sustainable land use planning.
- Spatial planning of biosphere reserve area is important to develop landscape portrait which integrate biodiversity, ecosystem services, climate mitigation and use of resources by local communities.
- Spatial planning will help taxonomists and wildlife managers in presenting appropriate data to optimise biosphere reserve boundaries in order to achieve the accomplish the most noteworthy pace of biodiversity safeguarding required to balance social and economic needs with the reference of habitat and species conservation.
- Develop protocols to incorporating ecological services, climate risk, mitigation and biodiversity into biosphere reserve management planning.

7.9. CLIMATE CHANGE ADAPTATIONS MITIGATION AND ADAPTATION

Climate change is increasingly recognized as a driving force for biodiversity change. In recent years, climate change-related issues have moved beyond the realm of science to the agenda of many international organizations, programs, treaties and initiatives seeking ways to mitigate and adapt this phenomenon. Climate change is likely to have an impact on the vegetation and forest types, as well as the ecological communities. Climate change is one of the most serious threats to nature, and it will increasingly complicate our management of protected areas. Rising global temperatures, large-scale melting of snow and ice, longer and more frequent droughts, changes in the intensity and timing of storms, changes in the timing of seasons, rising sea level and associated impacts along coastlines, and increased acidification of marine environments are some of the changes already underway as a result of the rapidly changing climate.

Biosphere reserves represent unique prospects to respond to the emerging challenges of climate change from droughts and also threatened food and water security, providing options for society to build resilience, plan and improve water resources in desert and also plan for food security in the region. Climate-resilient Forest types should be protected in order to preserve ecological communities and species accumulation

7.9.1. ACTIVITIES

- Increase capacity for safer and more profitable skills, better catastrophe management, and climate change adaptations.
- Enhance water resources in the region, by developing a strategy to replenish existing water bodies (tobas) and develop new ones in unserved areas. Desert channel is significant in executing this arrangement.

- Prepare plan to improve food security for both humans and wildlife in the park so that life can survive under the harsh environment and also combat disasters like droughts and climate change.
- Promote the carbon stocks through efforts of forest restoration in different zones.
- There must be approach for assessing future climate impacts of climate change on biodiversity, ecosystem services and local livelihoods. This concept will be incorporated into the formulation of biosphere reserve zoning and management plans, as well as livelihood enhancement efforts.
- Encourage research to related appropriate indicators for monitoring the park's natural and cultural values as a result of climate change.
- Conduct a vulnerability assessment in accordance to climate change.
- Conduct or support research related to arid landscape processes and ecosystems to facilitate improve park management at a landscape scale. Apply the outcomes of research to establish adaptive risk management techniques in the biosphere protective reserve.

7.10. PARTICIPATORY MANAGEMENT AND ENGAGEMENT OF LOCAL COMMUNITIES IN SUSTAINABLE RESOURCE MANAGEMENT

Participatory approaches to environmental management and development in general have grown in importance, alongside decentralization discourses and a rejection of more traditional top down, centralized, exclusionary approaches to natural resource management. The participatory approach will be employed to ensure the participation of stakeholders in order to;

i. Harmonize the point of views and benefit of the parties.
ii. Provide opportunities for marginalized groups to participate in the planning, implementation, and monitoring and evaluation of the outcomes.
iii. This strategy also seeks to align departmental policies (top-down) with public engagement (bottom-up).

7.10.1. ACTIVITIES

- Encourage the exchange of experience and knowledge between biosphere reserves, with the end goal of reinforcing the association of volunteers and nearby individuals in biosphere protection activities.
- Prepare guidelines for key aspects of biosphere reserve management, including the resolution of conflicts, provision of local benefits, protection of wildlife and habitat and involvement of stakeholders in decision-making and in responsibility for management.
- Ensure that local residents are involved in the planning and maintenance of biosphere reserves.

- Identify and endorse the activities which are compatible with the viable with the objectives of conservation, through the exchange of proper technologies that include traditional knowledge, and which promote sustainable development in the buffer and transition zones.
- Analyse and address the issues that contribute to environmental deterioration and unsustainable biological resource usage.
- Private sector should be encouraged in initiatives to establish and sustain socially and environmentally sustainable activities in the biosphere reserve and adjacent areas.
- Assess the reserve's natural resources and services, and use these results to promote environmentally sound and economically viable revenue opportunities for the local community.
- Encourage participation of neighborhood inhabitants, school children and related stakeholders in education, training programs as well as research and monitoring activities within biosphere reserves.
- Generate visitors' information about the reserve, its significance for conservation and the sustainable use of biodiversity, its sociocultural viewpoints, and its recreational and environmental educational programs and resources.

