(in)-between Transience and Permanence

Synchronising infrastructures and material geographies within the vulnerable Himalayan landscape in Uttarakhand, India

P5 Graduation Report
June 2024

Anmol Bhargava
5790824

First Mentor:
Taneha Kuzniecow Bacchin

Second Mentor:
Nikos Katsikis

Transitional Territories
Altered Nature. Poetics of Change

Delft University of Technology
Faculty of Architecture and the Built Environment
Master of Science Architecture, Urbanism, and Building Sciences
Department of Urbanism

All the drawings in this thesis are drawn by the author
All the photographs in this thesis are taken by the author unless stated otherwise

Acknowledgements

The graduation thesis has been a long and arduous journey and I would like to extend my sincerest gratitude to the numerous individuals and institutions that have supported, guided and encouraged me throughout this process. Without their unwavering support, this project would not have been possible.

First and foremost, I would like to express my deepest appreciation to Taneha, whose eloquent guidance and constant encouragement were critical to this project. Her expertise in critical design theory and her profound knowledge in landscape urbanism constantly helped me rethink and reflect upon the methodology and contribution of this thesis to academics and practice. Her calmness and kindness and our conversations beyond the project itself, about our values and responsibilities and the agency of design will continue to stay with me.

I am equally grateful to Nikos, for his continuous support and critical insights into the development of this thesis. His expertise in urbanisation theory, territorial design and systems thinking were pivotal in the framing of this research and his pragmatic feedback has greatly influenced how I perceive human and more than human processes beyond borders.

I would like to thank the scientists, administrators, activists and all individuals who were a part of this research, for sharing their valuable time, experiences and insights, which contributed to the richness and authenticity of this project.

I also want to extend my sincere thanks to all the tutors, colleagues and friends at the Transitional Territories studio. The collective wisdom, camaraderie and collaborative spirit of this graduation studio fostered an ideal environment for academic growth and personal development and I feel very fortunate to have been a part of it.

I am especially grateful to my friends who provided me with encouragement, support and sometimes, a necessary distraction from academic pressures. Thankyou for the countless memes, the laughter and for keeping up with me through my lows.

On a personal note, I am deeply indebted to my family. To my parents, whose unwavering belief in my abilities provided the foundation for my academic pursuits, and to my younger brother, Amit for his constant encouragement and emotional support. Their love and sacrifices have been my greatest source of inspiration.

In conclusion, I extend my heartfelt thanks to everyone who has been part of this journey. Your support, in various forms, has been indispensable, and words cannot adequately convey my gratitude. This thesis is as much a testament to your contributions as it is to my efforts.

Abstract

Within my graduation project I am investigating the drivers of change which have resulted in Urbanisation of the Himalayas. Seasonal activities such as pilgrimage, tourism, militarisation and hydropower production have rapidly altered the Himalayan Ecology as well as the socio-cultural landscape and its regional economies. To support these activities, large scale Critical Processes such as Infrastructural Development and Resource Extraction have been operationalised amidst the vulnerable Himalayan Geography has resulted in a state of Accumulation, . The existing model of urbanisation and anthropogenic appropriation of the Himalayas is transforming the region into a Global Hinterland and it will only amplify the degree of risk as well as the frequency of disasters in the region. This calls for a pedagogical shift in the model of urbanisation and the spatial logic of developing and maintaining infrastructures within the vulnerable Himalayan Landscape.

Thus, this project hypothesises an alternative approach of Spatio-Temporal Synchronicity which synergises the various ephemeralities within the critical processes in the region, through the agency of Spatial Design. A series of strategic operations are undertaken to synchronise the ephemeral processes within the material geographies of their context by adding, repurposing or removing infrastructures to serve a certain program during a certain time period which are further recycled and displaced to a new site to cater to a new process/program. Thus, the existing practice of accumulating infrastructures is acted upon by a set of Reductive operations which follow a Spatio-temporal program.

The region encompassing Alaknanda and Niti Valleys and the subsiding town of Joshimath, situated on their intersection, is chosen as a paradigmatic area to investigate and test this hypothesis through the research by design approach. Methods such as literature review, critical cartographies, field visit, interviews are employed to analyse the context which is followed by an adaptive cross-scalar strategic framework. It proposes a set of spatio-temporal operations that are manifested in the form of design experiments which try to spatialise and project development along the lines of Spatio-Temporal Synchronicity.

Keywords:
Urbanisation, Himalayan Landscape, Infrastructural Development, Accumulation, Ephemerality, Spatio-Temporal Synchronicity, Material Geographies

Table of Contents

1. Introduction

1.1 Project Context

Urbanisation of the Himalayas

The Himalayas are the highest mountain range in the world located in Asia which separates the plains of the Indian subcontinent from the Tibetan Plateau. It spans across five countries: India, Nepal, Bhutan, China and Pakistan, along a length of 2,400 kilometres, from the Indus River in the west to the Brahmaputra river in the East. The Himalayas are also the source of several major river systems including the Ganges and its tributaries, which are considered sacred in Hinduism and many pilgrimage sites and cultural landscapes have evolved along their banks, over centuries. This mountain range is home to rich biodiversity, with a wide range of flora and fauna (Britannica, 2024). Due to its size and scale, it acts as a climatic barrier and shapes the natural resources which support the urbanisation processes within the region. The availability of these very resources enables human processes which in turn transform the natural landscape to meet their demands, giving rise to dichotomies such as 'city vs nature' and 'nature vs society'. However, a combination of susceptibility to natural disasters, unplanned spatial and infrastructural development and large-scale extraction and power generation projects have rendered this geologically sensitive geography vulnerable.

The history of urbanisation in the Himalayas dates back to over a thousand years ago wherein a series of temples were constructed within the remote corners of the region and only the most arduous devotees would undertake this pilgrimage. Over centuries, this cultural landscape was shaped by human processes as more and more people started moving from the plains to this resource rich haven consisting of fertile soil, abundant water and food resources, resulting in the development of small agrarian societies within the region, organised within small independent kingdoms. However, with the advent of industrialisation and the smaller monarchies being replaced by capitalist regimes, the Himalayas were steadily transformed into a vast hinterland to supply food, water, hydroelectricity, timber and other raw materials to the bigger urban centres. Moreover, the picturesque setting of the Himalayan towns was overexploited to promote unchecked tourism which resulted in further urbanisation within this vulnerable setting. With the resource extraction operations on the rise in the Himalayan Capitalocene, the global hinterland debate has been set forth: How will the cities and the hinterlands within the Himalayas react to these rapid urbanisation, growing demands and supply chains and how will they adapt to the ongoing transitions in the energy sectors with an increased emphasis on renewable energy sources and rising geopolitical complexities? Will these Himalayan cities continue to grow or will the entire region be transformed into a Global hinterland? (Brenner & Katsikis, 2021)

The following project focuses on the region around the sinking geographies of Joshimath, located in the Himalayan state of Uttarakhand, India. A juxtaposition of multiple ephemeral landscapes such as pilgrimage, trtourism, military and so on, this vulnerable landscape has been rapidly subsiding amidst infrastructural developmental projects, resource extraction operations and susceptibility to natural hazards.

Fig. 1: A typical urban settlement in the Himalayan state of Uttarakhand, India

1.2 Problem Field

A. Drivers of Change

i. Pilgrimage / Char Dham Yatra

The Char Dham Yatra is a pilgrimage circuit comprising the four temple towns of Yamunotri, Gangotri, Kedarnath and Badrinath, located in remote river valleys in the Garhwal Himalayas in Uttarakhand, India. This revered pilgrimage attracts millions of pilgrims every year, driving economic activity and fostering infrastructure development across the region. The influx of pilgrims every year creates many employment opportunities in the hospitality, transportation, services and retail sectors and the native population is progressively shifting towards tourism-based economies. To accommodate the increasing number of pilgrims year after year, the government and private sector have invested a huge capital in building large infrastructural projects such as the Char Dham National Highway, an 889 kilometres long National highway with a road width of 10 metres to facilitate movement of tourists in Uttarakhand. The growing pilgrimage influx has also led to a boom in construction and real estate sectors, leading to rapid urban growth along the pilgrimage circuit. However, these processes have also had negative implications on the environment as they have resulted in issues such as deforestation, soil erosion and waste management, thereby threatening the fragile Himalayan Landscape. Thus, the Char Dham Yatra has been a catalyst for urbanisation in Uttarakhand and will continue to bring economic benefits to the region but its magnitude needs to be regulated, based upon the carrying capacity of the region. (Sati, 2023)

ii. Seasonal Tourism

Seasonal tourism has significantly contributed to the urbanisation of the Himalayas in the state of Uttarakhand, India. During summer, the majority of the population entering the region are pilgrims on their way to Char Dham Yatra but many of them also stay and visit the numerous hill stations on the way. Winter tourism has significantly gone up through the development of winter sports and adventure tourism in the region.These activities include skiing , snowboarding and other snow-related activities which are possible in the region owing to heavy snowfall in the months between November and March. Auli, one of the premier winter destinations in Uttarakhand, has seen a massive surge in the number of tourists who come for its pristine slopes and winter sports facilities. The tourists influx also helps in generating revenue for the regional population and therefore there has been a major investment in the development of transportation networks as well as accommodation facilities such as snow lodges, resorts and so on, resulting in the creation of urban hubs such as Joshimath which act as a more permanent economic to support this seasonal influx of tourists. Many tourists also visit the region for trekking and mountaineering expeditions such as the Valley of Flowers , Hemkund Sahib and the Nanda Devi Biosphere Reserve, a UNESCO World Heritage Site famous for its ecological biodiversity. Thus, seasonal tourism has acted as a major catalyst for urbanisation in the region but owing to its negative socio-ecological implications, it needs to be kept under check in the long term.

