JOURNEYS IN THE CULTURAL LANDSCAPES OF OKHAMANDAL IN GUJARAT, INDIA: AN ECOLOGICAL MODEL FOR HERITAGE CONSERVATION

BY

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THESIS

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Abstract

In the study of the cultural landscape of Okhamandal in Gujarat, India, cultural heritage conservation practices are leveraged in planning for ecological restoration. Dwarka, located in Okhamandal, one of the four holy sites across the Indian subcontinent, is facing drastic pressures of climate change resulting in rising sea levels, salt ingress, desertification, scarcity of water for drinking and agriculture, and a severe threat to the heritage sites. Okhamandal has many sacred sites, the largest of which is the holy city of Dwarka, where the Hindu god Krishna established his kingdom in antiquity. Krishna is an incarnation of Vishnu, the sustainer in the Hindu trinity of gods who create, uphold and destroy the universe unceasingly. In the cyclical understanding of time in Indic thought, creation is always preceded by destruction. According to Hindu mythology, Dwarka, situated along the coast of Gujarat, was swallowed by sea upon Krishna's death, a legend corroborated by underwater archaeological findings dating back to 15th BCE. Changes in the shoreline suggest that rising sea levels have inundated and destroyed coastal settlements as many as seven times. Okhamandal, a peninsula connected to the mainland by a narrow isthmus between the sea and the desert, is once again under threat. The trend for mean sea level rise is 2.06 mm/ year (± 0.06 mm) for the Okhamandal region; the projection for next 100 years is thus a 0.20 meters rise in sea level. This project proposes the conservation of sacred and archeological sites in the Okhamandal region based on a model derived from the scientific systems approach and faith-based environmental ethic. Krishna's life in Dwarka and Braj, his sayings and deeds emphasize nature reverence and have been very significant in guiding the faith of Hindus. The environmental ethic is developed from the concept of Krishna awareness, which represents a reverential and caring attitude towards nature demonstrated by working in harmony with natural systems. This project proposes reclamation strategies, including ground water replenishment by reviving wetlands and sacred water bodies and mitigation of coastal erosion through green terracing and floating islands, to promote resiliency. These strategies guide the design of an eco-cultural heritage trail for pilgrims circumambulating the sacred sites of Okhamandal. The trail will link sacred, archaeological, and environmentally reclaimed sites, facilitating the pilgrims' and visitors' experience of Krishna awareness as part of the journey through this cultural landscape. The restored sites along the eco-cultural heritage trail will also set a precedent for environmental reclamation of the Okhamandal peninsula and promote ecological and cultural resiliency.

Dedicated to my teachers

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CHAPTER 1: INTRODUCTION

1.1 Objectives

The objective of this thesis is to develop cultural heritage conservation practices that will leverage the ecological restoration of coastal cities in India by drawing inspiration from local resilience practices and reinterpreting myths tied geographically and culturally to local Hindu communities. This study is grounded in the local context of a region in India known as Okhamandal, a peninsula located on the western-most edge of the Indian subcontinent in the state of Gujarat that is home to Krishna's capital Dwarka (Fig 1.1). Krishna, an incarnation of Vishnu, the sustainer in the Hindu trinity of gods who create, uphold and destroy the universe unceasingly, established his kingdom in antiquity at Dwarka. The framework is based on interpreting Krishna's deeds and sayings as a conservation principle guiding an environmental ethic. My methods include studying and analyzing the sacred geography through - literature review, collecting and analyzing data from various archeological and environmental reports, mapping the cultural landscape, and envisioning a resilient future. This thesis aims to enlarge the scope of local conservation practices to regional scale and create opportunities for pilgrims to travel through the landscape on a journey that would be the beginning of unfolding of the Krishna awareness.

1.2 Background

Interpretation of nature is tied deeply into the foundation of many cultures. The roots of Hinduism are embedded in the reverence of nature and its processes. The concept of cyclical life unfolding in creation, sustenance and destruction, only to be recreated again, is the foundation of

Hindu culture which is derived from the understanding of rhythms of nature. Landscape is a relationship negotiated by culture with nature (Hays 2015). Thus, cultural landscape, an evolving phenomenon, is understood in terms of cultural patterns produced by spatial practices. Diana Eck (2012) argues, the whole Indian subcontinent is a sacred geography created by the traces of gods and footprints of the heroes in the landscape. The sacred geography is re-created and interpreted by movements of pilgrims who circumambulate around the landscape.

Pilgrimage routes at various scales, from national to regional to local, facilitate circumambulations around places created from the unbounded, eternal and creative energies of universe. Every Hindu, bound by the code of *dharma* (religious duty), undertakes pilgrimage and the most known is *'char dham'*, the four sacred sites in the four cardinal directions in the Indian subcontinent associated with Vishnu and Shiva. As mentioned before, Vishnu is the god of sustenance while Shiva is the god who destroy the universe unceasingly only to be recreated again. Temple and pillar are significant in Hindu culture as they symbolize the mythic image of cosmogony while the patterns of ponds and forest groves, and shrines are symbols at the micro-scale. This polycentric landscape links the many centers together through pilgrim movements (Eck 2012). Section 2.3 and 2.5 further discusses the pilgrimage at *char dham*.

Dwarka, one of the *char dhams* (four holy sites), is part of network of sacred sites in Okhamandal. Hindus regard it as the capital of Krishna's ancient kingdom, destroyed and rebuilt seven times according to myth. Archeological findings discussed in section 2.4 provide foundation to this myth. The shoreline of Okhamandal has constantly been changing due to its close relation with the sea as well as being a seismically active area (Gujarat Ecology Society 2014). The region has many inland and coastal archeological sites. Archeologists have traced

human existence here dating back to 5000 years from present (Rao 1990). “The landscape of faithful is not only shaped by archeology, but also by a faith that simply assumes the connection between Krishna of old and Krishna here today” (Eck 2012, pg.382). Millions of pilgrims who visit Dwarka are not drawn here because of the archeological evidences but because their faith and belief in the reality of Krishna then and now. However, archeological findings help in grounding the myths and stories for younger generation who are becoming distant from this belief system. The Geological Survey of India (GSI) and Marine Park Authority have confirmed the historical coral reef dating back to about 20 million years in Okhamandal. It appears that this part of the land was under the sea in the past and supported rich coral reefs.

The region is facing drastic consequences of climate change, including rising sea levels, coastal erosion, seismic activities, salt ingress, desertification and unproductive land, and scarcity of water for drinking and irrigation. The trend for mean sea level rise is 2.06 mm/ year (± 0.06 mm) for the Okhamandal region; the projection for next 100 years is thus a 0.20 meters rise in sea level (http://sealevel.climatecentral.org/). The fluctuation of water levels is accelerated by human impact as we are disturbing various ecological processes. Modern day development is ecologically insensitive and poses a threat to the natural ambiance of the sacred sites.

Pilgrimage is an opportunity for people to perceive the landscape and understand its natural processes. The evidence suggesting the transgression and regression of sea waters should made accessible to visitors and pilgrims to help understand how human activities are accelerating natural processes and posing a serious threat to our survival. The imagined landscape cast by the network of India’s pilgrimage contribute immensely to the sense of nationhood charged with the belief system that brings people with diversity together (Eck 2012). Historically, a pilgrimage

was done on foot, allowing for interaction with the landscape to reach to the state of *darshan* (sighting) of the divine in nature and built form. It used to take months to complete the journey that was a personal encounter with the landscape, charged with the presence of divine. Now, there are bus tours that considerably shorten many pilgrimages, reducing months' worth of arduous travel to a few hours or days. With increased facilities and improved infrastructure, there are more pilgrims visiting pilgrimage sites all around India. Places of pilgrimage often experience environmental problems as a result of pilgrimage pressure on natural resources (Luthy 2016).

1.3 Approach

This study takes the following approach to plan for a resilient future, for the cultural landscape of Okhamandal. Myths and cultural practices are reinterpreted to propose an environmental ethic based upon Krishna awareness. Krishna, who is considered to be reincarnation of the god of sustenance Vishnu, has always guided people to revere nature. The question now is: what would the 21st century Krishna do to overcome the present day ecological and cultural challenges? Krishna is not just a deity but an embodiment of a conservation principle or a philosophy of adaptability to help establish new ways of relating to natural. This project proposes that awareness of Krishna's principles can and should guide new landscape conservation and management practices based upon the idea of nature as part of everyday life, appreciating it and working with its natural course.

The religious and cultural landscape can be understood by examining myths of Hinduism. Archetypal images and recurring landscape patterns are seen in all *char dham* pilgrimage and are

analyzed more particularly in Okhamandal and specifically in Dwarka. The historic landscape is analyzed through the archeological findings of ancient settlements built and destroyed overtime. To understand the ecological history of the region, mapping and analysis are used (Fig 1.2). Mappings enable understanding of conditions, processes and events in the human world and represent the required information in a visual inventory (Amoroso 2010). The present day landscape is evaluated by studying various heritage risks like sea level rise as it threatens the peninsula region, ecological disturbances, the healthy functioning of ecosystems, and modern day development that disrupts the very nature of this religiously significant region. Based on these issues and ongoing conservation efforts a future scenario is projected. It exemplifies a 'lapsarian' approach to landscape design in which archetypal imagery is reinterpreted not as a static ideal but a dynamic condition (Hays 2015). The reclamation of Okhamandal is proposed in terms of strategies that can be applied to the given landscape condition. These lead to design interventions that aim towards increasing the cultural and ecological resiliency of Okhamandal (Fig 1.3).

1.4 Figures

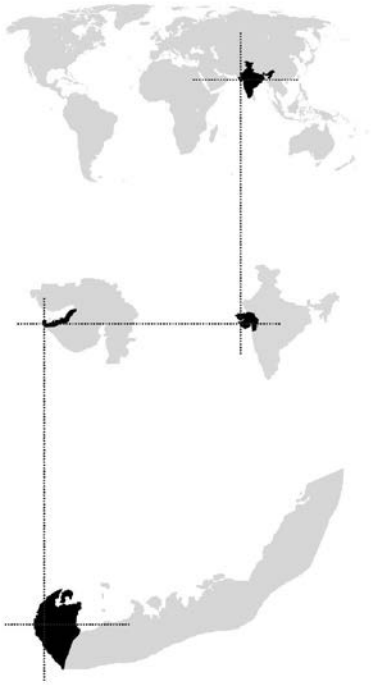

Fig 1.1 – Site Location

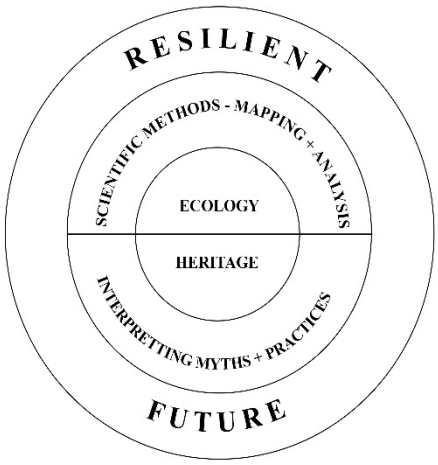

Fig 1.2 - Framework

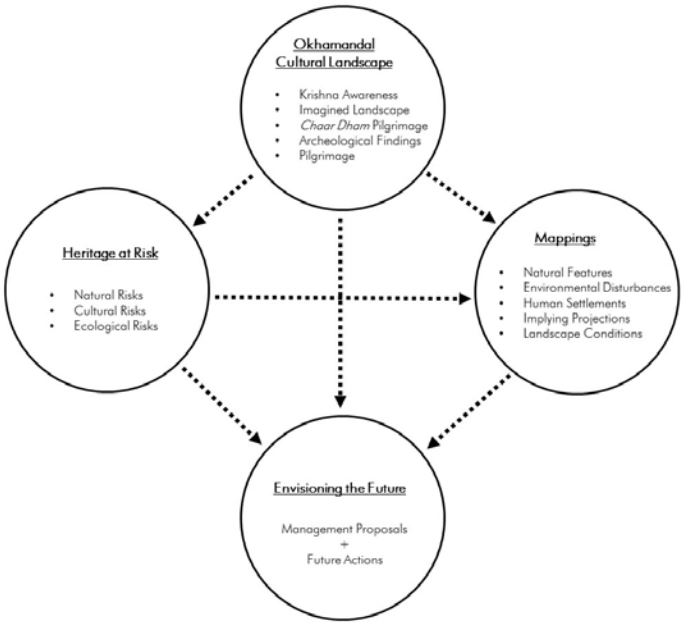

Fig 1.3 - Approach

CHAPTER 2: OKHAMANDAL'S CULTURAL LANDSCAPE

Cultural landscapes in India are crafted by religious and cultural myths. More often than not, myths are looked upon in a superficial manner and their real meanings remain buried. In interpreting their meanings we realize that the cultural landscapes are deeply associated and dependent on natural processes. The environmental history of any site can give us an insight into how nature was integrated into the cultural values and beliefs. The geological processes in ancient Indian civilization were believed to be the act of God and demons and thus became part of stories and legends (Chandrasekharam 2007). Although myths are considered non-essential knowledge today in the world of science and technology, they may lead to new directions in design (Hays 2013). Their interpretation can reveal historical facts, useful in building a timeline and projecting the future.

2.1 Krishna Awareness

Hinduism is an ever evolving philosophy that is based on the belief of the cyclical nature of life. The agents of this process are the divine triad in which Brahma represents creation, Vishnu represents sustenance and Shiva represents destruction (Fig 2.1). Vishnu takes various incarnations to appear on earth in different eras to protect the civilization from various challenges. Vishnu's eighth incarnation is Krishna. He was born in Mathura, spent his playful childhood and youth in Vrindavan- Braj which is located in North India. Braj is a culturally defined region and does not follow the political boundaries of states of modern India. After playing a significant role in the epic *Mahabharata* and the discourse in *Bhagavata Gita*, he later came to Dwarka and established his own kingdom. When he died, Dwarka was submerged, also marking the start of *Kali Yuga*

(present Dark Age). In *Bhagvata Purana* Lord Krishna tells his charioteer, "go to *Dvarika* and tell our relatives about the internecine destruction of our kinsmen, the departure of Sankarsana and my condition. You all, along with your families, should not remain in *Dvarika*. The ocean will submerge the city once it has been abandoned by me" (Bryant 2003 pg. 416).