7.11. RESEARCH ACTIVITIES COLLABORATION BETWEEN RESEARCH INSTITUTIONS/ACADEMIA AND THE ADMINISTRATION OF BIOSPHERE RESERVE

Biosphere reserves are the UNESCO designated areas that were established to promote and demonstrate the concept of sustainable development through collaboration with the local community and directed scientific research.

Biosphere reserves are widely acknowledged as a "learning site" for balancing conservation, developme nt, and learning functions. Seville Strategy for the Biosphere Reserves uses for research, surveillance, education and training at the international, regional, national and individual biosphere levels to achieve conservation and sustainable development goals. It is recommended to do. Management functions relies on the research to determine the current state of affairs, facts, and the basis for future actions. It serves as a baseline as well as a wake-up call for management to focus on achieving specific goals.

7.11.1. ACTIVITIES

- Conduct comparative environmental and socioeconomic research using the World Biosphere Reserve Network, including long-term study that will take decades to complete.
- Make use of the World Biosphere Reserve Network for worldwide research projects on biological variety, desertification, ethnobiology water cycles and global change.

- Support the improvement innovative and interdisciplinary research instruments for biosphere reserves, such as adaptable modelling systems for integrating ecological, monetary and social information.
- The utilization of biosphere reserve must be encouraged for shared exploration ventures of consortia of colleges related foundations of research and learning in the business and public sectors, at all levels of government and non-government.
- Integrate the biosphere reserves with regional and national scientific research programmes, and connect these projects to public and provincial approaches on conservation and sustainable development.
- Use the biosphere reserves for fundamental and applied research, especially interdisciplinary projects combining environmental and social sciences, as well as projects addressing soil and water conservation, ecosystem rehabilitation, and sustainable use of natural resources.
- Use the biosphere reserve as an experimental area for the testing and improvement of methods and approaches for approaches for the observing and assessment of biodiversity, quality of life of its inhabitants and sustainability.
- Develop measures of sustainability (in ecological, social, economic, and institutional aspects) for the various productive activities carried out within the buffer and transition zone areas using the biosphere reserve.
- Encourage local people and other stakeholders to receive adequate training and employment so that they can fully participate in inventory, monitoring, and research programmes in biosphere reserves.
- Conduct the research on the current situation of Patisar Lake to assess loss of biodiversity during the dryness of the lake.
- Analyse the quality of canal water on a regular basis.
- Conduct long-term studies on the behaviour of animals translocated from the captive conditions of smaller enclosure into the larger enclosures.

7.12. PROVIDING A UNIQUE EXPERIENCE FOR VISITORS/ PROMOTION OF ECOTOURISM

Ecotourism in protected areas have the potential to integrate local communities with a diverse range of stakeholders, including local travel agencies, local guides, farmers, artisans, hotel and restaurant owners, non-profit organisations, and government agencies.

When integration is done correctly, it creates strong incentives for local communities for nature conservation through economic integration advantages of healthy and well-managed protected areas. The perceived potential of ecotourism as an effective tool for sustainable development is the primary

reason why developing countries are now embracing it and incorporating it into their economic development and conservation strategies.

Lal Suhanra National Park is used consistently by nearby occupants of Bahawalpur. Visitors appreciate nature as well as magnificent vistas. The park represents a significant research asset that is frequently utilized by universities and research institutions.