iii. Geopolitical conflicts

Border conflicts between India and China along the Line of Actual Control (LAC) in the Himalayas have risen due to its strategic importance, forcing the Indian government to deploy and develop rapid military mobilisation and logistical support. This has resulted in Strategic Infrastructure Development which includes an extensive network of roads and bridges to improve accessibility to remote border areas. Large infrastructural projects such as the Char Dham road project serve a dual purpose of facilitating pilgrimage as well as enhancing defence logistics. New airstrips and helipads have been built, to support quick troop deployment and supply missions in case of conflicts. Moreover, military presence along the border has led to the establishment of semi-permanent and permanent settlements such as cantonments, camps, supply and support services. In order to sustain and support this strategic infrastructure, the Indian government has also provided economic incentives such as development subsidies and grants as well as there have been initiatives to create Special Economic Zones with tax breaks and investment incentives to promote regional industries, agriculture and tourism. Thus, geopolitical conflicts facilitate urbanisation due to security considerations, but at the

Fig. 2: Pilgrims at Badrinath Temple. (Tripathy , 2018)

Fig. 3: Winter tourism at Auli (Sethi, 2007)

same time they bring about economic development as well as socio-ecological challenges within the region. (Chakraborty, 2022)

iv. Hydropower Production

Hydropower production has been a significant factor in driving urbanisation of the Himalayan region in Uttarakhand, India. The rugged terrain and abundant river systems make the state of Uttarakhand an ideal region for development of hydropower projects. The construction of large dams and power plants requires the development of an extensive infrastructural network of roads, bridges, tunnels and supporting utility services. These projects often result in the creation of new townships and urban sprawl to accommodate their workforce. Moreover, the presence of hydropower projects spurs the growth of ancillary industries , thereby contributing to economic diversification. However, construction of dams and alteration of river systems also result in severe ecological imbalance. Rivers need to be diverted from their natural courses in order to build reservoirs which has an adverse impact on aquatic life and their livelihood, affecting the spawning and migration cycles of fish and other aquatic species. Building dams and reservoirs often require land clearance, deforestation and displacement of wild animals. Construction activities disturb the soil structure, making it more susceptible to erosion and , in turn, resulting in a higher sedimentation load in rivers. Large reservoirs also emit greenhouse gases, which accelerates the rate of glacial meltdown. The dead load of water in the reservoirs has also been found to accelerate seismic activity and occurrence of land subsidence in the Himalayan landscape. Although hydropower remains a crucial source of producing clean energy, the large scale infrastructure required to produce it coupled with its negative implications on the socio-ecological landscape, it is essential to balance hydropower development along with the preservation of the ecological integrity of the region. (Hussain et al., 2019)

v. Regional Economies

Urbanisation has brought about significant changes to the traditional regional economies, which were predominantly based on agriculture, livestock rearing and small-scale artisanal activities. As the growth in pilgrimage and tourism sectors has facilitated the development of infrastructural networks in the region, there has been a steady shift from traditional agriculture to service-oriented and tourism related activities in the region. This shift often results in the abandonment of agricultural terraces, which served as the primary source of income for the local population over centuries. Increased connectivity has also resulted in a gradual shift towards modern farming practices, but limited knowledge in their application is still a hindrance. Moreover, these practices focus on economic productivity which has negative implications on crop diversity as well as results in a loss of traditional farming methods and techniques. Moreover, the constant conversion of farmland and forested areas into commercial land parcels is also responsible for loss in traditional farming techniques, herding, community forests and traditional land tenure systems.

vi. Native Population

Urbanisation has resulted in the shifting of focus away from traditional agricultural practices to urban jobs and commercial enterprises, leading to the economic displacement of farmers who may not have the skills to adapt to the changing socio-cultural values. It has also resulted in a socio- cultural erosion and a loss of traditional craftsmanship, which were usually passed down through generations. The development of large-scale infrastructure to cater to the needs of the seasonal population of tourists and pilgrims, has resulted in deforestation and habitat loss, increased pollution , water and waste management challenges. A majority of the smaller towns and villages in this region are dealing with issues of migration of the younger generation to the urban centres and depopulation of villages. Moreover, excessive pressure on the fragile himalayan landscape has increased its vulnerability to natural calamities such as flooding and land subsidence.

Fig. 4: Tapovan Vishnugad Hydropower Project.

Fig. 5: Agricultural Terraces around Joshimath

B. Critical Himalayan Landscape

Historically, the Himalayan Geography has been prone to vulnerabilities due to its complex geographical setting and the human and non-human forces residing within it have evolved over time to be adaptive and resilient in the face of these natural calamities. However, the advent of rapid urbanisation and climate change has resulted in increased vulnerabilities which can be attributed to the following factors:

i. Natural Hazards

The vulnerability of the Himalayas to natural disasters can be attributed to a combination of geological, geomorphological and climatic factors.

Geological & Geomorphological:

[a] The Himalayas are located in a seismically active zone due to the collision of the Indian and the Eurasian tectonic plates. The ongoing convergence of these plates results in frequent earthquakes and other seismic hazards. Moreover, the steep and rugged terrain of the Himalayas also renders the region susceptible to landslides and avalanches.

[b] For instance, the region around the town of Joshimath India has witnessed numerous earthquakes, landslides and flashfloods of varying magnitudes in the past centuries. This can be attributed to its geographical setting over a fossil valley of the Alaknanda river, which may have been buried under an ancient weak, overburdened landslide mass from both glacial and fluvioflacial deposits. These morainic deposits are composed of irregular boulders and clay of varying thicknesses and are less cohesive in nature, thus making the area susceptible to land subsidence. Moreover, the town is situated on the Higher Himalayan Crystalline Rocks of the Vaikrita Group (mesoproterozoic to Neoproterozoic rocks), primarily high-grade gneisses and schists. Joshimath is bound with a north-west trending Pindari thrust in the north-east and the Main Central Thrust in the southwest, thus experiencing frequent tectonic activity (Rautela, 2005).

Hydrology & Climatic:

[a] The Himalayas acts as a natural climatic barriers and owing to this physiological feature, this windward side of the Indian Himalayas receives heavy rainfall from June to September which can lead to flashfloods, riverbank erosion and other water related disasters.

[b] The most recent instance of this was the 2021 Chamoli flashfloods which were caused by a glacial avalanche in one of the tributaries of the Alaknanda and took more than 200 lives at the NTPC-Tapovan dam construction site. The frequency of such floodinh has exponentially increased in the past couple of decades and it can be majorly attributed to climate change and heavy infrastructuralisation within this vulnerable territory (Bremner, 2022).

ii. Infrastructural Development

[a] The Himalayas have been subjected to rapid urbanisation in the last century to facilitate high tourist and pilgrimage influx which drives the economy of this vulnerable territory. These heavy infrastructural developments have resulted in ‘altered nature’, ie, drastic transformation of the existing natural ecosystems in the area for anthropogenic appropriation (Jha, 2023). These include the construction of roads, highways, bridges and tunnels as well as the development of tourism infrastructure on top of the basic infrastructural requirements ts of the local population residing within this region.

[b] Within the province of Uttarakhand which was formed in 2001 as a separate Himalayan state, the commodification of this mountainous region was chosen over its ecological balances (Agrawal, 2023). There was a significant emphasis on tapping onto the economic benefits from the plethora of pilgrimage sites and touristic locations which are located within Uttarakhand, especially the ‘Char DhamYatra’. The pilgrimage to the four sacred Hindu shrines is considered to be one of the holiest journeys in Hinduism and in order to facilitate this, massive infrastructural projects such as the ‘Char Dham Pariyojna’ are being undertaken to improve the accessibility of these remote locations through the construction of a 10 metre wide all-weather rode through this vulnerable territory (Rathee, 2023). Moreover, the local economy is heavily dependant on tourism which is seasonal in nature, i.e., the pilgrimage circuit is active during the summers from April to October whereas the period between December and February attracts a large number of tourists who flock here for hiking expeditions and adventure sports such as skiing. Therefore, a large number of unplanned tourism infrastructure has mushroomed all over this region to facilitate these processes. Furthermore, the proximity to the Indo-China border has resulted in heavy militarisation

Fig. 6: Uttarakhand Flash Floods (Indian Army, 2013)

Fig. 7: Rescue operations at the Silkyara Bend-Barkot Tunnel collapse (Jose-Kutty-Panackal, 2023).

of this region which includes improving border connectivity through extensive road network and positioning military infrastructures at strategic locations. Thus, this entire vulnerable territory is juxtaposed by these ephemeral processes which are facilitated by these infrastructural developments (Al Jazeera, 2023).

iii. Resource Extraction Operations

[a] The Himalayas have been appropriated for centuries to support human processes. The availability of natural resources enabled these human processes which in turn transformed the natural landscape to meet their demands, giving rise to dichotomies such as 'city vs nature' and 'nature vs society'. Extractive processes such as intensive agriculture, deforestation, mining operations, damming of rivers has transformed the existing vulnerable geography into a high-risk territory which is highly susceptible to riverine flooding, landslides, land subsidence and climate change. Thus, the More-than-Human processes which originally shaped the natural landscape and the human processes it contains are in a critical condition due to unchecked urbanisation in the Anthropocene (Ellis, 2014).