Various instances from Krishna's life help us in understanding him as the paradigm of godliness, being a divine entity in the form of a common man who is more approachable and human. "Krishna was among us as 'flesh and blood' and now remains among us in the sanctified images of temples as well as in the landscapes where he lived" (Eck 2012, pg.384). He lifted Govardhan hill in Braj on his finger to protect the herdsmen from the rains sent by god Indra. He urged the people of Braj to venerate the groves and water bodies of the hill instead of the gods. Krishna subdued the serpent Kaliya who was poisoning the waters of the river Yamuna. Believers participating in the *lila* (divine play), do not perceive Krishna as a god, but rather as their friend, lover or child. *Lila*, more than a divine play has a living quality to it as the episodes of Krishna stories are enacted and brought to life. "One of the most distinctive aspects of the pilgrimage landscape is the extent to which pilgrims enter into the drama as participants" (Eck 2012, pg. 366). Krishna relishes these personal associations far more than the conventional formal worship (Bryant 2003). Krishna responds to the people of Braj upon being suspected of his powers: "If you love me, and if I merit your respect, then you must regard me as your kinsman. I am neither god nor devil. I have been born into your family; this is the only way to look at it" (Dimmitt & Buitenen 1978, pg.103).

O bull, you have saved us time and again from death by poisoned water,
from the demonic poisonous snake,
from the tempest of the rain,
from the lightning's fire,
from the Bull and the Horses,
and from every kind of danger!
O friend, delight of all the cowherd women,
the inner witness of embodied beings,
have you not been born into the Satvata family,
as Brahma asked, in order to protect the world? (Dimmitt & Buitenen 1978, pg. 100)

The act of protecting natural features and conserving natural processes is veneration of nature, done through divine intervention in the form of human Krishna. Krishna needs to be considered not just as a deity, but as a conservation principle or a philosophy of adaptability to natural processes. This can help in establishing new ways of relating to the sacred landscape and new management practices. Krishna's life on earth is a great source of inspiration to modern Hindu India. Interpreting the philosophy enunciated by him can help in developing solutions to contemporary environmental and social problems. Awareness of his principles can help in re-establishing the beliefs of a cosmic order that is a balance between human and nature. Krishna awareness can be observed in Okhamandal, home to Krishna where pilgrimage is carried out through circumambulation and other spatial practices such as *bhakti* (devotion) and *darshan* (sighting) of deities in temples and bathing for ritual purification. "This is not just a pilgrimage journey to a sacred place or a single destination, but a meandering journey through a landscape saturated with the lore and life of the divine" (Eck 2012, pg. 367).

2.2 Imagined Landscape

As Diana Eck (2012) aptly argues, the polycentric landscape of the Indian subcontinent is a vividly imagined landscape that has been created by the linking, duplication, and multiplication of places so as to create an entire world. The landscape is imagined and shaped at many scales, as large as the Indian subcontinent to much smaller sites such as Okhamandal to even smaller sites such as particular shrines and temples. “The link between imagined landscapes described in words and images to the actual, physical landscape may, at first, appear tenuous, but on closer examination it is apparent that idealized imagery has indeed inspired and imprinted the present day cultural landscape of Indian subcontinent” (Sinha 2014, pg. 64). This landscape is seen, felt, tasted, and inscribed in the body through circumambulation, dance performances, festivals, and daily worship. The sacred geography of the Indian subcontinent is structured around the concepts of *char-dham* (four sacred sites) and *saptapuri* (seven sacred cities) around which pilgrims circumambulate and perceive the vastness of the region and its diversity in terms of culture and landscape. Sacred landscapes are created from natural archetypes like mountain, grooves, rivers, ponds, deity and temples that link ‘earth’ with ‘heaven’. Various traces of such archetypal forms are embedded physically into the landscape in the form of remains of temples, icons of deity, buried traces of rivers, ponds, and vegetation (Sinha 2011).

Archeology helps in uncovering such traces and provides a tangible form to the imagined sacred landscapes. From the study of archeological remains and ancient texts and literature, archeologist S.R. Rao (1999) recreated Okhamandal with its seven islands as it is described in the epic Mahabharata (Fig 2.2). The unknown Greek author in the first century wrote ‘Periplus of the Erythraen Sea’ referencing the islands which are now interspersed by the *Rann* (salt desert) and

sea. Rao mapped them based on the low and high points in the region to understand how these places would be perceived as islands due to rise in sea water level. Dwarka sits on rock bed which appears to be the land reclaimed from the sea. The archetypal image of land emerging from the waters, symbol of cosmogony is manifested in the landscape here as one sees the temple spire rising from the ocean at Dwarka. As per the Hindu belief of cosmogony, the land emerged from the vast ocean by churning it. This is readily imagined when one visits Okhamandal, which is a peninsula, as well as in Dwarka which is perceived as an island due to its topography and location. The temple spire in Dwarka at the sea edge represents the archetypal Mount Meru, the cosmic axis linking the three worlds. This axis signifies a center and the point of cosmogony where time and space originated.

2.3 *Char Dham* Pilgrimage

The *Char Dham* are the four sacred sites in the four cardinal directions in India associated with Vishnu and Shiva (Fig 2.3). It is an unsaid law for every Hindu to visit *char-dham* once in life as it takes pilgrims on a circumambulation of the whole country. The act of clockwise circumambulation encompassing the four directions defines the sacred geography of India. Many of ancient texts place much emphasis on making a sunwise tour of the earth to visit the sacred sites (Bharadwaj 1997). The symbolic representation of all spaces through its four cardinal points reflects the Hindu concept of *Brahman*, or the unbounded, eternal, creative energy of the universe, traditionally represented by four-ness (Eck 2012). “These concepts are played out in the microcosm of every Hindu temple, which are traditionally laid out on a pattern called a *mandala*, a cosmic map, which emphasizes its four-sidedness” (Davidson & Gitlitz 2002,pg. 241).

The ninth century philosopher and theologian Shri Adi Shankaracharya revitalized the concept of *Char Dham* by introducing religious institutions at all the four *Dhams*. Thus, one has to travel to each *Dham* to be educated about the *Vedas* and other scriptures while also allowing one to read and experience the sacred landscape of the continent. It is evident that the Hindu culture celebrates the image of land emerging from water in its religious sites by recreating it again and again. Association of *char dham* sites with water is clearly visible as most of the sacred sites lie either on river banks, at the confluence of rivers or on the seacoast (Bhardwaj 1973). This is due to the Hindu belief of cosmogony where the land emerged by churning the vast ocean. This image of creation is constantly recreated at sacred sites of *char dham*. In the north, the Badrinath temple is located in hill tracks along the bank of river. In the south, Rameshwaram temple complex has a large water tank along with sixty four other water tanks around the city. In the east, the Puri temple complex contains the water tank with other smaller tanks dispersed around. In the west, the Dwarka temple sits on the confluence of where the river Gomati meeting the Arabian Sea. Pilgrims make clockwise circumambulation around these sacred sites marking the Hindu cosmic axis. It also represents the sun circling the sacred mount Meru of the Hindu cosmos, thus pilgrims always follow the path of the sun (Bharadwaj 1997).

"Sacred places are humanly constructed, not just in the physical sense, but more importantly in terms of the very meaning they embody, and convey to the pilgrims" (Bhardwaj 1997, pg.7). The holiness of these places derives from their geographical circumstances, associations with gods and goddesses and from the attention given by holy visionaries. Pilgrims circumambulate around these sacred sites today either to earn religious merit that helps in purifying the soul or to gain

blessings of a deity for the solution of a problem (Bhardwaj 1973). To carry out the journey of purifying the soul, one has to detach from the family attachments. Contemplation and experiencing the landscape by being one with the nature brings inner peace.

The fourfold pilgrimage is widely duplicated in various regional pilgrimages at various scales and with the presence of certain elements of nature always present at sites (Eck 2012). Moreover, the archetypal forms of nature, such as the mountain-river dyad or grove-ponds, occurring singly or in combination at these sites, signify axis *Mundi*, linking this and the other worlds together through which flow the cosmic forces (Sinha 2011). Fig 2.4 illustrates the concept of self-similarity that further strengthens the idea of the polycentric sacred landscape of the Indian subcontinent. An example is Braj, a cultural site related to Krishna, which has archetypal forms of nature like the Govardhan Hill and the Yamuna River that are revered and circumambulated by millions of pilgrims each year (Haberman 1994). This can be observed in sites like Gopi Talav and Nageshwara in Okhamandal, which are the sites along the existing pilgrim trail. Pilgrims circumambulate the ponds and perform rituals in the groves enacting the archetypal landscape pattern.

The city of Dwarka in Okhamandal region, is significant in Hindu culture as it is one of the *char-dham* as well as *saptapuri*, meaning one of the most widely recognized sacred cities in Hindu India. The town and its temple are dedicated to Krishna, who, on leaving Mathura, made Dwarka his capital and dwelled here for the rest of his earthly life till his death after which the sea swallowed the city. The archetypal image of the mountain emerging from the water is visible in Dwarka (Fig 2.6). The main temple in Dwarka is located along the river edge and sits on the

highest elevation point (Fig 2.5). It is believed by the locals that this high point where the temple is located was actually an island. Looking at the larger landscape of the city, one can understand the foundation of this belief. The city is surrounded by various water bodies and marshlands which give the feeling of an island, especially during monsoon. Hindus here celebrate the mythic image of mountain emerging from the ocean as cosmogony. The landscape patterns are formed by the presence of a deity, ponds, and forest groves – each of which is important for life to exist. This can be observed in sites like Gopi Talav and Nageshwara, where deities like Krishna and Shiva are established at the edge of a pond with forest groves around it. Today many of these forest groves described in ancient texts are lost to farming while many of early buildings were destroyed during the period of Muslim rule from the 11th through the 15th century. Most of what the pilgrims visit today was built circa 1730. Pilgrims also associate this place with the 16th century philosopher- saint Mira Baj known famously as Mirabai who abandoned her life as queen to devote herself to worship of Krishna (Davidson & Gitlitz 2002). Legends speak of founding of this city 5000 years ago, while archeologists have traced its oldest relics to the 15th century B.C.E (Rao 1999).

2.4 Archeological Findings

The archeological excavation works carried out in 1980's – 90's have brought to light the relationship between the mythic city of Krishna and today's Dwarka. Archeology has played an immense role in understanding the larger landscape of Krishna ranging from Dwarka to Okhamandal. The archeological findings need to be made accessible to the younger generations and pilgrims so that they understand that myths are not mere stories but have a historic grounding.

Okhamandal

Okhamandal was formerly an island and is now a peninsula, connected with the mainland by a narrow isthmus. The islands and promontories along the edge are diverse in shape due to constant waves shaping the landscape, while the bright orange, buff, yellow and brown colors of terrain form the most pleasing landscape (Foote and Shah 1938). The name 'Okhamandal' derives from 'Okha,' meaning "the only" and 'Mandal,' meaning "the universe." The low-lying area is locally known as the Okhamandal Rann. It is an arm of the Gulf of Kutch, the bed of which has been slightly raised, probably by recent upheaval of the land due changes in tectonic movements. The Rann is nearly dry during the greater part of the year, but in the rainy season (July – September) it is covered with water. This is partially rain water, but also sea water collected in the gulf by the wind pressure of the southwest monsoon wind which blows for several months with steady force (Foote and Shah 1938).

The shoreline of Okhamandal has historically been in constant flux due to its proximity to the sea. The region falls under the highest magnitude zone of V. It had experienced at least three large killer earthquakes about 1500, 3000 and 5000 years BP respectively. Geomorphological evidence suggest that the North-Western part of the Indian landmass was seismically active during the last 10,000 years. These intense earthquakes are likely to have caused the shifting of the rivers and sea level fluctuation (Gujarat Ecology Society 2014). Further changes in environmental factors led to the disappearance of tributary of the Sarasvati River believed to flow through this region. Later, with the decline of the river as well as rising sea levels, the Indus valley civilization (3300 BCE – 1900 BCE) disappeared. The myth of Dwarka being swallowed by the sea describes the above in coded language.

The shoreline study play an important role in revealing the evolution of the landscape and culture over time. The edge of Okhamandal have scattered underwater coastal archeological findings. These findings now remain submerged under the sediments carried away by sea. The region also has many inland archeological sites. The excavated coastal and inland sites demonstrate the whole region as a network rather than isolated sites. Dwarka was a major sea port, Bet Dwarka was the administrative capital city, Aranda, Pindara, and Nageshwar were art centers dealing with shell work, pottery and pearl fishing (Fig 2.8). A few paved paths, drains, bastions of the fort wall, etc. have been excavated while, there are descriptions of houses destroyed by the sea (Rao 1999). The valuable artifacts found in the excavation are at National Institute of Oceanography (NIO) in Goa as there is no proper infrastructure on site for their exhibition and care. Infrastructure along with interpretation is needed on site to bring back the artifacts and make them available for display.

Dwarka and Bet Dwarka

The cultural landscape of Dwarka is a testimony to myths. It demonstrates the historic fall of the societies due to environmental impacts as well as their evolution and continued existence. Archeologists have traced human existence here dating back to 5000 years from the present (Rao, 1999). The underwater excavations - ancient port, temples, and settlements - in the region are the submerged ruins of the settlements in the late Harappan civilization flourishing around 1700-1300 BC. The occurrence of protohistoric pottery inland, where ground water is in plenty, suggests that there were small towns between Dwarka and Bet Dwarka in ancient times (Rao 1999, p. 104). Protohistoric sites in Bet Dwarka, now an island bring to light the large quantity of artifacts like pottery including perforated jar, sharp carinated dish, dish on stand and bowls, etc. that enable us to date the settlements back to the beginning of 2nd millennium BC (Gaur and

Vora 2007). The underwater excavation findings suggest that the settlement was a well-planned harbor city. During the Harrapan time period, the region had trade links with Mesopotamia and other Gulf regions. There is also a description of this place found in the Mesopotamian texts which date back to 3rd millennium BC (Rao 2001). The evidence testifies oversea trade.

