RISING
OUT OF THE
WRATH

The Post-Disaster Religious landscape of Kedarnath valley, Uttarakhand, India

VANSHIKA BHARAJ
THREE-DIMENSIONAL READING

The journal is arranged in three dimensions, the photo essay, the diagramatic descriptions along with textual explanations and a layer of the narrative glossary before every section. The reader can relate to the story by analysing all the three dimensions of the thesis for an overall reading experience.
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That prayer was swept away,
the heads bowed down in reverence were swept away,
It was heard, that when a mother's child flowed,
she jumped into the river, seeing her.

-Beh Gaye: Poem for Uttarakhand Relief by Amitabh Bachchan and Prasoon Joshi
ACKNOWLEDGEMENT

I would first like to thank my Thesis mentor Dr.ir. Inge Bobbink, Landscape Architecture, Faculty of Architecture and built environment at the Delft University of Technology. The door to Dr. Inge’s office was always open whenever I ran into a troubled spot or had a question regarding my research or design process. She consistently allowed this thesis to be my work but steered me in the right direction whenever thought I needed it.

I would also like to express my gratitude to ir. Henri van Bennekom from Architecture, TU Delft and Dr.ing. Steffen Nijhuis from Landscape Architecture, TU Delft for being on board as my supporting mentors. I am greatly indebted for your valuable time and the comments.

Further on, I would like to thank all the officials and the local people of Uttarakhand I interviewed for the purpose of the thesis who showed me around and provided me the ground reality of the state.

I would also like to thank all those who helped me with their distinct educational and professional background to understand my thesis better. A special thanks to my housemates Deepanshu Arneja, Surbhi Singhal, Nilofer Afza and Abhishek Agrawal for their critical comments on the thesis and being an everyday morning driving force on all those lazy days. I would specially like to thank Sanaj Mehta for being the constant support to motivate me and for always being there to help me stay on track.

Finally, but most importantly I would like to thank my family back in India for pulling me back up when I was low by sending across so much love and believing in me throughout the course of my thesis.

Figure d.
Pilgrims make their way up towards Kedarnath, Uttarakhand.
Photo credits: Nick Fleming
We are all aware about the climatic changes taking place in the world. Higher populations and lesser resources leaves the global south at the most vulnerable spot on the map. If we talk about the case of India, climatic change has been affecting many parts of the country with either landslides, earthquakes or floods. The most affected is the Northern part of the country, where maximum inundation usually takes place along the course of the River Ganges. The Ganges is one of the most sacred rivers to Hindus and is the embodiment of all sacred waters in Hindu mythology as well (Acciavatti, Bierig & Corrigall, 2015). It is pointed out as a living organism with millions of people dependant on it for their survival. Near its source, in northern state of Uttarakhand, it flows through one of the four spots of the Hindu pilgrim circuit, ‘The Char Dham’, (“four abodes”). It is considered highly sacred by Hindus to visit the Char Dham during one’s lifetime as it is believed could cleanse people of their sins. Revered by many Hindus in the country, The Char Dham attracts many pilgrims to the four temple sites in Uttarakhand. Situated in the lap of the majestic Himalayas, the pilgrimage leads to the pristine valley of the 3000-year-old Kedarnath Temple (one of the four spots).

In June 2013, Uttarakhand faced unusual heavy rainfall, series of cloud bursts and glacial lake outbursts all within 4 days leaving the sacred valley of Kedarnath completely ravaged. The flooded Ganges swept with it pilgrims, inhabitants, houses and flora/fauna creating a havoc in the valley. For days many people were stranded in forests without food, water and inappropriate clothing. The 3000-year-old Temple shrine at Kedarnath survived the major event without any damage. The unchecked tourism and unregulated urban sprawl of the valley aggravated the calamity to an apocalypse causing severe damage to infrastructure and the religious landscape of the valley. The Genius loci of the place was so affected that the pristine aura of the valley was transformed into a construction site with silt, boulders, and dilapidated structures. Therefore, the effects of the disaster leaves; the nature, the pilgrimage, and the landscape on its Last Legs.

The Char Dham is considered as the state’s biggest employment generating industry with over 50,000 people involved in small scale and large-scale businesses operating from various nearby villages and cities. The deluge not only affected the victims but also snatched away the bread and butter of half the state’s population. However, the faith of god keeps bringing the pilgrims back to the valley and the numbers keep increasing by the day. Hence, the fragile Post-disaster landscape is a challenge for physical reconstruction in order to appropriate for the growing number of pilgrims. India has a major population with different religions, beliefs, and cultures and due to the strong spiritual, social and political identity of the site, the project will aim to have a sensitive approach towards the holy river and the religious landscape.
This project seeks to mitigate the effects of natural disasters by designing and implementing a projective approach to a disaster-based landscape architectural design as opposed to strategies that are based in reaction. The test-bed selected for this thesis application is the sacred Kedarnath valley itself situated in Uttarakhand, India. Acknowledging the region as a sacred landscape and wanting to not only preserve, but reinvigorate the religious connection that cultures present in the area share with the land, the overall organization of the infrastructural formwork is to be predicated on the architectural components of traditional vernacular structures and materials. With the river as a living organism, it is important to raise awareness and to educate people to keep the river cleaner for its future sustainability. The idea of providing spaces in order to make places in such a landscape would be the challenge in order to respect yet prevent the recurring of the event. The project aims to provide the opportunity for local villagers and seasonal workers to indulge within the economic system while simultaneously providing flood resilience structure and stability to the landscape.

Figure 1.
The colourful entrance to the Dhari devi temple on route the Kedarnath valley
Photograph by: Archic, 2017
INTRODUCTION
In the midst of economic and biospheric crises, we have a unique opportunity to redirect the course of development unfolding within our global natural reserves. Many religious and sacred sites exist in such culturally diverse natural reserves which are now facing the biggest issue of climate change. New approaches are needed to combat the assault on this diversity, which is caught in a tide of contestations, driven by the unregulated influences of the global economy.

Contestation arises from the intrusion of urbanization, tourism, and the compounded effects of climate change. As these drivers of change infiltrate different territories within the biosphere they migrate from urban agglomerations to remote landscapes. These pristine landscapes can be found in developing countries and face the strain of expanding demands and patterns of consumption as urban sprawl increases. Afflicts of Global warming can be seen particularly in such sites because of their sensitive geographic location and high vulnerability index. Calamities such as floods, landslides and earthquakes are common and put the landscape into jeopardy but also disrupting the sense of place. And hence the post-disaster landscape poses a challenge for physical reconstruction as well as preparedness for the future recurring of such events.

In such remote landscapes, the dual threat of overexploitation and mismanagement requires a new ethic of conservation and environmental stewardship. By ignoring these patterns, we will risk approaching tipping points that could catastrophically reduce the capacity of ecosystems to provide essential services. With a long-term vision to slow climate change through the sustenance, the design process will seek to re-imagine the global approach to protect humanity, through the deployment of proto-ecological design strategies.

The landscape architect’s role in this project is to understand the sensitivity of such regions and provide sustainable site-specific strategies to preserve, enhance, protect, connect and control the existing patterns of the sacred sites. Design strategies will consider multi-scalar and multivalent dimensions of the issues and envision alternative futures.

On this point, the thesis will be similarly founded on the goal of interrogating global drivers by directly engaging the most valuable resources in landscape: culture, religion, sense of place, economy, tourism and the environment.
The objective of this thesis seeks to capitalize on the hydrological flows and pristine aura of valley of Kedarnath to establish the framework for restructuring the landscape. The restructured landscape will hence give rise to a generative landscape due to accretion that will help stabilizes the fragile nature of the valley and reinvigorated the cultural, economical and social life of the communities.
RESEARCH QUESTION

How can the culture, sanctity and the ‘Sense of Place’ of the Post-Disaster, Religious Landscape of Kedarnath valley be preserved and spatially enhanced along with providing flood resilience strategies and restructuring the unchecked tourism and unregulated urban sprawl?

SUB QUESTIONS
A set of sub questions were formulated to help answer the main research question.

What are the different ecological processes that have taken place in history?

What are the existing flood defense mechanisms in this region?

Does Indian mythology and ancient folklore of the region suggest ideas for flood resilience for the fragile landscape?

How can the dynamic landscape processes like sedimentation & erosion help in construction of a safe urban landscape?

How can the pilgrims and tourists adapt to the strategies provided and how can these strategies be made flood resilient involving the locals and visitors?

How can rootedness and community resilience enable the people of Kedarnath to maintain their ‘sense of place’?

How can community resilience enhance the seasonal economy of Kedarnath valley while promoting awareness for flood resilience and global warming?

How can the pilgrimage route be made less risky, all weather and more sustainable?

Figure 1.3
The current condition of the Kedarnath valley, Uttarakhand
Photo credit: Kiranmadhu
Social relevance: The 2013 flash floods in Kedarnath devastated the landscape of the valley claiming over 1000 lives and paralyzed the religious town for nearly two years. With infrastructure failing and lack of access to resources, the town undoubtedly faced one of the worst disasters in history. Responding to this urgent need for physical reconstruction and psychological rebuilding, the strategy and spatial design for Kedarnath valley will ensure resilience towards climatic events and enhance it spatially. Starting at the source of the river Ganges, the design appears as an opportunity for inspiration for the next 3000km along the river course. The socio-economic structure was also severely affected by the deluge and hence the plausible propositions will also provide plausible solutions for its revival.

