STUDY AREA

1.1 Geographical Location

The Gujarat State encompasses an arid area of 62,180 km$^2$, of which 73% (45,652 km$^2$) is located in the Kachchh district of the state. The district is poorly endowed in terms of its land quality, as about 23,310 km$^2$ (51%) of the area is covered by saline deserts (Greater and Little Ranns of Kachchh). Banni, the largest remnant grassland in India, is situated on the northern border of the Bhuj taluka (23°19' to 23°52' N latitude and 68°56' to 70°32' E longitude) of Kachchh district, Gujarat State, India and is located 60 km from the Bhuj-district headquarters. It forms the fringes of Greater Rann encompassing an area of 3,847 km$^2$, this inhabit falls within the administrative boundary of Gujarat State Forest Department (GSFD) of Kachchh Circle, Bhuj and declared as Protected Forest in 1955.

The topography of Banni is flat and represents an embayment between the Kachchh mainland uplift in the south, the Pachchham uplift in the north and the Wagad and Bela uplift in the east. The southern part of Banni has a stretch of high saline waste, known as Little Rann of Banni that separates the Banni from the Kachchh mainland (58, 124).

Banni is a vast single stretch of Grassland ecosystem (3,847 km$^2$), which accounts for approximately 45 per cent of the permanent pasture and 10 per cent of the grazing ground available in the Gujarat State (area of State is 1, 96,024 km$^2$). The elevation across the Banni mostly from 2 to 10 m from sea level. The name Banni was derived from a Kachchhi word ‘Bannai’, which means "Banni hui" in Gujarati (made up); signifies that the land has been formed by detritus. Geological studies highlight the fact that the sediments may be brought down by the rivers such as Indus, Luni, Banas and Saraswati, which in the recent geological past flowed through this area from the north and east (60).

The landscape of Banni is important to people living in this area because of different salinity and lowland areas and resultant types of grassland mixed vegetation communities which offer different opportunities for use as dry and wet season pastures (mainly after monsoon).
Figure 1: Map showing the Location of the Banni Region (Study area)
1.2 Panchyat and Pastoralist Communities

Banni was once referred as Asia’s finest grassland, which encompasses 48 villages, under 19 panchayats (2001 Census), i.e. Luna, Bhitara, Chachla, Sarada, Dumado, Dhordo, Mithdi, Sargu, Sadai, Udai, Shervo, Gorewali, Dadhhar, Hodaka, Bhirandiyara, Misariyado, Bhojardo, Berdo and Raiyada. Banni has a very low population density of 3.6 people / km² (as per 1991 census). The residents of Banni are called Maldharies who belong to Islam religion. There are 15-20 Maldhari muslim castes in Banni and they speak Kachchhi, a dialect close to Sindhi language. Muslims, Hindus and Vadhas are the three major communities inhabiting the area and Harijan communities is very least population inhabitant in the area. Majority of Maldharis would be Muslims divided into various castes: Raisipotra, Halepotra, Mutva, Sumra, Node, Jat, Sama, Garasia among others. The Maldhari (Cattle breeders) communities, unrivalled embroidery work and other handicrafts, soul- touching folk and Sufi music, earthquake resistant mud houses(called Bhunga), traditional fresh water resources Virda, traditional knowledge of medicinal plants and animal breeding and last but never the least, drought tolerant highly productive livestock- the very base of survival of Maldharis and a certain philosophy of life which would call for austerity, brotherly love and tremendous hospitality of outsiders. Livestock is the mainstay of the inhabitants of Banni, which constitutes the major bulk of their assets. Despite tough survival conditions, Banni buffaloes are the most productive cattle in India and are recently recognized by ‘National bureau of Animal Genetic Resources’ as 11th distinct bread of nation. Their interest mainly centers on livestock breeding and the area is a well-known cattle-breeding tract of Gujarat. The cattle population is about 97,000 (2007 census record) including cows, buffaloes, goats, sheep, and camels. However, due to establishment of milk co-operative societies in early 1980's, the people of Banni are slowly getting inclined towards selling of animal products such as milk, ghee etc., which gives an income of about Rs 1,500 / household / month. During princely rule, Banni was declared as reserve grassland, where grazing by milching cattle and buffalo was only permitted while sheep and goats were strictly prohibited. Further, Maldharies were not permitted to settle in Banni, hence, nomadism had prevailed for many years. However, after independence Maldharies of Banni have become pastoralist
and settled in various parts of Banni and nearest to water resource-called Zills. Human settlements/villages are located at a special distance of 5 to 15 km, in and around water tanks to ensure drinking water for themselves and to their livestock. The water holes (traditionally known as virdhas) thus played an important role in regulating the livestock grazing of an area. However, today the supply through pipelines from Bhuj to Banni has changed the scenario of few panchayats and water is no longer a factor to govern the livestock grazing.

