Reinvigorating the Genius Loci of Indian Handloom Clusters: An Integrated Handloom Production Center, Fatehabad, Chanderi, Madhya Pradesh

BACHELOR OF ARCHITECTURE

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DECLARATION

I, **Aman Sinha**, Scholar number **2015BARC023**, hereby declare that the thesis titled **'Reinvigorating the Genius Loci of Indian Handloom Clusters: An Integrated Handloom Production Center, Fatehabad, Chanderi, Madhya Pradesh',** submitted by me in partial fulfillment for the award of degree of Bachelor of Architecture, to the Department of Architecture at School of Planning and Architecture, Bhopal is a record of an original work carried out by me. The design work presented and submitted herewith is my original work, and I take sole responsibility for its authenticity. The results presented in this thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

Signature: **Date: July 10, 2020**

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CERTIFICATE

This is to certify that the student, **Mr. Aman Sinha**, Scholar number **2015BARC023** has worked under my guidance in preparing this thesis titled, **'Reinvigorating the Genius Loci of Indian Handloom Clusters: An Integrated Handloom Production Center, Fatehabad, Chanderi, Madhya Pradesh'.**

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ABSTRACT

Reinvigorating the Genius Loci of Indian Handloom Clusters: An Integrated Handloom Production Center, Fatehabad, Chanderi, Madhya Pradesh

Handloom weaving is a technique of weaving unstitched fabrics, and a handful of Indian communities like the one at Chanderi, Madhya Pradesh, have been skilled in this craft for centuries and continuing. The Chanderi handloom cluster, owing to its stature on a global level has even been listed under the UNESCO World Heritage Site. This handloom cluster, like many others, abound with a prolific number of centuries-old-handlooms that are engaged in weaving cotton, silk, and other natural fibers into fine unstitched cloth. This venerable craft is perceived more like a family legacy that is passed from one generation to the other. However, in the recent past, the adroitness of the Chanderi handloom weavers is failing to yield favorable outcomes, resulting in a degenerative flux in which the adept weavers are forced to find other ways to earn their living. The younger generation is finding it an onerous task to continue this family occupation due to a number of factors like lack of recognition, aberrantly low wages, abhorrent built-environment, and a highly competitive market. Adding to these hardships, they also face cut-throat competition from the products manufactured through power looms which easily imitate and produce similar designs in a fraction of time. The Ministry of Textiles (GoI), as well as the State Handloom Department, has taken various initiatives to safeguard this tradition of handloom weaving; although their efforts seem limited to the craft and its enhancement, and not to the associated spaces and the built environment. Hence, there is a compelling need to study and understand the imperative association between Chanderi's handloom business-model canvas, handloom weaver's intangible craft, and their tangible built-environment, which is central to their efficient working and living environment.

This Thesis is a design solution to the proposal put forward by the ***Madhya Pradesh Hastashilp Evam Hathkargha Vikas Nigam Limited***, which aims to develop a handloom village for about 150 Weaver households in the city of Chanderi. Although the proposed project brief primarily asks to develop a housing cluster, the brief has been tweaked a bit to incorporate imperative social infrastructure to support and further develop the community. The project is envisioned to be one of the future landmarks of this historic city, which accentuates its weaving tradition. The proposed project is envisaged to be a precedence of sustainability for various other communities across the country which are engaged in a similar craft. The Intervention proposed aims at Recapturing and augmenting the ***'Genius Loci'*** of the Indian Handloom Weavers' clusters, by designing a state-of-the-art handloom production village in Chanderi. The conceived proposal demonstrates Avant-Garde spatial planning while taking forward the vernacular language of the region.

The Thesis aims at breaking down the silos that impede better livability. By amalgamating the disciplines of design/architecture, technology, and business, impactful solutions can be created that hold real value for people. Especially with a community like the one this Thesis targets, architecture has to be backed by the other two domains, which are equally critical for the community's sustainable growth. Hence, along with fulfilling the fundamentals of architectural thesis by providing a design solution pertaining to the built environment, the proposed thesis aims to take a step further by conceiving a viable business model along with innovative technological advancements and integrate it with a compatible built environment.

Keywords

Cultural landscapes, Indian handloom clusters, Chanderi, Genius Loci, Architectural Metaphorism, Sustainability, Interdependencies and linkages, Degenerative flux, Community resilience, Economy, Built-environment.

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CHAPTER 1
INTRODUCTION

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1.1 Background

The living heritage, according to UNESCO is stated to be,
"Our legacy from the past, what we live with today, and what we pass on to future generations".[1]
New approaches to urban preservation and heritage planning are embracing heritage as a lifestyle, incorporating it into planning processes, and adding to their communities' quality of life. Depending on the city, different aspects of continuity such as roles and societies, uses and users can be adopted by living heritage.

Handloom weaving has been the most primitive form of collective cultural activity found in almost every traditional community in the world. This home-based industry of handlooms has served mankind with the cloth until the industrial revolution and the mechanization of the cloth industry.[2] With the rise of industrialization, the handloom industry started to vanish all over the globe. The developed countries titled the handlooms as a cultural heritage of their communities and are still appreciated as prominent art forms depicting unique traditional skills.

The Indian handloom industry is one such cultural industry that has been portraying qualities of vernacular lifestyles for centuries. Next to agriculture, the handloom industry contributes towards major employment to the rural households and uplifting women in the process. Unfortunately, the industry has been severely damaged by the uprising of mechanical power loom industries set up after the industrial revolution. The onset of industrialization has not served any good to the weavers but only degraded the value of process-oriented handlooms and entitled the weavers to the status of laborers. Hence, there's a need to safeguard the traditional craftsmanship to uplift the weavers and thus preserve the cultural heritage of the country.

The Indian handloom clusters depict a unique understanding of local building materials and local architectural characteristics. This sensitivity to the continuity of vernacular architecture by the handloom weavers is major because of the organic character of their craft, the efforts required in the process, and the socio-cultural linkages of the craft with its community. The handloom weaving heritage is not only limited to the craft of producing but is also manifested in the spaces in which it is produced. The plans of weaver households and weaving centers depict a hierarchy of enclosures and have developed according to the needs of the individual weavers.

A range of government and private schemes to combat the decline and boost the handloom sector has been introduced. They vary from reserving such product lines specifically for the handloom sector to offering varied services and inputs such as marketing facilities credit and yarn directly.
There is however, one important aspect of the deteriorating situation of the weavers where adequate attention has not been provided. The dilapidated condition of their homes and that the continually worsening state of the civic amenities of their clusters.
The complete lack of attention given to the interconnectedness between the tangible heritage of weavers (their homes, cluster settlements, materials) and their intangible heritage (production relationships, ways of transmitting knowledge and skills through generations, etc.) may explain the decline of the hand-held industry to a large extent. Even input subsidies may not be able to keep it alive. In order to preserve, appreciate and revive such an iconic and uniquely Indian industry and feed it back to the possibility of sustainable growth and health, a far more sensitive effort of conservation, based on understanding these interconnections, seems to be called for.
Following is a brief overview of various schemes which have been implemented in the Indian Handloom Sector:

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[1] Retrieved from the web. http://www.unesco.org/new/en/culture/resources/in-focus-articles/safeguarding-communities-living-heritage/
[2] Semper, G. (1989). *The four elements of architecture and other writings.* Cambridge: Cambridge University Press.

- **National Handloom Development Program:** The NHDP is a centrally funded scheme implemented by the governments of the respective states, that include the Comprehensive Handloom Development Scheme (CHDS) and the Revival, Reform, and Restructuring Package (RRR) related to marketing, development of infrastructure and availability of credit.
- **Yarn Supply Scheme:** It has three parts, namely, Mill Gate Price yarn supply, 10 percent cotton hank yarn, domestic silk and wool subsidy, and the NHDC investment. This scheme aims to provide for all eligible handloom weavers the different types of yarn at Mill Gate Price and ensure the constant, interrupted supply of the raw material required and to further leverage the sector's full employment potential.
- **Handloom Weavers Comprehensive Welfare Scheme:** The Government of India has implemented this scheme through two parts.
     - Health Insurance Scheme (HIS) and Mahatma Gandhi Bunkar Bima Yojana (MGBBY).

Schemes	2012-13	2013-14	2014-15	2015-16
National Handloom Development Programme			288	125
Comprehensive Handloom Development scheme		108		
Integrated Handloom Development Scheme (CSS)	170			
Revival reforms and restructuring package for handlooms (CSS)	2,205	157		
Market and Export Promotion Scheme (CSS)	48			
Diversified Handloom Development Scheme	20			
Weaver Service centre	33	35	33	38
Handloom Weavers Comprehensive Welfare Scheme	105	65	55	15
Mill Gate Price Scheme	350	97	125	140
Total (Including others)	**2,960**	**519**	**621**	**486**

Table 1. Details showing the financial releases (in crores) during the 12th Plan period.
Source: Indian planning Commission.

Chanderi is one such traditional handloom cluster located in district Ashok Nagar of Madhya Pradesh. At present Chanderi comprises around 10000 artisans and since the last 500 years the cluster has been producing products like *sarees, safa, dupatta, and pagdis*. Artisans mainly work on traditional pit looms. Lately some technological improvements have occurred in the various processes of production through various interventions. Due to small scale the backward linkages with raw material suppliers are not competitive and market linkages are restricted. Moreover, the handloom industry is not being able to enjoy economies of scale, upgrade technology, improve productivity and diversify markets & products for greater value realization. Lack of quality and adequate support infrastructure is another critical bottleneck adversely affecting the industry. Therefore, the need of the hour is to organize them in specific locations supported by market linkages and good quality infrastructure in the form of a cluster park with common facilities for production, product design and development, processing and marketing.

1.2 Project Description

The project is put forward by the Madhya Pradesh Hastashilp Evam Hathkargha Vikas Nigam Limited, which has proposed a handloom village for about 150 Weaver households at Fatehabad area in the city of Chanderi. The site is located right at the foothills of a 90m high hillock, which is about 2.5kms away from the city core. The connectivity between the site and the city center is through a 9m wide state highway. Suggestions are for development of **Common Facility Centre** (CFC) to optimize the production cost and trading facilities and **Decentralized Cluster Infrastructure** (Crafts Tourist Trail) to showcase and popularize the handloom products among tourists.

Following are the project objectives:

- To create weaver's housing clusters in response to their unique livelihoods. The project is proposed by Madhya Pradesh Hastashilp Evam Hathkargha Vikas Nigam Limited for approximately 150 weavers household.
- To create training center and common facility center along with community facilities to impart collective growth of weavers and thus escaping the vicious hierarchy of merchants and traders.
- To generate tourism in the cluster with an endogenous approach. To create a weaver's live exhibition museum instead of a textile museum which is currently creating a gap between product and process.
- To generate awareness among the common folk related to handloom weaving thus transforming the ideology.

1.3 Project Justification

- **Constrained city core:** The city core houses majority of the traditional handloom weaving households. These centuries' old dwellings cannot accommodate the growing family size of the weavers, which has resulted in outmigration of the younger generations of the weavers families. Hence, in order to retain this age-old craft from dying there is an utmost need to provide space for these growing families to accommodate themselves and continue with this craft.
- **Tourism center:** Chanderi, situated in the Ashok Nagar district of Madhya Pradesh, is a destination famous for its historical significance. The town presents a delightful sight through its historical monuments and natural wonders. The town is at a distance of 103 km from Jhansi and 214 km from Bhopal, and draws approximately 50-100 tourists daily.
- **Institutional framework:** Lack of efficient supporting institutional frameworks in the town has made this venerable craft to slowly fade away. Although government has been funding the weavers and other cooperatives to overcome financial stress, but they seem limited, and do not suffice for the actual needs of the weavers and the craft.

1.4 Aim

To propose architectural design strategies for Chanderi's handloom cluster in response to physical and socio-cultural needs of the weavers' community; thereby designing a weaver's settlement with household clusters and social infrastructure.

1.5 Objectives

- Understanding 'Community Resilience' as a concept, and determining its major aspects.
- Studying broadly Chanderi's handloom weaving community; thereby studying history, weaving processes, tools, and evolution of its weaving tradition.
- Understanding both, the intangibles- the craft of handloom weaving, the business-model, and the traditional values associated with it, and tangibles- the built environment and spatial logic supporting weaving activities, that are associated with Chanderi's cultural heritage.

- Establishing embedded linkages between the three parameters of community resilience- The social, economic and environmental, within Chanderi and other handloom communities in India.
- To propose design strategies from inferences associated with social, spatial and economic requirements.

1.6 Project Rationale

In a globalizing world threatened by corporate homogeneity and complicated by translation, Indian weaving clusters offer a window into a place that is deeply connected to its social, cultural and natural environment. A living heritage indeed, the Indian handloom industry has stood the test of time and has been contributing to the country in a plethora of enclaves. Analogous to any other 'living system', the Indian handloom industry too, experiences incessant transience. Especially at this point in time, when the challenges faced by the industry couldn't have been more severe, such communities do need some empathy and attention from various sects of the society and the government alike.

The studies have demonstrated a strong association between the handloom weaver's intangible craft and their tangible built-environment, which is central to their efficient working and living environment. This calls for architects and designers like us and hands us an immense opportunity to pitch in and support the venerable handloom communities standing strong at this moment of turbulence. Hence, there is an immediate need for architectural projects that can not only help in mitigating the living heritage of handloom weaving from ebbing away but also provide a solution for enhancing their existing cultural landscapes.

Chanderi in Madhya Pradesh, is one of several traditional handloom weaving clusters of India where lies immense potential regarding the culture and architecture which has yet not been explored and needs to be studied and reinvented to establish an identity for the weaver's town thereby setting an example for further developments in various other clusters of India.

1.7 Scope and Limitations

- The scope of this research is to focus upon the characteristics of the built environment, socio-cultural fabric and economic framework specific to the handloom cluster of Chanderi.
- The research will majorly focus upon the weaver households in Chanderi, the user understandings and aspirations, traditional knowledge systems and the overall architectural character specific to Chanderi's handloom clusters.
- The research would be majorly reliant on secondary data collection, and will be limited to only the Chanderi's handloom weavers and their socio-economic and cultural backgrounds, not to the cultural backgrounds of other industries.
- Major limitation of this research is its inadequacy in terms of primary data collection caused due to the COVID-19 pandemic and the nation-wide lockdown.
- This research is carried out within a time constraint of three months, hence the outcomes would be limited to the amount of research possible within this stipulated time-frame.

1.8 Research Questions

- (R1) What is a living heritage? And, what is the significance of Indian handloom as a living heritage?
- (R2) Why is there a need to study Chanderi's Handloom cluster?
- (R3) What is community resilience, and its relevance with respect to Chanderi's Handloom industry?
- (R4) What are the different aspects that contribute towards the resilience of Chanderi's handloom community and how can they help measure the degree of resilience instilled within Chanderi's handloom industry?
- (R5) How can Chanderi handloom cluster be revived through architectural manifestations?

- (R6) How can traditional systems of Chanderi's handloom community be reconfigured to bring in resilience and sustainability?

1.9 Methodology

Process Step	Description
Defining Aim, Objectives and Research Questions	**Literature Studies:** Building theoretical framework for the research through Research papers, Journal articles, Book Chapters, Thesis Reports. The literature study would include the following: • Architecture and Handloom weaving. • Handloom Sector in India. • Community resilience and its aspects. • Principles of sustainability embedded in Chanderi's weaving Industry.
Defining parameters for research as derived from the literature studied, pertaining to resilience & sustainable growth of Chanderi Handloom Industry	**'Community Resilience' parameters as defined:** Built-environment (Environmental), Culture (Social) and Business (Economic).
Chanderi Introduction and Analysis	• Context study of Chanderi. Historic significance of Chanderi and its handloom heritage. Existing Business model fabric and key partners. Various stakeholders. Their role in business development. • Analysis of Chanderi's existing fabric on the basis of defined parameters for Business, Architecture, and culture. • Defining problems in the existing framework.
Case Studies Data Collection	**Primary Studies** — Live visits, photographic documentations, visual observations, interviews, mapping. **Secondary Studies** — Literature Review: Books, Thesis reports, Journals, legal documents and reports for demographics, history and community's cluster networks.
Case Studies Data Analysis and comparative Analysis	Different cases of handloom weaving clusters across India. **Analysis based on the defined parameters as derived from the literature study.** Following aspects would be looked upon: • Embedded linkages between the social, economic and environmental aspects of resilience in various handloom communities. • Factors that have helped enhancing community resilience. • Applicability of such strategies in other contexts.
Result Outcomes of comparative analysis of the cases studied on the basis of defined parameters.	Analysing the performance of different cases on various parameters of community resilience. Understanding the factors that have worked well and their contribution towards overall sustainability of the cluster. Comparative analysis of the case studies; thereby proposing plausible parametric re-configurations that can fit well in the context of Chanderi.
Proposing reconfigurations and Design Concept for the Handloom Weaving Cluster of Chanderi.	

Table 2. Flow Chart explaining the research Methodology
Source: Author

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CHAPTER 2
LITERATURE STUDY

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2.1 Architecture of Handloom Sari Weavers' Settlements.

Bagchee, A. (2017, December). A case for conserving the Vernacular Architecture of Handloom Sari Weavers' Homes and Settlements.

2.1.1 Summary

This paper calls for concrete action to preserve the tangible heritage of India's famous sari weaving clusters. Weavers ' households that further serve as their art workshops reflect a distinctive typology of vernacular dual-purpose architecture. It discusses the implications of local architecture, its ties with the indigenous handloom weaving craft, and the results of a pilot project which aims to preserve this valued heritage built in India's historic city of Chanderi.

The study concludes with the following:
The lack of consideration of the interconnectedness between the tangible heritage of the weavers (homes, cluster communities, materials) and intangible heritage (manufacturing relationship modes of intergenerational knowledge transmission, skills and inspiration) explains to a large extent the decline of the handheld industry. Sustaining it thriving simply through involvement subsidies proposed by various government schemes may not be conceivable. These households' vernacular architecture suggests a unique typology of traditional households constructed with local materials. The region-specific layouts and design accommodate both the space for the household and also the work space for various handloom weaving processes necessary to weavers for their traditional household profession.

The paper deals with the following aspects of the tangible heritage of Chanderi weavers households:
- Historical significance in the trade links between India and the rest of the World.
- Critical relationship between Chanderi's architecture and creative inspiration for weaving.
- Requisites of weaving that shaped the architecture for the craft.
- The tangible and intangible values' relationship.

The paper reveals many bio-climatic and spatial requisites essential for handloom weaving that have shaped the architecture- airflow and ventilation, balance in humidity, sufficient light, soft flooring treated with mud and dung, linear spaces for stretching of loom, ancillary spaces for pre-loom activities, flagstone flooring, etc.

2.1.2 Keywords

Bioclimatic variables, Vernacular architecture, handloom weaving, weavers, settlements, Chanderi, Interdependencies.

2.1.3 Findings

The built environment of Chanderi's weaving heritage. Its critical importance in continuation of traditional lifestyle and creative inspiration thus sustaining the remaining handloom weavers' communities and clusters. Links between ornamentation on saris with the monumental architecture of the town.
Bio-climatic requisites for weaving that shaped the architecture for the craft such as maintenance of temperature control, regular air flow and ventilation, balance in humidity, sufficient light, soft flooring treated with mud and dung, linear spaces for stretching of loom, spill out spaces for pre-loom activities, flagstone flooring, and so on. The traditional values, both tangible and intangible, are extremely vulnerable on account of the irreversible changes that are being enforced on them.
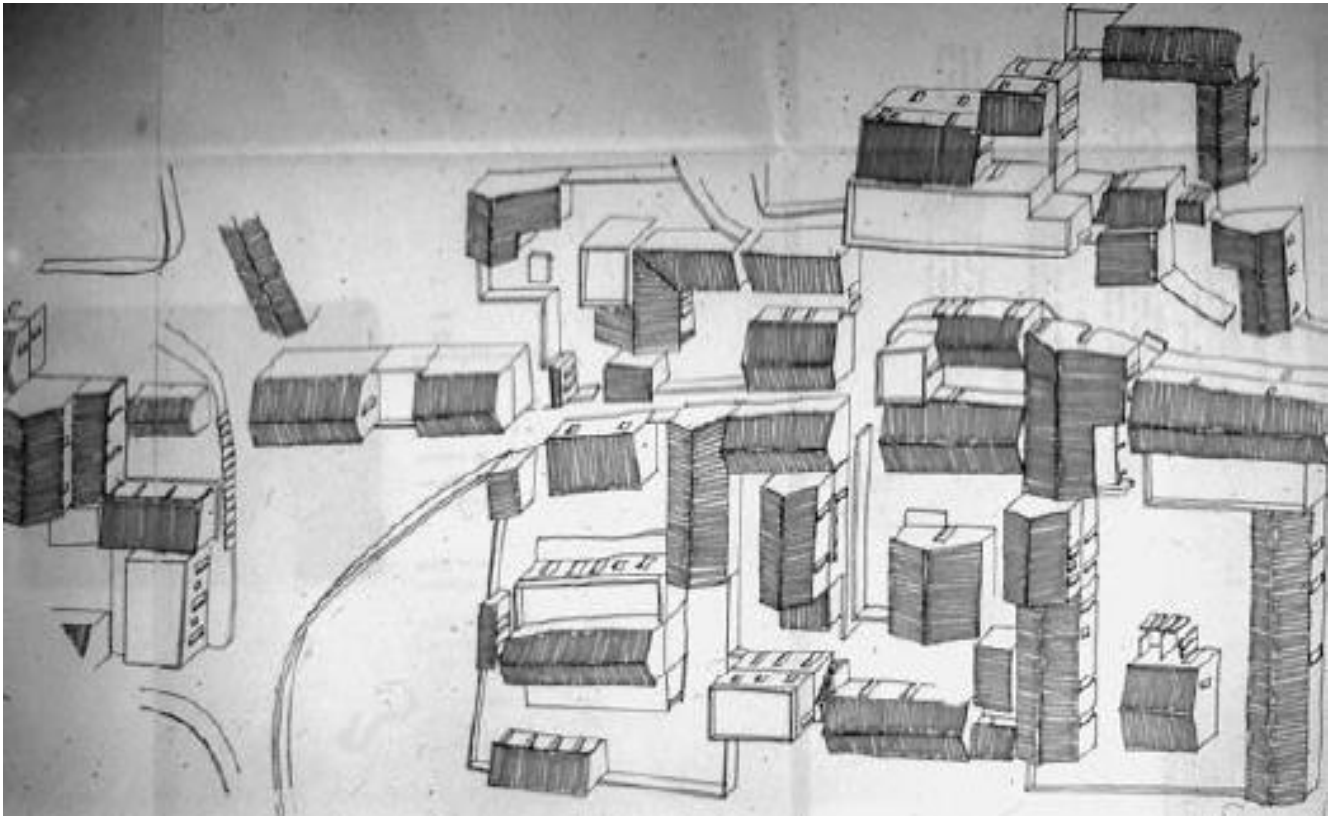
Figure 1. A typical weaving cluster with a network of built and unbuilt spaces to support the weaving process.
Source: *Bagchee, A. (2017, December). A case for conserving the Vernacular Architecture of Handloom Sari Weavers' Homes and Settlements.*

2.2 Handloom Sector in India: A Review of Government Reports.

2.2.1 Summary

This paper is a detailed compilation of the government reports pertaining to the Indian Handloom sector. It starts off with an introduction to Indian Handloom and its contribution in building up the country's economy since the historic times. Building further on that, it provides statistical data on the growth and production rates of the Handloom Industry, and various factors that have contributed towards the observed trends. It explains and critically compares the various Five-Year-Plans, and what place was the handloom sector given in each one of them. It then reviews numerous Government support schemes and initiatives. The paper concludes with a section on 'Market research and Marketing Strategies'.

2.2.2 Keywords

Handloom production, exports, handloom weavers, twelfth five-year-plan, government support schemes, market research.

2.2.3 Findings

- The distinctive image of the handloom sector is seen to be improving because of the implementation of certain government projects like 'Make in India', and inclusion into the 'Economic priority sector'.
- The United States of America, the United Kingdom, France and Germany are the biggest importers of the Indian handloom products.
- There is a dip in the number of handloom weavers, if one compares the third handloom census with the
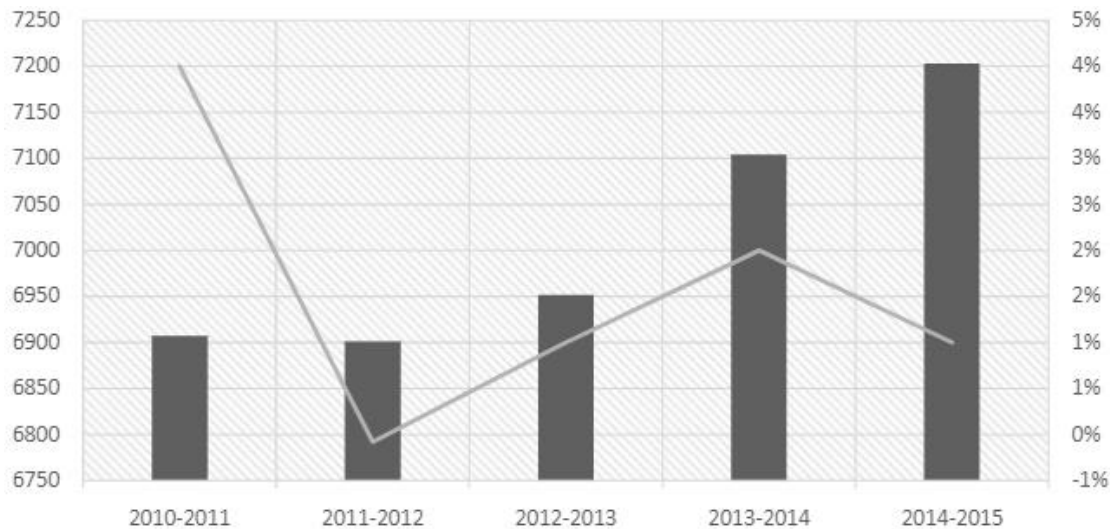
Figure 2. A Comparative chart showing fluctuating production and growth rates of the Indian Handloom Industry
Source: Venkata V. Nair S. (2017). Handloom Sector in India: A Literature review of Government Reports. International Research Journal of Management and Commerce.

- The Indian government introduced schemes and initiated exhibits, a museum of crafts, center for trade facilitation and e-commerce in order to support weavers.
- The Handloom market research established the need for large-scale funding for advertisement, accessibility, Handloom designer dresses and awareness campaigns.

2.3 Exploring the contribution of rural enterprises to local resilience.

Steiner A., Atterton J. (2015). Exploring the contribution of rural enterprises to local resilience. Journal of Rural Studies 40 (2015) 30-45

2.3.1 Summary

In this paper the authors majorly talk about the results of their case study in Southern Australia. The paper walks us through the roles that the local businesses play in community resilience. The paper majorly explores and answers the Why, How and what questions like, how do the local businesses help in community resilience? What is the reason behind local businesses helping the local communities? And how do they actually help?

The results show that rural enterprises contribute both directly and indirectly to local resilience. Some examples of direct contributions are: the creation of local jobs, local products and services. On the other hand, some examples of indirect contributions are the knock-on effect of main business activities or added value. Providing job opportunities, for example, helps in reducing the possibility of out-migration and depopulation.

The study shows the importance that rural context has in shaping the behaviour of rural business owners and incentivising them to operate in responsible ways from an environmental, economic and social perspective especially with regards to the embeddedness. However, this must not be considered a passive relationship; rural

enterprises have the motivation and resources to respond to specific local challenges, opportunities and characteristics and to turn them into entrepreneurial opportunities, proactively and skillfully. As such, they are a part of the cycle of adaptation, serving as agents of transformation to promote rural resilience. This cycle of adaptation leads to increased group resilience that allows the alteration of internal institutions and the quest for solutions to cultural, environmental and social challenges.

2.3.2 Keywords
Private sector businesses, Local (economic, social, environmental) development, Embeddedness, Resilience, Rural

2.3.3 Findings
- The following table highlights the various contributions which the rural enterprises bring to the local communities:

Category of Generated Benefits	Type of contribution	Example
Economic	Employment creation	New local jobs, diversity of jobs (e.g. provision of part-time, full-time, seasonal)
	Product and service delivery	Delivery of products/services that otherwise would not be locally provided. (e.g. accommodation, groceries, engineering services)
	Collaboration with other local and regional businesses	'Cross-promotion' and mutual support; trading and exchanging information. (e.g. distribution of discount cards encouraging to visit other local businesses)
	Added value and spillover effects	Knock-on or 'domino-effect' of business activities (e.g. generated jobs encourage young people to stay in the area)
Social	Engagement with community	Being an active member supporting a community in a range of matters (e.g. membership in a community council board)
	Promotion of community and location	Building the profile of a community and its recognition (e.g. receiving a national prize)
	Training opportunities	Provision of skills development programmes (e.g. work experience and apprenticeships for young people)
	Sponsorship, event support	Donations and support offered to local community groups (e.g. football club)
Environmental	Environmental awareness	Acting in an eco-friendly manner (e.g. through recycling)
	Protecting natural environment	Developing eco-friendly solutions (e.g. water recycle, production of solar energy)

Table 3. Various contributions which the rural enterprises bring to the local communities
Source: Exploring the contribution of rural enterprises to local resilience.
Steiner A., Atterton J. (2015). Exploring the contribution of rural enterprises to local resilience. Journal of Rural Studies 40 (2015) 30-45

- The following table highlights the economic and social contributions to local resilience of rural enterprises. In addition, the table provides information on rural enterprises' environmental contributions to developing rural resilience.
- Also, the following table finds the reasons why the local enterprises work in order to bring in local resilience.

What	How	Why
Economic	**Direct** e.g. - *Employment creation* (e.g. 'we have 21 full-time, 5 are part-time employees) - *Service delivery* (e.g. 'we give a service to the locals')	**Direct** e.g. - *To increase financial income for the area* (e.g. 'We would like to make it like a destination point eventually, have a cafe where people can come in and taste our whole range of ice-creams, look at the way the ice-cream is made, the process, so make it a destination point for people to come and visit the township… and that would promote the region and increase the amount of money that's coming into the area')
	Indirect e.g. - *Collaboration and networking with other businesses* (e.g. 'our production materials we're able to source in the local area') - *Added value and knock-on effect* (e.g. 'if we do decide to move to Adelaide, this place would be wiped off the map because we're the biggest employer')	**Indirect** e.g. - *To maintain local economic development* 'We're going to put another person on, there's another vehicle, the vehicle has been bought from the local car dealer, it will be maintained by the local car dealer, it will get its fuel from the local fuel agent, so we are contributing to the local economy in that sense'.
Social	**Direct** e.g. - *Sponsorship* (e.g. 'there is a corporate social responsibility element of supporting the local community, putting back into the local community') - *Training opportunities* (e.g. 'we are an employer of people with disabilities … it's also a place where they can mix with each other and it gives them a sense of belonging. It teaches them social skills and ethics)	**Direct** e.g. - *To be part of social networks* (e.g. 'Our family has been here on this farm for 130 years and so we're sixth generation here… so we see enormous value in being part of a small community, a strong community and so we see the value in contributing in trying to maintain that')
	Indirect e.g. - *Engagement with community* (e.g. 'We've been involved with the football club, the school council… local government … we've been involved in various sporting organisations … we are on boards and committees that will bring things back down to happening here') - *Promotion of community* (e.g. 'over the years they've come to be kind of proud of us … half of South Australia knows about us')	**Indirect** e.g. - *To support community development* (e.g. 'If we can continue to grow our business one of the opportunities is to employ more people. That means we either give locals kids the opportunities to stay in their local area and maybe take on apprenticeships, or maybe it brings more families into the local community, the local district. And that will have positive benefits for schools and the service industries in this area')
Environmental	**Direct** e.g. - *Environmental awareness* (e.g. 'we made the decision to review all our ingredients and become a palm oil free company')	**Direct** e.g. - *To maintain environment sustainability* (e.g. 'the philosophy … is that we have to be sustainable into the future and we're not here to rape and pillage the land, our family has been here for a 125 years so we have to learn how to improve our environment rather than degrade it')
	Indirect e.g. - *Natural environment protection* (e.g. 'we're seen as assisting with innovative projects, people can see that their wastewater is being recycled and used, it's a resource')	**Indirect** e.g. - *To reduce carbon footprint* (e.g. There's a fair range of products that we have on sale… so that it actually saves them customers hundred k round trip to get those sorts of things')

Table 4. The Direct and Indirect Contributions made by Local Businesses to Community Resilience
Source: Exploring the contribution of rural enterprises to local resilience.
Steiner A., Atterton J. (2015). Exploring the contribution of rural enterprises to local resilience. Journal of Rural Studies 40 (2015) 30-45

2.4 Chanderiyaan: Weaving Digital Empowerment into the Indian Handloom Industry

Majumdar B., Basu S., Jain S. (2018). Chanderiyaan: Weaving Digital Empowerment into the Indian Handloom Industry. WDI Publishing, William Davidson Institute (WDI) at the University of Michigan (2018).

2.4.1 Summary

Chanderiyaan, a Digital Empowerment Foundation (DEF) initiative aimed at bringing digital connectivity and empowerment to the hand-held industry in Chanderi, in north-central India. Chanderiyaan's focus had grown beyond merely digitizing the indigenous handloom business, and was now a full-fledged organization involved in designing, manufacturing, marketing, and selling handloom sarees and other dress materials.

The case elaborates on India's handloom industry as well as the growth of Chanderiyaan as a social enterprise including its interventions and services.

2.4.2 Keywords

Sustainable business model, digital empowerment, social enterprise, handloom, Chanderi.

2.4.3 Findings

- The main services provided by the Community Internet Resource Centers (CIRS) in Chanderi included:
  - **Digital literacy:** Through training in foundational courses in computer and the Internet, and more specialized courses in software programs for professional purposes.
  - **Digital services:** Scanning, photocopying, sending emails, conducting video calls, etc.
  - **Information services:** Information search on the Internet about jobs, education, e-commerce and entertainment.
  - **Public access services:** Participating in e-governance through the Internet.
- Information technology, particularly internet connectivity, can likely solve two of the handloom industry's most pressing problems:
  - Need for new patterns and designs.
  - Lack of outreach and intermediaries.
- Primary objectives of the Chanderiyaan project which were realized in the project.

Wireless for Communities (W4C)	This was a part of the larger Wireless for Communities program, jointly launched by DEF and Ford Foundation, to connect rural communities and empower them through knowledge and access. Under the W4C, Chanderiyaan offered wireless internet connectivity to the local population of Chanderi, using the 2.4 GHz and 5.8 GHz unlicensed internet spectrum provided by the Government of India.
Design Innovation in Chanderi Handloom	The workshops for looms and block printing at Chanderi were set up to create a platform where weavers could learn and apply the new technology hands-on, and see in real time the differences in the production process and the labor involved. The looms were fitted with the Jacquard technology, which considerably simplified the production process.
E-retailing of Chanderiyaan Products	Chanderiyaan began e-retailing Chanderi products by setting up the website www.chanderiyaan.org. The site had an intricately laid out display of over a hundred different Chanderi product offerings ranging from fabrics to garments for men and women, to home decoration items such as cushion covers, wall hangings, curtains and photo frames. Enabled with a digital payment gateway, this site enabled purchase of Chanderi products from across the world.
Wireless Women for Entrepreneurship and Empowerment Program (W2E2)	It aimed at empowering grassroots-level women entrepreneurs through IT education. Under this, women community members who were interested in entrepreneurial ventures as a means of livelihood were trained in using the Internet and social media as an aid to their chosen vocation.

Heritage, Culture, and Tourism	The handloom business in Chanderi was intricately related to the heritage of the town and its architectural splendor. The historical monuments drew tourists to this spot, who also purchased Chanderi sarees from the weavers, thus boosting the market. Moreover, the preservation of the heritage sites contributed to the preservation of the heritage of the handloom art and its authenticity.
Education through ICT	To portray digitalization as not only access to information, but also as a means to advance one's trade, DEF launched the first design training center in Chanderi. At the center, weavers and their family members were provided with training in creating software-aided garment design, thereby saving the time and costs involved in manual design.
Self-Help Groups (SHGs)	To promote its vision of enabling from within, Chanderiyaan focused on enabling the people associated with the Chanderiyaan movement to organize into autonomous self-help groups. The purpose of these SHGs was threefold: to engage in activities that make them financially stable and sustainable; to undertake educational and social initiatives that help in self-development; and to create a community ecosystem and network dedicated to collective decision-making and mutual assistance.

Table 5. The Primary Objectives of the Chanderiyaan Project which were Achieved
Source: Chanderiyaan: Weaving Digital Empowerment into the Indian Handloom Industry
Majumdar B., Basu S., Jain S. (2018). Chanderiyaan: Weaving Digital Empowerment into the Indian Handloom Industry.
WDI Publishing, William Davidson Institute (WDI) at the University of Michigan (2018).

2.5 Shared Concepts in Textile and Architecture Fields. Thesis report.

Teräs, T. (2013). Fabricated Tectonics: Two Shared Concepts in Architecture and Textile. Otaniementie 14, 02150 Espoo, Finland: Department of Design Aalto University, School of Arts, Design and Architecture.