From the onshore and offshore excavations carried out in Dwarka, interesting topographical features are discovered which help in understanding the environmental history of the landscape. The archeology report shows a possible sea water channel around the ancient mound on which the present town stands (Ansari and Mate 1966). Moreover, there is evidence of rock-cut channel extending over some 200 m into the sea westwards, indicating the extension of the Gomati river flow (Rao 1999). From the findings of the underwater remains, Rao (1999) has conjectured the layout of the town with six sectors, all fortified and connected, with the Gomati channel running through them. The submerged remains have been instrumental in writing the history of mythic and present day Dwarka (Fig 2.9).

Geological Survey of India (GSI) and Marine Park Authority have confirmed the historical coral reef dating back to about 20 million years belonging to Miocene, and Tertiary periods. The site is located about 15 km away from Dwarka near Bhimpura village of Okhamandal. This fossilized ancient reef is a valuable paleontological heritage of the Arabian Sea and Gulf of Kachchh coasts. Fossils of marine life and coral fossils are also found near the sacred site of Gopi Talav. This uplifted fossilized reef reveals the story of rigorous tectonic movements experienced in this area in the past resulting from coastline lifted above the present-day sea level. At Mithapur, about 300 - 400 m from the Arabian Sea coast, dead coral stones in form of coral reef are found.

The setting of coral reef stones is in a form of the layer below two meters from the surface of the earth in a well. It appears that this part of the land was under the sea in the past and supported rich coral reefs (Gujarat Ecology Society 2014).

2.5 Pilgrimage

According to Bhardwaj (1997), pilgrim circulation has developed over a long time period, and is constantly in the process of becoming. The *char dham* pilgrimage allowed people to have *darshan* (sighting) of the divine deity as well as allow them to perceive the landscape and its natural processes. Historically, various landscapes are described in ancient *Vedas* and *Puranas* as an outcome of such pilgrimage being carried out by mythic figures and historic heroes. Along with the *darshan* (sighting), pilgrimage also celebrates the sacred geography and make one self-conscious and aware that we are part of the larger system and its ecological and social parameters. Pilgrimage is not only a matter of the feet, but also a matter of heart (Eck 2012). It is not a climatic end of a journey, rather, a beginning of cultivating mindfulness as one visits the divine in the form of shrines, ponds, and sacred groves.

'Indic religions have preserved human interdependency with nature to an extraordinary extent, clearly manifest in the shape of the built environment and the myriad patterns of human interaction with it' (Sinha 2013, p.176). Based on my interaction with the pilgrims, I can say they come to the site and perform various rituals because they have profound religious belief. The rituals they perform and the hymns they recite from the religious scriptures are part of the intangible heritage that has passed on from one generation to the other as living traditions (Fig. 2.10). This intangible heritage is vital as it defines the living historic past embedded in enduring social relationships (Kurin 2004). These traditions are re-enacted through rituals as people relate

to them (Fig 2.11). Myths represent the historic past of a culture. It is the culture that people practice as a part of their daily life in the form of their beliefs, perspectives, ephemeral performances, and events.

The main temple in Dwarka is the Dwarkadhish temple where Lord Krishna is revered. The archeological findings suggest the temple to be some 2000 years old. The temple was enlarged in around 15th to16th century. It is believed to be built by Vajranabh, the great grandson of Lord Krishna. There are two entrances to the temple. The main entrance is the north entrance which is called *Moksha Dwara* (Door to Salvation). This entrance leads to the main market (Fig 2.12). The south entrance is called *Swarga Dwara* (Gate to Heaven). Outside this doorway are 56 steps that lead to the Gomati River (Fig 2.13). Along the Gomati River, there are series of built steps called *ghats* that allow the pilgrims to interact with the rising and receding waters. On the far south-west edge, there is the temple of Varuna (God of Oceans). Here the Gomati River meets the Arabian Sea; hence it is called the *Gomati Sangam* (Fig 2.14).

Pilgrims cross the Gomati River either by foot during low tide or by boat during high tide to reach the island formed by years of deposition brought by the sea. On this island are the sacred sites called *Panch Kund* (five sacred water tanks) (Fig 2.15). This site is described in the epic *Mahabharata* because the main protagonists – the five *Pandavas* visited this site. Although most of the city has salty ground water as it is on the edge of the Arabian sea, these five '*kunds*' have fresh water that is served by the groundwater aquifer. In the outskirts of the city, there is a historic temple called Rukmini Temple dedicated to the wife of Lord Krishna (Fig 2.16). Both temples – Dwarkadhish and Rukmini - have intricate sculptural details constructed from limestone that are still in pristine condition (Fig 2.17).

Presently, the pilgrim circuit route (Fig 2.18) starts with Dwarka as it is the arrival point for many pilgrims coming in train. Dwarka has infrastructure to support pilgrim needs of accommodation and food. Other pilgrim destinations lack such infrastructure and thus the overall landscape is left unexplored. There are many tourist companies in Dwarka that take the pilgrims around on tour to other pilgrimage sites. The modern day pilgrim mode is through automobile and thus one can go around various destinations within few hours and come back to Dwarka. Dwarka is perceived more as a holiday destination rather than a pilgrimage venue especially because the tourism department plans to put it on the global map of tourism by bringing in high end laser light fountain shows. There is need to revive the traditional mode of pilgrim on foot with rest spots at certain intervals thus encouraging close interaction of pilgrims with nature and landscape. The interactions could be circumambulating, bathing, collecting shells and corals for worshipping, ingesting sacred soil, watching birds, meditating and admiring scenic views.

The bus tour starts from the urban square in the downtown. First stop is Rukmini Temple dedicated to the wife of Lord Krishna. The temple has intricate sculptural details constructed from limestone. Second stop is Gopi Talav where Krishna bathed with *Gopis* (cowherdesses) in this pond. The soil of this pond is considered holy and tiny amount is ingested as part of a ritual. Third stop is Nageshwar which is considered one of the *Jyotirlinga* (radiant sign of the lord Shiva). Shiva Purana mentions this site as an ancient forest known as *Darukavana*. There are archeological evidences of shell and pottery works from late Harrapan period at this site (Rao 1999). Gopi Talav and Nageshwar landscapes demonstrates the archetypal pattern of temple at the edge of pond and forest groves around it, symbolic of Mount Meru rising out of the ocean. Fourth stop is Bet Dwarka which has temple as well as archeological sites. Presently a boat ride

is needed for reaching Bet Dwarka which is a conch shell shaped island. There is a sea bridge proposed for this site to avoid boat rides for the pilgrims. This bridge will be open to use in 2017.

The total number of tourists arriving in Dwarka in 2011-2012 was 1,436,488, which increased to 1,770,438 in 2012-2013. This shows a total growth rate of 23.25% in the total number of tourist arriving in Dwarka in just one year (http://www.gujarattourism.com). The new developments like the light-laser fountain shows, *choupati* (public beach in Mumbai) like sea front, *Sudama Setu* Bridge – pedestrian suspension bridge, etc are definitely playing a significant role in attracting the tourists. However, it is difficult to say how much the sites convey in terms of their history and culture. Cheaper and efficient transportation has also played a significant role in high number of pilgrims. Pilgrims numbers double to approx. 3,540, 876 during *Janmashtami*, as it is the main festival in August/September for celebrating the birth of Lord Krishna. There are number of pilgrims that visit to Dwarka to bathe in the confluence of river and sea, and offer prayers on a full moon of every month. Scientifically, it is known that moon's increased gravitational pull causes high tides as well as this increased energy is also felt by human mind at subconscious level. Thus, Hindus believe that praying on full moon also help in calming one down in his/her deeds and actions.

2.6 Figures

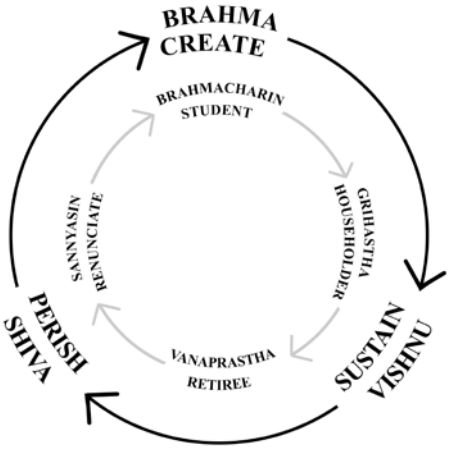

Fig 2.1 Cycle of Life

Fig 2.2 Mythic islands of Dwarka

(Redrawn based on Rao 1999)

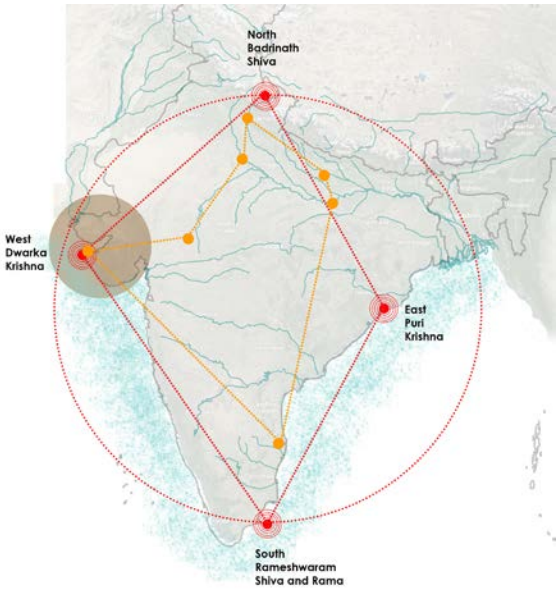

Fig 2.3 *Char Dham* sites across India

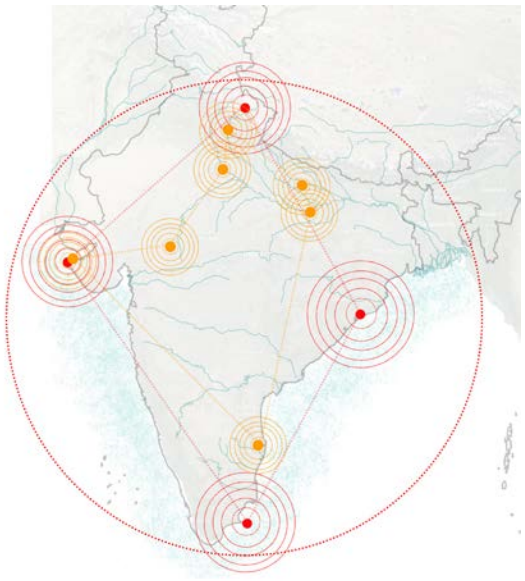

Fig 2.4 Self-similarity concept

Fig 2.5 The archetypal image of mountain emerging from water

Fig 2.6 Dwarka representing the archetypal image of land emerging from water

Fig 2.7 Archetypal image of land emerging from water – Instances in Okhamandal

Fig 2.8 Archeological sites of Okhamandal

Copper vessel

Bronze bell

Dwarka headland and bay from the south

Source- Hornell, 1909

Hemispherical door socket

A disturbed wall

A long wall

Two courses of wall & cluster of block walls

Vishnu temple hailing to 9th Century AD

Two earlier temples below Vishnu temple

Fig 2.9 Archeological findings

Source – Rao, 1999 and 2001

Rituals

Iconography

Fig 2.10 – Intangible heritage

Krishna birth (Source - harekrishnabrighton.com, www.indusladies.com

Krishna stealing butter
Source - fineartamerica.com, www.ibtimes.co.in

Krishna's *raas lila*
Source - haribhakt.com, www.thehindu.com

Fig 2.11 – Re-enactments

Fig 2.12 – North entry – *Moksha Dwara*

Fig 2.13 – South entry – *Swarga Dwara*

Fig 2.14 – Confluence of river with sea – *Gomati Sangam*

Fig 2.16 – *Rukmini* Temple

Fig 2.15 – Five sacred water tanks – *Panch Kunds*

Fig 2.17 – Limestone temple carving

Dwarka

Okha

Bet Dwarka

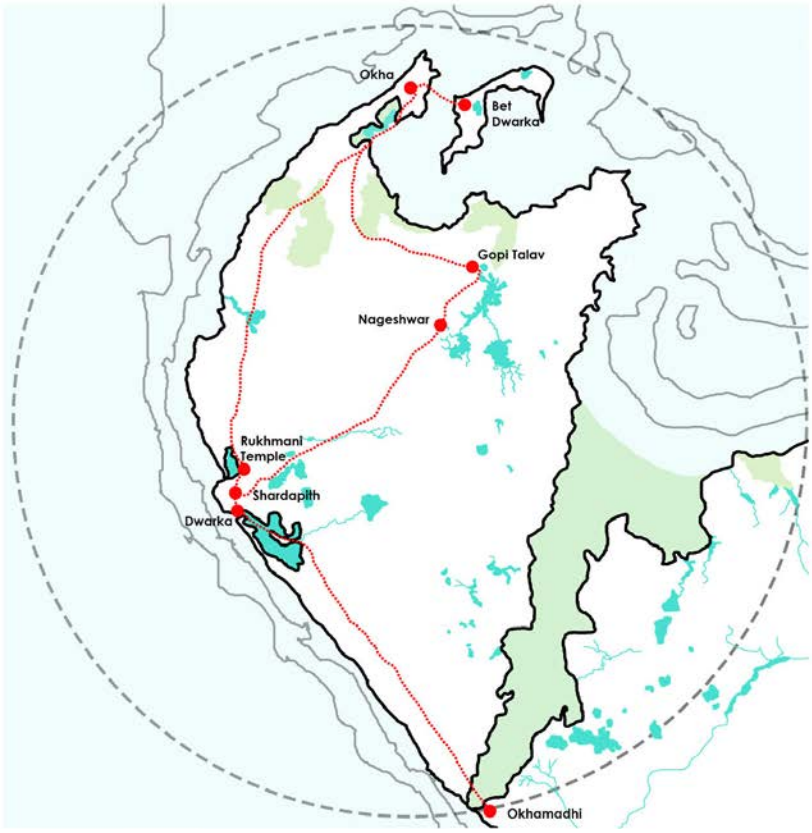

Fig 2.18 – Existing pilgrimage route in Okhamandal

Gopi Talav

Nageshwara

Okhamadhi

CHAPTER 3: HERITAGE AT RISK

3.1 Natural Risks

Sea Level Rise

For ninety percent of human existence, sea levels have been lower than the present by as much as 130 m. The current sea level was only established about 6,000 years ago. As humans mainly lived close to the water, a large majority of humanity's development took place on areas that are now submerged (www.unesco.org). Towards the end of Pleistocene epoch (part of Quaternary Period) sea level began rising rapidly as the massive continental glaciers melted. Sea level was more than 100 m below present during the last glacial low stand. Sea level rose rapidly until somewhere between 8000 and 6500 B.P. Thus, the sea level change has been the major reason for transgression and regression of land.

