

Indigenous Spaces. Indigenous Traditions:
An Immersive environmental education center in Kodagu, Karnataka, India.

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I ACKNOWLEDGMENTS I

To Mom and Dad: For introducing and sustaining an interest in me to learn about this incredible part of the world.

To my family in Coorg: Mom, Dad, Dorai Thai, Anupa and Vinitha. Thank you for supporting me in my research in and out of Coorg. This research project would not have been possible without your help.

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*For Somanna. Aarya. Rhea.
For always being the wind beneath my wings*

I ABSTRACT I

Indigenous Spaces. Indigenous Traditions:

An Immersive environmental education center in Kodagu, Karnataka, India.

TANYA NACHIA

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Peter Cohan

Department of Architecture

Located deep in the heart of the Western Ghat mountain range in the southern Indian state of Karnataka is Kodagu - a land and a tribe whose history goes back thousands of years in time. An ancient and elusive culture - a fierce martial forest tribe were the guardians of the great forests that lie in this region. They are the original protectors of the greatest South Indian river –the Cauvery – whose origin springs deep in these sacred mountains. Recognized as one of the 7 great hotspots of biodiversity in the world, today, this region faces unprecedented cultural and ecological impacts due to numerous internal and external influences. The aforementioned indigenous tribe of this region – the Kodavas , are a declining population. This thesis examines the current influences that potentially threaten the ecological future of this land.

The thesis is grounded in the principle that environmental education via a built intervention could very well be the peaceful yet forceful catalyst for change that is much needed in this region today. This thesis proposes an immersive environmental center in the capital town of this district to regenerate the ecology and the ancient culture of the region. It proposes inclusivity in programming and involves locals, farmers and tourists participating in its environmental programs. Drawing from ancient vernacular architecture that was the foundation of this regions core community structure , this thesis explores a built project intervention that could have the potential to impact the attitudes of the people who live in, and visit the region; thereby having a permanent impact on the long-term sustainability and survival of this unique land and its people.

I PREFACE I

Growing up in this ancient, incredibly diverse land of Kodagu*, Karnataka; and with the ancient indigenous culture that is the Kodavas*; I have only realized the unique and special nature of the people and the place as I have moved out of India, and traveled to many countries around the world. Over the years, I have gone from seeing it as a young child and as an isolated biodiverse environment; to what it has become today in such a short span of time, a region facing unprecedented cultural and ecological loss.

The lessons I learned as a child in this natural ecological wonderland have impacted and influenced me throughout my life. I am hoping that through this thesis project - that could one day come into fruition - there is the potential to educate others of the incredible diversity of this region through the medium of education and the built environment.

* The district of Kodagu is still referred to as 'Coorg', its anglicized name. Its people, the Kodavas are still referred to as 'Coorg's'.

“Environmental education is an approach aimed at developing a world population that is aware of and concerned about the total environment and its associated problems, and has the attitudes, motivations, knowledge, commitment and skills to work individually and collectively towards solution of current problems and the prevention of new ones.” [1]

William B. Stapp

[1] Stapp, W. B. (1969). The concept of environmental education. *Environmental Education*, 1(1), 30-31.

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I CHAPTER 1: INTRODUCTION I

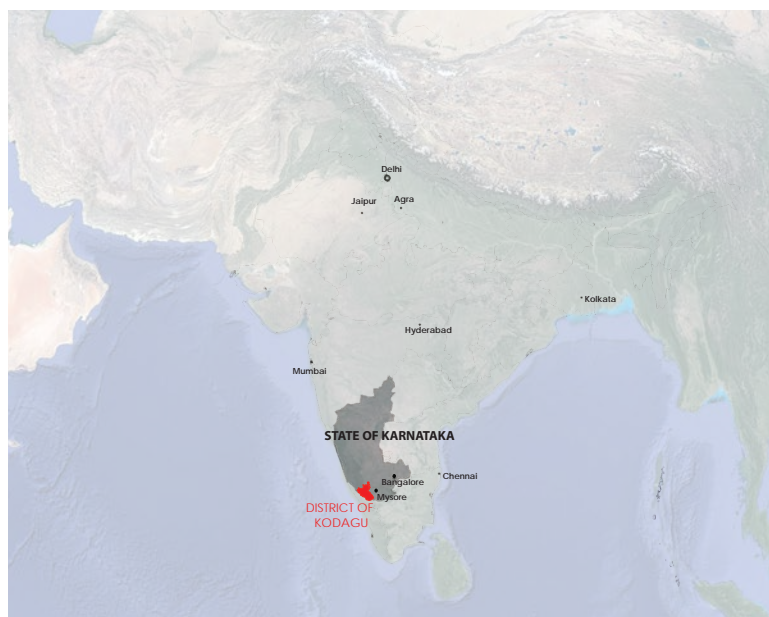


Figure 1. Map of India

Figure 2. Map of Karnataka State

GENERAL OVERVIEW

India is one of the world's oldest civilizations. An ancient land, its oldest cities Mohenjo-Daro and Harappa date back to 2500 BC. With over 8 main religions and 500 languages and dialects, it is a land of many cultures and incredible human diversity. As diverse as the culture are its lands. Its geography is distinct from the great Himalayas in the north, to the vast Deccan plateau in the mid-west, to the forested mangroves of Bengal in the east. In the south west, the ancient mountain ranges of the Western Ghats act as a geographic divide between the south west and south east. (Figure 1. Map of India). This chapter begins by exploring the significance of the geography, biodiversity and history of the land and its people.

PROJECT OVERVIEW

The thesis is divided into four chapters. Chapter one is introduction to the impetus behind the thesis. This included the problem statement and thesis proposition. The second chapter will outline the theoretical framework of the thesis which will explore the key components of the problem statements. The third chapter explores the site selection and analysis, a list of the programmed spaces, and design principles that will guide the architecture of this space. Chapter four will detail the design response, and chapter five concludes the project.

The thesis represents an attempt to preserve the ecological diversity and cultural uniqueness in Kodagu district. This introductory chapter examines the main unique characteristics of the region, the current challenges the region faces, and suggests a proposal for helping address those challenges through a built intervention.

Geography

The site for this thesis – Kodagu district in Karnataka State lies between 3000-5000 feet above sea level, and is nestled in the heart of the Western Ghat mountain range (also known as the Sahyadri mountain ranges in the ancient Indians language of Devangiri). The Western Ghats rise in the western Indian state of Gujarat and stretch all the way to Tamil Nadu. They traverse south past the states of Goa, Maharashtra, Karnataka and Kerala. That is 6 significant Indian States that are part of this mountain range. The Western Ghats cover an area of approximately 62,000 sq. miles or 39,680,000 acres. Kodagu occupies an area of 1,584 sq. mi [2] or 1,013,760 acres within the Western Ghats mountains. Kodagu makes up about 2.5 % of the land area of the large Western Ghats. And in turn, the Western Ghats represent a small 1.4% of the earth's total land surface.

These mountain ranges are older than the Himalaya mountains. "The mountain chain of the Western Ghats represents geomorphic features of immense importance with unique biophysical and ecological processes. (Its) high montane forest ecosystems influence the Indian monsoon weather pattern. Moderating the tropical climate of the region, the region presents one of the best examples of the monsoon system on the planet." [3]

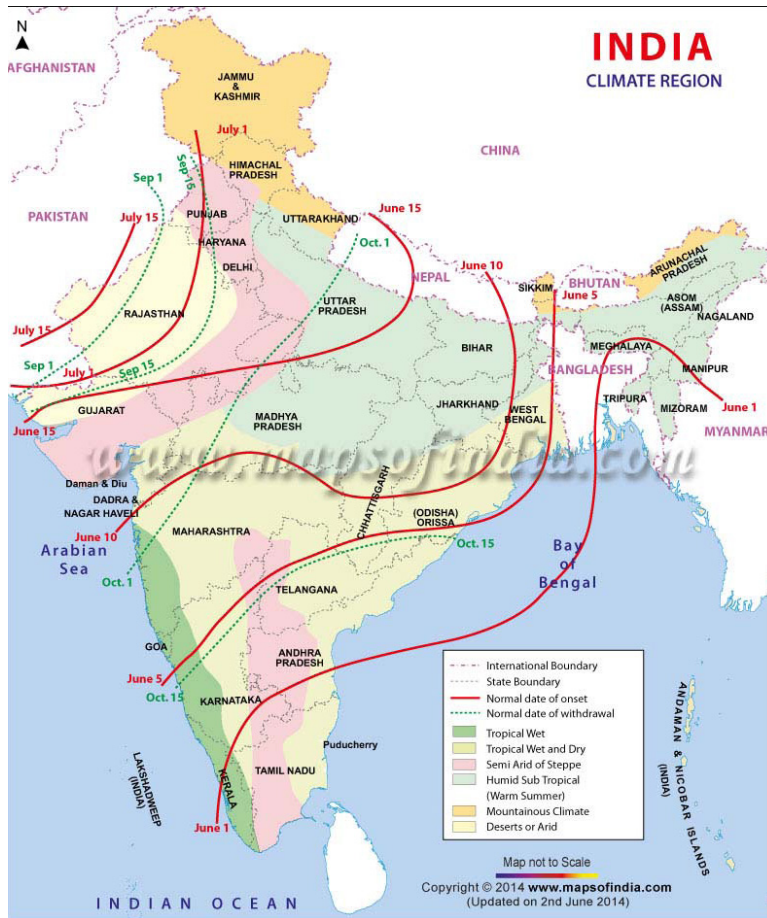
2 "KODAGU DISTRICT." KODAGU DISTRICT. N.p., n.d. Web. 03 Mar. 2017.

3 Centre, UNESCO World Heritage. "Western Ghats." UNESCO World Heritage Centre. N.p., n.d. Web. 03 Mar. 2017.



Figure 3a. District Map of Karnataka State - India context

Figure 3b. District Map of Karnataka State



Climate

The climatic condition (Figure 4. Climatic zones), are very distinct in this mountain range. As per the map, it is categorized as a tropical wet climate. Kodagu has three distinct seasons - summer, winter and monsoon. Kodagu has an average temperature of 15 °C (59 °F); and a temperature range of 59 °F to 82 °F throughout the year. The average rainfall is 110-150 inches a year, making it amongst the highest rainfall regions in the world. Summer months are from March to June. Monsoon is from July to September and is called *Kakkada* [4] the local dialect of *Koda-tak* [5]. Winter is from November to February. The primary prevailing wind is the south-west monsoon wind.

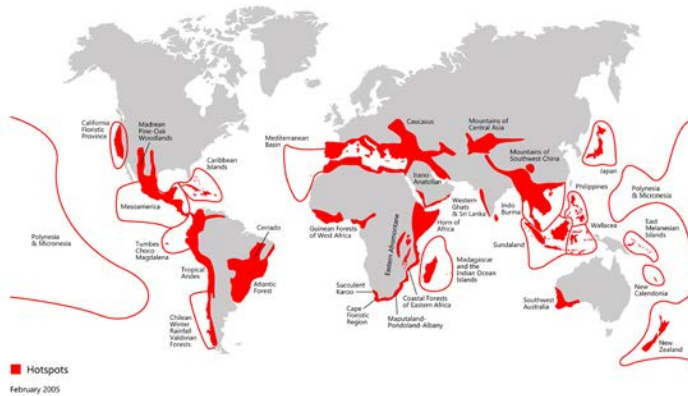
[4] *Kakkada* is a time where there is a cultural restriction on having any ceremonies as historically the land was (and still is) dangerous to traverse in monsoon.

[5] *Koda-tak* is the spoken dialect of the Kodavas. There is no written script of its own, it borrows the script of Kannada

Figure 4. Climatic Zones

Biodiversity

CONSERVATION INTERNATIONAL



Kodagu has an exceptionally high level of biological diversity and endemic species of flora and fauna. It has been identified by ecologists and scientist around the world as one of the world’s eight “hotspots of biological diversity in the world”. [6] (Figure 5). The forests of the Western Ghats include some of the best examples of non-equatorial tropical evergreen forests anywhere in the world. The Western Ghats contain 36% of the worlds endemic species, 60 percent of amphibian species and nearly half of all the plant species on earth, and are home to at least 325 globally threatened flora, fauna, bird, amphibian, reptile and fish species. [6a]

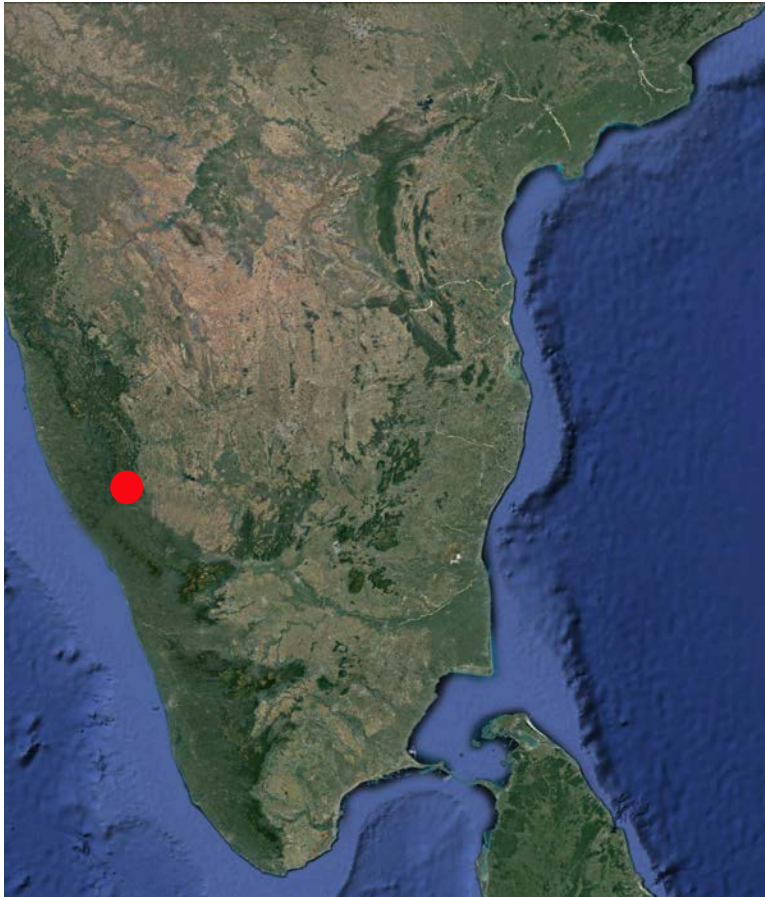
According to UNESCO, “the mountain chain of the Western Ghats represents geomorphic features of immense importance with unique biophysical and ecological processes. The site’s high montane forest ecosystems influence the Indian monsoon weather pattern, moderating the tropical climate of the region.” [7] This region is considered to have one of the best examples of the monsoon system on the planet, and some of the best representatives of non-equatorial tropical evergreen forests anywhere in the world.

[6] Mittermeier, R., Goettsch Mittermeier, Cristina, Myers, Norman, Robles Gil, Patricio, Conservation International, Cemex, S.A. de C.V, & Agrupación Sierra Madre. (1999). Hotspots : Earth’s biologically richest and most endangered terrestrial ecoregions (1st English ed.). Mexico City]: CEMEX : Conservation International.

[6a] Ghoshi, Padmaparna. “Western Ghats home to endangered species - Times of India.” The Times of India. N.p., n.d. Web. 20 Mar. 2017.

[7] Centre, UNESCO World Heritage. “Western Ghats.” UNESCO World Heritage Centre. N.p., n.d. Web. 03 Mar. 2017.

Figure 5. Conservation International: Worlds biological hotspots



The biodiversity of this region was first recognized internationally when the British conservationist and ecologist Norman Meyer, along with two other scientists, Russell Mittermeier and Cristina Mittermeier, funded by the organization Conservation International, conducted a study of the earth's most endangered ecological places and came up with a list of twenty-five hotspots that needed to be protected. The book, 'Hotspots: Earths biologically richest and most endangered terrestrial ecoregions' was published in 1999. This publication, the result of a 10-year study in remote corners of the earth, was ground-breaking and staggering. It found that the Western Ghats had "over 7,402 species of flowering plants, 1,814 species of non-flowering plants, 139 mammal species, 508 bird species, 179 amphibian species, 6,000 insects species and 290 freshwater fish species." [8]

Figure 6. Kodagu nestled in the Western Ghats

[8] Clara Lewis, TNN Jul 3, 2012, 04.02AM IST (2012-07-03). "39 sites in Western Ghats get world heritage status". The Times of India. Retrieved 2013-01-03.



Figure 7. Talakaveri wildlife sanctuary



Figure 8. Kodagu rice fields

Figure 9. Kodagu forests

Figure 10. Kodagu coffee plantations



Figure 11,12,13,14,15,16. Kodagu wildlife

This research found that these 25 hotspots were the richest and most threatened reservoirs of plant and animal life found on Earth. The Western Ghats is on this list. These identified hotspots today only cover only 1.4 percent of the Earth's surface. This area is reduced from 12 percent of the earth's surface due to human and environmental factors over the years. Yet the region contained in this incredible ecology was and continues to be threatened by many factors that include deforestation, encroachment for expanding plantations, poaching, lack of government intervention and tourism.

UNESCO World Heritage Site

In 2009, the Government of India published a 449-page document that detailed the biodiversity of the Western Ghats entitled 'Serial Nomination of the Western Ghats of India: Its Natural Heritage for inscription on the World Natural Heritage List'. [9] This was spearheaded by the top conservationists and ecologists of the region who knew that in order to protect the Western Ghats from further and rapid degradation, they needed to bring it to the attention of the world. After finding government support to back them, this document was submitted to UNESCO, the United Nations Educational, Scientific and Cultural Organization.

[9] [Http://whc.unesco.org/uploads/nominations/1342rev.pdf](http://whc.unesco.org/uploads/nominations/1342rev.pdf). N.p.: State Party of India, 2009. Print.

In 2012 UNESCO included 7 sites cluster sites in the Western Ghats the as the 29th UNESCO World Heritage Site in India. These sites included national parks, wildlife sanctuaries, and reserve forests that were designated as world heritage sites – twenty in the state of Kerala, five in the state of Tamil Nadu, four in the state of Maharashtra and ten in the state of Karnataka. One of these ten sites, the Talakaveri region, falls in Kodagu district. (Figure 9)

The World Heritage Committee, part of UNESCO, is the main body in charge of implementation of forming the World Heritage List. With the international assistance from the World Heritage Fund these UNESCO sites are given a level of financial assistance to protect them. The World Heritage Committee has very specific criteria for a property to be considered for selection. The Western Ghats region falls under this particular category :

- VII. “contains the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation” [10]

There has been some local controversy with UNESCO stepping in to help protect the Western Ghats. This is a very rich landscape and has the potential for tremendous capitol gain in terms of using and selling its resources for the local industries and government.

[10] “Operational Guidelines for the Implementation of the World Heritage Convention.” [Http://whc.unesco.org/en/guidelines/](http://whc.unesco.org/en/guidelines/). UNESCO, 26 Oct. 2016. Web.

There was a controversial government commissioned report issued by the state of Karnataka in 2010 -2012 advising that only 37 percent of the Western Ghats was 'ecologically sensitive' and should be protected, while the rest of the 63% was a cultural landscape. Meaning that this cultural landscape could be a resource for mining, timber, farming and site for industries. The Western Ghats mountains are home to large deposits of mineral and nutrient reserves like iron ore and manganese. These are the raw materials for steel and stainless steel production, a huge source of income for the state governments. Ecologists, conservationist and the government are in contention about how much of the Western Ghats should remain protected, and how much should be used for capitol gain. Today, 4.5% of the total land area of the Western Ghat mountain range has been designated with a protected status via the UNESCO World Heritage Sites. Of this 25,946 acres lies in the Northern part of Kodagu district, the Talakavery Wildlife Sanctuary. It represents 2.5% of the total land area in Kodagu.

Kodagu district has three wildlife sanctuaries and one national park: the Brahmagiri (similar in area to the Talakaveri), the Talakaveri, the aforementioned UNESCO World Hertiage Site (25,946 acres), the Pushpagiri Wildlife Sanctuaries; and the Nagarhole National Park, also known as the Rajiv Gandhi National Park (158,642 acres). Together these four areas total more than 210,534 acres. About 20% of Kodagu district is protected, either by UNESCO or the local forest ministry. This leaves about 80% of the land privately owned in the form of rural plantations or commercial and residential plots closer to the urban village centers.

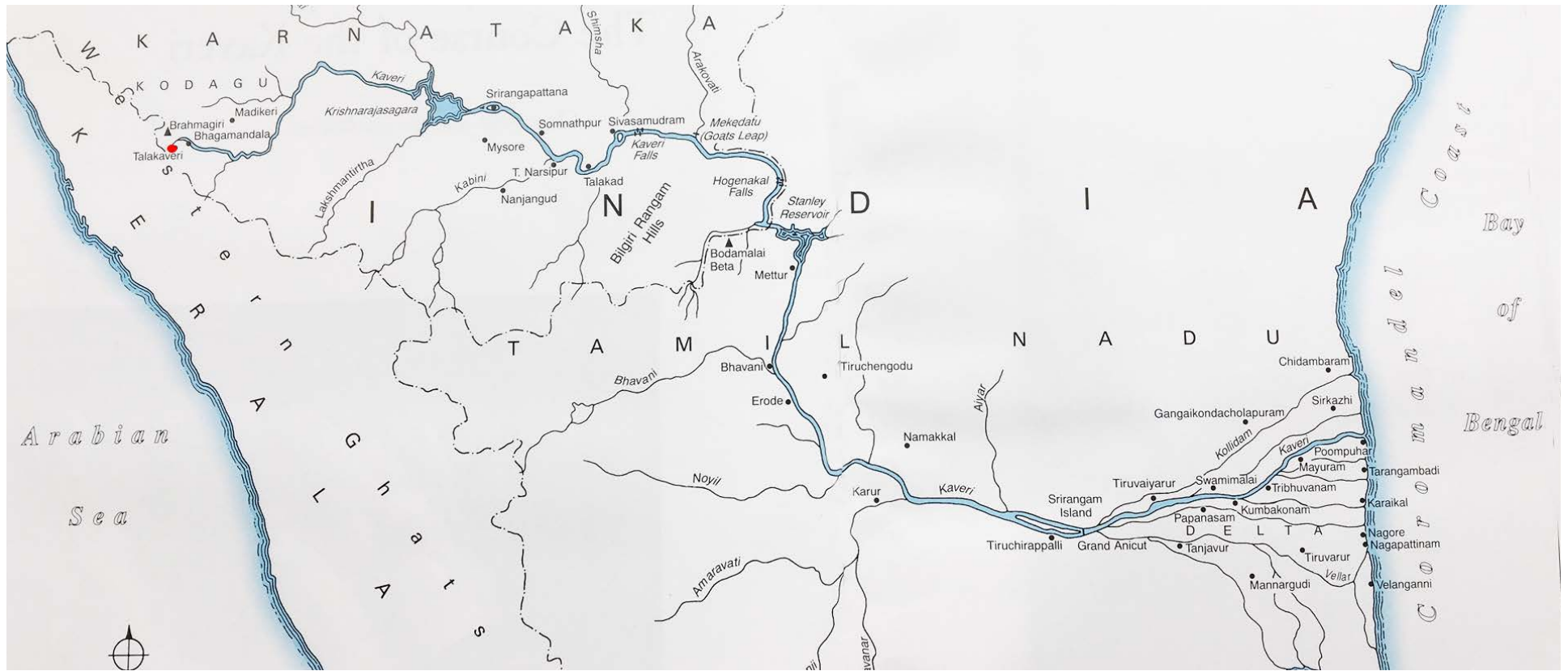
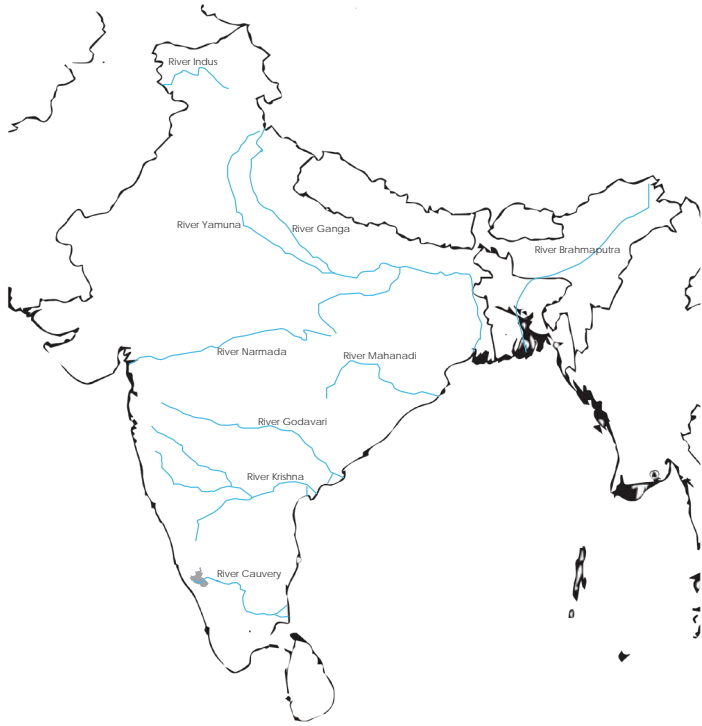


Figure 17. Path of Cauvery River



Cauvery River

Out of the Western Ghats, rise the three greatest south Indian rivers, the Krishna, the Godavari and the Cauvery. The rich delta these three rivers have carved out support an incredible array of flora and fauna. They are also the major source of drinking water, irrigation and hydroelectricity in southern India.

Out of the Talakaveri Wildlife Sanctuary in Kodagu rises the mighty Cauvery River. [11] The Cauvery emerges as a spring at 4,400 feet in the mountains in Kodagu district, and travels a distance of about 500 miles south-eastwards until it drains into the water-body of the Bay of Bengal. (Figure 5: Major rivers in India). The Cauvery River is revered and worshiped as the river Goddess Cauvery in the southern part of India, and especially in Kodagu. This Goddess ecology is an inherent part of the cultural and religious fabric of Kodagu and the rest of Southern India.

The significance of this mighty river is economic and cultural. It is the heart-beat of life in a large part of southern India. The Cauvery has ten majority tributaries. The regions to the north and south of the river are known as the Cauvery River Basin. The major part of the basin is covered with farmland, and according to the WRIS (Water resources information system of India) accounts for 66.21% of the total land area of southern India.[12] The river basin spans four south Indian states – Karnataka, Tamil Nadu, Kerala and Puducherry. The river is also a major source of hydroelectric power in the region.