Scientific relevance: Climatic change and its impacts are increasingly being studied especially in the global south. Spatial interventions for sensitive regions (in this case religious, social and political sensitivity) is a concept that needs to be delved deeper into in order to understand potentials and opportunities. Furthermore, material and technique research are comparatively less explored hence suggesting a pressing need to explore these design possibilities in more depth.

In addition, the graduation project aims to research the potential of landscape design along with providing flood resilience strategies which can enhance the spatial quality of the Kedarnath valley for following aspects:

a. Spatial contributions
b. Ecological contributions
c. Economic contributions

Figure 1.4
A pilgrims journey, Omnote Kedarnath
Photo credits: Nick Fleming
The first two sections of the thesis aims at the global relevance of the project and the events that took place with their immediate effects towards the landscape and humanity. The third and the fourth section lays focus on the spatiality of the region, the ongoing works and the existing site conditions that the landscape now holds. The methodology is then introduced in the fifth chapter which also explains the research approach and the design research. The final chapter is the design vision and the plausible propositions for the thesis.
Resilience
The capacity to recover quickly from difficulties; toughness; Elasticity

Resilience is the ability to bounce back from a negative experience (physically and psychologically) with “competent functioning” but also keeping in mind the recurring nature of events. For a Landscape architect, working along with nature rather than in opposition will provide for a more resilient environment after a calamity. It is important to tap the potential of the natural processes in order to help regenerate and to learn how to cope with the ever changing ‘new normal’.
THE DELUGE
Understanding the relationship and impact that nature and cultural diversity have on, not only towards one another, but also their impact on or the changes to them due to the influences of climate change and globalization, is a key investigation being approached in today's society. In recent years, it has become more and more apparent that biological and cultural diversity are linked to one another, be it positively or negatively, and that the richness of their diversity, both individually and as a collective unit, is largely dependent upon the state of our environment. Because the environment is facing an age where globalization and climate change are rapidly destroying the wealth of diversity at a global scale, it is important to understand the environmental issues so that those regions that are approaching a tipping point, where intervention, constructive or destructive, can be the deciding factor of whether or not that society persists.

For the purposes of the development of this thesis, the issues that were considered highly prominent and influential at a global scale were natural disasters and calamities. The map on the top left shows the world's climate change vulnerability. By studying it further it becomes apparent that at highest risk is the overwhelmingly populated Global South. This data will often be the source of inspiration for innovative design solutions that will counter the declining health of our earth's environment locally, regionally and globally.

Topographic conditions directly influence the richness and scarcity of biological and cultural diversity within a given region. Regions that are most affected by this imbalanced relationship are those embedded within topographic extremes, like coastlines or high mountains. Their geologic, climatic and topographic conditions allow for a natural richness of biodiversity but are also the areas most prone to suffer negative impacts from environmental shifts. Regions with extreme and unique topography are the largest shareholders of the earth's biodiversity but, consequently, have the most to lose as they possess delicate ecosystems that are suffering catastrophically from environmental disruption. Thus, these are the areas in need of protection.

If we consider the case of India, climate change has been affecting many parts of the country with either landslides, earthquakes or floods. The affects in the northern part of the country are even worse as many major Indian river flow from their northern source towards the sea. One of them is the Holy river Ganges which originates from the Himalayas and joins the Bay of Bengal in the west.

Previous page spread Figure 2.0
The fury of the river Ganges as seen during the time of the floods in Uttarakhand in 2013.
Photograph: Sunny. Pereda

Figure 2.1 (Top)
Map of the World's climate change vulnerability
Figure source: Maplecroft

Figure 2.2 (Bottom)
Map of India showing climatic threats to the country
Figure source: RiedelChristopher Patton and Bernd Riedel

THE LARGER PICTURE
The Ganges is considered as the most sacred river according to Hindu mythology and it’s seen globally as the center of Hindu spiritualism (Drew, 2017). It is believed that a holy dip in the Ganges can liberate the person all from the occurred sins. According to the popular belief, the ashes of the cremation if released in the Ganges, purifies the soul. This practice is observed from millions of worshippers every year. There are hundreds of temples situated along the banks of the river, along with the sacred valley of Kedarnath.

The Kedarnath temple is one of the 4 pilgrimage spots in the northern India Hindu pilgrimage circuit situated in Uttarakhand, India. Every year thousands of people trek up to visit all the 4 pilgrimage sites as completing the circuit at least once in one’s lifetime is considered highly sacred. Situated under the lap of the Himalayas, all the four temples are on the bank of the tributaries of the Ganges.
2013 was one of the most devastating years in the history of Uttarakhand, the so-called Land of Gods. Due to heavy rainfall and a series of cloud bursts, the sacred valley of Kedarnath was flooded and the holy river Ganges swept with it pilgrims, inhabitants, houses and flora/fauna. Many pilgrims and tourists were left stranded for days in forests without any supplies and some died due to severe weather conditions (Singh, 2013). The unchecked tourism and unregulated urban sprawl aggravated the calamity to an apocalypse causing severe damage to infrastructure and the religious landscape of the valley. Today, the Post-disaster landscape poses a challenge for physical reconstruction as well as preparedness for the future recurring of such events.

The rage of nature left us with about 1800 missing persons, hundreds of damaged houses, bridges and roads and deaths that couldn't be even traced till now (Trapped in Kedarnath: National Geographic Channel, India, 2013). The gravity of the Kedarnath disaster in June 2013, which killed thousands of people shocked the public almost to the point of numbness. For Uttarakhand, it seemed unbelievable that pilgrims as well as their village support teams, humans and animal, should have been so unfairly singled out for nature's unbridled wrath. What provoked this calamitous reprisal and why were the gods so uncaring of human life? What went wrong in Kedarnath and were the gods alone to blame for such a calamity? Or did human folly contribute to the devastation of the pristine landscape?

This thesis attempts to answer these questions and more importantly tries to come up with a spatial solution direction to prevent the reoccurrence of the tragedy.
Figure 2.8
Figure source: Author 2017
The role of faith, belief, culture and superstition plays a huge part in the floods according to the local people. The previous diagram explains how people’s belief system stands strong in the situation of the calamity and their outlook towards the disaster is surrounded by the fact that what god created will be fixed by him as well. The attitude of the locals is fixed to the fact that the flooding was god’s will and was meant to happen. Though people are aware of the concepts of climate change and its affects on nature and humanity, but still some are purely blinded by the religious sentiments they hold for their almighty. The boulder that stopped right at the temples foot and diverted the water now has become a temple in itself that people specially visit and pray to.

No disaster changes the devotion people have for the god they believe in and a small example is the increase in number of pilgrims that visit every year even after the disaster. The pilgrims have developed an acceptance to their fate when they start their journey towards the temple. As per the figures, Expected pilgrims in Kedarnath 2017 may rise to 10 lacs (1 million).

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<td>154430</td>
</tr>
<tr>
<td>2016</td>
<td>389746</td>
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Figure 2.10 (Left)
The god’s rock is said to be the savior of the Kedarnath temple as it stopped right at the foot of the temple and diverted the flow of water. Photo credits: Manoj Thapliyal

Figure 2.11 (Right)
Increasing number of pilgrims seen over the years even after the disaster in 2013. Data source: Badrikaedar.org
Char Dham Yatra
The four holy abodes of God of the Hindu pilgrimage circuit.

The char dham pilgrimage takes you through the foothills of the Himalayas into the serene mountainous landscape of Northern India. The pilgrimage trek is risky, tough and strenuous and hence the role of a landscape architect should involve safety of the routes, experience of the wild landscape and the enhancement of the spiritual walk of the pilgrims.
DEVBHOOMI
LAND OF THE GODS
Kedarnath sits at the banks of the holy river Mandakini and shows an ideal portrayal of Goddess Ganga spilling out of the tangled locks of Lord Shiva. As indicated by Hindu folklores, the sanctuary of Lord Kedarnath was constructed by Pandavas, the focal characters of the immense Indian epic Mahabharata. It is said that after the fulfilment of the war of Kurukshetra, the Pandavas felt remorseful for murdering their own particular relatives and looked for the endowments of Lord Shiva for reclamation. Shiva endeavoured to influence them to feel regretful and continued escaping from place to place. In this procedure, Shiva changed himself into the type of a bull and took shelter in Kedarnath. Shiva was going to conceal himself inside the earth when Bhima, the second of the Pandavas got a look at the bump of that bull and grasped it. The rest of the parts of the Lord showed up in some different parts of Uttarakhand, known as Tungnath, Rudranath, Madmaheshwar and Kalpeshwar. The present sanctuary of Lord Shiva at Kedarnath was built by Adi Shankaracharya and the symbolic bull statue stands outside the sanctuary entryway, guarding its doors at all times.
Lying in the lap the Himalayas, the temple at Kedarnath resonates peace, sacredness and energy. Less is known about its 3000-year-old history but a fragment of two verses found on its walls complete the jigsaw. These ‘Shlokas’ or Sanskrit verses bring out the real beauty of the temple and its presence today. They talk about the serene landscape that it lies in and the glory of the Himalayas however, there is no mention about the snow or even glaciers. This proves that the valley has been under the affect of climatic changes which completely changed its outlook and what appears now as a landscape of snow covered mountains and rivers would have been a vast land full of rice fields years back.