2.5.1 Summary

This work covers two areas where architectural and textile structures converge. The principles discussed are abstract, but can be found in and applied within both practices on a tangible level. These theories describe certain qualities found in both architecture and textiles and how they are used. Subject areas that will be looked at include ornamentation, the interrelatedness of material and structure and the concept of 'dressing' in architecture. Details of woven textiles paired with architectural drawings can add to the arguments presented, and by visually and concretely illustrating these abstract concepts. This dissertation is the result of approaches focused on both art and science. The subject began to be processed by drawing and weaving models once the research issue was determined.

By studying the overlapping areas between architecture and textile structures, it was possible to reveal certain universal principles among the two. These universal principles are discussed separately and in detail in the section preceding the catalogue of examples. The use of sources in this thesis is divided into two parts. The first set of sources– or bibliography– is referenced actively in the text, but the common viewpoint forming the basis of the thesis is the result of a wider range of literature.

2.5.2 Keywords
Textile, architecture, tectonics, structure, ornament, weaving, curtain wall.

2.5.3 Findings
- Tension between ornament and structure and how it appears in both building façade design and textile design.
- The second term concerns the 'dressing' of objects, which in textile and architecture explores architectural systems as a whole.

2.6 Indian Handloom Industry (Handloom Census 2009-2010)

Thesis Report: Gupta K. 2019, Handloom Weavers Village, Maheshwar. School of Planning and Architecture, Bhopal, India.

2.6.1 Summary

The Indian handloom industry is the second largest after the Indian agriculture industry and mostly 70% of its population is residing in rural villages and towns. With the advent of power looms, availability of cheaper synthetic fibers, cheaper saris, lack of raw materials, illiteracy, lack of awareness and many more heart trembling reasons, the Indian handloom industry has been ailing with several weavers abandoning their age-old traditional knowledge systems, skills and craftsmanship in order to find more economic livelihood options. The major problems are not associated with the lack of government schemes or opportunities but the lack of attention and neglect to the interlinks between the weaver's tangible heritage of architecture, settlement patterns, materials and spatial logics and the intangible heritage of connection of productions, inspirations, knowledge transmittance, lack of creativity, etc.

2.6.2 Keywords

Handloom Industry, economy, government initiatives, built environment, shortcomings.

2.6.3 Findings

Following are some of the problems majorly faced by handloom weavers in contemporary times in the view of their architecture:

- Insufficient daylighting leads to eye problems.
- Congested and cramped up spaces leave no space for activities.
- Open sewage and lack of waste management leads to diseases.
- Lack of ventilation leads to destruction of yarn materials.
- Long hours of work lead to backaches and chronic disease.
- Lack of sustainable vernacular architecture.
- Lost collective memories in modern architecture for weavers.
- An exclusive approach to their lifestyle separating their workplace and living space.
- Lack of repair and maintenance of traditional homes due to lack of money.
- Lack of traditional craft in vernacular architecture techniques.
- Lack of links between textile and architecture in their communities.
- Lack of tourism opportunities with the urban public.
- Lack of progressive weaving facilities.
- Lack of cultural and traditional interpretation centers.
- Lack of co working and learning spaces for the weavers to collaborate with modern textile designers and spreading their identity worldwide.

2.7 Analogies between textile and Architecture, Journal Article

CRAIG S, G. (2001). Weaving as an Analogy for Architectural Design. 89th ACSA Annual Meeting Proceedings, Paradoxes of Progress Architecture and Education in Post Utopian era, 478-483.

2.7.1 Summary

The paper talks about comparing of weaving and architectural design from the analogical/conceptual viewpoint. Weaving, as a skillful craft has been a mutual cross-cultural phenomenon for thousands of years. While patterns and techniques diverge between cultures the basic skill of weaving can be found in maximum. It is an appropriate analogy for how systems overlap and work organized to create a harmonious living environment as well as the possible demolition caused by the breaking of a sole component or strand in the fabric. Architects, as generalists, have conventionally occupied the role of administrator for a building project. They are accountable for managing and 'interweaving' the interests of the related consultants, owners, occupants and contractors to

produce an evocative work of architecture. Architects and weavers both distinguish the need to look beyond surface presences in the progression of designing.

Anni Albers, weaver from the Bauhaus, states "Surface quality of material that is '*matière*', being mainly a quality of appearance, is an aesthetic value and therefore a medium of the artist; while quality of internal structure is, above all, a matter of function and therefore the concern of scientist and engineer. Sometimes material surface together with material structure are the main components of a work; in textile works for instance, specifically in weaving or, on another scale, in works of architecture.' Architectural design and weaving analogy can inform the interlacing of philosophies, people, place, space and building.

The paper underlines the three basic guidelines of architectural education in linkage with weaving. Under the course of Woven Construction, the history of physical woven construction is explored the students. In 1851, Gottfried Semper published theory of the 'Four Elements of Architecture' categorizing the construction of primitive hut into four elements of Hearth, Roof, Mound and Fence out of which, he proposed that the walls of ancient houses were not made of stone but rather hanging cloth or woven mats. Woven material as an external wall are best adapted to tropical climates where the temperature is relatively constant and airflow is encouraged. Under the subtopic of Weaving analogy as Instrumental Device, there are three projects explained one which involves the actual creation of a woven wall, the second talks about the abstract conception of weaving, the third looks at the relation of weaving to building construction. The structure of weaving deals with the study of characteristics of actual weaving through empirical, hands on making of object at full size.

The topic of Weaving an Idea: Context, Culture and Construction deals with students employing weaving analogy in its most abstract form to understand how the site, program and construction being intertwined in the design of architecture. They study the interwoven experience of architectural space and construction, the overlap of light, shadow, solid and void within the aspect of movement in time. As Steven Holl states, 'When we move through space with a twist and turn of the head, mysteries of progressively unfolding fields of overlapping perspectives are altered with a range of light-from the steep shadows of bright sun to the translucence of dusk.' Through different media of communication studies are conducted on interior spatial conditions by establishing hierarchies between public and private, service and served space, vertical and horizontal circulation, bearing and non-bearing construction and how they overlap, parallel and penetrate each other. In abstract ways space is approached as a three-dimensional cloth pulled apart to reveal changing sizes, shapes and rhythms of space and structure.

The last project of Interweaving Construction concentrates on numerous construction systems of building which are woven together to make a comprehensive product. In 1852 Joseph Paxton presented speech to explain structural concept behind his 'Crystal Palace' in which he compared the iron structural frame and the enclosing glass envelope to a table and a tablecloth. The structural frame today functions as a type of loom framework on which other systems of architectural construction can be interwoven. In both textiles and architecture, the inner structure plays a significant role in the overall form. In this student's design enclosure systems and envelopes of wall sections which depict important relationships between the structure, service, envelope and shading systems to demonstrate how they coexist within the thin slice of space.

The remarkable statement in the paper is that 'For a textile to exist as a cohesive work, all the single yarns and erratic patterns should be bound together in a synergistic and integrated whole.' Analogous to this, all the influence on the design should ultimately coalesce into an ultimate product. The paper concludes with a realization into finding better ways for the students to understand the abstract notion of weaving an idea or space which could be further developed.

2.7.2 Keywords
Weaving, Architecture, Analogy, Education, Structure, Abstraction

2.7.3 Findings
Architectural design and weaving analogy can inform the interlacing of philosophies, people, place, space and building.
- Weaving analogy as Instrumental Device.
- Weaving an Idea: Context, Culture and Construction.
- Interweaving Construction.

2.7.4 Abstractions
Architects and weavers both distinguish the need to look beyond surface presences in the progression of designing.
- Weaving analogy in its most abstract form to understand how the site, program and construction being intertwined in the design of architecture.
- In abstract ways space is approached as a three-dimensional cloth pulled apart to reveal changing sizes, shapes and rhythms of space and structure.
- For a textile to exist as a cohesive work, all the single yarns and erratic patterns should be bound together in a synergistic and integrated whole.

2.7.5 Philosophies
Anni Albers, weaver from the Bauhaus, states "Surface quality of material that is '*matière*', being mainly a quality of appearance, is an aesthetic value and therefore a medium of the artist; while quality of internal structure is, above all, a matter of function and therefore the concern of scientist and engineer. Sometimes material surface together with material structure are the main components of a work; in textile works for instance, specifically in weaving or, on another scale, in works of architecture."

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As Steven Holl states, 'When we move through space with a twist and turn of the head, mysteries of progressively unfolding fields of overlapping perspectives are altered with a range of light-from the steep shadows of bright sun to the translucence of dusk.'

2.7.6 Associations
Under the subtopic of Weaving analogy as Instrumental Device, there are three projects explained one which involves the actual creation of a woven wall, the second talks about the abstract conception of weaving, the third looks at the relation of weaving to building construction.

CHAPTER 3
LITERATURE REVIEW AND THEORETICAL FRAMEWORK

3.1 The Genius Loci

"Sense of place and genius loci can be defined as: the collection of meanings, beliefs, symbols, values, and feelings that individuals and groups associate with a particular locality" (Williams & Stewart 1998)

Genius loci is a roman concept meaning that each and every space has an overruling or protecting spirit that defines the character and identity of that space. Following are the parameters for identifying the spirit of a particular place:

Energy fields, Authenticity, Local distinctiveness, Narrative with layers of history, Empowerment of ordinary people, Essence and Interiority, Character and Individuality, Pantheism, Pan psychism, Ecosystem.

Various concepts from the study of a phenomenological approach are:
Different actions demand different places with a different character.

- All places have character
- Character of a place is a function of time
- Enclosing properties of boundaries are defined by the openings
- Centralization, direction and rhythm are important properties of concrete space
- Settlement and landscape have a figure ground relationship
- Character is how things are in an atmosphere.
- Character of a place: function of time, transposing character, material and formal constitution of place.
- Psychological functions for understanding a place: orientation and identification.

3.2 Vernacular Architecture (Amos Rapoport, 1969)

As per the ICOMOS Charter on the Built Vernacular Heritage (1999), "Vernacular building is the traditional and ordinary way by which communities house themselves. It is a continuing process including necessary changes and continuous adaptation as a retort to social and environmental constraints". In layman terms, vernacular architecture refers to the architecture without architects. It refers to the architecture built with local considerations to the available materials, traditional tried and tested construction techniques. Built by local masons without exerting any harm to the natural built environment.

Amos Rapoport in his book talks about certain simplified theories related to the development of house forms and settlements of primitive dwellings and vernacular settlements based on previous research and documentations. The discussion is confined to the principal types of explanations, including physical ones- involving climate and the need for shelter, materials and technology, and site-and social ones-relating to economics, defence, and religion.

- **Climatic Determinism**: Although climate serves to be a determining factor in majority of settlements around the world but a difference in house forms in the similar climatic context gives indication to culture being a much more prominent in determining house forms. Climate guides the architectural form, orientation of built mass, spread of built volumes, type of organization and even the materials. Certain examples of arctic dwellings having varied house forms and plans within the same climatic backgrounds around the world contradict with the rigidity towards climate.

- **Materials, Construction and Technology**: More of modifying factors than form determining factors. They are often indication of progressive innovations and progress in the society. They don't decide what is to be build and neither the form of the building. They make possible a particular space organization decided upon different grounds such as cultural inclinations, climate, defence, religion, etc.
- **Site:** The physical setting of a settlement plays an important role in deciding the organization pattern of the dwellings, climatic considerations and building construction technologies used. A highly contoured

site in the hilly terrains indicates linear settlements constructed along the topography to minimize impact of earthquakes and landslides and thereby minimizing cut and fill. Similarly soil conditions of the site determine the structural considerations of building substructure. Other site conditions such as natural drainage patterns, vegetation, water holding capacities, type of soil, etc., also affect the settlement patterns, house forms and can also govern microclimate of the site.

- **Defence**: This factor often distinguishes settlements and house form from one and other. The need for defence and even the defence being obsolete can be a governing factor in which traditional communities thrive. The form and scale of defence elements of settlements also determine the characteristic of a vernacular settlement. The choice of method for defence to be used is of great significance.

- **Economics**: It is one of the most important factors in determining to determine settlements and building forms. Economy greatly affects the use of materials, the kind of construction technologies, maintenance of buildings and the available land. But in vernacular settlements and traditional communities, it is often found that people don't give up their way of life because of economy. Households often expand in consideration with the available economy. While for nomads, an economic base affects the house form by imposing the need for mobility. Often communities with similar economic background portray different house forms and organizations due to different settings and ways of life.

- **Religion**: This is an anti-physical determinism in contrast to the physical point of view. It indicates the notion that a house is more than a shelter but more of a temple. Many cultures around the world separate the dwellings of the man and the woman based on religious beliefs and even their house forms. Religion often affects the built form, the planning of interiors, the orientation and may also give existence to different shapes of houses which indicates majority of cultures having rectangular house forms with an ease of orientation.

3.3 Shared Concepts and Analogies in Textile and Architecture

3.3.1 Concept of Ornamentation
The historical evolution of attitudes towards ornamentation and its role in architecture is depicted by the various Art movements and styles that developed in Europe since the Gothic eras. From the Renaissance times, ornament's changing relation with the façade of a building and the structure's exposure or coverage is visible till the modern and post-modern ears. The earlier practice of ornamentation has been changed drastically to a more functional definition of ornamentation rather than a mere addition or coverage of the structural members. This development in architectural history can be easily linked with the textile history following similar trends of ornamentation. Modern textiles are much more simple, sophisticated and emphasize on the structural beauty of the material rather than highlighting it with organic and literal depictions.

In the Indian context it is evident from the ornamentations of saris which were traditionally derived from ornamentations on the forts of towns in which they were produced. For example, the Maheshwari sari, from Maheshwar, Madhya Pradesh, India derives it ornamentations from the Fort complex of Ahilya Bai Holkar. Moreover, the styles haven't been the same since ages as weavers over centuries have developed much simpler ornaments and imparted simplicity to the fabrics of Maheshwar.

Both textile and architecture were initially functional in nature and have throughout the history been ornamented in various ways according to cultural inclinations. Known as 'humanization' of environment, people all across the globe have been attracted to decorations after the basic requirements of shelter and security have been met. The motivations can be religious, cultural or spiritual behind the ornamentations of textile and architecture.

3.3.1 Concepts of Parts Forming a Whole
The notion of dressing or wearing a fabric is similar to the dressing of buildings conceptually and literally or physically. Textiles were used to provide shelter in the primitive architecture as discussed in the previous chapters got transformed into earthen materials thus forming the basic element of modern architecture, a 'wall'.

The wall as a single unit and its relationship between the structures underneath work as an integrated system similar to that in textile. Semper insisted in his works that earlier the wall was developed not only to provide a spatial experience but as a frame for the textile screens. (Semper, 1989) According to Semper, all the existing built forms, construction methods initially developed from textile production methods such as the interweaving, the knots, layering, etc. Semper was successful in tracing the origins of architectural practices, ornamentation and structural elements to the textile practices of specific cultural societies. (Semper, 1989)

From the works of Semper, Mies van der Rohe and John Ruskin, it is evident that textile and architecture components are used in a similar manner forming from parts to a whole. From the development of a primitive wall of woven covering inside a frame to the role of textile becoming distant from structural members similar to the exterior building gradually departing away from the interior load bearing structure. Through the architectural revolution by Le Corbusier and Mies van der Rohe of the curtain wall system, this condition is best depicted. Both architectural elements and textiles are produced from structural organizations and systems. If we remove the paint from a wall, the identity might change but the structural integrity won't. Similarly, the organization of threads in a textile have a unique integrity which distinguishes it from plastics. It is only through the Structural Rationalist thought of the 19th century that architects around the world came to perceive buildings as composite systems of structures and several other components.

For example, the traditional warp and weft technique of producing handlooms and the bamboo woven screens; the invention of modular building systems or jacquard looms depict that both textile and architectural industries have evolved to complex structural systems.

3.3.3 Layered formations

Certain structural typologies of textile and architecture are based on number of layers used to produce them. Both the fields can incorporate layers and even the functions of these layers can be integrated to enhance a spatial experience or a body comfort. For example, maximum houses in the harsh climates of hot and cold incorporate multi-layered façades with insulations consisting of exterior claddings, insulation, primary structure and interior finishes or wall papers for thermal comfort and acoustic treatment. Similarly, textiles are often woven in layers to enhance the body warmth or to increase the opaqueness. In textiles too, the functional properties of each of layer of textile can be layered upon others to increase certain thermal resistances or other qualities associated with the human body.

3.3.4 Permeability and Flexibility

A building envelope is so designed as to allow the easy flow of wind and daylight thus enhancing the comfort for the users inside. Similarly, textiles are woven with pores and varied openings to allow the body to breath and not to suffocate the user. The openings in architecture are similar to that in textile with only a difference of scale and proportion. As a fabric allows the body to breath with its permeability, so does the architecture enhance a spatial experience. Without efficient permeability according to the needs of the physical context, the user feels suffocated and hosts several diseases. A similarity in this aspect is also found in natural fabrics in textiles and natural materials in architecture.

3.3.5 Context response

Both textile and architecture are highly governed by the physical, social and cultural context it is present in. For example, the design of woollen textiles with multi layers, wool fabric, less permeability, dark colours, thick membranes and low thermal conductance is contextually responsive to the climatic conditions, locally available natural materials and the ornamentations are often culturally affected. Similarly, the traditional architecture of cold climates in governed by fewer openings, multi layered walls with insulations made from stone, timber or mud, pitch roofs and less thermal conductivities is contextually responsive to the harsh cold winds, snowstorms and heavy rainfall.

3.3.6 Tactile Memories (texture)

Materials used in both textile and architecture can be natural or synthetic based on the requirements of context and client. But often natural materials possess certain textures that have tactile memories associated with them. The aging characteristics that impart organic textures, colors, rootedness to the natural elements, transforming qualities under different climatic factors and the human scale of these natural materials are responsible for such memories to be naturally embedded in the human mind. Such tactile memories are common to both architectural elements and textiles. For example, the surface qualities of linen fabric, woolen fabric, silk fabrics, etc. and the textural qualities

3.4 Indian Handloom Industry (Handloom Census 2009-10)

3.4.1 Introduction

Since centuries, handloom weaving of India has been famous for its exemplary skill and diversity in designs, materials, ornamentations, etc. Handloom weaving in India has never been practiced in isolation or never treated as a craft done in isolation. It was always done in communities and families with a hierarchy of ownerships and hierarchy in trade facilitation. The handloom weaving tradition is now considered as an Intangible heritage of India. Ranging from *saris5*, handkerchiefs, shawls, carpets, and many more fabrics are unique to the handloom community of a specific geographical location. These handloom fabrics are imbued with rich cultural values, historical significance, religious values and traditional knowledge and skill systems attached to their production and use.

The uniqueness of Indian handlooms is the interesting relationships these communities have with their architecture in which their textiles are crafted.

3.4.2 Evolution

Ancient and medieval Indian textiles hold much of their record in literature and sculpture. There is archaeological indication, that fine woven cotton cloths were found in Mohenjo-daro during Indus Valley Civilization. The civilizations of Harappa and Mohenjo-daro also disclose the use of woolen and cotton embroidery in handloom.

This industry appears to grow between 5000 and 4000 BC. The tradition was kept thriving by the generations of the handloom weavers. A handbook of administration, the Arthasastra, uncertainly dated to the third century B.C., dealt with approaches for distributing materials to spinners and weavers whether the labors were guild memberships or worked privately at household. Even the Vedic literature has also cited about the Indian weaving graces. Preceding to imperialism in India, all the natural fabrics i.e. silk, cotton and jute were hand-woven and *khadi* was among the prevalent materials at that time.

Then throughout the British rule, the mechanical system was used for faster work in spinning and weaving and the export business of cotton and silk underway. This enabled the Indians to show their proficiency talent in other countries. During the freedom struggle Mahatma Gandhi tempted to the general public to make custom of handwoven clothes, as a fragment of the Swadeshi movement (1905 onwards). The home-grown impact of the *charkha* movement was also notable. On 15th August 1947, the *charkha* developed the symbol of national renaissance.

Handloom has carried onward an age-old inheritance and has evolved with specific regional geographies that are distinguishable due to use of characteristic styles and techniques. The post-independence period has observed considerable growth in this sector. *"According to the Handloom Census of India (2009-10), handloom industry establishes around 14 percent of total preindustrial production and 30 percent of the total export business. It is also the second largest industry in India."* ((Handlooms Census), 2009-10) Every state of India has the skill of handloom to offer, which displays their distinctiveness.

3.4.3 Sari, Traditional Fabric

Sari is a flamboyant unstitched piece of baric draping around a woman highlighting her socio-cultural identity. One of the oldest garments of the Indian subcontinent, sari enhances and blends the unique identity of every

Indian woman. From exquisite traditional ceremonies to casual everyday wear, a sari is the most celebrated costume for every occasion. Also, it is one of the oldest garments in the history of world's textiles and still followed on. India has a long tradition of unstitched garments like shawls, dhoti, dupattas, pagadis, etc. out of which a sari holds long traditional importance. It is not merely a piece of cloth with patterns, structures and weaving styles but it is also identified the style of draping that garment over and around a garment.

Generally, a sari is 45-52 inches in width and 4-9 yards by length but it is different in different regions, climates, cultural contexts and quality of material available to weave it. The weavers vary the dimensions of a sari based on kind of community that would be using it for example, the tribal communities have shorted span of saris that can assist them in their chores around a forest. It can also be governed by the way in which is draped around the human body. The ways in which a sari is draped signify the weaver's cultural identities and its origins. A traditional sari is easily distinguishable by the design and its weaving.

3.4.4 Condition of Handloom Industry in India
The Indian handloom industry is the second largest after the Indian agriculture industry and mostly 70% of its population is residing in rural villages and towns. With the advent of power looms, availability of cheaper synthetic fibres, cheaper saris, lack of raw materials, illiteracy, lack of awareness and many more heart trembling reasons, the Indian handloom industry has been ailing with several weavers abandoning their age-old traditional knowledge systems, skills and craftsmanship in order to find more economic livelihood options. The major problems are not associated with the lack of government schemes or opportunities but the lack of attention and neglect to the interlinks between the weaver's tangible heritage of architecture, settlement patterns, materials and spatial logics and the intangible heritage of connection of productions, inspirations, knowledge transmittance, lack of creativity, etc.

Following are some of the problems majorly face by handloom weavers in the contemporary times in the view of their architecture:
- Insufficient daylighting leads to eye problems
- Congested and cramped up spaces leave no space for activities
- Open sewage and lack of waste management leads to diseases
- Lack of ventilation leads to destruction of yarn materials
- Long hours of work lead to backaches and chronic disease
- Lack of sustainable vernacular architecture
- Lost collective memories in modern architecture for weavers
- An exclusive approach to their lifestyle separating their workplace and living space
- Lack of repair and maintenance of traditional homes due to lack of money
- Lack of traditional craft in vernacular architecture techniques
- Lack of links between textile and architecture in their communities
- Lack of tourism opportunities with the urban public
- An exogenous approach to their trade and craft
- Lack of progressive weaving facilities
- Lack of cultural and traditional interpretation centers
- Lack of co working and learning spaces for the weavers to collaborate with modern textile designers and spreading their identity worldwide.

3.4.5 Handloom Clusters (Bagchee, 2017)
Across the Indian subcontinent are numerous saris weaving clusters which have over centuries, produced exemplary traditional saris. Most of these communities are a part of the rural India away from urban punctures but also deprived of attention and care by the government. The architecture of such communities is mostly rural and vernacular in nature. Developed over the years, their traditional homes and settlements depict remarkable architectural qualities in sync with the textile they produce. Historic towns such as Chanderi, Maheshwar,

Banaras, Paithan, Kanchipuram, Pochampally and many more are famous for their unique style of hand-woven saris.

Following are some of the qualities these communities depict in their settlements and their artisanal workshops cum homes:
- Dual typology of spaces which means that spaces are evolved by the needs of living spaces along with working spaces. A sort of traditional co-working space.
- House significant amount of people, the handloom industry being one of the largest in India with 4.3 million people from rural artisanal families.
- Widespread across the entire country.
- Effect of regional factors of building materials, climate, culture and traditions of communities.
- The saris are imbued with historic tales, ancient links, trade routes and stories that age back to the royal times.
- Links between ornamentation on saris with the monumental architecture of the town.
- Maintenance of temperature in the architecture for the quality of cotton and silk, the handloom equipment and the weaver's health.
- Significance of permeability for maximum air flow thus using courtyards for the quality of yarn, threads and for a comfort of weaver working for hours.
- Humidification control to prevent breaking of yarn threads by using mud flooring and stone walls.
- Efficient daylighting by using large openings on opposite ends for the weaver's health of eyes.
- Soft flooring made from mud for flexibility of pit looms and for care and handling of loom equipment which can be costly for weaver. Also, it is bug and termite resistant which can hamper the yarn material.
- Longitudinal linear spaces for pre-weaving activities like stretching of yarn, etc.
- Open spill out spaces as courtyards for pre-loom activities and social interactions between the workers.
- Locally available materials such as mud, stone, country tile, slate, etc.

3.5 Theoretical Framework

It comprises of the theories used for site study and case studies in order to come up with design strategies and proposals after understanding the prevailing issues with the present condition of Chanderi's handloom weaver's cluster. The research develops around the following theories:
- Genius loci or spirit of place of a weaver's village
- Relationship between handloom weaving and architecture
- Physical determinants of house forms and settlement
- Socio-cultural determinants of house form and settlements

3.5.1 The Genius Loci

- **Energy fields**: A characteristic point of intense energy tangible or intangible that can be felt in a designed space. In the case of weaver's village, it is the unique sound of constant use of handlooms which identifies the place.
- **Authenticity:** Certain unique character or tangible element or intangible cultural value associated authentic to a certain place. In Chanderi, Saree ornamentation inspired from forts architecture.
- **Local distinctiveness**: Refers to local physical and cultural considerations manifested in the architecture of place. In case of Chanderi, Hierarchy of courts, compact clusters, traditional Wada architecture, brick architecture, thick walls, and deep plans, pitch roofs, etc.
- **Narrative with layers of history**: Story of Chanderi's handloom, Emotion of respect, care, trust, guardianship, empathy.
- **Empowerment of ordinary people**: Handloom Weaver and their families.
- **Essence and Interiority**: Dual nature with interwoven working and living environments, along with spatio-temporal variations.

- **Character and Individuality:** Cultural industrial environment with interdisciplinary linkages.
- **Pantheism**: Work is worship. Reality is identical to divinity.
- **Pan psychism**: Consciousness in the inanimate tools of handloom, raw material and the final textile product.
- **Ecosystem** of growth, inspirations, Eco friendly, intangible cultural heritage passed on to future generations.

3.5.2 Architectural Metaphorism

3.5.2.1 Relationship of parts to whole:
- Process oriented approach instead of product oriented.
- Interweaving and overlapping spaces, movements, activities, volumes, etc.
- Community involvement where families and neighbourhoods are interlinked.
- Layered formations wherein countless layers of traditions, spaces and knowledge skills are piled up.

3.5.2.2 Tactility:
- Tactile comfort which is required for handloom activities as it is a long strenuous activity.
- Tactile memories which aid in a sense of belonging and sense of responsibility to the space.
- Imparts an identity to the fabric as well as the architecture.

3.5.2.3 Permeability:
- Visual and perceptual permeability, community interaction, to expose the process of handloom.
- Breathing quality, to inhale and exhale.
- To expand and contract spaces.

3.5.2.4 Continuity:
- Spatial continuity.
- Perceptual and visual continuity.
- Contextualise or respecting and evolving the context.

3.5.2.5 Organic character:
- Temporal variations and multiple uses of the same spaces.
- Variety of community spaces.
- Labyrinth of pathways.
- Breaking away uniform patterns and similarities.
- Incremental, need based, irregularities, and variations in built forms and spatial organizations.

3.5.2.6 Ornamentation Concept:
The concept of ornamentation on the saris being inspired from the fort complex architecture has been followed since ages in almost all the weaver clusters. Ornamentation on the sari is also affected by the region and community for example the saris of Varanasi host zari work from block cards and those of Maheshwar are simple and geometrical inspired from the Ahilya fort complex.

3.5.2.7 Parts to whole concept:
The warp and weft techniques of Indian handlooms impart a unique structure to the sari and the use of zari work adds up to the structure more. A sari is never woven in one shot but takes a part by part designing and developing on the loom. The shear amount of intricacies and parts associated with a sari weaving is similar to the architectural structure of vernacular construction techniques followed by the communities. The vernacular architecture of mud brick, stone, mud and clay tile is also a part by part weaving of single units to form a dwelling unit.

3.5.2.8 Layered formation:

A sari is also woven in layers right from the initial stages via warp and weft with zari work and times which is similar to their architectural typologies depicting layers of open and closed spaces, public, semi-public and public spaces for the various process associated with the textile production. Also, a sari is renowned due to the countless layers of history it has preserved in the cloth in metaphorical terms which makes it unique to the region and its tales. There are layers of culture, tradition and heritage imbued in an Indian traditional handloom sari much like their vernacular architecture.

3.5.2.9 Permeability and Flexibility:

Handloom saris are made from natural yarn material mostly silk and cotton which serves to impart excellent permeability and body comfort to the wearer. Similar is their vernacular architecture that is permeable to wind, water and sunlight required for the quality of their textile production and the health of a weaver.

3.5.2.10 Contextual response:

Context response is pretty easy to observe in any traditional sari as the region-specific conditions of climate, culture, local material, traditional values, ornamentations, community needs, trade, etc. indicate the identity of the sari as well the vernacular character of weaver's communities. Often the sari is identified by the town it has been traditional produced in, for example Chanderi sari, Kanchipuram sari, etc.

3.5.2.11 Tactile memory link:

The tactile memories of saris and the vernacular architecture of weaver's communities are experienced and enhanced by their extensive use of natural materials to produce the fabrics and architectural elements. Also, the historic values associated with their intangible and tangible heritage are imbibed in almost all Indians.

3.5.3 Community Resilience

It is difficult to describe community resilience in a single definition, because there is no consensus about what constitutes one. While the term may be defined as the capacity of the system under consideration to withstand disruption and reorganize when experiencing change in order to maintain effectively the same role, identity and structure; resilience is often perceived as the presence, production and contribution of a community's resources by its members to ensure survival in an environment marked by changes, confusion, etc.

The certainty of change has become inevitable in modern community life, and societies can minimize the negative effects of any changes that they can foresee, and plan to rebound quickly from the ones that can't be mitigated. Resilience in a community implies adjustments and pro-activity relative to constraints, shifts, obstacles & challenges & involves mechanisms that enable a community to survive, given the continuing variations in the complex natural & complex socio-economic environment. Ideally societies have the ability to predict risk, restrict consequences, and quickly bounce back in the face of rapid change through resilience, adaptability, adaptation, and growth. This indicates that the interaction between community agents & structural forces where community members are impacted by, but are also capable of having an impact on their surroundings.

Existing literature in this field shows that social aspects, economic characteristics and environmental characteristics are the key components of communities that are truly resilient. It's necessary to have the capacity to adapt in all three of the above mentioned dimensions to build more resilient and productive communities; i.e. many rural communities that are resilient accept parts of a practically possible local economy, a clear social capital , sense of belonging and citizen participation, along with the quality of the local environment. It's widely accepted that economic, environmental and social capitals are the 'glue' that keeps these communities together and that each one of these kinds of capitals is necessary for well-functioning communities. Resilience does not depend on a single cause, and is not directly associated with economic or socio-cultural issues. Rather, cultural, environmental and social problems are interrelated, and resilience is simultaneously based upon all three.

4.1 Historical significance of Chanderi

The town of Chanderi, has been a prominent urban center since the XI Century AD. The town has a rich history shared among several dynasties such as the Kings of Paithara, Delhi and Mandu Sultans, Kings of Bundela and the Scandia's of Gwalior. Situated at the border between the cultural regions of Bundelkhand and Malwa, Chanderi's location was on a very important arterial route, not just to the ancient ports of Gujarat but also to Mewar, Malwa, the Deccan and Central India. The environment of Chanderi transformed this into a natural bastion.

Historically, the king, with the advice of his architects and planners, took decisions on the construction and layout of the town in Chanderi, at the settlement level. The walled town of Chanderi was laid out on the principles of Prastara planning. These ancient codes and scriptures informed the layout of key features such as the main streets, royal palace location and government and administration seats, neighborhood location, and the city's overall form. The king and other royal family members built water bodies such as *talaab* (ponds or lakes) and *baoli* (stepped wells), temples and mosques, and the city wall.

Today Chanderi is dictated by the art of weaving Sarees and a number of other hand-loom products. For the past six hundred years the living tradition of weaving has been prevalent and even today more than half Chanderi's population is sustained by work related to weaving. The town is divided into *mohallas*, or neighborhoods of residence. The *mohallas* of the various communities of weavers are a significant portion of the urban morphology and city.

Ibn Batuta, the famous XIII century visitor from Morocco remarked: "*it is a big city with thronged market places*", like the famous *Sadar bazaar*. The *Sadar bazaar* of todays' Chanderi is stocked with gossamer sarees shops. Designed originally, to be on the level with riders on elephants, horses and foot the shops are usually three-stories giving a unique profile to the bazaar's street.
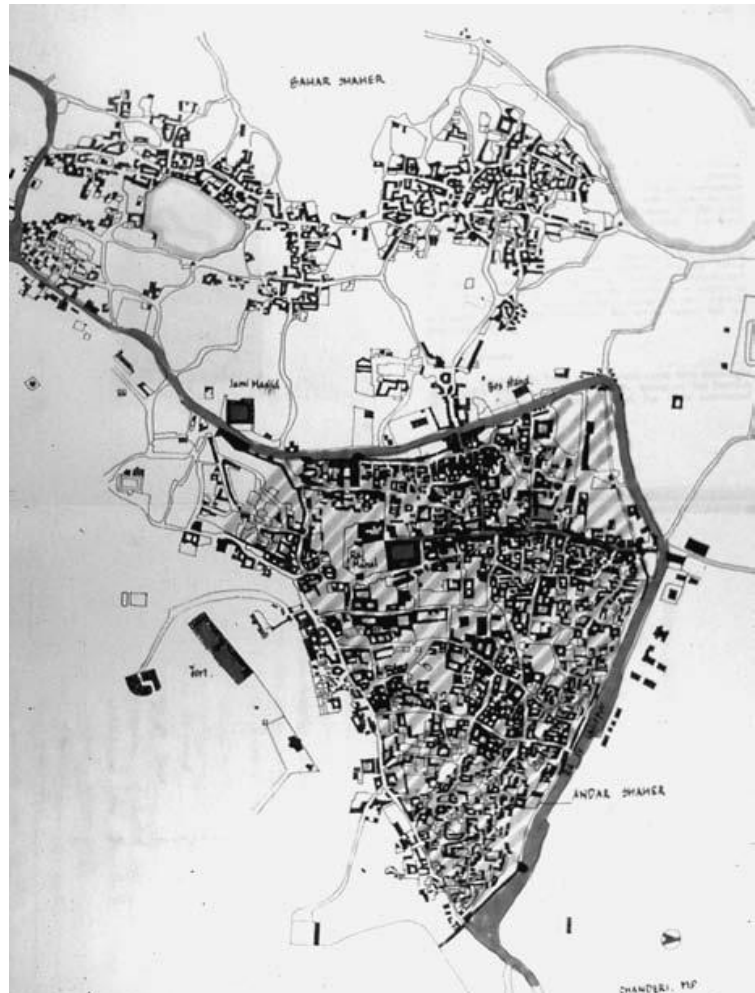

Figure 3. Layout of Chanderi, India. Shows an incrementally developed built form with separate neighborhoods. The dark line shows an asphalt road that connects the town to a highway.
Source: History, Tradition and Modernity: Urbanism and cultural change in Chanderi, India

Chanderi has been continuously evolving according to the transformations in the handloom industry. What we see today of Chanderi is the amalgamation of its tangible and intangible weaving heritage coupled with the contemporary and indigenous built environment. Chanderi is an effective subject to understand the translation of traditional to modern keeping constant the production and economy of the people.

4.2 The 'Living Heritage' of Chanderi's Handloom

The history of Chanderi dates back to the eleventh century, when it was a major trade center connecting all the major trade routes between North India, the Deccan, and the western coast port of Gujarat. Apart from its historic and archaeological splendor, Chanderi is world famous for sarees, cloth, and apparel, with its handloom trade dating back several centuries. Chanderi handloom products were originally used exclusively by royalty, but at the advent of the 20th century, the products became popular among the masses and the Chanderi handloom industry continued to establish itself in Indian as well as global markets.

Handloom forms the chief source of livelihood for about 60% of the population of Chanderi. It is home to about 15,000 weavers working on about 5,000 handlooms. Handloom had historically been a family trade, with all members of the family engaged in spinning and coloring the yarn, mounting the thread on the loom, weaving the saree, and washing and ironing to prepare it for sale. This centuries' old craft gets passed from one generation to another, chiefly through apprenticeship of youngsters under the elders of the family. The custom of marrying locally further kept the art alive as the brides, themselves from the families of weavers and trained in the art, joined the family trade in their conjugal homes.