Changes in the shoreline at any point could be due to various reasons such as tectonic disturbance or shift in sedimentological regime causing erosion or deposition. Many scientific investigations, focusing on the palaeo-shoreline vis-à-vis sea level fluctuations in India based on numerous geological techniques, have indicated that at about 6000 BP, the sea level was approximately 6 m higher than at present and about 4000 years BP it stabilized at the present one with minor fluctuations (Gaur and Vora 2007). The available geochronological data of the region suggests a prominent depositional break representing low sea level stand (regression) during an early Holocene (Bhonde and Desai 2011).

According to Nair and Hashimi (1988), the post glacial rise of sea level on the western continental margin of India was rapid. Advancement of the sea from the north suggests the

Okhamandal area formed an island as the sea encroached along the present Rann of Kutch (Lele 1973). Rao (1990) speculates the sea level in 1500 B.C should have been 10 – 11 m below present MSL (Mean Sea Level). Ancient sea level in 1st – 2nd Century A.D must have been 2-6 m below present MSL (Gaur and Vora 2007). Thus, we can understand the dynamic role the sea level fluctuations plays in the making of a landscape.

Shoreline advanced landwards by 550 m in the last 130 years with an average of 4 m/ year (Gaur, Sundaresh and Tripati 2004). The trend for mean sea level rise is 2.06 mm/ year (± 0.06 mm) for the Okhamandal region, thus the projection for next 100 years is a 0.20 meters rise in sea level (http://sealevel.climatecentral.org/). If this occurs, it is likely that pilgrim sites along the coastline of Okhamandal will be submerged for the eighth time. According to Hindu understanding, at the end of *Kali Yuga* (present age), we will experience a major catastrophe. However, our present day activities are accelerating global climate change that is resulting in melting of land ice and the expansion of sea water as it warms. From 1870 to 2000 CE, 200 mm of sea level rise has taken place. The present rate of sea level rise globally is 3.39 mm per year (http://climate.nasa.gov/). According to National Geographic, we can expect the oceans to rise between 2.5 and 6.5 feet (0.8 and 2 meters) by 2100 (http://ocean.nationalgeographic.com/). This is an alarming rate. According to a report by climate central (http://www.climatecentral.org/) 147 to 216 million people live on land that will be below sea level or regular flood levels by the end of the century, assuming emissions of heat-trapping gases continue on their current trend.

In view of recurring ice ages we learn that coastal areas are valuable. The issue with the global warming in the present age is the increase in the level of carbon gases. Heat is being trapped resulting in increase of temperature that is leading the ice caps to melt and increase in the sea

water levels. In one of the past ice age known as Karoo ice age the high amount of vegetation led to reduction of carbon gases and increased the oxygen leading to decrease in temperatures causing the freezing. Water has been an important factor for civilizations to thrive. The fluctuation of water levels is a part of cycle and is accelerated by human impact as we are disturbing the ecological processes.

3.2 Ecological Risks

Okhamandal faces drastic pressures of climate change- rising sea levels, coastal erosion, seismic activities, and salt ingress. The region had fresh water regimes until the end of 1960s, which were over exploited over time and now it is facing issues of salt ingress, unproductive land and scarcity of water for drinking and irrigation. Presently, 94% of water for irrigation and 57% of water for domestic purpose is drawn from groundwater. The region is afflicted with high chlorine and fluoride levels. If this continues, by 2025 it is likely that the groundwater source will be grey and there will be no fresh water available to the region (Gujarat Ecology Society 2014).

With the increase in sea traffic in the region and vulnerability of the region due to presence of settlements and cultural sites, there is need for integrated management of coastal waters with special emphasis on mitigation strategies. Okhamandal has 12,441 ha of area that is protected as part of the Marine National Park and Sanctuary (MNP). The north edge of the region in the MNP is rich in biodiversity with presence of coral reefs, marine life, mangroves, dugong and common dolphin. Adjacent to Okhamandal is the Jamnagar region, which is also part of MNP. Jamnagar has presence of various refineries and industries that use sea routes to transport oil. There are major instances of oil spill that affect the marine life near the site. Moreover, there is a wildlife

sanctuary in Okhamandal that is at risk because the vegetation that supports various wildlife is dominated by the wild growth of a weed – *Prosopis Juliflora*. It is observed that increase in soil salinity prompted growth and spread of this weed.

Cyclones striking in the Gulf of Kachchh, where Okhamandal sits, have increased since 1975. The severity of the cyclones caused extensive damage. In 1998, losses due to cyclone to the tune of INR. 1865 crores (approx. USD 440 million) were recorded (Gujarat Ecology Society, 2014). This severe cyclone had an enormous impact on the mangroves; for example, large scale uprooting of mangroves was observed.

The forest areas are under heavy grazing pressure and the management plans need to tackle the grazing problem at the settlement scale. According to Gujarat Ecology Society (2014), in 1997 grazing land per livestock was 0.16 ha. In 2007 the grazing land per live stock was 0.1 ha. High pressure of grazing poses a risk to the natural resources as well as the ecology of the region. The tradition of open grazing is preferred, as the locals believe that the practice results in better milk yield. Decline in cereal crops, which provided the major fodder as a by-product, is a major concern. Farmers prefer to cultivate cash crops like cotton and castor due to high return value but they have low fodder value. There is need for an awareness about the significance of preserving forest ecosystem and ecology.

Places of pilgrimage often experience environmental problems as a result of the added demands and impacts on natural resources (Luthy 2016). According to Gujarat Ecology Society's 2014 report, 15 Ton of solid waste per day is generated in Dwarka. Only 3 Ton of solid waste is treated while rest is disposed into the sea. The city plans to house more visitors but will not be able to cope with the demands of water, sewage and solid waste management systems.

Moreover, an engineering approach is used to solve all problems. To prevent the coastal erosion, huge concrete tetrapod are used along the coast. Site hydrology has been altered and some of the marshlands and wetlands have been filled up to build new infrastructure. There is a need to realize the potential of green infrastructure as a living system that can help to cope up with the issues discussed above along with conserving the ecology of the region.

3.3 Cultural Risks

Okhamandal

The region attracts pilgrims as it houses a number of religious sites. The cultural importance of Okhamandal is mainly due to Dwarka which is one of the four sacred sites in India that every Hindu must visit in his/ her lifetime. Besides Dwarka, pilgrims go on the circumambulatory route to visit other religious sites like Gopi Talav, Nageshwar and Bet Dwarka. Due to busy life schedule, pilgrims prefer going on bus tour to these sites, instead of foot journey. This practice is taking away the experience of being in the landscape and interacting with nature. Moreover, lack of pilgrim infrastructure along the trail is also one of the reason for pilgrims to be discouraged by the foot journey. Dwarka, as well as Okhamandal, is under pressure by the increasing population of pilgrims, hapazard urban growth and the naturally rising sea level. The ongoing development does not reflect any attempt towards interpretation of the cultural heritage encompassed in myths and history for the future generations. The heritage is embedded in layers of past that should be explored to understand our future. The need to understand origins is what drives us towards exploring the relics of history. Major archeological findings are not known to the pilgrims. Making these findings accessible would strengthen their belief in myths.

Dwarka

In Dwarka the major pilgrim hub, the number of pilgrims visiting religious sites has increased significantly due to affordable public transportation and access to various sites which were previously inaccessible by road. To meet the demands of pilgrims, various *dharamshalas* (rest houses), *ashrams* (hermitages), and hotels are increasingly coming up. The edge of Gomati ghat which has numerous temples and shrines is being rapidly developed with new booming infrastructure (Fig 3.1). As discussed in section 2.5, the new development even though help in attracting tourists, do not convey in terms of the history and culture of the place. As one approaches the main temple in Dwarka, the sounds of chanting hymns, claps of the pilgrims, and the smell of the incense sticks reminding the *parijaat* forests of Krishna gives a sense of being near the divine. However, the new development in around the urban setting takes away from the sacred ambience.

My interviews of locals brought to light their frustration with the new development that has encouraged tourism economy however, the very essence of place is being lost. One shop keeper on being asked about how he feels about the new development responded, “The new development has disturbed the natural hydrology of the city. People come here to interact with the water of Gomati River. But now the river is dry most of the time. We have more people visiting but the purpose of their visit is not fulfilled anymore”. A pilgrim being asked about her views on the new development along the sea edge responded, “This place just mimics the development of *choupati* beach done in Mumbai. This is not Mumbai, it is Dwarka. Krishna’s Dwarka. Here people come to interact with sea. But due to the new development, there is algae formation on the sea edge and thus we cannot interact with the sea” (Fig 3.2).

‘Increasing urbanization, deforestation, and environmental pollution during the last few decades has caused a dissonance between the real and the imagined by putting at risk many traditional practices, pilgrims today have fewer direct physical and sensual encounters with the landscape and the consequent disengagement limits their ability to envision the divine in nature’ (Sinha 2014, pg.60). The new infrastructure at the site is not communicating the heritage as there is no interpretation of the significance of mythology and history. The integrity of the site is at stake if such development continues.

3.4 Figures

Fig 3.1 B – Edge of Gomati ghat with dense development - 2013

Fig 3.2 A – Natural sea edge - 2008

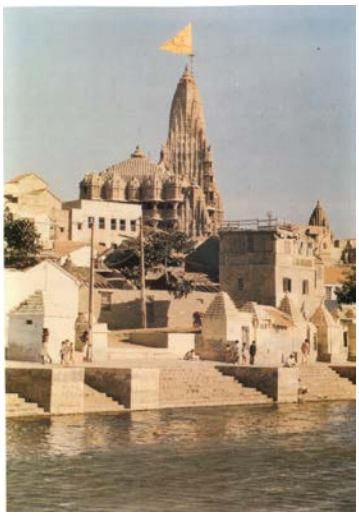

Fig 3.1 A – Edge of Dwarka 1980's
Source – Rao, 1999

Fig 3.2 B – Engineered sea edge - 2013

Fig 3.2 C – Algae formation due to engineered edge

CHAPTER 4: MAPPINGS

My primary method includes mapping the cultural and ecological features of the Okhamandal region to understand the history of this landscape. Rigorous literature review helped me to contextualize my understanding and interpretations of myths and their grounding in the landscape. Google earth and GIS have been the basic tools used for mapping. Data from annual reports produced by Tata Chemicals Society for Rural Development (TCSRD), a local NGO and Gujarat Ecology Commission (GEER), a government body- was useful in mapping natural resources. I conducted two site visits to the region in 2013 and 2014, which enabled me to see and experience the landscape directly as well as interact with pilgrims and locals to understand their perceptions. I had previously visited the site in 2008 and thus I had photographed the sites multiple times. My site visits also helped in documenting various practices by locals to deal with the environmental issues of the region.

4.1 Natural Features

The highest point in Okhamandal is 45.75 meters above sea level with the landscape mostly 15 to 30 meters higher than the coast (Fig 4.1). The region is pretty much flat topped forming a small scarped plateau. The majority of soil in this region has calcareous content which is deposited near the shallow water since the carbonate is precipitated by marine organisms that need land-derived nutrients (Fig 4.2). The presence of salt content in the soil is observed largely due to its proximity to the sea. The whole of region sits over three major fault lines (Fig 4.3). One of the fault line forms a depression which is now converted into major salt manufacturing field (Fig 4.4). Other two fault lines have relative depressions that accommodate marshlands and

wetlands. Natural processes are revealed in the landscape especially in *rann* sites where the fault line is utilized in salt manufacturing.

The shoreline of this region has constantly been changing due to its proximity to the sea. The islands and promontories along the edge are diverse in shape due to wave action. Loamy soil is considered ideal for agricultural use as it retains nutrients and water while still allowing excess water to drain away. However, the region has various levels of salinity in the soil making certain areas nonproductive. Such areas are ecologically significant as they contain mangroves and marshes (Fig 4.5). Even the salt pans attract number of migratory birds due to the appropriate height of water for their breeding. These resources need to be understood and conserved to increase the biodiversity of the region so as to re-establish the nature-culture balance which eventually effects human survival.