The temple is dedicated to lord Shiva, and came to existence during the age of Mahabharata. Though there is no proof of its actual construction date, scientific data and material study proves that the temple is at least 3000 years old. Since there has been no traces found in relation to the glaciers or ice found around the temple, the question arises as to how did the snow around the valley emerge from?

The answer to it lies in a kind of fungi which could have survived only in extremely low temperatures and takes thousands of years to grow. These lichens are found in the moraines that were left behind by the receding and proceeding of moving glaciers and hence then scientists thought about studying it further to dig from the past. What they found was shocking, as research said that the temple had been lying in ice for about 400 years of its existence in the 14th century during the little ice age. The walls of the temple as well prove this as it has marks and scratches of the moving glacial debris.

The temple is constructed in thick granite stone and carved out completely out of rock slabs which gives it immense strength to sustain the ice age as well as the flood today. Due to extreme heat and pressure underground, the rocks change their appearance and form and obtain extra properties like luminosity, hardness and roughness. With over a meter-thick walls, and roof carved out of monolithic stone, the temple today stands tall in all its glory below the mountains with no use of mortar or reinforcement for its support.

Climatic fluctuations have been seen maximal in earth’s last 20,000 years. From ice age to extremely high temperatures, the earth has faced a lot and what we experience now in the Himalayas is a ripple effect of the same phenomena. The temple has passed its test and what it witnessed now is basically just a tiny scratch compared to the fatal accident it went through years back.
The Himalayas are the most recently formed mountain ranges and still continue to form as we speak. The design site lies in the lap of the Himalayas and hence it becomes imperative to understand the geology of the landform. The diagram on the left explains the dynamics of the landform which was developed over thousands of years. The glaciers keep moving slowly from time to time due to pressure differences and melting snow. While moving forward or proceeding, the glaciers bring along Flavio glacial deposits rich in silt. While retreating back or receding, they change the form of the land creating moraines. This process when repeated over and over leads to the development of moraine loops that are usually formed on the edges of the valley. The sequence of diagrams show the proceeding, receding and development of moraines.

The Kedarnath valley also survived the Mini Ice Age and it is said that the temple as well as the landscape was trapped under the snow for about 400 years hence making it strong to withstand severe calamities.

The landscape that we see today is a result of glacial movement done over thousands of years. The glaciers push through the valley, scooping the landform resulting in the form a U-shaped valley which can be seen in the figure below. Hence the Kedarnath valley is a complete U-Shaped if cut in section. Two very distinct moraine loops are seen on the ridge; one a little lower and another a bit higher. These moraine loops are currently used by the local people, pilgrims and trekkers as pedestrian walkways because of their flat surface on either side of the ridge.
Due to the historic evolution of the Himalayas, the receding of the glaciers leaves many gaps and holes in the land which is then appropriated by the melting glaciers resulting into lakes. These lakes are usually naturally dammed by moraine brought down by the glacial movement and accumulated over millions of years. Some of these lakes date from the little ice age and are not directly fed by glacial melt any longer hence relying on rainfall now. Due to its altitude, this pristine landscape is untouched by civilization but is a popular camping destination in summers for professional trekkers. Climate change has not only affected the Himalayas but also disturbed the presence of these lakes all around the world. The only problem posed by the existence of these lakes is the untimely and sudden collapse of the lakes and the risk it poses on the civilizations residing downstream. With the increasing rate of glacial melt and heavy rainfalls, these lakes are either overflowed or breached creating catastrophic situations and a huge loss to man and ecology.

Many such glacial lakes exist in the northern part of Uttarakhand which are mapped in figure on the left. The Chorabari lake is one such glacial lake situated about a few meters north of the Kedarnath valley at 4000m above sea level. Though it is not directly fed by glacial melt anymore, rainwater and snow melt are the main sources for its existence today. Due to excessive rainfall, the natural moraine dam of the Chorabari lake was breached on the 17th of June 2013 resulting into the catastrophe we call the Kedarnath deluge today.
As per a research done on the Chorabari glacier, about 2-4m of water was being accumulated each year before it breached in June 2013. The volume of water contained by the lake during the deluge was said to be estimated equivalent to about 172 Olympic sized swimming pools which drained into the valley within 10 minutes of its breaching. However, a trek to the lake from Kedarnath takes about 4 hours, ironic to the disaster nature created. The water gushed through the temple town of Kedarnath bringing along large boulders and high amounts of debris collected over hundreds of years. The volume of water that escaped the lake, the heavy debris along with the altitude increased the speed of the water and led into creation of a new course of the river Mandakini that we distinctively see today on the map (Upadhyay, 2015).

The lake today is completely empty as the breached embankment drains threads of water into the Mandakini river all year long preventing it from filling up for quite a few years.

Figure 3.7 (Left)
The figure shows the facts about the breached glacial lake and its consequences on the landscape.
Figure source: Author 2017

Figure 3.8
Map showing the situation before and after the new course of Mandakini created by the breaching of the Chorabari lake
Figure source: Edited over google maps by Author.
All the factors of climate change together created a situation of havoc in the northern part of Uttarakhand destroying thousands of houses and killing many lives. The fury of the river swept through complete villages on its course and brought down millions of tons of boulders, construction debris, trees and dead bodies and accumulated them along settlements downstream. At Kedarnath, the breaching of the Chorabari lake made the situation even worse as stale water accumulated over hundreds of years brought with it silt and boulders that covered up the river bed and the surface of the Kedarnath island and created a whole new layer of debris on the landscape. This reduced the depth of the river bed, making the level of the river higher. Luckily the Kedarnath temple survived without any major loss but the debris covered the 6 feet plinth and the steps of the temple completely. Some built structures are also kept untouched as the ground floor spaces are filled up with debris and will cause the whole structure to collapse if excavated.

The Wadia Institute of Himalayan Geology has done numerous researches on the issue of debris and their suggestion to the government states that no debris should be removed from the surface of the island as it has now become a part of the landscape and presses its weight on the land and any disturbance created while removing the debris may create an imbalance in ecology (Das, Kar & Bandyopadhyay, 2015). Since many years have passed by, unfortunately the locals along with the government have cleared up debris from areas for easy functioning and movement of pilgrims but the rest of the debris still remains untouched.

With loads and loads of debris on site, I consider it to be one of the very prime opportunities that can help rebuild the fragile landscape to regain its value back.
**Sense of place**

It is a characteristic that some geographic places have and some do not.

A feeling, perception or belief held by people along with the characteristic of the place itself; Aura of the place; Genius Loci

For a Landscape architect, its is important to understand the ‘spirit’ of the space in order to keep its identity or sense of place alive. The concept of providing spaces in order to make places is achieved only when the space resonates with its existing identity, people, culture and aura.
The snow-covered peaks in the background, the constant sound of the rivers trickling down and the colorful aura of the majestic temple makes the essence of the valley of Kedarnath. It bustles with energetic devotees lined up in queues in the mornings and as dusk approaches the valley suddenly become less populated. The evening breeze carries chants recited by the priests and the day ends with a quaint silence. The entire setting, from the pristine landscape to the colorful people, the clear water to the lamps lit up in flames arouses a sense of enlightenment in every single person that sets foot on the island.
The season for the travel to Kedarnath starts by May and goes on till end of October due to the severe weather conditions in winters. The valley of Kedarnath is accessible only by foot for the pilgrims and the one side 17km trek can be covered in about 5 hours. Very recently a helicopter service has started from various points down the valley that take people to Kedarnath and back. This service was started for people who are unable to trek up to the valley as majorly old people make up the population of the pilgrims however, due to its mere pricing it is a popular mode of transportation for many visitors. The last motorable spot is Gaunikund, which also hosts many hotels and night stays for the pilgrims. Pilgrims usually prefer to take a day trip to Kedarnath keeping Gaunikund as their halt base for the night. However, trekking all the way up to the Kedarnath valley becomes tiresome and hence the valley also offers many cheap nightstays and hotels for pilgrims. Since a lot of the buildings were destroyed in the floods of 2013, a new base camp is constructed next to Kedarnath to accommodate 100 temporary structures to cope with more and more people in the valley. Per night prices cost a mere 2-4 euros. The ground floor of the built structures are usually restaurants, tea stalls and shops that sell religious goods. The upper floors are hotels, night stays or housing for priests and locals. The population of the users of the Kedarnath valley is made up of mainly 6 broad categories. The Sadhu (Monk), The Kandi (Porter), The Yatri (Pilgrim), The Pandit (Priest), The Paryatak (Seasonal trekker) and the Niwasi (Local resident).
The seasonal pilgrimage is the only source of economy for the 50,000 people that are involved in this yearly event. About 350 villages from around the region are directly or indirectly employed in the pilgrimage as it is called the biggest annual religious extravaganza. 25-30% of the state’s GDP comes from the tourism sector which is mainly the Char Dham Yatra. The locals from the valley also visit for the six-month season and return back to their respective villages in winter and survive on the funds they saved over the six months (Sethi, 2015). I term them as the ‘Seasonal Locals’.