[b] The region around Joshimath was initially appropriated as a productive agricultural landscape which facilitated for grains, vegetables, horticulture and dairy products and accounted as the primary source of income for the local population. However, with the industrial revolution and the advent of the Himalayan Urbicene, the focus was shifted towards deforestation for timber products, mining opperations and the creation of dams on the numerous river systems within the region for renewable energy generation. These extractive operations have altered the natural landscape in unimaginable ways and have further increased the degree of vulnerability of the region, which can be seen in the form of man-made disasters such as the sinking of the town of Joshimath (Ahmad, 2023).

iv. Degrading Socio-Cultural Ecologies

Urbanisation in the state of Uttarakhand has led to socio-cultural degradation by erosion of traditional practices and knowledge in farming, weaving, pottery and other traditions, lewding to a gradual disappearance of these practices. The oral histories, narratives and folklores that are closely knit to the socio-cultural identities of the place also face the risk of oblivion due to mass migration. Urbanisation has also impacted the ecological balance of the region as it has led to the encroachment of natural areas such as sacred groves, rivers which hold socio-cultural significance amongst the local population and they are central to their traditional rituals and community identity. Environmental degradation for large scale infrastructure and extractive operations has also altered the natural Himalayan landscape. Moreover, tourism and pilgrimage have emerged as such strong economic drivers within this region that these processes have led to the commercialisation and commodification of these socio-cultural practices, thereby losing its innate authenticity and cultural value. Lastly, the preservation of intangible heritage has been neglected due to overemphasis on urban development.

Fig. 8: Uttarakhand Flash Floods (Indian Army, 2013)

Fig. 9: Abandoned terraced villages in Uttarakhand (Varun Shiv Kapur, 2009).

Problem Focus

The Chamoli district in Uttarakhand, India, is renowned for its picturesque landscapes, ecological resources and rich socio-cultural heritage. The Alaknanda Valley, carved by the Alaknanda River, one of the major headstreams of the religiously significant Ganges River and it facilitates the process of pilgrimage owing to the presence of Badrinath Temple and Hemkund Sahib and many other religious sites. Niti Valley, located in the north-eastern part of Chamoli district near the Indo-China border, is a secluded and serene area known for its high altitude landscapes and unique cultural heritage. Historically, this valley facilitated cross border trade and cultural exchange and the valley's inhabitants, primarily engaged in agriculture and livestock rearing, uphold a unique set of socio-cultural values and intangible heritage.

The town of Joshimath is situated at an altitude of 1,890 metres above sea level, at the intersection of Alaknanda and Niti Valleys. It has a population of approximately 20,00 people and 4748 households and is an important pilgrimage site for Hindus, and is also known as the gateway to Badrinath. Joshimath also acts as the winter seat of the deity of the Badrinath Temple as the temple town is only operational from April to September and remains snow covered in the winters (NDMA, 2023). It is also a popular tourist destination, especially during the winter season due to its proximity to Auli, India's largest skiing resort and it also serves as the base for several treks and expeditions to nearby hikes such as the Valley of Flowers National Park or the Nanda Devi National Park. Moreover, due to its strategic location and proximity to the Indo-China border, it houses several army regiments and institutions such as the ITBP, BRO, GREF and so on (CNA Insider, 2023).

The town's economy is primarily based on tourism, with the majority of the residents being directly involved in the hospitality industry. In the rural areas in and around Joshimath, subsistence agriculture and animal husbandry are the major sources of income. Being situated in the close proximity of major tectonic discontinuities, Joshimath has been showing signs of distress due to burgeoning anthropogenic pressure, in the form of land subsidence. Several power generation projects such as NTPC's Tapovan Vishnugad Hydroelectric Project and JP's Vishnuprayag power plant have been sanctioned in the region to harness the energy of the fast flowing river systems, despite being fully aware of the geological/ environmental vulnerability of the area. There have been several geo-technical investigations and reports which have strongly recommended to restrict and ban heavy infrastructural development and excavation operation on the vulnerable terrain in the region, like the Mishra Committee Report of 1976 (Bisht & Rautela, 2010).

Beginning on January 2 , 2023, numerous houses and civil structures in the town of Joshimath began to experience major cracks due to land subsidence. According to the local residents, this subsidence had been noticed over several years but became increasingly severe from January 2 to January 8, 2023. The local government reported that 355 families were evacuated and temporarily relocated to hotels while a few others sought shelter with relatives or temporarily migrated to other parts within Uttarakhand (Bera et al., 2023). As per the bulletin reported by the district administration on April 27, 2023, 868 houses in Joshimath have been identified as having cracks and 181 houses have been marked as unsafe for living. The construction of NTPC's Hydropower project in Tapovan has been indefinitely halted, along with the functioning of the Joshimath-Auli ropeway. In the coming future, the rate of subsidence is likely to increase which poses a major threat to the future of the town itself (Sengupta, 2023).

Fig.10: Satellite image of Alaknanda-Niti Valley-Joshimath

1.3 Problem Statement

The rapid urbanisation of the Himalayas has been facilitated by the 'Drivers of Change', which include pilgrimage, seasonal tourism, geopolitical conflicts, hydropower production, regional economies and the native population. These have resulted in the creation of a 'Critical Himalayan Landscape', which is characterised by the following Critical Processes: natural hazards, infrastructural development, resource extraction and degrading social ecologies within the vulnerable landscape. Natural Hazards such as earthquakes are a naturally occurring phenomenon in this region as it is situated in seismic zone V as well as its vicinity to three fault lines. Lithographic and geological analysis shows that the region around Joshimath has a weak soil composition and is prone to landslides, soil erosion by perennial streams and glacial action. Moreover the landscape is also susceptible to seasonal riverine flooding due to heavy monsoonal outbursts as well as the threat of glacial lake outburst flooding which are a common phenomenon in this vulnerable territory. However, at the same time, natural forces might be disruptive but they also shape life sustaining natural processes. Infrastructural development in this region to support human processes of habitation, pilgrimage, tourism, militarisation and transport connectivity also increases the degree of vulnerability within this fragile landscape but at the same time these are key drivers of the regional economy of the Himalayan state of Uttarakhand. Extractive operation such as creation of hydroelectric dam projects, deforestation, mining, intensive agriculture and overgrazing are detrimental to the already vulnerable landscape but at the same time millions of households across the Indian subcontinent are directly dependant on these processes for life sustaining entities such as drinking water, food, power, minerals for industrial production and processing and so on. These processes have resulted in the degradation of the regional Social Ecologies resulting in a shift in traditional practices, loss of socio-cultural heritage, encroachment of natural areas and urban-rural migration and there is an imminent need to prioritise the rights and interests of the people of the region. This calls for the creation of a synergy between ecological processes, infrastructural development and resource extractive operations within the vulnerable Himalayan landscape of Alaknanda, Niti Valleys and the region in and around Joshimath, while safeguarding the interests of the regional population.

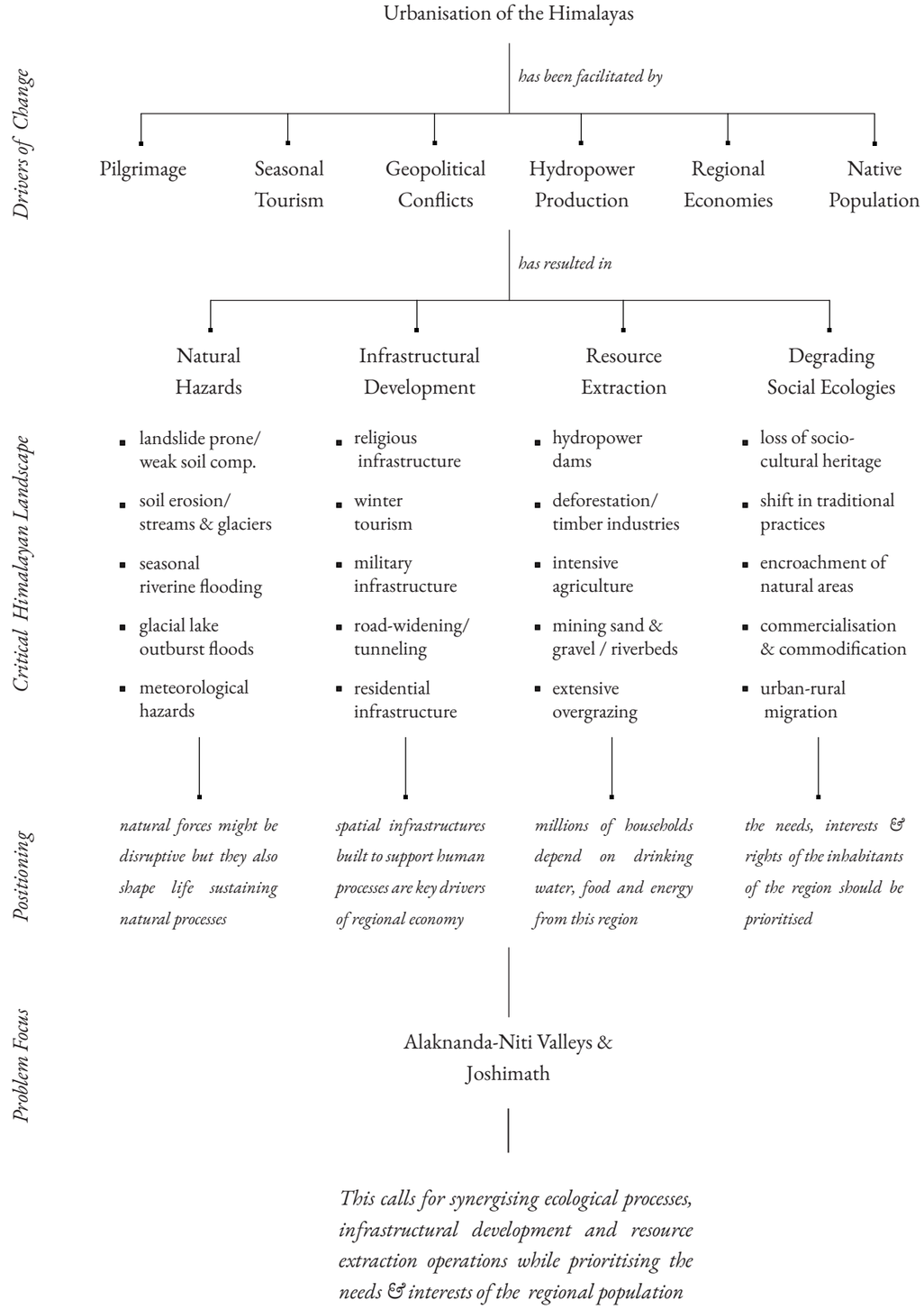


Fig. 11: Problem Statement

1.4 Manifesto

A project of the people, by the people, for the people of the region.