**Figure 2: Livestock population of Banni region (2011-2012)**

**Figure 3: Juth Panchayat wise Human population in Banni Region (2011-12)**
1.3 Climate, Soil and Rainfall

The climate of the Banni is arid. The temperature of Banni is high during most of the time and it reaches a maximum of 48-49°C during May-June while winter temperature goes down to 10°C with January and February being the coldest months. The average annual rainfall (June and September) is 348 mm per year with a coefficient of variation of 65 per cent, resulting in frequent droughts. The rainfall is extremely erratic and variable in distribution both in time and space. Therefore, droughts are a recurring phenomenon in Banni. During the period between 1901 and 1996, total 57 droughts (59 percent of the period) were recorded of which 23 are severe (<50 percent of average rainfall) droughts. The strong winds velocity leads to very high rates of evaporation. However, since last decade, Banni region is received almost double than average rainfall, which also changed significantly habitat characteristic and composition of palatable grass resources. The soil of Banni are inherently saline and consists of recent alluvium mixed at places with aeolian sandy deposit and the entire area has deep to very deep clayey and coarse textured soils in discontinuous patches. In Banni, soil material containing clay loam to silty clay loam covers 59 per cent of the total area. The salinity of the soil is highly variable from 1.0 to over 15.0 Mmhos/cm and the pH ranges between 6.5 and 8.5, which resulted in high salinity problems in about 50-60 per cent area of Banni. Though, the subsurface water in Banni exists at shallow depth of about 3-4m, it is highly saline, thus not suitable for drinking or irrigation purposes. Further, 70 per cent of the Banni area falls under very slow to slow permeability range (0.00 to 0.13 cm/hr), which subsequently leads to water-logging, during good rainfall years.

Figure 4: Temperature of Banni Region (2010-11-12)
Factors determining grassland communities and vegetation types are mainly the local climate and the location of the region involved. In the lowlands of Banni, mixed halophytes scrubs savannah is the dominant vegetation type. This type is well adapted to stress and can withstand high grazing pressure. At man-made water conservation areas, more favorable micro climate conditions exist, permitting the growth of vegetation which is richer in species and reveals a larger spread of grasses, herbs, shrubs and trees. Banni refers to an arid region that is covered with coarse and low perennial grasses like *Desmostachya bipinnata* (Dhrab), *Sporobolus marginatus* (Dhrabad), *Dichanthium annulatum* (Jinjvo), *Cenchrus ciliaris* (Dhaman), *Sporobolus fertilis* (Khevai), and *Chloris barbata* (Siyarpuchha); and sparsely distributed colonies of *Cynodon dactylon* (Chhabar), *Dactyloctenium sindicum* (Madhanu), *Eleusine compressa* (Nanu Mandhanu); besides sedge like *Eleocharis atropurpurea* (Nano Chiyo), *Cyperus rotundus* (Chiyu), *Schoenoplectus maritimus* (Kaluro) and coarse and pioneer colonising grasses like *Aeluropus lagopoides* (Khariyu) and *Cressa cretica* (Oin) occur extensively. Undershrub like *Suaeda fruticosa* (Unt Morad), *Suaeda nudiflora* (Lano), and *Tamarix aphylla* (Lai), occur abundantly all over especially in the places where water logging occurs in pools.
during the rainy season and sedges with annual grasses also occur around the fringes of such pooling spots. Today, palatable grass and tree species like *Acacia nilotica*, *Salvadora* spp. are though present, their abundance has decreased very significantly due to the invasion of *Prosopis juliflora*.