4.2 Environmental Disturbances and Conservation Practices

Environmental disturbances created by climate change and human actions pose challenges to the conservation of productive and inhabited landscape. One of the major issues in the Okhamandal region is of salt ingress, which is increasing at the rate of 30 hectare per year (Fig 4.6). This intrusion in the groundwater is affecting the farming and livelihood of the inhabitants. Land brought under salt production pans is also affecting the rate of ingress. There are various marshlands and scrublands which form an ecosystem of their own (Fig 4.7). They increase the biodiversity while forming a threshold to the highpoints. Marshlands form a transition between the aquatic and terrestrial ecosystems in the mainland. These marshlands are dominated by various species of grasses and reeds (Fig 4.8). The scrublands are dominated by variety of plants

adapted for dry climate which have small leaves to prevent water loss, thorns to protect from grazing animals, and long taproots to reach groundwater (Fig 4.9). Many of the grasslands in the region have been run over by *Prosopis Juliflora*, an invasive species, spreading at the cost of the indigenous flora (TCSRD Annual report, 2009-2010). It has adapted to the saline and arid conditions of the region, and has become a major source of firewood for the locals. The fragile ecosystems like coral reefs, mangroves and mudflats are under threat due to increasing salinity and *Prosopis Juliflora* (Fig 4.10).

Part of the long sea coast of Okhamandal under the Marine National Park and Sanctuary is a conservation zone. The Coastal Salinity Prevention Cell (CSPC) for the state of Gujarat focuses on Okhamandal to work with locals and fight the salinity. Another group TCSRD focuses on empowering locals through improving the quality of life and fostering sustainable and integrated development in these communities. With support of state and central government and other NGO's, there is incentive to reclaim the ecology and culture of this region as a whole.

4.3 Human Settlements

The region is home to communities that claim to be descendants of Lord Krishna and thus never leave this sacred home to move to larger cities. According to 2011 census, the total population of Okhamandal is 162,828. The record mentions 50% of population living in urban cities while other half live in rural villages. Dwarka (Fig 4.11) is amongst the highly dense with population of 38,873 (2011 census). Urban cities have 8000 to 12000 houses while the villages range from 45 to 1000 units (Fig 4.12). There are also number of temporary settlements of tribal communities living in 5 to 25 units who migrate twice a year (Fig 4.13). Rural housing is made

from permanent and temporary materials. The residents either find work nearby or end up in the fishing industry. A number of fishing communities live on the coastal edge (Fig 4.14). The migratory tribal communities generally make their houses with various temporary materials. They place their settlements nearby available resources. They prefer living in fertile lands with source of accessible water for farming and drinking along with wood available for fire. The region is connected through other part of the state through a highway and railroad. The region is also interconnected through network of roads.

The communities that house pilgrim sites majorly make their living through tourism. The region is home to Tata Chemicals which have their salt manufacturing plant in Mithapur. They are major principal promoter and the founder corporate member for TCSRD which works on numerous projects. Some of the major ecological projects include plantation of mangroves in wastelands, managing the watershed and building dams, encouraging agro- forestry, diversifying the farming and encouraging farmers to grow variety of crops and many more. These projects not only help the environment but also the locals.

4.4 Implying Projections

Drawing from the understanding of issues and risks, projections are developed based upon inter-related issues. There is no one single solution but, many solutions interwoven to improve the overall ecology of the region. *Prosopis Juliflora* which was introduced in India in 1877 has now become a major concern. The initial plantations in India were mainly established for the purpose of conservation. *Prosopis Juliflora* has become the main source of fuel in rural areas today (Walter 2011). It is now considered an invasive species that is encroaching and resulting into the decline of forest land. This has led to increase in fallow land due to lack of nutrients. The

increase in salinity due to increase in salt pans as well as groundwater depletion is also resulting in increase of fallow land. With increasing population there will always be pressure on the natural resources. With greater demand of farming, the groundwater resource is exploited thus adding to salt intrusion effect. The relationship between above mentioned factors along with the environmental disturbances from1960 - 2015 is the basis for projective planning and reclaiming the ecology of the region through proposed strategies.

It is important to keep check on *P. Juliflora* to help the forests and farms to revive. With increase in vegetation, the fallow land would decrease and increase the precipitation. In projective planning for 2060, forest cover and farmland will increase and groundwater will be recharged. With various rainwater harvesting and ground water recharging measures, the salt ingress could be suppressed. By bringing more coastal edge under plantation, coastal erosion can be prevented and rainwater can recharge the groundwater. Improving the soil nutrients and fresh water availability will naturally result in increase of vegetation and thus attracting more precipitation. Hence, the cycle continues. The locals need to be educated about the relationships and the strategies to reclaim their landscape. The intention here is to empower the locals who now rely on external help by encouraging them to manage their own resources (Fig 4.15).

Various steps are taken by the locals along with CSPC to fight the salinity. Some of the local steps include rainwater harvesting, ground water recharging and educating the locals. These local strategies are appropriate and thus need to be applied at large scale with other additional strategies that can strengthen their effectiveness. Government is also working on large scale steps on building levees and dams to prevent the rain water from draining away into sea. MNP is working on bringing more coastal areas under mangroves.

4.5 Figures

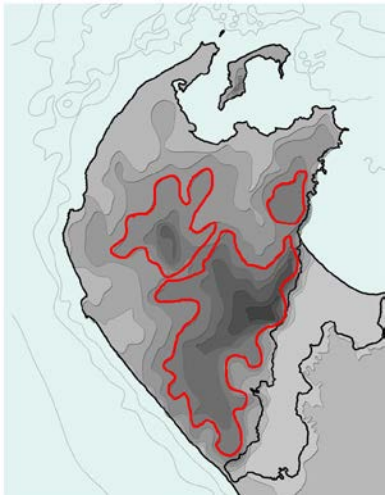

Fig 4.1 – Highpoints in topography

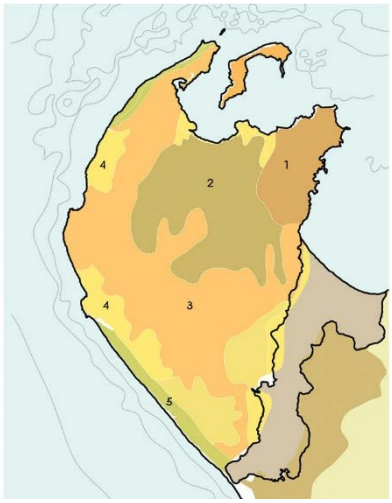

Fig 4.2 – Soils

1. Shallow, loamy, slightly saline soil
2. Very deep, fine, slightly saline soil
3. Very shallow, loamy, slightly saline with hummock
4. Deep, fine, extremely saline soil

