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I, Saakshi Terway, hereby submit this original work as part of the requirements for the degree of Master of Architecture in Architecture.

It is entitled:
Preserving the Intangible Heritage: Neemrana Kala Kendra – A Crafts and Tourism Complex

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Preserving the Intangible Heritage:

Neemrana Kala Kendra – A Crafts and Tourism Complex

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By

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Abstract

With rapid modernization and globalization, as the world is coming closer together, it gets even harder to preserve the unique history and culture of each region. By providing a ‘Kala Kendra’ for the artists and craftsmen of Neemrana Village, this project will look in depth at the problem of gradual erosion of the region’s intangible heritage. By analyzing the present-day challenges encountered by regional identity around the world, this project will look into the elements that form the heritage of Neemrana Village, as well as the persistent problems within the village that are causing the extinction of these elements. To preserve the culture of Neemrana, this thesis looks at the past attempts made around the world to address similar issues. Also, by evaluating the traditional and vernacular architecture of the village, as well as the arts and crafts of Neemrana, this project will use its essence to propose an adequate solution to preserve its heritage without causing hindrance to the village’s growth and development. Through blending methods of education and exhibition, a better typology will arise to more effectively serve the community of Neemrana Village. Such a project requires a revised understanding of the art and architecture and their maker’s process, and context. This new model will return art to the public to validate its importance as a process and not just the final product.
To Amma.
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Chapter 1. Introduction

With rapid modernization and globalization, as the world is coming closer together, it gets even harder to preserve the unique history and culture of each region. It is much more than just preserving a façade of a building. It is important to also retain the inherent essence and original ambience of the history.

The human history includes more than just the built environment. In an effort to conserve a region’s non-architectural heritage, one must consider both tangible and intangible elements that help define the beliefs, customs, and practices of a particular community.

India’s culture and heritage are a rich amalgam of the past and the present. Its languages, religions, dances, music, architecture, food, attire, and customs differ from place to place within the country, but nevertheless possess cohesion. India is one of the most culturally diverse countries in the world. The heritage of India is a combination of these diverse sub-cultures and traditions that are spread all over the Indian subcontinent and are several centuries old.

Regarded by many historians as one of the oldest living civilizations on Earth, the Indian heritage dates back to 8000 BC and has a continuous recorded history since the time of the Vedas, believed to be 3,000 to over 5,500 years ago.

With such a rich heritage, comes the responsibility to preserve it. Heritage is a gift from the past to the future, and it is the duty of every individual to take care of it and pass it on so that the future generations can also cherish and benefit from it.

Medieval feudal social systems and attitudes in Rajasthan, the largest state in India, persisted until very recently. This, and perhaps a host of other reasons, allowed several aspects of culture to remain preserved here for much longer than in other parts of our country. While Rajasthan has become well known for its architectural heritage, it is the intangible heritage of this state that is in need of the most urgent intervention to protect it from being lost. From the oral lore to the epic ballads, everything is threatened by the onslaught of modernity. Today Rajasthan is at the curious stage where everything ‘local’ and

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1 See Glossary (Definition for all terms in italics can be found in Glossary)
3 See Glossary
4 Ibid.
6 See Glossary
‘Indian’ has become uncool and passé within its local context, even as it becomes an aspiration among urban elites.⁷

The intent of this thesis is to research and analyze in depth the problem of the gradual erosion of the intangible heritage by studying the village of Neemrana, Rajasthan. The thesis will look in detail at the elements that come together to form the tangible⁸ and intangible heritage of the village, as well as the problems that persist within the village that are causing the extinction of these elements. It will also consider the traditional architecture of Neemrana and use its essence to propose an adequate solution to preserve its heritage without causing hindrance to the village’s growth and development. Eventually, to address the challenge of the fading away of the intangible heritage in Neemrana village, this thesis will look into forming a bridge between the traditional and contemporary architecture of Rajasthan.

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⁸ See Glossary
Chapter 2. Regional Identity, Heritage, Crafts and Tourism

Regional Identity and Its Importance

It is crucial to understand the meaning of the words region and identity in order to understand the term, “regional identity”. The word region can be used to describe an area as big as an entire continent or as small as a cluster of communities. For this thesis, we define it as an area or division, especially part of a country or the world having definable characteristics but not always fixed boundaries.

Identity, on the other hand, is a term that has multiple reference points. Generally, it is used to refer to a subject and to its surrounding environment. “Identity is formed in the interaction between self and society: The subject still has an inner core or essence that is the ‘real me’, but this is formed and modified in continuous dialogue with the cultural worlds ‘outside’ and the identities which they offer”. Hence, we can infer from the above, that regional identity can be defined as the unique appeal of a place that is defined by its people and society that forms its character and helps in identifying the region.

It helps in answering the long-asked question of the sense of belongingness. At a personal level, it provides the answer to the question, ‘Where do I belong?’. The answer to which is generally based on a personal spatial history.

Abraham A. Moles proposed a series of rules that define the local identity of a region. As per these rules, a region will have an identity if:

- There is a form of discontinuity that makes it easier to differentiate an "inside" from an "outside" and that will influence mobility patterns
- The discontinuity is easily identifiable
- The activities that everyone carries out within the place are numerous and concentrated in time
- The number of socially, economically, or culturally significant objects concentrated within the place is high
- The place has a denomination, the semantic fields associated with this denomination are wide, and the use of the name of the place to designate these semantic fields is frequent

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9 See Glossary
Threats to Regional Identity and What Can Be Done to Preserve It?

Culture in its various forms now serves as a primary carrier of globalization and modern values, and constitutes an important arena of contestation for national, religious, and ethnic identity. In today's world, globalization, modernization and unplanned development tends to form the biggest threat to regional identity.¹³

Modernization just for the sake of growth and at the cost of identity is never good. Modernization and culture should ideally go hand-in-hand. Neither one should suffer due to the other. Equal importance should be given to both, and planned progress should be encouraged.