4.3 The Tangible Values of Chanderi's Handloom Community

4.3.1 Spatial Hierarchies

Traditional handloom weaving clusters of Chanderi are the perfect demonstration of spatial hierarchies. Based on both functional and socio-cultural factors, the hierarchy of spaces in the built-environment has been a key factor behind the adept 'household-manufacturing' system that the community embodies. A spatial order is conceived between the interior spaces where the loom is placed, and the spill-out spaces which support ancillary activities such as stretching of looms and other pre-loom activities.

However, if one compares a traditional weaving cluster with one of the recently-developed ones, a gradual shift in these spatial hierarchies can be observed. Various factors such as, space constraints, dissolving social-hierarchies, modifications in ancillary processes (dying and stretching of yarn, warping of beams) and tools (majorly looms) have contributed to the gradual dissolution of the existing spatial order. This transformation ranging from micro-level (household) to macro-level (cluster) has contributed significantly in the overall weaving process, hence forms one of the major parameters to be analyzed.

4.3.2 Construction Materiality and Structural Systems

Modern construction practices have started to engulf traditional settlements as well. Taking an example of 'Chinkari Architecture', synonymous with Chanderi's vernacular construction style, is gradually being replaced by a generic RCC construction. This transition not only takes the community away from its roots, but also has an impact on the overall identity of the settlement. However, there aren't only downsides to it, aspects such as larger spans, high ceiling heights, etc., which are quite essential for a comfortable working and living environment can be well achieved through modern construction techniques. Hence, construction materiality and structural systems become a major aspect which is contributing to the transformation of the built environment of the weaver's clusters.

4.3.3 Architectural Response to Bioclimatic Requisites for Weaving

There are several bioclimatic requisites of weaving shaping the unique architecture of Chanderi's handloom clusters. Aspects such as maintenance of temperature control, balanced humidity, regular airflow, adequate lighting have led to the evolution of the indigenous architecture over the centuries. Now, that this vernacular architecture is being densely replaced with the generic RCC structures, one needs to analyze the bioclimatic performances of such structures, and how they are impacting the livability of weavers and their weaving process.

4.3.4 Weaving Tools

Ever-evolving weaving tools have been an important parameter delineating the built environment. At times, sudden transition from one type to another leads to unprecedented trouble, as the build might not be designed to accommodate the new tools. For example, until recent times, 'pit looms' were the only type of handlooms employed for weaving purposes, hence a 'pit' on the ground and low ceiling heights were designed to accommodate them. In the recent past, these traditional pit looms have been replaced by the 'ground' looms, which do not require a pit on the ground, but need a much higher ceiling height. Weavers are left with no other option than to adapt to abysmal anthropometric conditions; thus compromising on their health and productivity.

4.4 The Socio-Economic Hierarchical Configuration
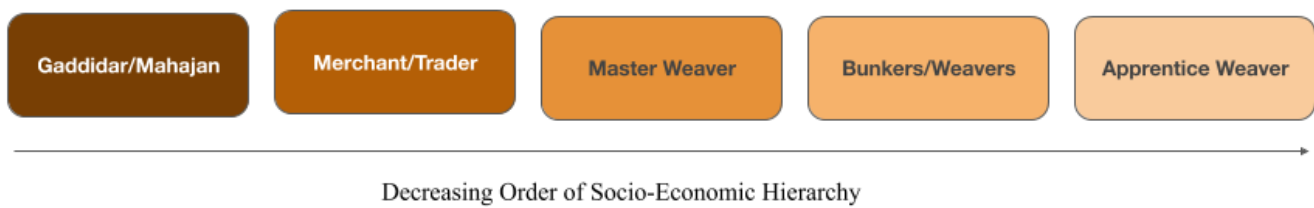
Figure 4. Decreasing Order of Socio-Economic Hierarchy in Chanderi
Source: Author

Handloom weaving is a cultural field where *Gaddidar/Mahajan* (the entrepreneurial group who invest their capital in several stages from production to trading), Merchant/Trader, Middlemen, Master-weaver (Small entrepreneurs who invest money in small quantity in comparison to the *Gaddidars*, and have a certain group of weavers working under him) and Bunker/Tanti/Weaver (the class of employee who performs the process of weaving in a network) are main identities who are occupying different positions connected to each other in weaving practice. In this area, these social groups represent an organizational structure that is the established pattern of relationship between different components or parts of the organization. These components define the formal division, grouping, and coordination of tasks.

These socio-economic hierarchies dictated the spatial logic of traditional weaving clusters. The design of each cluster responded to the socio-economic hierarchies, but keeping intact the essential linkages through space which these enclaves required for optimal functioning of the whole system. However, in recent times these hierarchies seemed to be fading away, as these clusters started to stand out on a global platform.

Numerous MNCs and fashion designers from across the globe began approaching these weavers directly and offered them direct contracts under them. This resulted in a gradual shift from an explicit hierarchical system to more of a 'nuclear' system, where the weavers found no need to be working at the lowest spectrum of the established hierarchy.

4.5 The Business Model Fabric of Chanderi

4.5.1 Key Players

Handloom weaving continued to be a household industry in India in which family members worked as one unit. In this kind of an enclosed setup, weavers traditionally depended on external agents for procuring raw materials and selling their products in the market. **The three-tier system of Chanderi Handloom Industry:**

The Weaver	The weaver weaves the cloth in the loom at his/her home or at a workhouse and brings it to the middleman or intermediary. Weavers typically do not directly sell their product to the market and have less access to the end consumers.
The Middleman	The middleman, also called the Master Weaver, buys the fabric or the finished product from the weaver and takes it to the wholesaler/retailer. The middleman often has a workhouse where several weavers work for him on a "per piece" rate. The middleman is responsible for generating orders from the wholesalers/retailers and providing design specifications to the weavers, depending on the demands of the market. Middlemen also typically provide the raw materials, such as cotton, yarn, and dyes, to the weavers.
The Wholesaler/Retailer	These include the sari shops, showrooms and firms such as Fabindia, who take the end product to the market. The wholesaler and retailer advertise the product, generate and assess demand, and provide design specifications to the middle men, depending on the trends in the international and national markets.

Table 6. The three-tier system of Chanderi Handloom Industry
Source: Author

4.5.2 Other Stakeholders

In addition to the tiers above, the handloom industry had another major stakeholder: the cooperative societies. The cooperative society system is designed to maximize benefits for weavers in the production chain. In cooperative societies, weavers unite in the functional areas of marketing, sales, and commissioning orders, in addition to weaving. This eliminates intermediaries and ensures a larger share of profits to the weavers. In general, weavers' cooperative societies follow a two-tier structure: a primary cooperative society at the village level, and an apex society at the state level.

4.6 Takeaways from the Analysis

The above analysis helps us identify both, positives and negatives pertaining to the Chanderi handloom clusters. Following are the conclusions gathered from the analysis:

- The Spatial hierarchy in Chanderi's weaving clusters is still well pronounced. A matrix of streets, courtyards, weaving rooms, etc. accommodate all the weaving and ancillary activities really well. Even though the materiality of the built spaces is shifting towards the contemporary ones, the spatial hierarchy is still very well retained.
- RCC structures with plastered walls are being adopted by the weavers at a rapid rate. These structures help them achieve higher ceiling heights, which was not possible with traditional stone construction. Plastered walls help weavers by providing a dry, moisture-free surface as compared to the mud walls.
- As compared to most of the traditional weaving communities of India, Chanderi excels in supporting infrastructure. Having been recognized globally, Chanderi now abounds with a number of government and non-government organizations, which in some way or other supports the weaving industry of Chanderi.

4.6.1 Emerging challenges faced by the handloom weavers of Chanderi

- Economic condition of weavers is still one of the bigger challenges to be tackled. Poor economic conditions of most of the weavers, is forcing them to take other occupations and leave behind their family legacy of weaving.
- Due to the staggered access of the artisan to the market, the weaver got paid on a daily or a 'per piece' basis. Further, there was lack of standardization in the prices, resulting in confusion among the consumers. The cooperative system, which otherwise could have been an answer to weavers' woes, was often riddled with corruption and political interference. Moreover, many handloom weavers were not members of these cooperatives. Finally, handloom weaves such as Chanderi saris lacked any quality control mark, leading to a dilution of the quality of the product.
- The dilapidated state of built-environment. For example, the traditional pit-looms are being replaced by the ground-looms. This transition requires a greater ceiling height as compared to the requirements of the pit-loom, this shift further accentuates the rapid use of RCC structures in place of the traditional *'Chinkari'* construction.

4.7 Parametric Analysis of Chanderi's Handloom Weaving Community
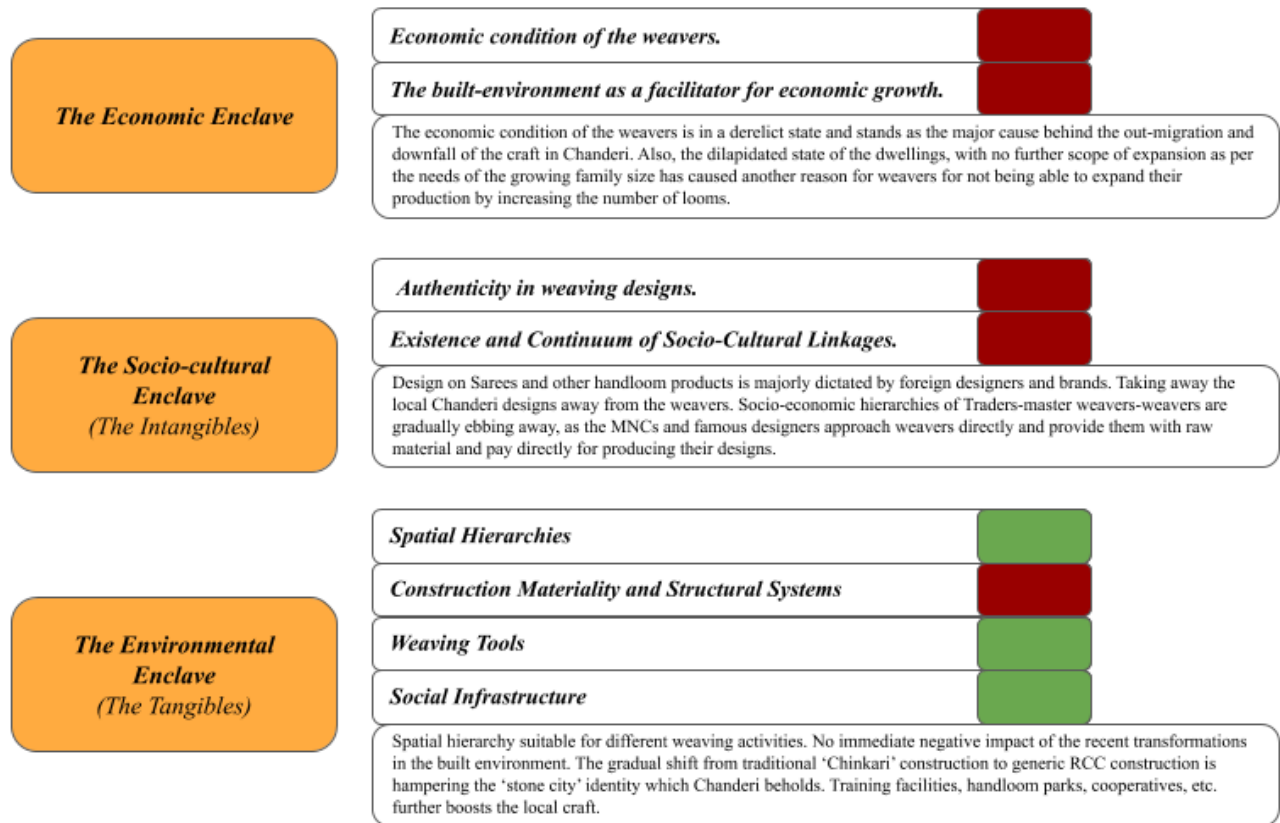
Figure 5. Parametric Analysis of Chanderi Handloom Cluster in Order to Measure Community Resilience
Source: Author

4.8 Plausible Reconfigurations to Chanderi's Handloom Cluster

As the results from literature and Case studies conducted during the course of this research are studied, a set of persistent problems have been identified. The in-depth analysis of Chanderi handloom community has helped identify some of the pressing issues (classified under the parameters of community resilience) that the community is going through. Following are some of the possible reconfigurations that can be made to the existing Chanderi handloom community.
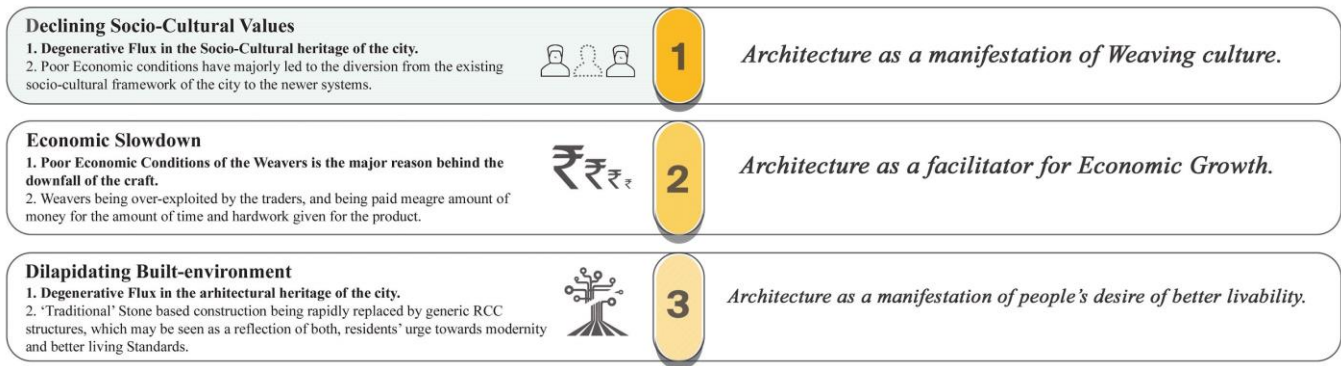
Figure 6. Takeaways from the Case Study of the Chanderi Handloom Cluster.
Source: Author

4.8.1 Reconfigurations to the Cluster's Economic Structure

Economy has always been an integral force behind any settlement being sustained. It's shameful that the highly skilled weavers, despite being well-qualified in the weaving industry for decades, are disheartened to continue pursuing a livelihood in this sector because it doesn't pay them well. In case of Chanderi, the existing business model fabric plays the vital role behind the poor economic state of the weavers. Therefore, it is imperative to identify potential avenues for revenue generation, and design a suitable supporting built environment for them.

● **Filling in the void between weaver and buyer:** In case of weaving clusters, the design of the cluster should be such that it allows for one-on-one interaction between the consumers and the weavers. This would not only create awareness in the users' mind about the whole process of weaving and but also offer a glimpse into the lives of the weavers and the amount of hard work that goes into it. This would also create a possibility of direct selling of the product by the weaver, such that he makes more profit.
● **Exploring the avenues of E-retailing:** E-retailing stands as one of the brightest prospects in Chanderi's handloom industry. This reconfiguration in the business model fabric would eliminate middlemen, who have been exploiting the weavers all this while. For e-retailing to become a reality, weavers would need to be empowered through the required knowledge and accessibility. Proper, designated infrastructure like training centers, would be required wherein the weavers could be trained with the new technology.

● **Direct selling of the handloom products by the weavers:** Keeping aside the quota of handloom products ordered by the traders, there can be an ancillary production, which the weaver could sell on his own. This would call for some appropriate infrastructure like a *'haat'*, wherein weavers can come together, exhibit their products, and sell them directly to the buyers.

4.8.2 Reconfigurations to the Cluster's Built Environment

● **Reinstating the Spatial Hierarchies:** Spatial hierarchies have been an important characteristic of Chanderi handloom cluster. However, in recent times, the traders started to import yarns which are already dyed. Since, there is no need to dye the yarns or other pre-weaving activities anymore, the ancillary spaces such as courtyards, streets, semi-covered verandahs, have been ebbing away. As the

dyed yarns cost more than the traditional un-colored yarns, the overall price of the final product also increases. Therefore, it makes more sense to design clusters in a way that respects the traditional spatial hierarchies, such that pre-weaving activities can be accommodated as well.

- **Contemporizing the traditional 'Chinkari' Architecture:** The traditional Chinkari architecture, characteristic to Chanderi weavers' household units can be reconfigured in the following ways:
    - **Stone Wall Sections:**
      Bioclimatic variables required for handloom weaving processes have some specific ranges. Hence, the weaving process often disrupts during the extreme climatic conditions, as the built environment fails to render the required conditions. For the weaving of cotton and silk a desirable range of temperature has to be achieved. When the temperature in the weaving units slide outside this particular temperature range, the threads seem to break, thereby reducing the overall quality of the woven products.
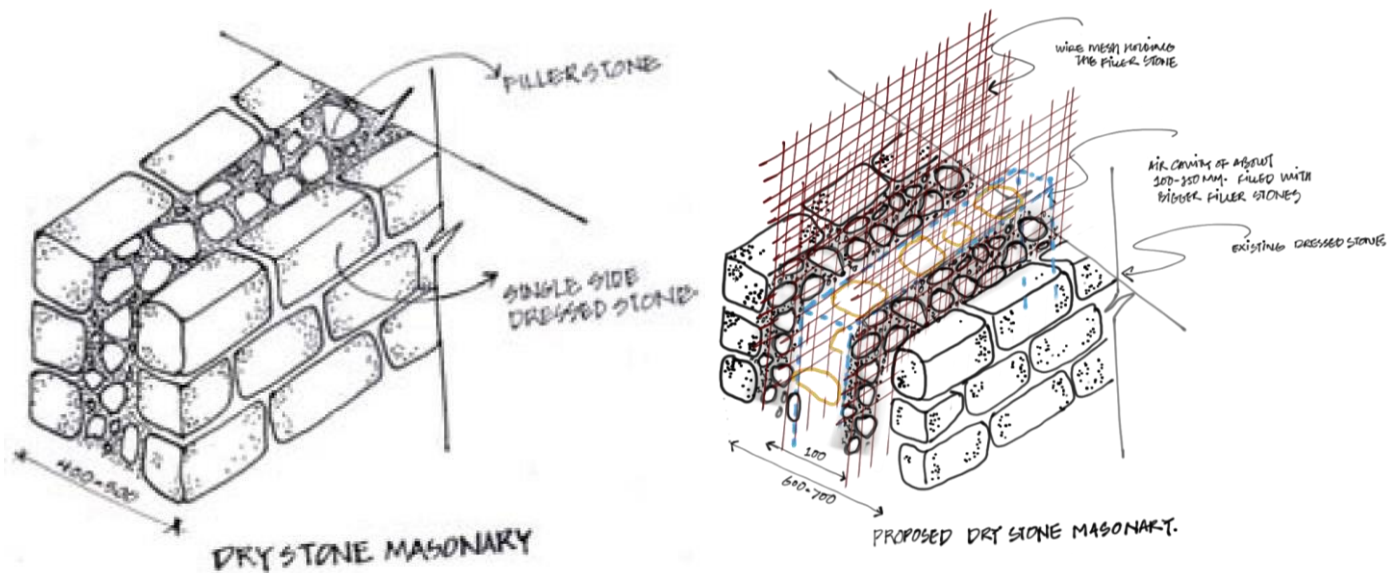
Figure 7. The existing (left) and proposed (right) stone wall sections for weavers dwellings, Chanderi.
Source: Author

Traditional Chanderi houses are built with local '*Chinkari'* stone, in which the stone walls usually consist of three layers. Dressed stones on both the faces and a filler stones' layer between them. These walls are about 0.5-0.7m thick, and have shown to be effective in negating this region's extreme climatic conditions. These are best suited for ensuring adequate thermal insulation. However, owing to harsh climatic conditions of Chanderi, the thermal insulation properties of these walls can be improved by implementing certain design changes.

Design Strategies have to be implemented such that,
The U-Value (thermal transmittance) of the wall decreases and the R-Value (Thermal resistance) increases. Calculation of U-Values for the existing and proposed wall sections:

U Value Calculation- Wall Section Existing				
S.no	**Material**	**Thickness (L)** **(m)**	**Conductivity (K)** **(K-Value)**	**Resistance (L/K)** **(R-Value)**
1	**Dressed Sandstone**	**0.200**	**2.32**	**0.086**
2	**Filler Stones and Mud Cavity**	**0.200**	**0.400**	**0.500**
3	**Dressed Sandstone**	**0.200**	**1.804**	**0.086**
Thermal Transmittance (U-Value) : ∑(1/R) = 1.488 W/M²K				

U Value Calculation- Proposed Wall Section				
S.no	**Material**	**Thickness (L)** **(m)**	**Conductivity (K)** **(K-Value)**	**Resistance (L/K)** **(R-Value)**
1	**Dressed Sandstone**	**0.200**	**2.32**	**0.086**
2	**Cotton Insulation**	**0.100**	**0.025**	**4.000**
3	**Dressed Sandstone**	**0.200**	**1.804**	**0.086**
Thermal Transmittance (U-Value) : ∑(1/R) = 0.172 W/M²K				

Table 7. U-Value Calculations for the Existing and Proposed Wall Sections for Chanderi Cluster Household Units
Source: Author

According to the calculations above,

For existing wall section, the Thermal Transmittance (U-Value): $\sum (1/R)$ = 1.488 W/M2K
For proposed wall section, the Thermal Transmittance (U-Value): $\sum (1/R)$ = 0.172 W/M2K
<u>Hence, we can observe a considerable decrease of 1.316 W/M2K in the U-Value of the proposed wall section as compared to the existing one, while reducing the wall width as well.</u>

This advancement in the wall section can help the overall weaving process by two ways:
Increased thermal insulation of walls can help retain the ambient mean temperature suitable for the weaving process in the weaving rooms.
Reduced width of walls can help increase the workable space within the dwellings, which currently is another major hindrance in the weaving process.

● **Roofing System and Wall Openings:**

  ○ Modern houses are built in a manner that allows for daily airflow and optimum cross-ventilation. This is accomplished by carefully designing their roofs and wall openings in relation to the neighboring open spaces' height, width and position.
  ○ An optimum combination of these keeps the weaving rooms airy and comfortable However, extreme temperature variation in Chanderi region affects the weaving process and the comfort levels of the weavers.
  ○ Extremely low temperatures (0-2 Degree Celsius) during the winter months of December to February prove to be challenging for weavers to weave, as hand movement is not that easy. Further, these winter months are extremely dry (RH 0-10%), which further adds on to the weaving difficulties.
  ○ The construction, conventional *'pataur'* or roof architecture in stone consists of stone slabs covering the roof from the top and then comes below is the layer of dense twigs. This combination ensures 'breathability' through the roof.
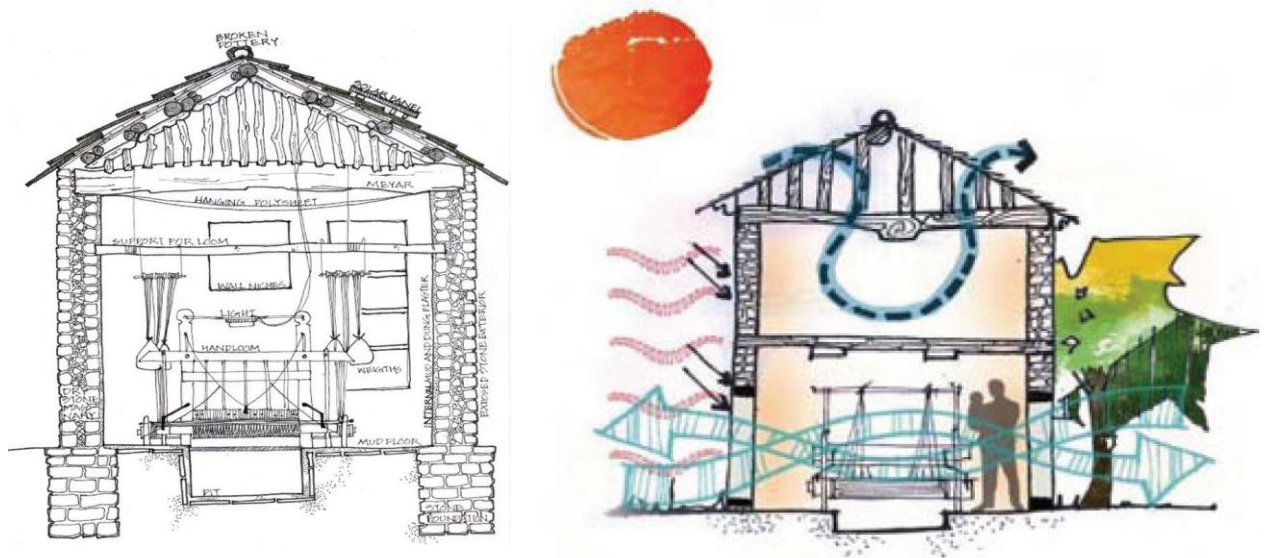
Figure 8. (Left) A Typical section through the weaving room. (Right) Air circulation pattern in the weaver's dwellings, Chanderi. Source: Author

● **Problem of water percolation from these roofs:**

  ○ Although this roofing style provides for good ventilation and air-flow required for weaving, the weavers upon our live surveys and case studies mentioned a problem about water percolation from these roofs. These roofs were sought to be protected from this water leakage using plastic sheets, which were hung from blow, and corrugated aluminum sheets which used to cover these roofs from the top.
  ○ **Probable Design Solutions for the roof and wall openings:**
  ○ **Reducing the number of joints in the roof:** The traditional '*Pataur'* style of roof system uses narrow stone slabs which are irregular in size. However, in order to reduce water percolation, these stone slabs shall be replaced by broader ones. This would reduce the number of stone joints in the roof, and a single stone slab will cover more surface area.
  ○ **Increasing 'breathability' or air flow through the roof:** The purlins, called '*Balliyan'* locally are currently thin, dry twigs which are supported on wooden trusses.

These purlins can be replaced by thicker wooden logs, with a layer of dense twigs underneath. This would enhance the 'breathability' of the roof.

- o **Increasing the clear height of the ceiling:** Instead of using wooden trusses which are currently in practice, steel trusses can be introduced. This shift can allow higher clear heights, which can let more of day-light inside the working rooms.
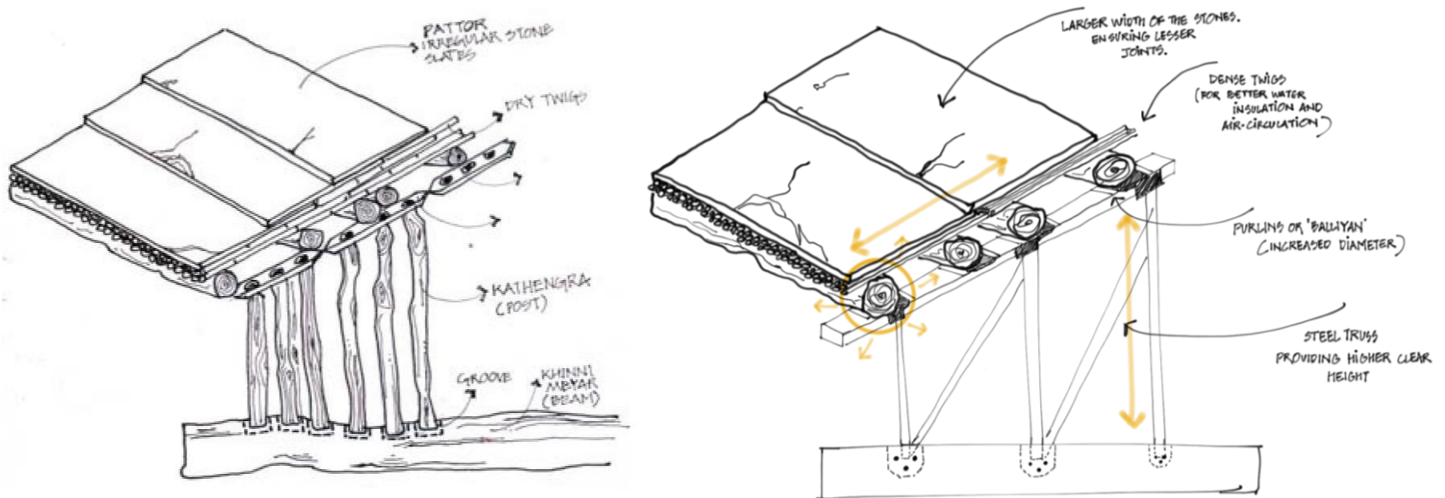
Figure 9. (Left) Existing roofing details. (Right) Proposed roofing details.
Source: Author

- ● **Maintaining adequate levels of Relative Humidity:** Introducing Burlap curtains or moist jute screens. A mechanism can be introduced on the top of wall openings, which constantly drips water onto these screens. As these wall openings are very efficient in cross-ventilation, the air passing through these moist screens will bring in moisture laden air during the dry summer and winter months. Desert coolers, which are extensively used by weavers at their weaving rooms, can be replaced by these low-cost, no-electricity, humidifying mechanisms.

4.8.3 Reconfigurations to the Cluster's Socio-Cultural Fabric

- ● **Reinstating the Socio-Economic Hierarchies:** It is important to retain and reconfigure the socio-economic hierarchies of Chanderi's handloom community. The master weavers are the most experienced of all the weavers, who had always trained the new generations of weavers called apprentices. This socio-economic hierarchy also dictated the spatial layout of the traditional Chanderi clusters, but the recent shift in these hierarchies due to the inclusion of foreign stakeholders have started to affect the built fabric as well. Hence, in order to continue the craft of handloom, and stop it from gradually dying, it is very important that the built environment supports such interaction between the master and apprentice weavers.

- ● **Re-energizing the traditional handloom style:** As the foreign MNCs like *Fabindia* have started to approach the weavers directly for getting designs woven, the traditional design of Chanderi has been gradually fading away. As these MNCs pay the weavers better than the local traders, many weavers readily agree on working for them. It is good that the economic conditions of the weavers are improving, but at the same time it is deviating them from their authentic designs. Therefore, there is a need to reconfigure this new system, such that the local weavers and the foreign designers can sit together and come up with designs which align with both of their interests.

CHAPTER 5
CASE STUDIES AND ANALYSIS

5.1 Introduction to Case Studies

5.1.1 Takeaways from Context Study
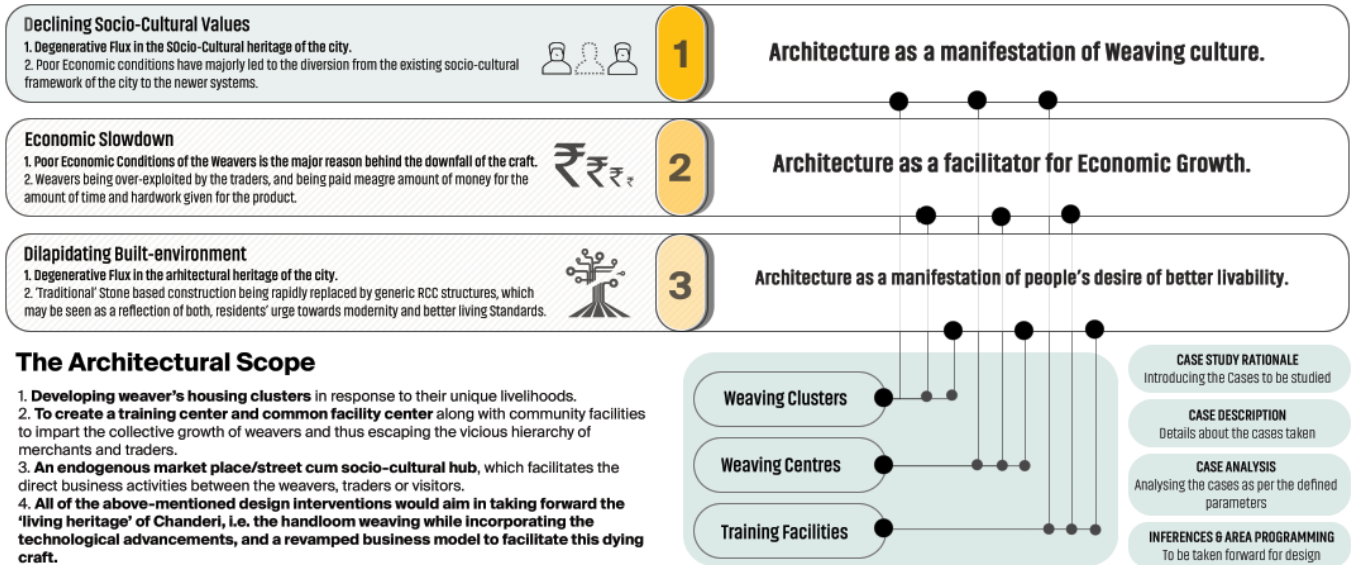
Figure 10. Takeaways from the Context study and Parameters to be analyzed in the Case studies. Different categories of cases selected for the study.
Source: Author

5.1.2 Selected Case Studies' Rationale

5.1.2.1 Handloom Weavers' Settlement and Household Study

- **Understanding the Spatial order of the Weaving clusters of Chanderi.**
    - The Ansari Neighbourhood, Chanderi.
    - Abdul Mubeen's and Mohammed Shafeeq's House, Chanderi Salim Haveli, Chanderi.
    - **What?** The Ansari family offers a valuable window into the cultural and spatial patterns of a typical weaver's family in Chanderi.
    - **Why?** The study of Ansari neighbourhood would contribute immensely to the understanding of 'micro clusters' in Chanderi.
- **Understanding the design principles behind the development of Weaver's Housing: Ahilya Vihar Colony, Maheshwar.**
    - **What?** Designed by Revathi Kamath in the 1990s, it houses 42 weaver households along with adaptive reuse of Ahilya fort complex including design for the community centre and Ahilya School for the children of weaver households.
    - **Why?** This case study would help to understand the spatial planning and layout of modern weaver households designed with the traditional vocabulary of materials, construction systems, climatic understanding and spatial requirements of users related to the different activities of weaving.

5.1.2.2 Handloom Weavers' Settlement and Household Study

- **The Traditional style: The Handloom School, Kaya Kalp, Maheshwar, Madhya Pradesh.**
    - o **What?** Location: Kaya Kalp, Ahilya Vihar colony, Maheshwar, Khargone district, Madhya Pradesh. The Kaya Kalp project was commissioned by Rehwa Society, a highly successful co-operative that markets local products at exhibitions throughout the country.
    - o **Why?** This case study shall help in developing an understanding of the spatial requirements of successful handloom weaving centres and co-operatives, and their functioning.

5.1.2.3 Handloom Weaving Centers Study

- **Contemporary Vernacular Architecture Style for Weaving Centers: Ganga Maki Textile Studio, Rishikesh, Uttarakhand.**
    - o **What?** Situated in a grove of mango trees. The design follows the natural terrain of the foothills. In Bhogpur, near Rishikesh, this weaving facility is, like the textiles produced here, handmade, intimate and sensitive.
    - o **Why?** This study shall equip with an understanding of contemporary textile studio constructed in a vernacular setting.
- **Indigenous Vernacular Architecture Style for Weaving Centres: Rehwa Society Unit 1 and 2, Maheshwar, Madhya Pradesh.**
    - o **What?** Situated in a grove of mango trees. The design follows the natural terrain of the foothills. In Bhogpur, near Rishikesh, this weaving facility is, like the textiles produced here, handmade, intimate and sensitive.
    - o **Why?** This study shall equip with an understanding of contemporary textile studio constructed in a vernacular setting.

5.1.2.4 Socio-Cultural Centers cum Indigenous Market Places

- **The Traditional style: Dilli Haat, Janakpuri, New Delhi.**
    - o **What?** Situated in a grove of mango trees. The design follows the natural terrain of the foothills. In Bhogpur, near Rishikesh, this weaving facility is, like the textiles produced here, handmade, intimate and sensitive.
    - o **Why?** This study shall equip with an understanding of contemporary textile studio constructed in a vernacular setting.

5.2 Live Case Study

5.2.1 Ahilya Vihar Colony, Maheshwar, Madhya Pradesh

Figure 11. Rendered neighborhood plan of the Fort Complex of Maheshwar, with highlighted area depicting the Ahilya Vihar Colony designed by Revathi Kamath.
Source: Rendering- Louis I Kahn Trophy 2015-16, SPA Bhopal, Edits- Author

5.2.1.1 Site Context and Location

Name: Ahilya Vihar Colony
Location: Maheshwar, Madhya Pradesh, India
About: Ahilya Vihar Colony was established in the 1990s by Architect Revathi Kamath. It followed Community Participatory Design Process. The Colony includes 42 weaver households along with adaptive reuse of Ahilya fort complex including design for community centre and Ahilya School for the children of weaver households.

5.2.1.2 Why this Case Study?

- **One of the rare examples of weavers' clusters that has been designed by an architect:**
  To understand the spatial planning and layout of modern weaver households in Maheshwar designed with a traditional vocabulary of materials, construction systems, climatic understanding and spatial requirements of users related with the different activities of weaving.
- **To understand the spatial logic of spaces at a cluster level:**
  The surrounding depicts a traditional vocabulary of courtyard planning, intimate spaces, use of clay tiles, mud flooring, raised plinths, hierarchy of spaces and introvert layouts. Hierarchy of streets and open spaces for different kinds of activities associated with weaving and community interaction.
- Parts to Whole: Micro Clustering pattern within the whole handloom cluster.
- To develop understanding of tentative area requirements for various activities in a handloom weaving cluster.