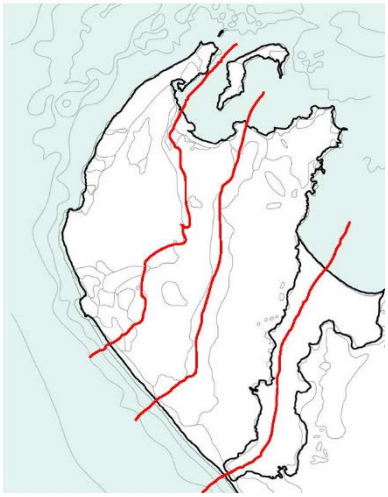

Fig 4.3 – Fault lines

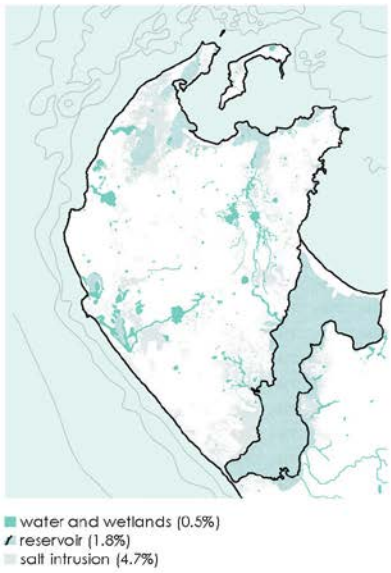

Fig 4.4 – Salt intrusion

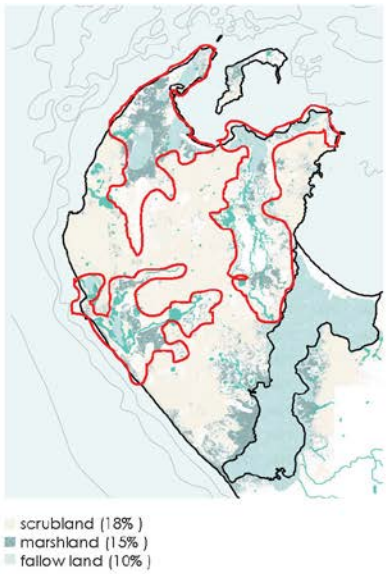

Fig 4.5 – Marshland and scrubland

Fig 4.6 – Fragile ecosystems

Fig 4.7 – Salt pan over one of the fault line

Fig 4.8 – Marshes

Fig 4.9 – Marshes with grasses and reeds

Fig 4.10 – Scrublands ecology

Fig 4.11 – Aerial view of Dwarka
Source – alamy stock photo

Fig 4.12 – Tribal settlements

Fig 4.13 – Fishing community settlement

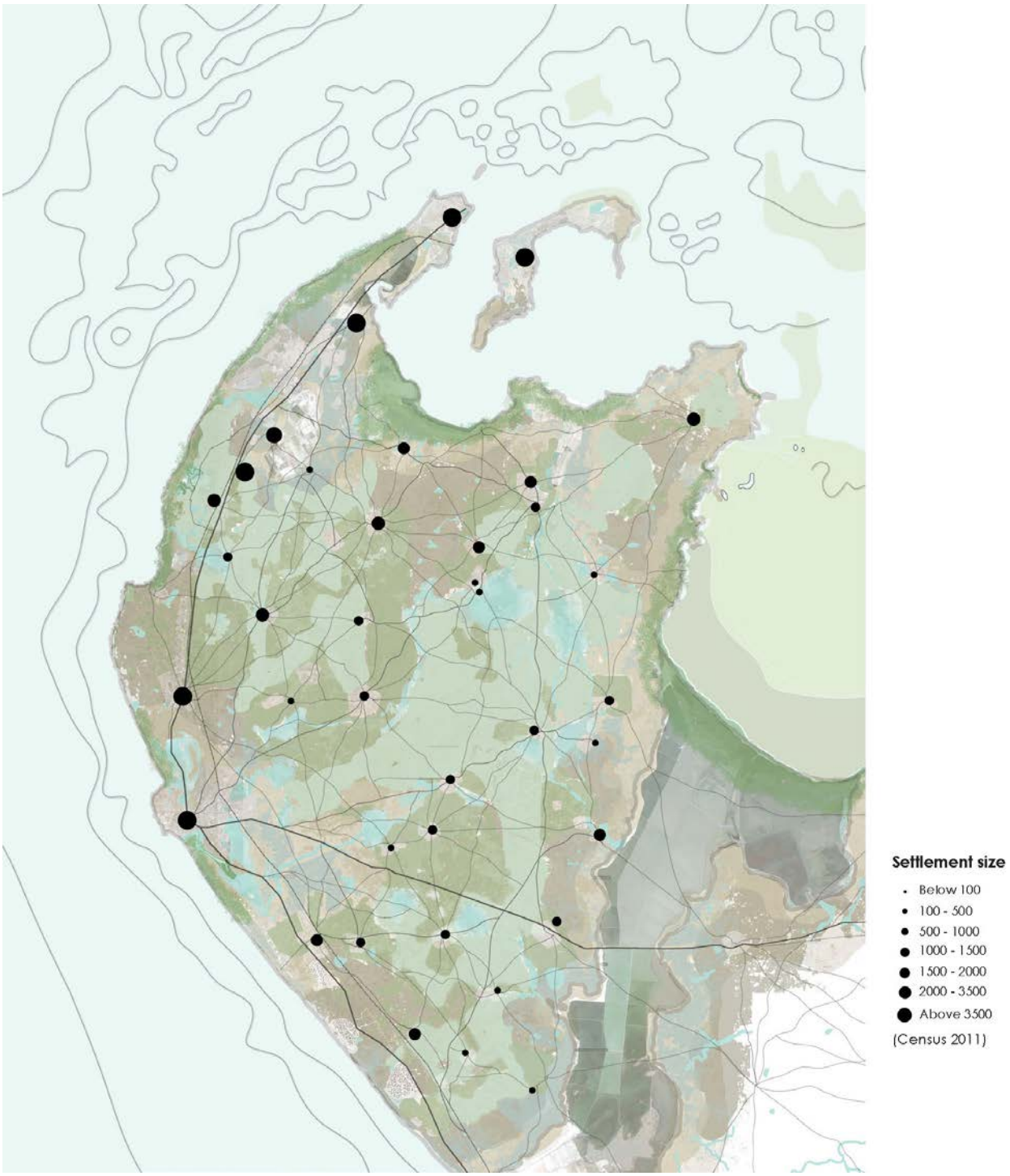

Fig 4.14 – Settlements in Okhamandal

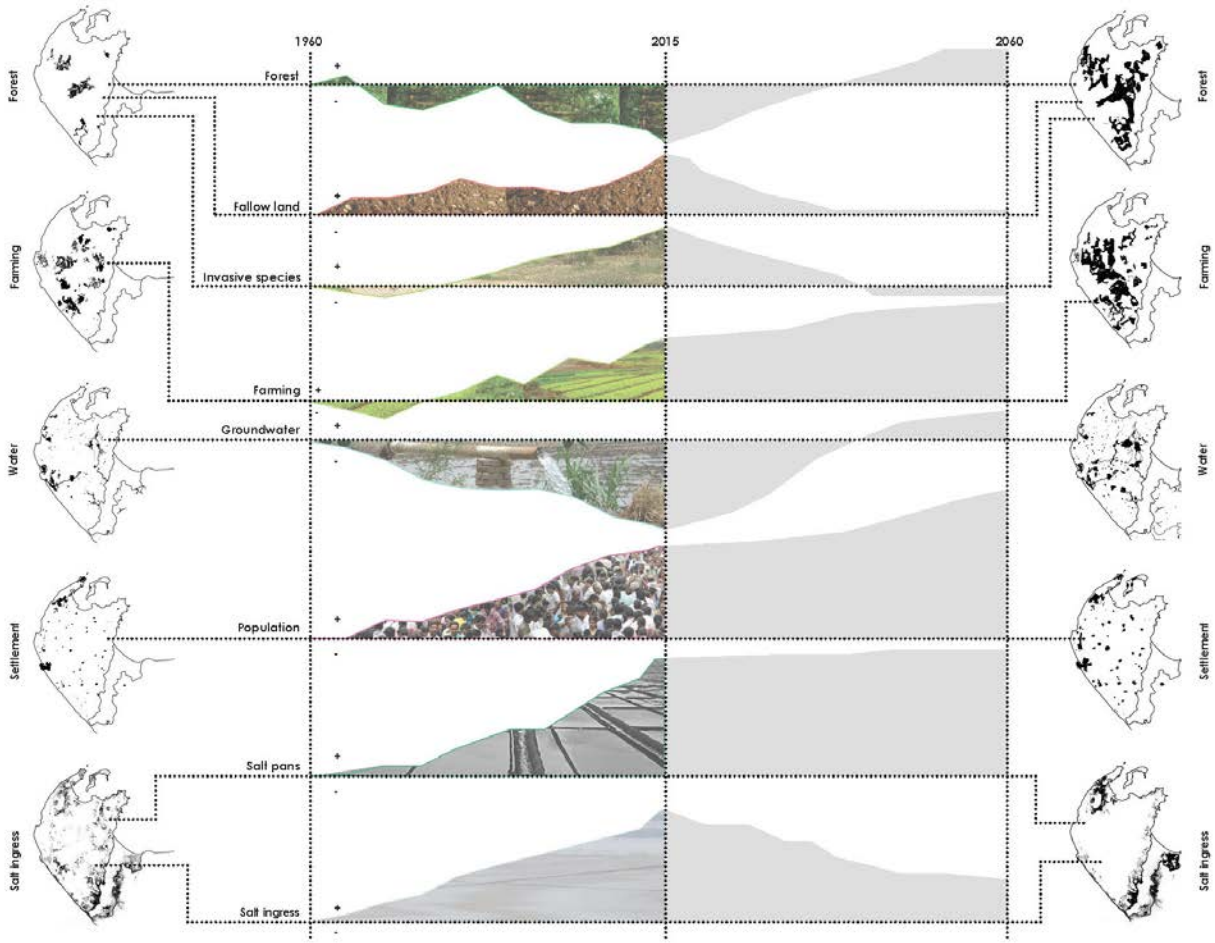

Fig 4.15 – Projections

CHAPTER 5: ENVISIONING THE FUTURE

5.1 Strategies

There are two typical conditions to be observed within the region- coastal and inland. Various strategies are formulated for these conditions that are applicable in prototype designs to reclaim the Okhamandal region (Fig 5.1). To deal with coastal erosion, floating islands are proposed as green buffers to assist in mitigating the erosion. A shift from hardscape to softscape edges will help in infiltrations and increase the biodiversity. The edge is a critical landscape and proposed to be transformed into a soaking sponge system that holds the fresh water and recharges the water table hence suppressing the salt ingress. Along the coastal edge wherever the conditions are favorable, mangroves should be planted.

In various watersheds, opportunity to reclaim the natural water bodies is identified. Sacred water bodies in the forest groves are proposed to be restored. These conform to the image of archetypal landscapes where in the performances occur and sacred rituals are enacted. Seasonal wetlands are planned to hold the water and increase the infiltration, recharge the water table as well as house various migratory birds.The strategies are applied in the design of an eco-cultural heritage trail.

5.2 Eco-cultural heritage trail

The trail encompasses the region's existing sacred sites and integrates them with selected conservation sites in proximity to archeological excavations. It is an extension of the existing pilgrimage route which some of the pilgrims also circumambulate on foot. The journey of the

proposed trail of 32.5 Kos (65 miles) could be carried out by foot taking anywhere between 3 to 6 days. Ten *padavsthals* (rest spots) are proposed along the trail, which will introduce the pilgrims to the reclaimed sites of cultural heritage. Awareness to the principles of Krishna will be enhanced while walking in the landscape and experiencing energy fields, rejuvenated and regenerated landscapes, bathing in *kunds*, celebrating festivals in groves, and viewing relics of destroyed Dwarka. The trail shall take the pilgrims through cultural sites where they will learn about life of Lord Krishna and other sites for understanding processes of land reclamation (Fig 5.1). Thus, Krishna awareness shall be realized through transcendence in this sacred landscape as pilgrims get opportunity to contemplate on their relation to Lord Krishna and their surrounding landscape.

Okhamadhi forms the arrival point for the island district of Okhamandal. This small town is known for its local temple and touristy beach. The site is also protected by Marine National Park under sea turtle conservation program. This site becomes the arrival point to the Okhamandal region. Thus the historic image described in the epic texts as going through the grove and entering an island is reconstructed. The stone icons representing Krishna will invite the pilgrims to interact with the landscape and make towers of stones and making a wish as this is one of the historic tradition pilgrims perform (Fig 5.2). Energy fields are extension of TCSRD's intention of sustainable energy sources thus allow the larger understanding of renewable options of energy for future generations. Dwarka has coastal protection and ghats revival plans along with trail that would educate the pilgrims about the archeological findings. The green sponge pattern near the sea edge will help in holding the rain water and to allow the salt tolerant crops to flourish. The adaptive reuse of the derelict stone quarry is envisioned as a cultural center where the local

artists will be involved to depict their interpretation of the stories of Lord Krishna on the sand stone surfaces. Also, the quarry has the potential to hold rainwater and to recreate traditional form of water architecture that will help in recharging the ground water and eventually help in suppressing salt ingress. Okha and Bet Dwarka are nodes in the processional path to continue the journey. Gopi Talav and Nageshwar will be environmentally reclaimed by reviving the sacred water catchments and increasing the area of the sacred groves of trees for cultural performances. The larger catchment areas will be planned to hold the surface water, recharge the ground water and to transform into a wetland ecosystem as the region attracts many local and migratory birds. Fig 5.2 represents the vignettes of the proposed site designs along the eco cultural trail.

5.3 Dwarka: Interface between nature and culture

Sea Edge

Dwarka comes under the National Heritage Development and Augmentation Yojana (HRIDAY) programme initiated by Urban Development Ministry, Government of India in 2015. The goal of HRIDAY is to promote an integrated, inclusive and sustainable development of heritage sites, focusing not just on maintenance of monuments but on conservation of the entire ecosystem including its residential communities and tourists while promoting sustainable urban development. Presently, tourism department is in charge of the site development. The present coastal edge has been built up with highly engineered approach to prevent the coastal erosion. The algae formation along the engineered coast hinders pilgrim’s interaction with the water for their rituals. Coastal salt ingress is approaching the city and invading its fresh water regimes. Many pilgrims are unaware about the archeological findings from under water excavations near Dwarka. The site is being planned to be a tourism destination and thus activities like light, laser

and water fountain shows are taking away the cultural essence of the site. Engineering approach towards problem solving is dominating over the existing cultural conservation practices in place. Pilgrims lack awareness of archeological findings due to lack of interpretation and exhibition infrastructure. The goal of present development is to put the site on a global tourism map rather than cultural pilgrimage map. The urban edge facilitates entertainment however it misses on the opportunities to create interpretive spaces.

The objective behind the reorganization is to educate the pilgrims and tourists about the rich history, culture and ecology. Cultural and ecological resiliency is achieved through application of 21st century Krishna principals of adaptability and sustainability. The shift in paradigm from hardscape to softscape helps to deal with coastal erosion, rising sea levels as well as salt ingress. The confluence of Gomati River with Arabian Sea have appropriate conditions for mangroves to flourish and create living landscape edge with an ecology of its own. The re-establishment of green terracing of mangroves will help in preventing coastal erosion along with other numerous ecological benefits. The floating islands created from recycled waste act as buffer for the coastal edge and open up huge opportunities for biodiversity. Green terraces will cause the rising sea level to mitigate. Floating deck with periscope will facilitate to view the underwater excavations of ancient Dwarka. There are various interpretive zones that depict the myths and history of this place and generate awareness amongst the pilgrims. The coastal edge is envisioned to transform into an urban space that reflects harmony between nature and culture (Fig 5.3).

Ghats along the river edge

The intersection of river and sea is worshipped as *sangam,* a moment of celebration in Hindu culture. Understanding this in scientific terms, the intersection of river and sea forms a delta

which is rich in diversity and thus should be protected. Traditionally the Gomati River use to flow into the sea. Thus, the archetypal ghats were built to allow the interaction of pilgrims with the river. Due to the urban landform changes, the watershed of the area was disturbed resulting in the drying up of the river. At present, twice a day when there is high tide, the sea water fills up this space. This is a challenge for pilgrims to cross the river to reach to the island which has the five *kunds*. These *kunds* – sweet water wells known as *PaanchKuaa* are in dilapidated condition and were described in epic Mahabharata as the tanks dug by five Pandavas when they visited the island on their journey to meet Krishna. Such historic and sacred landscape feature needs to be preserved. However, the island is seen as a spot to home five star hotels for the tourists, which will take away the essence of this landscape. The edge that is seen as recreation site is used for rituals like *aarti* (worshipping the river), bathing, and cremation.

The larger planning of watershed of the region will help to revive the Gomati River and will allow the pilgrims to carry out the rituals with ease and not rely on low tides. The proposed pontoon bridge will allow the pilgrims to cross the river and reach the island despite rising and falling water levels. The sweet water wells are preserved with traditional *chhatri* elements while creating interpretive trail around to communicate the significance of this place to the visitors (Fig 5.4).

5.4 Gopi Talav: Restoring inland water reservoir in the forest

Gopi Talav is sacred to the Hindus because it is believed that Lord Krishna took bath in this pond. Hence, the soil of this sacred place is ingested as part of pilgrimage ritual. Over time the grove around the site was replaced by the urban growth of the settlement and farming activities.

As part of ritual, pilgrims circumambulate around the pond and temples on its banks. The condition of the pond is dilapidated. The pond also dries out in summer but can be restored through watershed management and planning. Presently, farmers grow groundnut for its rich economic returns. The reclamation strategies should be applied to restore the groves and the *kunds*.

The proposal is to restore the pond and the forest grove through site planning and management. The forest grove will help to reclaim the sacred landscape as well as create spaces for cultural performances. Traditionally the clearings within the grove were used as cultural spaces. These spaces are significant as they are the *Dham* or abode where the divine dwells. The clearings are also mentioned in the epic stories where Krishna performs *raasgarba* - dance performance along with *gopis*. Such sacred spaces can be reclaimed for the rituals to be enacted as well as become performative spaces. The improved infrastructure around the pond will allow pilgrims to interact with clean water. Other ponds can be reclaimed to increase the forest coverage, biodiversity, harvest rainwater, and thus restore the ecology and promote culture. Various kinds of cultivations need to be encouraged that improve the economic conditions of locals whose livelihood is tied to pilgrimage (Fig 5.5).

5.5 Nageshwar: Reclaiming the performative spaces

Nageshwar is a sacred site to Hindus as it is amongst one of the twelve *Jyotirlinga*. According to Shiva Purana (Shastri et al. 1970), the Nageshwar *Jyotirlinga* is in the *Darukavana*. The term is derived from *Daruvana,* meaning forest of deodar tree. However, there are no deodar forests in the region. The significance of the site is mainly due to presence of Shiva here in the form of *lingam*. Presently there is a large Shiva idol built next to the existing temple. There is a pond

north to the temple. This is actually a wetland which support good number of terrestrial as well as aquatic birds. The wetland is under threat due to negligence of maintenance as well as the surrounding vegetation is taken over by the *Prosopis Juliflora*, a thorny bush and there are no trails and clearings for gatherings and performances in the forest area. The food and nesting condition are not conducive to the local fauna. The micro-ecosystem as well as the cultural spaces are both under threat here.

To deal with the issues, native vegetation should be brought back and allowed to flourish. The watershed is planned to revive the wetland near the site as well as other wetlands and ponds in the region. Once the conditions are established and the ecosystem revives, the flora and fauna would also regenerate. Apart from reclaiming the ecology, cultural spaces are also reclaimed within the forest as well as at the edge of the wetlands. These performative spaces would allow the pilgrims to celebrate festivals and other events. One of the major event to be celebrated is *Maha Shivartri* – marriage of Shiva and Parvati. People come together to build *lingas* and play colors during the festival *holi* in the performative spaces created within forest cleanings. Such events allow the pilgrims to interact with – soil, water, and trees and reaffirm the transcendental view of nature (Fig 5.6).

5.6 Reclaimed landscape: Green blue sponge

The biggest problem that the Okhamandal region faces today is the salt intrusion. This has led to an increase in derelict land. The productivity of the agricultural farms has gone down considerably. The condition has worsened with the salt intrusion into the ground water, leading to scarcity of fresh water for drinking as well as farming. Being a coastal edge, this has become a

major concern. If no preventive steps are taken, the region will face a major famine. Being a hot dry climate zone, there is already very limited amount of rainfall in the region. Changing trend of rainfall in the last few years suggests very few wet days but with severe and intense rainfall. This rain water ends up being drained into the sea as there are no proper ways to hold and retain it. There are few local measures taken by creating a texture of small depressions. This needs to be implemented at a much larger scale.

To deal with the issue of salt intrusion, one major step is to create fresh water holding sponge all along the edge wherever the condition persists. This would help in not only holding the freshwater but also recharging the ground water and thus suppressing the saltwater intrusion at the edge. The local patterns of forming depression can be transformed into a green and blue sponge which will hold water as well as allow opportunities for salt-tolerant crops to survive. These crops are major sources of biofuel, thus helping the region with alternative sources for energy. Government of India is working on development of salt tolerant crops all along the coastal edge of Indian subcontinent. By utilizing the existing cropping strategy, local communities can be involved in farming. Thus, these acts of responsibility to shape their own landscape would empower them (Fig 5.7).