7.12.1. ACTIVITIES

- Information relating to the Lal Suhanra National Park about the Lal Suhanra National Park must be provided through an interpretive leaflet with comparing numbered posts all through the recreation centre.
- Provide visitor facilities that are safe and low impact as well as interpretive information to help them better comprehend the park's assets and values.
- Set entry fees for admission into the park, fees for parking and for other services and use the funds for improvement of the park.
- Select bird watching sites in different parts of the National Park area after assessing potential locations.
- Execute and implement a Solid Waste Management Program particularly at the Children's Park.
- Provide information to tourists and the local community in order to raise awareness and regard esteems for Lal Suhanra National Park for Lal Suhanra National Park and ensure National Park protection.
- Provide tourists with information on safety and low-impact behaviours via the web and area guides.
- Tourist zones should be periodically reviewed evaluated in accordance with changing demands and ecological contemplations.
- Determine priorities for visitor management from tourist development plans, such as maps, interpretative material, visitor facilities etc., and start implementation.
- Ensure that appropriate material and maps are available for users.
- Develop strategies to acquire support from private sector organizations including non-profit organizations and cooperate partners.
- Develop and promote LSNP&BR Website including all ecological, facilities, tourism points and other aspects.
- Create and execute a tourism and recreation programme to promote the park’s values and sign Memorandum with TDCP.
- Establish a Park Information and Education Centre to conduct educational programmes and enlighten visitors about the park, its natural resources, and the park's facilities. Develop and implement safety procedures for the benefit of visitors and staff. Train the staff to follow

procedures in the event of emergencies. Public these procedures so that visitors are aware of them.

- Establish visitors' safety and health system and develop first aid posts at Children's Park, Enclosures and Lion Safari. Recruit suitably qualified personnel for visitor hours at the first aid posts.
- Develop animal research Lab near the Black Bucks and Chinkara Enclosures.
- Enhance current TDCP Motel accommodations and create a new facility in the form of a hostel for researchers and students.
- Establish Tourism Monitoring System and record the numbers of visitors who visit park facilities.
- Develop Ecotourism Education Program and publish publicity materials (posters, brochures, maps, etc.) for visitors.
- Arrange for the training relevant personnel of the forest department in social mobilization, conducting wildlife surveys, determining carrying capacities of pastures and range lands. Conducting tourist awareness programs, as well as conducting research into the area's requirements.

7.13. INFRASTRUCTURE MANAGEMENT

Infrastructure with Park area can play a vital role in fulfilling Lal Suhanra National Park's economic potential and improving management efficiency. Within the National Park Area, there are several tourism infrastructures.

7.13.1. ACTIVITIES

- Infrastructure for the park management and visitors should be physically separated.
- Infrastructure development should be done in collaboration with park management and neighbouring communities where possible to maximise conservation and economic goals.
- Strategic planning and feasibility studies must be used to make decisions about park management infrastructure. All infrastructure must be planned in appropriate zones and be approve as per departmental procedures and policies of Lal Suhanra National Park.
- For the better security and protection of core zone habitat and wildlife of Lal Suhanra National Park , five (05) guard watching tower must be constructed along the fence area.
- Annual maintenance costs must be estimated and included in Lal Suhanra National Park's annual budgets before any fixed costs are generated.
- Infrastructure developments should have an easy access to support services, such as reliable sources of water, electricity, road access etc.
- Water and communication lines should be placed in inconvenient locations, such as beside the road or buried.

- Where possible, road construction needs to be done with minimal use of local material and disturbance of soil, to ensure minimal environmental impact.
- Design buildings in such a way that they provide maximum cooling in the summer and maximum heating in the winter.
- In order to enhance the awareness about the park resources, it is important to establish an information centre. In addition, the park management will take appropriate actions for renovation of existing building, enclosures and other facilities.
- For effective watch and ward, the existing check posts will be renovated and a few new posts will be built.
- To promote ecotourism there is a need to develop camping sites, trails, bird hides and bird watching towers and a few other such structures.

7.14. FIRE MANAGEMENT

Fires are important, but socially and economically undesirable ecosystem disruptions. They cannot be seen as a problem, they are a global phenomenon. Protected areas are created to protect biodiversity, and strict protection is often required, forgetting that fire has shaped what we are trying to protect. This rigorous protection makes significant changes to protected habitats and makes them more vulnerable to devastating wildfires. Intense fires over large areas of National Park can cause the degradation of woodlands and shrubs or bush encroachments, so appropriate safeguard must be adopted and implemented. Fire Management plan is required for Lal Suhanra national park for the protection of biodiversity, property and reduction of impacts of fires on Park values.