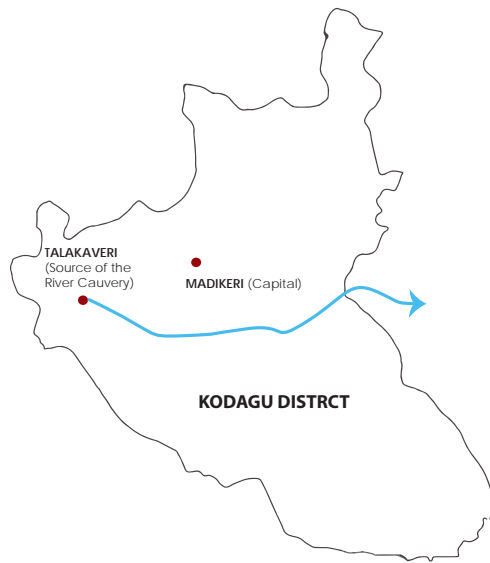


Figure 18. Major rivers in India.

Figure 19. Cauvery River in Kodagu district.

[11] Cauvery is also spelled as Kaveri and Kavery

[12] Water resource information system of India. <http://www.india-wris.nrsc.gov.in>



Economic significance of the River Cauvery

"The River Kaveri * is and has been a source of life, wealth and prosperity; and the bedrock of the success of the ebb and flow of the ancient empires along its sacred banks for centuries. Its almost 500 mile length is dotted with ancient temples, shrines, ancient forts and dams. Remnants of dams from the 10th century Chola empire can be still seen today on the Kaveri river banks. The Kaveri's significance of human settlements can be traced " from the times of the Ganga [Empire] and Chola [empire] in the tenth and eleventh centuries to the kingdoms of Mysore and Tanjavur [Tanjore] in the eighteenth and nineteenth century." [1] " In the lowlands it is a constant source of water, facilitating intensive wet cultivation of rice". With this farming wealth, the dynasty's that ruled Tanjore prospered for centuries and out of it emerged one of the most significant periods of art, architecture, and music south India has even seen. "It was this spiritually charged and agriculturally fertile landscape that was home to many of south India's greatest ruling houses, the active patrons of architecture, art, literature and music over fifteen hundred years." [13]

* The river Cauvery is also spelled as Kaveri and Kavery in various texts
 [13] Michell, George., Arni, Clare, and National Centre for the Performing Arts. *Eternal Kaveri : Historical Sites along South India's Greatest River*. Mumbai: Published by J.J. Bhabha for Marg Publications on Behalf of the National Centre for the Performing Arts, 1999. Print.

Figure 20. Above left - Cauvery* River delta, Karnataka state

Figure 21. Bottom left - Dam at Srirangam, Tamil Nadu state

Figure 22. Bottom right - 500 year old of Islamic shrine for all religious faiths, Tamil Nadu State

Figure 23. Top right - Idol of the Goddess Cauvery on the banks of the Cauvery River



Religious significance of the river Cauvery in Kodagu

Every year in October in Kodagu district occurs an auspicious event called *Kaverisankaramana*. [14] The day and time is set by the astrologers who consult the position of the stars. On this day, the Cauvery River rebirths and springs forth in the birth spring (Figure 25). The secondary well then fills up, (Figure 26) and after approximately a four mile journey under the mountains the river emerges at the base of the mountain as a mighty river.(Figure 27)

[14] Kaverisankaramana is one of the most celebrated, auspicious and prominent festival of the Kodavas.

Figure 25. Birth Spring of Cauvery River in Talakaveri , Kodagu district

Figure 26. Secondary well of Cauvery River adjacent to birth spring

Figure 27. Cauvery River emerges at the base of the mountain

Brief History of Kodagu

The history of the southern part of India covers a span of over four thousand years during which the region saw the rise and fall of a number of dynasties and empires. The known history of the region begins with the Iron age (1200 BCE to 24 BCE) period until the 14th century. Dynasties of Satavahana, Chola, Chalukya, Pallava, Rashtrakuta, Kakatiya and Hoysala were at their peak during various periods. These dynasties constantly fought amongst each other. The Vijayanagara empire was the most dominant kingdom South India had ever seen. Kodagu was part of the territory of many of these kingdoms, but since was historically not easily accessible part due to its mountains terrain, there is no evidence of any of these kingdoms in Kodagu.

When the European powers arrived during the 16th century CE, the southern kingdoms resisted the new threats, and many parts eventually succumbed to British occupation. The British created the Madras Presidency, which covered most of South India, directly administered by the British, and divided the rest into a number of dependent princely states. After Indian independence in 1947, south India was linguistically divided into the states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. Kodagu district fell into the State of Karnataka. It is after the 16th century that Kodagu district starts to have a recorded history.

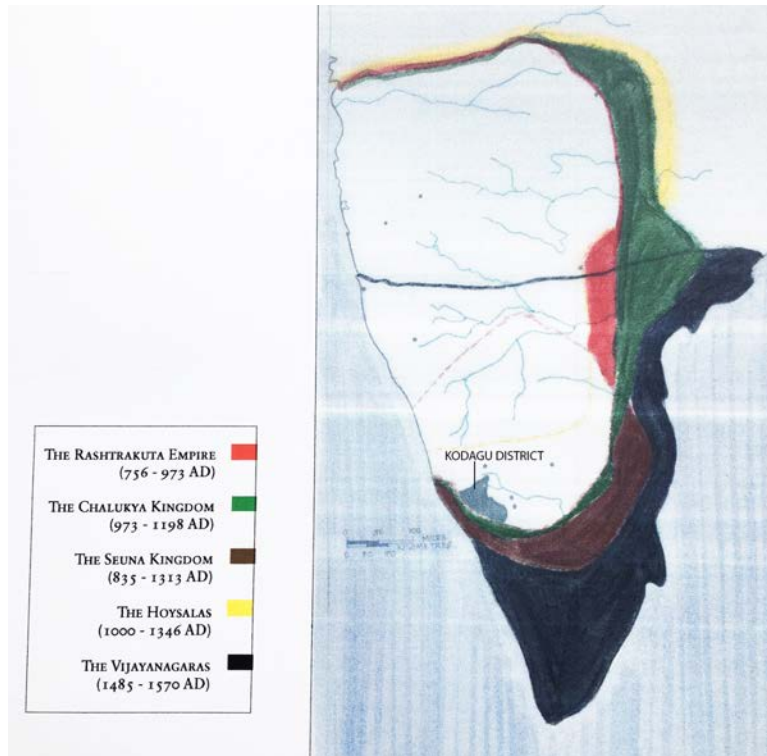


Figure 28. South Indian dynasties (756 AD- 1570 BC)



In the 16th century after the fall of the Vijayanagara Empire, the *Keladi Nayaks of Ikkeri* (originated from current day Tamil Nadu State) consolidated power in Kodagu and formed the Haleri dynasty. [15] The ruling family was of the Hindu faith. They ruled Kodagu for more than 200 years (1580 – 1834). In 1681, the capital of the Haleri Dynasty was moved to Madikeri. It was under the rule of the Haleri dynasty that Kodagu finally attained its status as an independent kingdom. From then until British rule in 1834, no other kingdom was successful in attempts to control the Kingdom of Kodagu. The Kodavas were known to be a fierce martial race that intensely protected their home.

The British ruled India from 1854 to 1947. They ousted the Haleri Kings in 1843 and took over control of Kodagu. After India won its independence from the British in 1947 Kodagu established itself as an independent state. In 1956, the Indian government began the division of States, and Kodagu was incorporated into the State of Karnataka.

[15] "Unique & Independant: Kodavas of Kodagu by Dr. Neria H. Hebbar." Boloji. N.p., n.d. Web. 07 Mar. 2017.

Figure 29. Top left - The last Haleri King: Chikka-viraraja

Figure 30. Bottom left - Kodava warrior council

Figure 31. Top center - Ancient Kodava warrior

Figure 32. Top right - Kodava council



Figure 33. Top left - A Kodava family, late 1800's
Figure 34. Top right - A Kodava family, late 1800's II
Figure 35. Bottom left - A Kodava of martial rank, 1800's.

Indigenous communities of Kodagu

The natives of Coorg district are multiple indigenous forest dwelling tribes – given the nature of the various south Indian kingdoms that ruled for centuries. The largest tribes that still have a presence today are the Yerevas, the Kurubas , the Uppars , the Peggades, the Kavati, the Marta, the Dombas, the Maleyas, the Kaniyas , the Amma Kodavas and the Kodavas. [16]

There is no recorded information for the demographic breakdown of these tribes in Kodagu. However, the most culturally dominant of these tribes are the Kodavas – and this is the tribe focused on in this thesis. The Kodavas are the only warrior tribe in Kodagu. The Kodavas fall under the general umbrella of Hinduism. In 2011 Kodagu's recorded population was 554,519. [17] This includes all the indigenous tribes of Kodagu including the Kodavas . Today in Kodagu district, there are over 350 small villages, 20 main towns and 1 capital. Today's capitol town Madikeri, was also the former capital of the Haleri Dynasty in the 16th - 18th century.

[16] P, Lalitha K. "Unique Tribes of Coorg." Diss. Department of Kannada, BMS College for Women, Bengaluru, India , October 2015. Abstract. International Journal of Research in Humanities and Social Studies 2.10 (2015): 1-5. Print.

[17] Directorate of Census Operations in Karnataka



Kodavas today:

Figure 36. Top left - Kodava men in an ancestral house at a festival, 2015

Figure 37. Bottom left - Kodava women - huthri festival dance

Figure 38. Top right - Kodava bride

Figure 39. Top right - Kodava women at a wedding

Figure 39 a. Bottom right - Kodava men at a festival



Figure 40. Top left - Stag horn dance

Figure 41. Top right- Pariyakali, the dance of a stylized battle

Figure 42. Top right - Kodava bride

Figure 43. Bottom right - Kodava battle dance



Figure 44. Top left - Priest at the Cauvery temple, Kodagu
 Figure 45. Right- incarnate of the spirits of the land
 Figure 45 a. Bottom Left - Oracle who can summon spirits of an ancestor
 Figure 45 b. Bottom Right - A fierce forest spirit that protects the land

In the past, and leading up to today, the main reason the multiple forest tribes probably did not join forces to form communities is likely due to isolated nature of the forest tribes, and with the Kodavas emerging as the most dominant. The Kodavas established their dominance by making advancements in developing a strong culture via a strong and distinct family structure, communities and even having the only known regionalized architecture in Kodagu, as shown later in the document. (Chapter 2: Indigenous culture and traditions | spaces and form.) The Kodavas also emerged as the most martially dominant tribe in this region, feared and respected by all the surrounding kingdoms.

This ancient martial race of the Kodavas cannot trace its ancestry beyond the boundaries of Kodagu. This district is a case study for an isolated type of geography in the Western Ghat mountains for an isolated tribe with a rich cultural heritage living in an agrarian setting. This ancient warrior tribe was cultured, with its own language, customs and traditions that are unique to them. They were revered and respected warriors by their surrounding neighbors and tales of their bravery are a thing of legend in south India even today. Over time, the region developed out of the forest dwellings and slowly adopted a modern way of life (Chapter 1). The Kodavas, due to their martial prowess had managed to either be granted or acquire lands through the Haleri Kings for their service in the ministry or Army.

As British rule established itself in southern India by 1834, there was not a need to protect their land from neighboring warring kingdoms, hence the Kodavas looked to agriculture as a way of life. Rice cultivation in paddy fields always was a way of life in this region for centuries. The Kodavas maintained a peaceful relationship with its British conquerors. In the 1850s, the British found Kodagu to have the ideal climate for coffee plantations , and introduced what was to become a new way of life for the indigenous tribes of Kodagu. Today, this practice is the dominant economic generator and main agriculture practice in Kodagu. The other primary crops cultivated here are rice, pepper, cardamom and oranges. Rich in resources, Kodagu has also become a source for timber and wood for the rest of the country.

The Kodavas today still practice their ancient rituals and ancestor worship. Oracles and mediums of spirit incarnates help facilitate their connection to their ancestors .(Figure 44, 45, 45a and 45b) There is a reverence towards the land and to the ancestors before them who lived amongst these mighty mountains and its forests.

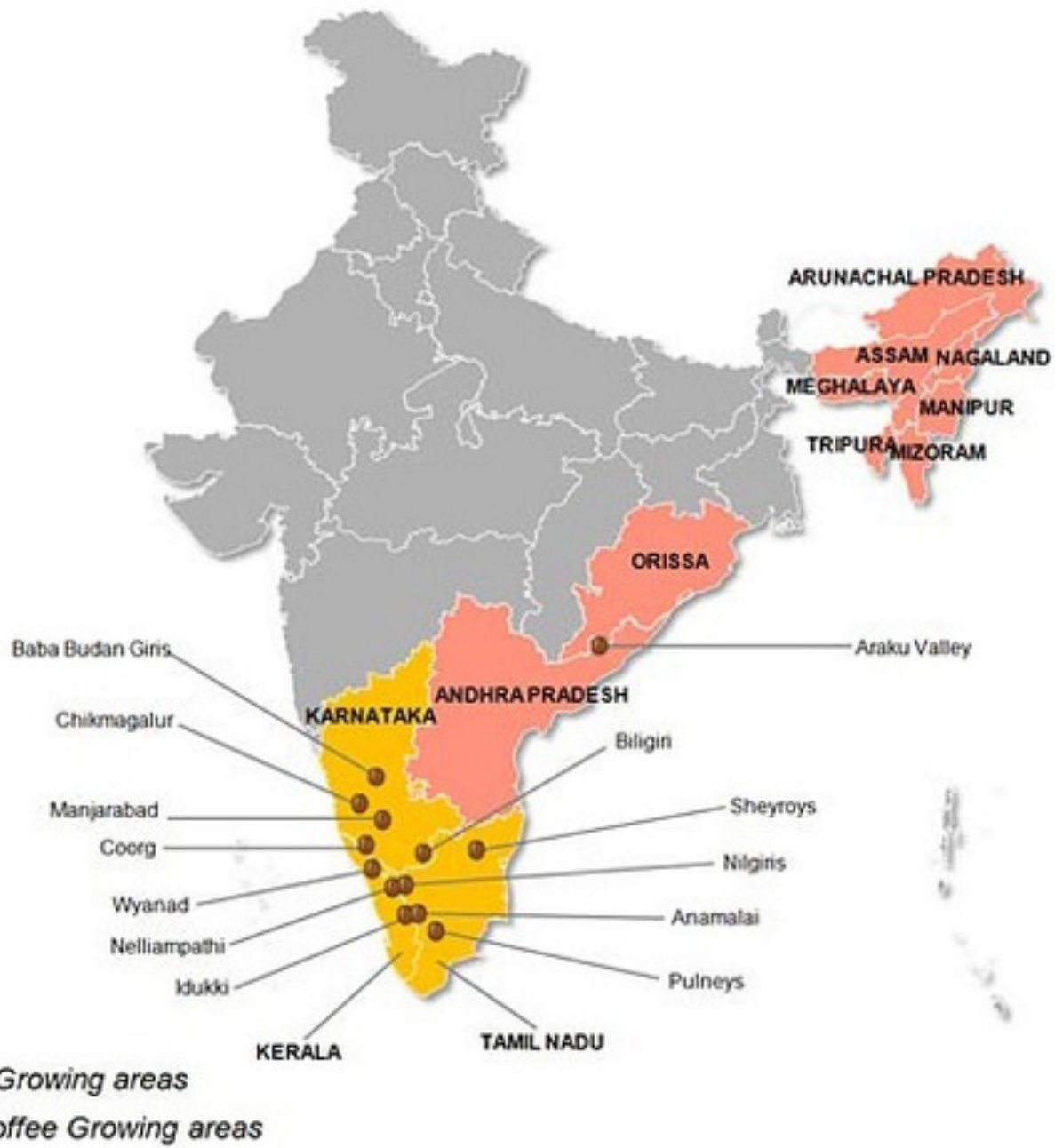


Figure 46. Coffee growing regions in India



Coffee Production today

Karnataka produces 53 percent of the coffee in India.[18] The other states that produce coffee are the neighboring states of Tamil Nadu and Kerala. There are approximately 250,000 registered coffee growers in India; 98% of them are small private growers.[19] As of 2009, India produced 4.5 percent of the total production of coffee in the world. It is estimated that almost 80% of the country's coffee production is exported. [20] The district of Kodagu plays a major role in coffee growing. Coffee production is the backbone of its economy and plays a significant role in the production of coffee in India for that matter. It has become the very livelihood of the Kodavas today.



Figure 47. *Coffee plantation , Kodagu*
Figure 48. *Coffee beans , Kodagu*

- [18] Yeboah, Salomey (8 March 2005). "Value Addition to Coffee in India". Cornell Education: Intag 602. Retrieved 2010-10-05.
[19] Lee, Hau Leung; Lee, Chung-Yee (2007). Building supply chain excellence in emerging economies. pp. 293–94. ISBN 0-387-38428-6.
[20] Illy, Andrea; Viani, Rinantonio (2005). Espresso coffee: the science of quality. Academic Press. p. 47. ISBN 0-12-370371-9.

CURRENT MAJOR ENVIRONMENTAL CONFLICTS

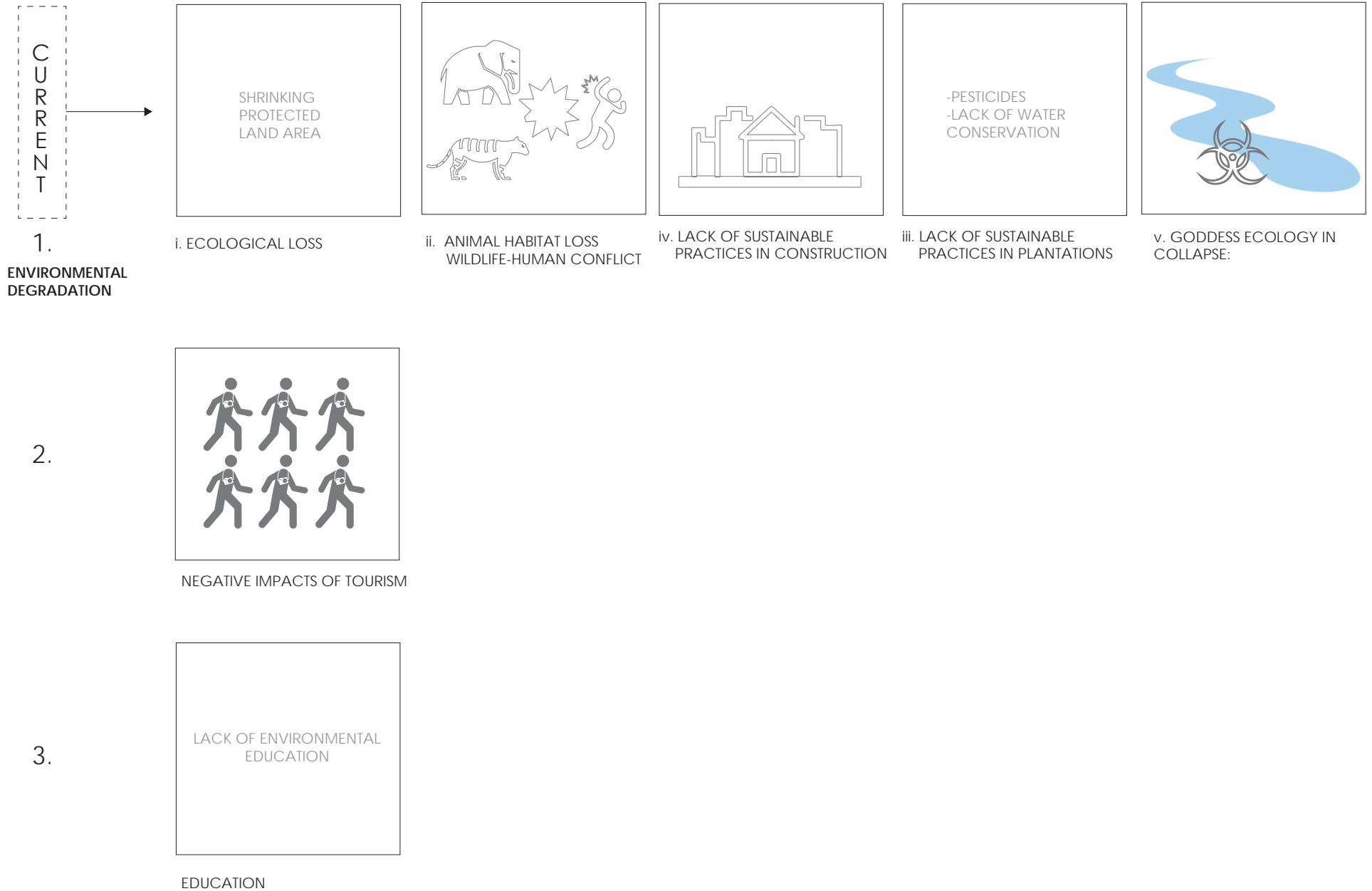


Figure 49. Current major environmental conflicts

PROBLEM STATEMENT

With modernization and influence from Great Britain came the rise of the established coffee plantations in Kodagu in the late 1800's. Over the next century, the region saw ecological decline, as an increasing amount of forestland was converted to plantations, and productive paddy fields were converted to residential and commercial land uses to support a growing population. The slow decline has become a rapid one in the 21st century with the rise of a myriad of other issues.

Though it is good for the economic wellbeing of the district to have an income generator in coffee plantations, this has come at a price and is not in balance with the local ecological diversity. What will be the future of Kodagu if there is no intervention in this ecological degradation? This thesis investigates the relationship between people, especially children – who are the future of the region, and the environment and sustainability. How can children, locals, farmers and tourists learn about Kodagu, its diverse environment and ancient culture, in a way that would create an environment of learning and caring for generations to come? Kodagu today, with the commercialization of its plantations, is at the cusp of change. From first hand research and observation **three** main barriers have been identified as factors that hinder the ecological future of Kodagu.

1. Environmental degradation:

- i. Ecological loss
- ii. Animal habitat loss | Human-Wildlife Conflict
- iii. Lack of sustainable agricultural practices in plantations
- iv. Lack of sustainable building practices in construction
- v. Goddess ecology in collapse

2. Negative Impacts of Tourism

3. Education : lack of environmental education



1. Environmental degradation

i. Ecological Loss

In spite of having a UNESCO World Heritage Site within its borders there is continued deforestation, and the encroachment of forest lands resulting in ecological loss. The aforementioned encroachment takes place illegally by private landowners in order to make their estates larger. The government tends to enforce some laws strictly and become completely lax or turn a blind eye to others. Corruption and the bribing of government officials to bypass laws is not uncommon here. There is no consistency with the government in trying to establish a balance between plantations and forests. With the alliance of Kodagu with Karnataka, a criminalized and powerful timber mafia has systematically stripped much of the forest wealth. [21] Ancient *devarakadus*, sacred protected forests, have vanished completely in most places. Dr Kalam, a noted Anthropologist wrote 'during the 180 year period that the *devarakadus* were under the care of the Revenue Department (of Karnataka), their extent shrank from 15,506 acres to 6,299 acres (that is a 60% loss). More than 9,5000 acres of *devarakadus* have been lost since 1905' . [22]

[21] Ponnappa, Kaveri (2013). The Vanishing Kodavas. Mumbai, India. Eminence Designs Pvt Ltd

[22] Kalam, M.A. "Sacred Groves in Kodagu District of Karnataka (South India): A Socio-historical study" Pondy Papers in Social Sciences (French Institute, Pondicherry), 2001

Figure 50. Top left - Ancient Kodagu *devarakadu*
Figure 51. Bottom left - After some years, some *devarakadu*'s became permanent structures

The oldest known *devarakadu* in Kodagu is said to be from 1000 BC. There is supposed to be at least one per village - it contains a shrine, a sacred tree and a water tank; and have forests associated with them that range in size from 50 acres to 1000 acres. Its significance is a reminder for the locals that the land is sacred and should be protected. Today, there are documented to be 346 *devarakadus* left in Kodagu, down from its former number of over a thousand.

Kodagu's forest and mineral wealth is utilized by the surrounding cities around it. Air Marshall K.C Cariappa is actively involved in the Coorg Wildlife Fund – a non-profit organization that is seeking to protect Kodagu's ecology. In regards to Kodagu being in very close proximity to major cities such as Bangalore, Mysore and Mangalore he says - " Kodagu is the golden goose for Bangalore. We have coffee and timber wealth that is utilized by others, and this is not befitting the region." [23]

ii. Animal habitat loss | Human-Wildlife Conflict

This is a direct result of the ecological loss of forests shrinking. Another contributor is a wildlife poaching. Years ago, Tigers were killed for their skins, and elephants for their tusks in this region. However, due to the dwindling tiger population in India, there has been very strict protection of tigers and elephants in Kodagu. However there are still reports of these incidents happening.

[23] Oral Interview with Air Marshall K.C Cariappa . July 2016



Deforestation is also taking place via slashing and burning forest land for farming. The forests are being used to dump large amounts of garbage. Villagers sometimes deliberately set forest fires to enable the regrowth of shrubs and grasses to have a place for their domesticated animals to graze. There is also the exploitation of forest products leading to the depletion of food sources for the animals. The fragmentation and destruction of forest lands have caused wild animals to come out of the forests and forage for food in plantations. With this habitat destruction, animals have become disoriented to their normal migratory routes. There has been a huge surge in the last decade of elephant herds taking new migratory routes through local roads, and through villages into coffee estates in Kodagu. This is causing severe crop damage and, in many extreme cases, loss of human life. There have been sightings of panthers, leopards and tigers in coffee estates and in villages bordering forest lands. In many cases, there have been cases of chickens, cats and dogs stolen as food by these large cats.

Figure 52. Top left - Garbage pile in Bandipur National Forest just outside of Kodagu

Figure 53. Bottom left - Elephant in a coffee plantation in Kodagu

Figure 54. Top right - Elephant on main road through Rajiv Gandhi National Park, Kodagu.



iii. Lack of sustainable agricultural practices in plantations

Water pollution

Plantation owners use pesticides for farming which leach into the ground water, and Cauvery River. There is no system of storm water management in place to treat this water before it enters the river. There is no water collection facility anywhere in Kodagu to collect water runoff in any organized manner and drain it back into the River Cauvery. The runoff from the plantations simply makes its way into field drains, rivulets and streams where it eventually drains into the Cauvery River making it very polluted today.

Lack of water management

The three main sources of fresh drinking water and irrigation water are groundwater, rainfall and the Cauvery River. Groundwater is fast being depleted as individuals drill private wells called bore wells for residential and commercial plantation use. There is no limit to how many wells one can drill as there are no licenses required for this from local authorities. Residents can bore as many as they need and can afford to construct. Kodagu has very high rainfall through the year, yet, water harvesting is not implemented by most public and private sectors. It is remarkable that in spite of this high rainfall, Kodagu suffers from a drought and water shortages for irrigation and household consumption during the summer months of April through June.

Water reservoir also known as water tanks (Figure 55) collect rainfall for irrigation use year round in the plantations. But no newer technology has been implemented for decades. Hence in a region with so much rainfall, due to improper water management practices, there is a drought every summer and some years minor crop failure. [23]

[23] Information obtained from first hand field research, and interviews with locals and plantations owners.