Over time, many attempts have been made around the world to preserve the identity of a region. From creating small scale museums to preserving the entire region in its essence, and from creating visual displays to interactive environments, efforts have been made on all scales and sizes. Many regional and global, private and public organizations are trying to safeguard the cultural heritage¹⁴ that is currently under the threat of extinction. These types of interventions can broadly be divided into two categories:

- Direct Interventions
- Indirect interventions

Direct interventions are normally targeted at a particular aspect of culture in a planned manner and may include infusion of funds and building of platforms and market places. Whereas, Indirect intervention can happen by encouraging local tourism, recognizing and appreciating local talent on nationalized or global cultural platforms. As prosperity and stature get linked with culture, it gets indirectly impacted towards stability and growth.¹⁵

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¹⁴ See Glossary
Chapter 3. Precedent Analysis

_Tangible cultural heritage_ has the great advantage over its _intangible_ counterpart, such that with proper care it will remain authentic over centuries. As long as historic monuments remain without falsification and misleading imitations, they will, even in a neglected state, create a sense of continuity that is an essential part of cultural identity.¹⁶

The process of preserving _intangible heritage_ on the other hand is difficult. The chances of achieving complete success is low. A lot is dependent on the method of translation and interpretation of culture. Following are a few examples of the efforts that have been made around the globe to achieve the above.

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Chokhi Dhani, Jaipur, India

**Location:** 20 Km south of the Jaipur City in Rajasthan, India

**Governing Authority:** Rajasthan Tourism Development Co-operation

**Site Boundary:** Restricted

**Architecture Style:** Replicating the Traditional and Vernacular Rajasthani Architecture

Chokhi Dhani, meaning special village, is a mock Rajasthani Village on the outskirts of the Jaipur City that iterates the Rajasthani culture and heritage. They have created a very interactive environment where visitors can see and experience the lifestyle of a traditional Rajasthani village. There are open-air restaurants and a bevy of traditional entertainment.\(^\text{17}\)

The complex has a defined edge but an abstract path. The intent is to encourage visitors to wonder about in the complex on paths similar to an actual village. This complex is an example of a scenario where the heritage center exists in a completely artificially made environment, independent of its site location. The sole purpose of this project is to create a unique experience for its visitors.\(^\text{18}\)

The following types of heritage are incorporated in this project:

- **Cultural Tangible Heritage**
- **Cultural Material Heritage**\(^\text{19}\)
- **Food Heritage**\(^\text{20}\)

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\(^{17}\) Self-analysis by Author based on site visit

\(^{18}\) Self-analysis by Author based on site visit

\(^{19}\) See Glossary

\(^{20}\) Ibid.
Pietrasanta Village, North Tuscany, Italy

Location: Tuscany region in Italy

Governing Authority: Italy Tourism Development

Site Boundary: Not Restricted

Architecture Style: Romanesque and Gothic Vernacular Architecture\textsuperscript{21}, mixed with a hint of Modern Architecture

Pietrasanta, meaning holy stone, is a town well known for its sculptures. It is located on the coast of northern Tuscany in Italy, in the province of Lucca. The area, has long enjoyed the patronage of artists. Pietrasanta grew to importance during the 15th century, mainly due to its connection with marble.\textsuperscript{22} Michelangelo was the first sculptor to recognize the beauty of the local stone. Since then, artists from around the world come to use the local marble studios and bronze foundries, and to benefit from the knowledge of master artisans.\textsuperscript{23}

The village follows a strong concept of the “open doors”. The Marble Artists and sculptors have studios and workshops with open doors, where people can see the entire process as well as learn some basic skills.\textsuperscript{24} The city has a general grid layout with occasional diagonal intersection. The program does not have a clear edge demarcation as it is well entwined with the lifestyle of the town creating an overall art district with the central plaza forming its epicenter. The following types of heritage are incorporated in this project:

- Cultural Tangible Heritage
- Cultural Material Heritage
- Cultural Intangible Heritage
- Natural Heritage\textsuperscript{25}

\textsuperscript{21} See Glossary  
\textsuperscript{22} MyMagicrome.com. “Pietrasanta Information.”  
\textsuperscript{24} MyMagicrome.com. “Pietrasanta Information.”  
\textsuperscript{25} See Glossary
Village of La Antigua Guatemala

Location: It is a small village in Guatemala

Governing Authority: UNESCO

Site Boundary: Not Restricted

Architecture Style: Spanish Baroque influenced Architecture

Antigua Guatemala is a city in the central highlands of Guatemala famous for its well-preserved architecture as well as a number of ruins of colonial churches. It served as the capital of the Kingdom of Guatemala. It has been designated a UNESCO World Heritage Site. The site is an iconic landmark that is the art district in itself. Antigua is a growing tourist destination in Guatemala as it is close to Guatemala City but is much calmer and safer, with more tourist oriented activities.26

The following types of heritage are incorporated in this project:

- Cultural Tangible Heritage
- Cultural Material Heritage
- Food Heritage
- Cultural Intangible Heritage
- Natural Heritage
- Virtual Heritage27

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27 See Glossary
Delhi Haat, New Delhi, India

**Location:** New Delhi City, in India

**Governing Authority:** Delhi Tourism and Transportation Development Co-operation

**Site Boundary:** Restricted

**Architecture Style:** Exposed Brick Vernacular Low-Cost Architecture

A *Haat*\(^\text{28}\) is an open-air market that serves as a trading venue for local people in rural areas. Delhi Haat is an open-air food plaza and craft complex that is meant to serve a similar purpose.

The intent of the complex is to provide a platform to artists from all over the country and try to eliminate the role of the middle man. Artists and craftsmen from different parts of India come here to sell their handicrafts. The shops are permanent, but the inhabitants rotate every month. This is an example of a scenario where the handicrafts are created outside of the site and the end product is brought in to be displayed and sold.\(^\text{29}\)

The edges have been defined using landscape and boundary walls. The complex has a main linear path connecting the entrance to the performance stage, forming the main circulation axis, but at the same time leaving scope for people to wonder around, creating a maze-like concept and a *bazaar*\(^\text{30}\) like atmosphere.

This axis has two prominent nodes that divide the complex into three distinct regions- shops, food and performances.