7.14.1. ACTIVITIES

- Different habitats may require different fire regimes, an adaptive burning strategy for each zone must be developed. Plant species which are considered important and possibly threatened by fire must be listed.
- Develop, implement and review fire management plans in association with Forest Department and other stakeholders.
- Continue to work with the relevant District Fire management department and Forest Department to minimise risk to life and property within and surrounding the biosphere reserve.
- Establish and implement fire emergency procedures within the Lal Suhanra National Park.
- Continually improve the knowledge and understanding of fire in the desert ecosystems.
- To protect infrastructure, proactive fire management must be used.

7.15. WASTE MANAGEMENT

Waste is a part of human's everyday life. Travel, as an essential component of modern man's life, is also a significant source of waste. The United Nations Environment Program (UNEP) estimates that tourists generate 4.8 million tonnes (14 percent) of solid waste. Improper waste management can lead to serious and irreversible environmental damage. Economic and social impacts such as B. Increased greenhouse gas emissions, land degradation, resource depletion, surface and groundwater pollution, biodiversity loss, and. Loss of aesthetic value in tourist areas. The most appealing destinations are frequently the most vulnerable, so it is critical to pay special attention to the problem of waste management in such areas5.

Waste disposal is always a major concern in remote and protected areas, regions, specifically when the volume of waste grows as the park's use grows. When infrastructure and projects are located near wetlands, proper wastewater treatment and disposal is very important.

7.15.1. ACTIVITIES

- Management will persue to remove all waste types from national park to all waste management sites in the long-term park management plan, however biodegradable garbage can be composted near the park area and where environmentally viable and appropriate. In the long-term park management plan, management will pursue the removal of all types of waste from the national park to all waste management sites; however, biodegradable content of waste can be composted near the park area and where environmentally viable and appropriate.
- Park management employees who live in the park area will be responsible for removing and transporting their own household waste as well as waste generated by visitors and staff.
- Waste storage facilities and sites should be appropriately enclosed to prevent wildlife and contamination from windblown litter.
- Where possible sort waste for recycling.
- Waste transportation to the dumping sites must be done in properly enclosed containers and vehicles to ensure that no littering will be occur.
- Wastewater must be treated according to the proper system, considering the practices, volume of waste generated, water availability, treatment and disposal costs and environmental impacts.
- Park management will assess existing liquid waste disposal facilities and, if necessary, implement a monitoring programme to ensure that they comply with national legislation, regulations, and standards.

[5] Dunjić et al. 2017, Sustainable waste management in protected areas of Vojvodina, Institute for nature conservation of Vojvodina Province,conference paper.