Therefore, the pilgrimage acts as a massive employment generating exercise and the seasonal locals become the opportunists whereas the pilgrims and tourists become the opportunity for this economic cycle. Any disturbance (like the floods of 2013) in this cycle can directly affect the 50,000 people who are economically dependent on this pilgrimage (The Hindu: Business line, 2013).
Since the floods in 2013, the government of India has taken various steps in order to bring the life back to the valley of Kedanath. Structurally, the government has put a double flood retaining wall at the crown of the island to prevent flooding at the confluence of the two rivers. The new master plan for Kedarnath aims to take down all the settlements and plans to rebuild the entire town (Bharatiya Janata Party, 2017). However, the government doesn’t provide any solutions to restructure the fragile landscape which will hold the new planned settlements. The government’s approach to tackle the issue is through the lens of infrastructural and architectural developments and making the experience of the pilgrims better as well as also trying to increase the number of pilgrims to stay on the island by producing more housing facilities. This approach is undoubtedly crucial but not at the cost of neglecting the idea of keeping the identity of the temple town sacred and not forgetting the concept of sustainability of the vulnerable landscape.
For the purpose of analysing and understanding the design site, a set of people were interviewed during the site visit. Victims, affected locals from nearby villages, workers and officials who could answer questions pertaining to the actual ground reality during the deluge and the aftermath of the event. The interactions were based on certain parameters of study (Drivers of Change) which were identified during the analysis. These parameters include Living conditions, Tourism, Built environment, Community sense and, Climate change and Natural hazards. These important drivers are relevant to understand the problems and findings of the in order to derive conclusions for the research design.

The Interviews were conducted in a one to one basis either personally or over video conference in the period of November 2017-December 2017. The actual on site interviews can be found in the ‘Appendix’ section.
Mainly tourist influx is due to the Char Dham Yatra (Four-stop Hindu pilgrimage circuit) in Kedarnath during the summer from May to October. The religious tourism in Kedarnath attracts about one million people every year during the peak season. On an average people stay in Kedarnath overnight. None of the interviewed people mentioned tourism in Kedarnath as a problem. Many thought that more tourism would benefit Kedarnath because it acts as economic backbone by providing jobs for nearby villagers and in-return adds to development of the region. Infact tourism is the only way the locals earn their bread and butter. Hotel and shop owners, daily workers like porters, Priests and construction workers all are employed in Kedarnath for a period of 6 months during peak season and then return back to their villages in winter. This seasonal pattern also shows the mentality of the local people who believe that its so normal to work for half a year and stay idle for the other half, whereas in bigger cities it becomes imperative for people to work on a daily basis to fill their stomach. Infrastructure for tourists becomes an issue during peak season. Many people thought that the Main path however towards Kedarnath is very dangerous and becomes a trouble for the tourists and hence they prefer the helicopter service. The new helicopter service has lead to an increase in tourism as well as it makes the pilgrimage more convenient and less time consuming. Locals also mentioned that the low availability of hotels and night stays during the peak season with high influx of pilgrims leads to an inelastic increase in prices of these facilities. Due to this practice, the vulnerable pilgrims and tourists pay about three times more than the actual hotel tariffs in the peak season. There is a sense of uncertainity regarding the future of locals due to rise in tourism as well. Many of locals are concerned that the government might ask them to leave the region to other parts of the state in order to construct more hotels and tourist related facilities to cater to the growing tourist population. Tourism also brings with it many environmental and health hazards which is also a concern amongst the locals as it take away the sense of place of the valley. Even though people related to the increase of waste with the increase of tourism, they did not blame the tourists, but instead the government for a failing system.

‘THIS IS OUR LIVELIHOOD. IF TOURISM STOPS OUR LIVES STOP TOO. WE EARN FOR 6 MONTHS AND THEN WE RELAX.’

- 27 year old daily worker, Soprayag

‘WE ARE A LITTLE SCARED. THE GOVERNMENT MIGHT ASK US TO LEAVE TO CONSTRUCT MORE FACILITIES FOR TOURISTS.’

- 48 year old local, Triyuginarayan

‘TOURIST FACILITIES ARE INCREASING BY THE DAY. NEW HOTELS, NIGHT STAYS AND RESTAURANTS ARE COMING UP IN THE REGION.’

- 45 year old contractor, Gaurikund
All the people interviewed were aware about the affects of global warming taking place around them. From young school children to the older generation felt that there is an urgent need to do something about this situation as not only does it affect their land but also disrupts their economy, ecology and wildlife.

The geographic location of Kedarnath, right in the lap of the Himalayas is the biggest reason for all these climatic changes taking place. The proceeding and receding glaciers are directly impacted by any kind of pressure exerted on the surface of the landmass. Locals complaint that one of the reason for hazards like earthquakes and landslides might be the vibrations caused by the helicopters service recently started from Gaurikund and other nearby towns to make the pilgrimage more convenient.

Many ecological changes have also been observed by the locals of the region over the past few years, like the river silting up post the flooding, shifting the level of the river bed to several meters upwards. This caused many settlements on the river bank to displace and move upwards to a more safer point. The river itself has become smaller in section in certain areas due to construction of artificial structures around the banks.

India’s sacred Ganges river is arguably one of the most iconic sites of worship, with a continuity of rituals for the living and the dead that span over two millenia. But large government-sponsored dams threaten to upend these practices. Construction of 23 out of 24 hydel power plants were scrapped after the deluge as the government realised the volatile nature of the river and the opposition by the aggressive local communities against construction on the holy river.

Many locals are coming together and take an initiative to protect their land and water. A climate resilient farming practice called ‘BARAnAJA’ is a mixed crop farming practice from Uttarakhand based on traditional wisdom. It is evolved from traditional farming practices and the crops grown help in nitrogen fixing of the soil to make it more compact and fertile. Climate change also affects the wildlife of the region directly. Many nature reserves around Kedarnath are a home to many exotic plant and animal species like the Musk Deer, Bear, Lion and Snow leopard who came down to many villages searching for food during the floods in 2013. Deforestation due to infrastructural construction is also causing a loss to the ecological reserves of Uttarakhand and makes the soil prone to landslides as well.

While young kids are taught aorestation at school, many adult locals have a carefree attitude towards their nature. They believe that all the calamities that occur are a sign by Gods and have a complete blind eye on this important situation. Education and awareness is less amongst most locals.
The hills are under constant pressure due to their strategic location and altitude, especially the Himalayas as they are one of the youngest mountain ranges. From years and years, construction techniques have been tested and molded according to the weather conditions and available local resources. But since craftsmanship and materials are becoming expensive, locals resort to cheaper methods of construction in concrete which may not be the most sustainable options for the region.

Landslides are very common and hence infrastructure needs to be solid in order to take the pressure land exerts on roads. Some people mentioned that they believe if constructed with the ideal materials, structures last longer with less maintenance.

Mostly newer ways of constructions are observed in and people rather prefer building easier and cheaper so they can maintain them from time to time. Very few buildings exist now in the ancient techniques of stone and timber and last almost a hundred years.

Infrastructure for the pilgrimage is highly crucial as devotees, horses and mules all use the pedestrian route that takes them from the last motorable spot Gaurikund to the Kedarnath valley. Landslides sometimes destroy the existing paths and then people take risky forest trails which are highly dangerous. The routing to the valley is highly challenging but time to time there are provisions for pilgrims to rest, halt and grab a snack or tea.

Facility wise, the island hosts a small clinic and chemist but for emergency situations patients have to be taken to the Sonprayag which is the nearest hospital about 20km away. The younger population travels to the nearby schools and colleges for education as the island is functional for just six months a year. For pilgrims, small shops, restaurants and hotels are available.

The interviewees were happy with the recent infrastructural developments that are taking place in the region however they are also worried about the over exploitation by people as more and more development take place.
The ancient temple with the pristine landscape backdrop has a certain aura that people relate with when they trek their way to the valley of Kedarnath. As per a few locals, the valley might be losing its pure charm due to the floods and increasing tourists every year. They feel that the idea of a pilgrimage comes from the peaceful experience they gather while they trek their way up towards their almighty which they somehow miss nowadays.

The identity that the place holds is so sacred and divine, almost as its untouched by man. Even with broken infrastructure and risky routes, many people still believe the pilgrimage is what will release them of all their sins and nothing can stop them from achieving their gods blessings.

The idea of making the island into a commercial hub also takes away from its angelic beauty that it has to offer. All you see around are hotels, nightstays, shops and vendors. what started with just a temple with a few priest’s houses has now inevitably become a whole city in itself.

The new trend of the helicopter service has also taken away from the idea of the on foot pilgrimage as more and more people now prefer the helicopters since that makes their travel faster and effortless. The holy expeditions or pilgrimages started as a way to reach the almighty god through a persons actual struggle and effort leaving all worldly pleasures and attaining the path towards spiritualism. Whereas taking the helicopter is a completely contrasting idea altogether.