5.2.1.3 Surrounding Context

Observations

- Ahilya fort complex, temple complex, handloom school, Ahilya School, Community centre and facilities, and Rehwa society.
- The surrounding depicts a traditional vocabulary of courtyard planning, intimate spaces, use of clay tiles, mud flooring, raised plinths, hierarchy of spaces and introvert layouts.
- Introvert Planning with formation of clusters.
- Tree covers alongside roads to prevent heat island effect from roads.
- Blockage of the west sun by gable walls and orientation of spaces.
- Hierarchy of streets and open spaces for different kinds of activities associated with weaving and community interaction.
- The settlement is constructed in response to the natural topography with the STP at the lowest point to the east before sending water into the Narmada River.

Inferences

- The drainage lines and the roads also follow the natural terrain thereby creating no obstruction.
- Supporting infrastructure like a weaving centre, weaving school and community centre helps improving the liveability of the resident weavers, and increases their productivity.
- Also, weavers housing depends majorly on passive systems of cooling, it is imperative to use natural contours and vegetation to use.

5.2.1.4 Household Study
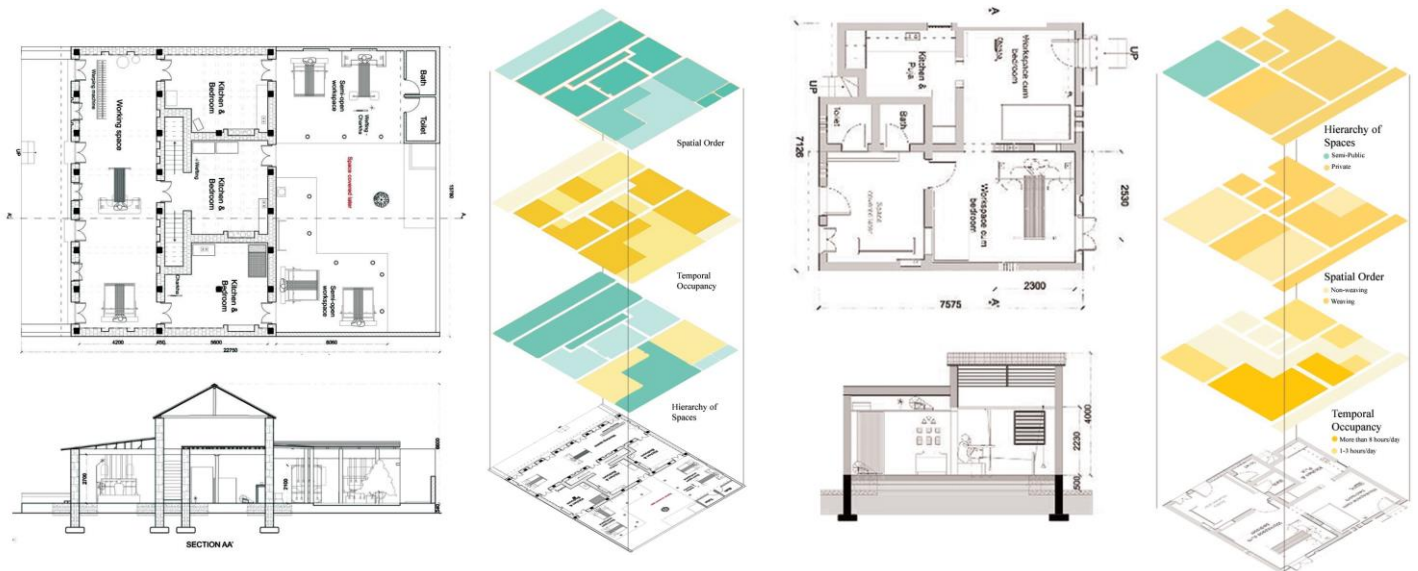
Figure 12. Household Unit Plans and Sections along with the illustrations showing Spatial Order, Temporal Occupancy and Hierarchy of Spaces. Ahilya Vihar Colony, Maheshwar, India
Source: Author, Thesis Report by Karan Gupta, SPA Bhopal

Observations

- **A 200 years old weaver house constructed in stone masonry and lime plaster.**
  - The roofing of the house was in timber and thatch, which was further transformed to contemporary GI sheet covering.
  - The additional space of the house to accommodate more looms is semi-open, and constructed in brick masonry.
  - The weaver has one pit loom, one pit loom with raised platform, four frame looms, and one warping machine.
- **An 18 year old weaver house.**
  - Materials: Lime plaster, Steel truss and GI sheet roofing insulated with clay tiles, Bricks.
  - Number of family members: 4
  - Ownership: Private
  - Number of handlooms: 1

5.2.1.5 Micro Clustering Patterns

5.2.1.5.1 Clustering Pattern Type 1
Dwellings with this type of clustering pattern had West facing front open-spaces and East-facing Weaving spaces.
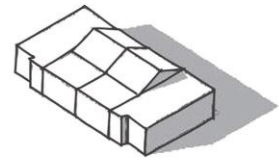
5.2.1.5.2 Clustering Pattern Type 2
Dwellings with this type of clustering pattern had topographical response and East facing front space. Average household size was 4-5 persons.
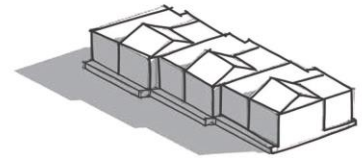
5.2.1.5.3 Clustering Pattern Type 3
Dwellings with this type of clustering pattern had North-South orientation and combined pitch roofs over weaving spaces.
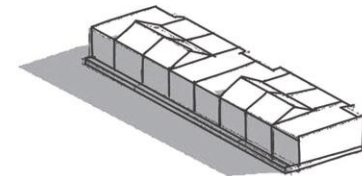
5.2.1.5.4 Clustering Pattern Type 4
Dwellings with this type of clustering pattern had shared community spaces in front which are used for pre-loom activities and parking.
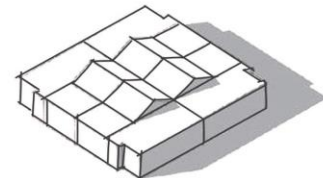
5.2.1.5.5 Clustering Pattern Type 5
Dwellings with this type of clustering pattern faced the front open street with weaving spaces towards the south.
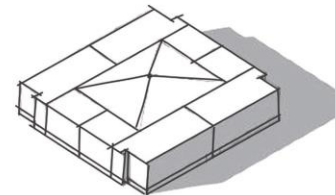
Figure 13. Right. Micro-clustering Patterns designed by Architect Revathi Kamath at Ahilya Vihar Colony, Maheshwar, India.
Source: Author

Inferences

- Topography response via planning and layout of built, unbuilt and circulation spaces.
- Climate response via double heighted forms in weaving areas. Lack of heat absorbent material on roads thus creating glare at some parts.
- Lack of semi open spaces due to lack of pre-loom and post-loom activities being a community dependent on Rehwa society.
- North diffused lighting preferred near sitting spaces of weavers.
- Multipurpose spaces preferred inside that can transform according to temporal activities.

5.2.2 The Rehwa Society, Maheshwar, Madhya Pradesh
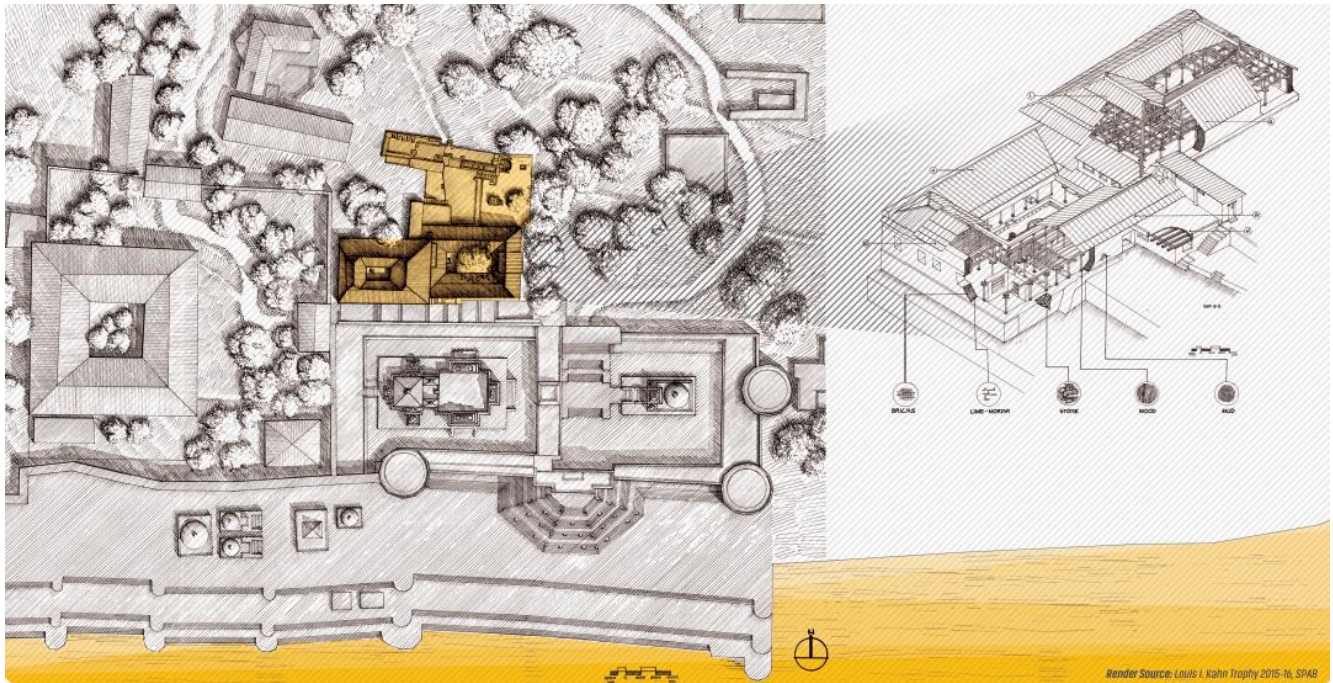
Figure 14. Rendered Plan of the Ahilya Fort Complex, Maheshwar, with highlighted buildings being the Unit 1 and 2 of Rehwa Society

Source: Rendering- Louis I Kahn Trophy 2015-16, SPA Bhopal, Edits- Author

5.2.2.1 Site Context and Location

Name: Rehwa Society
Location: Rehwa Society, Unit 1 and 2, Ahilya Fort, Maheshwar, Madhya Pradesh, India
About: Project Area: 1800 Square Metres
Date of Establishment: 1978
Concept: An adaptive reuse of fort complex to accommodate weavers.

5.2.2.2 Why this Case Study?

- To understand optimum and efficient working conditions of handloom weavers in a weaving centre.
- To understand the optimum spatial requirements for all stages of weaving.
- To understand the relationship between unbuilt and built necessary for the handloom weaving centres.

5.2.2.3 Functional Transformations: Incremental Changes as per the Requirements

- **Early Construction Stage (Pre-1970's)**
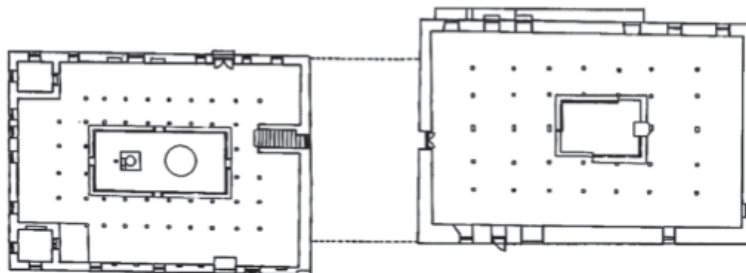
Figure 15. The Original Ground-floor of the Rehwa Society, Maheshwar
Source: Rendering- Louis I Kahn Trophy 2015-16, SPA Bhopal, Edits- Author

The ground floor initially constructed for religious purposes such as *lingarchan puja, Bhoj* for 100 *Brahmins* and often for *havan* and *abhishek* before starting any war. First floor initially used for making the divine Bhoj (feast). It was also used for making the small *lingas* for the *lingarchan puja*.

- **Inclusion of Rehwa Society (1978)**
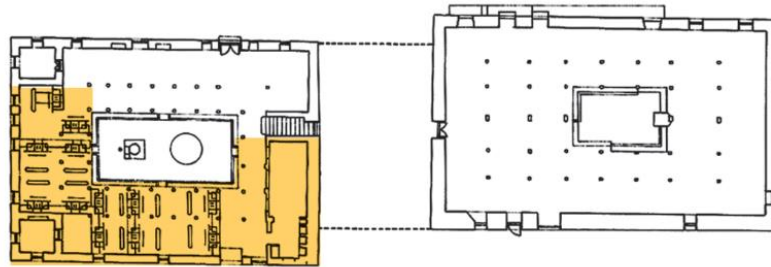
Figure 16. The Transformation of the Ground floor to accommodate handlooms (the highlighted portion)
Source: Rendering- Louis I Kahn Trophy 2015-16, SPA Bhopal, Edits- Author

The ground floor transformed into a weaving place when Rehwa society was set up. Pits were dug up for fitting the pit looms and partitions were built for raw material store. Initially 6 pit looms were fitted in the north direction. Later more pit looms were constructed in a clockwise direction. The first floor was out of use or for storage purpose until increase in demand for more looms.

- **Present State**

Figure 17. Present ground and first floor layout at the Rehwa Society. The Highlighted portions depicts the latest addition of the weaving spaces on the ground and first floor.
Source: Rendering- Louis I Kahn Trophy 2015-16, SPA Bhopal, Edits- Author

Minimal interventions according to functional, structural and spatial needs. Spaces transformed to accommodate economic needs of Rehwa society. The dyeing section was added on the north side. Washrooms are also built. Pit looms in the ground floor renovated and free-standing looms placed in the first floor. Carpenter's room on the first floor, finished products room, saree store and office room are modern constructions for functional and economic reasons.

5.2.2.4 Planning Principles and Role of Climate on Built Form
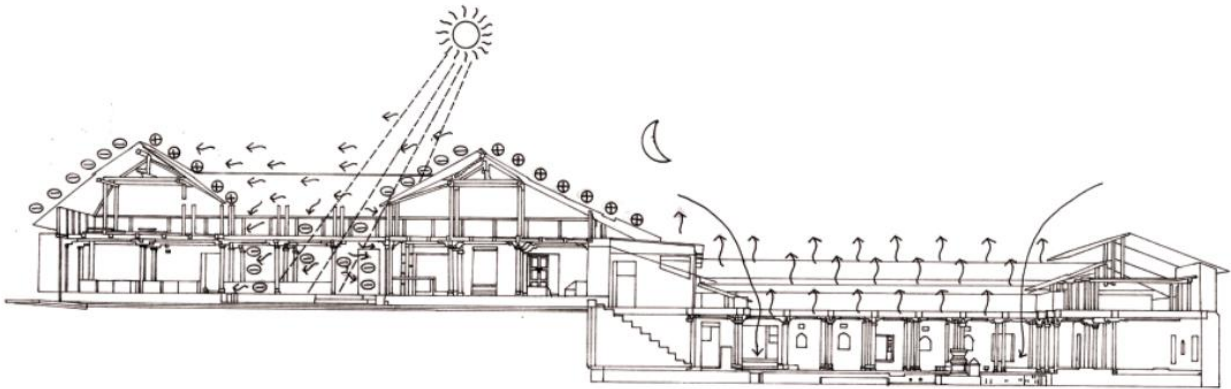
Figure 18. Sectional perspective depicting various levels and courtyard proportions of Unit 1, 2 Rehwa Society.
Source: Rendering- Louis I Kahn Trophy 2015-16, SPA Bhopal, Edits- Author

- Courtyard form of architecture met with the requirements of the traditional joint family system as well as the climate.
- The courtyard functioned as a convective thermostat and gave protection from extremes of weather. A dust storm could pass overhead with little effects on inmates. The courtyard moderated the extreme effects of the scorching summers and freezing winters of the area, and averaged out the large diurnal temperature differences.
- Height to width ratio of lower courtyard: 1:2, upper courtyard: 1:1 imparts an intimate scale to the built form. Prominent shading in the courtyard. Attic space and Compact forms to minimize heat gain. Sloped roofs bring in diffused light.
- Climate responsive courtyard layout and introvert orientation preferred.
- East West alignment for minimum heat gain.
- Merged patterns of officials and weavers. Clash points in the courtyard between different users. Visitor movement limited to saree store but has visual access.

5.2.2.5 Observations

- Introvert Courtyard planning for thermal comfort while working for long hours.
- Interwoven hardscape and soft-scape to escape the monotony of long working hours on handloom.
- Double heighted pitch roofs and other buffer zones to minimize direct heat gain as it destroys the handloom.
- Topography response to allow natural drainage. Use of natural materials such as mud and stone to create a tactile memory and thermal comfort for working spaces of handloom weavers.
- Efficient 10sqm space required for optimum usage and comfortable circulation around the loom.
- Architectural manifestation of weaving process in a linear manner transforming into a radial one.
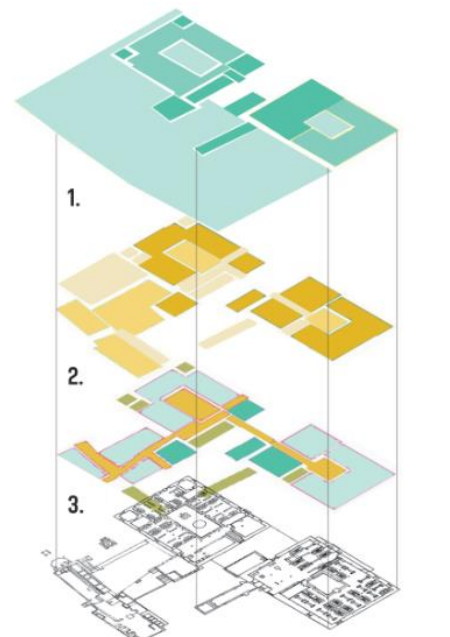
Figure 19. Hierarchy of Spaces, Temporal Occupancy and Spatial Order of the Unit 1 and 2 Rehwa Society.
Source: Author and Thesis Report by Karan Gupta, SPA Bhopal

1. Hierarchy of Spaces	Open	Semi-Open	Closed
2. Temporal Occupancy	Less than 1 hr.	1-2 hrs.	More than 6
3. Spatial Order	Weaving	Circulation	Commerce

5.2.3 The Ganga Maki Textile Studio, Rishikesh, Uttarakhand
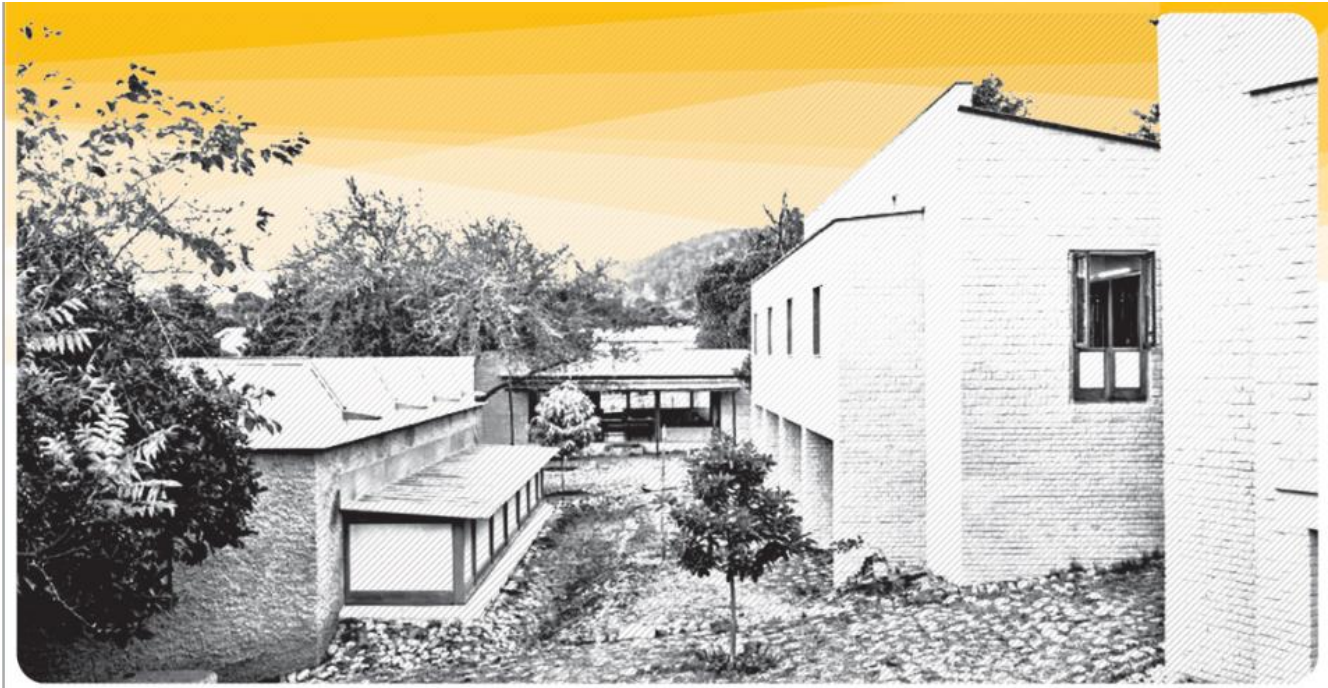
Figure 20. View of the Entrance Complex at the Ganga Maki Textile Studio, Rishikesh, Uttarakhand
Source: Author

5.2.3.1 Site Context and Location

Name: Ganga Maki Textile Studio
Location: Ganga Maki Textile Studio, Village Punniwala, Bhogpur (Around 30 Kilometres from Dehradun), Uttarakhand.
About: Architect: Studio Mumbai Architects
Project Area: 1300 Square Metres
Date of Establishment: July 2016
Concept: To embody and cultivate cyclical relationship between work and life. Bringing together the past, present and future.

5.2.3.2 Why this Case Study?

- **Understanding the relationship between Handloom and Architecture:**
  Situated in Rishikesh, this weaving facility is like the textiles produced here, handmade, intimate and sensitive. Hence, studying this case would help in developing understanding between the textiles and the architecture which supports it in a best possible way.

- **The Need to critically understand the application of indigenous building material:**
  The design is rooted in craft, place, people and environment. The scheme sensitively fuses locally harvested bricks and lime, stone and marble from Rajasthan, and Bengali bamboo; likewise, the craftspeople hail from different places: brick masons are local, lime and bamboo workers are from Bengal, stone masons and carpenters from Uttar Pradesh.

- To understand spatial relationships between various zones in a handloom weaving centre, while respecting the local context.

- To develop understanding of tentative area requirements for various activities in a handloom weaving centre.

5.2.3.3 Design Concept and Functional Aspects

- Introvert planning has been adopted with sequential opening up of places.
- Landscaping has been utilized to create enclosures for varied functionality of spaces.
- Situated in the grove of Mango Trees, hence minimal uprooting of existing trees.
- Design follows the Natural terrain of the foothills.

Weaving Workshop	-665SQM.	Guest Dining	-178SQM.
Display Gallery	-226SQM.	Utilities	-40SQM.
Washing and Dyeing Area	-145 SQM.	Security Cabin	-18SQM.
Residences	-388SQM.	Staff Dining	-60SQM.

Entrance to the Complex
Entrance pathway following the topography of the foothills.

(Above) Visitor's Gallery
Sawtooth gallery with marble sheet roofing for optimum level of natural lighting.

(Top Right) Design Studios
L-shaped studios where weavers and craftspeople make handwoven fabrics.

(Centre Right)
One of the stone filled courtyard at the residential part.

(Centre Right)
One of the stone filled courtyard at the residential part.

Figure 21. Area Statement and views of various areas of the Ganga Maki Studio.
Source: Author

At its heart are four L- Shaped studios where weavers and craftspeople make handwoven fabrics and garments. Arranged around a courtyard, the simple rectangular boxes are buttressed on one side by a narrow storage and service space, and on the other by a slightly elevated workspace.

5.2.3.4 Architectural Drawings
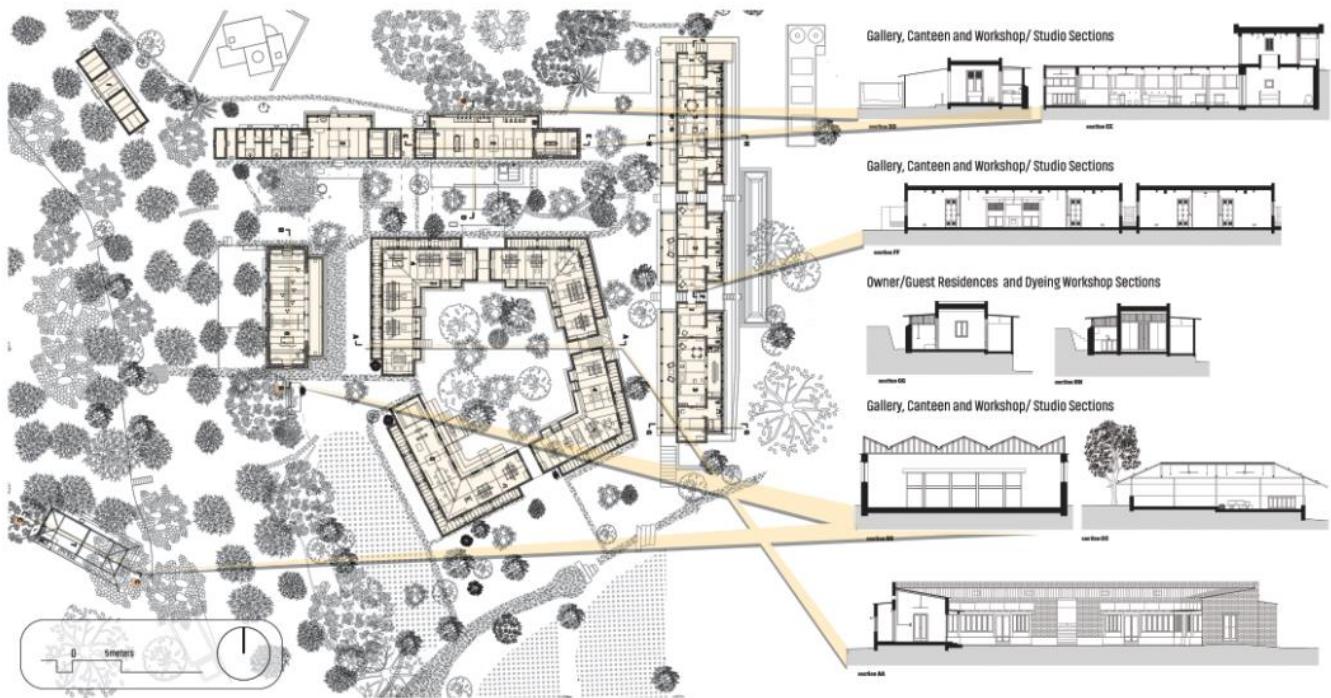
Figure 22. Site Plan and Block Sections of the Ganga Maki Studio
Source: Author

5.2.3.5 Spatial Logic

5.2.3.5.1 Development of Plan and Layout

- Of the four studios, the one designed for Maki is distinctive. Not linked to the others, the structure is built with bamboo frames, plastered with mud mixed with dung and covered by a transparent roof with a bamboo trellis beneath, resembling an eloquent earthen house. It is designed specifically for her use while the others are more collective.
- North of the central courtyard run the blocks housing the dyeing workshop, guest dining and other amenities. Right at the top of the campus sit the owner and guest residences.
- At the entrance, a gallery invites visitors.
- The facility is a space that looks internally into a sort of courtyard. It serves as a workshop as well as a kind of container within which there is an open void space in the middle – where a lot of the weaving and other activities can take place outside in good weather. During the monsoon, the weavers can stay in. But the idea is that this facility has the ability to contract and expand depending on seasonal weather changes.
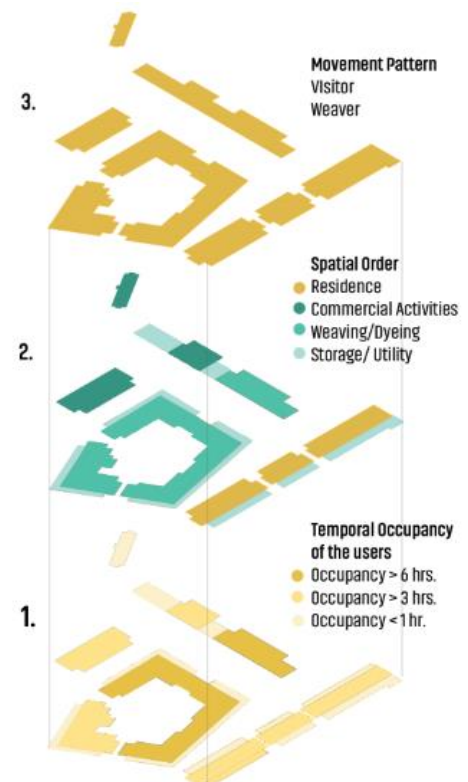
Figure 23. Organization studies of the Ganga Maki Studio
Source and Edits: Author and Thesis Report by Karan Gupta, SPA Bhopal

5.2.3.5.2 Climate Responsiveness

- Climate response via natural materials, planning and layout.
- Provision of low occupancy buffer zones to minimize direct heat gain.
- Topography response by channeling natural drainage.
- Minimal cut and fill.
- Enhancing visual and thermal comfort by natural landscape.
- Sufficient diffused lighting as direct sunlight destroys natural fabric.

5.2.3.5.3 Material Used and Spaces and their Functionality
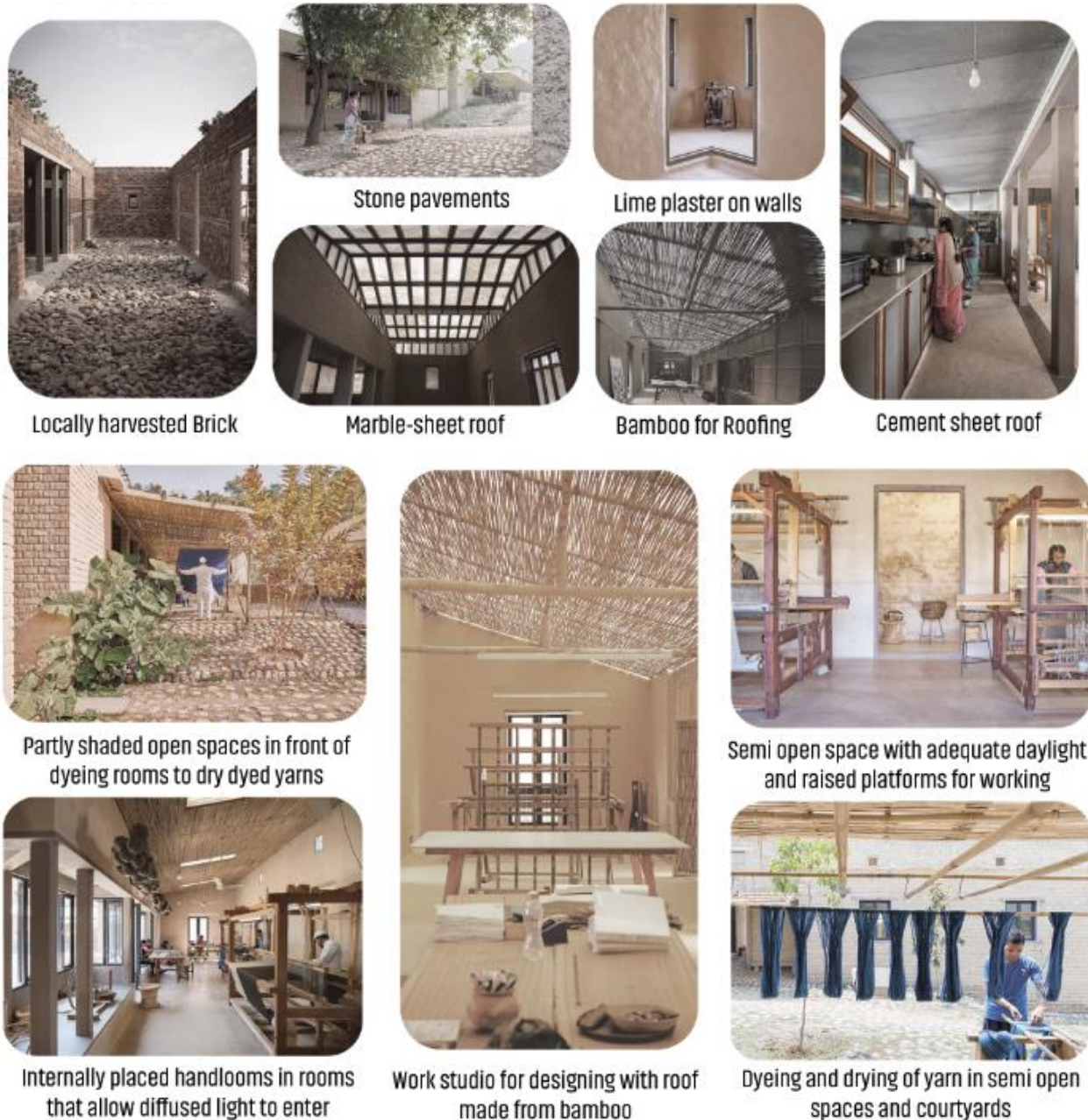
Figure 24. Views depicting various functionalities of spaces along with varied material usage.
Source: Author

5.2.3.5.4 Spatial Logic: Summing Up

- Open space like courtyard being used for weaving related activities like reeling and wefting, and for gathering or relaxing.
- Semi open spaces in courtyard used for handloom weaving.
- Mud flooring, pit loom specifically used by owner.
- Semi open spaces in front of dyeing block used for drying out dyed yarns. Covered with bamboo trellis.
- Raised workspace incorporated within the internal courtyard. Diffused lighting. Semi open space. Post loom activities internally placed handlooms with small opening and sufficient diffused light from courtyard and buffer zones.

5.2.3.6 Inferences

- **Climate response:**
  Achieved through the use of natural materials, planning and layout; Provision of low-occupancy buffer zones to minimize direct heat gain.
- **Design as a response to natural topography:**
  Topography response by channeling natural drainage, minimal cut and fill, enhancing visual and thermal comfort by natural landscape.
- **Planning and Layout as a response to weaving requirements:**
  Integrating workspace design within architectural form; tactile comfort while working for long hours; Introvert planning of working spaces.
  Sufficient diffused lighting as direct sunlight destroys natural fabric.
- Semi-private project with lack of efficient connectivity from the weaver settlements. Less number of commercial spaces for the management of raw materials, and lack of store manager spaces.

5.2.4 The Kaya Kalp Handloom School, Maheshwar, Madhya Pradesh
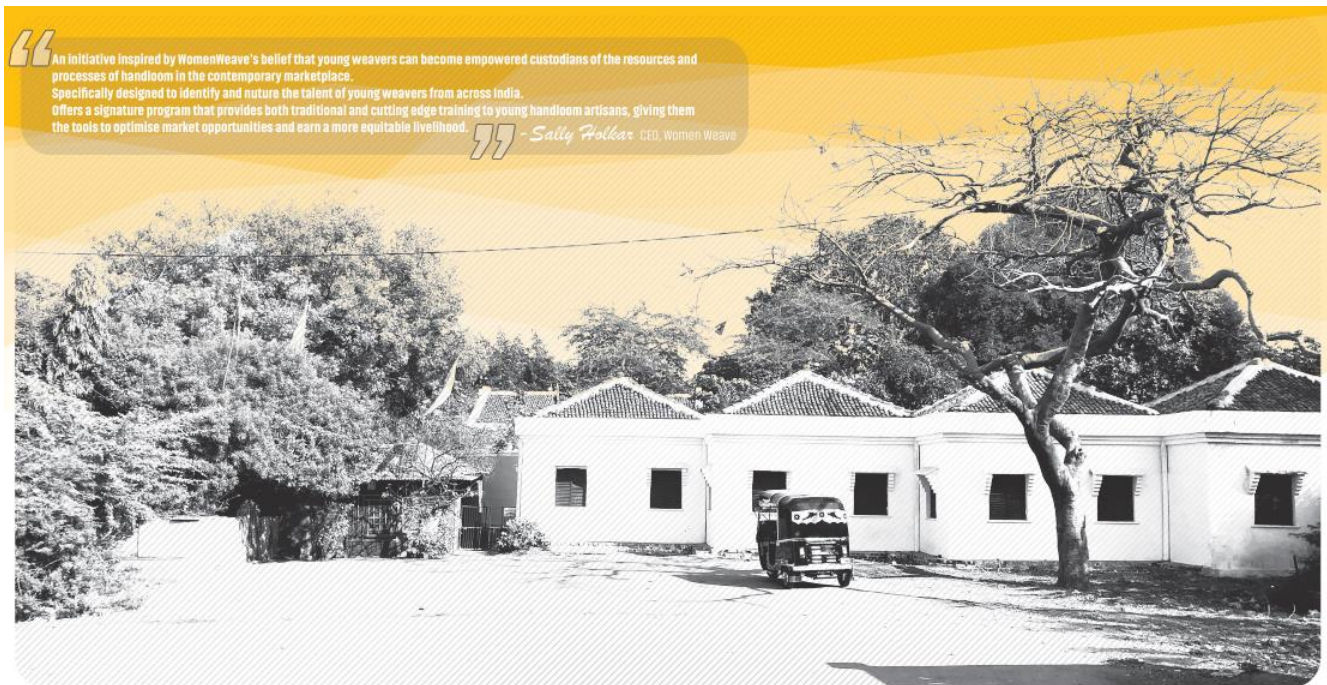
Figure 25. Entrance View of the Kaya Kalp Handloom School, Maheshwar
Source: Author

5.2.4.1 Site Context and Location

Name: Kaya Kalp Handloom School
Location: Kaya Kalp, Ahilya Vihar Colony, Maheshwar, Madhya Pradesh (90 Kilometres from Indore)
About: Project Area: 700 Square Metres
Architect: Revathi Kamath
Date of Establishment: 1995
Concept: To embody and cultivate cyclical relationship between work and life. Bringing together the past, present and future.