Figure 55. Typical water reservoir/ water tank in a Kodagu plantation



iv. Lack of sustainable building practices in construction

The flat roof phenomenon:

Driving through towns and villages – one observes a common feature in the smaller buildings that serve as homes, offices, retail, government buildings, medical clinics and hospitals. A majority of these buildings are built out of concrete with flat roofs or very slightly pitched roofs. The flat roof feature makes no sense in a region that gets some of the highest rainfall and high velocity monsoon winds in the country.

Water collection is harder when the roofs don't drain the water off completely and leaking roofs are almost a regular order of business in Kodagu. Another observation was that many of the government buildings also have flat roofs. This does not set a good precedent for the construction industry.

Figure 56. View from a residential rooftop in Madikeri, Kodagu. Flat roofs are indicated.



There are building codes and certain parameters for design and construction in place by the local authorities, but they are not implemented strongly (even in their own buildings). There are plenty of way to get around these parameters.

Lack of use of local vernacular materials

A typical building in Kodagu today is made of CMU block, concrete and steel rebar. Concrete beams and columns with rebar form the foundation structure. Floors are poured concrete with tile as a finish. Walls are CMU block with a plaster finish. Roofs are typically wood rafters and beams with plywood sheathing, a waterproofing membrane and a thin layer of concrete poured over it. Finally terracotta tile is laid on top of the concrete.

Leaks and mold are a commonplace in these buildings. Mold growth thrives in this moist wet climate and concrete and plaster are ideal surfaces for it.

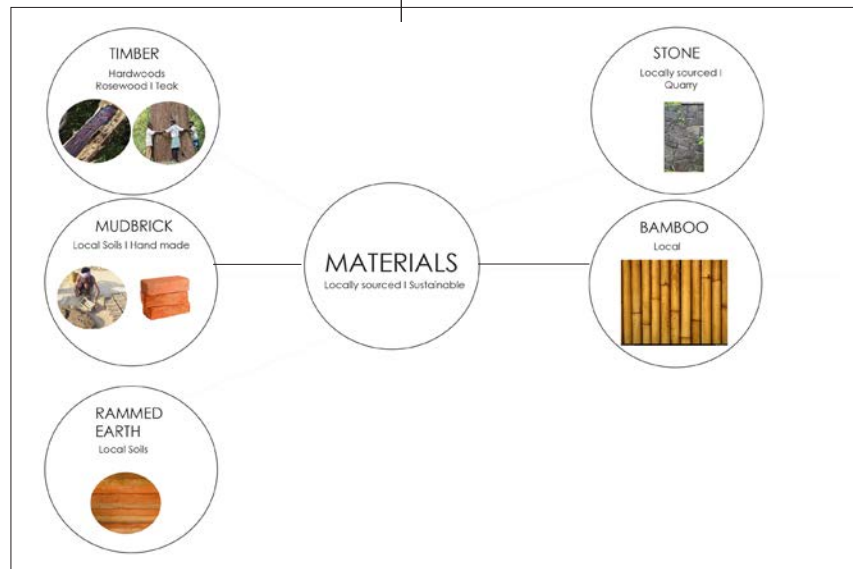
Figure 57. Top left - Out of context 1. A commercial building in Madikeri

Figure 58. Top right - Out of context 2. A residential building in Madikeri

Figure 59. Top middle - Out of context 3. A commercial complex building in Madikeri

Figure 60. Bottom left - Out of context 4. A commercial building revealing its construction materials

TRADITIONAL CRAFTSMANSHIP



Traditional craftsmanship in Kodagu architecture used vernacular materials that were locally available in the region. These materials are timber (teak, rosewood, bamboo), mud brick and stone (mostly granite). The case studies in the thesis examine local traditional architecture (Chapter 2: Culture and Traditions | spaces and form).

Today, the procurement of timber is very difficult due to governmental red tape, making concrete a much more convenient building material. In the new construction of buildings in Kodagu, there is no distinct style in its architecture of design. The appearance of these new buildings are completely out of context with the local vernacular architecture.

Figure 61. *Local vernacular materials*



Illegal sand mining

An ongoing environmental disaster in Kodagu now is the illegal sand mining from the sand banks of the local tributaries of the River Cauvery for making concrete. (Figure 62) This has resulted in a number of local drownings and deaths, as there are no signs that the banks below the water are giant mined pits. People have been caught unaware of the sudden change in depth while wading, walking and swimming along the river banks and have drowned.

In conversation with Anupa Mandanna, who has been practicing architecture in Kodagu since the late 1990's she says, "There are cases of architects not really understanding the area and designing houses more suited to cities and against the nature of the landscape here...sadly being blessed as we are with abundance of land, water and green coverage; people have been taking the environment for granted." [24]

[24] Oral interview with architect Anupa Mandanna of Anupa Mandanna & Associates. July 2016

Figure 62. Sand mining in Kodagu



Figure 63. *Cauvery River, in Kodagu, dotted with plastic bags and bottles on its banks.*

v. Goddess ecology in collapse

There are no methods of storm water management in place to treat all the pesticide runoff from all the plantations, hence the Cauvery River is extremely toxic and polluted in place. Also, garbage from commercial businesses and residences are just dumped directly into the river, and this is evident all over Kodagu. (Figure 63)

Considering that the region worships the river as a goddess, it is remarkable that it continues to pollute her, almost as if she has the healing powers to restore and renew the polluted waters. This is the goddess ecology in collapse. A study done in 2011 of the levels of toxicity in the Cauvery River concluded that the river must be protected at its source – the Talakavery, or very soon the extent of pollution will be irreversible.

There has been a sudden surge in cancer in the last ten years for the older population in this region that have been living in the region for a long period of time. There has been no documented evidence of the direct links of water pollution and cancer, but the locals believe that there has to be a correlation between pesticides leaching untreated water back into the river. In addition to water pollution via pesticides leached in from farms, there is also the spread of diseases in untreated water. The World Bank estimates that 21% of communicable diseases in India are related to unsafe water. Diseases such as rotavirus and diarrhea alone cause 1,600 deaths per day. [25]

[25] "India Water Crisis: Clean Water Scarcity In India." Water.org. N.p., n.d. Web. 08 Mar. 2017.

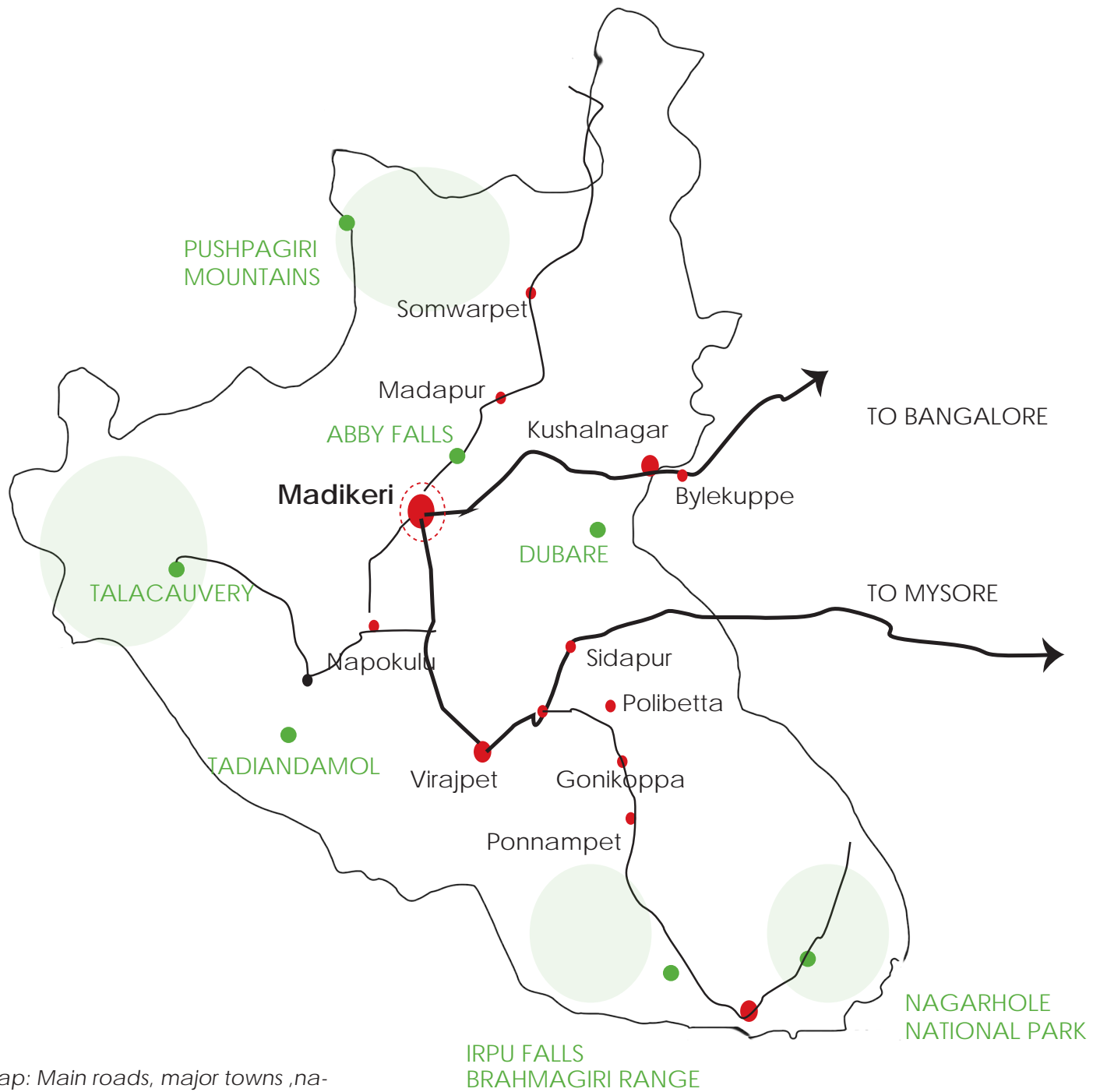


Figure 64. Kodagu Map: Main roads, major towns ,national parks, sacred sites and tourist sites (in green)

2. Negative Impacts of Tourism

Today, culture, traditions and natural beauty remains an inherent part of Kodagu, but the immense growing population of India, and nearby urban mega-cities is putting a lot of pressure on this land and its ancient customs.

According to the last UN Estimate for Population Demographics in July 1, 2016, India's population was 1,326,801,576. [26] India gained independence from its British colonizers on August 15, 1947 after nearly 200 years. The population just 3 years after independence in 1950 was 376,325,205.[27] So in 69 years, India's population has increased 10 times. The Majority of India's large cities face severe air and water pollution, 'Of the world's top 20 polluted cities, 13 are in India.' [28] City dwellers seek to retreat for their vacations to accessible rural areas as an escape from the congested and polluted city life.

Zooming into one of India's largest cities - Bangalore (or Bengaluru). It is in the southern Indian State of Karnataka, and has a population of 11.5 million people in its urban center. It is constantly ranked in the top 20 most polluted cities in the world.

[26] [27] "India Population 2017." India Population (2017) - World Population Review. N.p., n.d. Web. 09 Mar. 2017.

[28] Times, Chetan Chauhan Hindustan. "13 out of world's top 20 polluted cities in India, only three in China." <http://www.hindustantimes.com/>. N.p., 04 June 2015. Web. 09 Mar. 2017.

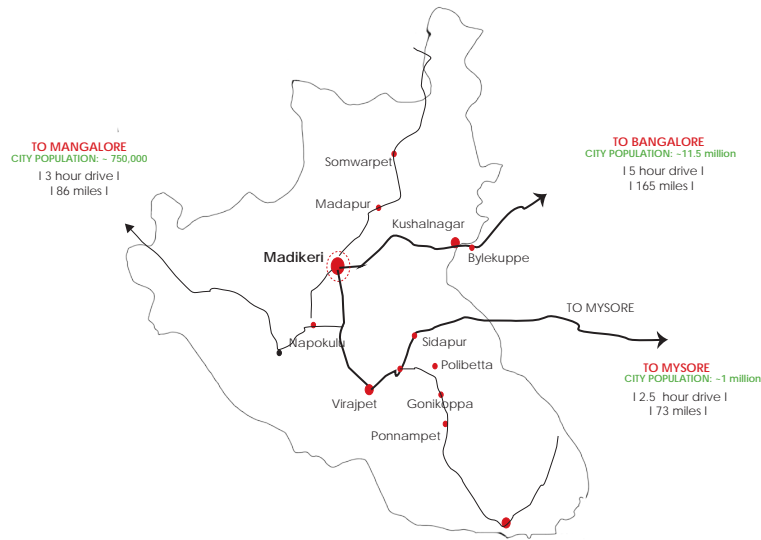


Figure 65. The surrounding cities around Kodagu district.



Bangalore is known as the 'Silicon Valley of India' or the 'IT capital of India'. Because of its role as the nation's leading information technology center, its population is rapidly growing, Other large urban centers close by include Mysore (population of 1 million), and Mangalore (population 500,000). [29] Kodagu district is located 173 miles from Bangalore and can only be accessed via limited road networks into the district. Kodagu is an attractive and close location for urban dwellers in the cities of Mangalore, Mysore, Bangalore. There are limited destinations that offers so much in terms of biodiversity and culture close by for these 3 major cities. (Figure 65)



There are many sites of cultural and historic importance to see in Kodagu given its ancient roots. Ancient Temples dot the landscape. In addition to this are natural landmarks such as waterfalls and scenic views of mountains; and wildlife in national parks . (Figure 64) There are 4 main national parks in Kodagu, out of which a portion of the Talacauvery national park is designated as the aforementioned UNESCO Heritage site.

The switch to tourism in Kodagu as a stable economic generator is becoming more and more widespread for individual plantation owners as it provides an alternate income to farming. The locals open up their own homes to become what is known in the region as *home stays* (boarding houses and guest houses). Homestays in Kodagu have become the top tourist destinations in Karnataka, many of them are part of working plantations and serve traditional cuisine, giving guests a unique view into local culture and traditions.

[29] "Population of Cities in (2017)." Population of Cities in (2017) - World Population Review. N.p., n.d. Web. 09 Mar. 2017.

Figure 66. Top - A typical Kodagu homestay
Figure 67. Bottom - A tourist stop



Tourism could be a positive factor for a region. But in Kodagu, the tourism is fractured and dispersed in multiple ways mentioned below:

Excess tourism

First, there is no regulation of this large amount of tourism . There is supposed to be a place that tourists register for a homestay but up to 75% of the homestays are undocumented hence illegal. It is estimated that Kodagu has over 3.5 million visitors every year , and the small population of over 500,000 in Kodagu has been unable to sustain this amount of tourism, as there has been a lack of governmental action to help.

Traffic on weekends and holidays

Many tourists come in bus and van loads, and many drive their own cars. Kodagu's roads are unmarked and confusing. The sacred sites can be as far as five to six hours apart if one is traveling north to south. Tourist vehicles often get lost in the narrow winding mountainous road often. The result is that traffic has surged in this small region. Locals have mentioned to me that with a surge in tourism on the weekends Madikeri is a nightmare to traverse.

Pollution

Environmental degradation due to tourism is evident everywhere. Litter, plastic bottles, plastic bags, aluminum cans are found choking up embankments and overflowing bins in the sacred sites and national parks in Kodagu. (Figure 63)

Figure 68. The main road signs directing tourists to sites around Kodagu in the capital city Madikeri



Lack of cohesiveness

Once the tourists make their way into Kodagu, they head to their home stays and tend to be isolated in that particular area for the entire duration of their trip, except for day trips to the major tourist destinations in Kodagu. Tourists have no idea of what they are looking at in terms of the sacred sites and how they are connected to the history, land and biodiversity around them. There is no regional tourist center to introduce the tourists to Kodagu district. The only visitors center there is in Madikeri town, a small concrete hut that was never open in the five different times during the day I tried to visit. (Figure 69).

There is no place visitor can go to learn about this region's rich biodiversity and cultural heritage, or how to impart a smaller footprint on the region. The concept of ecotourism does not exist for the simple reason that no one knows what it is. Today, Kodagu's landscape has transformed from an isolated self-sustaining biodiversity region to a national tourist destination. This transformation has dramatically affected the social, cultural, economic and ecological balance of this region. Many locals question the future of this region, asking whether it will collapse ecologically and infrastructure-wise under the immense pressure it is under.

Figure 69. *The current tourism information center in Madikeri*

4. Education : lack of environmental education

It is important to note that the public and private school system in India is directly linked to social status and affordability. For instance, in Kodagu, the plantation owners send their children to the best local private school,s and the plantation workers send their children to government public school. There is little question of an exchange within this system unless a scholarship is awarded, or if the private school have a concession for allocation seats to children that cannot afford the tuition. The reason this is mentioned is because the thesis seeks to level this mis-alignment is some small aspect with the environmental educational campus. With the mission that an education on sustainability of a region should be accessible to all children whether they are in private school or public, regardless of class or caste.

Secondly, as will be discussed ,in more detail in Chapter 2, environmental education is lacking in the public and private schools in Kodagu. It is also completely lacking in the realm of Kodagu outside of the school environment.

There are currently no museums, botanical gardens, zoo's or organizations that inform and teach children about the unique land they live in. There is no platform for all the children of the various schools to form clubs, groups or an environmental organization.

Kodagu is raising children that in spite of growing up in one of the worlds greatest hotspots of biodiversity, have only a basic understanding it.

FUTURE ENVIRONMENTAL CONFLICTS

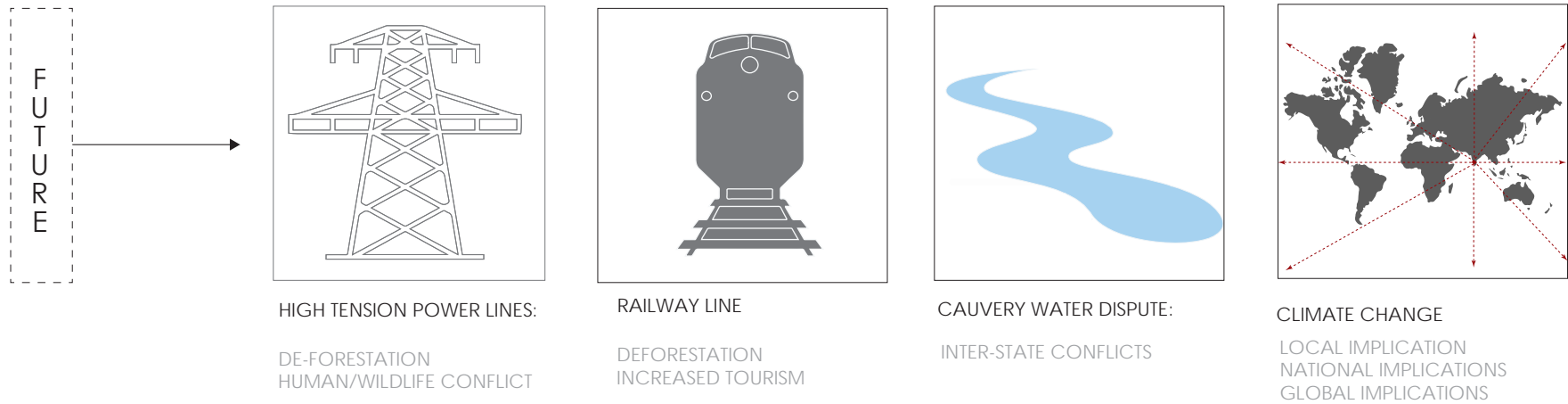


Figure 70. Future environmental conflicts

Future environmental conflicts

Kodagu already has major environmental issues it is dealing with today, and there are only more problems in its future. Such as a proposal to bring in high tension power transmission lines from Kaiga to Kozhikode from the North of Kodagu passing through the Brahmagiri and Pushpagiri wildlife sanctuaries resulting in the felling of over 55,000 trees along the 34 mile stretch. [30] Also there is a proposal to bring in a railway line from Mysore to Madikeri to increase tourist traffic and connectivity into the mountains.

There is also the current and future issue of the Cauvery River water dispute. For decades since the inception of states, the sharing and allocation of the waters of the river Cauvery is a source of serious conflict between the states of Karnataka and Tamil Nadu. In recent years, due to all the aforementioned environmental conflicts and global climate change, there has been less water remaining to be shared. In 2016 after negotiations between the states went stale, the unrest turned into violence with people burning buses and riots protesting the state of affairs.

Finally, Global climate change continues to affect this region's weather patterns. Rainfall, and the monsoon season that is the lifeline of the region has become too unpredictable for the farmers and plantation owners to rely solely upon.

[30] Nandini Kumar Nandini Kumar, Bangalore Mirror Bureau | Jan 10, 2015, 04.00 AM IST. "Celeb Coorgs add their might behind battle for Kodagu - Bangalore Mirror -." Bangalore Mirror. N.p., n.d. Web. 09 Mar. 2017.

“If there is to be any change for the ecological future of Coorg (Kodagu)– it needs to start at school level. Only here can you have true impact” [31]

Air Marshal K.C Cariappa

[31] Oral Interview with Air Marshal K.C Cariappa. July 2016

PROPOSITION

The thesis proposes an independent outdoor environmental learning center in Kodagu district that would be a platform to tie with local schools, both public and private with a very immersive learning technique. It would also be accessible to tourists to learn about the rich culture, heritage and biodiverse land of Kodagu. It would be accessible to local plantation owners and their families where they will receive education and training on new technologies and more sustainable practices in farming.

Part of this thesis project seeks to explore how coffee cultivation and forest management can co-exist in the future. It would enforce a strict school program from Monday through Thursday to optimize use for the over 850 public and private schools in Kodagu district. It would also incorporate a residential overnight program. Friday to Sunday the center would be open to tourists, local farmers and resident families to visit and learn more about their natural environment and local culture.

This thesis takes the position that teaching environmental education would instill the values of conservation at any age to disrupt the economic, social, and ecological imbalance that has been created today. This thesis has identified a gap in environmental education in local school curriculum, and the proposed center attempts to bridge that gap. The hope is that this environmental center will be a turning point for a generation that has the potential to take charge of the ecological future of Kodagu district.



Figure 71. *Kodagu landscape*

I CHAPTER 2: THEORETICAL FRAMEWORK I

INDIGENOUS SPACES I SACRED LANDSCAPES

“This savage beauty, this wilderness they inhabited, which protected them, made an inedible impression on the Kodava imagination and seeped into the Kodava soul. The rivers, hills and forests were all invested with sacredness. The Kaveri (river), referred to in songs as the Golden One, with her source high up in the extreme west of Kogadu in the shadow of the Bramhagiri peak, the towering bulk of the Kottenetta peak with its tiny shrine; the sacred hill of the Igguthappa kunde; the forest shrine of the Male thireke; the Irupu falls across the Lakshmantirtha river, were all sacred to the people of the land. Clear, highland streams, *dedathod*[1], teemed with fish, which were neither trapped nor eaten – these were, and still are sacred waters.” [32]

Kaveri Ponappa, The Vanishing Kodavas

[32] Ponnappa, Kaveri (2013). *The Vanishing Kodavas*. Mumbai, India. Eminence Designs Pvt Ltd



The ancient indigenous forest tribes considered the landscape they lived in sacred. A land to respect and worship, a land that gave them shelter and a livelihood. Every forest in Kodagu had its own guardian deities, who had to be appeased before entering the forest, or hunting in it. Hence, forest shrines or *devarakadu*'s were plentiful. "Landscapes are culture before they are nature; constructs of the imagination projected onto wood, water and rock" [33]



The landscape is engaged in major celebrations for the Kodavas. Though the Kodavas have now assimilated under the umbrella of the religion of Hinduism, they do not worship the conventional Hindu gods. The Kodavas main worship is the worship of their ancestors. Also, the considering the reverence to the sacred landscape, the Kodavas have two main deities in the region that they worship – the river goddess Cauvery, and the God of the rain and paddy– Igguthappa. In birth and in death, the sacred water of the Cauvery River is trickled in the mouth of a person. The paddy crop is also seen in these rituals. Twined in a bunch and used in significant moments in ceremonies. In the ancient Kodava festival of *Huthri*, the annual harvest festival where rice paddy is harvested, incantations to the Lord Igguthappa are chanted, and the first harvest of paddy crop is offered to him. Water and rice are significant in the first birth rituals and last death rituals of a Kodava.

The landscape, and the fruit of it , is invoked in any time of any significant event in the life of a Kodava.

[33] Schama, Simon. *Landscape and Memory* (Fontana Press, 1996), p.61

Figure 72. Above- River Cauvery in Kodagu

Figure 73. Below - Rice transplanting in rice fields in Kodagu

Using the sacred landscape to educate

Environmental Education

The concept of environmental education is a core concept of this thesis. The thesis asks the question of whether immersive exploration and active involvement in the landscape could change a person's attitude towards the land around them.

William B. Stapp, professor emeritus of Resource planning and Conservation in the University of Michigan School of Natural Resources and Environment is considered the father of environmental education in the country today. In his book 'The concept of environmental education', Stapp outlines five key objectives in environmental education : Awareness, Knowledge, Attitudes, Skills, and Participation. Stapp was convinced that as individuals and societies become aware of their environment, the knowledge of conservation and sustainability can develop attitudes towards protecting the environment. Eventually these skills that are learned can resolve environmental problems. It is important to implement these objectives and skills in young children as it will instill values of ecological responsibility when they are learning and growing.



Figure 74. Kodagu landscape



In his book 'Last Child in the Woods', Richard Louv directly outlines the negative effects that have resulted from the new generation's disconnect from nature.

He documents how close interaction with nature enhances creativity, mental and physical health, and an understanding for the environment. Louv believes that many people today lack a positive, day-to-day experience with the elements of nature, and this is changing people in fundamental ways. This is changing people's outlook to the environment. His belief is that bringing people closer to nature will inculcate empathy and a deeper connection with it, one that will promote environmental stewardship in a new generation of children.

Figure 75. Top left - Exploring the shore, Mathews Beach Preschool, Seattle, Washington

Figure 76. Top right - Building a solstice spiral at Cedarson Nature School, Vashon Island, Washington.

Figure 77. Bottom left - Nature observations, Fiddlehead Preschool, Seattle, Washington

Immersive and hands-on learning

Children are tactile learners. They learn and absorb information through touch, feel, smell and taste. It is this experiential learning that is seen to be highly successful is creating confident children with a strong sense of empathy and intelligence. For this reason , many preschools in Seattle are focusing more on play based learning than learning alphabets and numbers on a board.