1.5 Threats

1.5.1 Invasion of *Prosopis juliflora*

As a measure to check the advancement of the Rann, the Gujarat State Forest Department has planted initially about 31,550 ha exclusively of *Prosopis juliflora*. The cattle droppings contain the seeds of *Prosopis juliflora* that on getting moisture germinates and spread over. The environmental ambiance of Banni such as successive droughts, increasing salinity along with low palatability of the species provided more suitable condition for the growth and extension of the hardy *Prosopis juliflora*, which is today a dominant species of the vegetation of Banni and is spreading at the rate of about 25 km\(^2\) per year\(^{(58)}\) at the cost of the native species of Banni. *Prosopis juliflora* has crowed out native grasses and trees nearby reduced the grassland and taken root on the banks of the wetland. This process has destroyed the cover of indigenous vegetation on the banks. The indigenous variety of the same species that we call ‘Desi Babul’ and other indigenous shrubs and plant species are being slowly lost due to the onslaught of *P. juliflora*\(^{(58)}\).

1.5.2 Damming on Upstream and Salinity

Although, the inherent salinity existed even during the early days in Banni, the rivers, which were flowing from the Kachchh mainland to Banni were not only depositing the detritus and maintaining the soil moisture but also, leached the salinity of the area during good rainfall years. The construction of 6 medium dams namely Rudramata, Nirona, Nara, Kaila, Kaswati and Gajansar has nearly stopped the collection of water from 1,603 km\(^2\) catchment area except during the heavy monsoon years. Thus, natural leaching of the salinity of different parts of Banni is totally interrupted. In addition to this, seawater from the Kori creek entered the northern part of Banni due to the construction of Punjabi-road during the year 1965.
Further, low or absence of vegetative cover in high saline areas encourages the wind to transport the salt particles from the Rann to fertile Banni areas resulting in further increase of salinity. The cumulative effects of all these factors have the increase of salinity in nearly 90 per cent of the Banni grassland. Further, low or absence of vegetative cover in high saline areas encourages the wind to transport the salt particles from the Rann to fertile Banni areas resulting in increased soil salinity. All these activities have cumulatively resulted in salinity ingress in villages located along the fringes of western, northern and eastern part of Banni. As a result, about 50 per cent of the Banni area contains very high salinity and is unsuitable for plant growth, 40 per cent experiences moderate to high salinity where less palatable species grows and only 10 per cent of the area has low salinity, which is suitable for the growth of productive grass growth (42).
Plate 1: Threats of native vegetation and RET plants

Intensive invasion along the road side

Over grazing pressure by small ruminants
Plate 2: Threats of native vegetation and RET plants

Land digging activity in Grassland area

Illicit cutting of native tree species for fuel and fodder
Plate 3: Threats of native vegetation and RET plants

Salinity intrusion in pasture land

Invasion affects the natural water resources
1.5.3 Over grazing (immigration animals from outside)

During the normal rainfall years, livestock from neighboring talukas and districts of Kachchh and even from other States immigrate into Banni for grazing. Over grazing by native as well as these immigrant livestock in selected grazing areas is another major problem in Banni. Further, in spite of the heavy decrease of livestock from 49240 to 26084, the yearlong fodder requirement of native livestock of Banni alone would still be around 79,000 tonnes/year.

It is important to note that, high grazing pressure combined with stochastic events (temporary droughts, changes in soil conditions) may change perennial vegetation into one dominated by ephemerals, but continuous heavy grazing prevents renewed change from ephemeral to perennial vegetation when weather conditions change (17). This situation leads to loss of soil cover, which further aggravates the degradation of the area.

1.6 New Intervention

1.6.1 Legal Status

Banni- declared as Protected Forest under section 29 of the Indian Forest Act, 1927 vide Chief Commissioner of Kachchh’s Notification No. RR/155/55 dated 11.05.1955 and hence, the Forest Department has developed and sanctioned a working plan on Banni that seeks to convert open grazing lands into conservation coupes where pastoralist grazing will be prohibited, convert areas that have a high density of *Prosopis juliflora* (Ganda Bavar) into extraction coupes, and convert the scrub forests into restoration zones that will be planted with indigenous species. The plan seeks to sequentially close to grazing all conservation coupes and restoration zones, in the assumption that grazing by *maldhari* buffaloes is responsible for widespread “degradation.” (29).