5.2.4.2 Why this Case Study?

- **Understanding the typology of spaces required within a handloom school:**
  Kaya Kalp, Maheshwar being one of the rare 'handloom schools' than traditional handloom centres, provide key insights on how a traditional set up can suffice for a comfortable learning space for students coming from across the globe.

- **How the spatial layout and proper use of local materials can bring in optimum bioclimatic conditions for weaving:**
  Kaya Kalp is known for its frugality in material and construction style. Kaya Kalp covers a total area of 700 SQM and has been constructed at a cost of just Rs.1050 per SQM. These statistics surprised everybody because no inferior materials or processes were used. On the other hand, other similar projects in Maheshwar at the period had cost up to three times as much.

- **To understand spatial relationships between various zones in a handloom school.**

- **To develop understanding of tentative area requirements for various activities in a handloom school.**

5.2.4.3 Design Concept and Functional Aspect

The overall layout of the school is based on Introvert planning with sequential revealing of spaces. Hierarchy spaces can be very well observed with open, semi open and closed spaces in response to the user requirements and activity patterns of the weavers and their associated trainers, officials, stores manager.
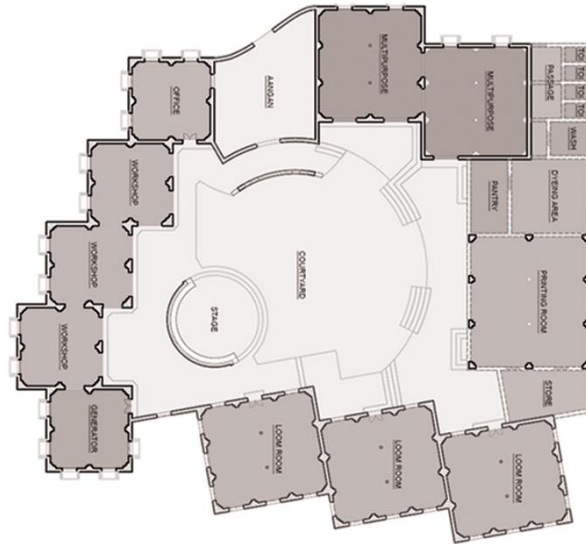
Figure 26. Floor Plan of the Kaya Kalp Handloom School, Maheshwar
Source: Author

5.2.4.4 Spatial Order and Movement Patterns

- Number of hours spent in each space by maximum number of users depict the design significance and consideration of the spaces associated with the weaving on loom.
- Spaces related to weaving such as warping, loom weaving, dyeing etc. are carried out in all open, closed and semi open spaces, thus require careful attention while design.
- Introvert planning with internal courtyard and surrounded by tree cover to enhance comfort levels in the inside.
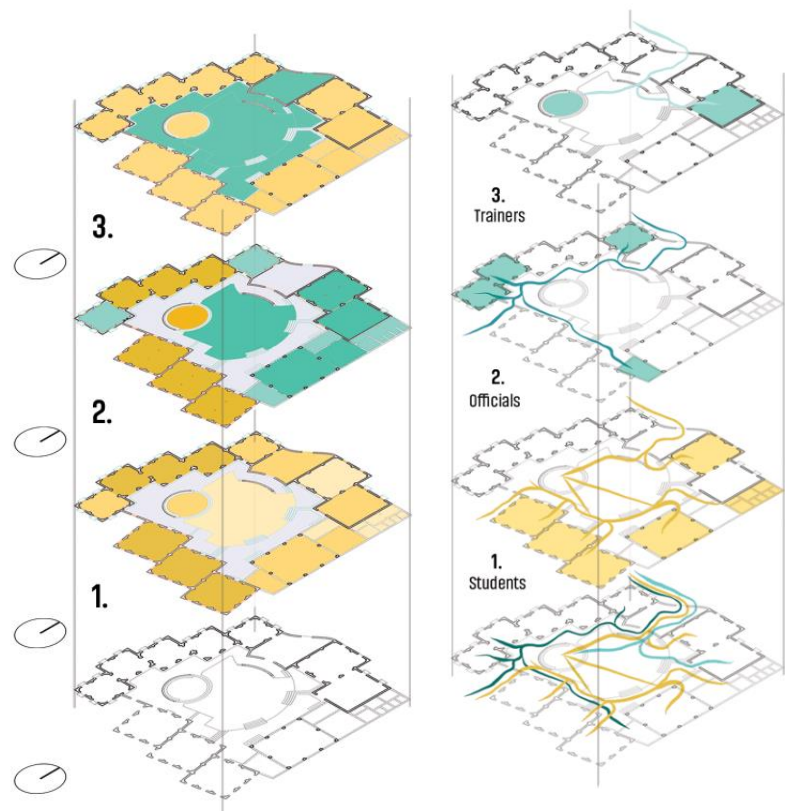
Figure 27. Right: Movement Pattern of various users within the Handloom School. Left: 1. Temporal Occupancy, 2. Spatial Order, 3. Soft scape and hard scape
Source: Author
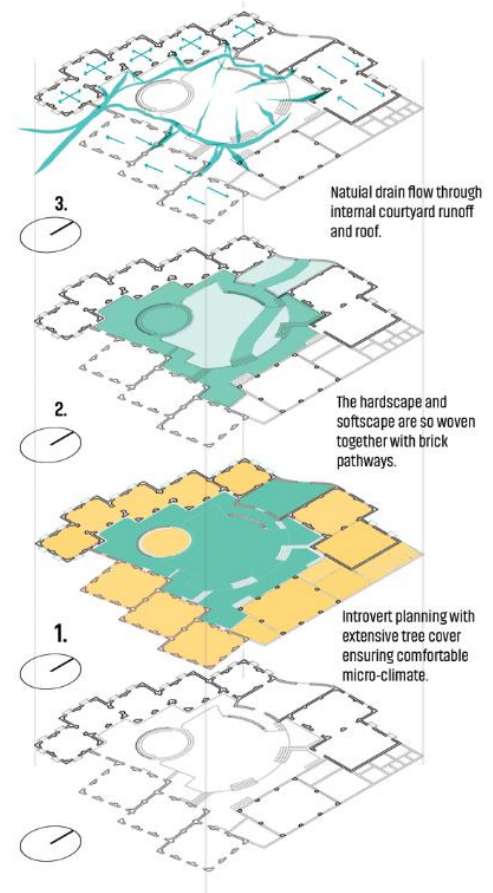
Figure 28. Top- Various Activities taking place within the school.
Right- 1. Introvert planning layout, 2. Softscape/ hardscape, 3.
Drainage pattern within the school
Source: Author

5.2.4.5 Materiality, Landscape and Roofing System

- **Materiality**
  - o Kaya Kalp covers a total area of 7500 square feet (700 square metres) and has been constructed (in the mid-1990s) at a cost of just Rs. 105 per square foot. These statistics surprised everybody because no inferior materials or processes were used.
  - o Mud flooring, terracotta tile for roofing, GI sheets for roofing, mild steel trusses in weaving studios and classrooms, Brick walls, Stone lintels, Brick pathways, Mud and lime plaster.
- **Landscape**
  - o Khair tree (outside), Guava, Berr, Almond, Jamun, Lemon, Jackfruit, Mango, fruiting trees all inside creating pleasant microclimate for long hours of working and gathering spaces.
- **Roofing System**
  - o The roof framework has steel trusses covered by corrugated galvanised iron sheets which are in turn, clad with interlocking half-round terracotta country tiles.
  - o Together they create an insulating air-gap that keeps the rooms cool, even in the 46° Celsius summers.
  - o The combination also prevents even the slightest leakage, which could easily ruin many days of work as it lies stretched out on a loom.
  - o Double heighted spaces with pitch roof and small opening at the top provides cross ventilation and increases the time for direct sunlight to reach the ground.
  - o Also, mud flooring enhances the thermal and tactile comfort in the weaving studios where weavers spend 8 hours per day.

5.2.4.6 Observations and Inferences

- Introvert planning with sequential revealing of spaces.
- Climate response via layout, materiality, double heighted forms, brick *jallis*, mud flooring and clay tiles.
- Internal and external environments are enhanced by the use of deciduous landscape trees.
- Response to topography by channelling natural drainage through the building.
- North south oriented spaces by blocking west winds and channelling them through the built form thus cooling them.
- Hierarchy of open, semi open and closed spaces in response to the user requirements and activity patterns of the weavers and their associated trainers, officials, stores manager.
- The loadbearing structure is built from locally made burnt brick, set in a mixed lime/cement mortar.
- There was minimal plastering of the external walls and certainly none on the inside.
- Double heighted pitch roof form to delay heat gain in the interiors.

5.2.5 The Handloom School, Maheshwar, Madhya Pradesh

5.2.5.1 Site Context and Location

Name: The Handloom School, Maheshwar
Location: Maheshwar, Madhya Pradesh (3 Kilometres from Maheshwar City Centre)
About: Project Area: 3200 Square Metres
Architect: SJK Architects, Mumbai
Date of Establishment: proposed
Concept: The local traditions of building, articulating a coherent framework about the facility, which locates itself within the parameters of its functional and socio-cultural context.

5.2.5.2 The Setting: Surrounding Land-use and Character

- Unlike the Kaya Kalp handloom school, this handloom school is a little away from the historic Ahilya Fort and the center of the town.
- The Site lies at a distance of about 3 kilometres west to the city center, on the banks of Narmada River. The main access to the site is through the National Highway 38, which is the Major NH that connects Maheshwar to the rest of the places. The site is majorly an agricultural land with a very thin settlement in vicinity.

5.2.5.3 Site Planning and Layout

- The Site overlooks the Narmada River.
- The Dye house is located behind the academic building but is detached.
- The more private areas such as the amphitheatre and the residential block is towards the rear end of the site, overlooking the river.
- The main academic building is at the entrance of the site as it's the most public accessed building. It has four weaving studios that are used as classrooms.

Figure 29. Right- Site plan of the Handloom School, Maheshwar
Source: Author
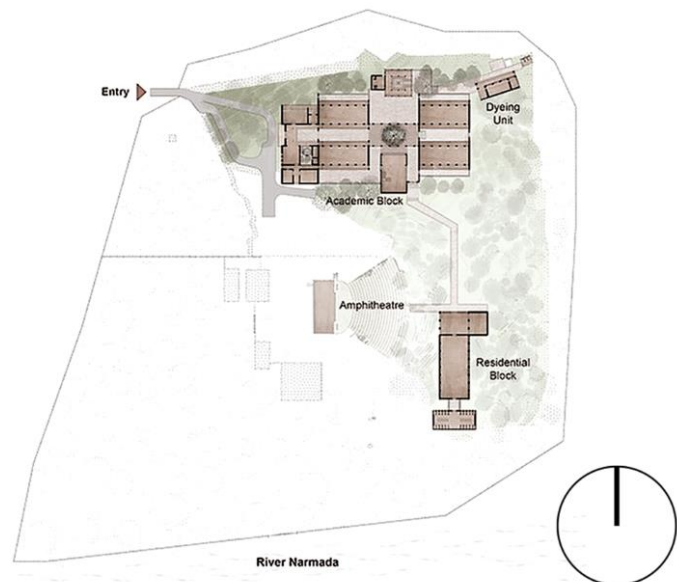
- These rooms are connected by street like corridors.
- The whole project is proposed to be built with locally available burnt bricks and the aesthetics are inspired from the forts of Maheshwar.
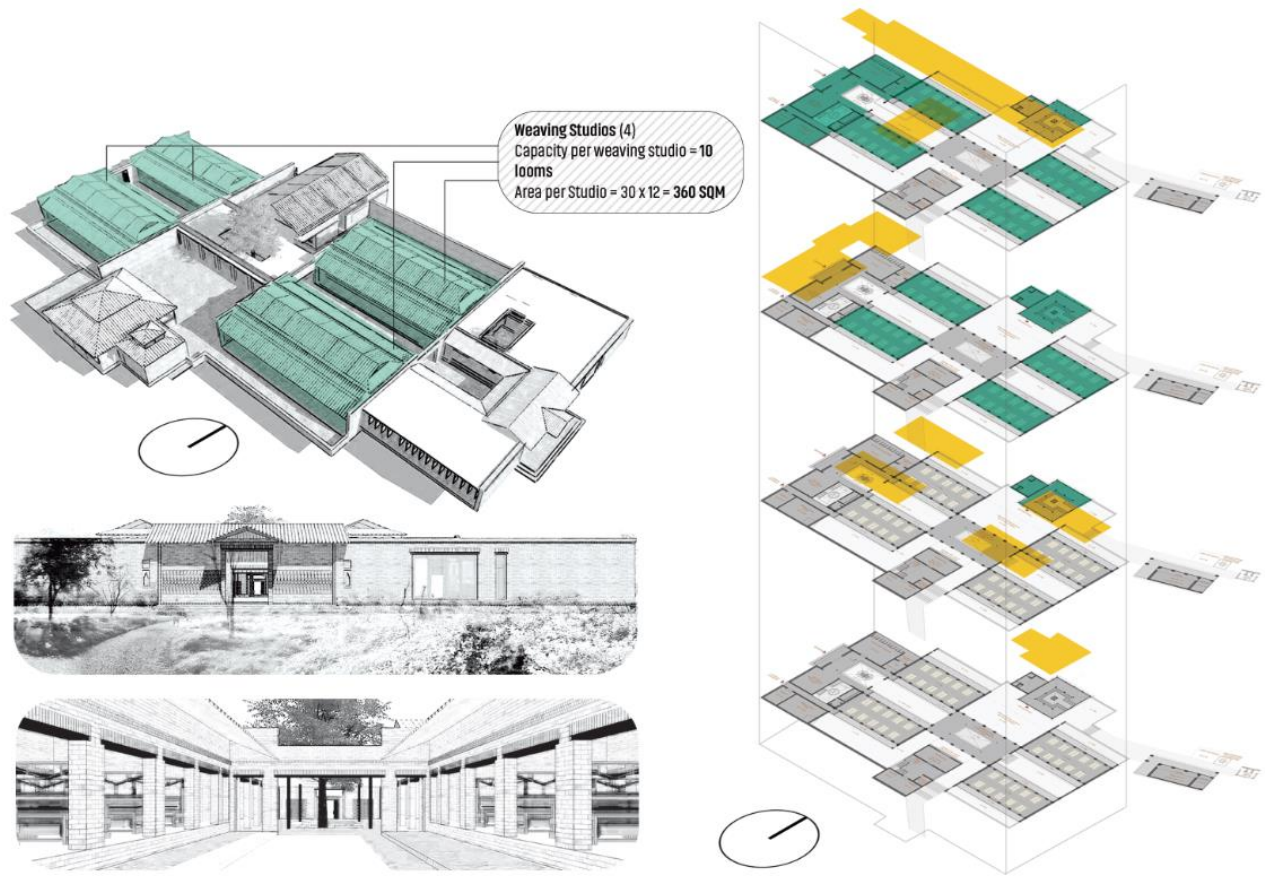
Figure 30. Clockwise. Aerial Perspective showing the school complex with highlighted weaving studios. Sequential built-up of the school complex. Views of the Handloom school
Source: Author

5.2.5.4 Observations and Inferences

- For optimum illumination levels required for weaving, the weaving studios should preferably have openings on the North and South walls to allow only diffused light to enter the space. Harsh, direct sun makes it hard to weave.
- The overall facility including the weaving studios should be designed such to imitate (through material usage and spatial logic) their local clusters, so the weavers feel homely at their workspace.
- Natural ventilation is a must for handloom weaving studios, also constant air flow is necessary to remove ant thread particles from the air.
- The dyeing unit should be kept separately to avoid heating and harmful fumes from entering other spaces.
- Flow and order of spaces: Administration -- Classrooms -- Rest area -- Dyeing unit -- Amphitheatre -- Residential block.

5.3 Literature Case Studies

5.3.1 Handloom Cluster of India: A Case Study Santipur Handloom Cluster

Site Context and Location		
Name: Santipur Handloom Cluster. **Location:** Ranaghat Subdivision. Nadia District, West Bengal. **About:** Santipur has a distinctive ancient culture and glory of its own. 42,000 looms are estimated to be present in the Santipur cluster. Major products manufactured are Santipuri Sarees and exportable fabrics.		
Condition of Santipur Handloom Cluster		
	OBSERVATIONS	**INFERENCES**
Weaver' Types	• **Entrepreneur weavers**: Buy their own raw material, develop the designs which they themselves have done, and are responsible for their own marketing through traders and other avenues. • **Labourer weavers**: They work directly under the master weavers. Master weavers provide raw material, designs and pay the weavers back for the final product. • **Cooperative fold weavers**: Similar to labourer weavers, the only difference is that they work with primary cooperative societies instead of the master weavers.	These classifications showcase the varied extents of associations between the weavers and their craft. These are vital for their sustenance, as individual weavers get an opportunity to choose their own path as per their needs.
Co-operatives Formation and Government's interventions	• The region of Santipur-Phulia is a weaver concentrated area. The area operates approximately 42,000 looms and about One Lakh people are associated with weaving works. Such units cannot be properly developed by an individual weaver and has to depend on the cooperatives. Therefore, there is cooperative development in the region. • Until 2005, there are a total of about 80 handloom cooperatives registered in West Bengal.	Cooperatives are playing a vital role in the sustenance of individual weavers. However, there should be some cooperatives intended for Entrepreneurial weavers as well. For the weaving industry to flourish, cooperatives' and government's support play a crucial role.

Cluster Economics	• The development of handloom cooperatives made a huge difference in the household income of Santipur, as various sources of income were generated. • Prior to the establishment of these cooperatives, the household income was severely low. • The survey results show a broader division of the income levels into five major ranges. These can be taken as: Income<Rs. 2000, 2000- 4000, 4000- 6000, 6000- 8000 and Income> 8000 rupees. • The node of income levels falls between 4000-6000, followed by the income level of 2000 to 4000. People falling in the income level above 8000 and below 2000 are very rare.	The data delineates an overall improvement in the economic condition of the weavers of Santipur. Nevertheless, Government bodies can play a vital role by creating job opportunities and providing some monetary advantages to the needy, for a holistic development of the area.

Table 8. Above and Below. Documented data on the Santipur Handloom Cluster, Santipur, Nadia, West Bengal
Source: Das C. Roy M. (2016) International Journal of Humanities and Social Science Invention ISSN 2319 – 7722

Structure of the Cluster: Spatial and Socio-Cultural Hierarchies	• Core Actors of the weaving cluster: They are the master weavers and the weavers. • Master Weavers: From being involved only in the weaving activities in the recent past, the master weavers today delve into a lot of other aspects of weaving as well. For example, supplying raw materials, developing new designs, paying wages to the weavers. • Mahajans: By making transactions on credit, the mahajans offer a better price realization for Sarees. • Weavers: The weaving and preparatory tasks include about 20,000 those working on looms and other 60,00 who are involved in the ancillary weaving activities. All the weavers on Jacquard looms have strong weaving skills to weave saree. The weaver family's average monthly earnings fall somewhere between 1500 and 2000 rupees. • Dyers: They work in separate areas called the 'dyeing units'. • Designers: They are approximately 100 in number in a cluster. They are not exposed to any formal education, and there aren't any avenues to enhance their existing knowledge. In a cluster, they have a responsibility of providing the master weaver with the punching cards used in Jacquard weaving process.	Various cooperatives have supplemented the income levels of weavers in the recent past. Hence, a major contribution of newly established cooperatives in their economy. Strong socio-economic hierarchy present within the Santipur Cluster, and the spatial layout has been able to address the same.

5.3.1.1 Parametric Analysis of Santipur's Handloom Weaving Community

The Economic Enclave

Economic condition of the weavers.	
The built-environment as a facilitator for economic growth.	

Poor economic conditions of the weavers. Many of them are forced to leave their craft and look for better 'rewarding' jobs. Since there is no traditional architectural style associated with this community, the shift in architectural style, which is as per the spatial requirements, has no direct negative impact.

The Socio-cultural Enclave (The Intangibles)

Authenticity in weaving designs.	
Existence and Continuum of Socio-Cultural Linkages.	

Foreign designers bringing in their designs and are being produced by the Santipur weavers. Hence, gradual ebbing away of authentic Santipuri weaving designs. The clusters still follow its socio-cultural linkages and the hierarchy is still maintained in terms of functioning.

The Environmental Enclave (The Tangibles)

Spatial Hierarchies	
Construction Materiality and Structural Systems	
Weaving Tools	
Social Infrastructure	

Spatial hierarchy suitable for different weaving activities. No immediate negative impact of the recent transformations in the built environment. Traditional handlooms still remain the most popular tool for weaving. Setting up of Cooperatives and other supporting infrastructure like training facilities, is helping in carrying forward weaving skills.

Figure 31. Parametric Analysis of Santipur Handloom Cluster in Order to Measure Community Resilience.
Source: Author

5.3.2 Living Conditions of Weavers: A case study of Varanasi Weaving Cluster

Tiwari, D. (Dec-2017). Living Conditions of Weavers: A case study of Varanasi. International Research Journal of Engineering and Technology (IRJET), 386-390.

Site Context and Location		
The weaving clusters selected for this study are located in and around Varanasi. Different slum pockets are selected from the city, namely Bajardiha, Badi Gabi and Bunkar Colony, where the occupation of the living people depends on this traditional art.		
	OBSERVATIONS	**INFERENCES**
Types of Weavers	• **Grihasthas (Profit making master weavers)**: They are directly under the traders, and have a certain number of apprentice weavers under them. Most of the profit is taken by the Grihasthas and a meagre portion is given to the actual weavers. • **Marginalized individual weavers**: Individual weavers are often exploited by Grihasthas, and carry the weaving process on their material, design and loom.	The classification corresponds more to the profit share; meagre profit percent share for the individual weavers. Hard work ǂ Earnings.
Co-operatives Formation and Government Policies	• Co-operatives were established with the aim of developing forward links (marketing sarees) and backward links (providing raw silk) to improve weaver conditions. • The weak weavers did not get rewards. Gaddidars/ Traders were able to use institutions of the Co-operatives for their business, marginalizing the poor weavers. • The entire cooperative structure makes it easier for larger weavers to take advantage of the offered subsidy. • Under Rajeev Aawas Yojana (RAY), three clusters were redeveloped in 2009 with identical layout for all the dwellings. Failed to solve the actual problems of the weavers.	Cooperatives failing to reach the poor. Richer segment further getting advantage of the cooperatives. Proper Policies and their Implementation for the downtrodden sect of the weavers should be enforced.
Cluster Economics	• Under financially strained conditions, about 70 percent of the weavers are living in acute poverty (monthly wages < Rs.1000). • Failure to own their own loom and reliance on Gaddidars to provide looms on contractual or rental bases, extract heavy amounts or labor to pay for the looms. • Contrasting segregation in the clusters on the basis of economic conditions. Gaddidars and Grihasthas are thriving, but weavers are struggling to earn their livelihood.	Highly polarized economic conditions. Gaddidars, on one hand, enjoy the economic flourish, whereas the individual weavers are struggling. Economic disparity breaking the community bond.
Structure of the Cluster: Spatial and Socio-Cultural Hierarchies	• Hindering the work of weavers, the housing conditions are marked with lack of natural light, sufficient ventilation and inadequate power supply. • **Stress on available resources**: The families have several property divisions not only at the level of the plot, but at the floor level.	Poor infrastructure leading to added production problems for the weavers. Government's redevelopment policies and designs indifferent to the weavers needs.

Urgent need of understanding the needs of the weavers and the weaving process alike before Redevelopment projects are undertaken.

- **Socio-Cultural Hierarchies:** A Strong distinction within a cluster on the basis of socio-economic conditions. Gaddidars (Traders) > Grihasthas (Master Weavers) > Weavers.

Table 9. Above. Documented data on Varanasi Handloom Weaving Cluster, Varanasi, Uttar Pradesh
Source: Tiwari, D. (Dec-2017). Living Conditions of Weavers: A case study of Varanasi. International Research Journal of Engineering and Technology (IRJET), 386-390.
Figure 32. Below. Parametric Analysis of Varanasi Handloom Cluster in Order to Measure Community Resilience. Source: Author

5.3.2.1 Parametric Analysis of Varanasi's Handloom Weaving Community

The Economic Enclave

Economic condition of the weavers.

The built-environment as a facilitator for economic growth.

70 percent of the weavers are leading their lives in acute poverty (monthly wages < Rs.1000). Hence, forced to leave the occupation.

The Socio-cultural Enclave
(The Intangibles)

Authenticity in weaving designs.

Existence and Continuum of Socio-Cultural Linkages.

Authentic Banarasi style of weaving is retained.

The Environmental Enclave
(The Tangibles)

Spatial Hierarchies

Construction Materiality and Structural Systems

Weaving Tools

Social Infrastructure

Spatial hierarchy required for weaving and its ancillary activities is missing. Poor infrastructure leading to added production problems for the weavers. Cluster redevelopment design by the government are indifferent to the needs of the weavers. Rapid transition from handlooms to powerlooms. Cooperatives failing to reach the poor. Richer segment further getting advantage of the cooperatives. No supporting infrastructure present.

5.4 The Case Studies' Analysis: Overall
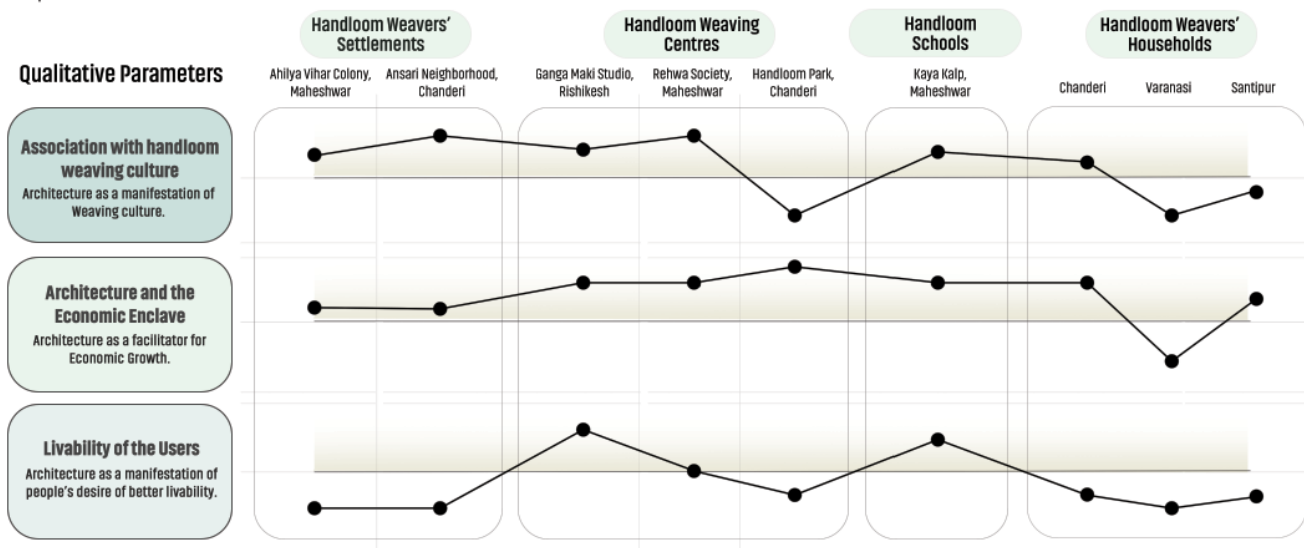
Figure 33. Comparative Qualitative Assessment Chart depicting how well the projects have performed against the defined parameters of case study
Source: Author

5.5 Comparative Analysis of Handloom Clusters

Through the four cases which have been analyzed on the basis of defined parameters, the following inferences can be made:
- All the four clusters faced similar issues on the lines of built-environment, socio-cultural linkages and economics. However, different cases showed varied responses to each of them.
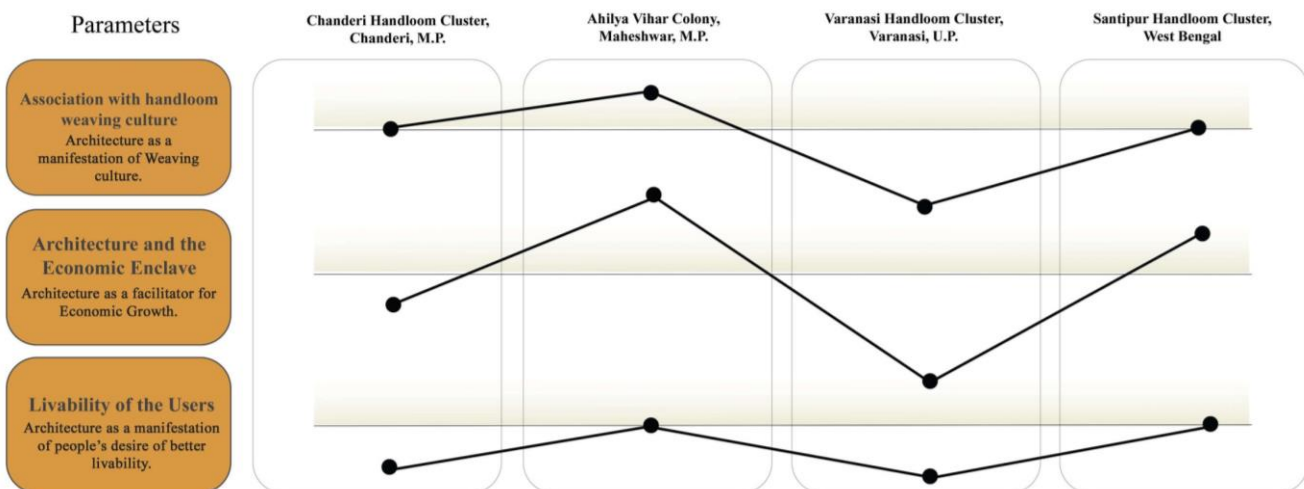
Figure 34. Comparative Qualitative Assessment Chart depicting Different Values of Resilience in the four handloom clusters taken as case studies. Source: Author

- **The Built Environment:**
  - All the four clusters have shown a certain degree of variation from the traditional architectural character. The Varanasi and Chanderi clusters have shown maximum deviation in terms of materiality and construction style.

- ○ The Generic RCC structures have replaced the vernacular architecture, which on one hand, have been able to accommodate the new tools for weaving and improve some aspects of livability, but have taken away the traditional architectural language of the clusters.
  - ○ Chanderi clusters, because of lack of space, cannot expand any further and thereby fail to accommodate growth in family size. This has forced the weavers to either move to other parts of the town or abandon their work of weaving. This lack of expansion has also resulted in economic downfall, as no new looms can be accommodated in the existing infrastructure.
  - ○ Lack of social infrastructure is another major challenge faced by the weavers of Chanderi and Varanasi. However, Ahilya Vihar Colony and Santipur clusters enjoy their benefits of social infrastructure such as Weaving Centers, cooperatives, schools etc. Presence of such infrastructure has not only improved the livability, but has also created a positive impact on the Economy.

- **Cluster Economics:**
  - ○ Handloom industry of Santipur and Maheshwar (Ahilya Vihar) display better economic conditions when compared to that of Chanderi and Varanasi.
  - ○ There are several inter-linked factors that have contributed towards the economic conditions of these clusters. Presence of Social infrastructure like cooperatives, and better built configurations of the clusters have enhanced the economic growth of certain clusters, but on the other hand inclusion of foreign stakeholders in the existing business model fabric has often backfired.
  - ○ In the case of the Chanderi cluster, middlemen and traders have been found to create more problems than what they have solved for the weavers. Even though they help in acquiring raw material from different parts of the country and selling finished products, most of the profits are also shared by them. Weavers are entitled to a meagre proportion of the total profit, which does not justify the hard work which was put in by them.

- **Association with Handloom Culture:**
  - ○ Amongst the four, Varanasi cluster most firmly retains its traditional weaving style.
  - ○ In the case of Chanderi and Santipur clusters, foreign designers largely affect the authentic designs and force weavers to produce their designs.
  - ○ These designers and multinational brands approach the weavers directly, bypassing the traders and middlemen. Weavers also work for these MNCs willingly, as they pay them considerably higher than the traders. Although this new system has helped improve the economic conditions of the weavers, it is gradually taking away the original design style of the community.
  - ○ In terms of weaving tools, the Chanderi cluster has well-retained the use of handlooms for production. None of the weavers have shifted to power looms, which has helped in safeguarding the original character and worth of Chanderi handloom products.

It can be observed from the above comparative chart that the Santipur and Maheshwar handloom communities are doing well on all three parameters, while the other two aren't on any. This clearly delineates how the three aspects are inter-linked. None of the three parameters of community resilience can work in isolation.

6.1 The Overarching Idea

The Thesis aims at breaking down the silos that impede better livability.

By uniting the disciplines of design/architecture, technology, and business, we can build impactful solutions that create value for real people. Especially with a community like the one this Thesis targets, architecture has to be backed by the other two domains, which are equally critical for their sustainable growth.

DESIGN
Ameliorating the lives of the residents through a better built environment.

TECHNOLOGY
Function Effectively with the right technology and compete with the market.

BUSINESS
Create Economic Value in the Marketplace.

Figure 35. The Overarching idea of the Thesis Project
Source: Author
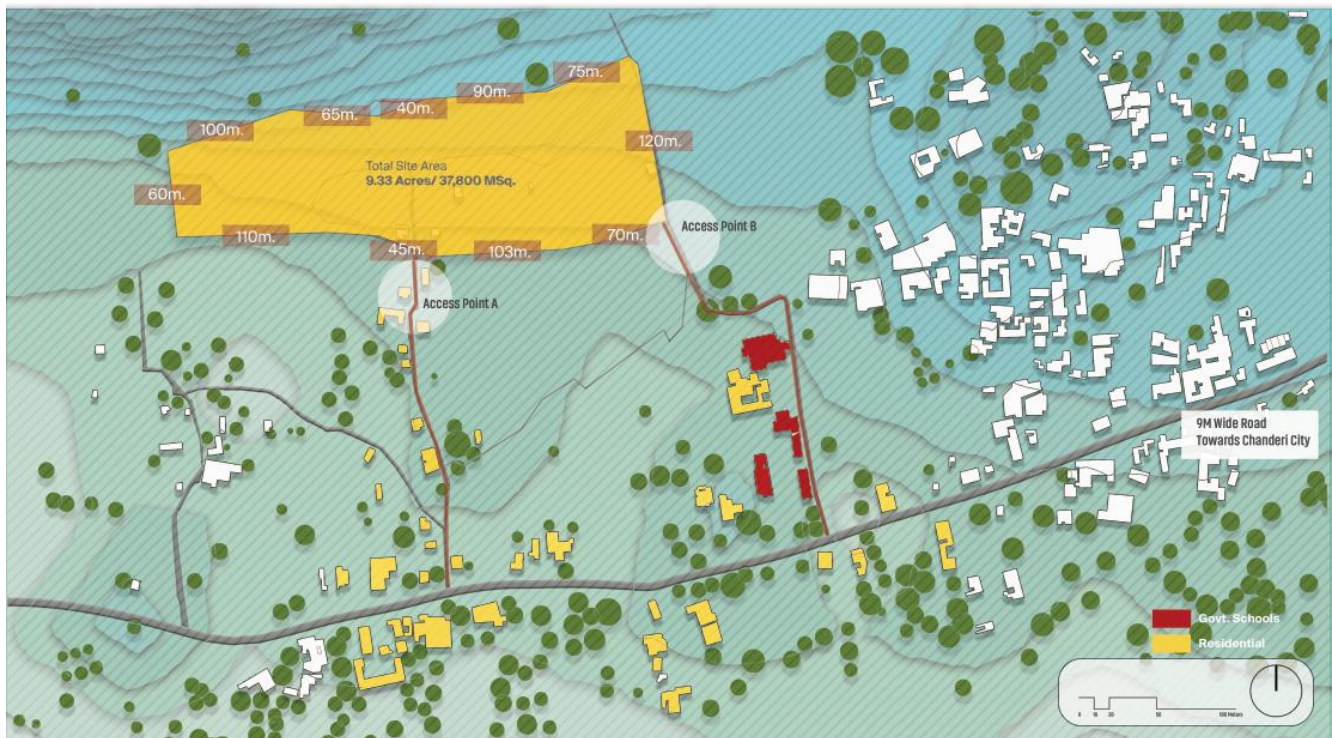
Figure 36. The Site context
Source: Author

6.2 The Geographical Context and Climatic Data

Geologically, Chanderi falls within the Malwa plateau, the most physiographic extensive division of India. Chanderi is located at the junction of the high Malwa Plateau and a lower terrace creating a landscape characterized by deep cut ravines with unwashed spurs having a dense clad of deciduous forests.