Emily Cross, a Professor in the School of Psychology at the United Kingdom’s Bangor University, explains in her Atlantic Media company interview, the impact of movement on memory and learning according to her neuroscience research. Her research shows that active learning, where the learner is physically moving and interacting, can change the way the brain works and can accelerate a child’s learning process. Whereas passive learning doesn’t favor brain activity. Cross, whose research focuses on pre-teens and young adults, said she found clear evidence that when learners are physically moving, they are learning far more than learners that are only observing the same thing. Cross has found that there are striking changes in brain activity when a physical activity is included in the learning context. In other words, people absorb a newly acquired skill-set better while engaging their bodies rather than simply observing.[34]

Environmental Education in Kodagu

The current setup of the schools in Kodagu do not utilize this incredible backdrop they are set up with to cultivate learning of the ecosystems and biodiversity around them. When asked why this is so, the response was “this is also because the education boards emphasizes a strict curriculum that puts pressure on a school to fulfill requirements with very little free time” ,“we find it difficult to implement (an environmental curriculum) with all the curriculum that is required to be covered.” [35]

There is one Public school in Madikeri district, the Government School in Kadagadal, that has a good amount of environmental education in their curriculum via an eco-club. They had a garden patch and grow their own school lunches in the growing season for 3 months of the school year. (Figure 78 and 79)

[34] Dotson-Renta, Lara N. “Why Young Kids Learn Through Movement.” The Atlantic. Atlantic Media Company, 19 May 2016. Web. 09 Mar. 2017.

[35] Oral Interview with Codanda .B. Deviah and Mr Srinivasan; the Trustee General and Principal of Kodagu Vidalaya School. August 5, 2016



In conversation with the school principal - Mrs Gangamma about the Eco Club, it was found that the learning done at the Eco Club stayed within the walls of the school campus. The Eco Club did not extend its learning to field trips in the landscape around them.

When an environmental center was proposed to both principals of the private and public schools, where the school could plug into this center at specific dates and times per grade level, both parties said this would make it a lot easier for the school to incorporate environmental education in their curriculum. Also, most schools follow the NCERT (National Council of Educational Research and Training) curriculum that allows for state to state modifications based on the region. So there is an opportunity to integrate some environmental learning into the curriculum. It is easier to plug an existing school into an entity that has an environmental curriculum set up, rather than integrate environmental learning in their own school curriculum. A lot more can be learned in a shorter time this way, making it an effective strategy for both the public and private schools in Kodagu.

The government School in Kadagadal,

Figure 78. Top left - vegetable patch prepped

Figure 79. Bottom left -vegetables growing

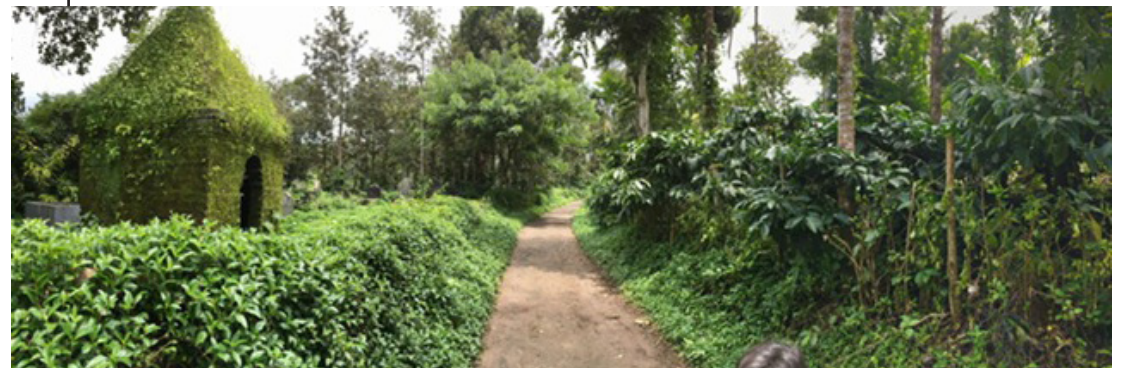
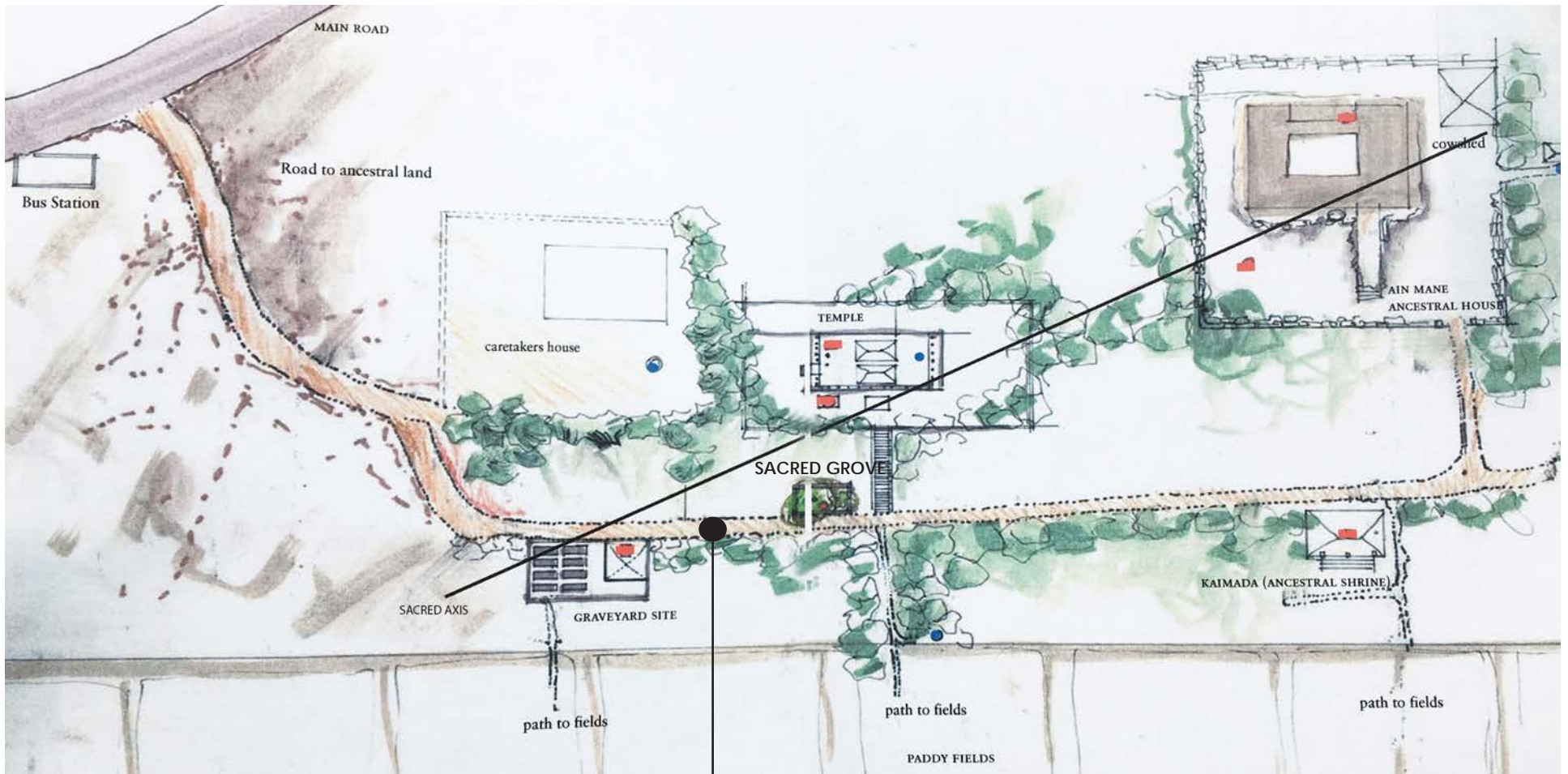
Figure 80. Top middle - children clearing space to plant a vegetable patch

Figure 81. Top right - Yield from the vegetable patch

The Built Environment

The concept of sustainability was practiced for centuries by the ancient Kodavas. Kodavas were Agriculturists and Architect's centuries before the British occupation of Kodagu in 1834-1947. Traditional Kodava architecture is important to analyze when considering any new built structure in this region of sacred spaces and ancient traditions. The best of Kodava architecture are the ancestral homes that still stand today.

The Kodavas built houses and structures that were climatically appropriate, functional, and a reflection of their beliefs and traditions. Their buildings had a minimal impact of their site and surroundings. They were sourced with local traditional building materials, and built with local building techniques. These basic principles of design and construction will be used in the environmental learning center as a contemporary interpretation of this culture.



Biddanda Ancestral home family compound:

Figure 82. Above- Site Plan, Biddanda ancestral home, Bavali Village, Kodagu, India

Figure 83. Below -Journey into the family compound. Family graveyard on left.

CASE STUDY

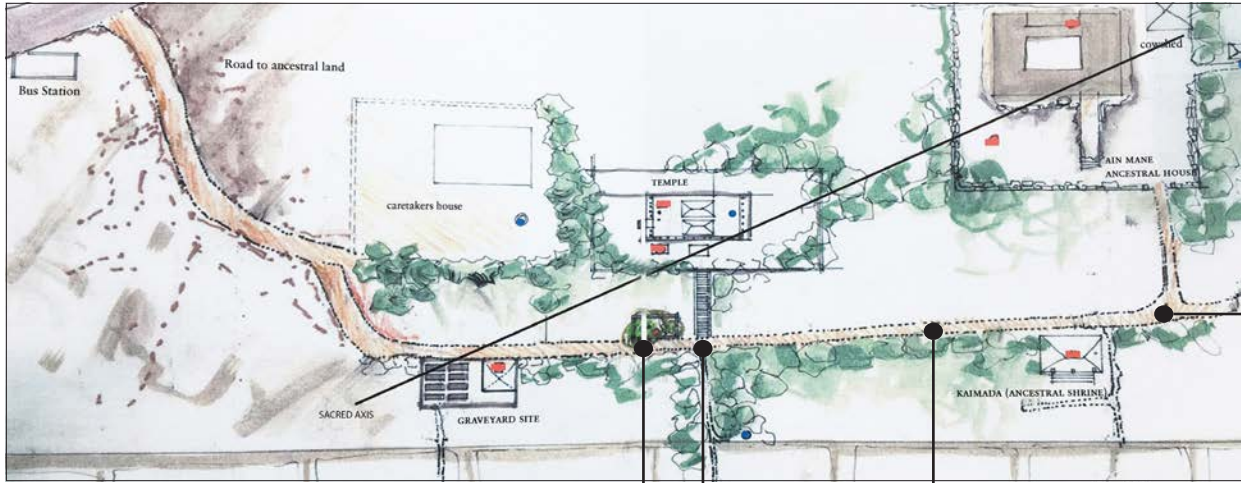
I Case Study 1 I

Biddanda ancestral home, Bavali Village, Kodagu, India

Centuries ago, the Kodavas lived as a joint family or an *okka*; a patrilineal social structure where members of the same blood lineage lived together under the same roof. Families made alliances with some *okkas* and fractured relationships with other *okkas*. Hence the compound in which an *okkas* lived was built in a way that could only be categorized as defense architecture. *Okkas* had to protect themselves not only from warring neighbors, but from wild forest animals such as tigers, panthers, leopards and elephants. The entire compound consisted of smaller buildings such as the family temple, the family graveyard, the ancestral shrine and the house compound. (Figure 82)

The Biddanda *ain mane*; or *ancestral home* was constructed around 320 years ago in the town of Bavali in Kodagu district. The Biddandas were a renowned family of martial status, having had two commander in chiefs of the Kodagu Army during the rule of the Haleri Kings. As can be seen from the master plan of the Biddanda ancestral house site, it is a series of buildings along a main road one has to walk through to approach the main house of the Biddanda clan. The house site was usually nestled up on a hill close to the paddy fields where rice was grown and harvested. The forest lands around the *okkas* compound were eventually converted to coffee estates over time. The house site is built almost like a fort with fortified stone walls. As one walks from the main gate into the Biddanda family compound on the route to the main house, there are reminders dotted along the path of other structures such as the family graveyard, sacred tree, family temple and ancestral shrine; that serve as visual reminders of this ancient tribe of martial forest-dwellers, and their own unique imprint on this landscape. (Figure 84-87)

The house plan is inwards facing with its inner courtyard – or inner sanctum being the main space of the entire house. The inner sanctum is a space that has multiple functions. Providing for light, natural ventilation, rain water collection, a common area for household tasks, a common area for meetings and ceremonies with the rest of the *okka*. (Figure 88, 90 and 91)



Biddanda Ancestral home family compound:

Figure 84. *Above right - Ancestral home*

Figure 85. *Below left - sacred grove*

Figure 86. *Below middle - stairs leading up to the Biddanda temple*

Figure 87. *Below right - Ancestral shrine*



Materials and Construction

In her book 'Silent Sentinels: Traditional architecture of Coorg', renowned Indian architect Brinda Somaya details the plans of seven ancestral homes of seven different Kodava *okkas*. The houses are all detailed and designed very similarly to case study 1 in terms of design, construction and materials.

Materials were all locally found on site, and sometimes brought in from the next village. In regards to the design of the home, construction workers were usually from the neighboring states of Kerala, which is why the architecture and detailing of the ancestral homes are similar to Kerala ancestral homes. This is especially evident in the wood carvings on panels around the ancestral homes. The Kodava ancestral homes are a unique regional adaptation to traditional ancestral homes in other parts of southern India.



The ancestral homes, shrines and temples were built of stone and mortar with solid carved woodwork for the doorways and windows. The foundation was of stone with mortar, along with the walls. The ancestral homes had one main living level. The entire house was raised off the ground with a high foundation – for protection from wild animals, snakes, insects, the rains, and warring locals. There was an attic space that served as the second level, and this was mostly used for storage of food and belongings of the family. It was a cool and ventilated space as the timber framed roof above it held thatched roofing. (Figure 94)

Figure 89. Above - A typical ancestral house facade

Figure 90. Below - Ceremony around the central courtyard in an ancestral house



Biddanda Ancestral house:

Figure 91. Top left - Inner courtyard

Figure 92 Top right - corridor around courtyard

Figure 93. Bottom left- entry veranda

Figure 94. Bottom right - attic space



In its very design with its raised plinth foundation, open inner courtyard with a large open corridor and rooms around it, with a secure attic, the ancestral homes exemplified simplicity in design. The flooring for the main floor was made of locally found materials on site, a mix of mud, lime, cow's milk and cow dung. The walls were mud plaster applied over the stone walls. These old structures have stood over 350 years, and are still as functional as they were when they were built.

Biddanda Ancestral house details:

Figure 95. Top left- timber structure above corridor around courtyard

Figure 96. Top right - eave detail at house exterior

Figure 97. Bottom -Column details at inner courtyard





Biddanda Ancestral house | Ancestral Shrine

Figure 98. *Top left - shrine overlooking the rice fields*

Figure 99. *Top right - eave detail at shrine*

Figure 100. *Bottom- ancestral shrine*

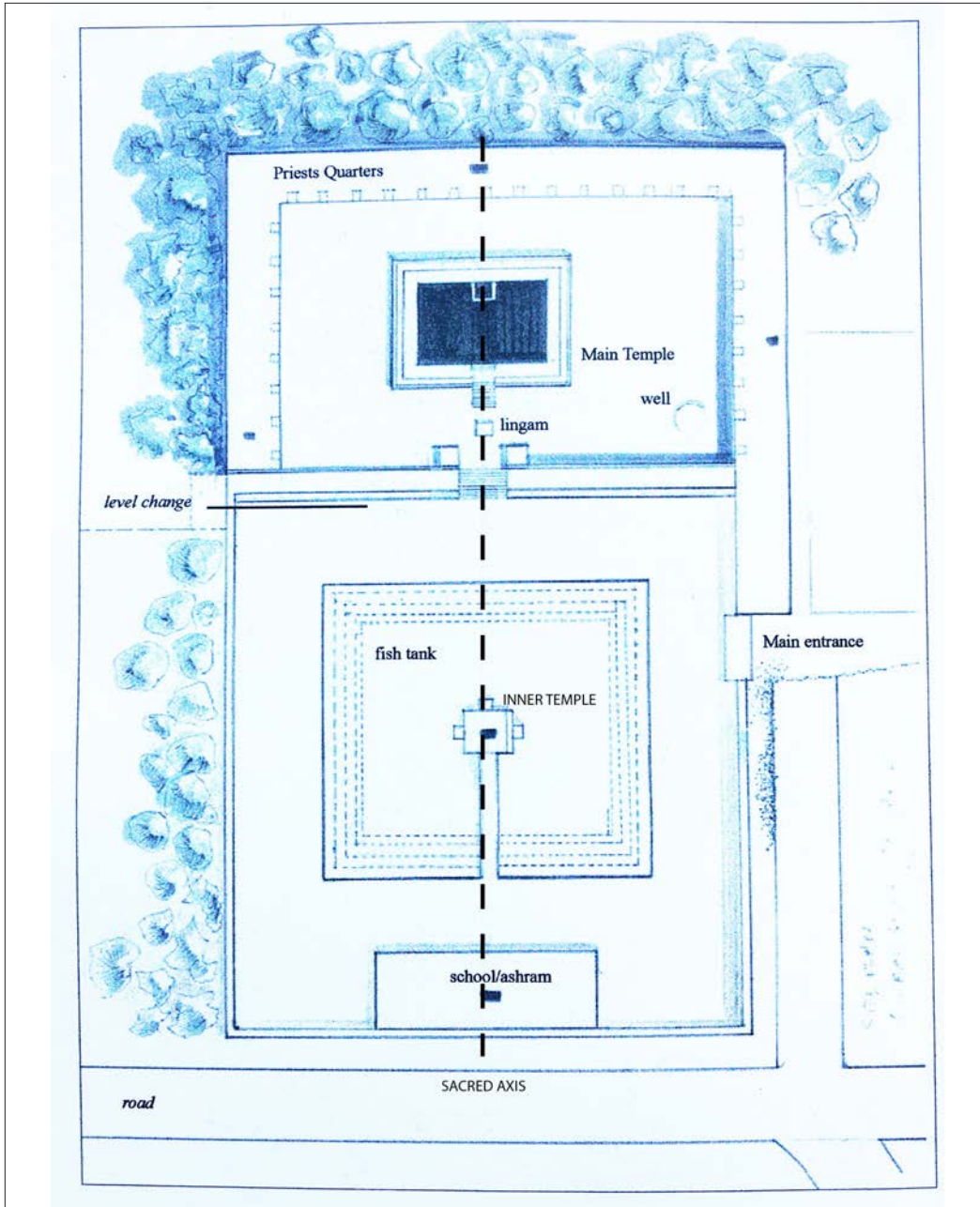


Figure 101. Left - Omkareshwar Temple plan

Figure 102. Top right - Omkareshwar Temple

I Case Study 2 I

Omkareshwar Temple I Madikeri

This Hindu temple was built by the Haleri Kings in the 18th century. It is a combination of architectural styles of local vernacular, Islamic and Hindu. The temple is divided into a lower portion with the water reservoir, and an upper portion accessed via stairs that contains the main temple and idol of the patron God Shiva. The significance of this temple as a case study is its two main architectural design features.

One feature is that water is central to the plan of this site. The entire temple is built around the sacred water reservoir. Water is of key importance to the local culture and it is honored and celebrated being the single focal element of this temple. There is a *mantapa* (smaller temple) located in the center of the water reservoir that can be accessed via a walkway. (Figure 102) Pilgrims walk around this reservoir and the upper temple three times in prayer.

The second feature of importance is the site's defined sacred axis that lines up every building of importance in a linear path. This axis lines up the sacred water reservoir and *mantapa* with the *Shiva Lingam* (abstract idol representation of Lord Shiva) and the Idol of the Lord Shiva in the main temple interior. (Figure 101) In spite of the temple being divided into an upper and lower portion via stairs, the axis binds the entire complex in one simple move. It is not obvious, but this subtle axial symmetry acts as a powerful force to tie ritual and religion.

Case study conclusions

Vernacular materials

The local building materials used in the the local regional architecture use the vernacular materials of timber, stone and mud brick. As described earlier - each material had its own specific function and was used in a particular part of the building.

Form

The architecture of the spaces all have one design feature in common - they are all wrapped around a void space. This void space is the courtyard space that provides for multiple purposes - from light and ventilation, to a place to collect rainwater, and a common space to gather for rituals and chores. The form of the ancestral home structures are solid with its only punctures being the courtyard space in the interior, and smaller windows on the exterior. The buildings are tight and compact and are either square or rectangle in plan. This was likely for conserving heat and maintaining a secure perimeter within the building. Once inside the ancestral home, it was an insular space that wrapped around a person.

Site Arrangement

In the ancestral homes, the journey through a series of smaller spaces eventually lead to the large house. The individual sites are well integrated into the forest land around it with minimal impact to local flora and fauna. Functions are separated clearly. In the case of the Omkareshwar Temple , the water feature is given the most importance. The entire temple is arranged around the hollowed out courtyard that holds water from the Cauvery River .

Architecture

The architecture of the region is unique to Kodagu. It is climatically appropriate with its large thatched roofs that were later replaced by the clay tile roofs that we see today. The roof overhangs were wider all around the building structure allowing for shelter from the rains under them. The few examples of regional architecture seen all have the common feature of being built on a plinth, and are well integrated into their site, they also have views of the land around it. The main architectural feature on the facade is the roof which dominated the structure of the house.

Symmetry was an important feature in the architecture here. For the most part, a plan was mirrored in the symmetry of a half.

Spaces were given an order of hierarchy in having them separated by function and tied together in a journey of discovery. An example is the layout of the ancestral shrine, temple, and house in their own specific path on a journey towards the house.

Journey

To walk to the ancestral home, was to walk down a road dotted with sites of history reminding one of the past. The homes were immersed into the landscape, and both land and history tie in seamlessly in this journey down the path to the ancestral home. In Omkareshwar Temple the journey is walking around the water feature and up the main stairs through the gates, up more stairs to the temple. It is these transitions that allow for the mind to prepare for its ultimate end in the journey.

Sacred axis of symmetry

Both the ancestral home and the Omkareshwar temple, have what is the thesis will refer to as a sacred axis of symmetry. This invisible line ties the entire site and building together in a single linear move; invoking history, culture, religion and land.

ANALYSIS OF PRECEDENTS

Case study 1 : Historic and Cultural Precedent

Waskowitz Outdoor Education Center , North Bend, Washington, WA

Waskowitz was first built by the Civilian Conservation Corp in 1935, a public work relief program. Over time it changed hands until it was bought and is now run by the Highline School District in Washington State. It is one of the only two State and National Historic Preservation sites in the United States with all of the original buildings still standing. It is spread over 372 acres including a river running through the property and has served over 200,000 students in visiting and overnight programs since its inception as an education center. The campus consists of a core group of log cabins that consist of three residential cabins, a common dining hall, and a meeting cabin.

Of its many programs, the living history program immerses a visitor back into the early nineteenth century, and a view into the life of settlers in the Western coast of the United States. Around the core buildings are gateways or time portals where one is taken back to the pioneer days. There are four portals of living history: Homestead/logging; Native American; Mining (Coal and Gold in the river) and Railroad/Logging. (Figure 103-107).

The mission statement of Waskovitz is "Waskowitz Outdoor School is a magical journey of discovery exploring the diversity of people and nature." The interesting part about Camp Waskowitz is that the children come out of it with a deeper understanding about how early settlers lived in America because it has popped out of the history pages and come to life in front of them. They are using the actual tools settlers used and understanding what it was like to work in the environmental conditions of wind, rain, cold and snow. They get a basic understanding of what life was like as a logger, a miner, a gold panner and as a Native American. They start to connect how each related to the other to make the greater community. This kind of immersive, hand-on, visual method of teaching about living history is truly effective for a child.



Waskowitz Outdoor Education Center

Figure 103. Top Left - Railroad/Logging portal.

Figure 104. Top middle - Mining portal

Figure 105. Top right - Native American portal

Figure 106. Bottom left- Passing through a portal at Was-
kowitz

Figure 107. Bottom right - Native American portal



Islandwood

Figure 108. Top Left - site plan

Figure 109. Top middle - Dining hall

Figure 110. Top right - Outdoor greenhouse

Figure 111. Bottom right- classroom building and wetlands in foreground.

Case study 2: Sustainability Precedent

IslandWood , Bainbridge Island, Washington; USA

IslandWood is a 225 acre private outdoor learning center that invites children and adults for day and overnight stays. Their mission is “to provide exceptional learning experiences and to inspire lifelong environmental and community stewardship”. IslandWood works with local and national schools in immersive programs from three day overnight camps to summer day camps and urban school programs. During this immersive environmental experience, students stay in dorms on campus and work towards completing a program specifically geared toward science, technology, and the arts. The design for the campus provides spaces for both indoor and outdoor learning and exploration.

The campus comprises of separate buildings that have specific functions such as eating, sleeping, indoor classrooms and gathering. This campus, designed by the Seattle architects Mithun maximizes on views to the outside. It is an indoor-outdoor fluid design which enhances the great benefits of learning in nature, and encourages a seamless transition between the indoor and outdoor spaces. The portion with the least impact to the environment was chosen as the building site after Site Analysis. (Figure 108) The campus buildings integrate sustainable elements in their design and teach the children about sustainability as it works. Energy conservation, composting, recycling, growing vegetables in the greenhouse and serving them in the dining hall, harnessing alternative energy sources are part of their program.(Figure 109 and 110). In this way, they are not only imparting a lesson to visitors that simple, day-to-day tasks have long term impacts on the environment, but they are also teaching visitors how to live more responsibly in the natural world.



Islandwood

Figure 112. Top - living machine building

Figure 113. Bottom - human waste composting toilets



Two features of particular interest were at Islandwood were the composting toilets and the living machine.

Composting toilets

There are two composting toilets on campus in the multi-stall public restrooms of the main classroom building. These composting toilets provide for compost that is made and put back into the forest . It serves as an example on how human waste can be composted on site and used to benefit nature. The human waste falls into a pit where it is mixed with woodchips and composts for a period of eight months until it is finally turned into a manure. (See Figure 113)

The living machine

The living machine is a building where the greywater and blackwater from the classroom building is treated and turned into drinkable water. This building was built originally in the year 2000. In 2015 its in Though due to state of Washington laws, it cannot actually be consumed even though it does pass all the regulations for qualifying as drinking water. (See Figure 112) All waste from the public restrooms of the classroom building first goes into a holding tank where the solids are separated from the liquids. Then the waste water only enters the tidal wetlands that are near the building. The filtered water is then sent to the living machine building. It passes through three large circular plant 8 foot deep troughs that have shale and specific plants in them to remove toxins from, and cleanse the water. Next it goes through a larger L shaped tough , and then into the Koi pond. The water is so clean by then, that the Koi fish living in this pond are as old as the living machine, which is about 7 years old , having been put there as baby fish. Finally, the water from the Koi pond are sent to a series of filters where the end water is clean enough to be drinking water. However, due to strict Washington State policy , the water cannot be consumed. Therefore the function of the living machine at at Islandwood is to be an example for its students on how wastewater can be turned into potentially drinkable water.