With more and more visitors per year also comes the developments requires to host them but not at the sake of losing the character of the ancient temple town and its heavenly surroundings.

‘WITH MORE TOURISTS COMING IN EVERY YEAR, THE QUALITY OF THE PILGRIMAGE IS ALSO REDUCING.’

- 44 year old Commandant BIIAT, Dehradun

‘THE PATH TO OUR GOD MIGHT BREAK, BUT THE FAITH IN HIM WILL NEVER BREAK.’

- 37 year old Local, Gaunkund

‘I DRIVE TO ALL THE FOUR PILGRIMAGE SPOTS EVERY YEAR AND THE AMBIENCE OF THE PLACE IS NOT LIKE IT USED TO BE BEFORE.’

- 30 year old Taxi driver, Dehradun

SENSE OF PLACE

The ancient temple with the pristine landscape backdrop has a certain aura that people relate with when they trek their way to the valley of Kedarnath. As per a few locals, the valley might be losing its pure charm due to the floods and increasing tourists every year. They feel that the idea of a pilgrimage comes from the peaceful experience they gather while they trek their way up towards their almighty which they somehow miss nowadays.

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With more and more visitors per year also comes the developments requires to host them but not at the sake of losing the character of the ancient temple town and its heavenly surroundings.
The interviewees had different opinions about the governmental policies and its efforts to improve the scenario in Kedarnath. Where some people felt that they hadn’t been compensated for their losses during he flood, some felt the government is making all the necessary developments for the local economies to run smoothly.

A particular case is of one of the villages in the region called Deoli-Bramhagram which is now popularly know as the ‘Village of widows’. The whole village’s economy is dependent on the seasonal pilgrimage of Kedarnath and all the men from the village were employed at the Kedarnath valley during the year of the flood as shop owners, priests or porters. The flood swept about 52 people from the same village leaving weeping widows without no source of income. An NGO called the Sulabh International approached the village 6 months later and provided a means for the women of the village to stand up on their own feet to earn their bread and butter by installing machinery for sewing and even arranged equipment for computer classes for kids. They were also provided a monthly stipend.

Many nearby villages also hosted injured pilgrims and visitors that were stranded during the floods at their own homes but no compensation by the government was received for their humanitarian gesture.

The government in India changes every 5 years and at the time of the flood the state had a different government which made plans for redevelopment. As soon as the government changed, the new party decided to scrap all previous developments to establish their own ideas leaving the people in the same situation as they were before. This political stalemate situation crushes all hopes that the locals have from their leaders.

The new government however is making a conscious effort for the restructuring of the valley and plans on providing infrastructural and architectural solutions for the locals and their businesses to function smoothly.

The local people themselves have small regional communes that make the effort to get back on their feet even if the government does not help and work hand in hand with building a future for themselves as a strong community.

‘OUR VILLAGE IS CALLED THE VILLAGE OF WIDOWS. THE GOVERNMENT DID NOTHING BUT NGO’S HAVE GIVEN US OUR LIVELIHOODS BACK.’

- 30 year old widow, Deoli-Bramhagram

‘WE HOSTED 30,000 TOURISTS IN OUR VILLAGE DURING THE FLOOD. THE GOVERNMENT DID’NT COMPENSATE FOR ANYTHING.’

- 48 year old local, Triyuginarayan

‘THE GOVERNMENT AT THE TIME WAS DIFFERENT. NOW THE CENTRAL GOVERNMENT HAS TAKEN OVER. THE STATE AND CENTRE DON’T GO PARALLEL.’

- 44 year old Commandant BIIAT, Dehradun
METHODOLOGY
Based on the theoretical research and the analysis done on site, four very prominent factors were determined that affected the site directly. The factors are derived by taking in consideration all scientific data available, documentation done on the deluge, government initiatives, social interactions (down-up method) and visual observation on site. These factors found throughout the site are water, religious activities, tourism and housing and infrastructure and are termed as the drivers of change.

Kendall Baldwin’s theory explains that a change or a shift in any one of the drivers of change, may affect the stability and functioning of other subsequent drivers. However, the magnitude of change may not matter, the change is certain (Baldwin, 2011). Since the drivers identified have such a significant interdependence on each other, it becomes imperative to address them in order to ensure any negative impacts the drivers may cause can be changed, preserved, controlled or connected.

Kedarnath valley is the confluence of the 2 glacial fed rivers: Mandakini and Saraswati which are at a constant flood risk. Climate change and global warming leads to increasing rainfall and cloud bursts every year hence causing infrastructural losses. Eventually the dilapidated condition of housing and infrastructure affects the seasonal inflow of tourism every year which in-turn affects the economic backbone of the region. Controlling or adapting to the large amounts of water that the valley receives and harnessing the natural water surges can be a huge potential as the water also brings with it large amounts of sediments.

The religious activities make the sense of place or the aura of the valley. If tourism is increased; the sense of peace and satisfaction would go missing. “The sense of peace and satisfaction that I used to get visiting here was clearly missing this year,” Shyam Prasad Gupta, a pilgrim from Karnataka. If tourism decreases, economy goes down and unemployment will affect many locals. The religious activities can be affected in case rivers dry up due to the holiness of the river. In floods, it disrupts tourism, ecology, health and infrastructure. Hence, preserving the aura of the valley is an important step that needs to be taken.

The religious valley hosts about a million tourists every year and hence they keep circulating the valleys economy with a net worth of Rs.1000 crore. With more and more tourists coming in every year, housing and infrastructure becomes inappropriate and in-turn affects the religious pilgrimage. Tapping on to the potential of the amounts of tourists visiting every year, measures need to be taken where the valley benefits from the tourists as well so that this pilgrimage flourishes today and for years to come.

The dilapidated conditions of the infrastructure is an increasing threat to the numerous tourists that visit the valley each year. The natural climatic conditions are an important factor for the reason and development for the existing infrastructure hence more and more sustainable techniques should be implemented to cater to this issue.
After determining the important factors and the Drivers of change, the research approach aimed at the concept of tapping into these identified drivers into plausible strategies, that could be hence be used as tools for further design. The approach derived was to plug-in the existing conditions and solutions for establishing a practical spatial design. For example, adapting to water surges through dynamic processes of sedimentation, tapping into religious activities to spread awareness and education, engaging the pilgrims into community resilience and changing the infrastructure into a more sustainable design.

The approach aims at restructuring the landscape in a functional manner, subtly targeting spatial and social issues through providing solutions that can be easily replicated on site. The design approach is to heal the fragile landscape by going with the nature rather than going against it and aiming at minimal disturbance to existing settlements and ecologies. The Himalayas are ever changing and the ideas is to give it time to breathe and achieve desired results through temporal processes.
The analysis is focussed on the spatial arrangement and existence of the temple town of Kedarnath and is done in four layers; Basic form, Programme form, Spatial form and Image form. Mostly each layer is analysed or compared in two scales, to understand the overall and zoomed in spatial qualities of the space so that the same can be projected onto others.

The basic form, in which the position of the different components in plan is examined with respect to the geomorphology and the topography of the site. The programme form understand the compositional organisation and interpretation of the on-site programmes. The spatial form is about the organisation of the landscape space, the visual-spatial relationships between the site and the panorama, between enclosure and horizon. The image form relates to the representation of nature and relationship of nature and culture.

Finally, the compositional scheme is a conclusion drawing taking the key elements from a few or all layers to explain the site in an abstract way and can be found in the thesis’s conclusion section as it overlays the design as well. The different layers along with the design are clubbed together in a drawing concluding the entire story. Although a conclusion, it may be understood in isolation.
The four abodes are located in the valleys between high mountain ranges. The temples are aligned along the cardinal directions for religious reasons and the market street is aligned along the direction of the valley.

All the four abodes lie on the banks of the rivers that pass through the town.

Figure 5.4 (Left and right)
Four abodes of Uttarakhand (Char dham yatra).
Figure source: Author, 2017
Zooming into the scale of the temple, the dimensions and proportions of the temple were analysed and a series of observations were made. The main shrine or the Shivalingam is located in the centre of a square. The intersection of two circles drawn from either corners of this square determine the centre of the entire rectangle within which the complex is designed. The same rule can be observed in the larger scale with the spatial arrangement of the temple in relation with the island. The island here relating to the boundary of the temple complex.
The temple is dedicated to Lord Shiva and the Shivalingam (Religious symbol) present in the temple is a representation of the landscape around in a smaller scale. As the mountains rise around the temple, the Shivalingam and pillars rise within the temple on a raised platform. Further, the entire temple is placed on a higher pedestal with walkways all around it and set within the debris brought by the flood and landslides. Lastly, the image one relates to would be to the rivers flowing in the valleys between mountains, and the religious temple island situated in between this vast landscape, even when both the scales are quite different.