Fig. 12: Inhabitants of Joshimath outside Narsingh Temple.

2. Research Question

Main Research Question

How can we synergise infrastructural development and extractive operations within the vulnerable social ecologies of Garhwal Himalayas in Uttarakhand, India through the spatial agency of design?

Analysis sub-questions

A.1 How have the Human and More-than-Human processes resulted in the operationalisation of the Himalayan landscape in Uttarakhand, India?

A.2 How have the processes of Urbanisation resulted in the creation of Critical Landscapes in Chamoli district in Uttarakhand, India?

A.3 How have the processes of Urbanisation resulted in a state of Accumulation of large-scale permanent infrastructures and extractive operations within the vulnerable Himalayan Geographies in Uttarakhand, India?

A.4 How have the various perennial and ephemeral landscapes evolved over time and how do they manifest periodically within this vulnerable Himalayan Geography?

Design sub-questions

B.1 How to program the transition from the existing state of accumulation and extreme vulnerability in the region to a new spatial logic of urbanisation to support these spatio-temporal processes in the longue duree?

B.2 What are the future conditions of these processes of Urbanisation within which the project is positioned?

B.3 What are the strategies to synergise these critical human and ecological processes within the vulnerable, ephemeral landscapes and seasonal economies around the region?

B.4 What spatial operations/interventions within the agency of spatial agency can synergise infrastructural development, extractive operations awithin the vulnerable social ecologies of Garhwal Himalayas in Uttarakhand, India?

B.5 How can these strategies and interventions be projected on the territorial scale to synchronise and spatialise the spatio-temporal dynamics of these processes?

B.6 How can we evaluate and assess the performance and feasibility of the proposed design methodology and its spatial implications?

3. Methodology

3.1 Literature & Research Framework

The research comprises of three main categories of readings and literature review:site conditions, theories and earth sciences and site conditions. Research on the site started with a literature review of the ground reports from the disaster prone town of Joshimath. The scope of the site research covered the themes of infrastructural development & extraction operations such as the construction of dams and urban sprawl for economic gains that have resulted in a socio-ecological disaster wherein rapid ground subsidence has been observed in Joshimath. Further, readings of multiple theories which helped in understanding and dissecting the phenomenon of urbanisation in the Himalayas, programming a transition within vulnerable geographies and how to work with material ecologies in such dynamic, ephemeral landscapes. This research was further supported by the 'Lines of Inquiry' lecture series during Studio Essentials. For research into Earth Sciences such as Hydrology, Geology and Meteorology, the eight institutional reports which discuss the ground subsidence issues in Joshimath through multiple scientific perspectives were reviewed and analysed.

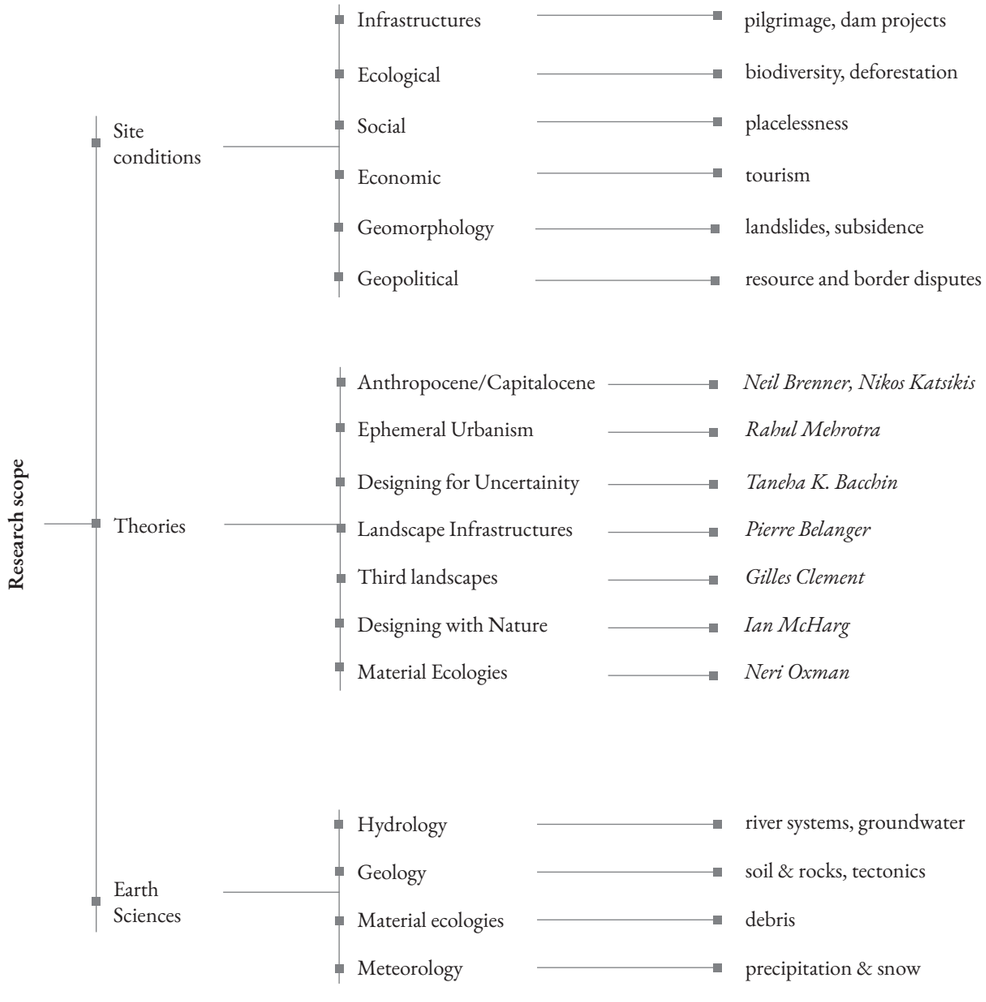


Fig.13: Research Framework

3.2 Spatial investigation & Catographic Exploration

The spatial analysis and cartographic exploration methods employed through the course of the project can be divided into 4 categories: Studio Essentials, Geographical Urbanism, Global Hinterland and Critical Landscapes. In Studio Essentials, subsequent cartographies are developed against the notions of composition, alteration, limits, palimpsest and transposition to understand, analyse and map the various critical processes within the region resulting from the anthropogenic appropriation of natural resources. In Geographical Urbanism, the spatial relationships of human, more-than-human, city and more-than-city processes is analysed and drawn through multiple scales ranging from the Indian subcontinent (5000 km x 5000 km) to the pressure on the subsiding ground within the sinking geographies of Joshimath (5 km x 5 km). Thereafter, under the Global Hinterland subchapter, the processes which have resulted in the operationalisation of the Himalayas are analysed which is further followed by a spatial investigation of each process individually to develop an understanding of how these have resulted in the creation of critical landscapes in the vulnerable region through a state of accumulation of infrastructures.

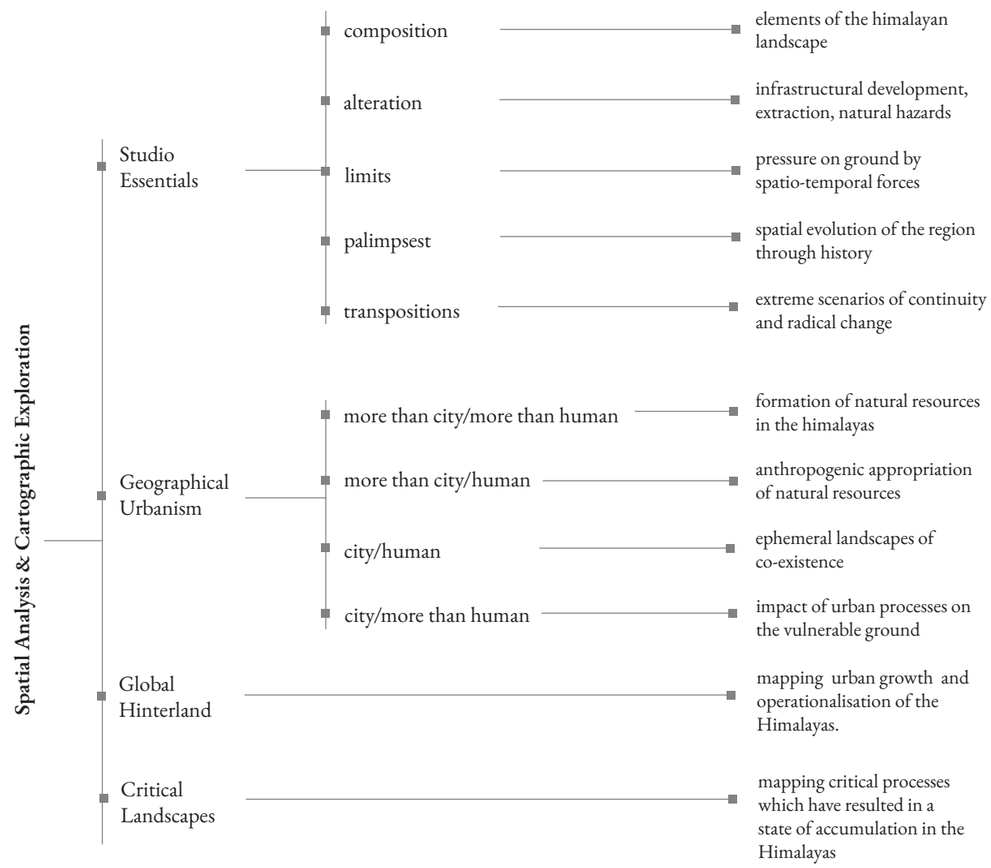


Fig. 14: Spatial Analysis Framework

3.3 Fieldwork & Data Collection

For fieldwork and data collection, the following four methods to collect data were employed: contextual study through literature review, interviews with experts, stakeholder interaction and field observation techniques. Through the series of interviews, an archive of the 'voices of the people' along with a series of cognitive maps. The interviews with the experts are translated into a deconstructed lexicon. An overall analysis of these four techniques helps in identifying the various subjects at different scales in and around the vulnerable region of Joshimath which are thereafter visually and spatially documented through a series of photos, video montages and cartographies.