Topographically, Chanderi is characterized by general undulations of plateau and valleys accompanied by the flat-topped low rounded hills which abound to the east. The two major geological formations- the Vindhyans and the Deccan Trap have together played an important role in shaping the resultant topography of the region. The area is covered by a thin soil-mantle and characterized by narrow hills, sills and dykes aligning themselves in a south-west - north-east direction.

6.2.1 Site Contours

The Site is located right at the foothills of one of the hillocks peaking at about 90 meters higher from the site. Although, across the site, overall level difference varies from 4-6 meters over a span of 350 and 150 meters respectively.
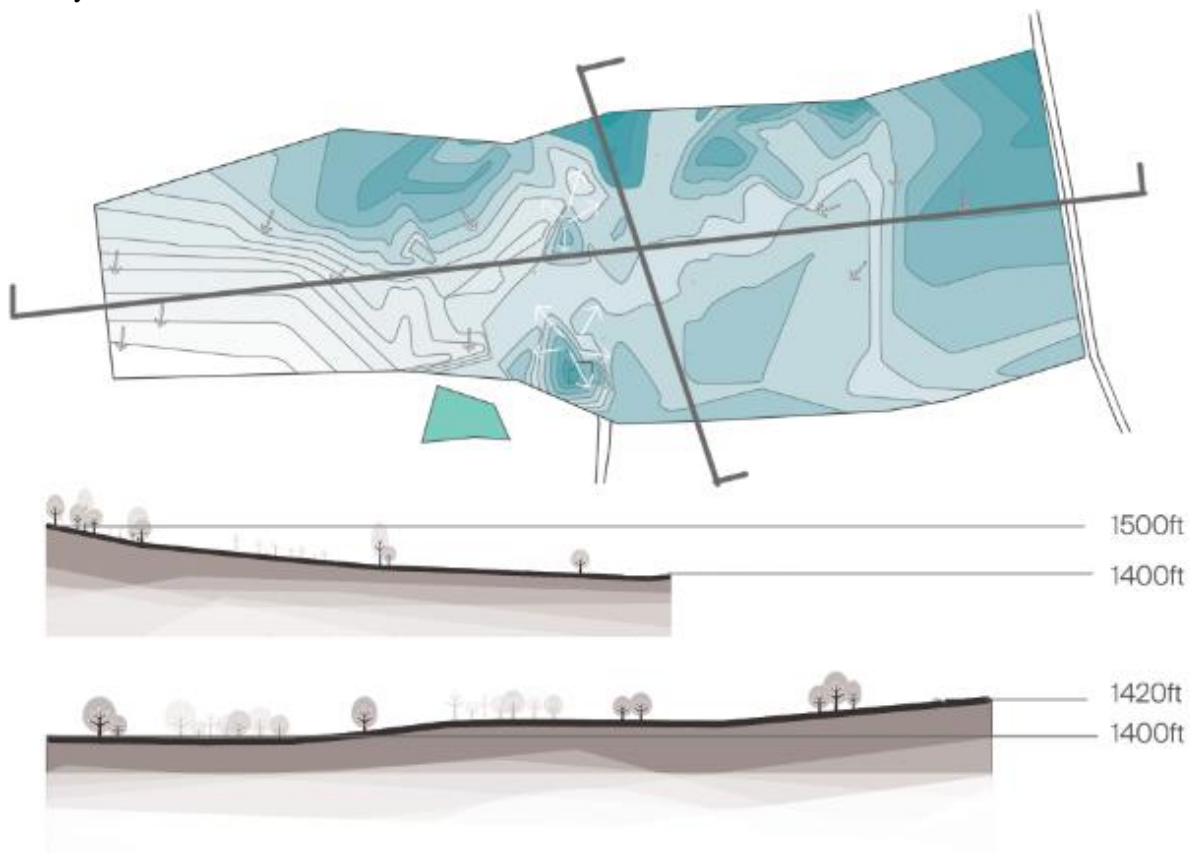
Figure 37. The Site Sections showing the overall slope gradient across the Site
Source: Author

6.2.2 Wind Pattern

- The Site Experiences strong winds predominantly from the West and the North-West Directions.
- However, being located right at the foothill, the site experiences a slight restriction of wind flow from the North-West, hence forming a wind-shadow cover.
- Average Wind Speed at the site is around 12 Kilometers per hour, blowing from the West- North West.
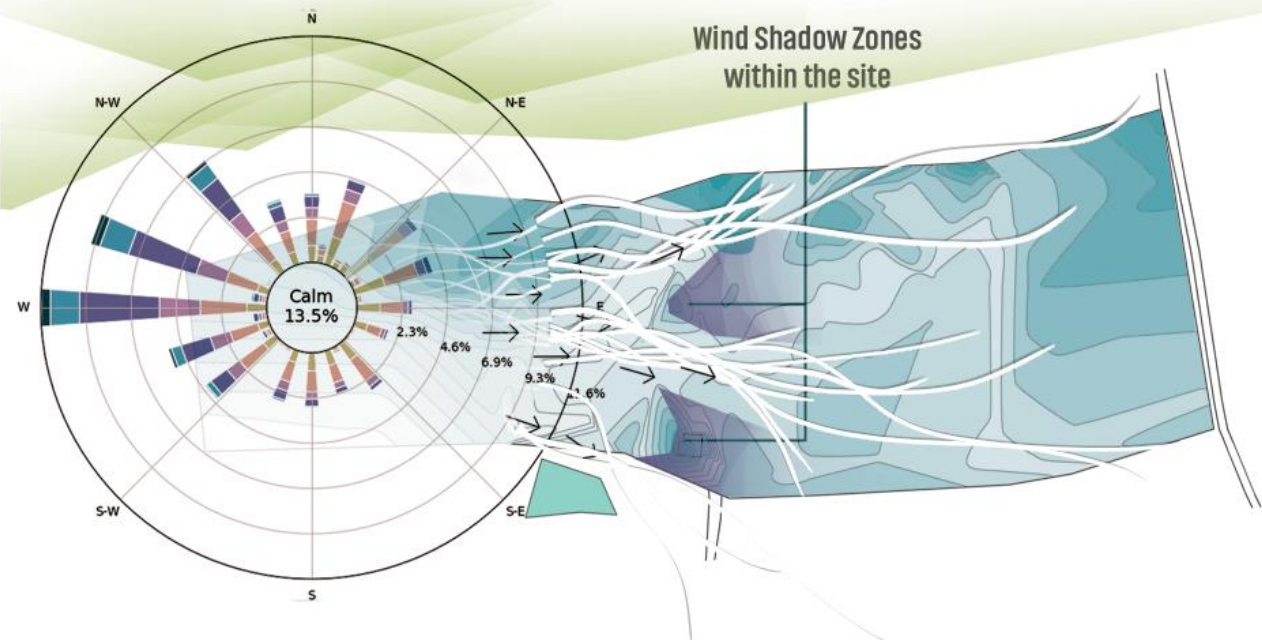
Figure 38. Wind Pattern at the Site. The Hill on the North creates a Wind Shadow Zone within the Site.
Source: Author

- **Strategies to Tap Maximum Wind within the build blocks.**
  Aligning roads along East-West, such that the streets act as channels for the wind to flow across the site. Within the building blocks, providing sufficient opening on both the West and East walls would ensure proper cross-ventilation, which is imperative for such climatic zones.

6.2.3 Sun Path and Shadow Study
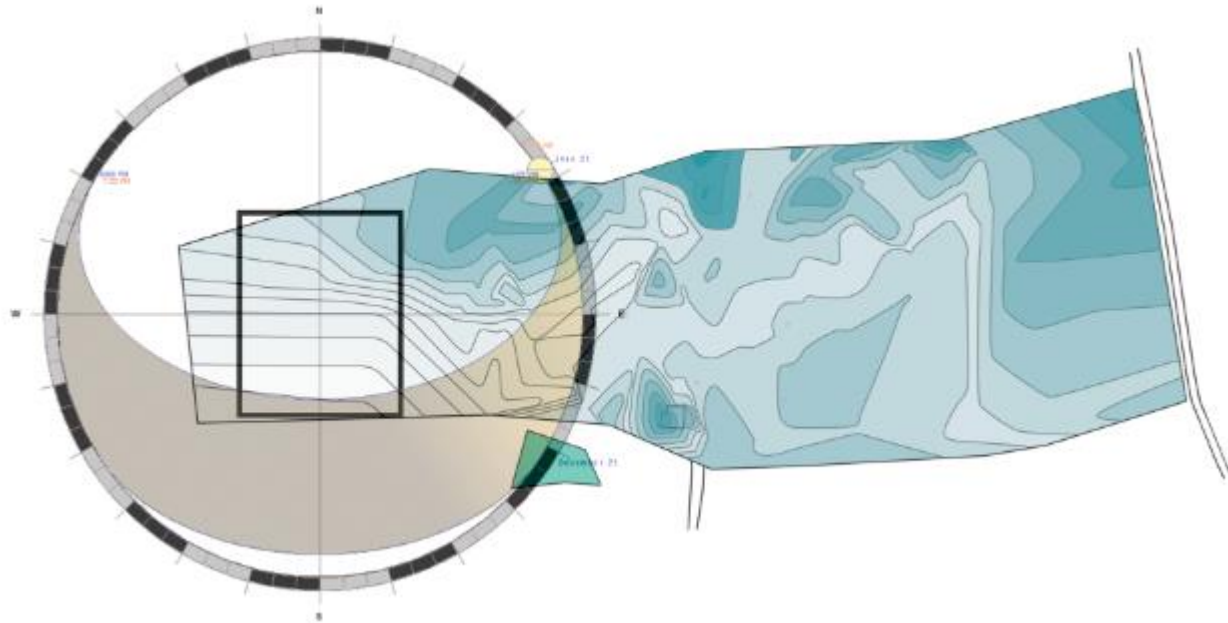
Figure 39. Sun Path for Chanderi
Source: Author

- **Azimuth and Altitude of Summer and Winter Sun:**
- **Noted for January 21**, the Winter Solstice Sun makes the following angles at noon. Azimuth -177.43° and Altitude 43.02°.
- **Noted for June 21**, the Summer Solstice Sun makes the following angles at noon. Azimuth -102.87° and Altitude 87.53°.

6.2.4 Rainfall and Drainage Pattern

Chanderi lies on 427m above sea level.
The climate is warm and temperate in Chanderi. The rain in Chanderi falls mostly in the winter, with relatively little rain in the summer. According to Köppen and Geiger, this climate is classified as CSA.
In a year, the rainfall is 1011 mm or 39.8 inch.
The driest month is April, with 2 mm or 0.1 inch of rainfall. In August, the precipitation reaches its peak, with an average of 345 mm or 13.6 inch.
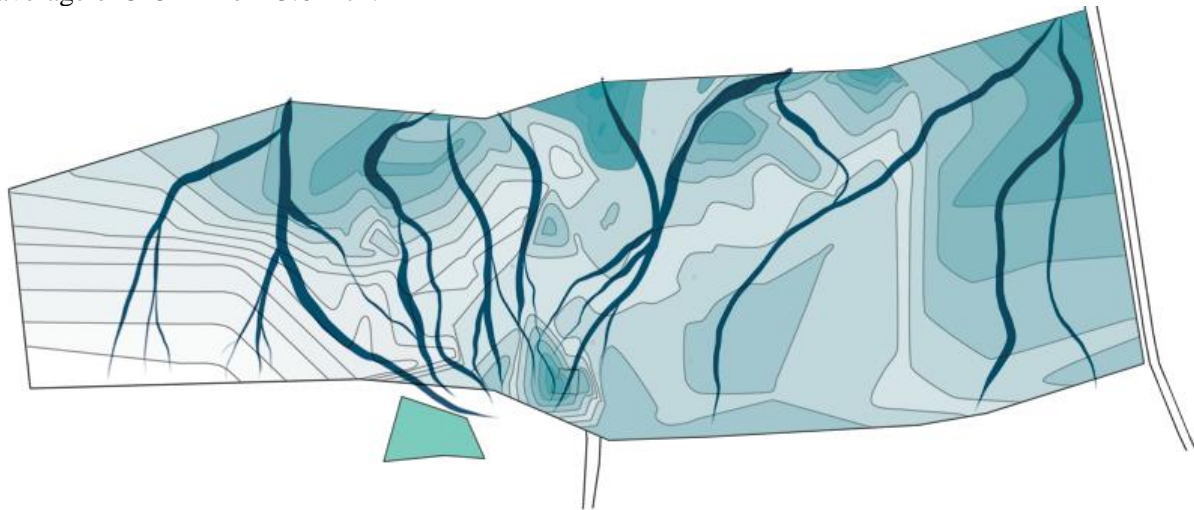
Figure 40. Natural Drainage lines as per the contours within the site
Source: Author

6.2.5 Geotechnical Data

- **Hills**
  Chanderi is surrounded by the flat-topped low rounded sandstone hills on all sides.
  The important hills in the region are:
  The Andhiyari Pahari (450m), the Gurela Pahari (450m), the Salia Pahari (503m), the Kansol Pahari (374m), the Karh Pahari, the Mor Pahari (482m), the Gol Pahari (492m), the Mungra Pahari (472m), the Mahjera Pahari (495m), the Chopra Pahari (450m), the Gidkhil Pahar (460m), the Chandela Pahari (481m), the Majheri Pahari, the Malan Khoh Pahari (530m), the Morya Pahar (515m), the Karla Pahari etc.

- **Flora**
  Chanderi and its surrounding regions bear the bulk of the forest. The forests blocks of the eastern offshoot of the Vindhyans Range extend in a crescent along the southeastern and north-eastern boundary. They are covered under the Chanderi Range. According to statistical analysis about 23% of the land is covered by forests.
  Teak is the prominent tree in these forests. Teak under natural circumstances grows best on the Deccan trap, the resultant black cotton soil on the lower reaches and alluvial soil along the streams. Apart from teak other kinds of trees that are found in these forests are *Baikal, Bharberi, Koril, Saja, Tendu, Bet,*

Khair, Palas, Ber, Reunjha, Salak, Gurjan, Behda, Awata, Landia, Mokha, Kusum, Ghote, Dhok etc. on the slightly clayey soil etc.

Around Chanderi and Bamori, the soil is mostly sandy and shallow with occasional patches of black soil.

- **Fauna**

  Leopards, Bears, wild-dogs, Hyenas, Jackals, wild-cats are found in the large forest blocks along the streams. Bears, wild-dogs and hyenas are common in the Chanderi range. The *Chital* or Spotted Deer are found in herds of ten to twelve along the water courses in the interior of the forests.

  The Blue bull or the *Nilgai*, wild Boar, *Sambhar*, *Chinkara*, Black-buck, wild-pig, barking Deer and Rabbit are also common in the Chanderi range.

- **Climate**

  The rocky plateau land during summer gets heated up really quickly accounting for intolerable day temperatures from mid-April to May (41.5°C). However, this scorching heat leads to the appearance of new leaves and by the last week of the month of May the shade provided by the deciduous trees on the plateau surface relaxes the increase of temperature.

  Normally the summer season covers from the month of March to the middle of June.

  The winter season starts from the middle of October and continues till February.

  At a pleasant 24.7°C the winters are moderate.

  The monsoons make their appearance around the middle of June and extend up to September.

  Humidity generally exceeds 70% on the average. Occasional heavy rain accompanied by strong winds and thunderstorms are caused by the depression which come from the Bay of Bengal during the monsoon months. It is comparatively less during the rest of the year, although, for the most part of summer, humidity generally stays below 20% in the afternoon. Dust storms occasionally occur during the summer season.

6.3 Site Massing Evolution

Inferences and implications of Geographical Factors on Site Planning.
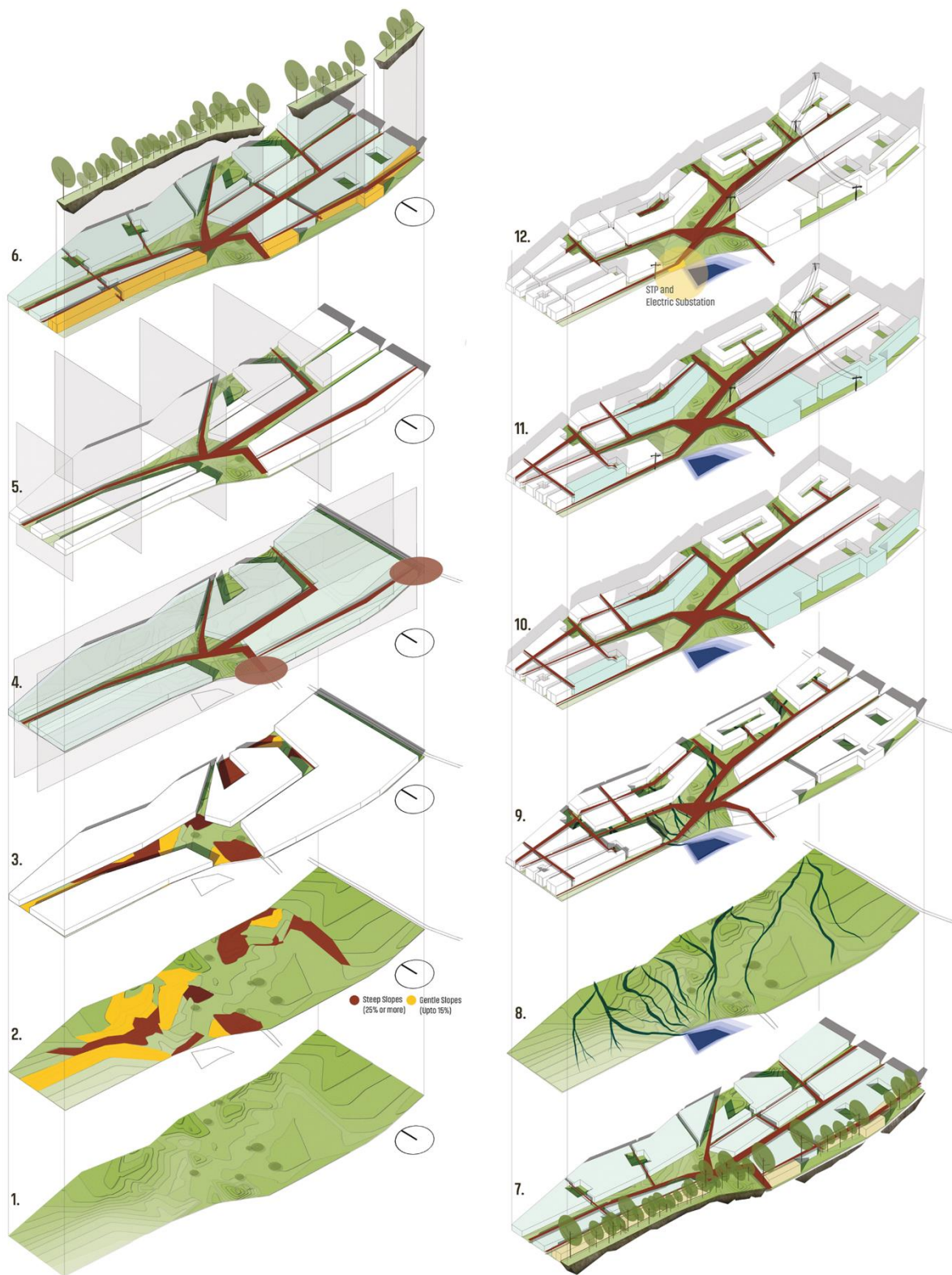
Figure 41. Site Massing Evolution as per the Geographical context of the Site
Source: Author

DESIGN PHILOSOPHY AND CONCEPTION

The Conceptual framework of the thesis is based on the following two theories:

1. The Genius Loci, or the Spirit of any place.

2. Architectural Metaphorism

The thesis aims to **reinforce the socio-cultural roots** of the historic city of Chanderi while ameliorating the economic conditions of the weavers.
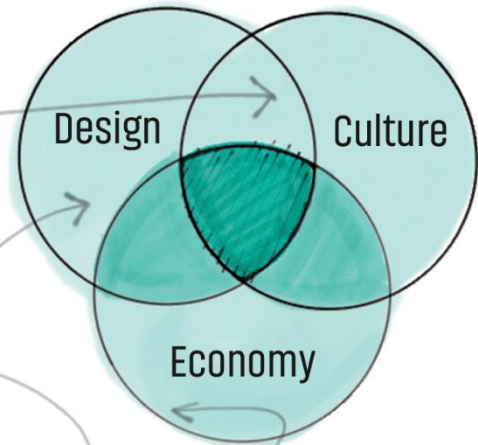
ARCHITECTURAL METAPHORISM

How can architecture manifest the living heritage of Chanderi, i.e. the weaving culture of the town?

What are the analogies that can be drawn between the product itself which the weavers produce, and the built environment where they produce it?

REINVIGORATING THE GENIUS LOCI

How can the 'Spirit of Place' be instilled in a fresh settlement?

The need of the hour for the weavers of Chanderi is not just to replicate the spirit of place which exists in their traditional clusters, but to reinvigorate it along with the business/economic enclave.

The Fusion of the Genius Loci's!

Bringing together the genises of the manufacturing and business enclaves, such that the weavers accomplish what they truly deserve; which perhaps, cannot just be achieved by providing a fresh infrastructure/ built environment.

Figure 42. The Design Philosophy and Conception Graphic.
*Source: Author*

7.1 Design Philosophy and Conception

The Conceptual framework of the thesis is based on the following two theories:
1. The Genius Loci, or the Spirit of any place.
2. Architectural Metaphorism.
The thesis aims to reinforce the socio-cultural roots of the historic city of Chanderi while ameliorating the economic conditions of the weavers.

7.1.1 Reinvigorating the genius loci

How can the 'Spirit of Place' be instilled in a fresh settlement?
The need of the hour for the weavers of Chanderi is not just to replicate the spirit of place which exists in their traditional clusters, but to reinvigorate it along with the business/economic enclave.
The Fusion of the Genius Loci's!
Bringing together the geniuses of the manufacturing and business enclaves, such that the weavers accomplish what they truly deserve; which perhaps, cannot just be achieved by providing a fresh infrastructure/ built environment.

- **Energy Fields:**
  A characteristic point of intense energy tangible or intangible that can be felt in a designed space. In the case of weaver's village, it is the unique sound of constant use of handlooms which identifies the place.
- **Authenticity:**
  Certain unique character or tangible element or intangible cultural value associated authentic to a certain place. In Chanderi, the Saree designs are largely inspired from Chanderi's architecture.
- **Local Distinctiveness:**
  Refers to local physical and cultural considerations manifested in the architecture of place. In case of Chanderi, Hierarchy of courts, compact clusters, traditional Chinkari architecture, thick stone walls, deep-plans, pitch roofs, etc.
- **Narrative with layers of history:**
  Story of Chanderi's handloom, Emotion of respect, care, trust, guardianship, empathy.
- **Empowerment of local people:**
  The Handloom Weaver and their families.
- **Essence:**
  Dual nature with interwoven working and living environments, spatio temporal variations.
- **Ecosystem:**
  An ecosystem of collective growth, inspirations, Eco friendly, intangible cultural heritage passed on to future generations.
- **Character and Individuality:**
  Cultural industrial environment with interdisciplinary linkages, labyrinth of activities.
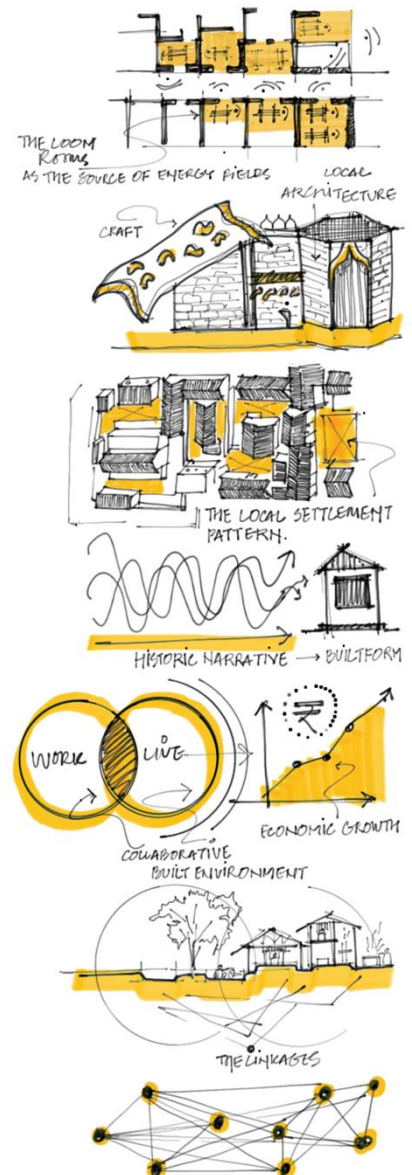
Figure 43. Right- Various elements which constitute the Genius Loci of any place
Source: Author

7.1.2 Architectural Metaphorism

How can architecture manifest the living heritage of Chanderi, i.e. the weaving culture of the town?
What are the analogies that can be drawn between the product itself which the weavers produce, and the built environment where they produce it?

- **Permeability:**
  • Visual and perceptual permeability, community interaction, to expose the process of handloom.
  • Breathing quality, to inhale and exhale.
  • To expand and contract spaces.
- **Continuity:**
  • Spatial continuity.
  • Perceptual and visual continuity.
  • Contextualism or respecting the evolving context.
- **Tactility:**
  • Tactile comfort which is required for handloom activities as it is a long strenuous activity.
  • Tactile memories which aid in a sense of belonging and sense of responsibility to the space.
  • Imparts an identity to the fabric as well as the architecture.
- **Organicity:**
  • Temporal variations and multiple uses of the same spaces.
  • Variety of community spaces.
  • Labyrinth of pathways.
  • Breaking away uniform patterns and similarities.
  • Incremental. Need based, irregularities, variations in built forms and spatial organizations.
- **Layering:**
  • There are layers of culture, tradition and heritage imbued in an Indian traditional handloom sari much like their vernacular architecture.
  • A sari is also woven in layers right from the initial stages via warp and weft with zari work and times which is similar to their architectural typologies depicting layers of open and closed spaces, public, semi-public paces for the various process associated with the textile production.
- **Contexuality:**
  Context response is pretty easy to observe in any traditional sari as the region-specific conditions of climate, culture, local material, traditional values, ornamentations, community needs, trade, etc. indicate the identity of the sari as well the vernacular character of weaver's communities.
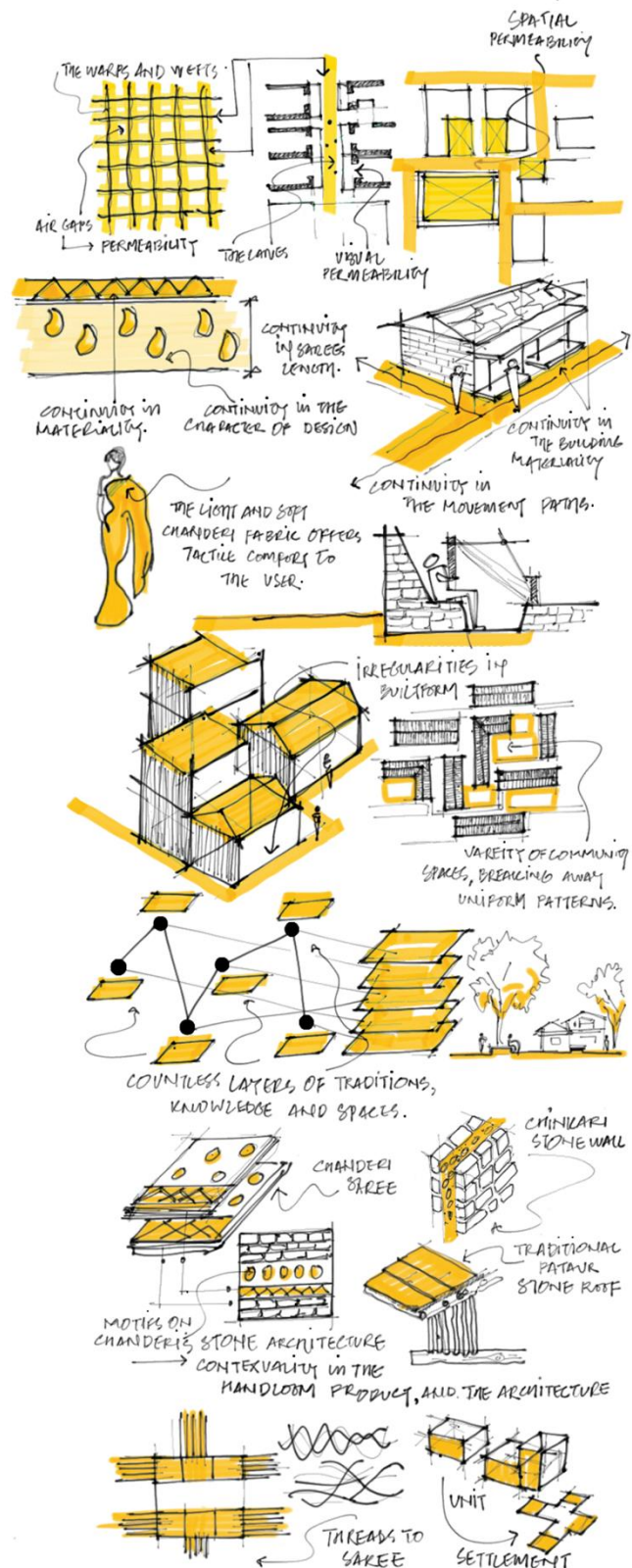
Figure 44. Right- Analogies between a handloom product and the built-environment of handloom weavers' clusters
Source: Author

7.1.3 The User Group
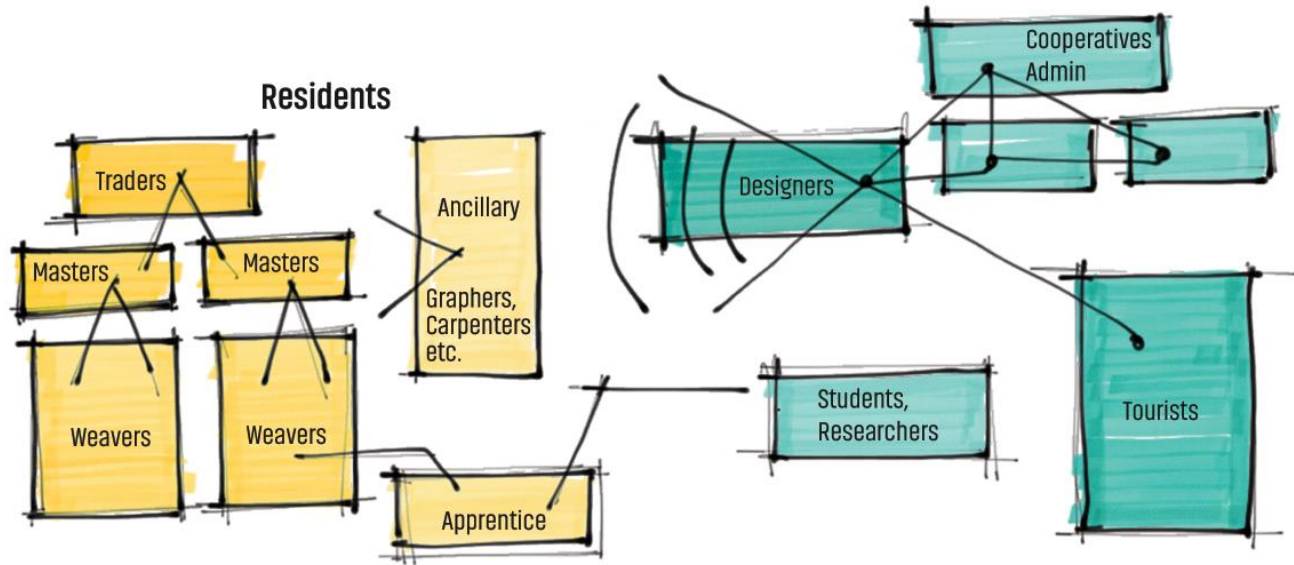
Figure 45. Various User groups which the project would be catering to
Source: Author

7.1.4 The Design Parti

- **Genius Loci:**
  Locating the Genius Loci from micro to macro. Within a cluster, it is a master weaver's dwelling which becomes the genius loci, and moving further, on a macro level it's the whole cluster which is the genius loci of the handloom products.
- **Social Hierarchy:**
  Clusters Formation in accordance with the social hierarchy in a weavers' village.
- **Common Facilities:**
  Clusters with common dyeing, drying, washing sheds and social infrastructure.
- **Process Exposition:**
  Community common work sheds to expose the process of weaving to the tourists and guests. Making sure that it's not the final product which is displayed, but the whole process of weaving.
- **Co-working Landscapes.**
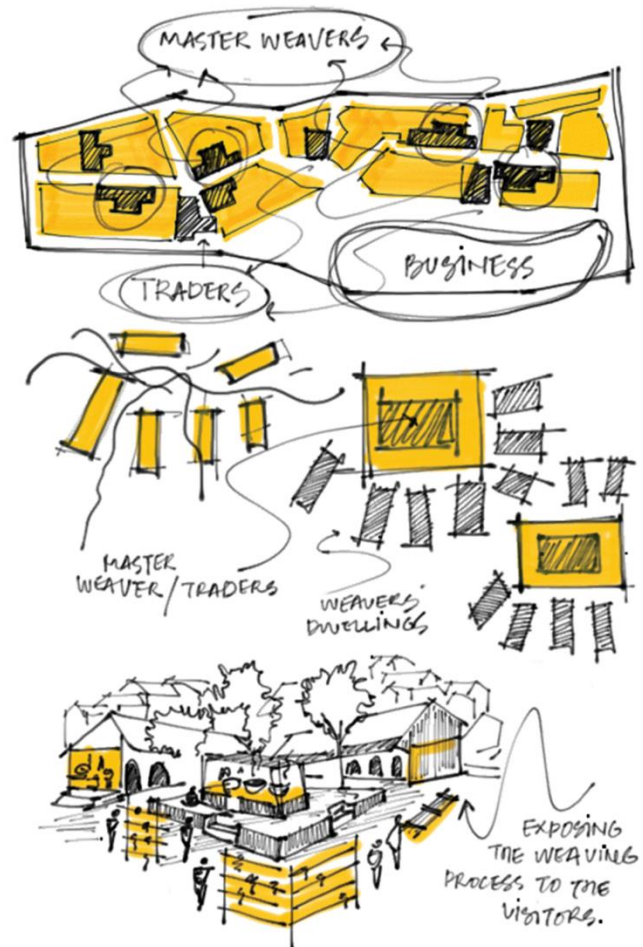
Figure 46. Right- The Design Parti
Source: Author

7.2 Design Development

7.2.1 Evolution of Site Plan

Following are the steps undertaken to develop the site plan.

1. **Vacant Site and Background from Site Analysis:**
   The Outcomes from the Site analysis became the basis for the site development and proved to be the stepping stones for the site layout development.

2. **Functional Zoning:**
   The Site is divided into two major uses:
   The Manufacturing Zone, which covers 80% of the site and contains weavers' dwellings and clusters.
   The Business Zone, which reinforces and takes forth the produced products to the market.

3. **Entry-Exit points and Major Road Network:**
   Two access roads connect the Highway to the Site. The one on the South is a *Kuchha* road, 3.5m wide. The one on the East is a 4.5m wide Cement Road.
   Major Tourist Entrance is hence given from the South-East and for residents from the South gate.

4. **Clustering:**
   Sub-divisions of blocks and introducing a central spine which runs throughout the site and connects various clusters.

5. **Porosity within Clusters:**
   Placement of various build blocks around the nodes and bringing in porosity within the blocks through streets and labyrinth of open spaces.