- The following types of *heritage* are incorporated in this project:
  - *Cultural Tangible Heritage*
  - *Cultural Material Heritage*
  - *Food Heritage*
Figure 3-11: Comparison and Analysis of the four Case Studies
Comparison, Analysis, and Application

*Figure 3-11* shows that some interventions work better than others. A well-defined complex boundary tends to help maintain the focus of the program, and a landmark on the site helps in creating a focal point and generate a sense of direction among the visitors. Also, a main linear path connecting the site programs creates a sense of continuity and ensures that the visitors understand the site narration, but at the same time, providing a wanderer’s trail helps the visitor in exploring, discovering and interpreting the program in their own unique way. Encouraging interaction between the artists and the visitors, as well as, encouraging the visitors to get engaged in the task of creating the handicrafts always works well as it helps the visitors understand and appreciate the skills better. More than often, interweaving the history and heritage with the present-day life tasks to create an interactive and educational complex helps in building a bridge between eras.
Neemrana Village: A Case Study

Neemrana – From Then Till Now

Nested in the Aravalli range, Neemrana is a historic village in the Alwar District of Rajasthan, India. It is located 122 km. from New Delhi, on the Delhi Jaipur Highway (NH8) in the Behror district. Although there has been claims of historians tracing it back to the *Matsya Janapada*\(^{31}\) of the *Mahabharata*\(^{32}\) times, the present-day village has been there since the 1400s.

Neemrana was the third capital of the descendants of Prithviraj Chauhan III, who had retreated from Delhi around 1190s, after being defeated in a battle by Muhammad Ghori. The Neemrana Fort Palace was built in 1464. The kingdom flourished for a while and grew in all directions. In the mid-1700s, the British rule was established in India. The Rulers of Neemrana, proud of their lineage, continued to assert themselves, even under the British, as their kingdom suffered. Thus, parts of their lands were chipped away and given to other princely states like Alwar, Patiala, Nabha and others who entertained the viceroy's of the British raj.\(^{33}\)

After independence, in 1947, as the façade of the fort palace crumbled and its ramparts began to give way, Raj Rajinder Singh of Neemrana moved to Vijay Bagh and tried to get rid of his liability.\(^{34}\)

Very little development took place in the village until 1991, when the Neemrana Fort Palace was restored and opened as a luxury hotel. This new establishment drew the focus towards the village and slow development started taking place. Neemrana Village stepped up in stature and became a town as newer additions were made around the periphery of the dense village.

At the same time, as development became rapid and intense in Delhi, industries got pushed further and further away, towards the outskirts of the city, into the neighboring states. Over time, as Delhi grew bigger in size, the concept of creating a *National Capital Region*\(^{35}\) (NCR) got incorporated. Slowly,

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\(^{31}\) See Glossary
\(^{32}\) Ibid.
\(^{33}\) Nath, Aman. “History of Neemrana Fort Palace.”
\(^{34}\) Ibid.
\(^{35}\) See Glossary
surrounding districts of the neighboring states got include in it to protect Delhi’s infrastructure from extreme pressure.

In the first half of the 2000s, Hero Honda was the first company to purchased land alongside Neemrana. This tendency for the industries in the National Capital Region to be further afield was motivated by multiple factors, land prices and labor cost being the biggest. Neemrana became the optimum choice as both the costs were considerably low compared to the neighboring towns and cities. This gave way to a new trend and led to the creation of the Neemrana industrial complex, which grew rapidly. 36

Around the same time, in 2004, the Neemrana Fort-Palace got nominated for the Aga Khan Award 37, and in 2008, an additional wing was added to the fort-palace. The fort, that had once become ruins, now stood proud and glorious. The Fort-Palace became the first of its kind. It started attracting tourists, putting Neemrana on the map, making people interested in the history and heritage of the village. 38

Neemrana saw a rapid development in both, heritage tourism as well as industrial development. Soon enough, in 2013, Neemrana along with a few other surrounding regions, became a part of the Delhi NCR. 39

Over the years, tourism, industrialization and expansion has made Neemrana grow considerably. Since a lot of this development was rapid and unplanned, two separate regions were created in the process. The historical region, that includes the original village which got preserved along with the fort, and the modern region that got created due to industrialization and expansion. Both these regions had separate epicenters, but slowly, due to expansion, one center is encroaching upon the other. Needless to say, the modern industrialization development is currently wining.

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37 See Glossary
38 Nath, Aman. “History of Neemrana Fort Palace.”
Neemrana – Craftsmanship and the Challenges Faced

As its history suggests, Neemrana is highly influenced by the Rajasthani culture. This influence is evident through its architecture, food, language, attire, and people. The thing that makes Neemrana unique though, is its arts and crafts.

Over the years, factors like availability of local material and use of regionally significant illustrations as motifs, have evolved the Rajasthani arts and crafts in Neemrana, resulting its own unique style.40

As global markets opened, lack of a platform to exhibit their produce and benefit directly from the required volumes started impacting the craftsmen. The middlemen started exploiting these craftsmen by buying their products and selling it in upscale markets. Despite so, the benefit to the craftsmen was minimal as they could not travel and hence could not gauge the prices their produce was being valued at outside of their village. Also, seeing development in their vicinity made them aspire for a better lifestyle. These scenarios lead them into taking blue collar jobs in the industries and letting go of the traditional craftsmanship which was being passed down to them over generations. This resulted in the fading out of the local craftsmanship, bringing it to the brim of extinction.

In current times, lack of platform to exhibit their skills, as well as, involvement of the middle man is making the craftsmen leave their old ancestral practice and take up blue collar jobs in the industrial region due to its perks.41 The practice of these art and craft forms are slowly declining. If this process continues, the craft skills that were being passed on over the generations will eventually become extinct.

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Neemrana and Tourism

The proximity to the national highway, and its connectivity to major cities like Delhi and Jaipur, make Neemrana easily accessible and helps draw tourism.

Currently, the Neemrana fort-palace is the only major tourist attraction. Although the restoration and adaptive reuse of the fort saved it from disintegrating into ruins, it ended up making the heritage structure inaccessible to the general public. As the entire fort, has been converted into a hotel, the establishment charges an entry fee to visit the public accessible areas. These areas are only accessible for a few hours a day.42

Tourists who come to Neemrana, also like to visit the baoli43, or the stepwell44 that lies on the outskirts of the original village and is currently non-functional. They also like to take camel rides or walk around the existing village to see and experience the traditional and typical village life.45

Another Neemrana Fort-Palace property, the Neemrana Mud Houses, is in the pipeline and its construction will soon reach completion. This property will connect the stepwell to the fort complex and will give the visitors a chance to stay and experience the village life of Neemrana.46

The state government has also been making efforts to draw more tourism. Proposals are already in action to restore the stepwell to its original glory.47

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42 Observation by the Author
43 See Glossary
44 Ibid.
45 Mahajan, Vipul. In person interview. 2016. – Manager of Neemrana Fort Palace
46 Nath, Aman. In person interview. 2016.- Owner of Neemrana Properties
Neemrana Kala Kendra

Currently, there is an ongoing conflict between the industrial region and the heritage region of Neemrana for expansion. Also, the artists and craftsmen are struggling to benefit commercially from their traditional crafts. In order to give the heritage and culture of Neemrana a fighting chance for sustenance, both direct and indirect interventions are required to come into play. Building platforms for encouragement and showcasing the local skills and crafts along with helping them benefit financially and channelizing prosperity into the lives of local artisans will encourage the youth to stay with the unique skills and crafts in their families. In order to give the heritage and culture of Neemrana a fighting chance, one needs to provide them with that platform.