Spirited form

The whole structure fuses the daily life of the island and its surroundings with the divine aura of the nature, through a structure that is raised on a terrace transitioning from the hustle and bustle of the market street towards the sacred shrine. It invites the pilgrim inward towards the Shivalingam (the temple's central core) as well as lifts him upwards into a symbolic space marked by its spire. The majestic snow capped himalayas in the backdrop just completes the frame and adds to the sanctity of the space.
In the larger scale, the pilgrimage follows a route from west to east direction, i.e., clock-wise direction starting from Yamunotri and proceeding towards Gangotri then Kedarnath and the termination of the pilgrimage is at Badrinath. It is believed that Adi Shankaracharya was freed from the cycle of birth and death and attained salvation at Badrinath. This pilgrimage also therefore, metaphorically indicates our journey towards salvation through the difficulties of life.

Figure 5.9 (Left and Right)
Spatial form: Macro
Figure source: Author 2017
At the scale of the temple, the strict rectangular enclosure of the temple walls within which the collonaded pavilion is situated acts as a noticeable space-making element for the movement within the complex.

The holy shrine replicates the Shivalingam in the centre of the temple which represents verticality and gives an orientation to pilgrims. The circumambulatory around the temple follows the east to west direction through south which replicates the sun path.

Therefore, the pathway inside the temple is an important element in defining the space and movement in the smaller scale, which can further follows the same rules for the entire temple complex.

Another reason for this kind of spatial composition of the temple and the movement pattern lies in a deeper understanding of the hindu religious laws. The shrine or Shivalingam in the centre which represents verticality was also said to release magnetic energy all around it. Therefore, the movement of pilgrims around the shrine in the clockwise direction reinforces positive magnetic energy around the temple.

Figure 5.10 (Left)
Spatial form: micro scale
Figure source: Author 2017
The programmatic disposition of the island basically comprises of the ancient temple and the activities or facilities related to the temple like the market street, hotels, routing and helipads. The river acts as the source of water and holds a strong religious symbolism, hence it becomes one of the major identity of the island apart from the temple.
The water management and flood protection of the valley is done through different technical systems that include divergent channels and retaining walls which with the natural gradient of the valley divert water into the rivers. Recent development post the floods in 2013 have focused more on the protection of the temple by creating the retaining wall at the temples rear but what needs more strength is the ridges of the valley in order to restructure the foundation of the island as well.
THE ROAD AHEAD
The strategy is to anchor all the three scales together, the smallest being the landscape architectonic formwork anchoring into the large scale processes of sedimentation and eventually leading to a spatial framework for the site. This strategy helps to restructure as well as opens opportunities for a generative landscape for future. The design aims to produce the largest effect by combing the smallest scale elements together as they act as the building blocks for the entire system to function smoothly.
Since the flow of water is fast, the idea is to slow it down in order to decrease the level of erosion of the ridge and increase the rate of sedimentation. The smallest scale landscape formworks can be arranged in a way where sedimentation is high to strengthen the eroded landscape.

To slow down the water, it is first necessary to deepen the river bed as a lot of debris brought down by the foods had raised the actual river bed. By this process the river can meander and deposit sediments in the desired pockets. The earth dug out could then be used to create terraces on the island so as to achieve a gradual slope for walking, keeping the temple at the highest level.

Since the meandering river will bring a lot of sediment with it, its is important for it to cluster together for it to provide strength to the eroded landscape. For this the landscape formwork so designed should have a collecting and condensing quality.

The different diagrams show the spatial concepts that were tested and experimented in the design process.

Figure source: Author 2018.
To establish the design concepts it was decided to test them spatially in a working physical model and the apparatus was set up at the university’s model workshop. The base contours of the model was constructed with clay and a constant water source was added to stimulate the flow of a river. A slope gradient was also added for accurate readings. Minute particles of stone acted as sedimentation and existing debris.

First the water was run for 1.5 minutes and erosion and sedimentation was noted. Eroded areas were then blocked by structures (acrylic blocks) to create pockets for sedimentation to take place. The water was run again for 1.5 minutes and sedimentation and erosion was noted. Adjustments were made and those spots were then chosen for the placement of the actual designed sedimentation structures.

Though a computer model would have been more accurate and precise, but a physical model was chosen for the experiment due to time constraints. The physical model broadly demonstrates the idea behind the experiment and can be spatially tested later for more depth on the subject.

Figure 6.3 (Left)
Snippets from the experimentation done to check the sedimentation process.
Photo credits: Author 2018

Figure 6.4 (Right)
The experiment also helped in understanding the flow of excess water which can be diverted and slowed.
Figure source: Author 2018
Figure 6.5 (Left) The gabion structures system is an ideal solution as the system uses the on-site debris, prevents erosion and facilitates sedimentation leading to restructuring of the fragile landscape.

Figure 6.6 (Right) The diagram shows the growth and space appropriation of the structures through time.

Figure source: Author 2018
Figure 6.7
An illustrative collage showing the atmosphere of the multipurpose structures
Figure source: Author 2018
Since the gabions are structural members, various spatial iterations can be derived from them. A combination of such typologies can result in a system of usable spaces like walkways and bridges out of filled gabion blocks, whereas openable shops and meditation spaces with frames of the gabions.

A similar design language can be achieved inland where the gabions can be used as building blocks for construction of walls, street furniture, seating spaces, planters and steps.

Figure 6.8 (Left)
The model depicting the possible spatial iterations of the structures.

Figure 6.9 (Right)
Inland typologies of the structures and their spatial appropriation.

Figure source: Author 2018
Figure 6.10
Initial sketch showing the main axis route towards the temple and the gabions used as placemakers and guiding elements.
Figure source: Author 2018 drawn over photograph by Ajay
Figure 6.12 (Right)
The spatial form of the existing site was considered while designing the main axis and a circumambulatory path around the temple town was designed.

Figure source: Author 2018
The amount of debris accumulated onsite acted as an opportunity for the site's development as slowly the landform could be molded and spaces could be carved out of the existing site material. To achieve the desired view lines for the main pedestrian street, the debris was removed from the axis and placed on the sides to create terraces. This created a distinct section keeping the pedestrian always a little higher while they proceed towards the temple, whereas creating a difference by keeping the other activities on a step lower.
The design intervention takes place in four major phases as described below:

**Phase 1**
The design intervention starts with clearing excess debris for the production of the gabion sedimentation units. Debris is also excavated from the river beds to make more room for the river as well as from the process of cutting and filling in the ridges by removal of earth and compacting those areas ready for installation.

**Phase 2**
The second phase involves widening of the main pedestrian access route and restructuring the infrastructure (paving, railings) for the same. Dilapidated building are taken down and recycled into pavements for the main pedestrian route. Excess debris is stacked on the surface to create terraces on the island with the temple at the highest point. The area behind the temple is also cleared so that the view of the Himalayas shines in the backdrop. The sedimentation gabion structures produced by the locals are then installed on the ridges and various other parts of the valley. Flood gates are introduced at the retaining wall at the crown of the island so that excess water can be diverted and slowed at the other side of the island.

**Phase 3**
Slowly the sedimentation gabions fills up and develops into spatial pockets. Small retail shops start popping up in some parts and public spaces take shape. Water mills on the other side of the ridge are installed for harvesting the surges of the water.

**Phase 4**
The watermills become landmarks for the valley, standing tall as they are installed at various points throughout the pilgrimage route as important iconic structures that guide pilgrims to the island and back. Recycled houses, health facilities and a memorial museum is constructed. The planted terraces also bloom in summer with medicinal crops that are sold at ayurvedic store on the island.
The pilgrims are invited into the welcome court which also houses the visitors center and other public facilities like toilets and cafes. The central axis is designed where the pedestrians can catch their first glimpse of the temple. Movement is defined by the provision of steps and ramps guided by seating spaces on both sides for tired pilgrims to rest. The site is divided into terraces which are accessible by stairs and ramps from either side of the pedestrian nave. After climbing up the last mile of their pilgrimage, the devotees reach the large square with informal markets on all side and a central Kund (reservoir) for storing excess rainwater. The 25m high ancient temple catches the pilgrims eye and the Himalayas in the backdrop complete the frame. The meadow behind the temple blooms with white flowers during summer and is covered with snow during winters. Two streets on either side take the pilgrims to the other corners of the island; on the east the medical facilities and ayurvedic gardens where pilgrims can experience a typical green atmosphere of the hills and plant a sapling in their name; on the west they gather a glimpse of the panoramic energy generating towers which provides them the view of the majestic Himalayas and the entire temple town.
Figure 6.17 (Left)
Site sections through the pedestrian street.
Figure source: Author 2018

Figure 6.18 (Right)
Diagram showing the on-site development and construction stages through time.
Figure source: Author 2018
The design is functional yet has a deeper hidden meaning and belief. The valley of Kedarnath is dedicated to Lord Shiva, the protector and destructor of the universe and hence the belief system of people is so strong within the Hindu community, the 2013 floods was taken as a God's revenge towards the action of humanity. Us as designers should be cautious of such pre-existing norms and hence the design needs to adopt a soft and sensitive approach. Lord Shiva is always depicted sitting in the lap of the Himalayas with the Ganges flowing through his matted locks, symbolically as the image form of the existing site. Shiva adorns five tools for protection on his body. Each tool has a symbolical meaning attached to it ranging from alertness, consciousness, knowledge, wisdom and righteousness. Protective structures around the site provide resilience as well as symbolically depict the adornments of Shiva. The number 5 has a significance as well in Hindu mythology, relating to the five senses, five balance chakras and the five elements. They can be seen as the beads adorned by Shiva on his chest. This was translated in the design with the five levels of terraces. On the larger scale as well, the energy producing linear landmarks are placed on 5 distinct points connecting the heaven to earth.
The design deals with various user groups that were identified onsite and many trails were designed for their movement. Another heritage route was introduced for a more explorative and educational experience within the site.
Figure 6.21
The first stop
Figure source: Author 2018