6. **Nodal Formations:**
   Traders' dwellings double up as spaces for public gatherings, convenience shopping, and a space for tourists to sit back and catch their breath.
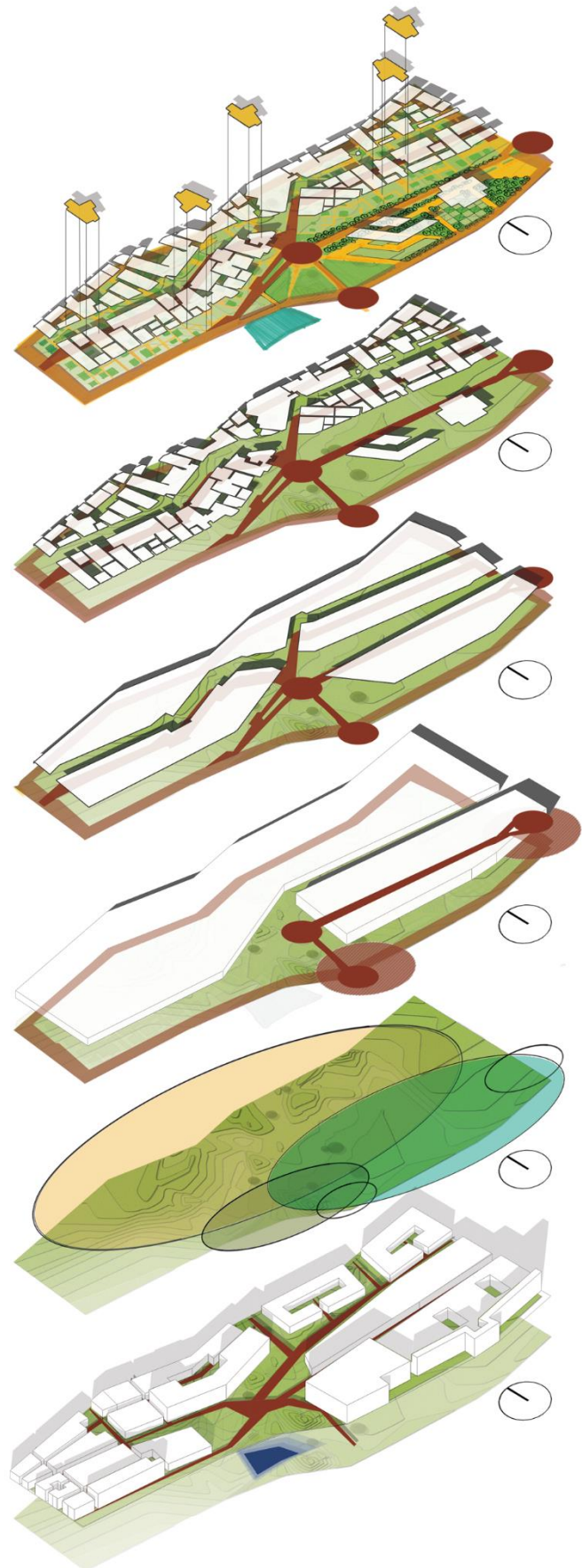
Figure 47. Right- The Evolution of Site Plan
Source: Author

7.2.2 Conceptual Sketches- Weavers' Clustering
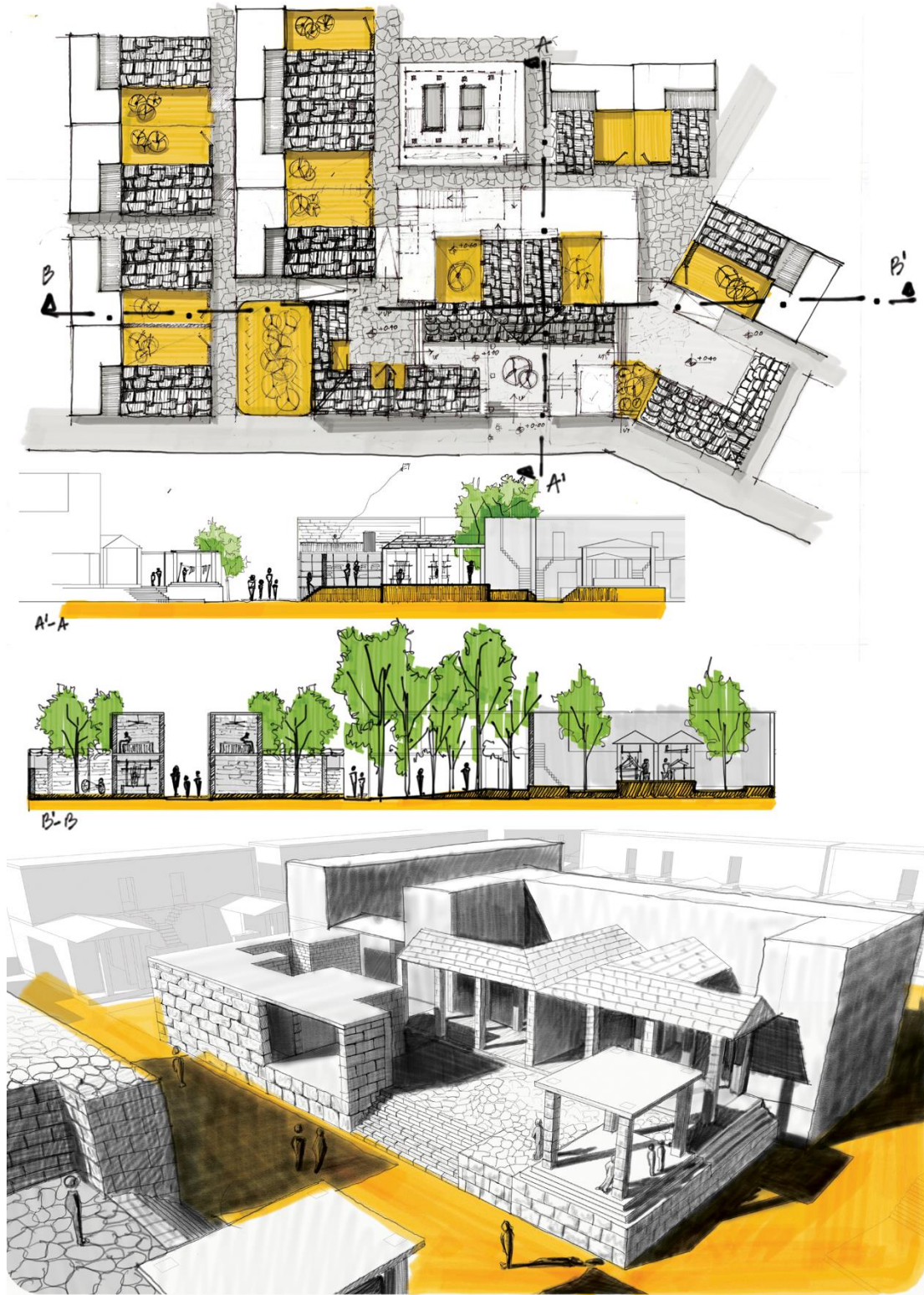
Figure 48. Initial Conceptual sketches of Weavers' clustering.
Source: Author

7.2.3 Conceptual Sketches- Weavers' Households

- **Apprentice Weavers**
  These are the units to house the apprentice weavers/students to stay
  during the tenure of their visit.
  Area of each unit: 20SQM (5mx4m)
  Spaces: Each unit houses a bedroom attached with kitchenette and a
  washroom.
  Number of units per cluster: 3-6

- **Weavers' household with 1 Loom**
  These are the units which belong to the weaver' households of 4-5
  people and houses 1 loom.
  Area of each unit: 42 SQM (7mx6m)
  Spaces: Each unit houses a loom room for one loom, a kitchen, toilet
  and storage on ground floor, and bedroom and an attached bathroom on
  the first floor.
  Number of units per cluster: 6-7

- **Weavers' household with 2 Looms**
  These are the units which belong to the weaver' households of 4-5
  people and houses 2 looms.
  Area of each unit: 70 SQM (7mx10m)
  Spaces: Each unit houses a loom room for two looms, a kitchen, toilet
  and storage on ground floor, and two bedrooms and an attached
  bathroom on the first floor.
  Number of units per cluster: 14-15

- **Master Weavers**
  These are the units which belong to the master weaver' and is the center
  for training for the apprentice weavers.
  Area of each unit: 120 SQM (12mx10m)
  Spaces: Each unit houses a semi-open area enough for 4 looms (for
  apprentice weavers), a design studio along with one loom for master
  weaver, a kitchen, toilet and storage area on ground floor, and two
  bedrooms and an attached bathroom on the first floor.
  Number of units per cluster: 2

*Figure 49. Right- Conceptual Sketches depicting various typologies of
weavers' households within the clusters.*
Source: Author

CHAPTER 8
DESIGN PROPOSAL

Find attached the following drawings:

8.1 The Overall Developed Site and its Surrounding Context

8.2 Site: Plan and Sections

8.3 North-West Cluster: Plan and Sections

8.4 West Cluster: Plan and Sections

8.5 East Cluster: Plan and Sections

8.6 North-East Cluster: Plan and Sections

8.7 The Social Quadrant: Plan and Sections

8.8 Unit Design- Social Quadrant
Incubation Center and the Weaver's Market

8.9 Unit Design- Social Quadrant
The Design Co-lab Studios and Assembly Hall

8.10 Unit Design- Social Quadrant
The Community Center

8.11 Unit Design- Master Weaver's dwelling

8.12 Unit Design- Dwelling Unit with Two Looms

8.13 Unit Design- Dwelling Unit with Single Loom

8.14 Site Level Services and Project Summary

8.1 The Overall Developed Site and its Surrounding Context

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8.2 Site: Plan and Sections

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8.3 North-West Cluster: Plan and Sections

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8.4 West Cluster: Plan and Sections

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8.5 East Cluster: Plan and Sections

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8.6 North-East Cluster: Plan and Sections

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8.7 The Social Quadrant: Plan and Sections

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8.9 Unit Design- Social Quadrant
The Design Co-lab Studios and Assembly Hall

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8.11 Unit Design- Master Weaver's dwelling

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8.12 Unit Design- Dwelling Unit with Two Looms

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8.13 Unit Design- Dwelling Unit with Single Loom

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8.14 Site Level Services and Project Summary

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CHAPTER 9
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PART- I

Background Study and Introduction

The Tangible Heritage of Chanderi and Project Introduction.

1. The Vernacular architecture of Chanderi Handloom Clusters.
2. How is the socio-cultural hierarchy manifested in the built-fabric of Chanderi's Handloom Clusters?
3. What is this project about?
4. What is the Site Context?
5. What is the overarching idea of the project?

The Stone-Kissed Town of Chanderi
Key Elements of Chanderi's Indigenous Architecture

Critical Links between the Tangible and Intangible Heritage
The Socio-Economic Hierarchy and the Settlement Pattern

Built Environment as a Response to the Spatial requirements of a Weaving Process

Architecture as Design Precedence

A Typical Weaver's Cluster at Chanderi
An Interplay of the built and unbuilt

Inferences

The Indigenous Architecture of Chanderi as a Response to Bioclimatic Requisites of Handloom Weaving
- Relative humidity
- Regular Airflow
- Adequate Light
- Maintenance of Temperature Control
- Soft Floors

Project Details

Project Justification
Existing Issues with the Handloom Weaving Industry of Chanderi
- Declining Socio-Cultural Values
- Economic Slowdown
- Dilapidating built-environment

Site Context

The Architectural Scope

The Overarching Concept

02 Design Thesis- Final Jury
Introduction: The Built Heritage of Chanderi's Handloom Clusters and Project Introduction

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh
AMAN SINHA

The Geographical Context.

1. What is the Geographical context of the site?
2. What are the implications of the geographical context on the overall evolution of the site layout?

Geographical Context and Climatic Data

Site Contours

Wind Pattern

Strategies to Tap in Maximum Wind within the build blocks

Sun Path and Shadow Study

Azimuth and Altitude of Summer and Winter Sun

Site Massing Evolution
Inferences and Implications of Geographical Factors on Site Planning

Geographical Context and Climatic Data
Rainfall and Drainage Pattern

Climatic Data

Geotechnical Data
- Hills
- Flora
- Fauna
- Climate

03 Design Thesis- Final Jury
Introduction: The Geographical Context of the Site

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh
AMAN SINHA

Sheet 04

The Case Studies.

1. What were the takeaways from the Site Context Study?
2. What were the parameters chosen for the selection and analysis of the Case Studies?
3. What were the Cases studied?
4. What was the methodology adopted for case studies?

Project Conceptualization
The proposed project will be a design solution to the proposal put forward by the Madhya Pradesh Hastshilp Evam Hathkargha Vikas Nigam Limited, which aims to develop a handloom village for about 200 Weavers' families in the city of Chanderi. Although the proposed project primarily looks forward to developing a 'weaving cluster,' developing the proposed site to be one of the future landmarks of this historic city which accentuates the weaving tradition of the city. The proposed project is envisaged to be a precedence of sustainability for various other communities across the country which are engaged in a similar craft.

The Overarching Concept
The Thesis aims at breaking down the silos that impede better livability.

By uniting the disciplines of design/architecture, technology, and business, we can build impactful solutions that create value for real people. Especially with a community like the weavers, architecture needs to be backed by the other two domains, which are equally critical for their sustainable growth.

Case Studies' Analysis
Comparative Qualitative Assessment

Qualitative Parameters:
- Association with handloom weaving culture
- Architecture and the Economic Growth
- Livability of the users

Takeaways from Context and Site Study (Stage 1)
Existing issues with the Handloom Weaving Industry of Chanderi

1. Declining Socio-Cultural Values → Architecture as a manifestation of Weaving culture.
2. Economic Slowdown → Architecture as a facilitator for Economic Growth.
3. Dilapidated built-environment → Architecture as a manifestation of people's desire of better livability.

The Architectural Scope
1. Developing weaver's housing clusters in responses to their unique livelihoods.
2. To create a training center and common facility center along with community facilities to impart the collective growth of weavers and thus securing the relative hierarchy of merchants and traders.
3. An endogenous market place/street cum socio-cultural hub, which facilitates the direct business activities between the weavers, traders or visitors.
4. All of the above-mentioned design interventions would aim in taking forward the 'living heritage' of Chanderi, i.e. the handloom weaving while incorporating the technological advancements, and a revamped business model to facilitate this dying craft.

Weaving Clusters · Weaving Centres · Training Facilities

Design Guidelines
As Derived from the Case Studies

1. Room for placing the looms min size not less than 2.4m one side.
2. The room height should be not less than 12 feet.
3. Weaving room should have capacity to house at least two to three looms.
4. All rooms should have light and ventilation. Room in which looms are installed should have a window on the outer wall.
5. Special arrangements should be made for the weaver to sit while weaving.
6. Storage space for the yarn is also required.
7. Personal open space for each house is the preferred choice by residents.
8. Common spaces should also be provided in the premise for community gathering.
9. The project with mini host for providing platform for commercial benefits for the weavers will enhance the tourism development, have positive economic impact in the region.
10. Tourist arrivals are distributed throughout the year. Nearly 50-100 tourist visit Chanderi daily. This gives an opportunity to establish the training centre and exhibition cum sales counter in the housing clusters.
11. Provision of demo centre will attract the tourist for hands on and haat (outlet to sell the produce) would increase involvement of younger generation as a lucrative business to continue with.
12. Tourism oriented planning and tourism facilities to be incorporated as a decentralized craft infrastructure trail.
13. Need for socio-cultural and climate responsive architecture with integrated training centres, market and community gathering spaces to ensure an environment of constant growth. (Inclusive Design Approach)
14. Need for Variety of compact climate responsive household units with varied sizes, separate and combined living and working environments, maintenance proof materials and structure, courtyard layout for spill over activities.
15. Possibility of expansion/increment of household units to accommodate handlooms.

1. Handloom Weavers' Settlement and Household Study
1.1 Understanding the Spatial order of the Weaving clusters of Chanderi: The Ansari Neighborhood, Chanderi, & 1.2 Kodar Mubeen's and Mohammed Shafeeq's house, Chanderi

2. Handloom Weaving Centers Study
2.1 Contemporary vernacular Architecture Style for Weaving Centres: Ganga Maki Textile Studio, Rishikesh, Uttarakhand. (Live Case Study)
2.2 Indigenous vernacular architecture Style for Weaving Centre: Rehwa Society Unit 1 and 2, Maheshwar, Madhya Pradesh

3. Handloom Schools / Training Facilities Study
3.1 the traditional style: The Handloom School, Kaya-Kalp, Maheshwar, Madhya Pradesh. (Live Case Study)

4. Socio-Cultural Centres cum Indigenous Market Places
4.1 the traditional style: Dilli Haat, Janakpuri, New Delhi (Live Case Study)

Shantipur Clusters · Chanderi Clusters · Varanasi Clusters · Chanderi Handloom Park

(Parameters: Spatial Hierarchies, Construction, Materiality and Structural Systems, Weaving Tools, Social Infrastructure, Design Inspirations/ Precedences, Socio-Economic Conditions and Hierarchical Linkages)

Sheet 05

The Design Philosophy and Area Programming.

1. The applicable bye-laws and Area Calculations.
2. Initial area programming and clustering ideas.
3. Structuring within the individual clusters.
4. The Conceptual Framework and design philosophy behind the project.

DESIGN PHILOSOPHY AND CONCEPTION
The Conceptual framework of the thesis is based on the following four tenets:
1. The Genius Loci, or the Spirit of the place.
2. Architectural Metaphorism: the best comes to reinforce the socio-cultural ideas of the historic city of Chanderi with an underlying progressive conditions of the weavers.

ARCHITECTURAL METAPHORISM
How can architecture manifest the living heritage of Chanderi, i.e. the weaving culture of the town?

REINVIGORATING THE GENIUS LOCI
The Fusion of the Genius Loci's

GENIUS LOCI
'Spirit of Place' of Handloom Weavers' Clusters of Chanderi
1. Energy Fields
2. Authenticity
3. Local Distinctiveness
4. Narrative with Layers of History
5. Empowerment of Local People
6. Essence
7. Character and Individuality
8. Ecosystem

ARCHITECTURAL METAPHORISM
Architectural Manifestation of Weaving Culture and Analogies between the built environment and the handloom product
1. Permeability
2. Continuity
3. Tacitity
4. Organicity
5. Layering
6. Contextuality
7. Parts to Whole

THE USER GROUPS
Residents

THE DESIGN PART I
1. Genius Loci
2. Social Hierarchy
3. Common Facilities
4. Process Exposition
5. Co-Working Landscapes

Landscape Usage
1. Weavers' Houses + Looms
2. Weaving Setup + Looms
3. Master Weaver

About the Site
Applicable Bye-Laws and Area Calculations
Site Area: 37,800 MSQ
Permissible Floor Area Ratio: 1.25
Maximum permissible built-up area:
37,800 x 1.25 = 47,250 MSQ
Maximum Permissible Ground Coverage = 60%
Maximum permissible ground coverage
37,800 MSQ x 0.6 = 22,680 MSQ

Area Programming Overview
Tentative Clustering
Total Number of Weavers' households to be achieved = 150
Weavers' Households in one cluster = 20
Total number of Weavers' Clusters (150/20) = 7.5

Area Programming- Prototype Cluster
Weaver's Household

Cluster Prototype: Master Weaver (1), Master Weaver (II), Master Weavers (Apprentice) etc.

Total Area for 1 prototype Cluster = 2,465 SQM
Therefore, for 8 Such clusters = 19,720 SQM

PART- II
Design Proposal

The Overall Developed Site and its Surrounding Context.

The North -East Cluster

The Major Access point for the visitors through a 6m wide road.

The East Cluster

9m wide Internal Main Road.

9m wide peripheral Road.

6m wide central pedestrian pathway (with light traffic).

The Social Quadrant

The North-West Cluster

The Site Access point through the 4m wide village road.

Retention Pond
The Lowest Point in the Site. Pond fed by the treated water from the anaerobic STP.

The West Cluster
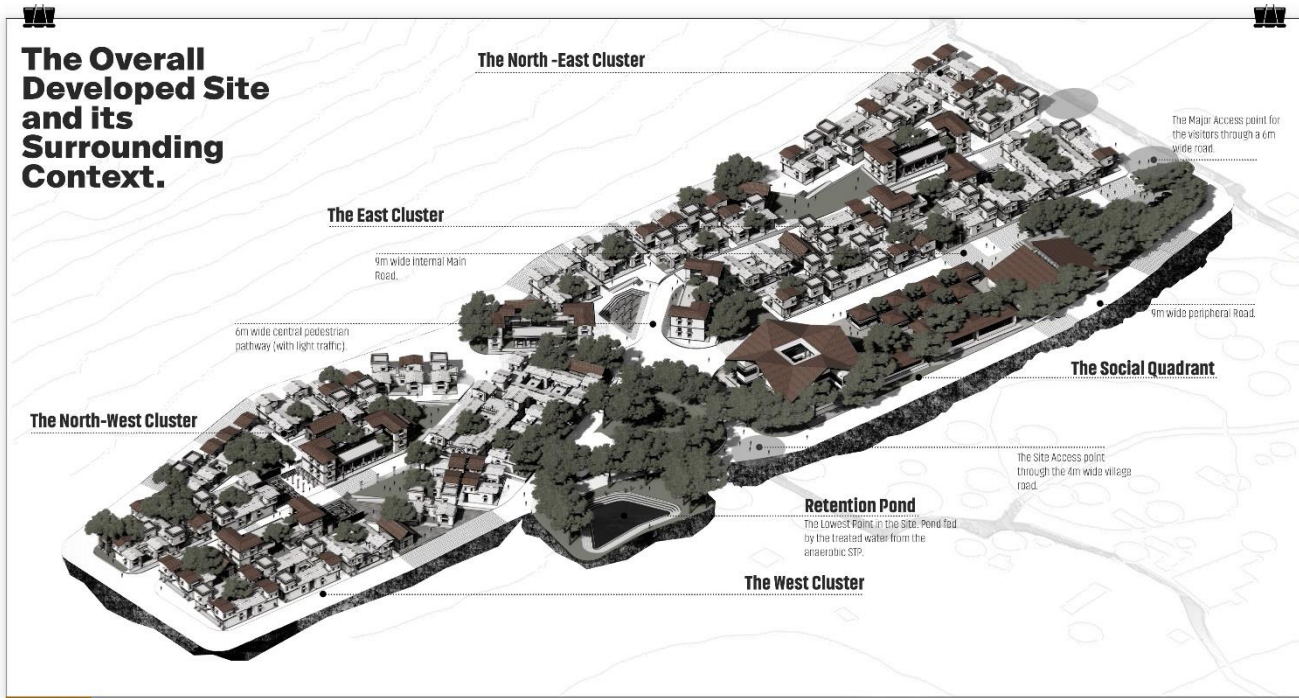
07 Design Thesis: Final Jury
Site: Overall Site Axonometric

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

105

Site Evolution Process

Emergence of nodes across the site, in accordance with the positioning of master weavers' dwellings.

Emergence of individual weavers Clusters.

Further Division of the two blocks and introduction of road networks as per the contours.

Broader Site Massing and Connection between the two entry/exit.

The Household Units-Weavers Clusters

The Social Quadrant

Lowest Point- Retention Pond and STP

Entry/Exit

Entry/Exit

The site blocking as derived from the geographical context study.

The North-West Cluster

The North -East Cluster

The West Cluster

Retention Pond

The Social Quadrant   The East Cluster

08 Pre-Final Thesis Review
Site: Development Process, Plan and Sections

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

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Site Views.

Intersection between the North-west and West cluster. The weaver's exhibit area overlooking the 6m. wide road, with a glimpse of master-weavers dwellings on either side of the exhibits.

The lowest point of the site and the already existing, rain-fed water body connected into a retention pond for the treated water coming from the anaerobic STP situated right next to it. This water body along with the green mound makes for a peaceful getaway from the clusters.

Entrance point to the site from the 3m. wide Kachha road passing through the village. The dense mound on the left and community center on right marks the entry point to the site with trees on either side of the road creating a 9m wide boulevard.

Main Entrance point to the site from the 6m. wide road, shows the intersection between the Social quadrant and the East Cluster. Along with it a subtle glimpse of the Design-Collab Studio, weaver's marketplace and the community center.

The community center standing tall as a landmark of the whole settlement, connecting the past and future of the weavers of Chanderi. The sheer scale of the building and a typical roofing system makes it stand out amidst the settlement.

09 Design Thesis- Final Jury
Site: Views

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The North-West Cluster.

About the Cluster

The North-west cluster houses **29 household Units.**
Within these 29 units, there are:
Master Weaver's Dwellings- **2**
Therefore, population of this cluster- **130 People.**
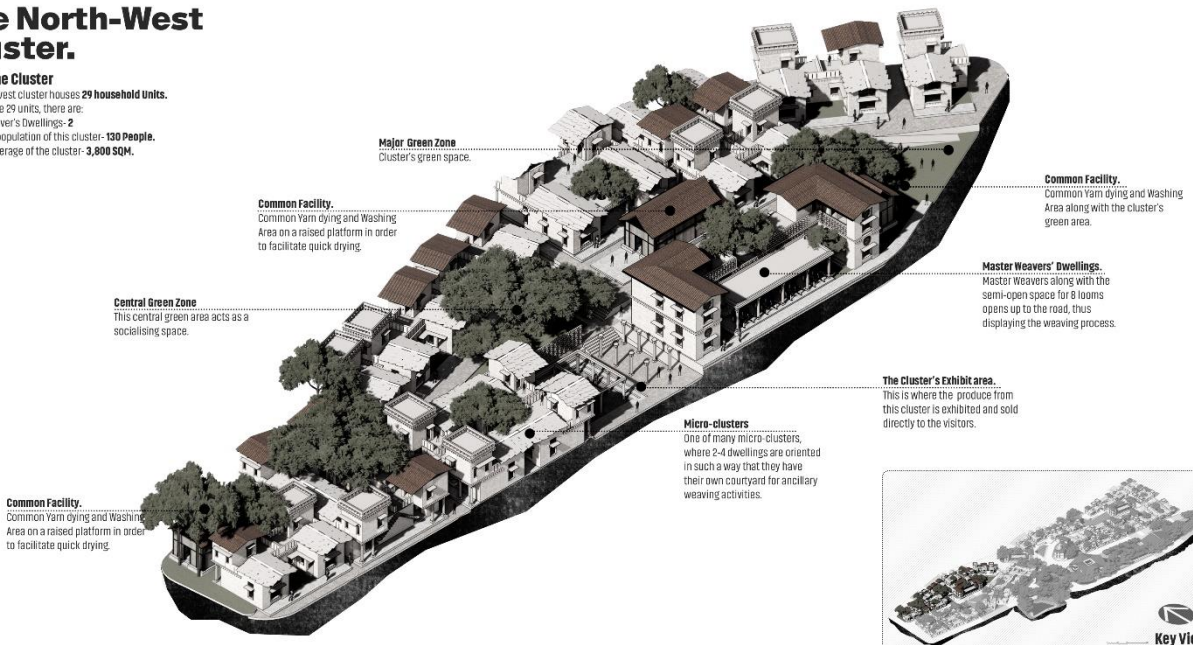Ground Coverage of the cluster- **3,800 SQM.**

Major Green Zone
Cluster's green space.

Common Facility.
Common Yarn dying and Washing
Area on a raised platform in order
to facilitate quick drying.

Central Green Zone
This central green area acts as a
socialising space.

Common Facility.
Common Yarn dying and Washing
Area on a raised platform in order
to facilitate quick drying.

Common Facility.
Common Yarn dying and Washing
Area along with the cluster's
green area.

Master Weavers' Dwellings.
Master Weavers along with the
semi-open space for 8 looms
opens up to the road, thus
displaying the weaving process.

The Cluster's Exhibit area.
This is where the produce from
this cluster is exhibited and sold
directly to the visitors.

Micro-clusters
One of many micro-clusters,
where 2-4 dwellings are oriented
in such a way that they have
their own courtyard for ancillary
weaving activities.

Key View

10 Design Thesis- Final Jury
North-West Cluster Design
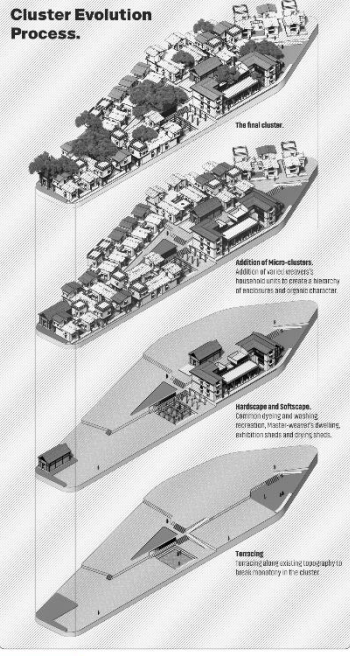
0   10m   20m   40m

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

Cluster Evolution Process.

The final cluster.

Addition of Micro-clusters.
Addition of varied weaver's
household units to create a hierarchy of enclosures and organic character.

Hardscape and Softscape.
Common dyeing and washing,
recreation, Master-weaver's dwelling,
exhibition sheds and drying sheds.

Terracing
Terracing along existing topography to
break monotony in the cluster.

NORTH-WEST CLUSTER PLAN

CLUSTER SECTIONS

CLUSTER SECTIONS

11 Design Thesis- Final Jury
North-West Cluster Design

0   10m   20m   40m

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

North-West Cluster Views.

ROADSIDE ELEVATIONS
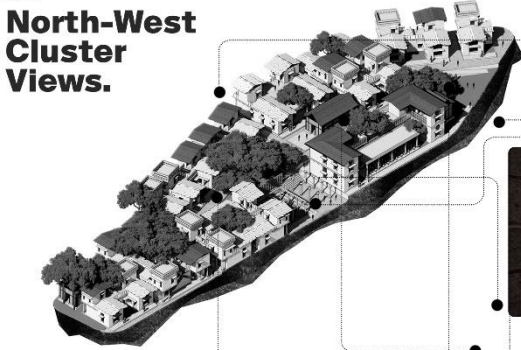
View of the exhibition area from one of the windows on the first floor of the master weaver's dwelling.

The Exhibition area and the master weaver's dwelling along the main road, such that it becomes readily accessible to the visitors, who can witness the production process, as well as buy the product directly from the cluster's weavers.

View of the central green area overlooking the cluster's exhibition area and the master weavers dwelling.

View of the internal lanes of the cluster, right behind the master weavers dwelling. Difference in levels provides an enhanced visual connectivity within the cluster.

The Common dying and washing facility right next to the master weavers dwelling. A special wattle and daub construction to ensure optimum inner environment of the facility.

12 Design Thesis- Final Jury
North-West Cluster Design

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The West Cluster.

About the Cluster
The North-west cluster houses **32 household Units.**
Within these 32 units, there are:
Master Weaver's Dwellings- **2**
Therefore, population of this cluster- **144 People.**
Ground Coverage of the cluster- **5,100 SQM.**

Micro-clusters
One of many micro-clusters, where 2-4 dwellings are oriented in such a way that they have their own courtyard for ancillary weaving activities.

Common Facility.
Common Yarn dying and Washing Area along with the cluster's green area.

Master Weavers' Dwellings.
Master Weavers along with the semi-open space for 8 looms opens up to the road, thus displaying the weaving process.

Common Facility.
Common Yarn dying and Washing Area on a raised platform in order to facilitate quick drying.

The Cluster's Exhibit area.
This is where the produce from this cluster is exhibited and sold directly to the visitors.

Central Green Zone
This central green area acts as a socialising space.

Micro-clusters
One of many micro-clusters, where 2-4 dwellings are oriented in such a way that they have their own courtyard for ancillary weaving activities.

Common Facility.
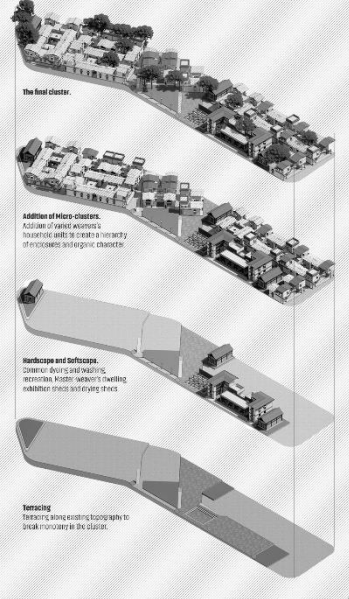Common Yarn dying and Washing Area on a raised platform in order to facilitate quick drying.
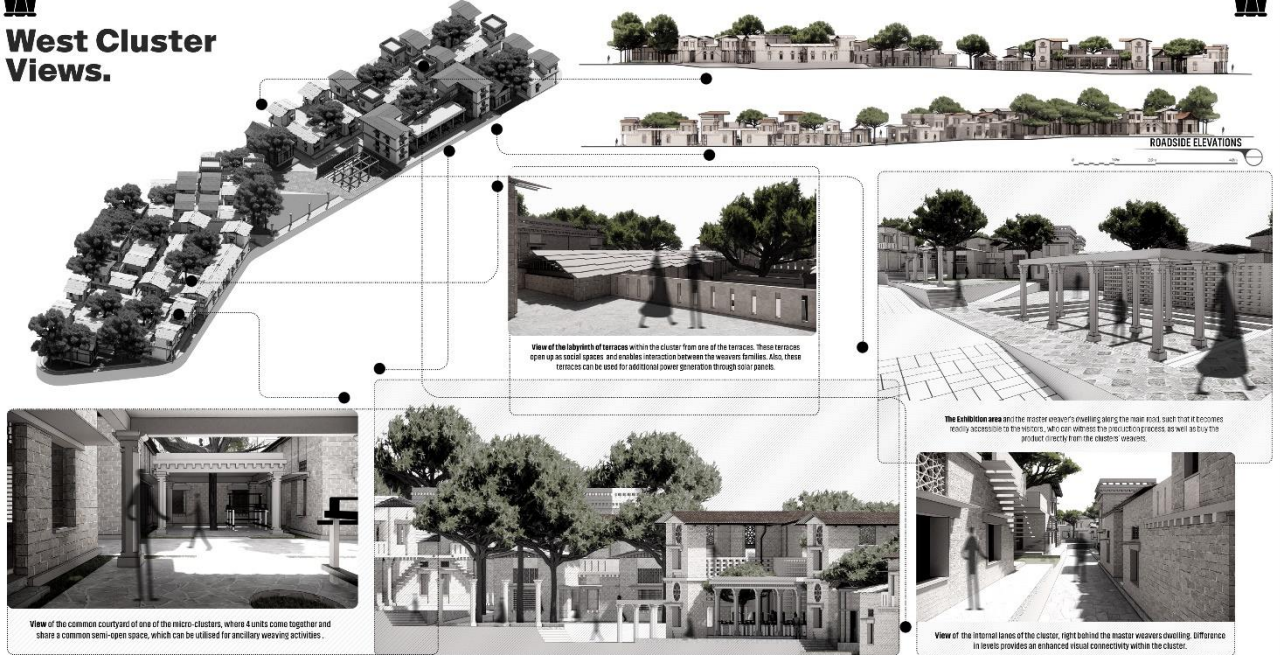
Key View

13 Design Thesis- Final Jury
West Cluster Design

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

108

Cluster Evolution Process

The final cluster.

Addition of Micro-clusters.
Addition of varied weaver's household units to create a hierarchy of enclosures and organic character.

Hardscape and Softscape.
Common dyeing and washing, recreation, Master weaver's dwelling, exhibition sheds and drying sheds

Terracing
Terracing along existing topography to break monotony in the cluster.

WEST CLUSTER PLAN

CLUSTER SECTIONS

CLUSTER SECTIONS

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

West Cluster Views.

ROADSIDE ELEVATIONS

View of the labyrinth of terraces within the cluster from one of the terraces. These terraces open up as social spaces and enables interaction between the weavers families. Also, these terraces can be used for additional power generation through solar panels.

The Exhibition area and the master weaver's dwelling along the main road, such that it becomes readily accessible to the visitors, who can witness the production process, as well as buy the product directly from the cluster's weavers.

View of the common courtyard of one of the micro-clusters, where 4 units come together and share a common semi-open space, which can be utilised for ancillary weaving activities.

View of the internal lanes of the cluster, right behind the master weavers dwelling. Difference in levels provides an enhanced visual connectivity within the cluster.

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
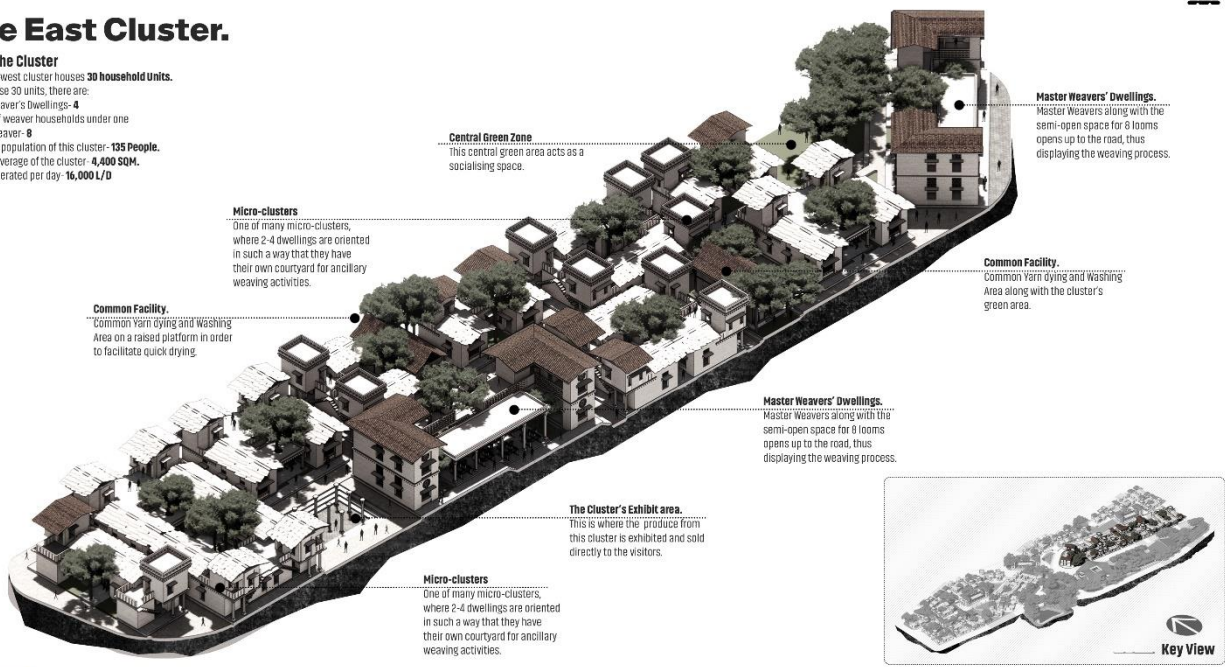Chanderi, Madhya Pradesh

AMAN SINHA

The East Cluster.