5.7 Rejuvenated Landscape: Abandoned stone quarry

This abandoned stone quarry is located near a small community settlement. It provided the locals with some work opportunities but as the quarry was abandoned about six years ago the locals have to go to distant places in search of work. The quarry is proposed to be transformed into a rest spot on the eco cultural heritage trail. With proper water management it could become a

space to hold fresh water and encourage artists and locals to interact and create source of income for the locals. Being very near to the coastal edge, it will also help to fight the salt intrusion. Salinity is spread due to the groundwater depletion allowing the saline water to intrude in the mainland. The water recharging strategies applied along the coastal edge would not only suppress the intrusion but also increase biodiversity. Along with measures for the groundwater recharge, marshlands and mangrove plantations should be planned as buffers and to prevent the salinity intrusion.

The quarry is proposed to be transformed into a traditional step well system that would harvest water, recharge the groundwater, suppress the salt intrusion, increase biodiversity and encourage the artists to come to carve out Krishna's myths on the sandstone surfaces. The sandstone surface also acts as a filtering layer to the groundwater recharge thus improving the quality of water. The proposed development will bring more tourists to explore this place thus creating work opportunities for the locals. A walk through this waterscape of the sandstone quarry will educate the visitors about the geology of this region as well as create new cultural spaces for display of arts. It will rejuvenate the landscape and spread awareness about the natural processes and represent Lord Krishna as an environmental deity (Fig 5.8).

5.8 Regenerated Landscape: Wetlands and bird sanctuary

The region at present does not have any framed watershed management strategies. It has a hot, humid, and arid climate and receives annual rainfall of around 10.5 inch per year. With global warming and resultant erratic seasons, Dwarka in 2013 received 4.5 inches of rain in 48 hours which is far beyond the amount of rain per month. Such unexpected rainfall condition gave rise

to a major flood situation. With the ongoing conditions of rainfall the situation is bound to worsen further. Even though there is water everywhere, there is no water for drinking and farming for the locals. Thus, watershed of the region needs to be remodeled and various wetlands need to be planned to help address issues at many levels.

The proposal is to plan for larger watershed and create wetlands to act as water holding sponges in case of flooding, while releasing the waters when the water level hits a low. They also help in filtering the water and enhance the biodiversity. Being home to many migratory birds, the planned wetlands will generate conducive conditions for the migratory birds to breed and nest. The relation between wetlands and birds is guided by numerous factors. These include the availability, depth, and quality of water; the availability of food and shelter; and the presence or absence of predators. Birds of the wetlands depend on the physical and biological attributes of the wetland for breeding. With enhanced vegetation around the wetland, precipitation can be regulated and thus assisting the natural cycle to flourish (Fig 5.9).