The fort-palace is already drawing a substantial volume of tourist inflow. This inflow will only increase after the completion of the Neemrana Mud-House Property and the restoration of the stepwell. The craft and tourism complex, alongside the other historic monuments will end up creating an entire heritage complex in Neemrana, that will not only cater to and preserve its regional identity, but will also help Neemrana develop and grow.

The design will majorly focus on three main components of the built project:

- The Performing Arts Building
- The Workshop Building
- The Artist’s Residential Building

Apart from that, the design will also focus on incorporating the existing heritage buildings on site into the new built project and using site landscape to revive the stepwell. Without equal consideration of these elements, the purpose of the project shifts in a direction contrary to the goal of the thesis.
Chapter 5. Methodology

The culture and heritage of Neemrana is the driving force for this project. As mentioned in Appendix A, the heritage of a place includes many categories. As mentioned in Chapter 4 – Neemrana Village: A Case Study, the traditional architecture and the craftsmanship of Neemrana are the two major aspects of its culture and heritage. Hence, this project will look in detail at the traditional and vernacular architecture of Neemrana as well as the five forms of craftsmanship in Neemrana to draw inspiration for its design.

Traditional and Vernacular Architecture of Neemrana

Vernacular architecture is an architectural style that is based on local climate, local needs, and availability of construction materials that reflect the local traditions and practices.48

In Neemrana, the climate is mostly hot and dry, and hence, their architecture has been influence by the following basic factors:49

- Response to climate
- Response to defense
- Response to religion
- Response to culture

Neemrana is highly influenced by the traditional architecture of Rajasthan. Over the years, the above-mentioned factors have influenced the traditional Rajasthani architecture and evolve a vernacular style to cater the needs of Neemrana. Some of the key architectural features of this style that have existed over time are:

- Jaalis50 Courtyards
- Waterbodies
- Local Materials
- Jharokhas51
- Streets
- Placement and orientation
- Roofs

50 See Glossary
51 Ibid.
Figure 5-1 lists the key features of the traditional and vernacular style of Architecture of Neemrana and analyzes their functions to understand the architectural principles behind it. The analysis shows that passive heating and cooling, natural ventilation, defused lighting, and shading are the four major architectural principles that most of these elements are addressing.
Many architects have attempted to incorporate these elements of *vernacular architecture* into the modern and contemporary design. Following four case studies are some of the more successful projects that exist in a similar cultural and climatic belt as Neemrana and follow a similar vernacular style:

- **Sangath by B.V. Doshi**: It is an office building located in Ahmedabad. The climate in this region is like that of Neemrana. Many of the typical features of the traditional architecture, like waterbodies, courtyards, local materials, building orientation and openings have been incorporated in this building in a very contemporary sense.52

- **Indian Institute of Management** by Louis Khan and Bimal Patel: This complex has been designed in two parts by two different architects with very different architectural styles. While Louis Khan uses the vernacular elements in a more literal sense, Bimal Patel uses their essence in a more modern and minimalistic way.53

- **Bharat Bhavan by Charles Correa**: Bharat Bhavan is a multi-art center, set up to create an interactive proximity between the verbal, visual and performing arts. It is a center for innovative creativity, pursuit of the classical and traditional and wide participation in a new cultural upsurge.54

- **Pearl Academy by Morphogenesis**: The Pearl Academy of Fashion, Jaipur is a campus which by virtue of its design is geared towards creating an environmentally responsive passive habitat. The institute creates interactive spaces for a highly creative student body to work in multifunctional zones which blend the indoors with the outdoors seamlessly. The radical architecture of the institute emerges from a fusion of the rich traditional building knowledge bank and cutting edge contemporary architecture.55

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52 Self-Analysis by Author based on Site Visit
53 Ibid.
54 Ibid.
Figure 5-2 is a comparative analysis of the above-mentioned case studies that show the traditional and vernacular elements being used. This analysis affirms our inference from Figure 5-1, that defused light and shading are the key elements of the traditional and vernacular architecture in this region.
Analysis of the Craft forms of Neemrana

Neemrana is known for its five forms of craftsmanship that are typical and unique to the village. Following are the five types of arts and crafts that are typical to Neemrana:56

**Jewelry Making:** It is one of the major source of income in Neemrana. The process involves cleaning and melting of gold, and then, converting them into gold bars. These bars are then transformed into thin gold wires or leaves, which are used to make the jewelry.57

**Weaving:** The weaving process is so simple that it seems to contradict the richness of the finished product. It requires just two beams. These beams are held in place using wooden or stone posts that are fixed into the ground. Across these beams, threads are wrapped and stretched horizontally. The only tool required is a fork, or a panja. The craftsman sits on a movable bench that is raised over the loom.58

**Leather Work:** In the olden days, this work used to be done on pure leather of buffaloes, goats, camels, etc. In today’s day and time, in the interest of animal welfare, it is also done on resin59, which acts as a substitute for leather. Many different varieties of items like shoes, saddles, purses, bags, saddles, etc. are made by leather work.60

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57 Aggrawal, Rajesh. Informal interview. 2016. - Jewelry Making craftsmen in Neemrana
58 Bansal, Usha. Informal interview. 2016. - Waving craftsmen in Neemrana
59 See Glossary
Wood Work: Various tools like pastel roller, flat discs, and bottles are used for making attractive wooden statues, figures and furniture. Normally, hard and durable timber wood is used to prepare these artifacts.61

Pottery: Apart from providing vessels and pots, the potters also make metaphorical models of animals and human forms as toys for children and idols or sculptures for the festivals. Over the years, the shape and style of pots have transformed in hope of making them functionally and aesthetically more desirable.62

By analyzing these five craft forms and the process involved in creating them, one key element that tends to stand out and seems critical of their process, the use of direct and indirect natural light. While Jewelry making and weaving require indirect light, leather work, wood work, and pottery mostly require direct light.