About the Cluster
The North-west cluster houses **30 household Units.**
Within these 30 units, there are:
Master Weaver's Dwellings- **4**
Number of weaver households under one
master-weaver- **8**
Therefore, population of this cluster- **135 People.**
Ground Coverage of the cluster- **4,400 SQM.**
Waste generated per day- **16,000 L/D**

Central Green Zone
This central green area acts as a
socialising space.

Micro-clusters
One of many micro-clusters,
where 2-4 dwellings are oriented
in such a way that they have
their own courtyard for ancillary
weaving activities.

Master Weavers' Dwellings.
Master Weavers along with the
semi-open space for 8 looms
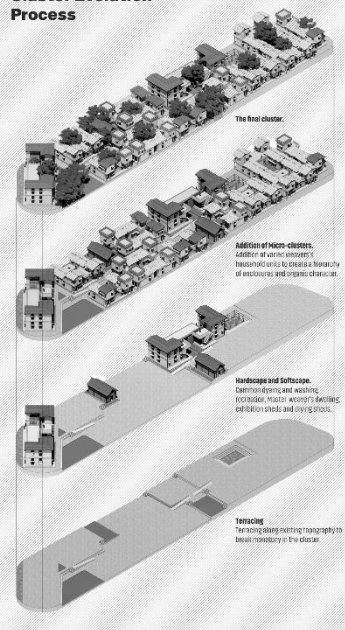opens up to the road, thus
displaying the weaving process.

Common Facility.
Common Yarn dying and Washing
Area along with the cluster's
green area.

Common Facility.
Common Yarn dying and Washing
Area on a raised platform in order
to facilitate quick drying.

Master Weavers' Dwellings.
Master Weavers along with the
semi-open space for 8 looms
opens up to the road, thus
displaying the weaving process.

The Cluster's Exhibit area.
This is where the produce from
this cluster is exhibited and sold
directly to the visitors.

Micro-clusters
One of many micro-clusters,
where 2-4 dwellings are oriented
in such a way that they have
their own courtyard for ancillary
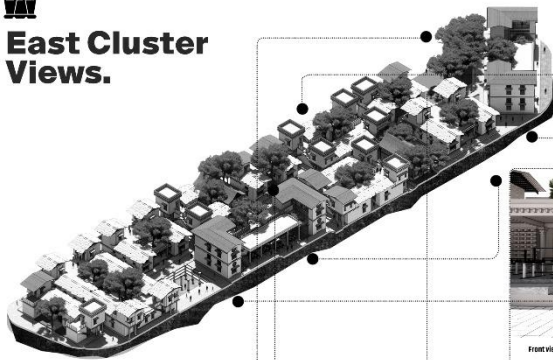weaving activities.

Key View

Design Thesis- Final Jury
East Cluster Design

0   10m   20m   40m

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

Cluster Evolution Process

The final cluster.

Addition of Micro-clusters.
Addition of varied weaver's
household units to create a hierarchy
of enclosures and organic character.

Hardscape and Softscape.
Common dyeing and washing,
recreation, Master weaver's dwelling,
exhibition sheds and drying sheds.

Terracing.
Terracing along existing topography to
break monotony in the cluster.

EAST CLUSTER PLAN

CLUSTER SECTIONS

CLUSTER SECTIONS

Design Thesis- Final Jury
East Cluster Design

0   10m   20m   40m

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

East Cluster Views.

ROADSIDE ELEVATIONS

Front view of the master weaver's dwelling with the semi-open space for apprentice weavers showcasing the weaving process to the visitors.

The Exhibition area and the master weaver's dwelling along the main road, such that it becomes readily accessible to the visitors, who can witness the production process, as well as buy the product directly from the cluster's weavers.

View of the common green area right behind the master weavers dwelling. This space can be used for multiple purposes including play area for kids, interaction area for the elders.

View of the internal lanes of the cluster, right behind the master weavers dwelling. Difference in levels provides an enhanced visual connectivity within the cluster.

18 Design Thesis- Final Jury
East Cluster Design

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The North-East Cluster.

About the Cluster
The North-west cluster houses **34 household Units.**
Within these 30 units, there are:
Master Weaver's Dwellings- **4**
Number of weaver households under one
master-weaver- **9**
Therefore, population of this cluster- **153 People.**
Ground Coverage of the cluster- **5,700 SQM.**
Waste generated per day- **20,000 L/D**

Micro-clusters
One of many micro-clusters,
where 2-4 dwellings are oriented
in such a way that they have
their own courtyard for ancillary
weaving activities.

Master Weavers' Dwellings.
Master Weavers along with the
semi-open space for 8 looms
opens up to the road, thus
displaying the weaving process.

Common Facility.
Common Yarn dying and Washing
Area along with the cluster's
green area.

Central Green Zone
This central green area acts as a
socialising space.

Micro-clusters
One of many micro-clusters,
where 2-4 dwellings are oriented
in such a way that they have
their own courtyard for ancillary
weaving activities.

Common Facility.
Common Yarn dying and Washing
Area on a raised platform in order
to facilitate quick drying.

The Cluster's Exhibit area.
This is where the produce from
this cluster is exhibited and sold
directly to the visitors.
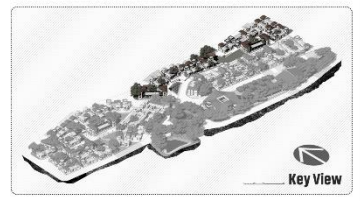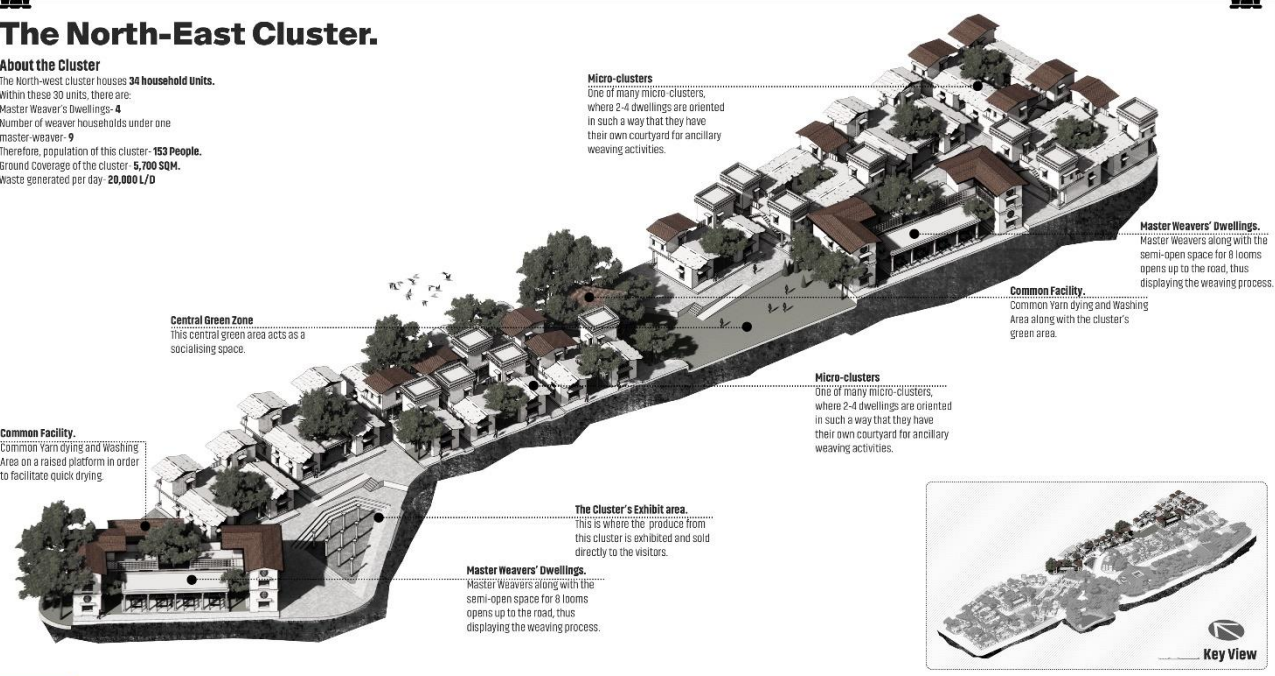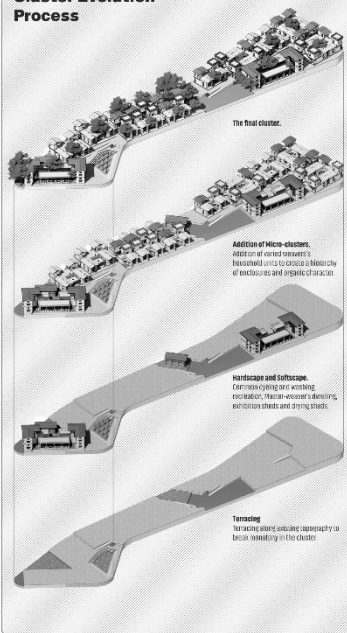
Master Weavers' Dwellings.
Master Weavers along with the
semi-open space for 8 looms
opens up to the road, thus
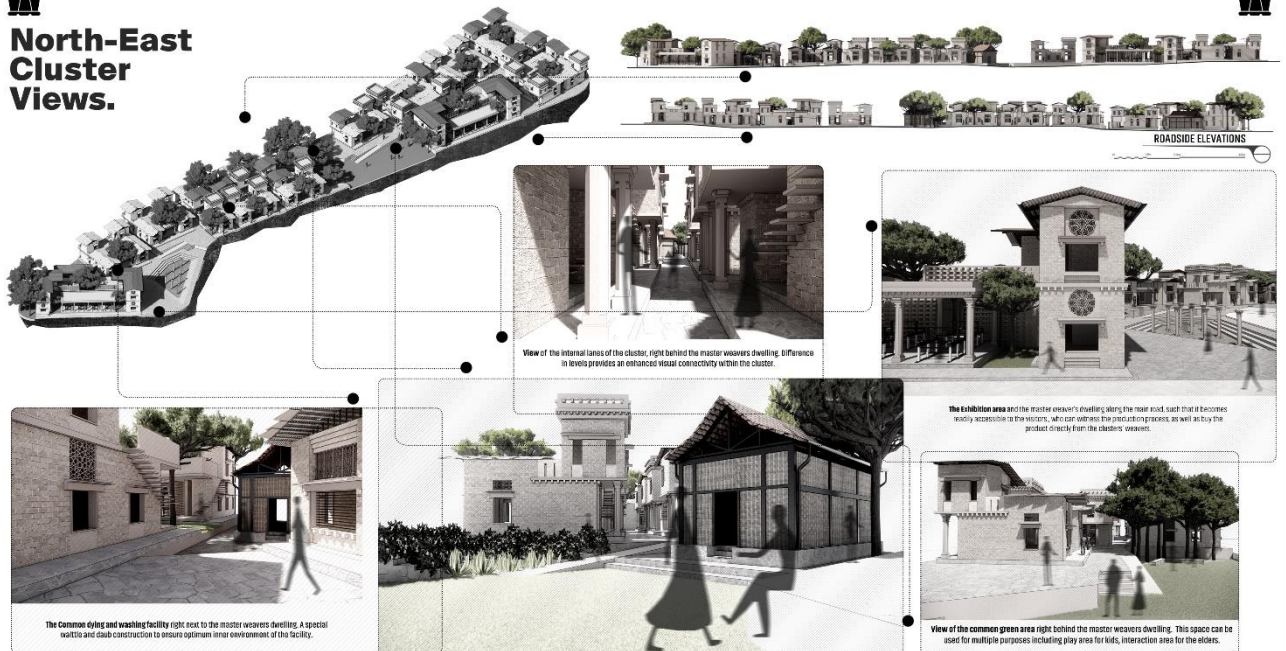displaying the weaving process.

Key View

19 Design Thesis- Final Jury
North-East Cluster Design

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

Cluster Evolution Process

The final cluster.

Addition of Micro-clusters.
Addition of varied weaver's household units to create a hierarchy of enclosures and organic character.

Hardscape and Softscape.
Common cycling and washing, recreation, Master-weaver's dwelling, exhibition sheds and drying sheds.

Terracing
Terracing along existing topography to break monotony in the cluster.

NORTH-EAST CLUSTER PLAN
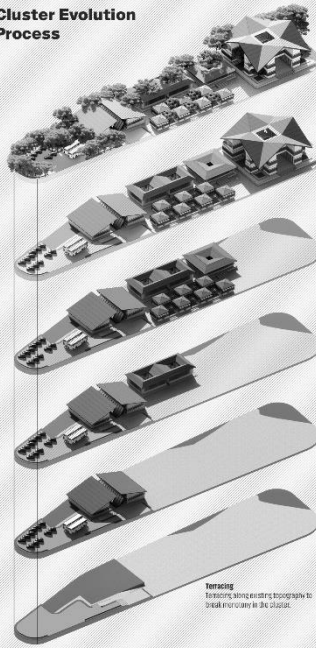
CLUSTER SECTIONS

CLUSTER SECTIONS

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

North-East Cluster Views.

ROADSIDE ELEVATIONS

View of the internal lanes of the cluster, right behind the master weavers dwelling. Difference in levels provides an enhanced visual connectivity within the cluster.

The Exhibition area and the master weaver's dwelling along the main road, such that it becomes readily accessible to the visitors, who can witness the production process, as well as buy the product directly from the clusters' weavers.

The Common dying and washing facility right next to the master weavers dwelling. A special wattle and daub construction to ensure optimum inner environment of the facility.

View of the common green area right behind the master weavers dwelling. This space can be used for multiple purposes including play area for kids, interaction area for the elders.
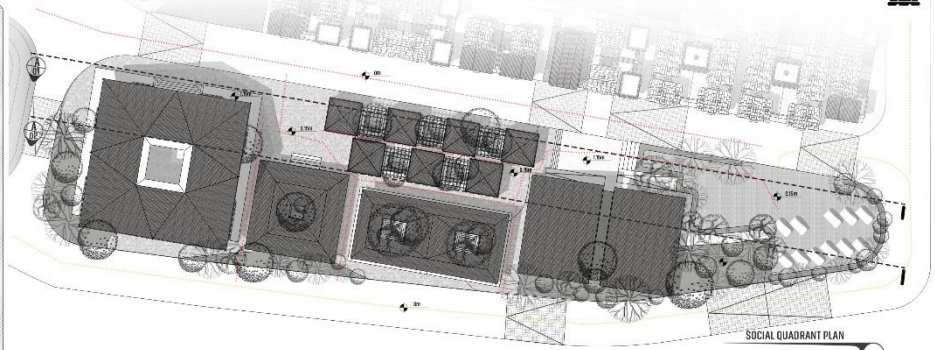
Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The Social Quadrant.

About the Social Quadrant

This cluster is meant for the socio-economic development of the weavers so as to compete well in the challenging market. Apart from all the weavers housholds and their interstitial social spaces, the weavers need a complex of institutions where they can learn and grow amongst themselves and with the help of outsiders.

They need an institution within the village ollowing an inclusive approach, which can train the weavers and and uplift their livelihoods.

The Community Center
The landmark of the whole site because of its functionality and enormous scale as compared to other buildings.

The Assembly Hall
This becomes as a gathering space for both the residents as well as the visitors.

The Incubation Center
Satellite Offices for various cooperatives working in the city of Chanderi. Also, this provides office chambers for the administrative works of the cluster.

The Weaver's Market and amenities area
The residents of this settlement would also require a market for their daily needs. This serves their purpose of providing them with a space where they can cover thier daily needs.

The Design Co-Lab Studios
This space is dedicated for the design collaboration between the designers from MNCs and the local weavers. Digital Design training as well as photo studios for clicking pictures of their products and sell them on various E-commerce platforms.

The Visitors' Parking area
This 750 SQM Parking space right next to the access point of the site provides enough space for 30 Four wheelers at a time.

Key View

0   10m   20m   40m

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA
2019BARCH23 DESIGN THESIS

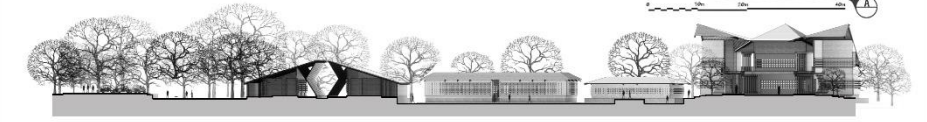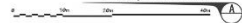
Cluster Evolution Process

Terracing
Terracing along existing topography to break monotony in the cluster.

SOCIAL QUADRANT PLAN
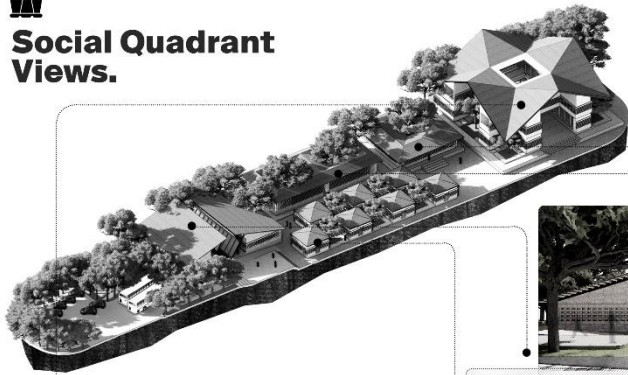
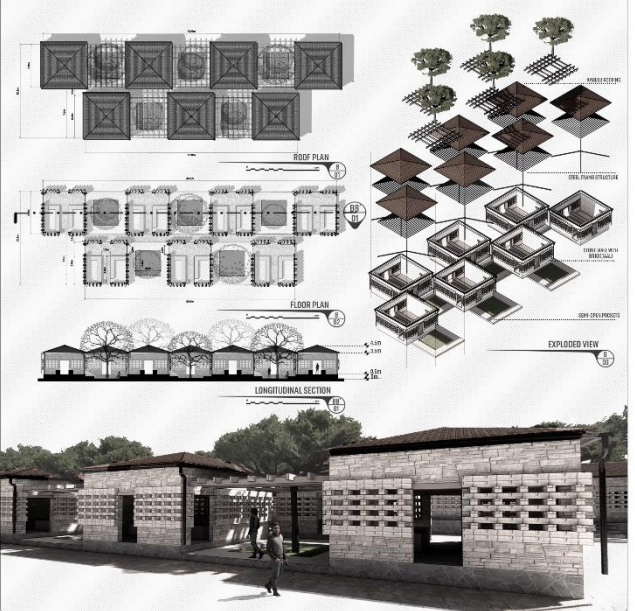SOCIAL QUADRANT SECTION A
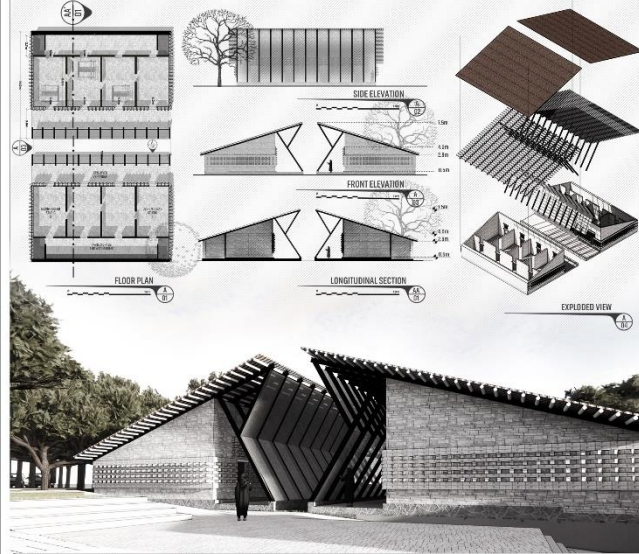
SOCIAL QUADRANT SECTION B

0   10m   20m   40m

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA
2019BARCH23 DESIGN THESIS

Social Quadrant Views.

Weavers' Incubation Cum Admin Center: View of the incubation center, with roofing system creating open-to-sky spaces within the building.

The Design Co-Lab Studios: These studio are meant for the much needed interaction between the foreign designers from brands like Fabindia, Mrignayani etc. This houses space for 4 studios, which can be leased out on a monthly basis to these brands.

The Assembly Hall: An assembly area for about 60 people, which is meant for the important information sharing between both, the residents and the visitors. SHG's can use this space widely for their discussions.
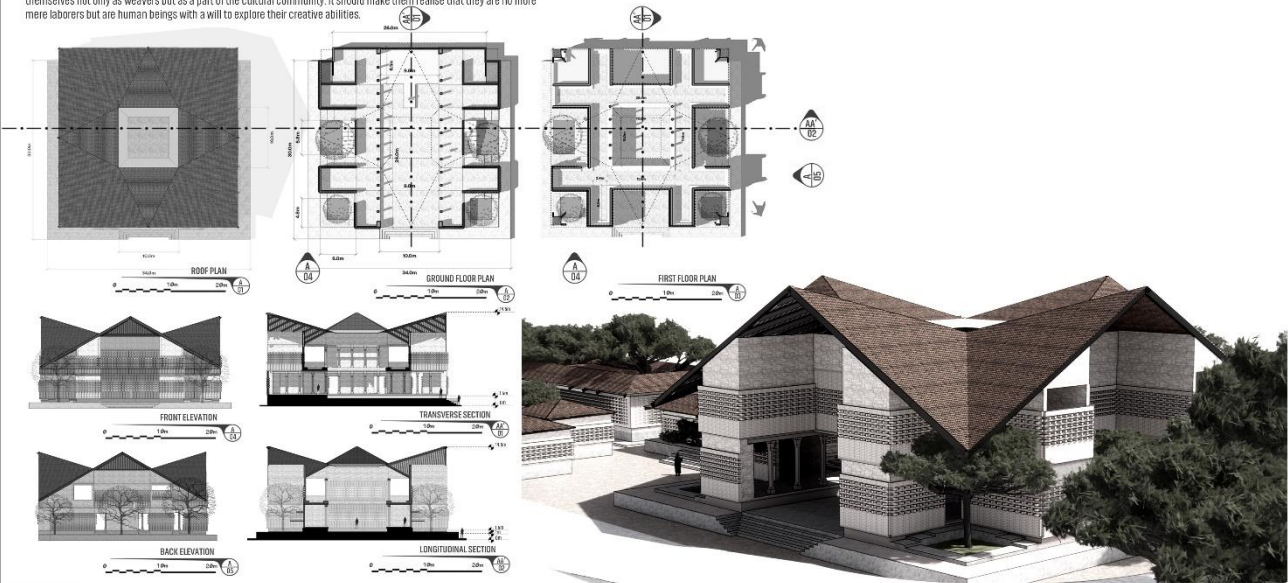
The Community Center: Interior view of the community center which accentuates the traditional Chanderi's architectural elements. This space would be used to host the frequent fashion shows that happen in the town.

Weavers' market: View of the Weavers' market with shops and intertwined open spaces.

24 Design Thesis- Final Jury
The Social Quadrant Design

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The Incubation Center.
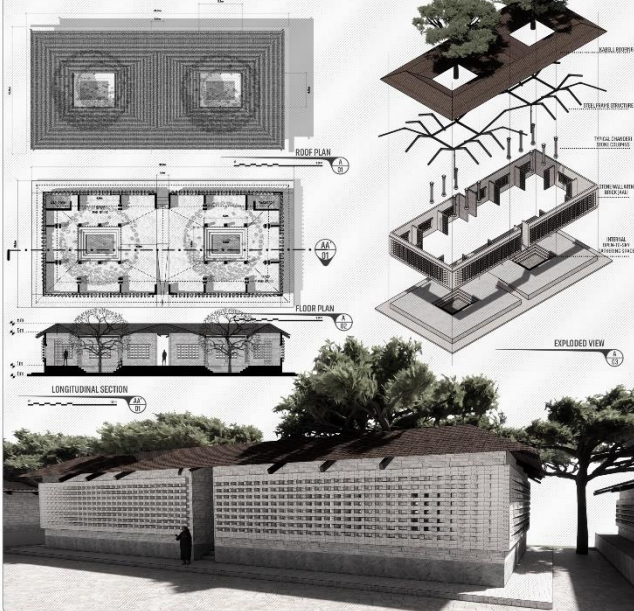
The Weaver's Market.

25 Design Thesis- Final Jury
Units' Design- The Social Quadrant

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The Design-Colab Studios.

About
These studio are meant for the much needed interactin between the foreign designers from brands like FabIndia, Mrignayani etc. This houses space for 4 studios, which can be leased out on a monthly basis to these brands.

SIDE ELEVATION

FRONT ELEVATION

FLOOR PLAN

LONGITUDINAL SECTION

EXPLODED VIEW

The Assembly Hall.

About
An assembly area for about 60 people, which is meant for the important information sharing between both, the residents and the visitors. SHG's can use this space widely for their discussions.

FLOOR PLAN

ROOF PLAN

EXPLODED VIEW

LONGITUDINAL SECTION

FRONT ELEVATION

26   Design Thesis- Final Jury
Units' Design- The Social Quadrant
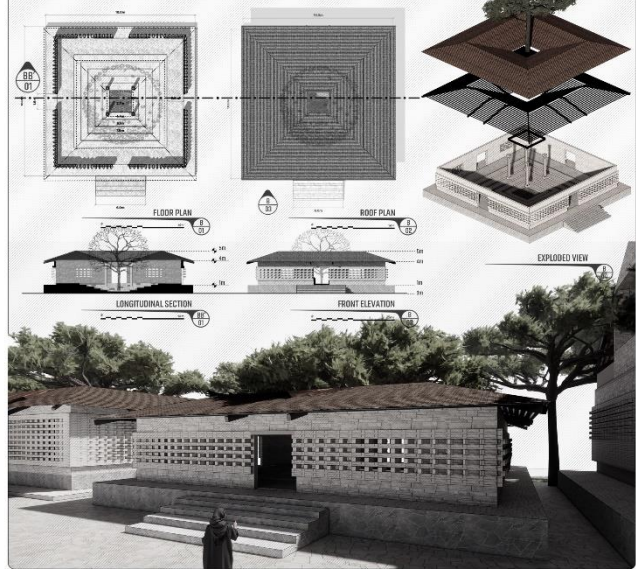
Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The Community Center.

The community center acts as a beacon for connecting the past and the future of development for handloom weavers in Chanderi. It can incorporate spaces specific to the needs of weavers in Chanderi. It should give them spaces to explore themselves not only as weavers but as a part of the cultural community. It should make them realise that they are no more mere laborers but are human beings with a will to explore their creative abilities.
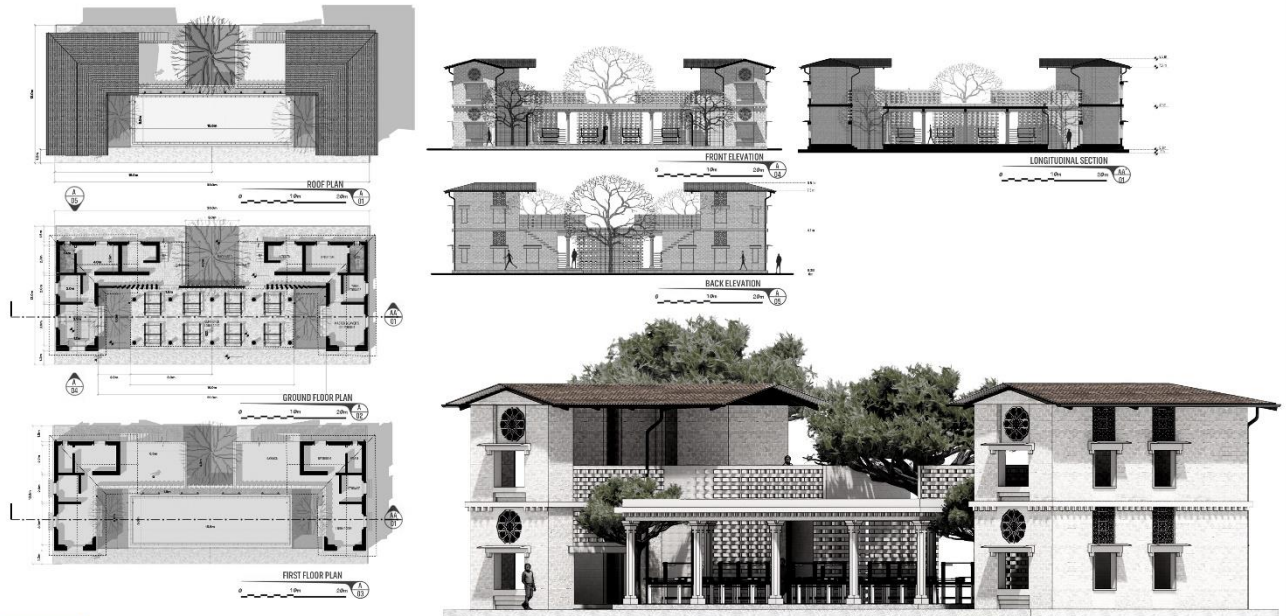
ROOF PLAN

GROUND FLOOR PLAN

FIRST FLOOR PLAN

FRONT ELEVATION

TRANSVERSE SECTION

BACK ELEVATION

LONGITUDINAL SECTION

27   Design Thesis- Final jury
Units' Design- The Social Quadrant

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The Master Weaver's Dwelling.

ROOF PLAN

GROUND FLOOR PLAN

FIRST FLOOR PLAN

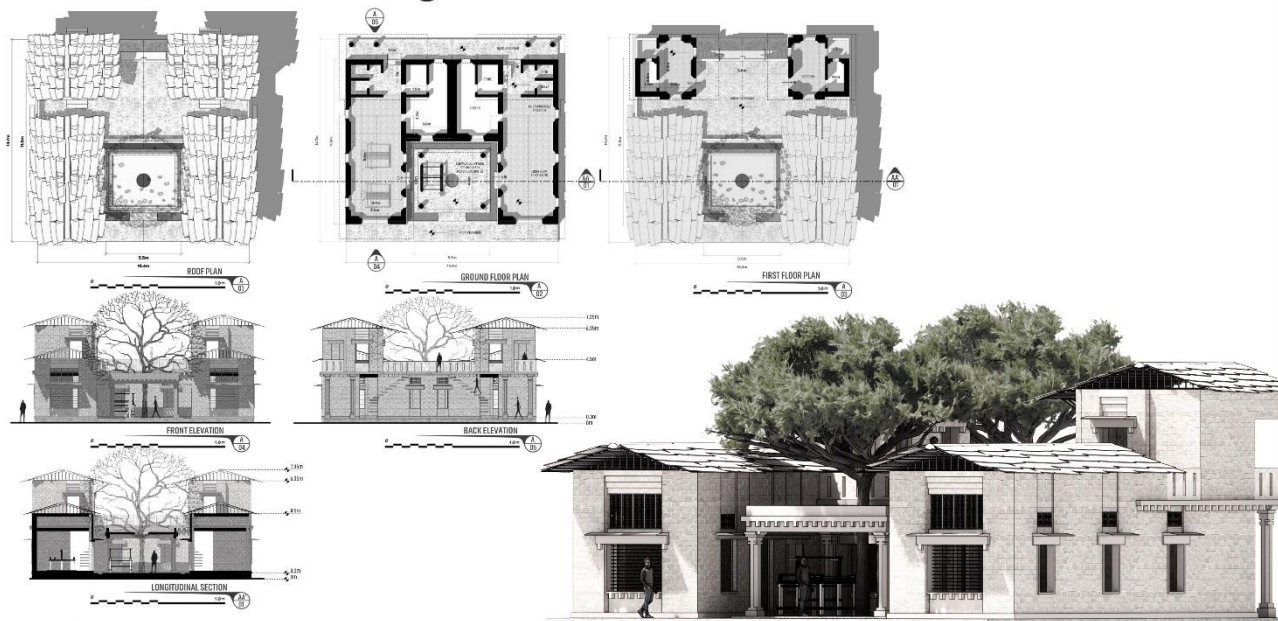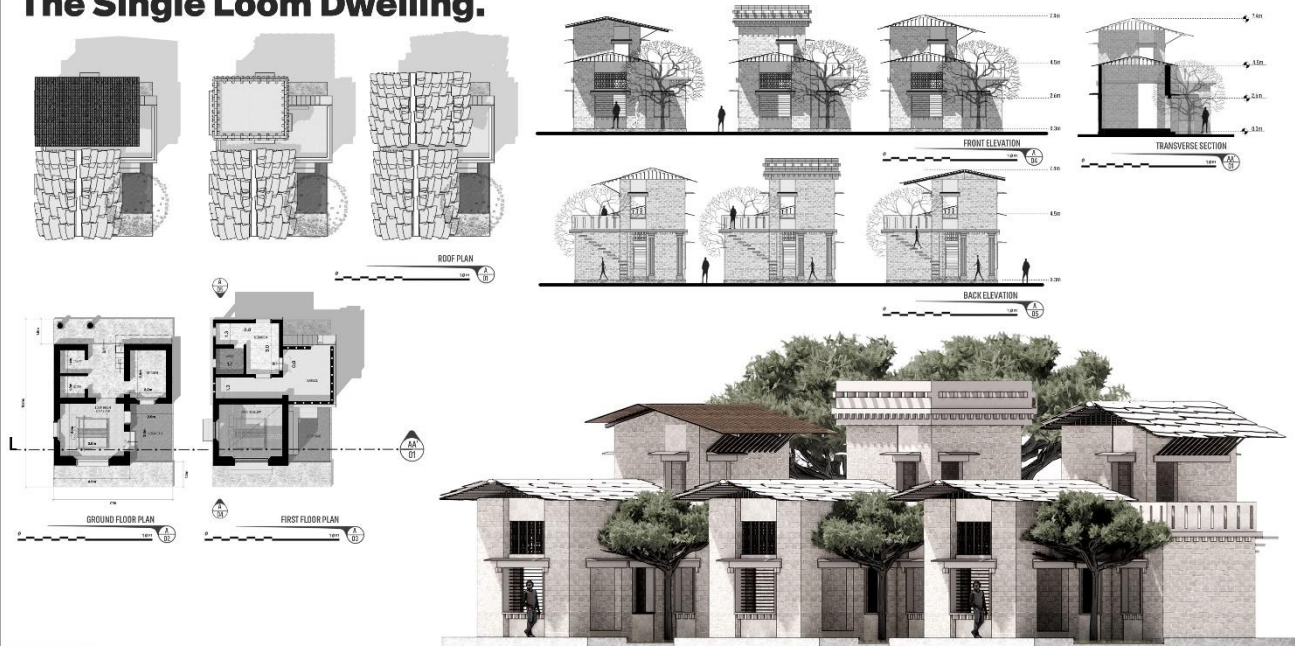FRONT ELEVATION

BACK ELEVATION

LONGITUDINAL SECTION

28 Design Thesis-Final Jury
Household Unit Design

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The Two Looms Dwelling.

ROOF PLAN

GROUND FLOOR PLAN

FIRST FLOOR PLAN

FRONT ELEVATION

BACK ELEVATION

LONGITUDINAL SECTION

29 Design Thesis- Final Jury
Household Unit Design

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

The Single Loom Dwelling.

ROOF PLAN

GROUND FLOOR PLAN

FIRST FLOOR PLAN

FRONT ELEVATION

TRANSVERSE SECTION

BACK ELEVATION

30
Design Thesis- Final Jury
Household Unit Design

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

Site Level Services and Project Summary

1. What is the Geographical context of the site?
2. What are the **implications** of the geographical context on the overall evolution of the site layout?

Water Requirement and Waste Disposal

Fire Tender Movement Pattern and Electrical Substation

Project Summary
'Reinvigorating the Genius Loci of Indian Handloom Clusters'

132 Weaver's Households
12 Master Weavers
23,000 SQM of Ground Coverage
and

One Handloom Community

31
Design Thesis- Final Jury
Site Level Services and Project Summary

Reinvigorating the Genius Loci of Indian Handloom Clusters:
An Integrated Handloom Production Center, Fatehabad
Chanderi, Madhya Pradesh

AMAN SINHA

ANNEXURE II
JURY COMMENTS

Jury Members:
1. **Prof. Aneerudha Paul**
2. **Dr. N. Kavita Daryani Rao**

Positives:
- *"Commendable Context Study."*
- *"In-depth understanding of Chanderi's built-fabric."*
- *"Commendable understanding of the users and the existing socio-cultural hierarchies in Chanderi."*
- *"Overall design is deeply rooted in the local context and the understanding is highly reflected in the overall design of the project."*
- *"High level of control is reflected in the spatial design, and the design seems very well balanced."*
- *"Didn't overdo the design, which is pretty common amongst the architects"*

Negatives:
- None.

Questions:
- *The nature of the project? Who would be occupying these clusters?*
- *Why has the government proposed such project?*
- *How relevant is it to continue with the traditional socio-cultural and economic hierarchies in the upcoming architectural projects?*

ANNEXURE III
SIMILARITY REPORT