REFLECTIONS

Waskowitz Outdoor Education Center is an example of how history can be relived and recreated in a hands-on and immersive way for children. I witnessed first hand how employing active learning techniques , and using Richard Louv's philosophy of a close up interaction with nature enhances creativity, mental and physical health, and an understanding for the environment. The combination of a close interaction with nature and hand-on learning creates a platform for any kind of learning - whether it is about the environment, history or culture. Waskowitz Outdoor Education Center is able to launch off this platform it has set up to focus specifically on history in its 'living history' program. Waskowitz engages with local schools, and has the option to visit for an afternoon, or to stay in a 2-3 day overnight camp. Their belief is that learning can be done in either time frame.

To explain to a child how heavy the steel and lumber was to lift into place to form a rail, and to actually have a child use a pulley to place the wood and steel pieces to form a railroad are two completely different learning experiences. The literature engaged in the theoretical framework suggests that the later way of learning is far more beneficial to a child and is able to imprint in a child's memory via way of physically doing. In engaging Professor Emily Cross's research, she found clear evidence that when learners are physically moving, they are learning far more than learners that are only observing the same thing. People absorb a newly acquired skill-set better while engaging their bodies rather than simply observing.

Islandwood offers a 3 day overnight camp for schools specifically targeted at 5th grade students. Their belief is that learning needs to be done over a longer period when it is more immersive and hands-on for the best results. Islandwood teaches through its site, and also through its buildings and its facilities via specialized features such as composting toilets and the living machine. Islandwood also believes in physical observation and immersive hand-on learning for maximum absorption of information.

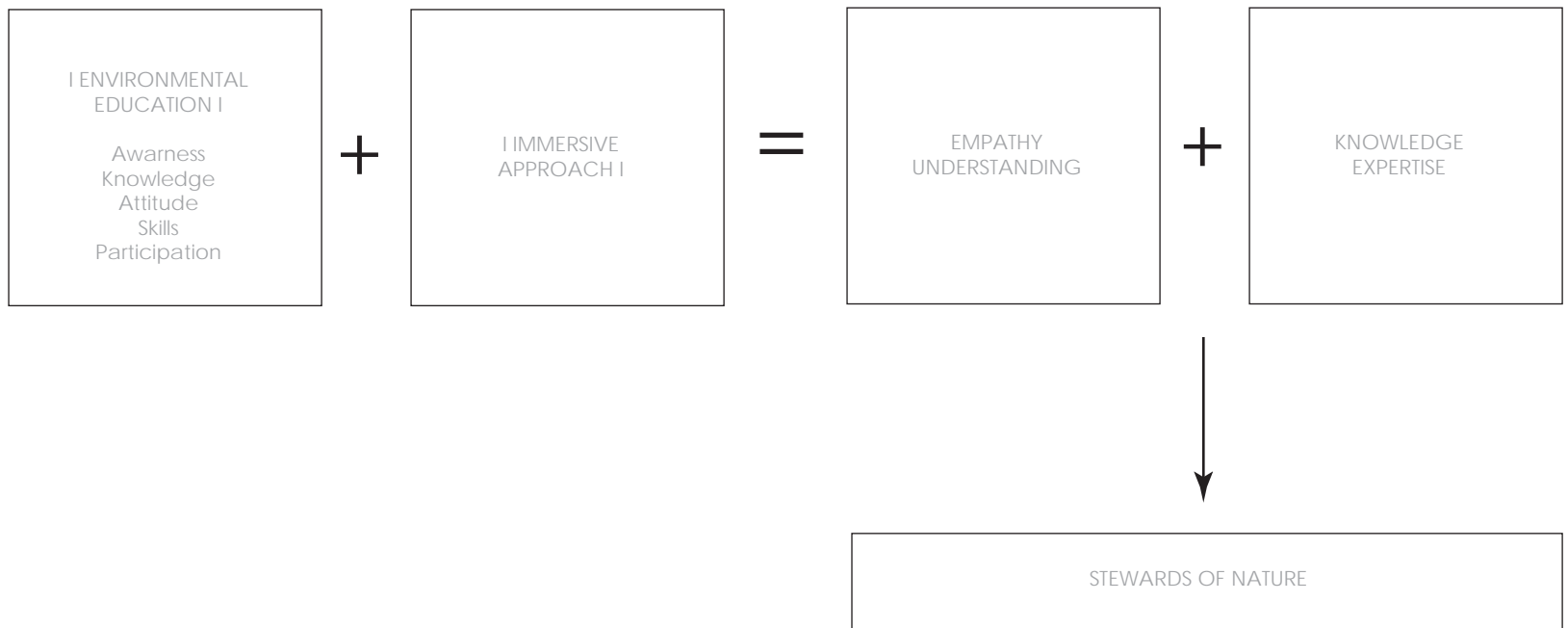


Figure 114 : Mission of the proposed environmental center

The current lack of care for the environment observed in Kodagu comes from a lack of understanding and empathy towards the land. This attitude can continue from one generation to another if there is no intervention, eventually resulting in a complete disconnect with nature. This thesis project seeks to intervene in this process, creating a place for understanding and empathy towards the environment to develop. Though focused on school age-children, believing that this is where the most change can happen, it also gives a platform for locals and tourists to be educated about the environment.

In today's world of modernization and globalization, no place will remain in complete isolation. Tourism can be seen as a positive factor to educate a new group of people about the diversity in their own country. This is evident in the concept of ecotourism where it can contribute to a growth in the local economy and boost cultural and ecological interest in the region. Ecotourism could be a vehicle with the potential to make positive contributions to the conservation of endangered biological resources. The environmental learning center could very well be the platform that is needed to bridge the fractured situation as it exists today. In having a common platform that brings people together, the indigenous tribes of Kodagu can benefit from outside interventions of sustainable practices and newer technologies.

Environmental learning center

This thesis builds its foundational premise on the value of immersion in the outdoors and being physically, mentally and emotionally connected to the land, just as the ancient Kodavas were so intrinsically connected to their land. The physical aspect of learning and observing collecting data in the field, and testing it is a key component of the type of immersive learning that takes place in the environmental center. With its focus on local children, the center will hope to promote stewardship of nature in the next generation of this district. With its platform for allowing local farmers to interact, the center will hope to promote more sustainable agrarian practices in the district, and also serve as a tourist destination. The built intervention embraces the imminent future of the district, and will deal with the future by being inclusive and promoting environmental education.

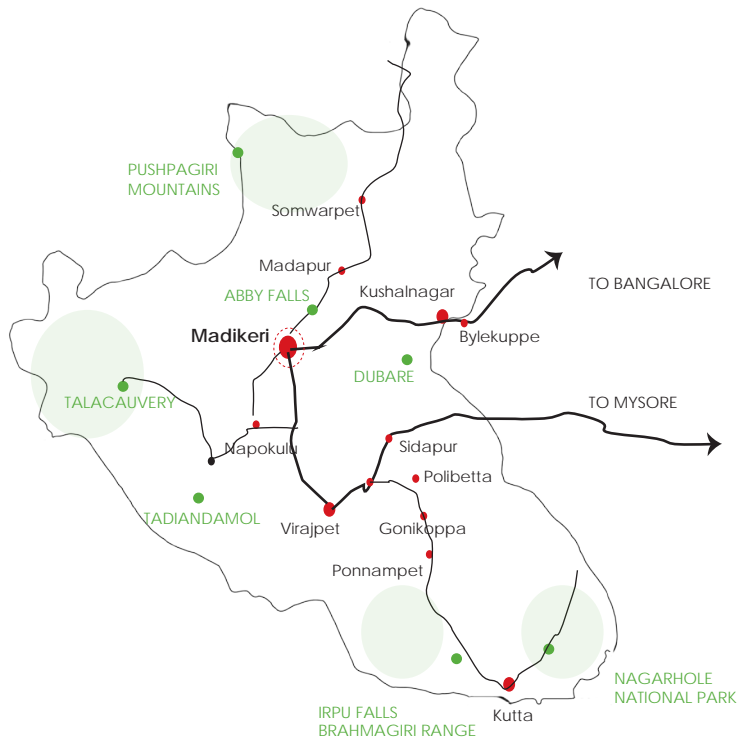
This thesis takes the position that the platform of environmental education can be a great catalyst for generational change and community engagement. This thesis sets out to increase the environmental awareness in Kodagu via an educational environmental learning center that would provide a platform for education for schools, tourists and local farmers. It will help children and adults learn through a hands-on immersive environmental learning approach. It proposes that this center will integrate the agrarian sustainable farming techniques into an environmental curriculum in the hope of encouraging environmental stewardship in the future.

The thesis takes the position that education via an environmental center can be an effective strategy to deal with the ecological loss and lack of sustainable practices that are currently prevalent in Kodagu district, inculcating environmental stewardship.

(Figure 114) An environmental learning center with place-based education will immerse students in local heritage, cultures and landscapes, using this as a foundation for the study of language arts, mathematics, social studies, science and other subjects across the curriculum. Program elements of the environmental learning center will include a hands-on approach to learning about the major causes of ecological loss mentioned earlier, and provide methods and strategies to deal with it in the future.

Architecture

The design principles that are generated for the thesis project are based upon a analysis of local conditions of regional, local, and vernacular building techniques. The essence of the culture that reveres and worships its land will play an integral part of the design. Conclusions from the case studies of the local vernacular architecture will be an integral part of the foundation design principles of the new structure.



SITE SELECTION

City of Madikeri, Kodagu district

Madikeri is the government capitol of Kodagu district. It was the capital of the Kingdom of Kodagu during the reign of the Haleri Dynasty in the 16th Century. Madikeri features a tropical highland climate and has an elevation of 3838 feet. The only access to Madikeri, and the rest of Kodagu district is via road. There are no train stations or airports in this hill town. Madikeri is the main hub of Kodagu district. It is where the government has its official seat. It is also where all roads connect, and is the central core of the district of Kodagu.

Figure 115 : Kodagu Map

- 1 Madikeri Fort
- 2 Omkareshwara Temple
- 3 Raja's Seat
- 4 Tomb of the Haleri Kings

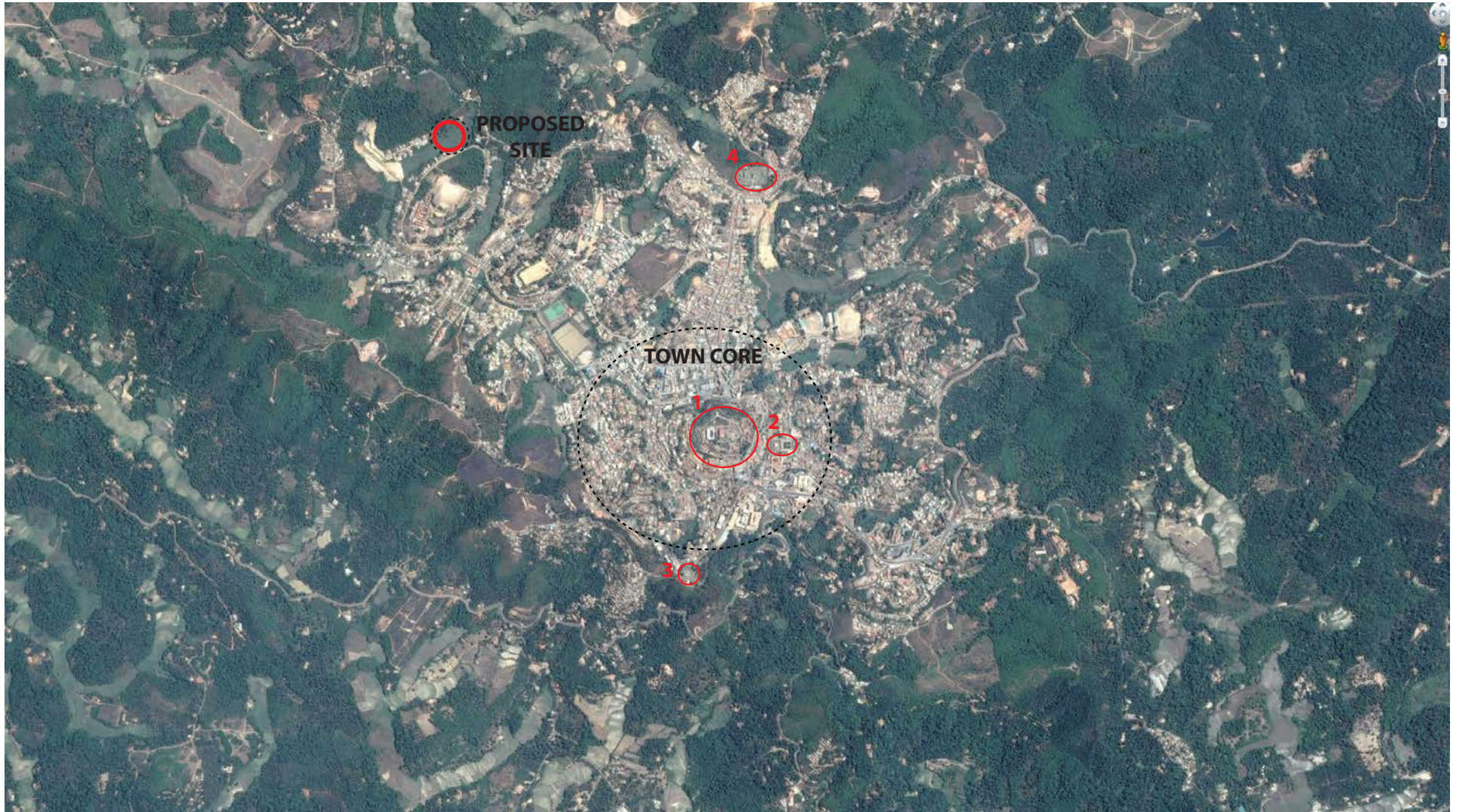


Figure 116 : Madikeri main sites



Existing Urban conditions

The town is split due to an elevation gain of about two hundred feet into smaller upper government town, and a lower commercial town. The segmented parts of town are walkable to each other, but there are limited pedestrian pathways. Madikeri is the pulse of Kodagu district, the first point of entry for tourists and visitors alike. All major roads from the surrounding cities lead here. The strength of choosing the main city in Kodagu district is its visibility and accessibility to schools, tourists and the locals. (Figure 115)



The town core is compact and crowded with vehicular traffic. (Figure 117)
The residential area outside of the town core is more spread out and has more potential sites. Finally, as one gets half a mile out of town, the beauty and expanse of the Kodagu landscapes becomes evident. Because it is important that the environmental center be immersed in the landscape, choosing a site farther away from town is critical. (Figure 119)



In terms of geography, Madikeri is centrally located in Kodagu district. It bridges the remote corners of Kodagu district around it with its prominent location. All arterial roads lead to Madikeri. In terms of school children arriving via bus from all over Kodagu, it is conveniently located.

Figure 117. Top - Commercial center in Madikeri

Figure 118 Middle - Residential areas in Madikeri

Figure 119. Below -Outside of the town core, Madikeri

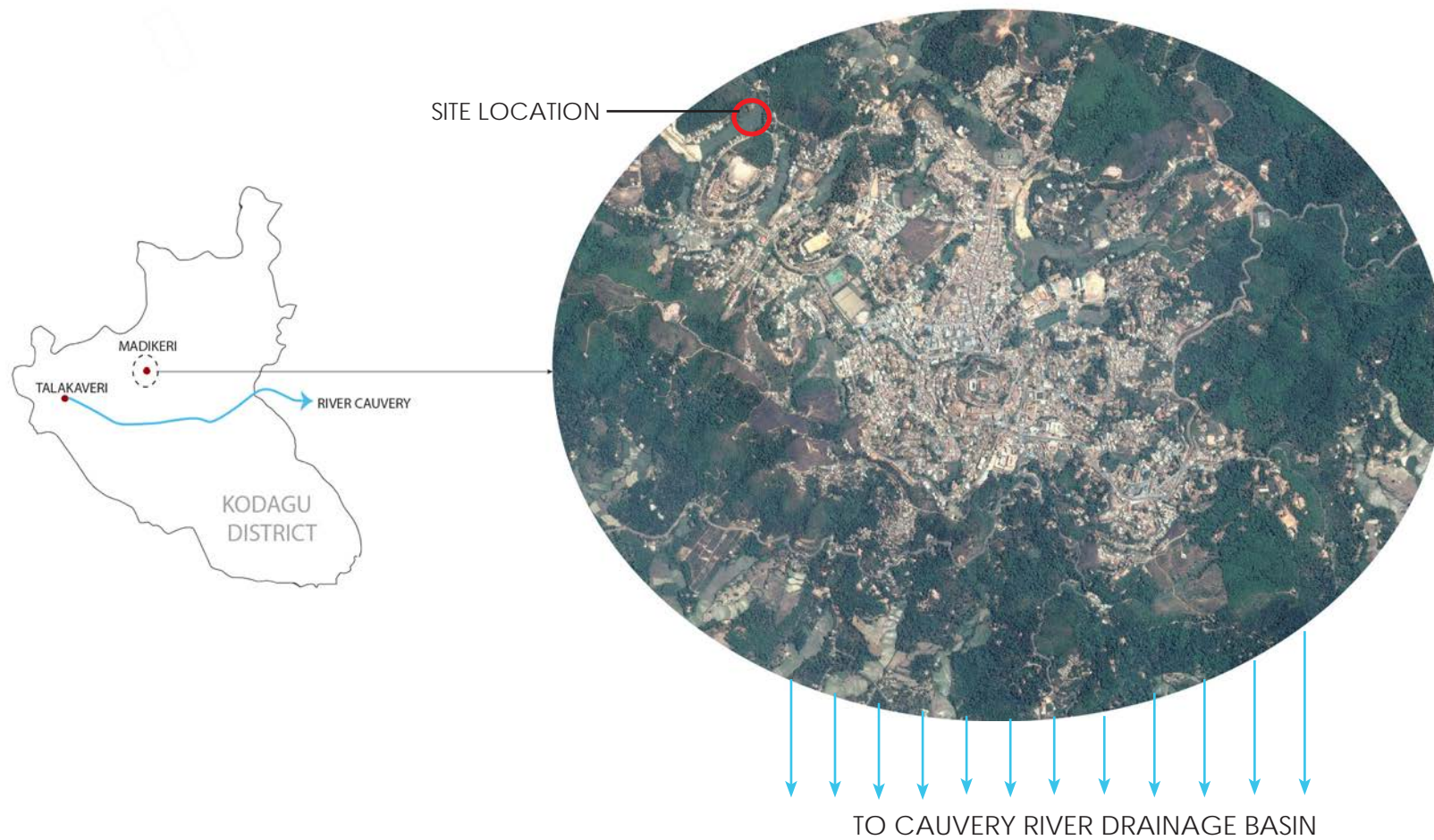


Figure 120. Location of Madikeri relative to Cauvery River drainage basin

KODAGU ECOSYSTEMS



Ecosystems

Water from Madikeri town and its surrounding plantations and fields eventually drain down into the Cauvery River basin. Therefore making it a very important site for learning about water conservation and pollution. (Figure 120) Visually, Kodagu has three distinct landscapes : mountains, plantations and rice fields. (Figure 121) Each of these have incredible diversity in their own unique ecosystems. The mountains contains old growth trees that are hundreds of years old; the plantations grow coffee, pepper, cardamom and a host of other plants; and the rice fields are culturally and economically significant in the growth of rice. Learning about these three ecosystems is learning about the people culture, history and landscape - and how environment and people are so deeply connected. The proposed site includes these three ecosystems.

Figure 121. Kodagu Ecosystems



Figure 122. Above - Madikeri map

Figure 123. Below - Site location within Madikeri



SITE ANALYSIS

The site location is about 2.7 miles - and a 10 minute drive from the center of Madikeri. The site is within the city limits. It is accessible by local public transport, or via automobile. It is a 25 minute walk from the town center. The reason the site is chosen is because it has all the three aforementioned ecosystems: mountain slope with old growth forest, a coffee plantation and a flat terraced rice paddy area. The site is visible from the main road, and on the path to one of the most popular resorts in Madikeri - Club Mahindra resort. The site is 10 acres or 43,5600 square feet.

Figure 124. *Site Analysis*



Figure 125 .Existing Site Plan



1. View from inner access road to top of site. Coffee bushes below.



2. Old growth forest with coffee bushes below.



3. View west into the site from the inner access road



4. View from the main road from town into the site



5. View from the house site to the paddy/ rice fields below

Figure 126 .Existing site photographs



OLD GROWTH FOREST WITH COFFEE PLANTATIONS



COFFEE PLANTATIONS WITH OLD GROWTH FOREST



RICE PADDY FIELDS



PRIMARILY OLD GROWTH FOREST & COFFEE PLANTATIONS

PRIMARILY COFFEE PLANTATIONS & OLD GROWTH FOREST

RICE PADDY FIELDS

Figure 127 . Three ecosystems on site

Additional site information

The site currently operates as a small scale coffee plantation. The area around this site has dramatically changed over the years as it has gone from being on the quiet outskirts of the city, to being in a prime location of where the city is growing towards.

Neighboring sites include residential plots, the main golf course in Madikeri, the main local government college, established national destination resorts as well as upcoming resorts. The site is well located in terms of access and visibility into the site.

The site also contains three distinct local ecosystems which are mentioned earlier in the thesis, which are important as they represent a cross section of the local landscape in the district.

PROGRAM

The goal of the environmental center is centered around immersive environmental education, using indigenous spaces and indigenous traditions of the ancient Kodavas as a tool to educate. Its focus is to immerse the students into the landscape, the environment and the culture to promote stewardship of nature.

The children in Kodagu district do not learn about the indigenous culture at all from their school text books. There is no part of the history curriculum where Kodagu history is taught. Instead, they learn about Kodagu from their family and community. Attending events and ceremonies, children learn visually about their culture and environment. Kodagu does not have a written script of its own, until only very recently did it borrow the script of state language of Karnataka - known as Kannada. This means for centuries, rituals were passed down via stories and songs.

The environmental center will be inspired by its historic traditional vernacular architecture, reinterpreting and invoking spaces as they were built centuries ago. Views from the center and of the center, climatic conditions, journeying through the site and access to the outdoors are the major considerations of the project. The center will have a series of structured indoor spaces such as an exhibit, wet labs, offices and a multi-purpose hall to gather for formal and informal events. The center will also have outdoor wet labs which act as a base to gather, collect and analyze field data. A residential component is important as it will provide on-site residences for overnight students. The furthest schools are about two hours away. That is about four hours round trip for a young child. Having the option to stay overnight is important in these cases. Also, it gives the center the option to have a longer time to teach children with its various programs it will operate.

PUBLIC SCHOOL POPULATION: GRADE 1-12

TOTAL NUMBER OF PUBLIC SCHOOLS : 641

TOTAL NUMBER OF PUBLIC SCHOOLS STUDENTS: 88,694

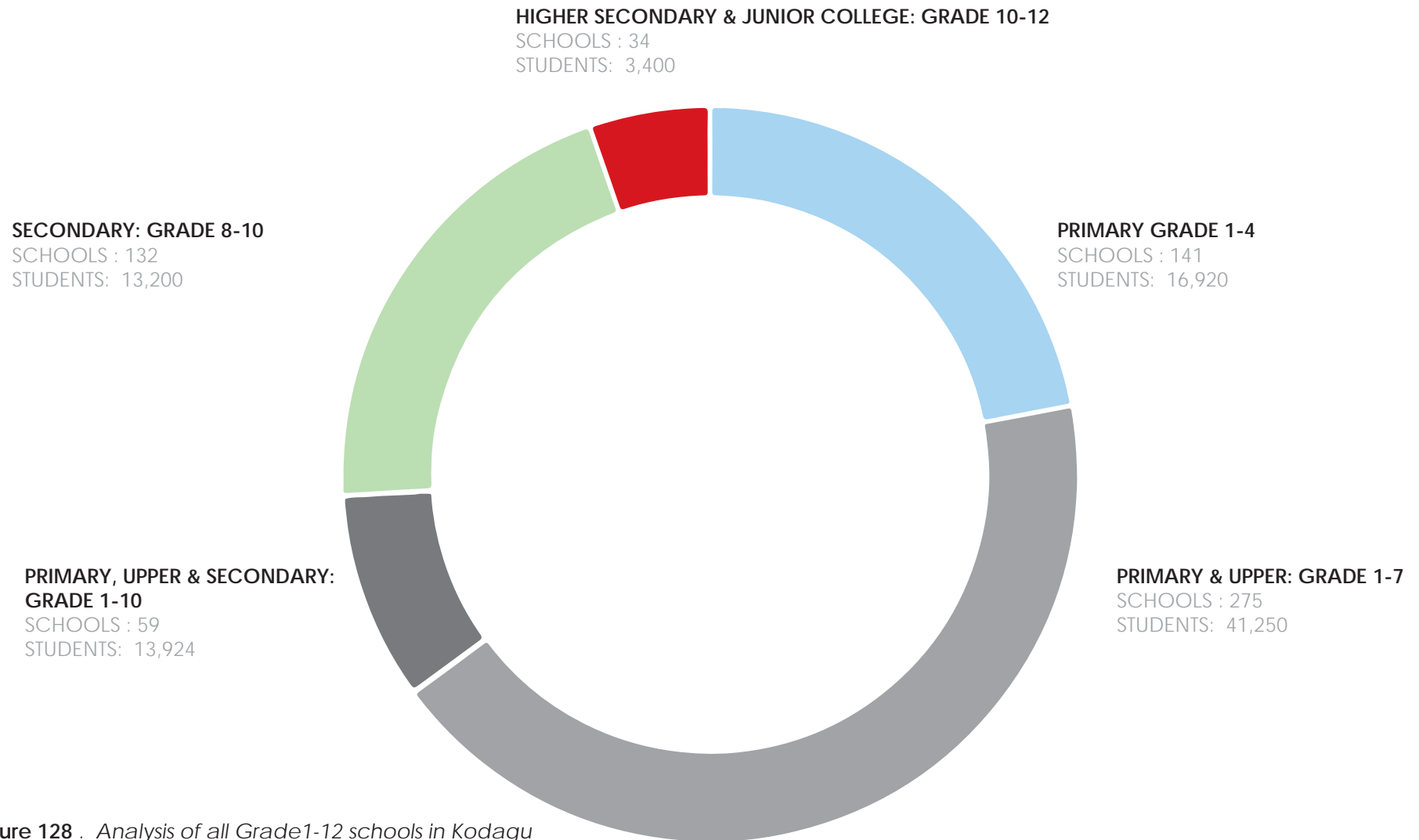
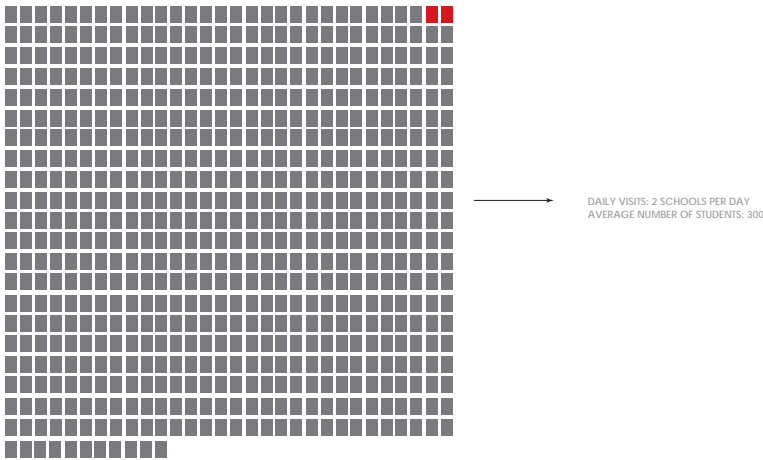


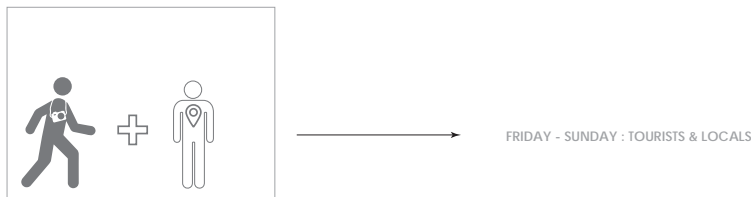
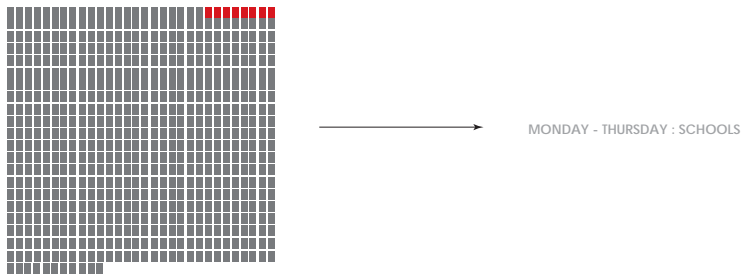
Figure 128 . Analysis of all Grade1-12 schools in Kodagu

ENVIRONMENTAL CENTER : PROGRAMMING

TOTAL NUMBER OF SCHOOLS: 641



ENVIRONMENTAL CENTER : PROGRAMMING



According to the local government education office in Madikeri, there are 641 schools servicing 88,694 students from Grade 1- 12 in Kodagu district. (Figure 128)

The environmental center will be operational to service schools 10 months of the year. (April and May are the summer holidays) During April and May, the intention is for the environmental center to host week long summer camps and overnight camps. Deducting school holidays and weekends when schools are not operational, the center will be able to service 2 schools per day at a maximum of 150 students for each school, for a total of 300 students on campus for 4 days a week - from Monday to Thursday. (Figure 129)

The center then shifts its focus to accommodate tourists and the local population for special programs Thursday to Sunday. The center will open up its residences as cabins which can be rented to tourists and the locals for an additional income. The idea is that the center will also be able to generate an income via its residences and multi-purpose hall that could be rented out for events such as weddings, conferences and workshops. The vision is that the environmental center will be run by a non-profit body.