7.16. MAINTAINING THE NATURAL DESERT LANDSCAPE

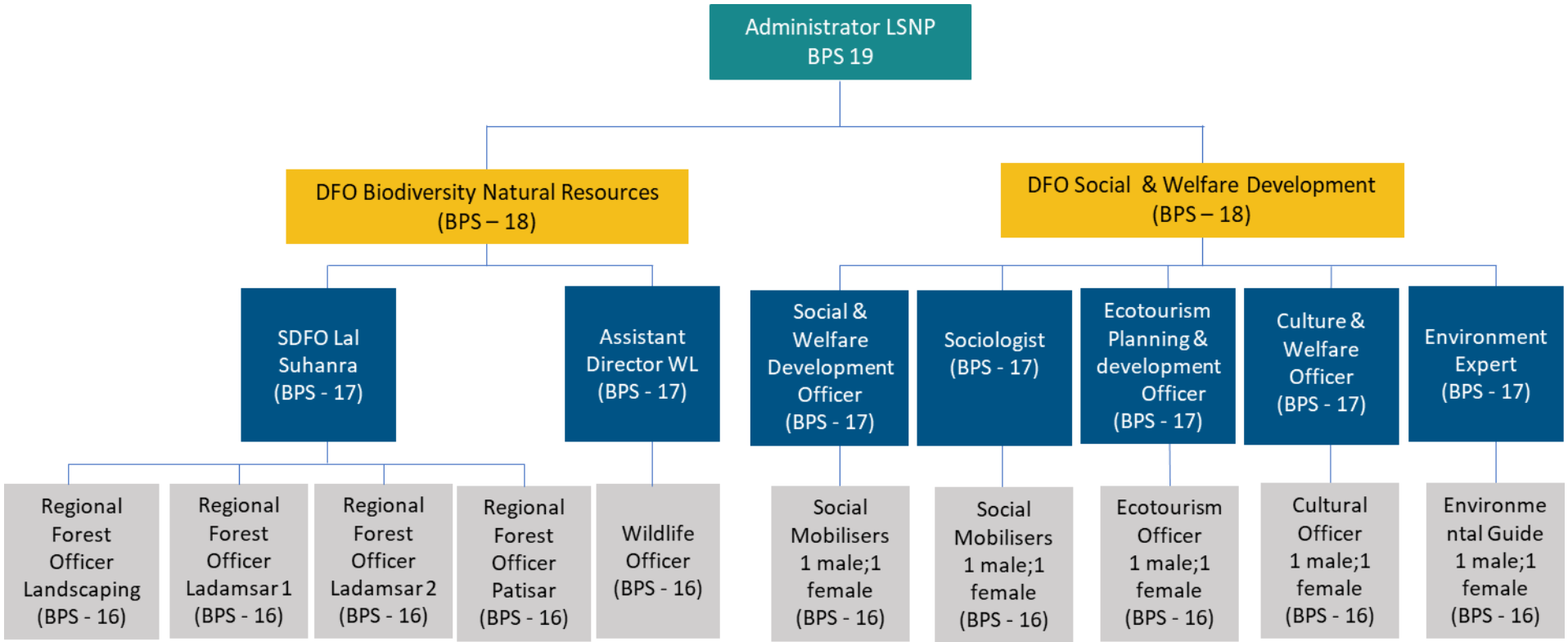
A variety of management operations, such as track maintenance, repair, and activities related with burning, fuel reduction, and the provision of visitor amenities, have a complex impact on landscape values. To prevent damage to landscape values, work must be done in a systematic manner. The most effective way to manage the natural landscape of Lal Suhanra is to focus on restore, conserve and enhance the significant habitats that make up the natural beauty of the Lal Suhanra National Park. Bring together experts and organizations to collaborate for the benefit of the entire landscape. Ecologists, cultural heritage experts, tourism bodies, outreach workers, and companies are all needed to work as a team.

7.16.1. ACTIVITIES

- The location, type and design of tourist's facilities requires vigilant considerations to ensure that such type of facilities are not visually intrusive.
- Land-use development outside the Park area must be influenced in such a way that it is fully aligned and integrated with zonation of the Park and conservancies.
- Integrate landscape protection measures into the design and siting of all facilities and utilities. Constantly improve landscape values while planning and implementation of management activities.
- Reduce the negative impacts of management and visitor activities, as well as visitor amenities, on the landscape; improve landscape values by removing unwanted visual intrusions.
- Prepare site plans for zone areas in conjunction with landscape architects, ensuring that all management activities, visitor facilities, and any other approved developments are planned to have the least impact on landscape values.
- Ensure that regional authorities are fully aware of the economic impacts of the Park, and of the negative impacts that inappropriate planning will have on conservation and its ability to contribute to the regional economy.

8. INSTITUTIONAL FRAMEWORK FOR THE IMPLEMENTATION OF EMP

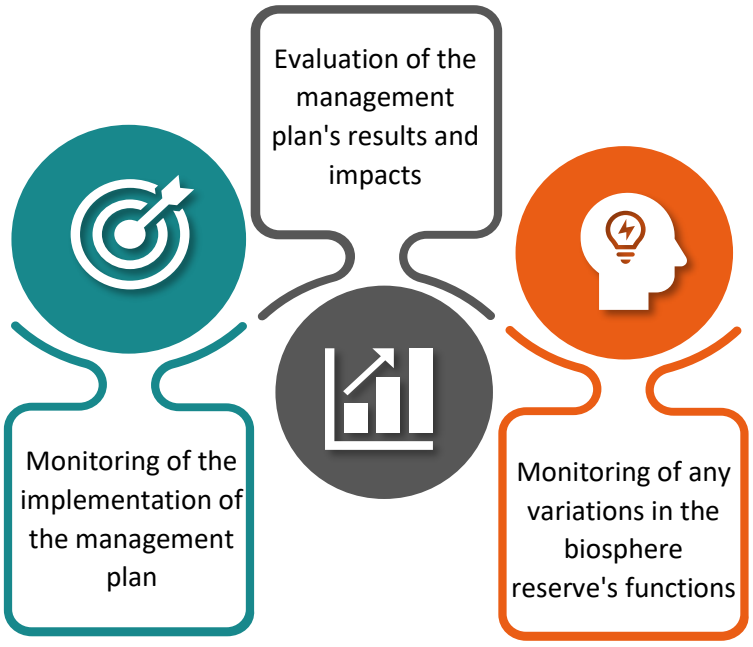
The institutional Framework for the implementation of EMP is as follows:



9. MONITORING & EVALUATION

Monitoring and evaluation are key components of a successful and effective adaptive management plan execution. It facilitates the effective evaluation of management actions and, if necessary, can be utilised to build the ability of professional personnel to carry out the management plan.

The monitoring and evaluation plan of Lal Suhanra National Park is composed of three (3) parts:



As a result, the monitoring and evaluation plan's main goals are:

GOALS

- To deliberately deal with the execution of the administration plan and strategically use resources to achieve the management plan's goals and objectives,
- Adequately assess project impact and extract lessons useful for developing the next 5-year management plan,
- Figure out necessary actions for maintaining the biosphere reserve's values,
- To evaluate any progressions in organic, natural and social qualities and elements of the biosphere

9.1. REGULAR MONITORING

The implementation Park management plan shall be regularly observed by Forest Department in collaboration with responsible departments and authorities. Regular monitoring focuses on the following:

- Progress and results of subprograms specified in the management plan.
- Possible environmental and social adverse effects of project activities.
- Difficulty in implementing subprograms.
- Recommendations

The results of regular monitoring will be reported at Forest Department regular meetings so that concerned members can discuss all necessary steps to resolve such issues.

9.2. ANNUAL MONITORING

The annual monitoring primarily focuses on:

- Park management plan physical accomplishments.
- Financial expenses made by pertinent agencies and departments for sub-program execution.
- Progress of activities achieved.
- Problems to be addressed in the execution of park management plan.

Forest Department will also gather monitoring data in coordination with appropriate departments and agencies, of this management plan. The annual monitoring results will be presented at Forest Department Annual meeting, so that the management and relevant departments/agencies can review and prepare their respective annual operating plans for the next year based on the annual monitoring data.

9.3. MONITORING OF THE FUNCTIONS OF THE BIOSPHERE RESERVE

In addition to the management plan's monitoring and assessment, the Forest Department must regularly monitor and assess whether the biosphere reserve retains its values and functions as they were when it was designated by UNESCO MAB.

Although, in order to meet with UNESCO MAB requirements, an official review must be conducted every ten years. It is recommended that the status of the biosphere reserve be checked more frequently so that the appropriate actions can be done to maintain the biosphere reserve's values and functions before they deteriorate to an irreversible degree. The UNESCO MAB's seven (7) criteria can be used to track the state of the biosphere reserve.

METT (Management Effectiveness Tracking Tool) for the protected areas, developed by WWF/World Bank Alliance for Forest Conservation and Sustainable Use since 2002, is one of the key tools that Lal Suhanra National Park could use for regular monitoring of the status of the biosphere reserve, particularly for the core and buffer zones. This toolkit has been updated over time as it has been used in a variety of nature reserves throughout the world. METT is divided into two sections: evaluation forms and guidebooks. The form was modified by WWF in 2007, and the user manuals were amended in 2016. (Stolton and Dudley, 2016). The modified version of METT is shown in Annex. In 2003, the METT was used to evaluate the management efficacy of the Bidoup-Nui Ba natural reserve (predecessor of Bidoup-Nui Ba National Park), and ten years later, it was used to evaluate the management efficiency of Bidoup-Nui Ba National Park.

SDO, 2016. Draft Action Plan for the Implementation of the 2030 Agenda for Sustainable Development. Sustainable Development Office, Ministry of Planning and Investment;

The METT consists of 3 tables: (i) general information on the nature reserve; (ii) Threats; (iii) Evaluation sheet.

Table 1. General information on Lal Suhanra National Park cost estimates:

Name and contact details of the person responsible for completing the METT	
Date of Assessment	
Name of Protected Area	Lal Suhanra National Park
WDPA protected area code: This code can be found on https://www.protectedplanet.net/2091	2091WDPA ID

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