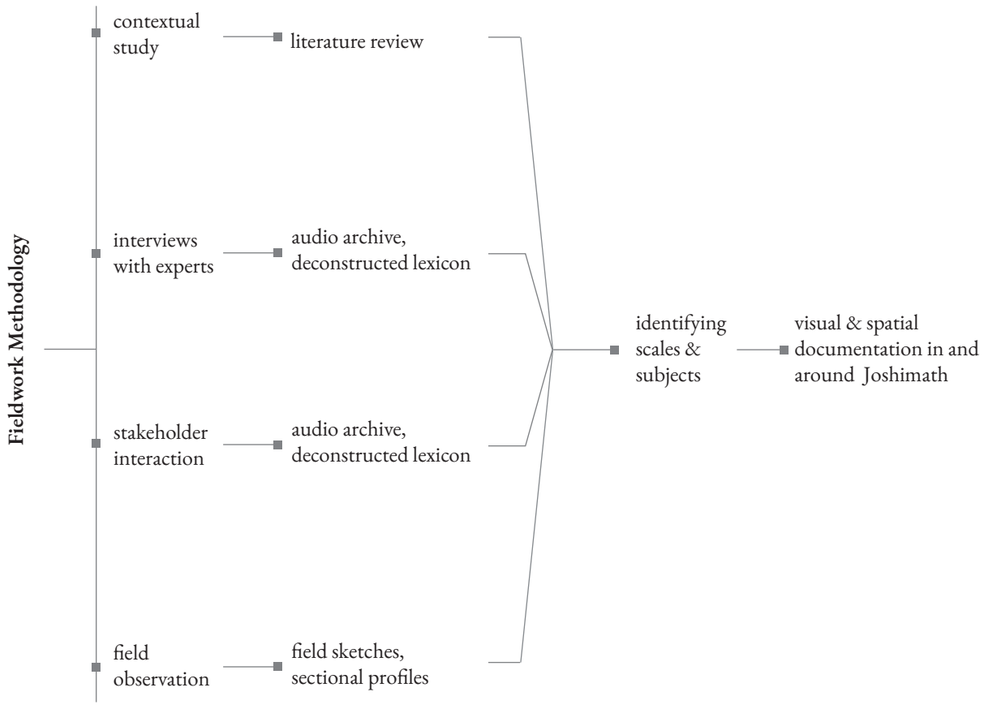


Fig. 15: Fieldwork Methdology

3.4 Design Synthesis & Project outcomes

The outcomes of this graduation project can be categorised into 4 main categories: Design goals & synthesis, Atlas of Critical Cartographies, Audio & Visual Archive and Theoretical Synthesis.