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62 Ibid.
Chapter 6. Site Study

Location

As mentioned in Chapter 4 - Neemrana Village: A Case Study, under the sub heading Neemrana – From Then till Now, nested in the Aravalli range, Neemrana is a historic village in the Alwar District of Rajasthan, India. It is located 122 km. from New Delhi, on the Delhi Jaipur Highway (NH8) in the Behror district. Over the years, Neemrana has grown to include the historic village as well as the industrial area.

As seen in Figure 6-1, Figure 6-2, and Figure 6-3, the site for this thesis is located North of Neemrana on the outskirts of the village area. The foothills of the Aravalli mountains lie towards the eastern side of the site.

The Site is connected to the village, and eventually to the highway, through a road on its western boundary. This road runs south to meet NH-8 and further north, to the village of Naghori, Pratappur, Ghilot, and so on. There is a pedestrian walk at the eastern boundary of the site, the directly connect the Neemrana Fort Palace to the Site.

Hence, even though the site is located outside the village, it is well connected to the Neemrana Village, the Neemrana Fort Palace, the Highway, and the neighboring villages.
Site Analysis

The 87-acre site is located on the outskirts of the village. It is heavily contoured as it is on the foothills of the Aravalli mountains. It currently has just 17 trees, and the soil type is alluvial.\textsuperscript{63}

The site mostly experiences a south-east blow of wind at an average velocity of 5 Km/hr which after hitting the mountains change and blow in the south west direction.\textsuperscript{64}

The site experiences harsh sun with the max. sun angle of 40 degrees in winter and 90 degrees in summer.\textsuperscript{65}

The Site has a great view of the Mountains on the east and the open fields on the west. Towards the south, it has a distant view of the Neemrana Fort Palace, the Neemrana Mud House Property and the Village. Towards the North, it has a distant view of the mountain range and barren land.\textsuperscript{66}

\textsuperscript{63} Self-analysis by Author
\textsuperscript{64} Rajasthan Govt. “Maps of Rajasthan.”
\textsuperscript{65} Ibid.
\textsuperscript{66} Self-analysis by Author
**Existing Buildings on Site**

The site has seven existing buildings on site:

- A 16th century temple
- A 17th century temple
- A 18th century temple
- Two 15th century Hut
- A 15th century Stable
- A 15th century Stepwell

All of them are clustered together on the North-West corner of the site. These buildings are further subdivided into three smaller groups:

- The stepwell
- The *Baoli* temple complex
- The residential cluster

The three temples together form the *Baoli* temple complex and are located to the South of the *stepwell*. The two huts along with the stable forms the residential cluster and is located to the North of the *stepwell*.
The Neemrana Stepwell

The Baoli is a significant structure in the Neemrana village. Built in 1760s it is a nine-story underground structure of majestic scale. It was built by the Rajas of Neemrana for famine relief. Traditionally, baolis in Rajasthan have acted as sarai\(^{67}\) for the travelers. The Baoli has been neglected for decades. Now under the Rural Tourism project of the Union Govt. this structure is being converted into a Crafts' Haat. Being only 125kms from Delhi and in close proximity to Neemrana Fort-Palace, the tourist traffic can be generated.

The project involves restoring many roofs, re-doing the brackets, flooring, plastering and ensuring security through metal gates and kathera's (stone parapets). The steps about 200 in number will also be re-laid. The baoli is made of rubble covered over with plaster and dressed stone, fringed on three sides by rows of small chambers—possibly to shelter passersby; baolis often acted as camping grounds for travelers. Stepwells are wells in which the water is reached by descending a set of steps. They are covered and protected and are often of architectural significance. They are multi-storied having a bullock which turns the water wheel to raise the water in the well to the first or second floor. A major part of the monument is underground.\(^{68}\)

The stepwell consists of three major parts:

- The vertical well
- Staircase
- Numerous intermediate pavilions

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\(^{67}\) See Glossary

ANALYSIS OF THE NEEMRANA STEPWELL

Figure 6-12: Analysis of the Neemrana Stepwell
Chapter 7. Design

Site Design Guidelines

Although the site is 87.4 acers, not all area is suitable for construction. Factors like the Surface run-off water catchment ponds, site setbacks, ASI guidelines for heritage monuments, views from the site and access to the road restrict the area of construction to 27.8 acers.

Figure 7-1: Diagrammatic analysis of the area suitable for construction
Building Design Guidelines

Based on the Analysis in Chapter 5: Methodology - Traditional and Vernacular Architecture of Neemrana as well as Chapter 6: Site Study – Site Analysis, following are the building design guidelines that should be followed:69

- Minimize indirect solar radiation in open spaces like courtyards
- Plan narrow winding open corridors, which are shaded and relatively cool should be provided to allow through-ventilation and adequate natural lighting
- Avoid large open spaces where hot air can collect during the day
- Provide ample shaded public spaces
- Include green areas of plants around and within the settlement to provide shade and cool air and to stabilize the soil
- Plant and cultivate xerophytes that require little or no water
- Integrate water bodies, which evaporate and therefore reduce temperature
- Provide maximum shading of direct and reflected sun radiation in the hot season
- Provide ventilation by regulated air movement and small openings
- Avoid large exposed exterior surfaces
- Use reflective outer surfaces
- Balance the extremes of day and night temperatures by adequate thermal storage mass
- Reduce internal heat production and conduction gain
- Promote evaporation and heat loss by radiation

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Conceptual Design

The site caters to two different aspects of design,

- The Kala Kendra
- The restoration and revitalization of the Stepwell

Although the scope of this thesis only includes the Neemrana Kala Kendra, the project will also look at revitalizing the stepwell at a conceptual stage using landscaping elements to create an overlap between the two aspects of the projects so that they can function together as one site.

The conceptual design of the project is divided into three main elements:

- The Site
- The Landscaping
- The Built Project

The Site- The site focuses on following three ideas:

- Creating moments of view from the site
- Creating a Narrative experience of site circulation

As mentioned in the previous chapters, this project, along with the other existing heritage sites in the village, tends to form a heritage zone. The placement of the project site is such that there is a clear line of view to all the remaining sites. The project site also enjoys a lot of Natural views on its north, east, and west sides. These views are kept in high consideration with designing the buildings and planning the site circulation. Elements have been provided within the designs to capture and frame each of these individual views.