Figure 129 and Figure 130 . Programming

“At the beginning of the millennium, when the pace of change is obliterating all traces of many ancient cultures faster than we can record them, where the Kodavas came from seems to matter less than whether they will still be able to hold on to their unique way of life. As globalization draws us all closer, it becomes more important to look at our identities, at way of adapting them to the future.”

Kaveri Ponappa, *The Vanishing Kodavas*

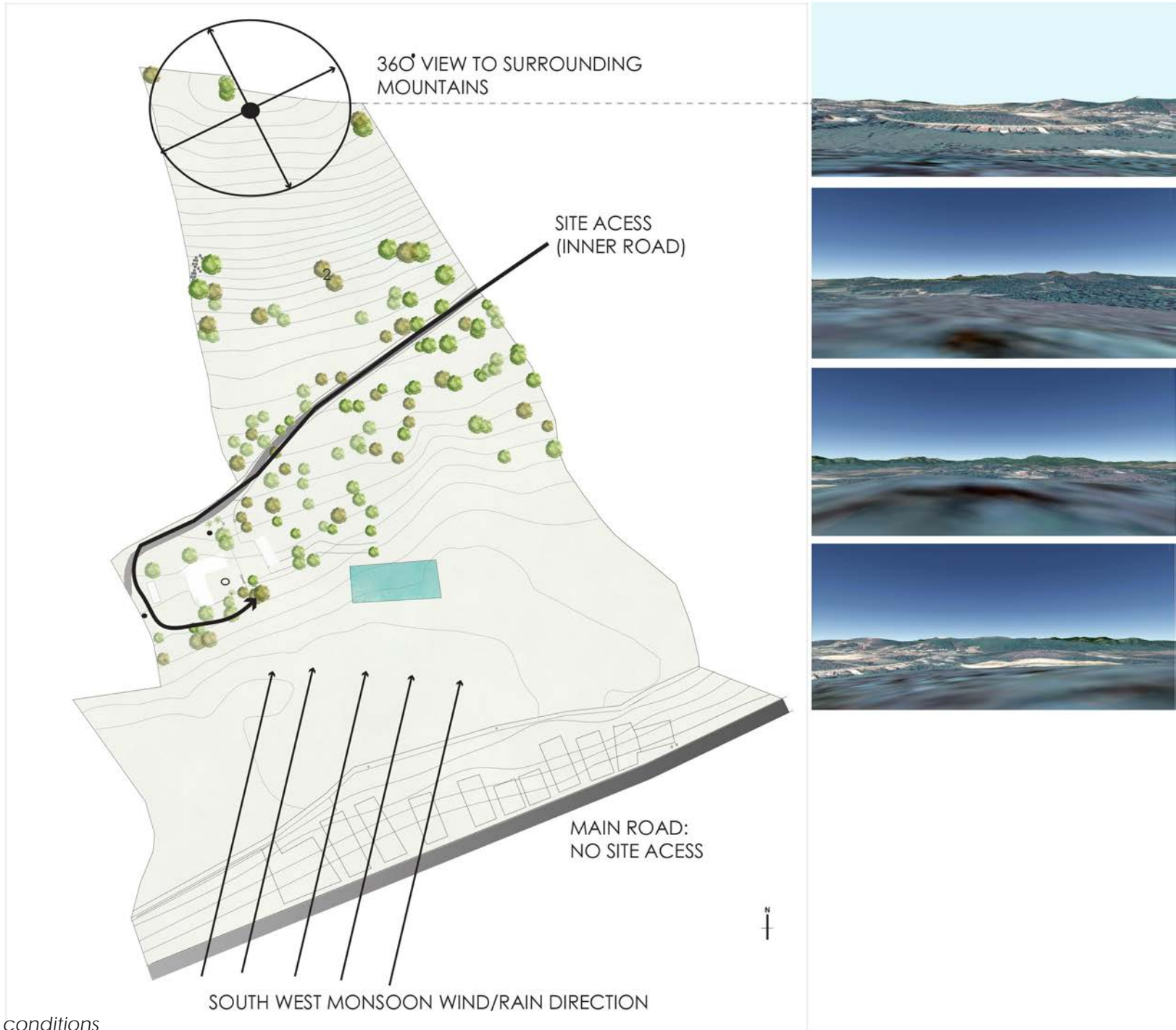


Figure 131. Existing site conditions

SITE CONDITIONS

The main concerns with a built intervention on this site were the following:

Three ecosystems

The three ecosystems needed a design approach where all land typologies are addressed carefully with a built intervention . The environmental center needs to activate and engage all parts of the terrain.

Old growth forest

These ancient trees harbor endemic species of fauna , some are endangered. The high leafy tree canopies also provide a much needed buffer and shade for the coffee bushes below it in order for them to thrive and grow. Its expansive root systems also prevent soil erosion on the steep slope, and allow for the absorption of water for the coffee bushes below. Uprooting these trees would cause irrevocable damage on the site . The count is upwards of 130 of these old growth trees on site.

Water

Currently , the rainwater drains from the top of the slope naturally into a water reservoir below .(Figure 125) This water reservoir is used for the irrigation for the entire site in the months outside monsoon, and for the household supply of water. There is no need for any extra city water to be supplied to the site for irrigation purposes.

Climatic conditions

The south west monsoons winds can be high speed winds accompanied with directional rain. Creating a visitors center that responds to this condition is of key importance. (Figure 131)

DESIGN CONCEPTS

The design proposal for the environmental center is site specific. The built part of the site has a minimal impact on the site, with just a few old growth trees relocated for the building. There are three design concepts that are used as the main strategies for organizing the program. The built intervention is low impact and seeks to merge with the landscape around it. At all times, visual connections to the site all around are of key importance to be in cohesion with the idea of an immersive experience. The three aforementioned ecosystems of the site are experienced in three key concepts typologies.

(Figure 132)

I ABOVE I

The residential program are elevated cabins constructed of locally sourced timber on wood stilts. These are located on the mountain slope.

I IN I

The main visitors center which is the main point of entry into the site is nestled and surrounding by the land around it. This is located in the gradually sloped coffee growing region.

I ON I

The outdoor research labs or wet labs sit on the earth of wooden platforms that reach into the land around it. This is located in the rice fields and the rest of the site.



Figure 132 . Design responses: working with the landscape

TYPOLOGIES

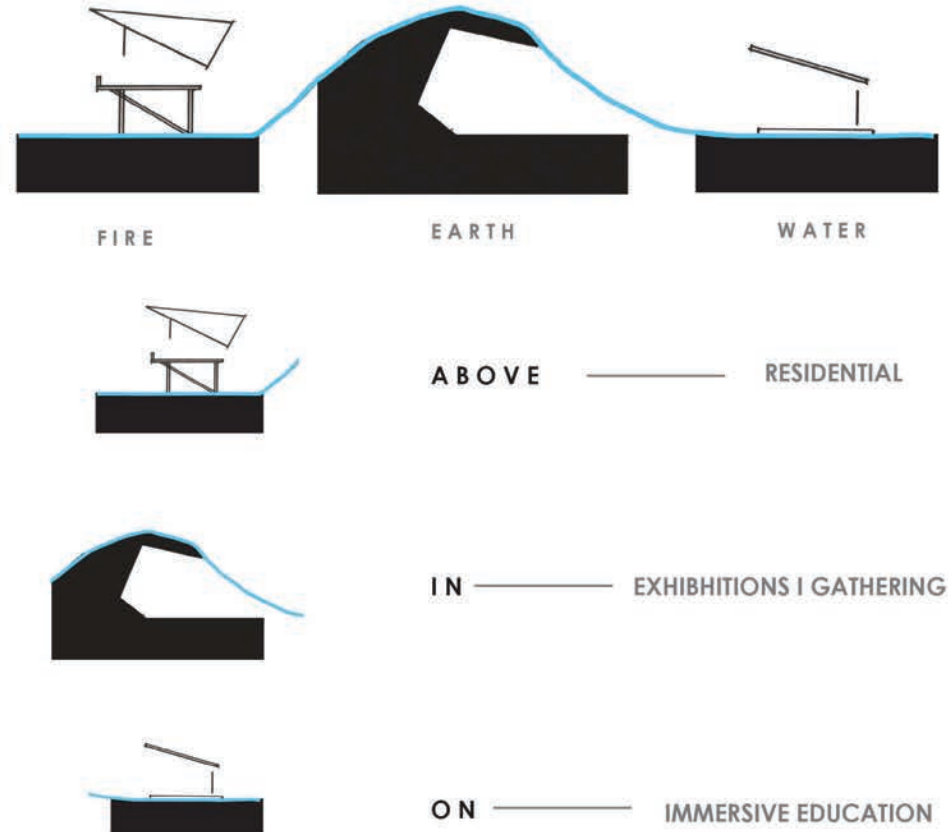
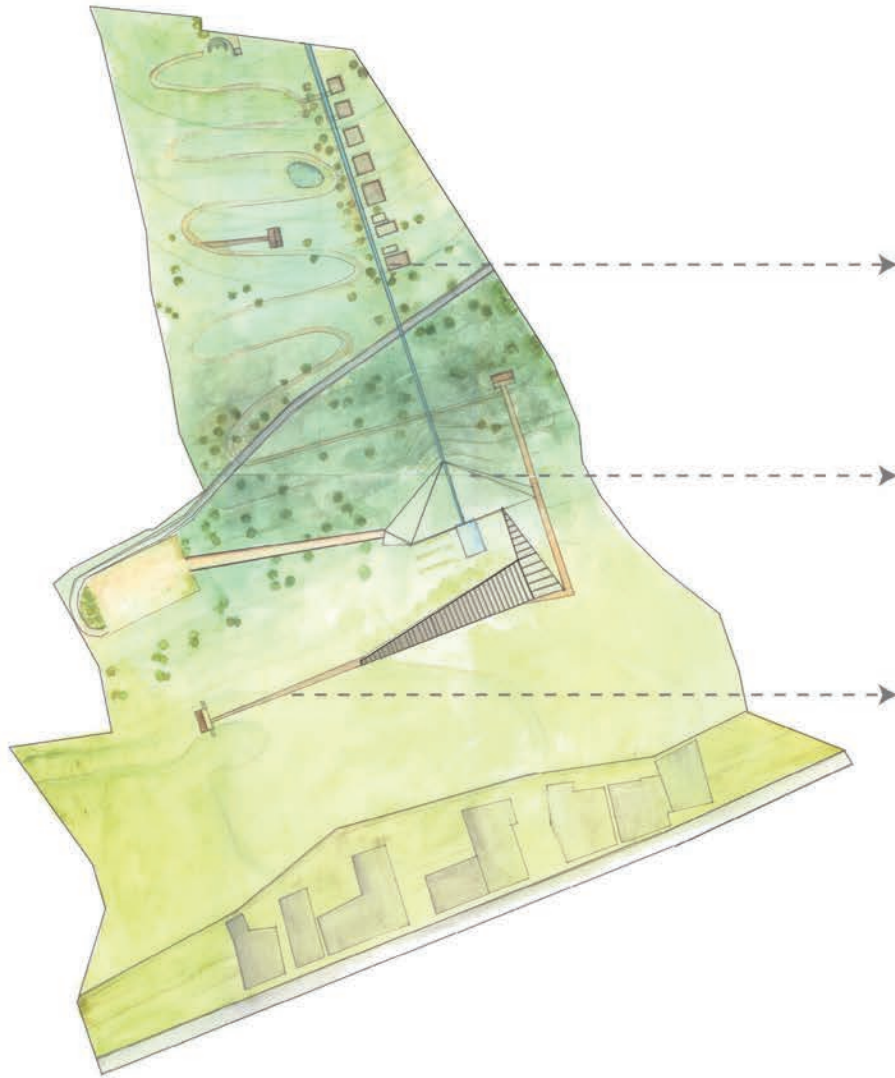


Figure 133. Design responses: site strategy

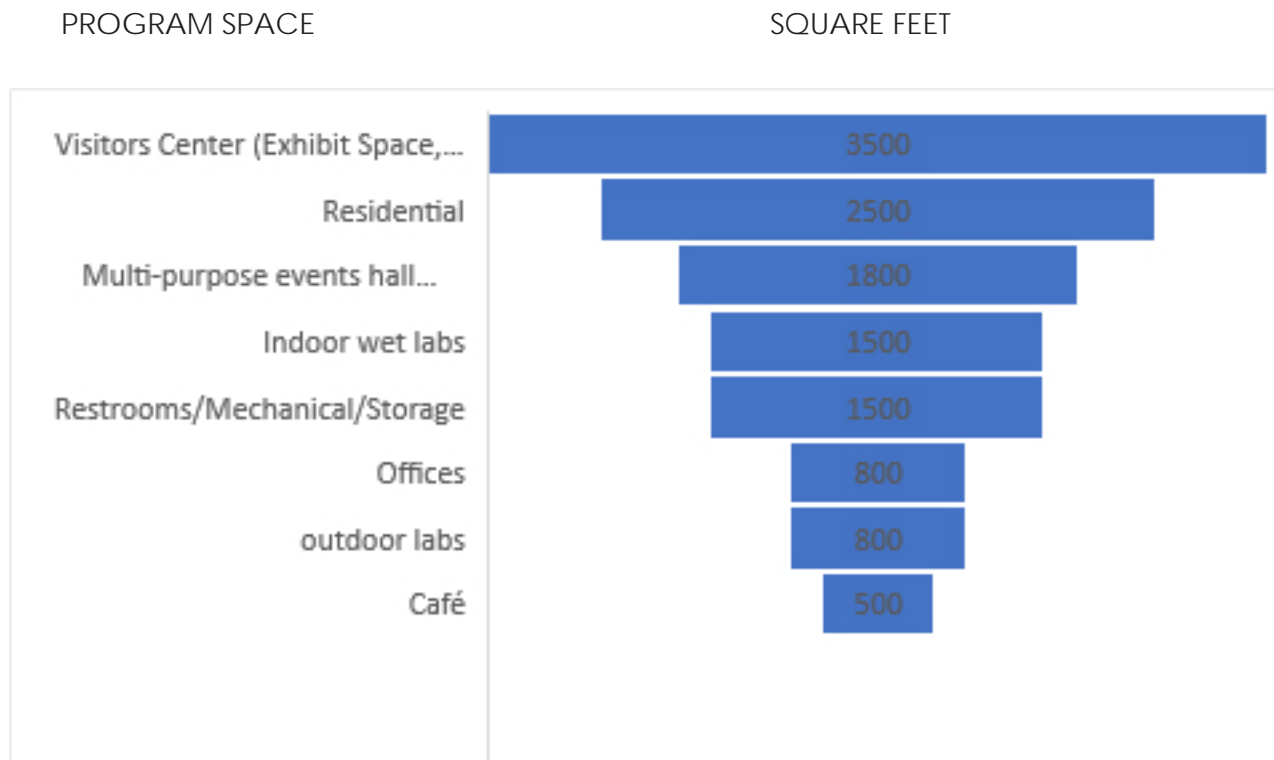


Figure 134. Program spaces

Site Plan and Program Integration

The strategy of 3 design concepts allows for the simple spatial organization of the program required for the center to be integrated into the site. (Figure 134)

The residential portion of the center is separated from the main center for maintaining the privacy of the residences, making use of the beautiful views out to the surrounding landscape from the tree houses, and maintaining a clear spatial organization in the program.

The main visitors center has within its walls all the functions necessary to operate at times of heavy wind and rainfall, where it would be more conducive to stay indoors. Hence, the exhibit spaces, library, gift-shop, multi-purpose hall, offices and indoor wet labs are all covered spaces that can be transitioned from one to another seamlessly. These spaces wrap around an open courtyard where during the growing season, students tend to and plant vegetables and local plants for observation and experimentation. The protected nature of the courtyard ensures safety and security to the students from the elements, and also helps keep a class together in an open yet contained space. The courtyard also gets maximum sunlight in its east-west orientation. The indoor laboratories are located in close proximity to the courtyard for access in and out of the growing gardens. The indoor laboratories are kept separate from the exhibition space to ensure plenty of light, privacy and space for classrooms to focus and conduct research work. Views were also important here, and the indoor laboratories are able to look into the surrounding landscape around them. (Figure 141 and 142)

Finally, outdoor research stations or outdoor wet labs are built on wood walkways that access the three aforementioned ecosystems. Two of the 3 walkways are directly connected to the main visitors center. The idea is that students would use these boardwalks as a launching and gathering point to walk into the three ecosystems. These outdoor wet labs have a simple roof structure over the very end, ensuring protection from the elements whenever needed.

There are smaller informal walking pathways that are interconnected all over the site to further integrate the building elements into the site.

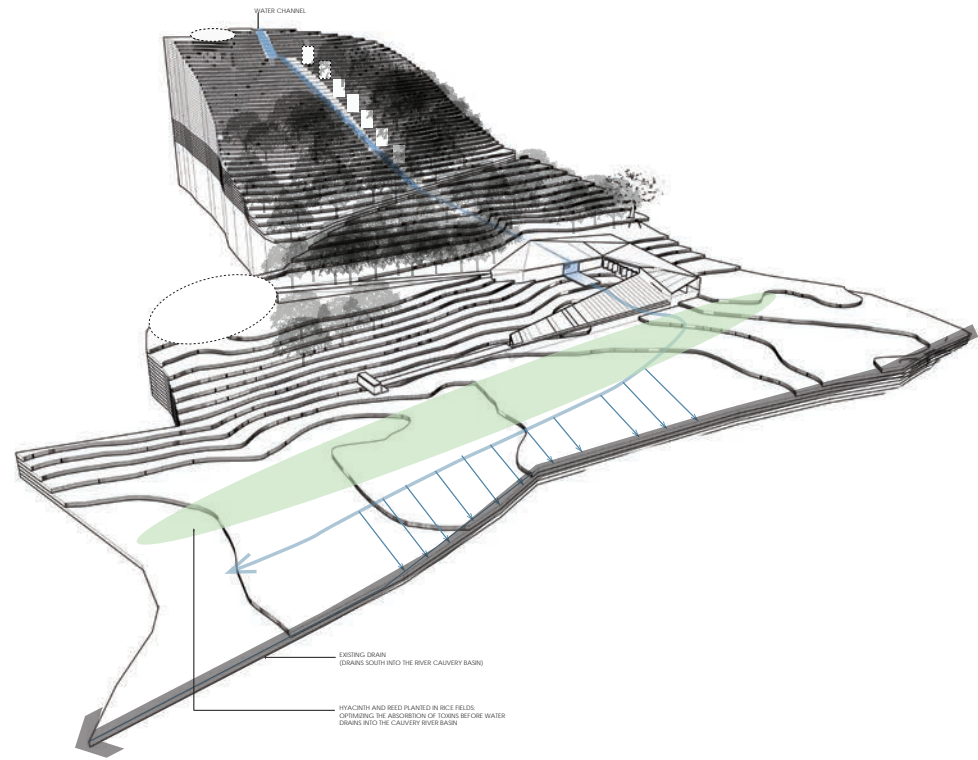
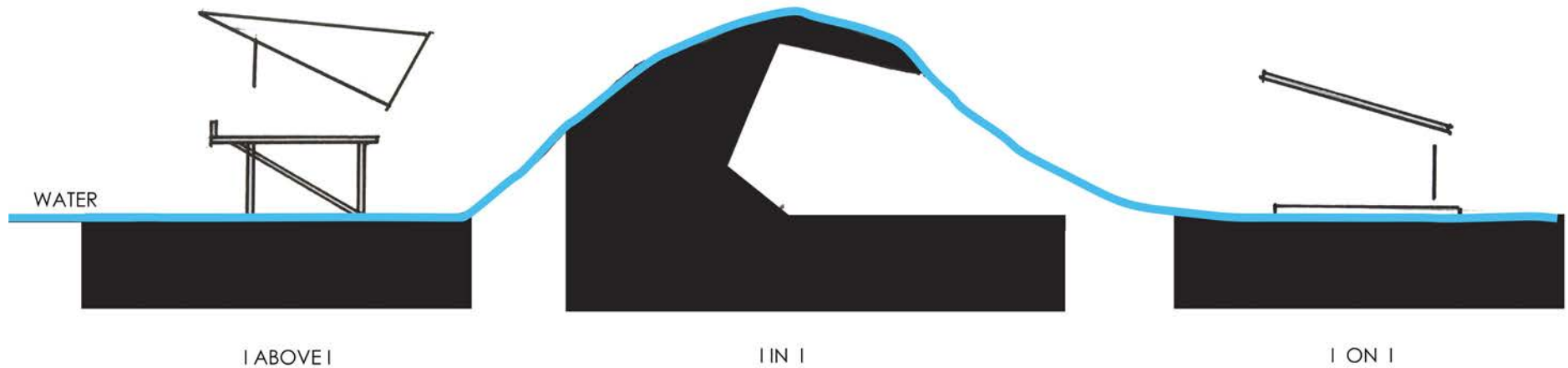


Figure 135. Site response II : water

Figure 136. Site response II : flow of water



SITE RESPONSE

Water

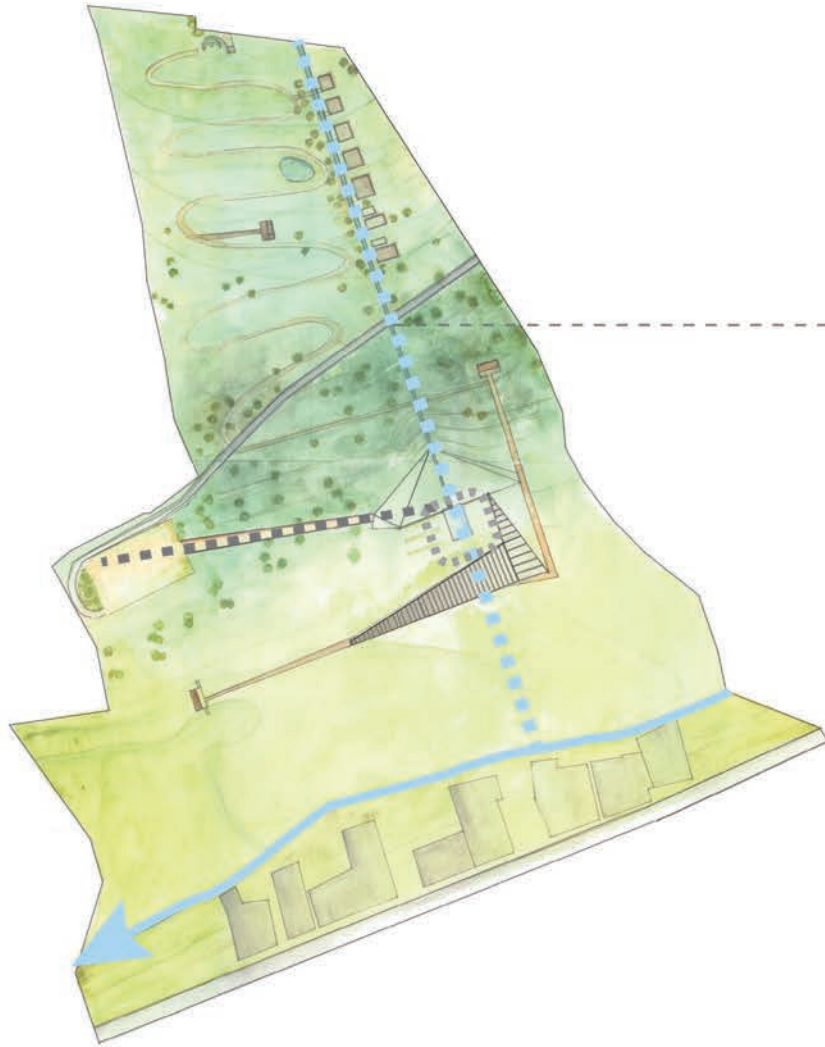
The sacred element of water is central to the design of this project. Given the importance of the Cauvery River culturally, religiously and economically in this district, and the mismanagement and pollution of water in the district today, it was important for the element of water to be given a key role in the very core of the education at the center. The water from this site eventually drains into the River Cauvery, (Figure 136) setting up a valid platform to begin the education on water conservation and management.

The early design explorations looked at how water traversed the site, and how it could interact with the three key concepts of 'above', 'in' and 'on' in how the building program was organized.

Also, given the historic nature of a central core in vernacular architecture, and the key element of water in the project, early design explorations looked at how water could be a central element of the environmental center and its campus weaving through the built intervention.