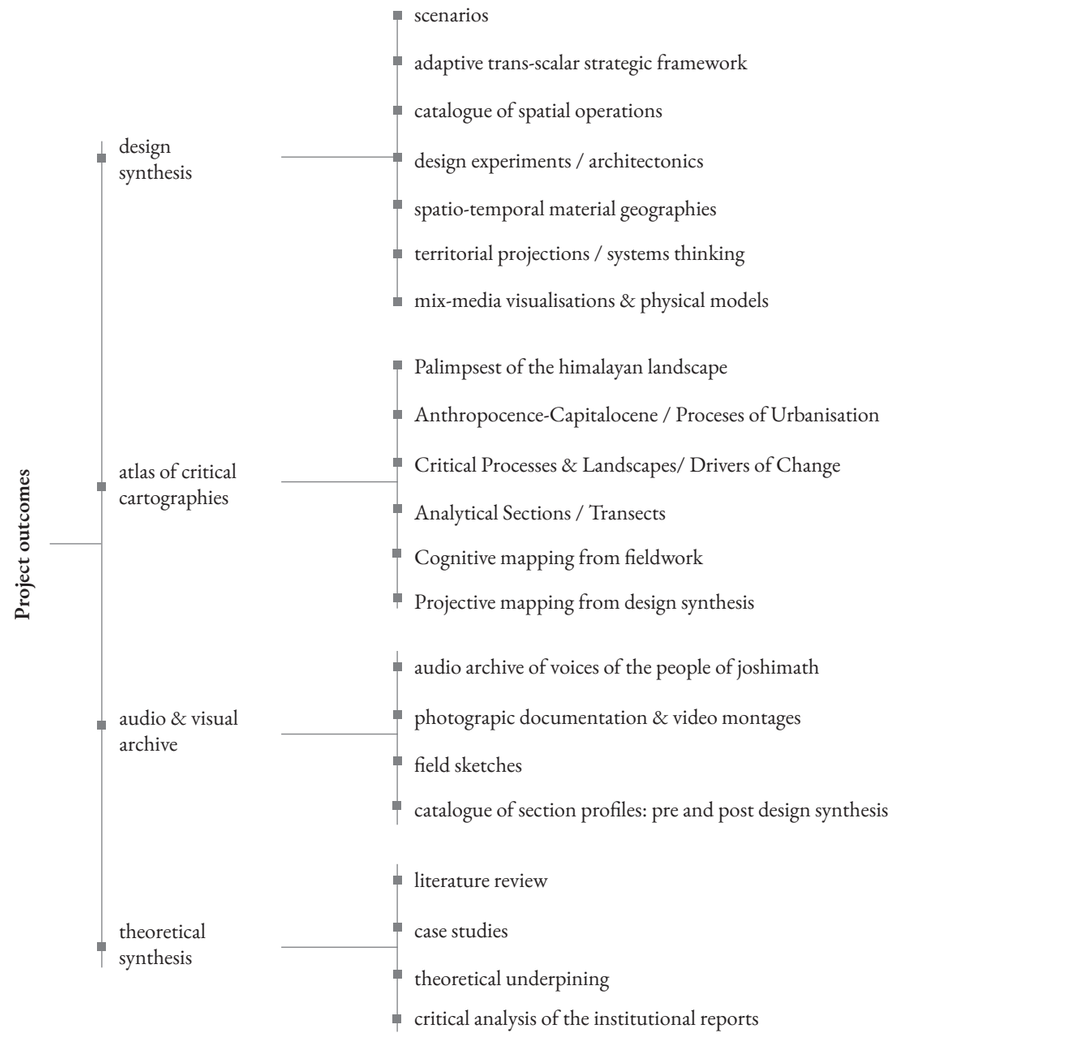


Fig. 16: Design Framework

3.5 Project Summary Framework

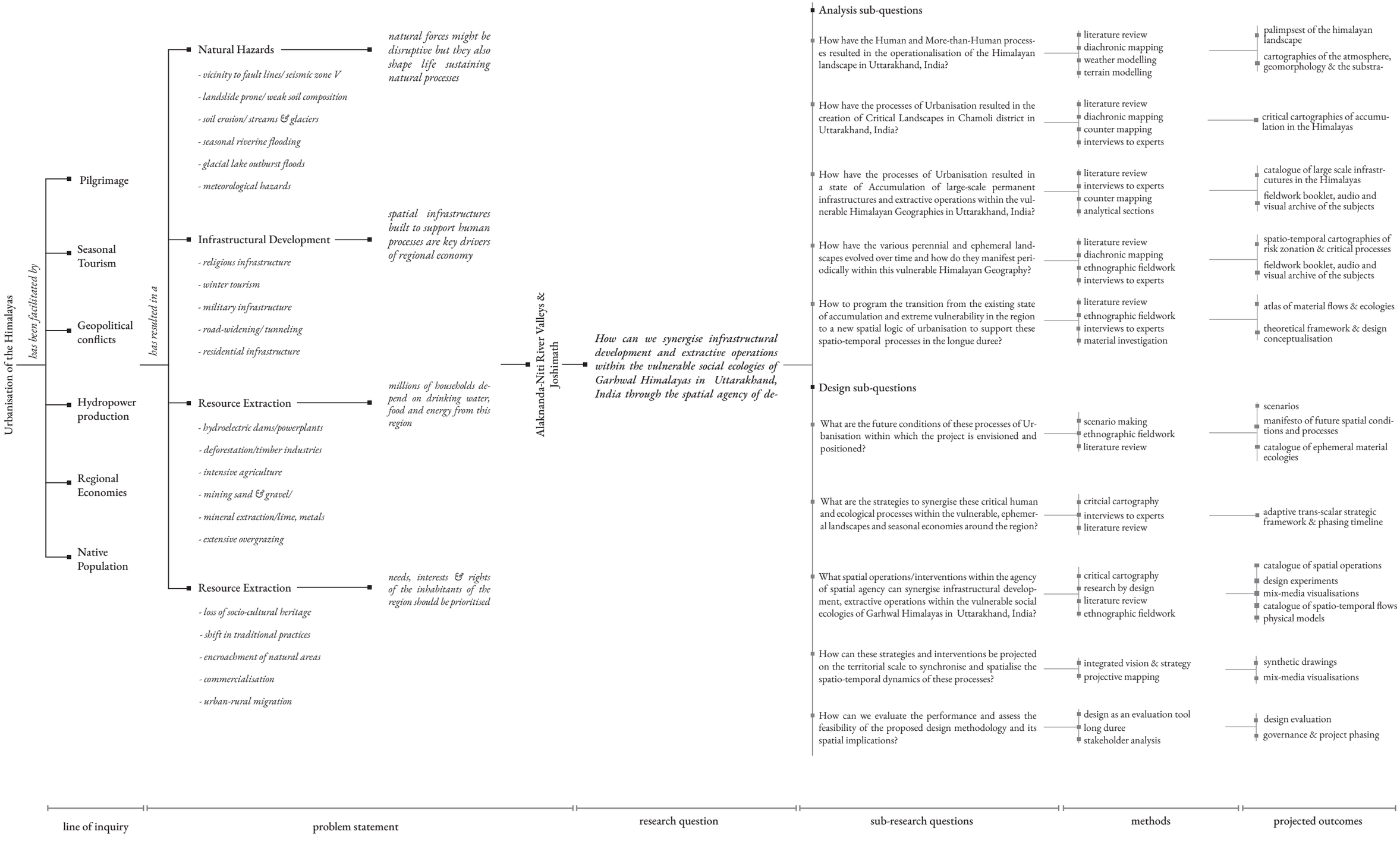


Fig. 17: Project Framework

4. Literature Review

4.1 Lines of Inquiry

A. Altered Nature

A (de)constructed lexicon is used to brainstorm and breakdown the complex research aims into a subject, object, verb, adverb and adjectives which helps in prioritising objectives through different scale and time . These provide the theoretical bases for the mapping/ drawing exploration. The concept of a 'white hole' shows the coexistence of different perspectives and how entities such as Nature and Infrastructure are often at conflict with each other, as is the case in Joshimath. Climate catastrophe further aggravates this problem as a formless, uncertain entity which has planetary effects. However, the notion of Pluri presence of uneven flows suggests that cannot homogenise the response options to this crisis as each context has its unique set of actors, specificity of place, scale and materialistic, vulnerabilities as well inter human and beyond human interdependencies. The concept of slow violence describes environmental and social harms that are caused by long term processes such as heavy infrastructural projects in the Himalayan territory which go unnoticed or are not prioritised. The roots of the human-engineered ecological catastrophe shows that whatever we as humans design has far reaching consequences beyond us, in this era of the Anthropocene.

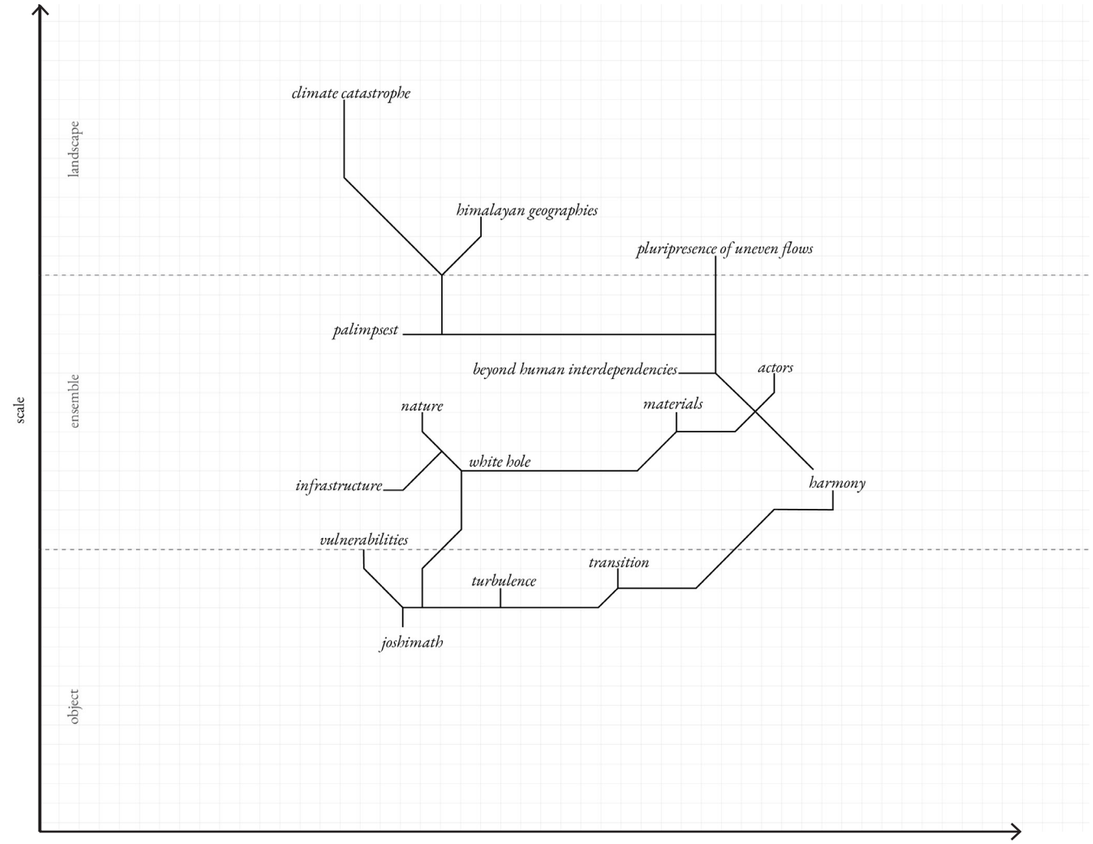


Fig. 18: Alteration of the Himalayan Landscape

B. Scarcity

Scarcity is a socio-ecological problem. The demand for water, food, energy, land and minerals has been rising exponentially making these natural resources scarce and more expensive. The Himalayas are a haven for these resources as most of the large rivers in India originate here as well. The area houses vast forests, agricultural fields, mineral riches and unique biodiversity. The Himalayan landscape acts as a reciprocal landscape to support and cater to the needs of the growing population living in the bigger urban centres in the vicinity. With the transition towards the use of clean energy, large hydroelectric projects and dams are being constructed in this region to support this shift which shall bring about a transition in regional economies. Moreover, there are extensive deposits of precious minerals as well as recent discoveries of rare earth metals which are set to disrupt the geopolitical future and have impacts on the planetary scale. Moreover, a high demand of tourism influx in the Himalayas has resulted in the need to develop supporting infrastructure which puts a stress on the regional socio-ecological resources.Resources are elements occurring in their natural state which have a functional use which is subject to time. The Himalayas are full of such natural human reserves which need to transition with the shifts in economies, energy technologies and regional geopolitics and this vulnerable geography needs to have a territorial agency to guide these shifts.

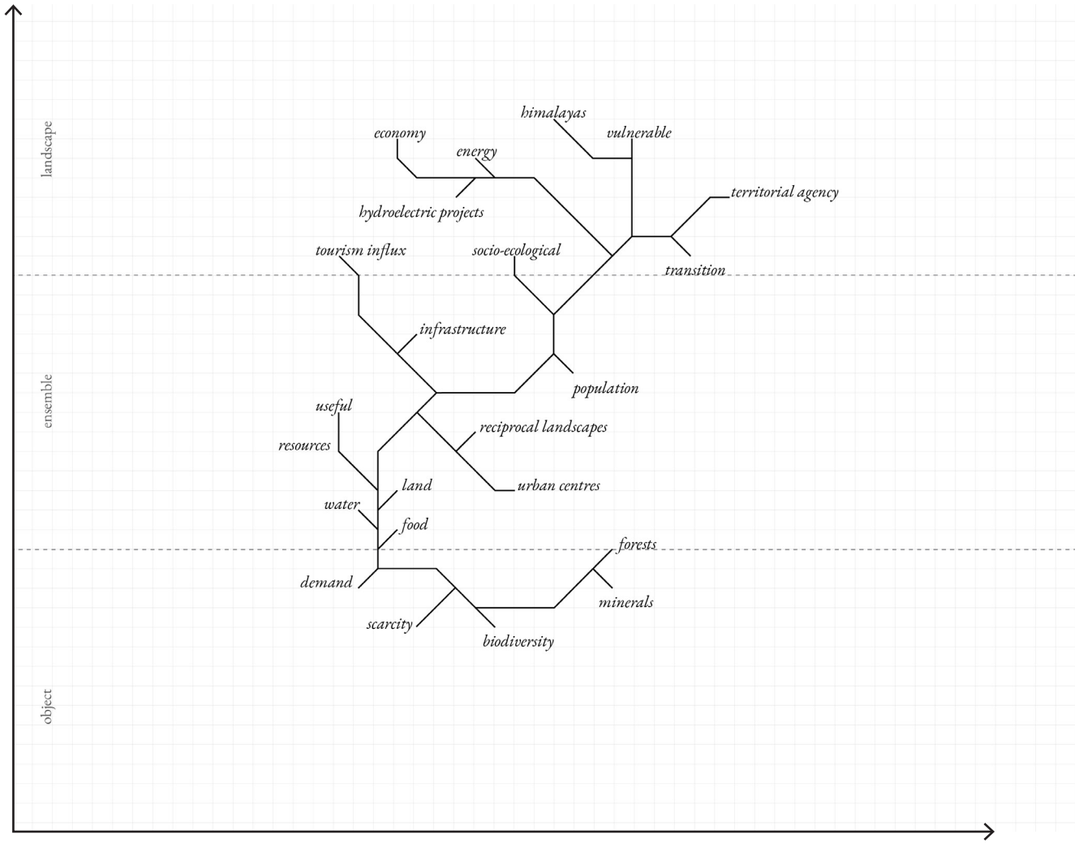


Fig. 19: Abundance of resources: a curse or boon?