Importance is also given to the on-site movement of the visitors. The site contains a wanderer’s track as well as definitive path. The wanderer’s path gives the visitors a chance to explore and discover the moments and elements on site, where as the definitive path makes them move on a guided path creating a narrative using the buildings and the program.
Figure 7-2: The Moment of Views
**The Buildings:** The primary focus of the new buildings is the visitor’s interaction with the craft and the craftsmanship. In order to do so, the main program is divided into two parts, the visual experience and the interactive experience. Each of the two public buildings cater to one of these experiences.

The building forms have been inspired by the site contours. The intent was for the buildings to gradually emerge from the contours and eventually submerge into them, following the contour curve lines. The idea was to design around *stepwell* so that the *stepwell* becomes the focus of the site program.

The new building designs have been very sensitive towards the existing buildings on the site. At no point does the proposed design clash or overpower the existing built complex. Effort has been made using architectural elements to build connection between the new and the old complex and make is function as one.

**The Landscape:** The landscaping on site is divided into two type;

- Formal
- Informal

The formal landscape is used around the built complex as an element to enhance the visitor’s experience. The informal, on the other hand is used on the remaining site area for holding on to the surface run off water, so that the water seeps into the ground water table and increases the ground water level so that the stepwell can be revived.

As can be seen in *Figures C-6, and C-7*\(^{70}\), the rainfall in Neemrana is approximately 60-70 cm per year and the ground water table level on average is 7 meters below ground level. *Figure C-8*\(^{71}\) tells us that Neemrana lies in the highest area of ground water use where most the village’s water needs are meet by consuming the ground water. The focus of the informal landscape is to use native plant species to hold on to the surface runoff water on site and help it seep into the ground to increase the groundwater table level.

As shown in *Figure B-1*\(^{72}\), the village has a mixed vegetation cover. The major vegetation type of the village is Shrub Savannah with spurs of Dry Deciduous Forest.\(^{73}\) *Appendix B*, shows a list of native plant cover that can be used on the site to achieve the idea mentioned above.

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\(^{70}\) See Appendix C  
\(^{71}\) Ibid.  
\(^{72}\) See Appendix B  
Schematic Design

The intent behind the program distribution is for the visitor to first see the final product and get enticed and inquisitive enough to explore the process behind it. The idea is that once they explore the process, the visitors will develop an even greater appreciation of the skills and craftsmanship.

Performing Arts and Display Block: The first building on site is the performing arts and display block. The main function of this building is to display the final products of the craftsmanship. The building acts as a display gallery to display the tangible aspect of the Neemrana Heritage.

Workshop block: The main function of this building is to display and engage the visitors into the process of craft making so that they can develop a deeper apparition for the skill set. This building is designed around the existing temple complex, making it the focus of its west façade with the intent of seeking blessings from god. The east façade is focused on the view of the mountains and the connection of the humans with nature.

Residential block: This building is located on the other side of the stepwell near the existing building residential complex. This building is not accessible to the general public and is designed to cater the needs of the artist. The function of this building is to provide residential and studio space to the visiting artists for a short span of stay.

Design Development

In the built complex of the project, the façade and the materiality are the two major aspects that were looked at in detail for the project to work as intended.

The façade: Based on the inference drawn from both the Methodologies mentioned in Chapter 4, natural direct and indirect light are the two essential elements that need to be incorporated in the design. The façade of each of these buildings works in depth to cater the need of the intensity of the light within each of the buildings based on the programs it caters to. Elements like Jalli, perforated walls, and recessed doors and windows are used to achieve the above.

The Material: In order for the new and the existing buildings on site to work as one built complex, there needs to be some form of uniformity. In this project, this uniformity is achieved by using the same materiality for the external façade. As shown in Figure C-7 in Appendix C, limestone can be found in abundance in Neemrana. The existing buildings on site are made majorly from limestone. The exterior façade of the new buildings are claded with limestone to provide the element of uniformity.
Chapter 8. Conclusion and Design Reflection

This project proposes a viable solution to the issues generated by the research of the existing typologies. It addresses the concepts stated in Chapters 2, 3, and 4, with the main goal of addressing the problem of the gradual erosion of the intangible heritage in Neemrana Village. By reading chapter 5, and then evaluating the design, one can see how the research work and the built project are intertwined. The one area that is still a challenge, is the exploration of the architectural solution to issues that are not relevant to the thesis. The boundary for this issue remains blurry and is currently a hurdle for the project.

This project possesses certain strengths and weaknesses based on the scope of the research work. Since the project originated from the initial interest in the topic of regional identity and its gradual erosion in the village of Neemrana, the Performing Arts Block and the Workshop block have a greater influence on the direction of the project and a stronger research base than the Residential Block.

The concept of the Residential Block comes more from a personal understanding of the scenario and the research to collaborate these views, and hence remains comparatively weak. However, its existence is essential for the built complex to function smoothly. Additionally, it provides the commercial anchor for building the intangible heritage by providing the focus for visitors, performers and artists.

The concept of incorporating the elements of the traditional and vernacular architecture of Neemrana provides a strong and well defined focus on its heritage and culture. Its inclusion in the project remains essential for the redefining and combining of the established topologies.

As the entire thesis was based on the concept of the process being more important than the goal, this project will be an ongoing effort. Even though the main objective of this thesis was the built complex, the overall project also included restoration and revitalization of the stepwell. An introductory incorporation of this topic was made at the conceptual design stage of the project, but further in-depth research can be conducted to address the needs of the site in a more intense and investigatory manner.

Also, although the site circulation has been well thought of to incorporate the moments of views, the remaining elements of site scaping remain under researched and leave scope for further investigation.

Architecturally, the façade and the roof system of the buildings have been researched in depth, but the remaining architectural elements leave room of in-depth research.