A DAY IN THE LIFE OF A PILGRIM
Figure 6.24 The brace.
Figure source: Author 2018

Figure 6.25 The walk through memory lane
Figure source: Author 2018
Figure 6.26
The three maps depict the water level increase in the valley area. 1. Normal flow 2. High flow 3. Flood situation
Figure source: Author 2018
Figure 6.27 (Left)
The drainage map
Figure source: Author 2018

Figure 6.28 (Right)
A typical section of the stormwater drainage on the main pedestrian spine of the site.
Figure source: Author 2018

Figure 6.29 (Next page)
Using the ruins from the 2013 floods as memory and connecting them through a heritage trail for an explorative and educational experience. The route not only connects the ruins but also regenerates the urban voids of the site.
Figure source: Author 2018
Figure 6.30
An illustration depicting the heritage route, dedicated in memory of the 2013 flood and its dialogue with the fabric.
Figure source: Author 2018
Figure 6.32 (Right)
The new shops or tea stalls will use gabions as building blocks for walls which will help recharge the ground water level and will be used in the nearby planted swales. The solar panels produce energy which can be directly used by the shop.

Figure source: Author 2018
Figure 6.33 (Left)
Making existing spaces into places.
Figure source: Author 2018

Figure 6.34 (Right)
Making existing situations on-site.

Top Photograph by: Alamy
Bottom Photograph by: Photo credits: Screenshot from Youtube documentary: "Reporter’s diary: The catastrophe that hit Uttarakhand"
Since the routing is a crucial part of the pilgrimage, the material of the paving is designed keeping in mind the users of the site. A combination of hard and soft materials like recycled concrete, stone, steel, grass and earth are used specially to cater to slipperiness and steep slopes of the site.

Figure 6.35

Figure source: Author 2018
Figure 6.36
Fragment construction Detail A.
Scale 1:50
Figure source: Author 2018

- Railing
- 100mm stone for seating
- Drain
- Gabion boxes with debris
- Concrete footing
- 150mm Brick curb wall for planter
- Planting soil
- Gravel
- Geo filter fabric
- Subgrade compact to 95%
- Steel ties
- Cross wire reinforcement
- Back filling (compost on-site soil)
- 300mm rock mattress (Rock-bed)
- Deep soil reinforcement
Figure 6.37
Fragment construction Detail B.
Scale 1:50
Figure source: Author 2018
These linear elements act as distinct landmarks, guiding the pilgrims along the stretch of the pilgrimage route. For their placement, the sites along the river are strategically chosen in areas with an existing helipad, flat terrain surfaces, and beautiful views. The helipad has the most common imageability in the hills for locals. These turrets also act as safe zones with stocked provisions in case of a catastrophic event. These structures are symbolically derived from the linear cosmic ‘Stambhas’ which connects the heaven and earth. They are multifunctional energy generating units that use the ancient Himalayan technology of ‘Gharats’ that was used to channelize the surges of free-flowing water to grind grains. In the designed version, they are used to harness the water’s potential to generate electricity whilst providing halt spots for rest, educational tours for raising awareness and an observatory for experiencing the majestic Himalayas.
Figure 6.40
A section through the energy generating towers and the gabion structures.
Figure source: Author 2018

Figure 6.41
An illustration from the panoramic tower framing the majestic Himalayas and the ancient temple.
Figure source: Author 2018
Figure 6.42 (Left)
The ambience of the valley in the different seasons
Figure source: Author 2018

Figure 6.43 (Right)
Planting scheme
Figure source: Author 2018

Figure 6.44 (Next page)
Planting details for the designed areas
Figure source: Author 2018; data retrieved from "Plants of Kedarnath wildlife sanctuary, western Himalayan" by Rai, Singh, and Rawat
TREES
Khursu oak (Quercus semecarpifolia) 20m
Bhojpatra- Himalayan Birch (Betula utilia) 25m
Roga- Himalayan Fir (Abies spectabilis)
Maple- (Acer acuminatum)

MEDICINAL HERBS
Poppy (Meconopsis aculeata)
Barafso (Viola pilosa blumei)
Roscoea alpina rayale
Jamboo (Allium stacheyei)
Mahamida (Polygonatum verticillatum)
Rishibhak (Malaxis muscifera)

PERENNIAL FLOWERS
Brahma karna (Saussurea obvallata)
Stellaria himalayensis
Goodyera fusca
Goodyera fusca
Goodyera fusca
Figure 6.45 (Left)
Graphical representation of the East zone featuring the ayurvedic centre and its gardens.
Figure source: Author 2018

Figure 6.46 (Right)
Sectional representation depicting the run off water flow and its utilisation by planted terraces.
Figure source: Author 2018
The aspect of education and awareness holds a huge importance for the project since the site has a major footfall due to religious tourism and hence reaching a larger audience is at hand. Brochures, posters and social media campaigning is a helpful tool to spread the word of global warming and its implications on the fragile landscape. The use of helicopters, keeping the Ganges clean and planting more trees are a few examples of this movement. Awareness can also be generated by involving the local community in the process of collaborative participation in building. This would not only benefit the locals but also pilgrims, visitors and volunteers who would want to devote their time in helping to rebuild the area and also educate themselves on building with local materials and vernacular techniques.

Figure 6.47
Various methods to spread awareness and educate locals, pilgrims and visitors.
Figure source: Author 2018
Figure 6.48 (Left)
Diagram depicting the various systems that take place within the site. 
Figure source: Author 2018

Figure 6.49 (Right)
The spatial design elements and their interrelation with the various systems resulting in social & ecological benefits for the site. 
Figure source: Author 2018
The calamity in 2013 created a situation of havoc in the state of Uttarakhand, leaving people devoid of basic necessities like food, shelter and clean water. With the increasing number of pilgrims returning every year, it became imperative to provide spatial solutions for providing a safe and satisfying pilgrimage.

The research summarized the existing problems that the Kedarnath valley faces today: High influx of tourist in summers, unregulated sprawl and diminishing loss of the spirit the place holds. Many factors like the faith and belief people have for the god also emerged which acted as potentials for developmental change if channelized in the right manner. Existing spatial development in terms of infrastructure done by the government include the retaining flood wall at the valleys crown and architectural transformations, neglecting the need for restructuring the fragile landscape which is crumbling every day.

The thesis aims to approach this issue of climate change with a very sensitive eye by going with nature rather than against it. The Kedarnath temple is dedicated to the god of construction and destruction ‘Shiva’, who is said to be the only god that has the power to withstand the power of river ganga. Ironically, the temple survived the floods in 2013 proving the gods power. The design process also symbolically molds with the story line and minimal efforts are made to tackle the problem.

The adopted methodology fostered the use of analytical tools like on-site interviews and cognitive mapping which emphasized the importance of the Down-Up approach in a country like India. The layer analysis acted as a spatial design tool which helped in unraveling the various pre-existing elements of spatial arrangement on site and their symbolism which were then adopted as norms for the spatial planning of the site.

The governments efforts turned a blind eye towards the situation of the brittle landscape hence the design focusses consciously on the aspect. Tapping into the dynamic processes of sedimentation and erosion that take place in the valley to strengthen the landscape were adopted. The seasonal economy was also a major challenge and therefore the design includes community involvement in the design process as well. All these design developments combine together to achieve spatial enhancements for the valleys sustainability by including concepts to energy harvesting through the use to traditional techniques like watermills and multi-crop plantation.
Awareness and education was also a major part of the design and hence plugging in the religious backdrop of the valley, a larger audience can be reached to spread the word for climate change and global warming. The river Ganges is always under speculation when it comes to its purity and negates ironically with the symbolism attached to it. Through the medium of this thesis, a conscious word of alertness and awareness to keep the Ganges clean is spread. This acts as a starting point not only geographically but also can go on to start a ripple effect for the 3000 km to follow downstream. Lastly but the most important aspect of the Sense of place is ultimately achieved as commercialization is reduced by limiting accommodation on the island and regulating the retail activities as employment will be generated through other spatial developments.

Hence the objective of this thesis was to capitalize on the hydrological flows and pristine aura of valley of Kedarnath to establish the framework for restructuring the landscape. The restructured landscape will hence give rise to a generative landscape due to accretion that will help stabilizes the fragile nature of the valley and reinvigorated the cultural, economical and social life of the communities.