1.6.2 GUIDE & GSFD Project

The project, aimed at ecological assessment of grassland biodiversity and development of degraded grassland in Banni region. As a part of research and monitoring, maps of Banni has prepared with the help of topo maps, cadastral maps and the satellite imagery under GIS platform. The land use pattern has classified into five major types; *Prosopis*
dominant, *Suaeda* scrub, *Prosopis* with other Vegetation, Grassland with sparse *Prosopis*
and water bodies. As part of restoration of Banni grassland, currently five NGOs are
working at seven villages in Banni, covering an area of 705 ha. The development
activities are in progress which will cover the targeted area of 4000 ha by 2012. In
addition, micro-planning of 44 villages was also submitted to GDFE, Gandhinagar.
In connection to above said Banni-GUIDE Project, a district committee for smooth
execution of project had been proposed and sanctioned by GoG (Government Resolution

### 1.6.3 BPUMS and NGOs working in Banni

Over the years Maldharies (traditional breeder) have played important role in
conservation and improvement of Banni Buffalo. Maldharis of Banni came together to
form "Banni Pashu Uchharak Maldhari Sangathan" (Banni Breeders' Association) with
membership of more than 1100 animal breeders from this region with the objective of
recognizing their animal as distinct buffalo breed of the country as well as conservation
and improvement of this germplasm scientifically supported by their traditional wisdom
which would be complementary to the Banni Grassland Ecosystem. The main objectives
of the association are conservation and improvement of Banni breed, recognition of
Banni breed as distinct breed of the country, conservation of grassland on which animals
are grazed, establish organized milk market for the region and create backward
integrations like availability of water, animal feeds, value addition and systematic animal
marketing. In order to recognize Banni buffalo, Breeders' Association initiated process of
characterization of Banni breed and developing breed descriptor with the support of NGO
and Agricultural University. They also willing to participate in efforts on conservation of
the Banni breed and in fact, members of Breeders' Association are already participating in
in-situ breed conservation programme being jointly implemented by SDAU and
Sahjeevan \(^{(12)}\).

### 1.6.4 Eco Tourism (Hodko-Shame Sarhad and Rann Utshav)

Shaam-e-Sarhad (Sunset at the Border) Rural Resort, owned and operated by the
community of Hodka, a Village near Bhuj (63 kms) which is capital of the Kachchh
region of Gujarat. Hodka village is surrounded by an area of impressive natural beauty, an ideal base location to discover Kachchh. Kachchh is renowned and visited by guests from all over the world for its arts and crafts and also visited by bird watchers for spotting migratory birds in winter. Designed in local style, and exquisitely decorated with mirror work, textiles and other local crafts, the Shaam-e-Sarhad Rural Resort is the perfect gateway to a unique travel experiences in India. Shaam-e-Sarhad Rural Resort is an excellent example of how local communities can come together and execute an eco-tourism concept that increases awareness of local arts and crafts and employment and is a good example for other upcoming rural tourism projects in India.

Rann or Kutch Utsav is a three to four days of cultural extravaganza organized at different locations within Kutch in Gujarat. The fair is like a mirror to the traditional art forms and culture of India. Rann Utsav is organized by the Gujarat tourism department to celebrate the diversity and uniqueness of the Kutch district. Kutch is the most ecologically and ethnically diverse areas in the state of Gujarat. The people and geography of Kutch can be described by the hospitality, warmth and diversity of culture and communities found here. There are numerous cultural activities organized during Rann Utsav that engage all visitors. Semi parched Grasslands of the Banni hosts the most magnificent display of vernacular architecture as the exhibition platform for the varied range of arts and crafts of the region. The most enchanting experience in the Festival is the presentation of different art forms, dances, Music during the shade of Full moon and in an aura of chilling winters.