I hope to address most, if not all of these issues in the continual design of the project beyond the writing of this document.
Glossary

AGA KHAN AWARD: The Aga Khan Award for Architecture is given every three years to projects that set new standards of excellence in architecture, planning practices, historic preservation and landscape architecture. Through its efforts, the Award seeks to identify and encourage building concepts that successfully address the needs and aspirations of societies across the world, in which Muslims have a significant presence.74

BAOLI/STEPWELL: A masonry well with steps leading down to water level.75

BAZAAR: It is a shopping place or a market quarter.76

CULTURAL HERITAGE: It is the legacy of physical artifacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations.77

FOOD HERITAGE: It encompasses the origins of plants and animals and their dispersal, the sites where people first cultivated plants and domesticated animals, as well as the earliest locations around the world where people first processed, prepared, sold and ate foods.78

HAAT: A Haat is an open-air market that serves as a trading venue for local people in rural areas.79

HERITAGE: Property that can be inherited.80

INDUSTRIAL HERITAGE: The physical remains of the history of technology and industry, such as manufacturing and mining sites, as well as power and transportation infrastructure. The term is often also used in connection with museums or historic places related to industry, including worker housing and warehouses.81

75 “BAOLI - Architecture.” Welcome to the Sikh Encyclopedia.
77 UNESCO. “Convention Concerning the Protection Of The World Cultural And Natural Heritage.” November 1972.
INTANGIBLE CULTURAL HERITAGE: Traditions or living expressions inherited from our ancestors and passed on to our descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts.  

JAALIS: A perforated stone or latticed screen, usually with an ornamental pattern constructed using calligraphy and geometry.

JHAROKHAS: A type of overhanging enclosed balcony used in Architecture of Rajasthan.

KALA: Art.

KENDRA: Epicenter.

MAHABHARATA: One of the two great Sanskrit epics of the Hindus, existing in its present form since c.400 AD. It describes the civil war waged between the five Pandava brothers and their one hundred stepbrothers at Kuruksetra near modern Delhi.

MATSYA JANAPADA: It is one of the sixteen kingdoms or oligarchic republics that existed in ancient India.

NATIONAL CAPITAL REGION: It is a region or district surrounding a capital city.

NATURAL HERITAGE: The overall sum of the elements of bio-diversity. This will include the flora and fauna and their ecosystems as well as the geological structures.

REGION: An area or division, especially part of a country or the world having definable characteristics but not always fixed boundaries.

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83 Oxforddictionaries.com. “Jali.”
85 English to Hindi Dictionary. "ART MEANING IN HINDI.”
87 Oxforddictionaries.com. “Mahabharata.”
88 Wikipedia. “Matsyajanpada.”
89 Wikipedia. “National Capital Region.”
90 UNESCO. “Convention Concerning the Protection of The World Cultural And Natural Heritage.” November 1972.
**REGIONAL IDENTITY:** The unique appeal of a place that is defined by its people and society that forms its character and helps in identifying the region.

**RESIN:** a solid or liquid synthetic organic polymer used as the basis of plastics, adhesives, varnishes, or other products.\(^2\)

**SARAI:** INN.\(^3\)

**TANGIBLE CULTURAL HERITAGE:** It includes buildings and historic places, monuments, artifacts, etc., which are considered worthy of preservation for the future. These include objects significant to the archaeology, architecture, science or technology of a specific culture.\(^4\)

**VEDAS:** They are a large body of knowledge texts originating in the ancient Indian subcontinent. Composed in Vedic Sanskrit, the texts constitute the oldest layer of Sanskrit literature and the oldest scriptures of Hinduism.\(^5\)

**VERNACULAR ARCHITECTURE:** It is an architectural style that is based on local needs and availability of construction materials that reflect the local traditions and practices.\(^6\)

**VIRTUAL HERITAGE:** It is the body of works dealing with information and communication technologies (ICT) and their application to cultural heritage, such as virtual archaeology.\(^7\)

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\(^1\) Dictionary.com. "Resin."
\(^2\) HinKhoj Dictionary. "Sarai."
Bibliography


HinKhoj Dictionary. *Sarai.* n.d. http://dict.hinkhoj.com/%E0%A4%B8%E0%A4%B0%E0%A4%BE%E0%A4%AF-meaning-in-english.words (accessed March 2017).


UNESCO. "Convention Concerning the Protection Of The World Cultural And Natural Heritage." November 1972.


Appendix A: Heritage and its Types

Heritage can be defined as property that is inherited. As per the UNESCO world heritage center guidelines, heritage can be broadly classified as:98

- Natural Heritage: The overall sum of the elements of bio-diversity. This will include the flora and fauna and their ecosystems as well as the geological structures.99

- Cultural Heritage: It is the legacy of physical artifacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations.100

- Digital/ Virtual Heritage: It is the body of works dealing with information and communication technologies (ICT) and their application to cultural heritage, such as virtual archaeology.101

Cultural Heritage can be further categorized as:

- Tangible Cultural Heritage: It includes buildings and historic places, monuments, artifacts, etc., which are considered worthy of preservation for the future. These include objects significant to the archaeology, architecture, science or technology of a specific culture.102

- Intangible Cultural Heritage: Traditions or living expressions inherited from our ancestors and passed on to our descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts.103

98 UNESCO-CI. "Various Types of Heritage."
100 Ibid.
Classification of heritage is not an easy process. More than often, there are one or more overlaps. To make this process easy, over the years, UNESCO has come up with a few other categories, such as: 104

- **Food Heritage**: It encompasses the origins of plants and animals and their dispersal, the sites where people first cultivated plants and domesticated animals, as well as the earliest locations around the world where people first processed, prepared, sold and ate foods.

- **Industrial Heritage**: The physical remains of the history of technology and industry, such as manufacturing and mining sites, as well as power and transportation infrastructure. The term is often also used in connection with museums or historic places related to industry, including worker housing and warehouses.

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Appendix B: Native Plants of Neemrana

Figure B-1: Vegetation Type Map of Rajasthan

Legend
As shown in *Figure B-1*, Neemrana has a mixed vegetation cover. The major vegetation type of the village is Shrub Savannah with spurs of Dry Deciduous Forest cover.\(^{105}\)