RECOMMENDATIONS

The circuit of the Hindu pilgrimage in northern India consists of 4 temple towns that are historically known for over 3000 years. Due to their fragile geographic location, these sites are under the constant threat of global warming and climate change which pose various implications on the sustainability of these historically rich monuments. A recommendation for the other 3 sites could be the use of a similar methodology, to determine drivers of change that are site specific and to critically look at the needs of people (down-up approach), beliefs (religious, folklore or sentimental) and pre-existing notions that the site offers.

Designing with a certain focus (belief system, restrictions, symbolism) can lead to a typical design outcome but it can sometimes really help in experiencing the space better. In the case of a sacred site like the Kedarnath valley, certain religious norms and symbolic design decisions were made in order to restore and spatially enhance the pilgrim’s sacred experience. This thesis could demonstrate such an example for. Heritage and culturally significant sites all over the world can be spatially enhanced or re-activated if implications like these are translated into spatial design and a much larger audience can then be reached through this medium to express common views, ideas and awareness like in this case the idea of Climate change.

Figure 7.2
An abstract conclusion drawing explaining the key elements from the various layers of the design.
Figure source: Author 2018
In June 2013, Uttarakhand faced unusual heavy rainfall, series of cloud bursts and glacial lake outbursts all within 4 days leaving the sacred valley of Kedarnath completely ravaged. The flooded Ganges swept with it pilgrims, inhabitants, houses and flora/fauna creating a havoc in the valley. For days many people were stranded in forests without food, water and inappropriate clothing. The 3000-year-old Temple shrine at Kedarnath survived the major event without any damage. The unchecked tourism and unregulated urban sprawl of the valley aggravated the calamity to an apocalypse causing severe damage to infrastructure and the religious landscape of the valley. The Genius loci of the place was so affected that the pristine aura of the valley was transformed into a construction site with silt, boulders, and dilapidated structures. Therefore, the effects of the disaster leaves; the nature, the pilgrimage, and the landscape on its Last Legs.

Societal Relevance:
Sustainability in a broader sense is aimed at in the thesis, including socio-spatial, economical and ecological sustainability. The most important aspect is the sustainability of the ancient tradition of the pilgrimage. The thesis provides spatial solutions for securing the heritage and sanctity of the pristine valley. Maximizing on the locally available resources for the intervention not only turns out economically but also secures the ecology of the fragile landscape. People from about 350 villages are directly or indirectly employed in the seasonal pilgrimage and the thesis provides a framework to give them back their paralyzed economy to keep the cycle running.

Moral sensibility:
All the sequence of events that took place in Kedarnath in 2013 were a result of constant global warming and changes in the climate and if not controlled may have long term consequences. Can climate change hence be called a moral issue? With the quality of our life at stake in the future, and no conscious effort put in by the inhabitants to protect it, the people who restrict action are not just misguided, they’re wrong. Hence, its high time we start treating climate change as moral issue.

Moral analysis:
The Kedarnath valley is visited by about 3000 people per day and the vulnerable condition of the infrastructure and facilities is unlikely to suffice the needs of the visitors. Situated in a remote region and high altitude, safety becomes one of the prime aspects to be targeted at. However, involved stakeholders like the government and locals would rather have provisions to facilitate more people on the island which doesn’t even have the means or capability to host that many visitors. Their sole interest lies in generating as much economy for the island in the six months by putting at risk all the visitors and locals in a vulnerable and fragile environment which may collapse at any given point.

Figure 7.3
Lansdowne, Uttrakhand: Onroute Kedarnath
Photograph by: Arthr 2017
Moral creativity:
There can be various ways to look at the problem of climate change. The simplest way to treat this issue would be to shut down the pilgrimage and let the landscape breathe. However, there were many aspects attached to this particular case like the holiness of the temple, the constant flow of pilgrims and the inevitable weather conditions. How can all the factors be considered to derive a single solution? It has to be a combination of small solutions to achieve the larger affect. This thesis also aimed at starting at the smallest scale and anchoring it together to achieve resilience at the largest scale. By doing this it helped the valley socially, economically, environmentally and ecologically.

Moral judgement:
In a climatically challenged world, us as landscape designers need to make crucial judgements. In the case of a post disaster site, the most obvious choice for the intervention would be to devoid the land of all rubble and buildings and start from scratch however, the ecological impacts that would pose on the landscape are beyond imagination. To increase employment, more tourism would be generated resulting in more people and less resources. Hence, the landscape designer needs to critically approach towards the site and respond sustainably to attain the larger goals.

Moral decision making:
Climate change is highly subjective. Where there are millions who do not care about the issue, a bunch of few are making a conscious effort to change the world. We share this earth and are equally responsible for the threats that it faces. Therefore, for me it is something that should come as a personal thought from within to act upon. If everyone does their bit for the society it will sustain. However, the power that the nature holds is much larger than our efforts to protect it. We as humans are acclimatized to change, adapt to challenges and stand back on our feet gradually. The people of Kedarnath are under constant threat when it comes to climatic changes. Given a framework, the people of Kedarnath can also work as a knit community and overcome the natural calamity, ready to face it again but this time more cautious and prepared.
Resilience
The capacity to recover quickly from difficulties; toughness; Elasticity

Resilience is the ability to bounce back from a negative experience (physically and psychologically) with "competent functioning" but also keeping in mind the recurring nature of events. For a Landscape architect, working along with nature rather than in opposition will provide for a more resilient environment after a calamity. It is important to tap the potential of the natural processes in order to help regenerate and to learn how to cope with the ever changing 'new normal'.

Char Dham Yatra
The four holy abodes of God of the Hindu pilgrimage circuit.

The char dham pilgrimage takes you through the foothills of the Himalayas into the serene mountainous landscape of Northern India. The pilgrimage trek is risky, tough and strenuous and hence the role of a landscape architect should involve safety of the routes, experience of the wild landscape and the enhancement of the spiritual walk of the pilgrims.

Sense of place
It is a characteristic that some geographic places have and some do not.

A feeling, perception or belief held by people along with the characteristic of the place itself; Aura of the place; Genius Loci
For a Landscape architect, its is important to understand the ‘spirit’ of the space in order to keep its identity or sense of place alive. The concept of providing spaces in order to make places is achieved only when the space resonates with its existing identity, people, culture and aura.

Glossary

Sense of place
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Hindi Words

Baranaja
'Bara' meaning 12, 'Anaja' meaning crop; multi-crop ancient farming practice of Uttarakhand.

Gharats
Ancient traditional watermills used in hilly regions of India.

Ghats
Series of steps leading down to a body of water like a lake or a river usually used for religious rituals.

Kund
A reservoir or tank used for harvesting rainwater for drinking purposes.
REFERENCES


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APPENDIX
The devastating 2013 Flash floods in Uttarakhand, India (a state in northern India) were a massive loss to land, water and mankind. The holy river Ganga, flooded the Hindu shrine of Kedarnath Valley (northern corner of the Hindu pilgrimage circuit) and swept away pilgrims, inhabitants, houses and flora/fauna. The unchecked tourism and unregulated urban sprawl aggravated the calamity to an apocalypse causing severe damage to infrastructure and the religious landscape of the valley. Today, the post-disaster landscape is not just a challenge for physical reconstruction but also psychological re-building as the site holds a strong spiritual, social and political identity. Even after the disaster, the faith in the god brings the people in large amounts that increases everyday. The ruptures caused by the disaster presents the following challenges for the landscape response: to remember the lives lost, the prior condition of the landscape, the intimate attachments to places now gone and the recurring of the event itself.

During my visit on-site in the past week, I wanted to know what the people really felt about the place. The user group of Kedarnath valley include Daily Porters (carry people on horses to the valley), locals from nearby villages who work near the temple, current construction workers, pilgrims, trekkers etc. I interviewed some of them and asked them to draw the trek route map to the valley from the last motorable spot.

According to the association of these people to the valley, the maps also varied. Some very detailed and some very vague yet having certain elements that remained constant in every map. These elements were mainly the major landmarks or eye-catching features that is perceived by every individual who is linked to the valley.

This exercise really helps me to analyse the way people perceive a place and how they associate towards certain landscape elements in their everyday life. These are also key elements that I should be looking at while designing for my design problem.
THE OLD MAN: LOCAL
Rameshwar Goswami, 70

- Has lived all his life in the nearby village and visits the valley once every two years.
- Map is not to scale.
- Major landmarks like Helipads, river, and temple are highlighted.
- Start point is not clear, but end point is clear.
- Very rough idea about the place can be gathered.
- Not aware of the new route.
- The island is demarcated with a boundary hence sense of enclosure is felt.
LOCAL CONSTRUCTION WORKER
Rai Singh Rao, 45

- Lives in the nearby village and visits the valley almost twice a week.
- Map is almost to scale.
- Major landmarks like Helipads, river and temple are highlighted.
- Distances and time taken are accurate. Levels are also marked.
- Drawing is clear and provides important information.
- Aware of the old and the new route.
- New constructions and changes marked.
LOCAL RESCUER
Bhakt达尔shan, 48

- During the floods, a group of people from the village went to look for survivors.
- A new route through the forest was taken.
- Map is not to scale and does not depict clear directions or information.
- A route is through forest, trees and landslides observed are marked.
- Start and end point are clear.
- Aware of the conventional route which was broken during floods.