C. Ground

Using the concept of the 'Assemblage and performance of urban landscapes', the vulnerable Himalayan landscape is a complex system encompassing numerous types of risks such as economic, environmental, geopolitical, societal and technological. Anthropogenic activities such as mining, intensive land and water usage as well emissions from infrastructural development projects accelerate climate change which inversely impacts human life through natural hazards such as landslides, floods, land subsidence and biodiversity loss and the sinking town of Joshimath is an extreme result of these activities. Moreover, the carrying capacity of the ground is a function of soil and water conditions in that specific region and the mismanagement of these resources has resulted in the sinking of the ground in Joshimath. Reverse Engineering with Nature is a concept which analyses complex natural processes and thereafter applies the principles in diverse fields. These two concepts can be projected into the case of extreme Himalayan landscapes to synergise the extractive processes in the region by taking a position: are we the aggressor or the victim? Furthermore, the quality, quantity and the performance of soil can be analysed and reconfigured to synergise the spatial planning and design practices within the vulnerable Himalayan territory. An understanding of the critical tectonics and the traditional knowledge systems along with a critical analysis of the landscape through the Layers Approach can also be implemented in studying the tectonics in Joshimath and to come up with experimental exploration of designing along with subsidence.

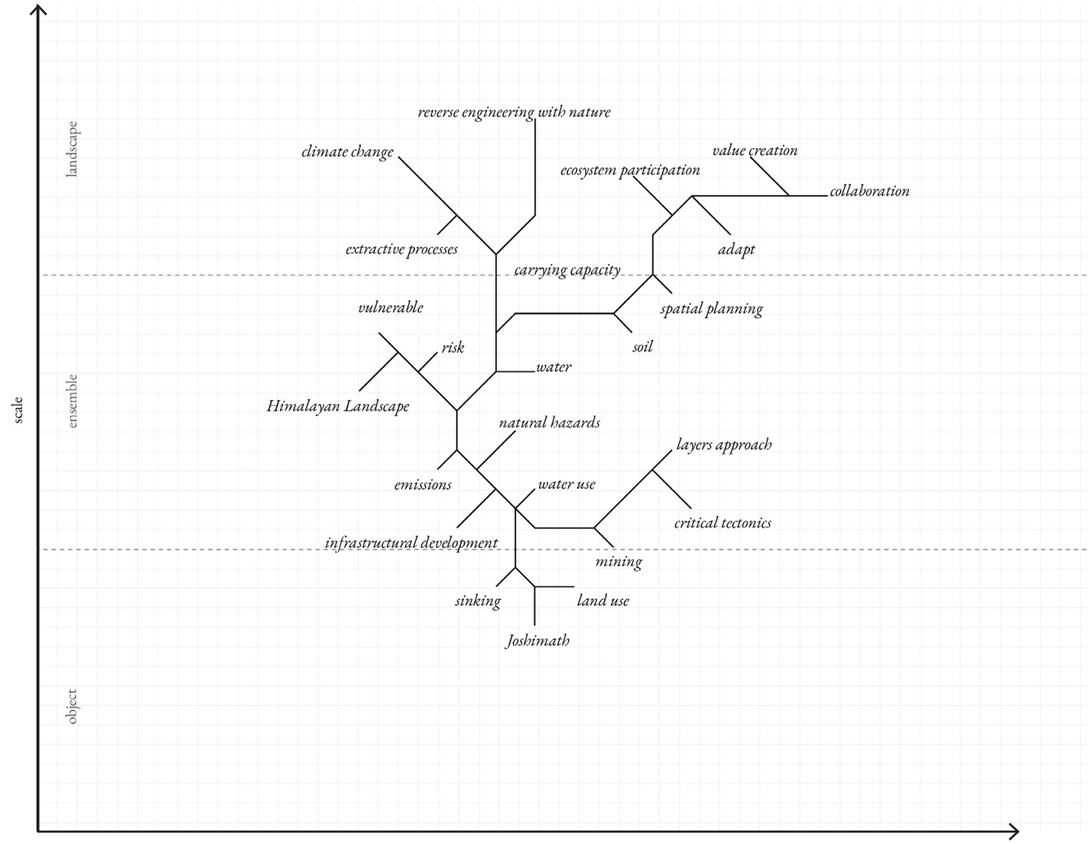


Fig. 20: Sinking Geographies

D. Rare Earth

Mining in the Himalayas is a complex and contentious topic that involves numerous environmental, social and geopolitical considerations. The Himalayan region is rich in mineral resources and has been a target for mining activities for decades as it houses vast deposits of limestone, dolomite, coal as well as metals like iron, copper and lead for their economic value. However, mining in this vulnerable region is a major threat to the local ecosystems which already share a critical relationship with natural hazards such as landslides which can be further exacerbated by mining activities. Moreover, since several major rivers originate in the Himalayan glaciers, mining activities can have downstream effects on water quality, which supplies drinking water for millions of people. Mining activities also have a profound impact on the indigenous communities and disrupt traditional livelihoods and lead to social conflicts. However, the recent discovery of rare earth minerals stretching 1000 km across the Tibetan plateau has rekindled the debate of mining in the Himalayas. The transition to a clean energy system brings new energy trade patterns, countries and geopolitical considerations into play and also govern the geoeconomics: the intermingling of national security and economic policy in extractive landscapes in the Himalayas. This calls for a spatial perspective to critically rethink the territorial effects of this transition.

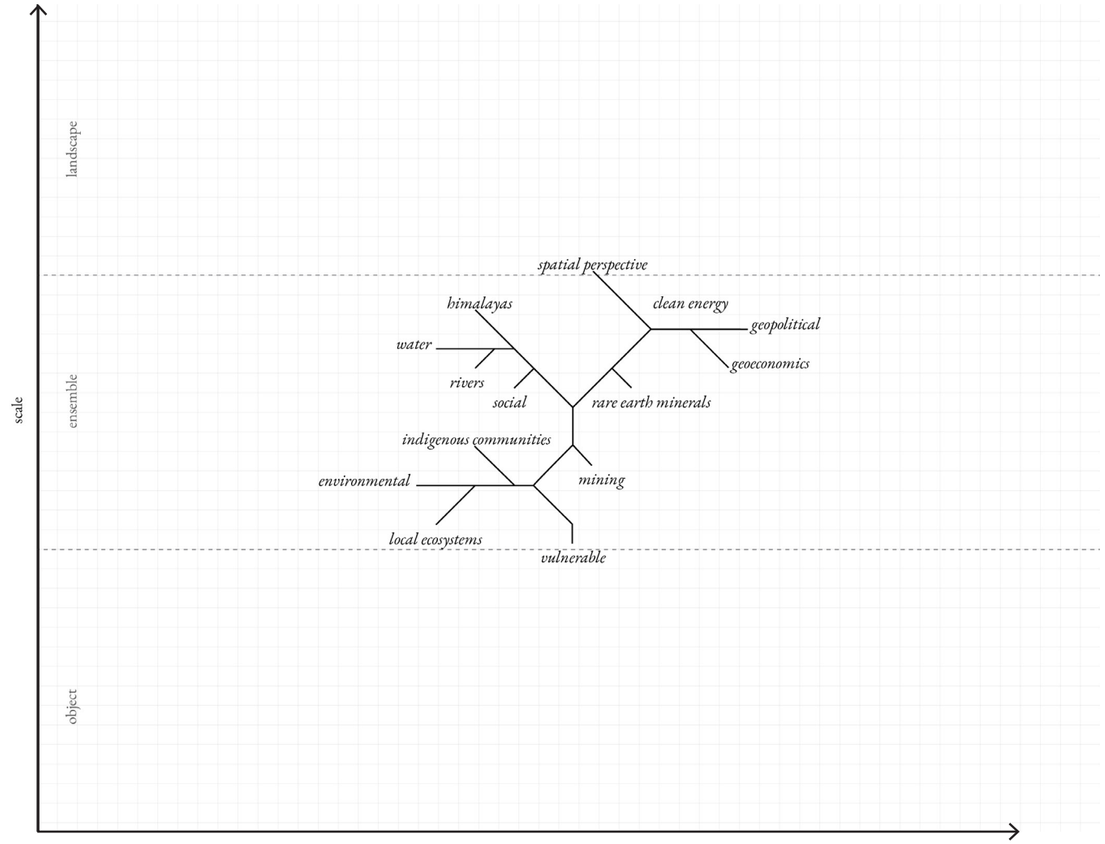


Fig. 21: The race to the Himalayan Treasure

E. Altered Values

Using the concept of the 'Assemblage and performance of urban landscapes', the vulnerable Himalayan landscape is a complex system encompassing numerous types of risks such as economic, environmental, geopolitical, societal and technological. Anthropogenic activities such as mining, intensive land and water usage as well emissions from infrastructural development projects accelerate climate change which inversely impacts human life through natural hazards such as landslides, floods, land subsidence and biodiversity loss and the sinking town of Joshimath is an extreme result of these activities. Moreover, the carrying capacity of the ground is a function of soil and water conditions in that specific region and the mismanagement of these resources has resulted in the sinking of the ground in Joshimath. Reverse Engineering with Nature is a concept which analyses complex natural processes and thereafter applies the principles in diverse fields. These two concepts can be projected into the case of extreme Himalayan landscapes to synergise the extractive processes in the region by taking a position: are we the aggressor or the victim? Furthermore, the quality, quantity and the performance of soil can be analysed and reconfigured to synergise the spatial planning and design practices within the vulnerable Himalayan territory. An understanding of the critical tectonics and the traditional knowledge systems along with a critical analysis of the landscape through the Layers Approach can also be implemented in studying the tectonics in Joshimath and to come up with experimental exploration of designing along with subsidence.