Savannah Scrubs is a vegetation cover predominantly occupied by shrubs or poor tree growth chiefly of small or stunted trees with crown density less than 10%. The Dry Deciduous forest on the other hand occur at an altitude of around 200-600 meters and are equivalent to northern dry mixed deciduous forests predominantly occupied by teak, and thorny trees.\(^{106}\) As shown in *Figure C-5*\(^ {107}\), Neemrana Village has the Aravalli Landscape. Based on the Research work in papers *New Records of Plants from Rajasthan*\(^ {108}\) and *Mapping the Vegetation Types of Rajasthan, India Using Remote Sensing Data*\(^ {109}\), we can safely assume that it is likely for the following Flowering Native Plants of Rajasthan to be able to grow in the Neemrana Village.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Scientific Name of Grass</th>
<th>Common Name of Grass</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apluda mutica L.</td>
<td>Mauritian Grass</td>
<td>Perennial</td>
</tr>
<tr>
<td>2</td>
<td>Setaria verticillata (L.) P. Beauv.</td>
<td>Hooked Bristlegrass</td>
<td>Annual</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Scientific Name of Creepers</th>
<th>Common Name of Creepers</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Abrus precatorius L.</td>
<td>Rosarypea</td>
<td>Perennial</td>
</tr>
<tr>
<td>2</td>
<td>Dioscorea bulbifera L.</td>
<td>Air Yam</td>
<td>Perennial</td>
</tr>
<tr>
<td>3</td>
<td>Momordica dioica Roxb. ex Willd.</td>
<td>Balsampear</td>
<td>Perennial</td>
</tr>
<tr>
<td>4</td>
<td>Cardiospermum halicacabum L.</td>
<td>Balloon Vine</td>
<td>Annual/ Biennial/ Perennial</td>
</tr>
<tr>
<td>5</td>
<td>Cocculus hirsutus (L.) Diels</td>
<td>Moonseed</td>
<td>Perennial</td>
</tr>
<tr>
<td>6</td>
<td>turbinata Lag.</td>
<td>Lilacbell</td>
<td>Annual</td>
</tr>
</tbody>
</table>


\(^{107}\) See Appendix C


<table>
<thead>
<tr>
<th>S.No.</th>
<th>Scientific Name of Shrubs</th>
<th>Common Name of Shrubs</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Calotropis procera (Aiton) W.T. Aiton</td>
<td>Roostertree</td>
<td>Perennial</td>
</tr>
<tr>
<td>2</td>
<td>Cayratia trifolia (L.) Domin</td>
<td>Threeleaf cayratia</td>
<td>Perennial</td>
</tr>
<tr>
<td>3</td>
<td>Cissampelos pariera L.</td>
<td>Velvetleaf</td>
<td>Perennial</td>
</tr>
<tr>
<td>4</td>
<td>Clerodendrum inerme (L.) Gaertn.</td>
<td>Embrert</td>
<td>Perennial</td>
</tr>
<tr>
<td>5</td>
<td>Commiphora wightii (Arn.) Bhandari</td>
<td>Guggal</td>
<td>Perennial</td>
</tr>
<tr>
<td>6</td>
<td>Gardenia jasminoides Ellis</td>
<td>Cape Jasmine</td>
<td>Perennial</td>
</tr>
<tr>
<td>7</td>
<td>Holarrhena antidysenterica (L.) Wall</td>
<td>Tellicherry Bark</td>
<td>Perennial</td>
</tr>
<tr>
<td>8</td>
<td>Chamaecrista nictitans (L.) Moench ssp. nictitans var. leptadenia (Greenm.) Gandhi &amp; Hatch</td>
<td>sensitive partridge pea</td>
<td>Annual/ Perennial</td>
</tr>
<tr>
<td>9</td>
<td>Tinospora cordifolia (Willd.) Miers</td>
<td>Moonseed</td>
<td>Perennial</td>
</tr>
<tr>
<td>10</td>
<td>Adhatoda zeylanica Medic.</td>
<td>Adusa</td>
<td>Perennial</td>
</tr>
<tr>
<td>11</td>
<td>Cassia alata L.</td>
<td>Datkapat</td>
<td>Perennial</td>
</tr>
<tr>
<td>12</td>
<td>Cayratia carnosa (Wall.) Gagnep. ex Wight</td>
<td>Amar-bel</td>
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</tr>
<tr>
<td>13</td>
<td>Datura fastuosa L.</td>
<td>Datura</td>
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</tr>
<tr>
<td>14</td>
<td>Grewia flavescens Juss.</td>
<td>Kali-siali</td>
<td>Perennial</td>
</tr>
<tr>
<td>15</td>
<td>Hibiscus micranthus L. f.</td>
<td>Chanak bhindo</td>
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<td>16</td>
<td>Ipomoea carnea Jacq.</td>
<td>Gloria de la manana</td>
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<td>17</td>
<td>Ipomoea eriocarpa R. Br.</td>
<td>Morning Glory</td>
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<td>18</td>
<td>Lantana camara L.</td>
<td>Iantana</td>
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</tr>
<tr>
<td>19</td>
<td>Lycium barbarum L.</td>
<td>Matrimony Vine</td>
<td>Perennial</td>
</tr>
<tr>
<td>20</td>
<td>Nerium oleander L.</td>
<td>Oleander</td>
<td>Perennial</td>
</tr>
<tr>
<td>21</td>
<td>Ricinus communis L.</td>
<td>Arandi</td>
<td>Perennial</td>
</tr>
<tr>
<td>22</td>
<td>Thevetia peruviana (Pers.) K. Schum</td>
<td>Pila-kaner</td>
<td>Perennial</td>
</tr>
<tr>
<td>23</td>
<td>Triumfetta rhomboidea Jacq.</td>
<td>Diamond Burbark</td>
<td>Perennial</td>
</tr>
<tr>
<td>24</td>
<td>Ziziphus zizyphus (L.) Karst.</td>
<td>Jujube</td>
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<tr>
<td>S.No.</td>
<td>Scientific Name of Trees</td>
<td>Common Name of Trees</td>
<td>Season</td>
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<td>Bauhinia variegata L.</td>
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<td>Ficus carica L.</td>
<td>Fig</td>
<td>Perennial</td>
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<td>8</td>
<td>Holoptelea integrifolia (Roxb.) Planch</td>
<td>Papri</td>
<td>Perennial</td>
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<td>Bombax ceiba</td>
<td>Red Silk Cotton tree</td>
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<td>Terminalia arjuna (Roxb. ex DC.) Wt. &amp; Arn.</td>
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<td>Vitex negundo L.</td>
<td>Chinese Chastetree</td>
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Figure C-3: Temperature Map of Rajasthan (January)

Figure C-4: Temperature Map of Rajasthan (May)
Figure C-5: Soil Map of Rajasthan

Figure C-6: Hydrogeomorphology Map of Rajasthan
Figure C-7: Rainfall Map of Rajasthan

Figure C-8: Ground Water Table Map of Rajasthan
Figure C-9: Ground Water Use Map of Rajasthan