Figure 137. *Driving design concepts*

WATER



LOCAL AND REGIONAL ECOSYSTEM



CULTURAL AND SACRED



ARCHITECTURE

Figure 138. Site and water

Water channel

Water is sacred and has made this landscape and its people what they are today. It is important to give the element of water that key place in the design of the center. (Figure 138) The site strategy for making water a key component in this project is a water channel that runs through the site north to south from the top of the slope, over the roof of the environmental center, into a water reservoir where the water from the site is stored and used for irrigation and for the centers uses. The vision is that the water is filtered and the center could use this water for tap water and watering plants. Much like the aforementioned sacred axis of spaces in the vernacular case studies, this visible channel serves as a visual marker for the water that is the heartbeat of this land. It also shows how much water can be collected on site, and what can be done with the water. There is also the aspect of the phenomenological aspect of observing, hearing and seeing water that is sacred to this landscape. In the upper slope, bermed earth feeds the water channel from either side ensuring that as much water from the slope is collected and channeled into the water channel. (Figure139)

The intersection of the main movement of people into the environmental center, and the path of the water channel result in a water collection pool in a central courtyard space. The visitors center is built around this space. The spatial feel of the ancient vernacular spaces of the Kodava ancestral homes is invoked through this design strategy. (Figure 138)

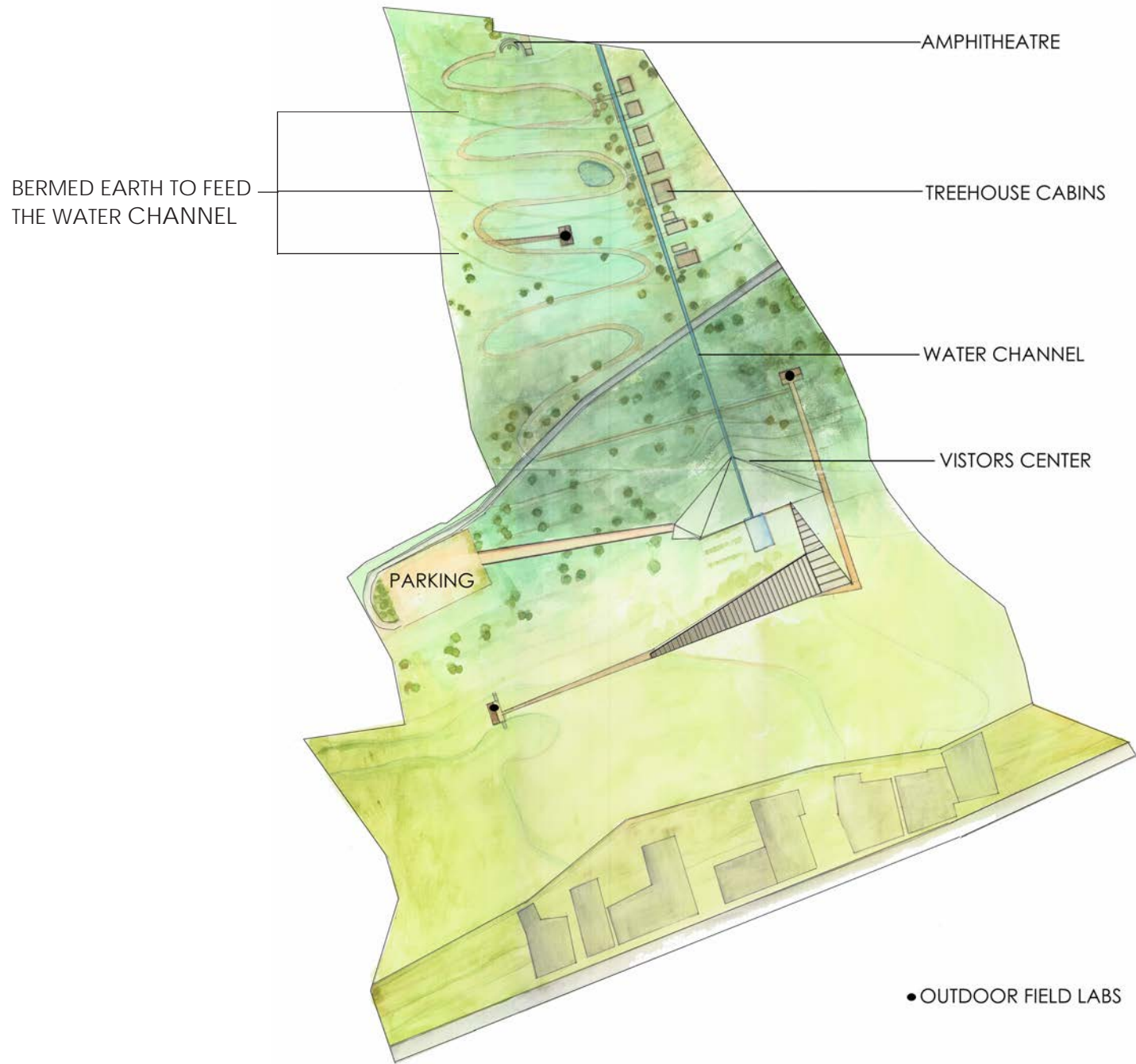


Figure 139. Proposed site plan

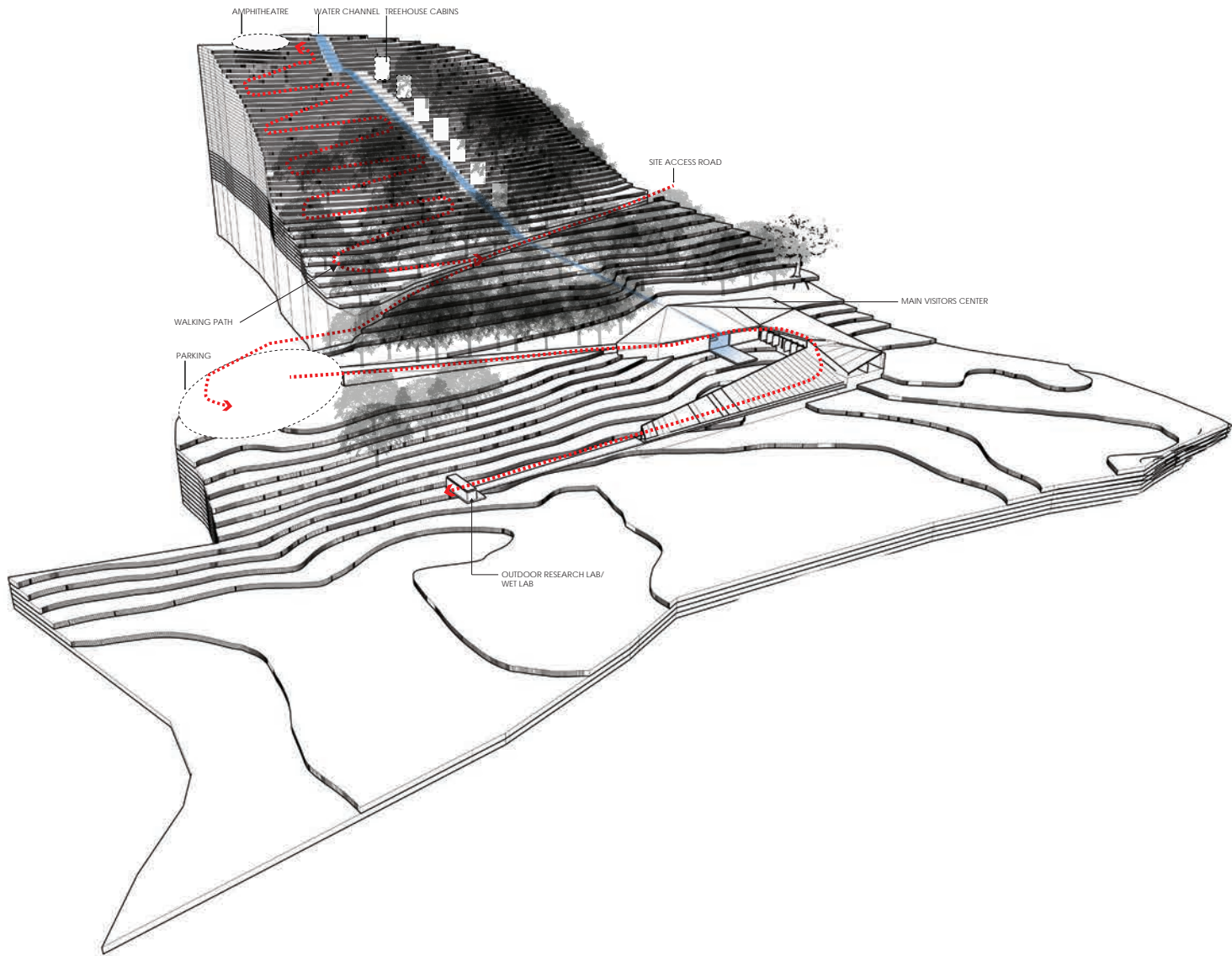


Figure 140. Proposed site plan II: Main paths for the movement of people in the site

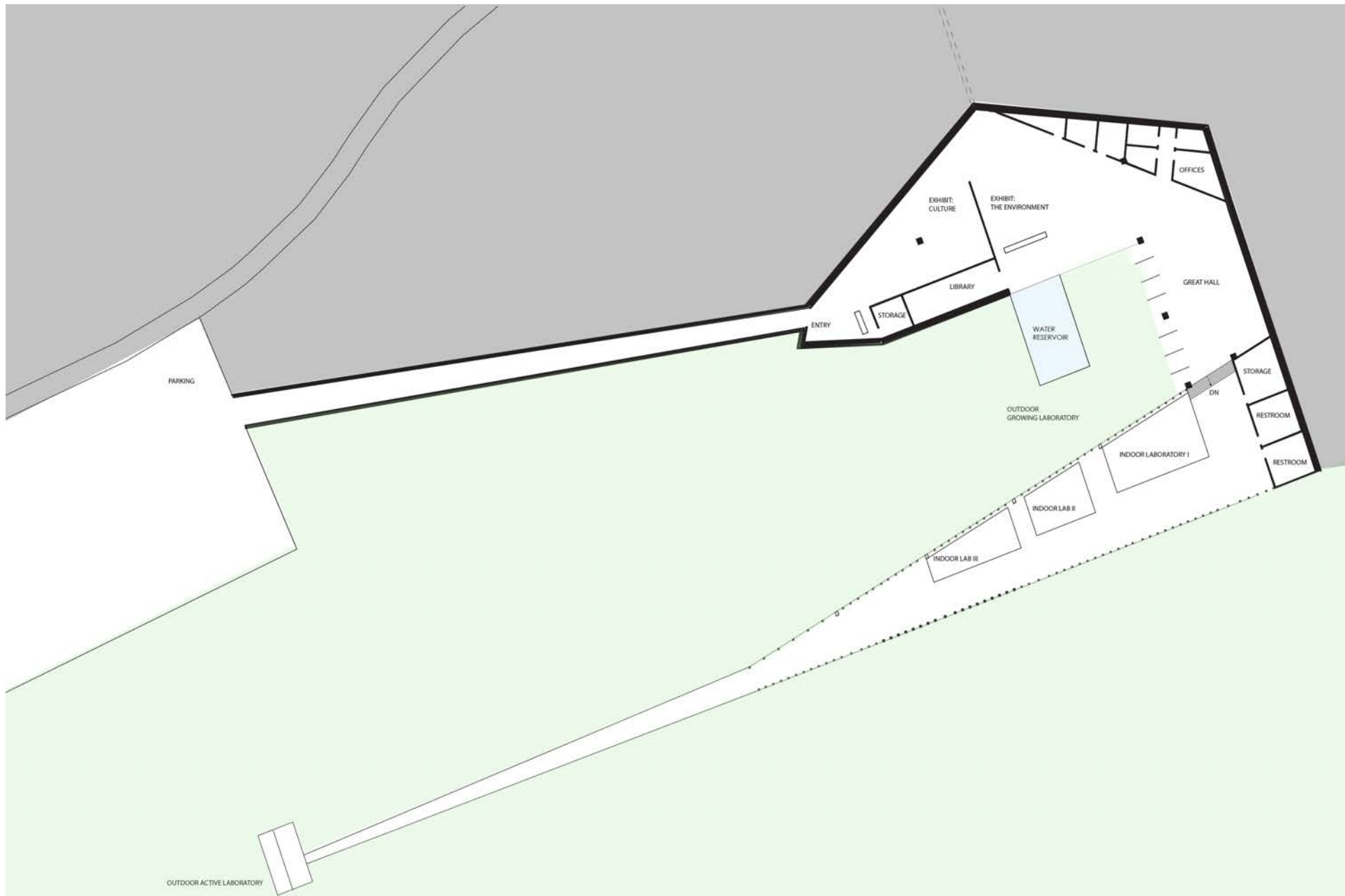


Figure 141. Plan of the visitors center

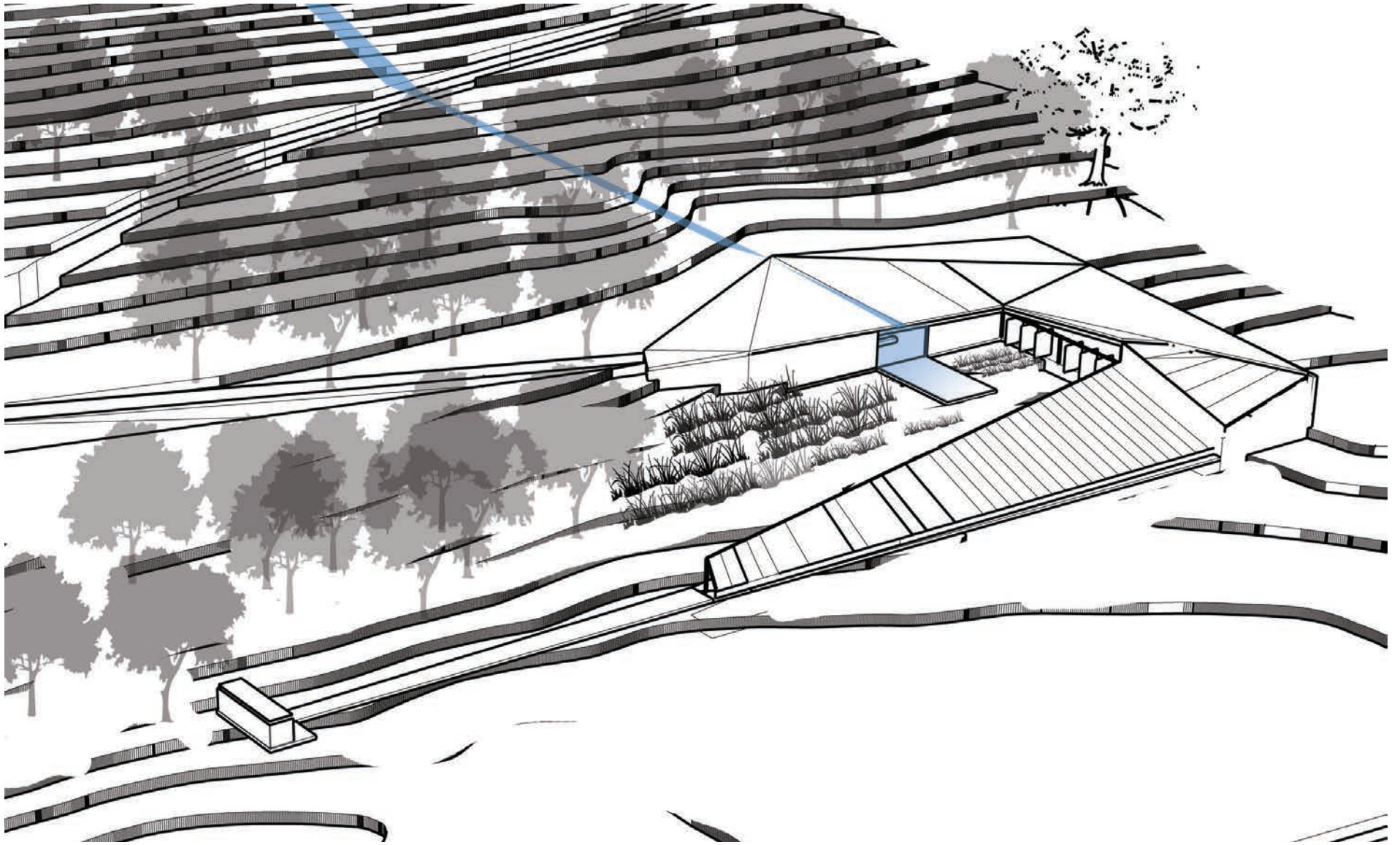


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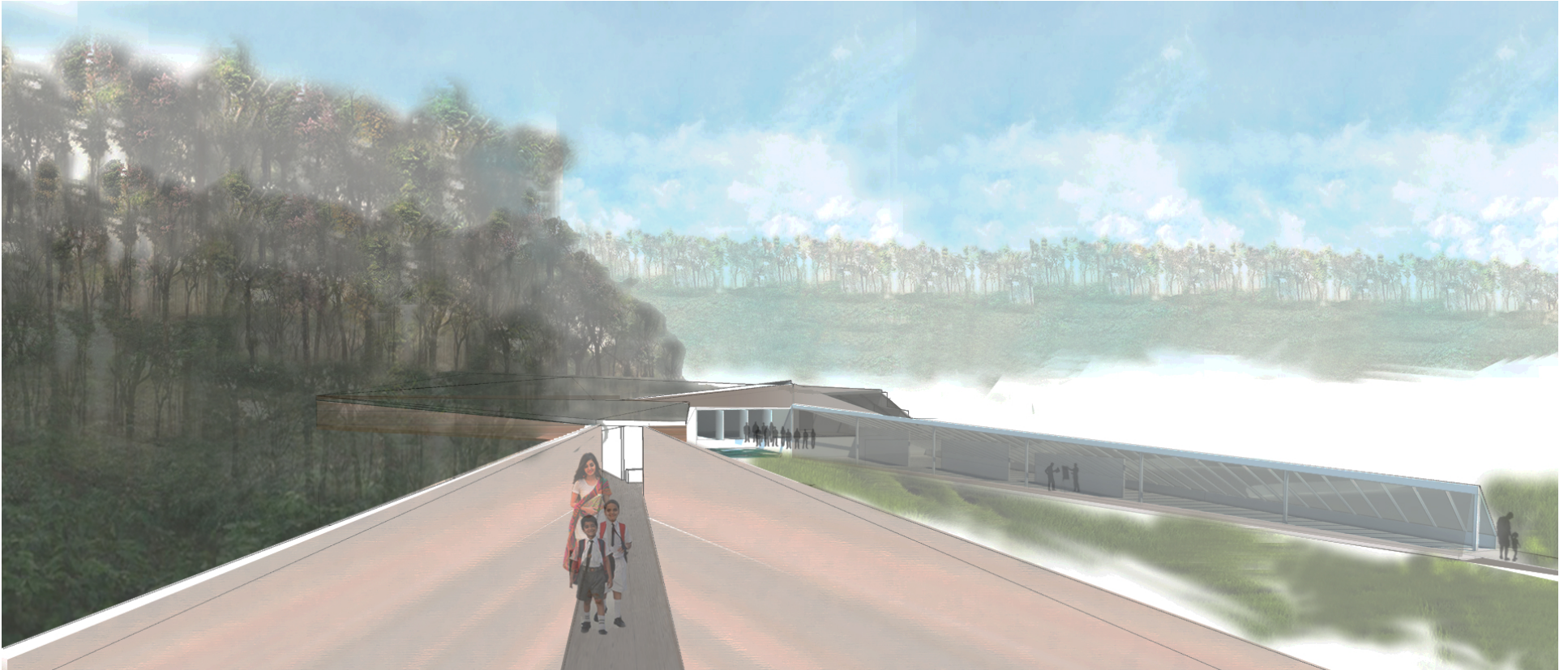


Figure 143. Entry - visitors center

Given that the interior access road already exists, and is the only main access into the site, this existing road remains the entry point into the visitors center. The old house site is already a flattened area without old growth trees, so it is this area where the main parking lot is proposed. The main center is first accessed from the parking lot. From the visitor center, wooden platforms built on the land off-shoot into the landscape around, hence drawing out the core of the center into the landscape around it, integrating the visitors center with the landscape in a physical move. The residential cabins are located on the mountain slope above the main visitors center. Here they are built on stilts and elevated, blending into the old growth tree canopy around it. A walking path from the visitors center traverses the entire northern sloped site bypassing the residential cabins to the very top of the site where there is an amphitheater that is also a gathering space that takes in the 360 degree view of the land around the site.

Journey

The description below is what a typical student would experience on a field trip to the environment center: (Figure 140, 141, 142)

The school bus drives through the access road into the campus of the Kodagu environmental center. The old growth trees majestically loom over the buses on either side of the road. They have stood here for over one hundred years. Below, the coffee bushes are ripe with red coffee berries - coffee picking season is right around the corner. On their right is the mountain slope where they see and hear a water channel with gushing water which goes under the road in a drain. They see the water channel emerge on their left, on the downward slope on other side of the road. Once the buses have parked in the parking lot, everyone gets down and embarks on a journey. The students follow the rammed earth wall that seems to take them deeper into the earth. As they enter the main building, they have descended sixteen feet below the parking lot into the a structure that is nestled within the earth. The walls are made of the rammed earth from the site. (Figure 145) The experience of touch and tactility start at the very beginning of this journey. On entering the main entry of the center, one is wrapped within the cool rammed earth walls, evoking memories for many children of their Kodagu ancestral homes. It is dark, as the children adjust their eyes to what it is like to be inside the earth. They notice the spotlights on beautiful pictures on the walls of a the *Huthri* festival (harvest festival) that just took place a few weeks ago, and an exhibit on the environmental center's current attempts to stop the illegal sand mining that is happening for building construction materials on the banks of the Cauvery River.



Figure 144. View into waterfall and courtyard

There is the soft background noise of water falling as the children learn more about the local culture and the mighty river, and her key role in this agrarian district. As the children turn the corner to learn more about the exhibits, they see a beautiful waterfall in front of them that pools the water into a large water reservoir. (Figure 144) They learn that all of this water is natural runoff from the 10 acre site during the monsoon season, and re-circulated in the other months to show just how visually much water this site can collect. There is enough water collected for tap water for the center, and all the irrigation for the site in summer months without tapping into the city water line.

Past the water fall and water tank, the children can see a growing garden with other students working on harvesting vegetables they planted on a past field trip. (Figure 146) They are using water from the water reservoir for the growing garden. The children walk into the multi-purpose great hall where they are given a presentation by one of the instructors at the center. They learn about a variety of plants that thrive locally are endemic plant species only found in Kodagu district. They learn the importance of rice cultivation and how it was the bedrock of agriculture in the region for a millennium before coffee was introduced by the British Raj in the late 1800's. This fact is a surprise to most, as they thought coffee grew wildly and always was a way of life in the region. The children learn about how intensive coffee plantations are to run, and a number of sustainable practices they can implement starting with water conservation. They also learn how excess water from the water reservoir in monsoon is drained into the rice fields. Here, water hyacinths and reeds are also planted along with the rice paddy cleaning the water of any toxins built up in the water after years of pesticide use on this site into the drainage ditch that eventually drains into the Cauvery River basin. They learn that there are ways to ensure clean water runoff from a plantation into the drainage basin. The children receive their two projects for the day. The first project is to check the Ph level of soil samples from six corners of the environmental campus to determine what is the optimal PH level for coffee growth. The second project is to fill up a field journal booklet provided to them. (Figure 151 and 152)

The children then tour the indoor laboratories where other students from the Gonicopa school are field testing soil and plant samples. (Figure 145) They enter the indoor lab and are given a description of all the equipment and hints to what might be the best tools to use for the data collection and testing they need. The children are very excited as they have not done anything remotely like this in school before. They walk out of the environment center onto the boardwalk of the first outdoor field laboratory to begin.