5.9 Figures

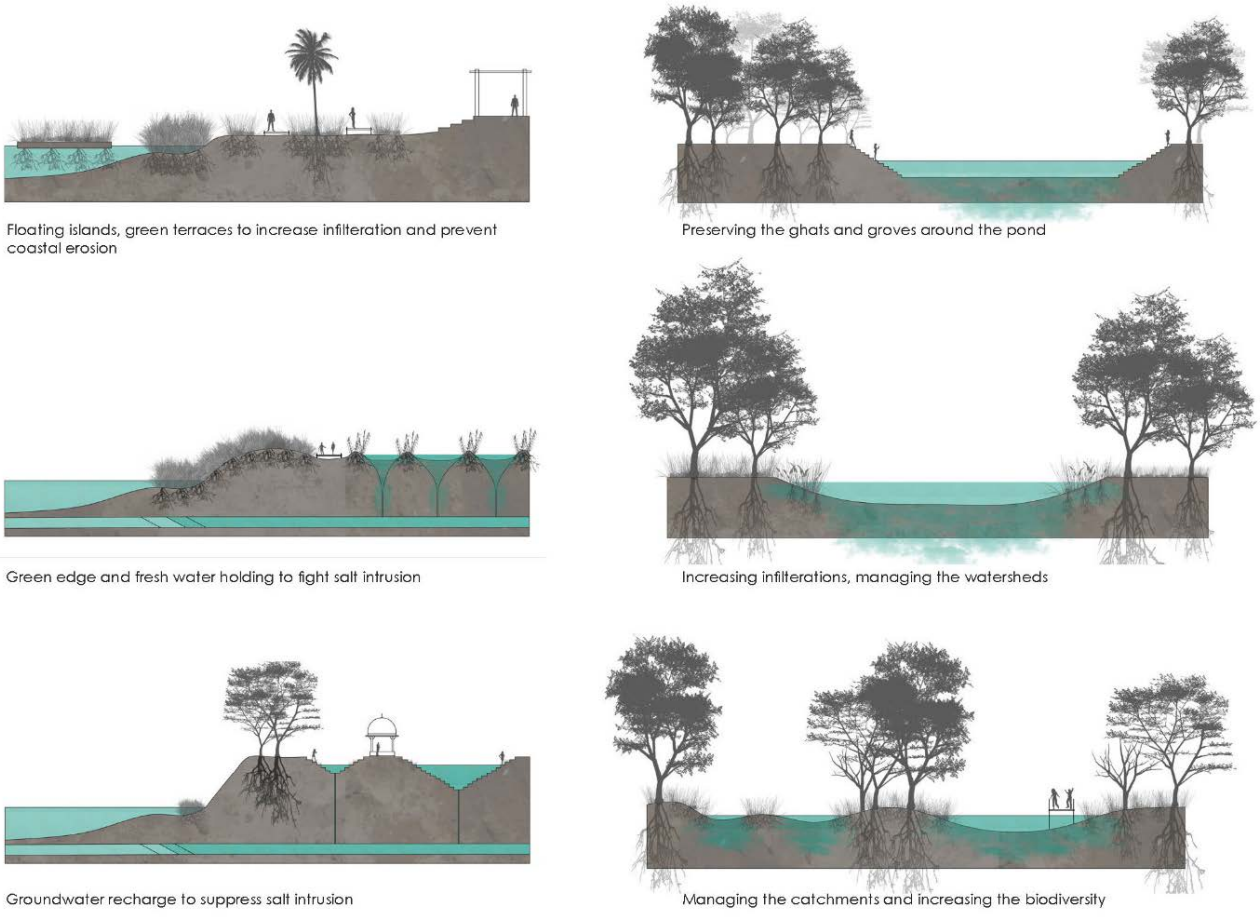

Fig 5.1 – Landscape conditions – coastal and inland

Fig 5.2 – Eco cultural heritage trail

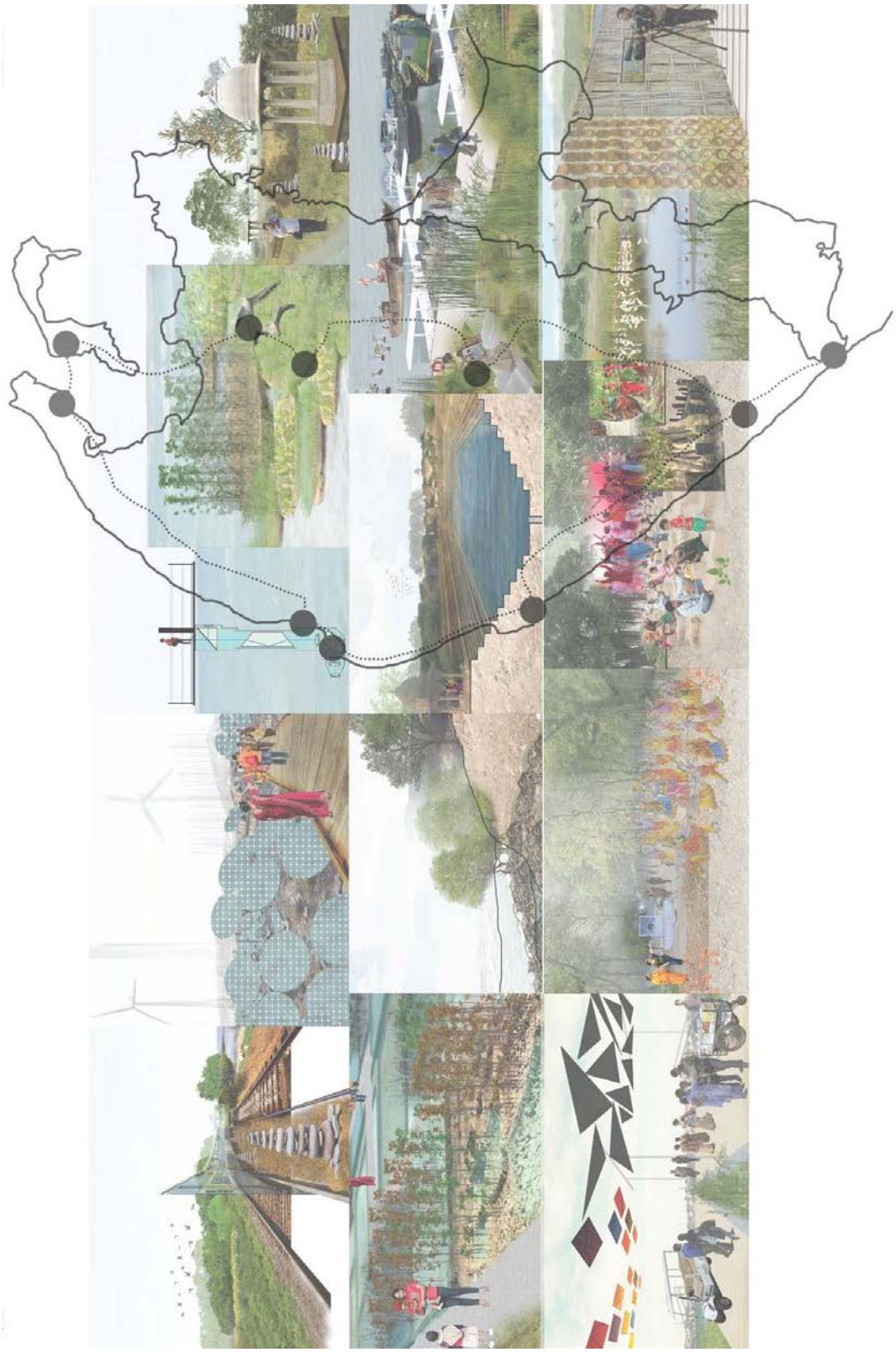

Fig 5.3 – Vignettes of the proposed design

Fig 5.4 – Sea edge, Dwarka

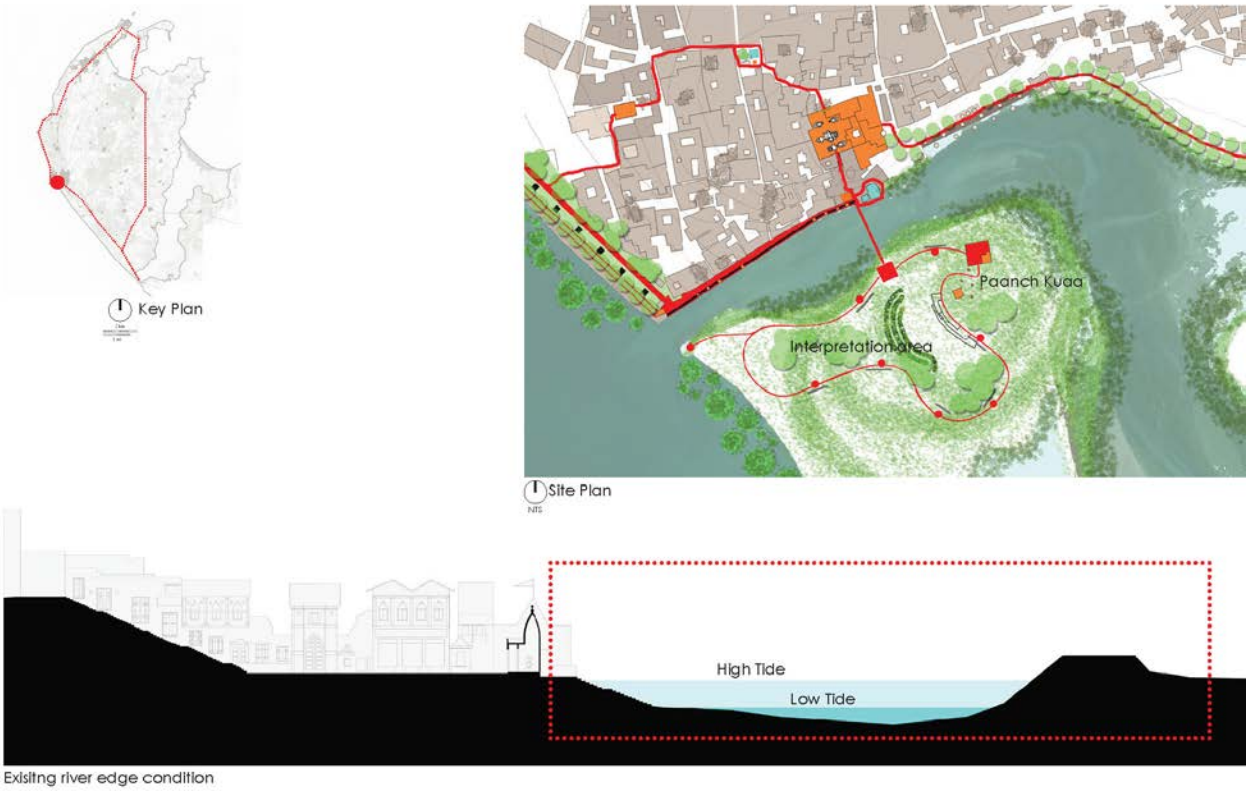

Fig 5.5 – Ghats along the Gomati River edge, Dwarka

Fig 5.6 – Gopi Talav

Fig 5.7 – Nageshwar

Fig 5.8 – Reclaimed landscape of green blue sponge

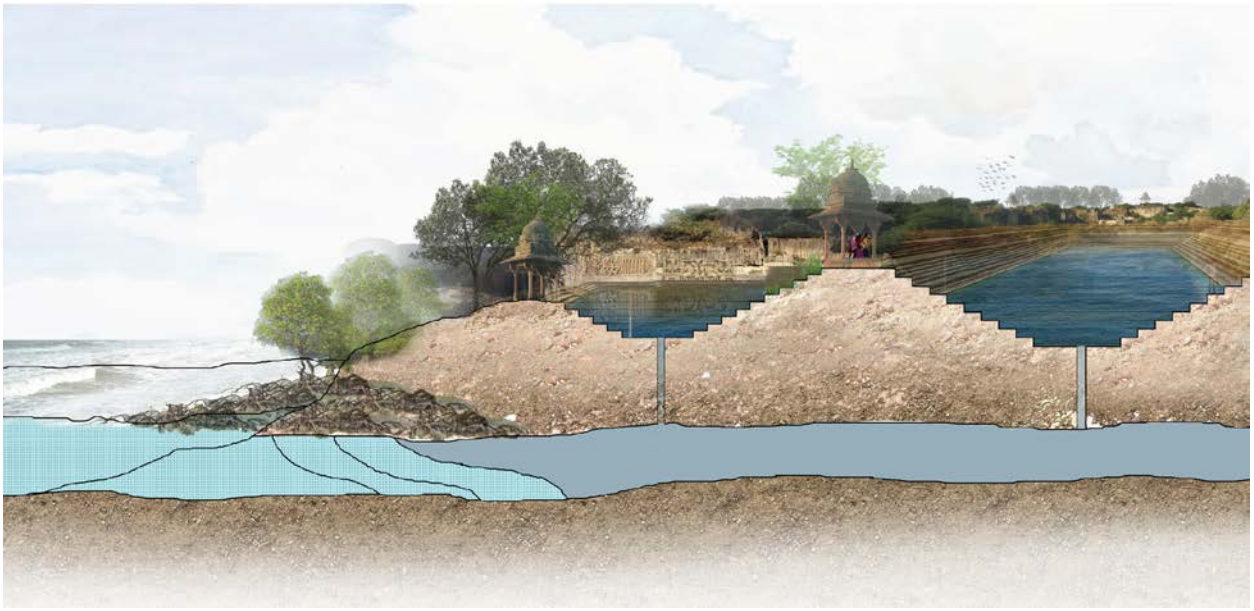

Fig 5.9 – Rejuvenated landscape of abandoned stone quarry

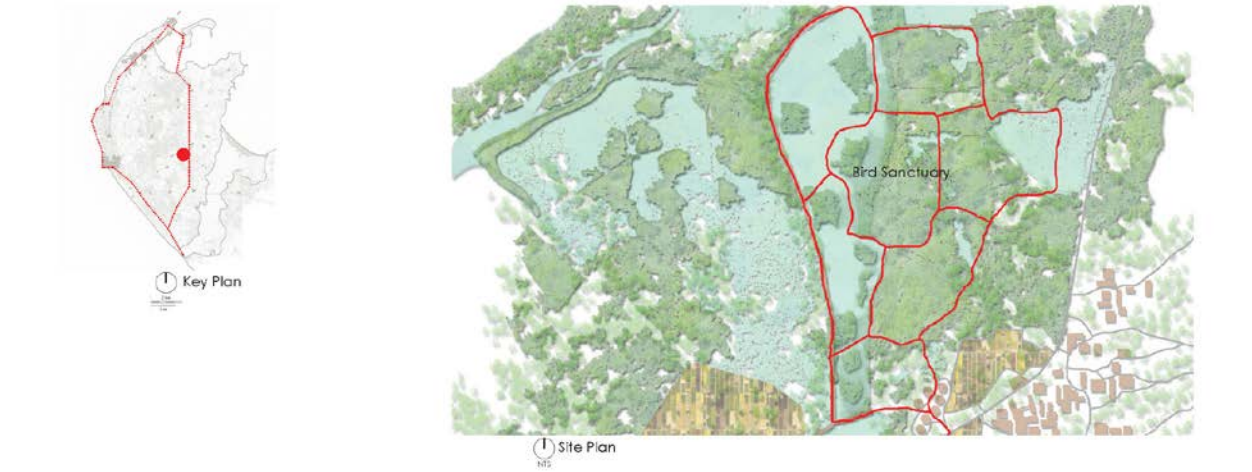

Fig 5.10 – Regenerated landscape of wetlands

CHAPTER 6: CONCLUSION

With the predicted global warming and resulting sea level rise, coastal settlements around the globe face major threats of coastal erosion and salinity ingress. The proposed landscape strategies will help Okhamandal to preserve its culture and history and at the same time meet the environmental challenges of salt ingress, sea level rise and desertification. The goal of planning and design is to restore the balance between culture and nature. The awareness of Krishna's act in reclaiming land from the sea is the foundation for the existence and evolution of Okhamandal as a region that was lost and reclaimed many a times. The proposed reclamation project is a sustainable approach for a holistic, sensitive and purposeful development (Fig 6.1).

The proposed eco-cultural heritage trail encourages the pilgrims to visit the sites beyond the temples and engage them with the landscape through movement. The traditional method of pilgrimage on foot should be revived to encourage immersive experience and cultivate appreciation for nature and Krishna mindfulness. Archeological sites on the proposed trail will build the connection between myth and history for the visitors.

6.1 Future directions

Modern day development and increasing pilgrimage and tourism are posing a serious threat to the sacred sites in India. The infrastructural approach does not address environmental issues or promote sustainable development. Moreover, there are many culturally and ecologically significant sites along the coastline of India that are under threat due to the rising sea levels. Such is the case with many other cultural sites all around the world. This project is an attempt to develop a framework for a systematic approach towards solving a global issue in local sites

rooted in a given cultural context. Instead of a traditional approach of problem isolation, this thesis demonstrates system-based thinking. For any sustainable development it is tremendously important to involve the local people, understand the local context and culture and derive the landscape reclamation from local practices. This shift in paradigm will help to find Krishna relevance in the twenty first century.

In order to proceed further within the new paradigm, there are some gaps that need to be bridged:

1. A collective understanding amongst the governing bodies with decision-making powers is needed to conserve the cultural value of such sites. Presently, such sites are only looked upon as tourist destinations influenced from other tourist places around the world. It is important to address and develop the locality of such sites rather than trying to put them on the global map of tourism.

2. There is a need to value the existing conservation practices instead of borrowing best practices from other cultures. For generations these local practices have been chalked out, practiced and have evolved with time. Locals who understand them well should be involved in the process of growth.

3. There should be sincere attention given to the local myths rather than just discarding them as mere stories. It is evident that many cultures preserve their myths and legends through landscape practices. Such intangible heritage has been passed on through many generations and is still alive. It should to be preserved for the future. With increasing knowledge of ecosystems and new archeological discoveries, there is a need to revisit the myths and contextualize them in the landscape.

4. More work needs to be done in the field of landscape archeology in the region of Okhamandal. Numerous archeological excavations have been carried out since 1980's; however, research about the evolution of cultural landscape and its environmental history of the region is severely lacking in application. Such study will further strengthen the grounding of myths in geography. This will also help us to understand the relationship between past settlements and the rising/ falling sea levels through history. We may be able to draw some lessons from these studies for our future generations.

6.2 Figures

Fig 6.1 – Reclaimed Okhamandal

References:

Amoroso, Nadia. *The Exposed City: Mapping the Urban Invisibles*. London: Routledge, 2010.

Ansari, Zainuddin Dawood, and Madhukar Shripad Mate. *Excavations at Dwarka*. Poona: Deccan College Postgraduate & Research Institute, 1966.

Bhardwaj, Surinder Mohan. "Circulation and circumambulation in tirtha yatra - In Light of Geography and Self-Organization Concept of the Chaos Theory." *Colorado.edu*. First presented at the 26th Annual Conference on South Asia (October 16-19, 1997) at the University of Wisconsin, Madison. Web. 17 Mar. 2016.

Bhardwaj, Surinder Mohan. *Hindu Places of Pilgrimage in India; a Study in Cultural Geography*. Berkeley: University of California, 1973.

Bhonde, Uday, and Bhawanisingh G. Desai. "Discontinuity surfaces and event stratigraphy of Okha Shell Limestone Member: Implications for Holocene sea level changes, western India." *Journal of earth system science* 120.4 (2011): 723-734.

Bryant, Edwin. *Krishna: The Beautiful Legend of God: Śrīmad Bhāgavata Purāṇa, Book X: With Chapters 1, 6 and 29-31 from Book XI*. London: Penguin, 2003.

Chandrasekharam, D. "Geo-mythology of India." *Geological Society, London, Special Publications* 273.1 (2007): 29-37.

Davidson, Linda Kay. *Pilgrimage from the Ganges to Graceland*. Santa Barbara, CA: ABC-CLIO, 2002.

Dimmitt, Cornelia, and J. A. B. Van Buitenen. *Classical Hindu Mythology: A Reader in the Sanskrit Purāṇas*. Philadelphia: Temple UP, 1978.

Eck, Diana L. *India: A Sacred Geography*. New York: Harmony, 2012.

Foote, Robert Bruce, and Shah C. C. *The Geology of Baroda State*. Addison, 1898.

Gaur, A. Sundresh., and Sila Tripati. "An ancient harbour at Dwarka: Study based on the recent underwater explorations." *Current Science*, Vol. 86, May 2004.

Gaur, A. Sundresh., and Vardhan Patankar. "Ancient shell industry at Bet Dwarka Island." *Current Science*, Vol. 89, September 2005.

Gaur, A. Sundaresh., and Vora. K. H. "Ancient shorelines of Gujarat, India, during the Indus civilization (Late Mid-Holocene): A study based on archaeological evidences." *Current Science*, Vol. 77, July 1999.

Gaur, A. Sundresh., and Vora. K. H. "Shoreline changes during the last 2000 years on the Saurashtra coast of India: Study based on archaeological evidences." *Current Science*, Vol. 92, January 2007.

Goyandka, Jaydayal. *Shrimad Bhagvadgita: Tatvavivechani Hindi - Tikasahit*. Gorakhpur: Gitapress, 1999.

Haberman, David L. *Journey through the Twelve Forests: An Encounter with Krishna*. New York: Oxford UP, 1994.

Hays, David L. (ed.) *(Non-) Essential Knowledge for (new) Architecture*. New York: Princeton Architecture Press, 2013.

Hays, David L. “Lapsarian Landscape” in *Matericos Perifericos*. Rosario, Argentina, 2015: 8-10

Hays, David L. “New nature, new landscapes”, lecture in Ph.D. colloquium at University of Illinois at Urbana Champaign. Nov 6, 2015. Unpublished.

Judge, William Q. *Bhagvad Gita*. Theosophical University Press, 1978.

Kurin, Richard. "Safeguarding Intangible Cultural Heritage in the 2003 UNESCO Convention: a critical appraisal." *Museum international* 56.1-2 (2004): 66-77.

Lele, V. S. "The miliolite limestone of Saurashtra, western India."*Sedimentary Geology* 10.4 (1973): 301-310.

Luthy, Tamara. "Few people know that Krishna was the first environmentalist." (ed.) by Mostafanezhad, Mary. *Political Ecology of Tourism: Community, power and the environment.* New York: Routledge, 2016.

Rao, S. R. "Excavation of the legendary city of Dvaraka, in the Arabian Sea." *Journal of Marine Archeology*, 1990.

Rao, S. R. “Marine Archeology in India”, *Ministry of Information and Broadcasting, Government of India*, 2001.

Rao, S. R. "The lost city of Dvaraka New Delhi: Aditya Prakashan." 1999.

Shastri, Jagdish Lal., Arnold Kunst, G. P. Bhatt, and Ganesh Vasudeo. Tagare. *Ancient Indian Tradition & Mythology.* Delhi. Motilal Banarsidass, 1970.

Sinha, Amita. "Cultural heritage and sacred landscapes of South Asia." (ed.) by Kapila D. Silva and Neel Kamal Chapagain. *Asian Heritage Management: Contexts, Concerns, and Prospects*. New York: Routledge; 176 -188.

Sinha, Amita. *Landscapes in India: Forms and Meanings*. Boulder, CO: University of Colorado Press, 2006; reprint Asian Education Services, 2011.

Sinha, Amita. "The Sacred Landscape of Braj, India Imagined, Enacted, and Reclaimed." *Landscape Journal* 33.1 (2014): 59-75.

Website and online accessed references:

"Coastal Salinity Prevention Cell, Ahmedabad", Web. 07 July 2015

http://cspc.org.in/

"Gujarat Ecology Society." Report - Ecological Profile for Coastal Talukas of Gulf of Kachchh. *Gujarat Ecology Society*. Web. 20 Dec. 2014.

http://www.gesindia.org/index.html

"New Analysis Shows Global Exposure to Sea Level Rise." Web. 16 Feb. 2016.
http://www.climatecentral.org/news/new-analysis-global-exposure-to-sea-level-rise-flooding-18066

"Sea Level Rise - National Geographic." Web. 12 Sept. 2015.
http://ocean.nationalgeographic.com/ocean/critical-issues-sea-level-rise/

"Surging Seas Sea Level Rise Analysis by Climate Central." Web. 16 Jan. 2016.

http://ss2.climatecentral.org/#11/22.3110/69.0065?show=satellite&projections=0-RCP85-SLR&level=5&unit=feet&pois=hide

"TCSRD/ Tata Chemicals Society for Rural Development". Web 07 June 2015

http://www.tcsrd.org/publication_annual_report.htm

"The Vishnu Purana : A System of Hindu Mythology and Tradition."*(Book, 1961) [WorldCat.org]*. Web. 07 Apr. 2015.

https://archive.org/details/vishnupurnsyst01wils

"Vital Signs: Sea Level." *Climate Change: Vital Signs of the Planet*. Web. 12 Dec. 2015. http://climate.nasa.gov/vital-signs/sea-level/