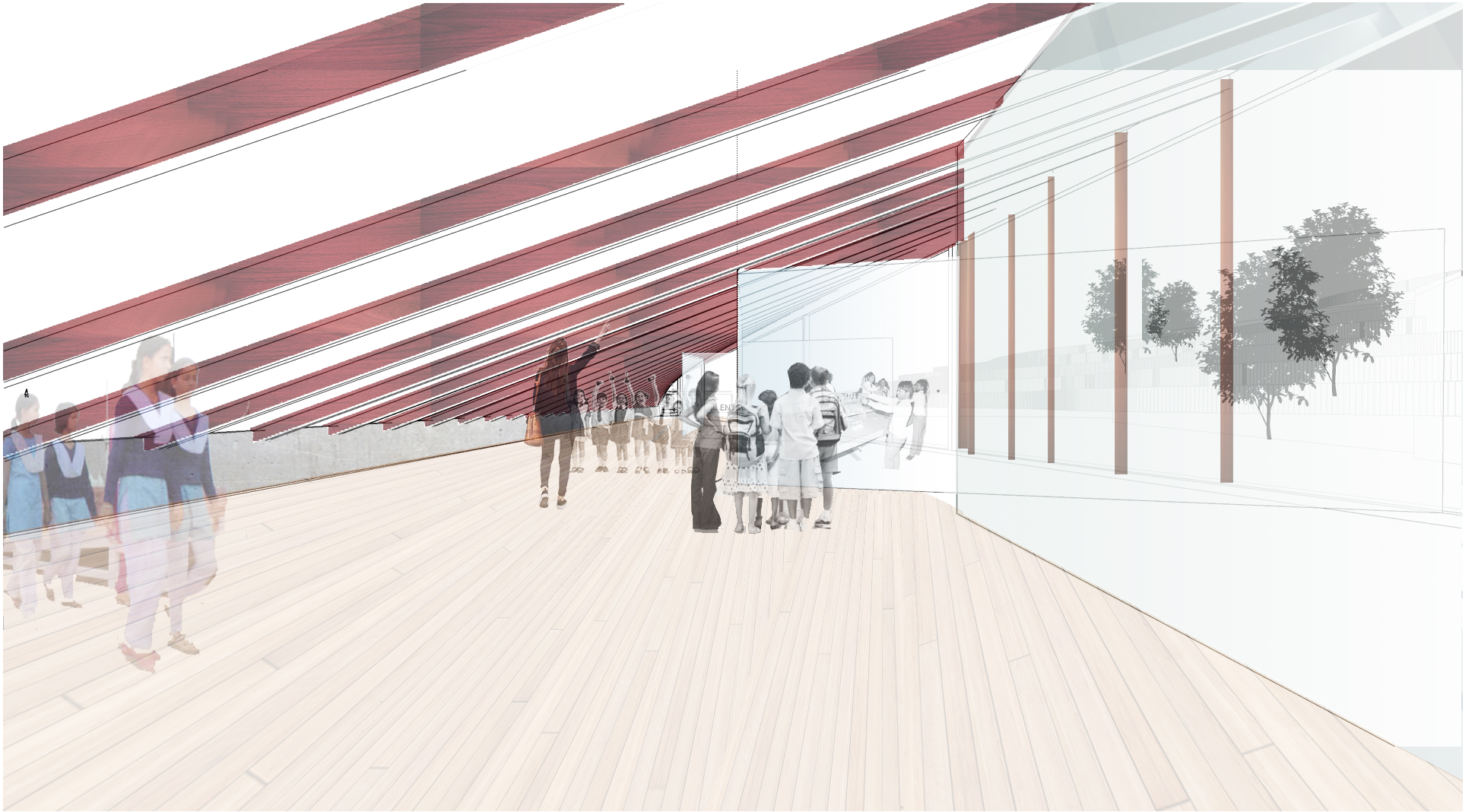


Figure 145. View into indoor laboratories



Figure 146. View into the center - from main road to city center at night

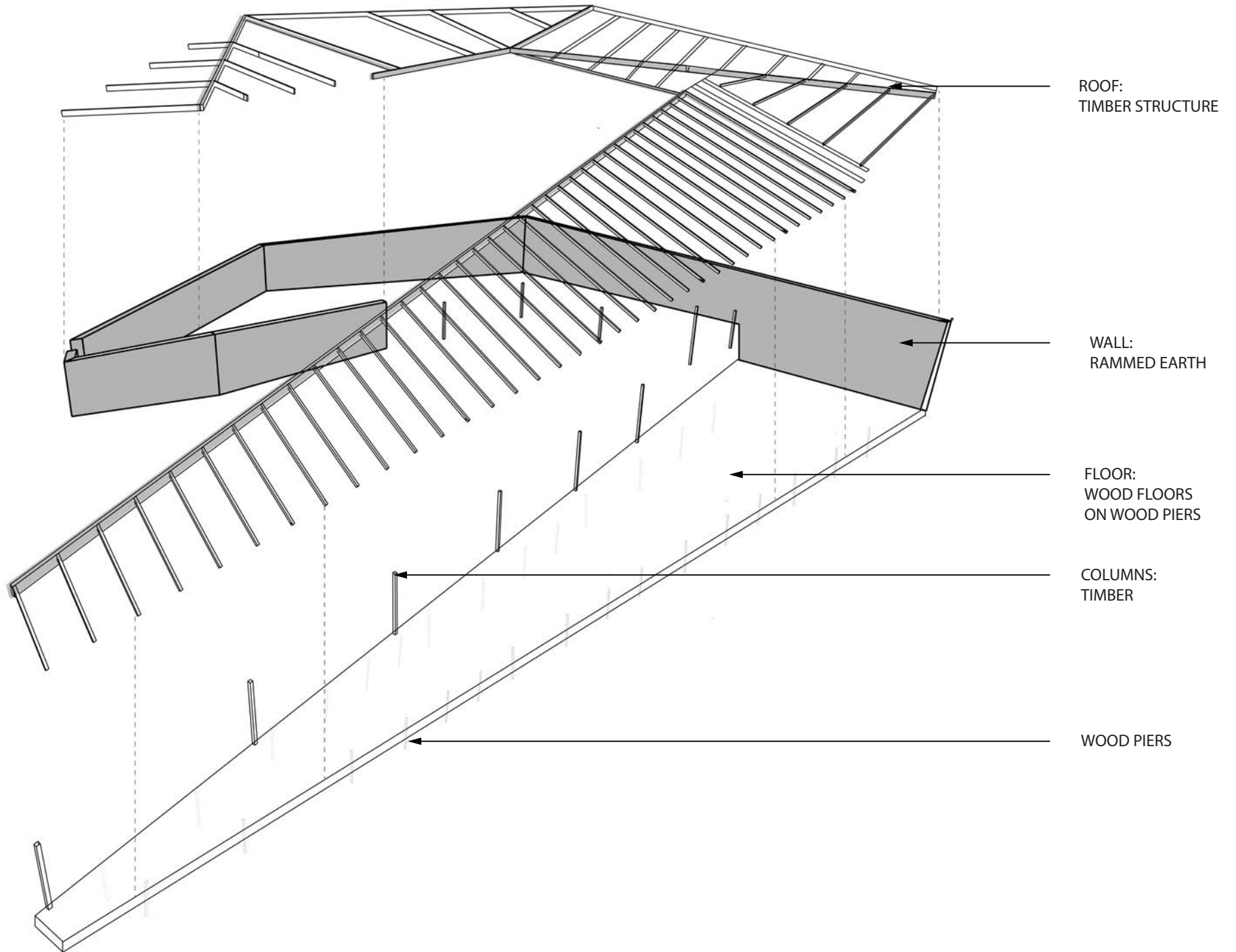


Figure 147. Tectonic structure

A switchback path leads people past the residential tree houses to the proposed gathering/ amphitheater space that is at the very top of the site. It has a panoramic view of the land around it. (Figure 139) The view into the center from the main road that leads into the town center heading west, and into the two largest resorts in the area heading east are very important. The thesis project seeks to create a place of interest that tourists will visit as another attraction. A well lit structure at night that people would view on the way to returning back to their resorts after a day spent touring the sites of Kodagu, would generate interest. (Figure 146) The roof will have a large array of solar panels to capture solar energy during the year to use as electricity for the center . (Figure 148)

Tectonic structure (Figure 147)

Walls

The walls - like the ancestral homes of Kodagu , are a mud brick with stone to help hold back the earth where necessary,

Flooring

The floor is a combination of mud brick and cow dung along with various added natural binders such as lime, ash and peat. This was the same combination used for flooring in the ancestral homes that have lasted centuries. Because there is a level change in the center as it ascends from the mountain slope into the paddy field, the part of the building that houses the laboratories have a flooring structure made of timber on wood stilts.

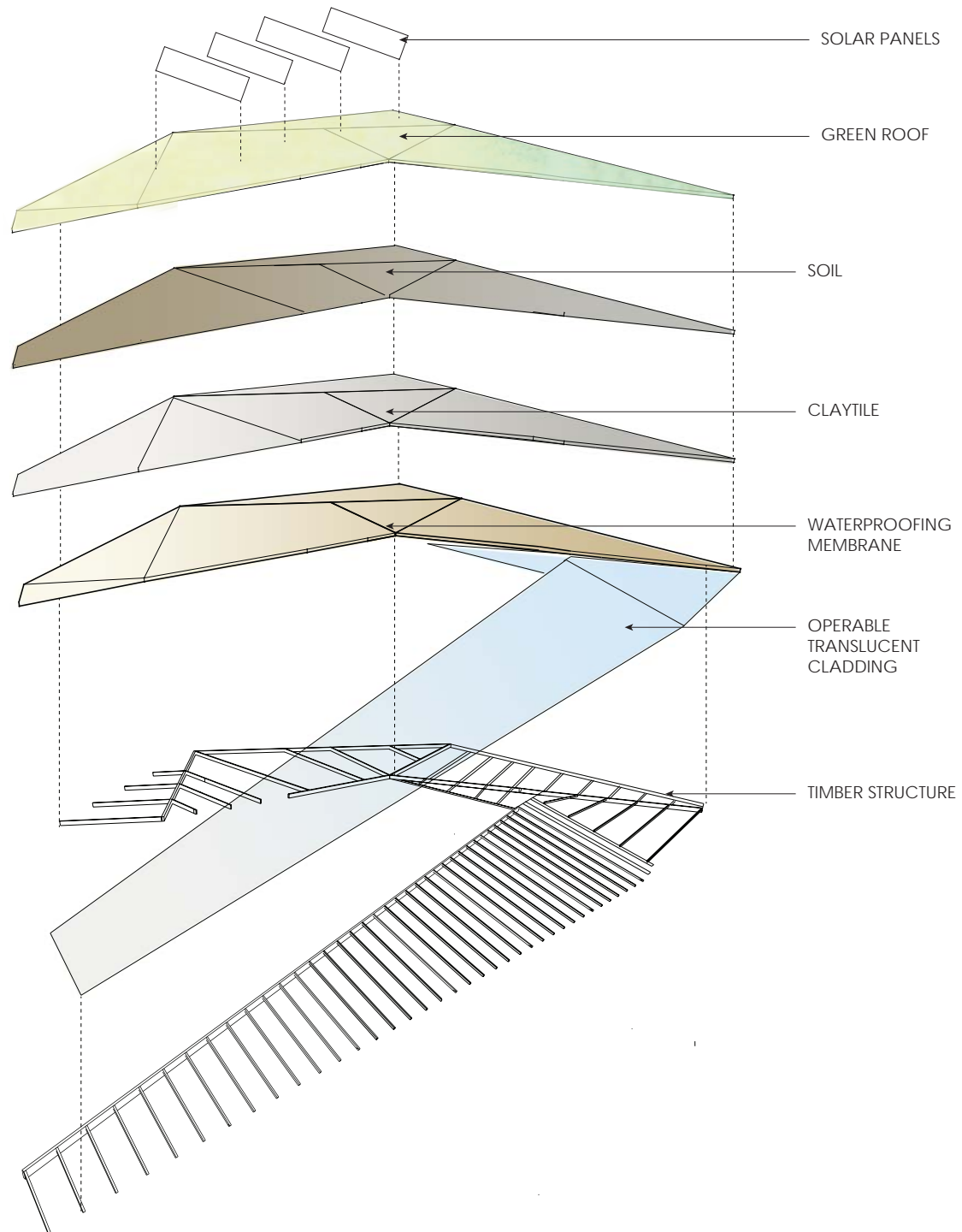


Figure 148. Roof structure

This is because this part of the building sits directly on the paddy fields, and has to be elevated to prevent water logging and flooding.

Roof

Drawing from the case studies of the local vernacular, the center uses the 3 main locally found materials for its construction - timber and mud brick. Stone would be used when necessary as retaining walls. The exhibition space is a mud brick structure with a green roof clad timber roof that is nestled into the earth. As the structure emerges out of the mountain slope, its roof visually peels away leaving a timber roof structure with translucent cladding where the laboratories are located. (Figure 148) In the 3 months of the monsoon season, the cladding system seals this part of the center, and during the rest of the 9 months - the cladding system can be operable to optimize for ventilation. The idea is that the individual laboratories are conditioned spaces that are independently functional.

The roof above the exhibition space and partially above the great hall space has multiple functions. It is a green roof with solar panels and also holds the weight of the water coming off the roof into the water reservoir. The solid mud brick exterior and interior walls work to hold this added weight. The roof structure peels away from the building at the great hall to become a lighter structure. The slimmer timber columns at the laboratory space support this lighter structure and also act as a design feature, accentuating the dichotomy of the heavy and light structures within the center .

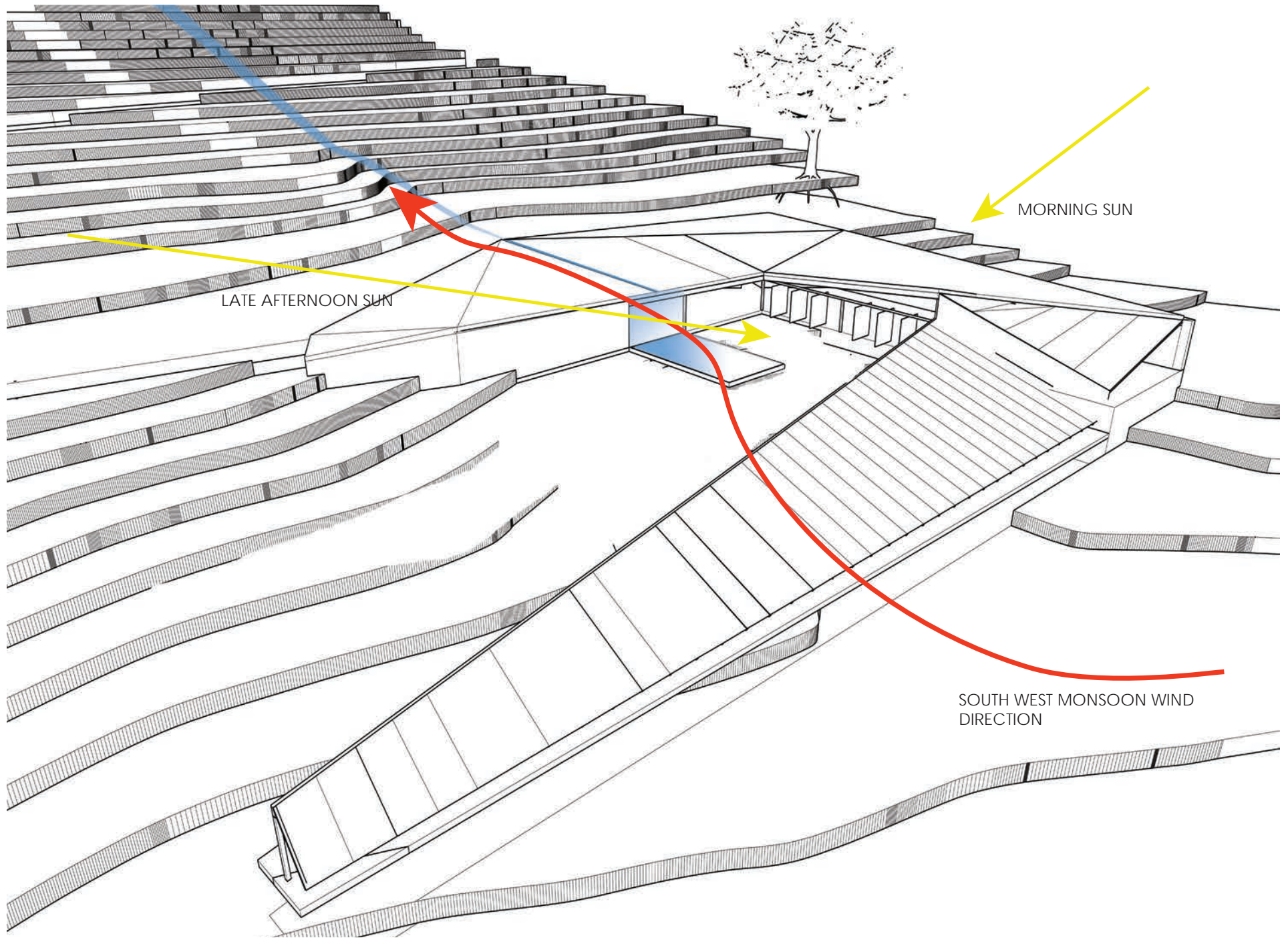


Figure 149. Climatic responses

Climatic responses

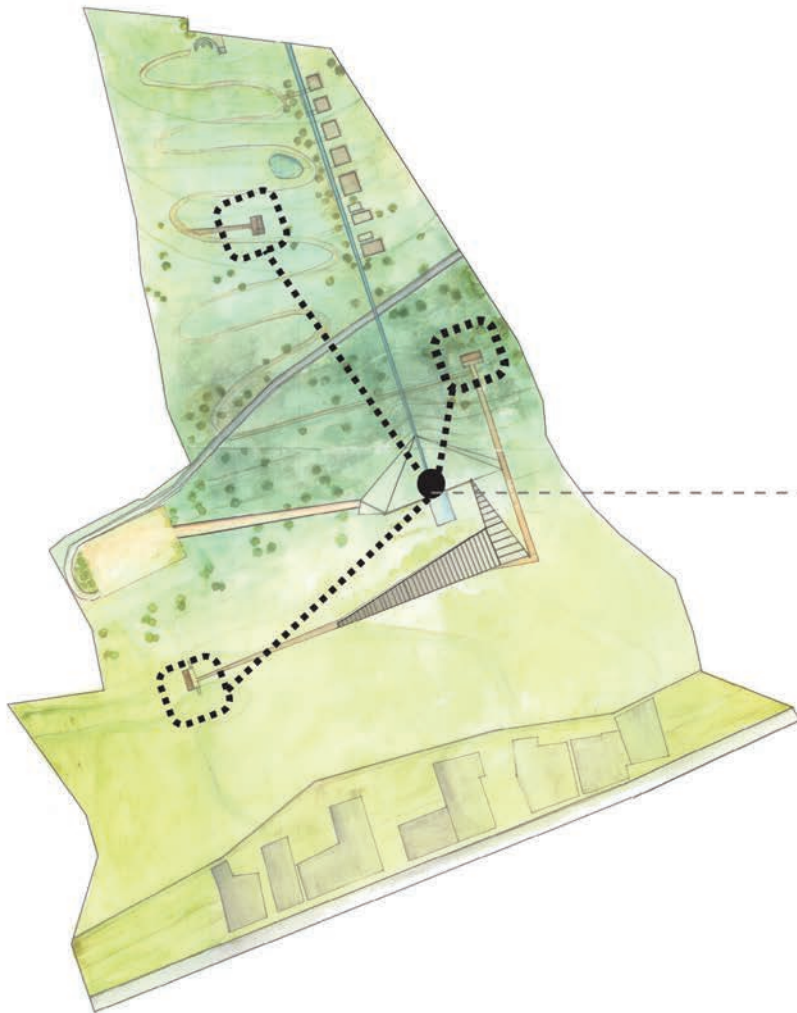
South west monsoon winds

The main climatic condition for the center's design consideration is the above mentioned monsoon winds. These heavy winds occurs during monsoon season bring in directional rain. The environmental centers is oriented against this , with its roof structure at the laboratories angeled to uplift the wind and carry it over the rest of the center, This also ensures that the courtyard is protected from this climatic condition. (Figure 149)

Sun

The east-west orientation of the center ensures maximum daylight for the center. The central courtyard that features a growing garden benefits from this exposure. The learning laboratories with its southern exposure will maintain a good level of daylight for laboratory working conditions. The solar panels on the north end of the center are placed in the best location to capture solar energy.

IMMERSIVE EDUCATION



LEARNING CONTENT

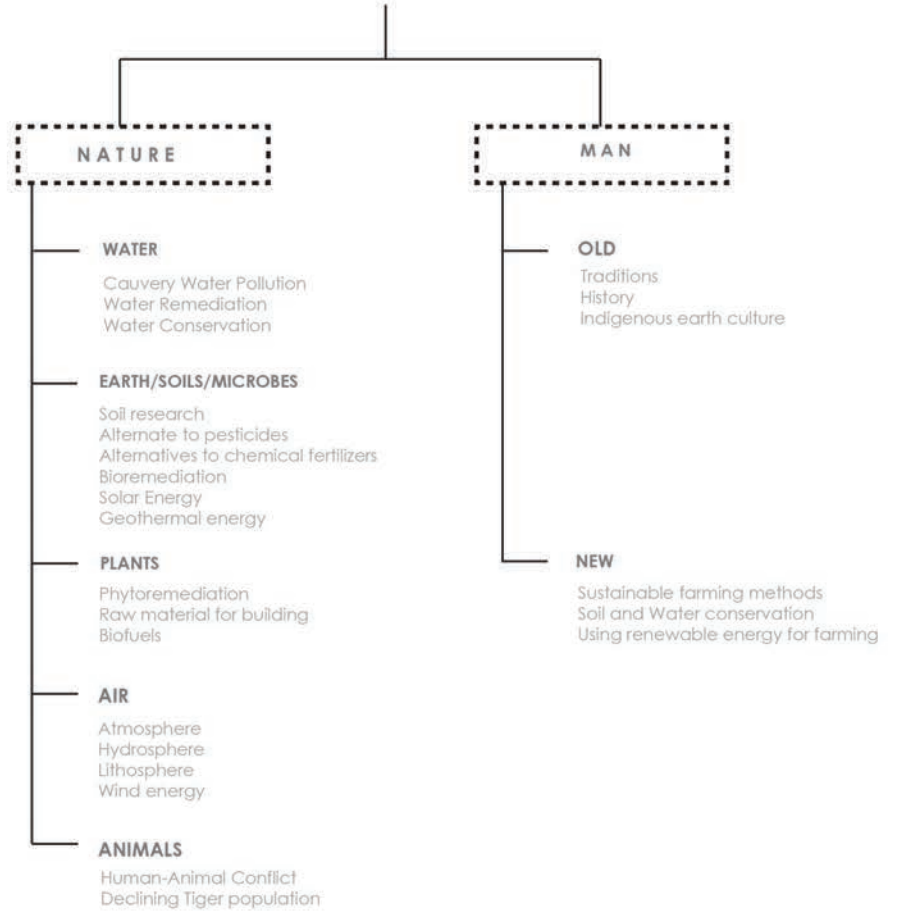


Figure 150. Learning content

The outdoor field laboratories

With the three ecosystems, are the three outdoor research laboratories that reach around into each of these ecosystems. They are partially covered for shelter, and act as visual markers to the new ecosystem visitors are transitioning into. (Figure 150)

Learning content

The Learning content focuses on the natural elements of climate, soil, water, flora and fauna. In conjunction with nature is the study of people. In this case the role of the indigenous ancient tribes in this landscape, and the role of people in today's world and the role that they used to play and continue to play in the landscape of the region. The field journals that the students fill as part of their visit encourage them to be immersed in the landscape around them. (Figure 151 and Figure 152)

KODAGU ENVIROMENTAL CENTER
FIELD JOURNAL

Name of Environmental Steward:

Group #:

Cabin:

School:

Kodagu Environmental Center Instructor:

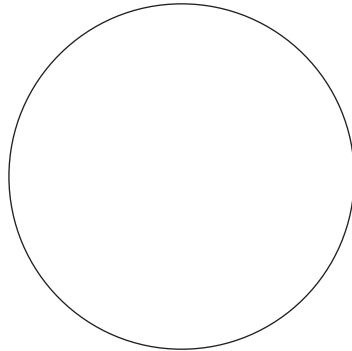
*"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed its the only thing that ever has."
Margaret Mead*

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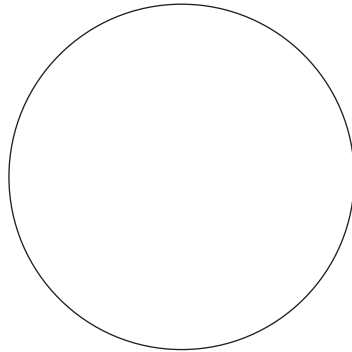
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Figure 151. A sample student's field journal

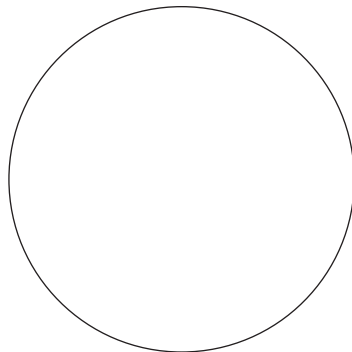
Draw three different soil organisms:



Name:
Observation:



Name:
Observation:



Name:
Observation:

Water Source:

| | |
|----------------|--|
| Color | |
| PH | |
| Temperature | |
| Turbidity | |
| Oxygen Level | |
| Oxygen Level | |
| Nitrate Levels | |
| Ammonia Levels | |

Overall Analysis Report:

Figure 152. A sample student's field journal II

I CHAPTER 5: CONCLUSION I

The thesis proposal is not exhaustive. Meaning, it does not address every single issue Kodagu is facing today. However, the solutions described represent a small part of what might potentially work to help in the remediation of this land via education. Drawing on facts and research throughout, the center is the closest architectural solution to the problem I have identified in this region.

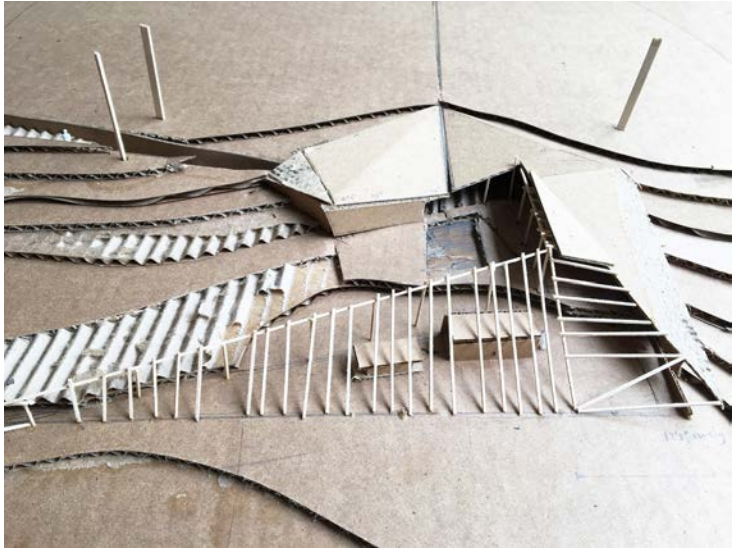
With more time, this proposal could have been developed with more detail. Such as the sustainability performance of the building - research into how much solar energy is actually harnessed and utilized; how much water is actually collected on site and utilized. Thoroughly investigating detailed features such as composting toilets; working out the mechanism of the operable cladding in the visitors center; details on the operations of the water channel and detailing the residential tree houses.

However what I have is a vast knowledge of the land and its people from centuries ago to today. Being from the region, this thesis project opened my eyes in looking at the uniqueness of Kodagu for what it is - an incredibly special land that should be nurtured and protected as India becomes a developed nation in the new millennium. After my in depth field research in Kodagu, talking to locals and others who live in the region, and the architectural solution I developed in the thesis; what I have is the architectural foundation for a functioning center that could potentially be a legitimate solution for some of the problems the region is facing today .

Drawing from the case studies of the old vernacular structures in the region, the resulting center embraces innovation and new form, yet acknowledges in its architecture the legacy it is built and inspired from. The design is site integrated, inspired by the landscape it is set in. The design is also responsive to climatic conditions around it, unlike what is happening in the region today.

In regards to the future of this thesis proposal, the design response for the proposed Kodagu environmental center is site specific, and will completely change depending on its site. However, lessons have been learned through the research of the thesis, and a good understanding has been reached of the land and its people to create site responsive architecture. These lessons will be carried forward to any new potential site location.

Finally, the thesis project does not seek to recreate history and events of the past in its education, and lock itself in a past era. The new architectural form of the Kodagu environmental center is representative of today and the future. It seeks to embrace the coming changes via arming the region's young and old alike with knowledge and tools to face this change with affirmative long term solutions. The hope is the thesis proposal is able to do adapt the region to a new millennium of change it is facing in a positive way, via environmental education and the built environment .



Sketch Models

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Figure 154. Above left - Environmental center

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@Nita Shankar photography

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Air Marshall K.C Cariappa (Member of the Coorg Wildlife Fund) July 2016

Anupa Mandanna (Architect: Anupa Mandanna & Associates) July 2016

Codanda .B. Deviah (Trustee General), and Mr Srinivasan (Principal) of Kodagu Vidalaya School. August 5, 2016

Chowrira Cauvery Poonacha (Coffee Plantation Owner) July 2016

Duleep Nachia (Coffee Plantation Owner) July 2016

Gangamma M.J. (Principal of the Government school in Kadagadal, Madikeri, Kodagu) July 2016

Vinitha Kariappa (Dentist and mother of a student at Kodagu Vidalaya) July 2016