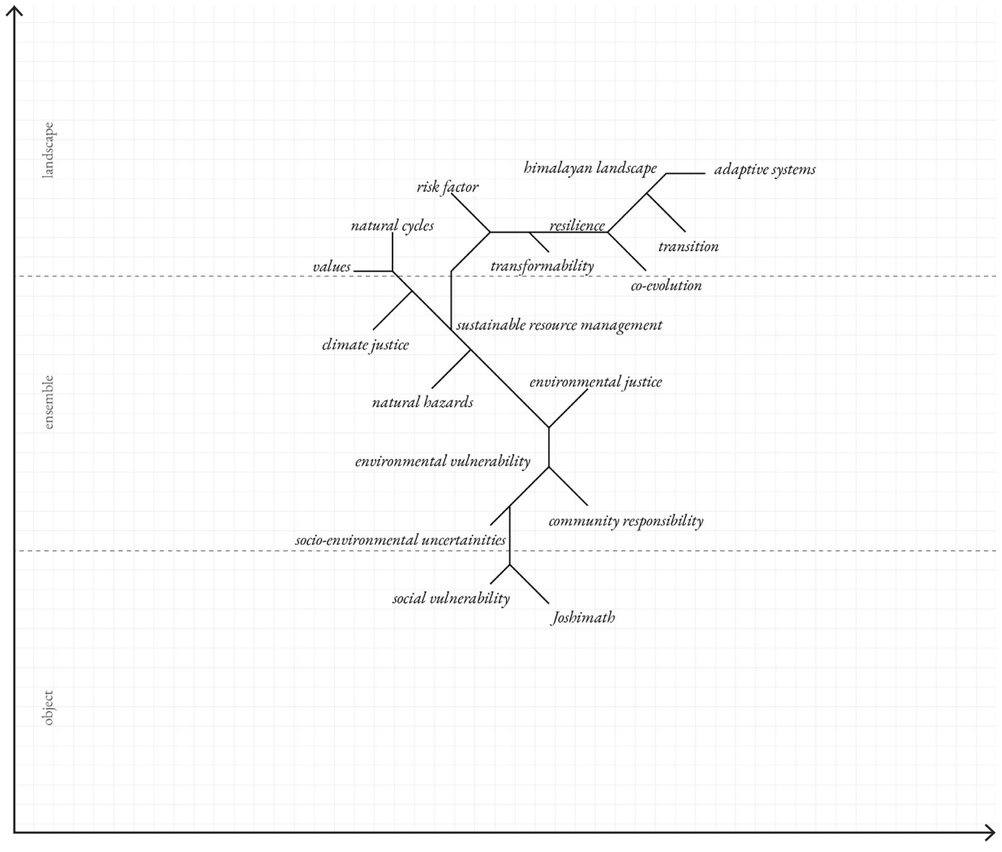


Fig.22 A new paradigm?

4.2 Theoretical Underpinning & Hypothesis

A. Anthropocene/Capitalocene

The Anthropocene marks the era in Earth's geological history which is characterised by a lasting human footprint on the planet's ecosystems. The Himalayas, the highest mountain range in the world, are also being constantly transformed due to anthropogenic appropriation of its natural resources to facilitate exponential urbanisation and industrialisation. These extractive operations are controlled and carried out within this vulnerable territory by powerful capitalist forces which has resulted in the alteration of its natural ecosystems, thus marking the beginning of the Himalayan Capitalocene. This period is characterised by drastic changes in the land use patterns within the region and the once agrarian society is being transformed by man into a concrete jungle consisting of large scale infrastructure projects being carried out to meet the planetary demands of the capitalist economy (Brenner & Katsikis, 2021). This gives rise to the Himalayan Urbicene which is a dystopian reality marked by frequent natural disasters such as flooding, landslides and land subsidence due to accelerated climate change, deforestation and biodiversity loss and adverse impacts on the indigenous communities living in the region for centuries. Moreover, the capitalist tendency to extract more and more has also resulted in geopolitical tensions between countries like India and China over the sharing of water and mineral resources within the region.

B. Design with Nature

McHarg's theory of Design with Nature synthesizes the idea that human operations such as the design and planning of the built environment should be in harmony with the natural environment. It emphasizes upon the integration of multiple disciplines to provide holistic design strategies, the ability to tackle wicked design problems residing in a wide range of scales and targeting landscape performance in a quantitative manner(McHarg, 2005) . Within the context of the sinking geographoes in the town of Joshimath, the principles of overlay mapping for the Himalayan ecological, geomorphological and hydrological processes as a preliminary base for designing anthropogenic operations in the region can be developed.

C. Ephemeral Urbanism

Ephemeral Urbanism refers to temporary and transient processes within the urban realm and beyond which include installations, events or temporary structures aimed at activating/ transforming a public space for a brief period of time. This concept seeks to engage communities, ponder material ecologiex and impermanence as well as ideate and test new solutions without the permanence and long-term commitment associated with traditional methods of urban planning : is a recognition of the transitory nature of physical substances integral to the city construction process (Mehrotra et al., 2022)? Within the vulnerable Himalayan context of the town of Joshimath which houses numerous perennial and ephemeral landscapes that continue to form and disintegrate, working with the idea of non-permanent configurations within the seasonalities of the city-landscape could prove to a pivotal step in transitioning from the current state of turbulence to future state of equilibrium between ecological processes and anthropogenic operations.

D. Material Ecologies

Neri Oxman's concept of material ecology suggests an approach to design that draws inspiration from natural systems and processes. She hypothesizes that matter which is secondary to shape constitutes the fallacy of design after craft and material should not be considered a subordinate attribute of form but rather its progenitor. The ability to design, analyze and fabricate using a single material unit implies unity of physical and digital matter, enabling nearly seamless mappings between environmental constraints, fabrication methods and material expression (Oxman, 2010). Within the vulnerable landscape of Joshimath, the faculty to author new forms of expression will depend on matter, fabrication, environment and its integration into the design practice as an undifferentiated scheme, able to process matter into shape as informed by the environment. Once achieved, the built environment in and around Joshimath will have arrived at an ecology of the artificial: a Material Ecology which shall explore the development of new construction materials that are adaptive to the vulnerable and ephemeral context, are readily available locally as well as integrate the heritag values and cultural landscape of the Himalayan context.

E. Third Landscapes

In his book 'Manifesto of the Third Landscape"'(Manifeste du Tiers-Paysage), Gilles Clement challenges the traditional notions of landscape architecture and emphasizes the importance of the neglected, aabndoned and non-designed spaces in the urban environment such asurban fringes, post-industrial landscapes, vacant lots and other overlooked spaces. These areas are neither cultivated nor developed and function as a 'reservoir' of biodiversity and ecological potential that might struggle in a more managed, urban environment. They spaces have the ability to adapt, evolve and regenerate independently, without human intervention. Making them publically accessible and a part of a community-driven participatory approach helps in the care and management of these neglected spaces as well as fosters a sense of responsibility and stewardship. Moreover, the third landscape is not static and is rather highly dynamic, in a state of constant flux which is constantly shaped by the interaction of natural and anthropogenic forces, thus transforing into a planetary garden (Clément et al., 2015). In the context of Joshimath, the highly vulnerable, subsiding areas can be strategically de-infrastructuralised and through a series of seed interventions aimed at renaturing ecological processes, transformed into a 'Garden of Collective Memories' which houses, protects and preserves numerous religious and cultural fragments of the town's rich heritage.

F. Landscape as Infrastructure

As ecology becomes the new engineering, the projection of landscape as infrastructure the contemporary alignment of the disciplines of landscape architecture, civil engineering, and urbanism has become a pressing challenging. Predominant challenges facing urban regions and territories today including shifting climates, material flows, and population mobilities, need to be strategised. Responding to the under-performance of master planning and extreme alteration of natural processes calls for the strategic design of 'infrastructural ecologies'. Within the context of the Himalayan town of Joshimath wherein rapid urbanisation has resulted in extreme ground subsidence, the highly vulnerable areas and extractive operations such as NTPC's hydroelectric dam project need to be de-infrastructuralised immediately and by adapting and accommodating them in the longue duree, they shall become a part of a synthetic landscape of living, biophysical systems that operate as urban infrastructures which shape and direct the future regional economies and cultures within the region (Bélanger, 2017).

4.3 Theoretical Framework

The theoretical framework is developed by unpacking and using the aforementioned theories at differing stages of the project. The theory of Anthropocene/Capitalocene is used to investigate the processes which have resulted in the Urbanisation of the Himalayas. McHarg's concepts of mapping vulnerabilities from 'Designing with Nature' are used to develop critical cartographies during spatial investigation. The concepts of Ephemeral Urbanism are used to analyse the spatio-temporal dynamics existing within the context and these are combined with theory of material ecologies to develop the design concept for the project. Belanger's theory of Landscape as Infrastructure and Infrastructure as Landscape and the theory of Third Landscape are put to use during the design and strategy development.

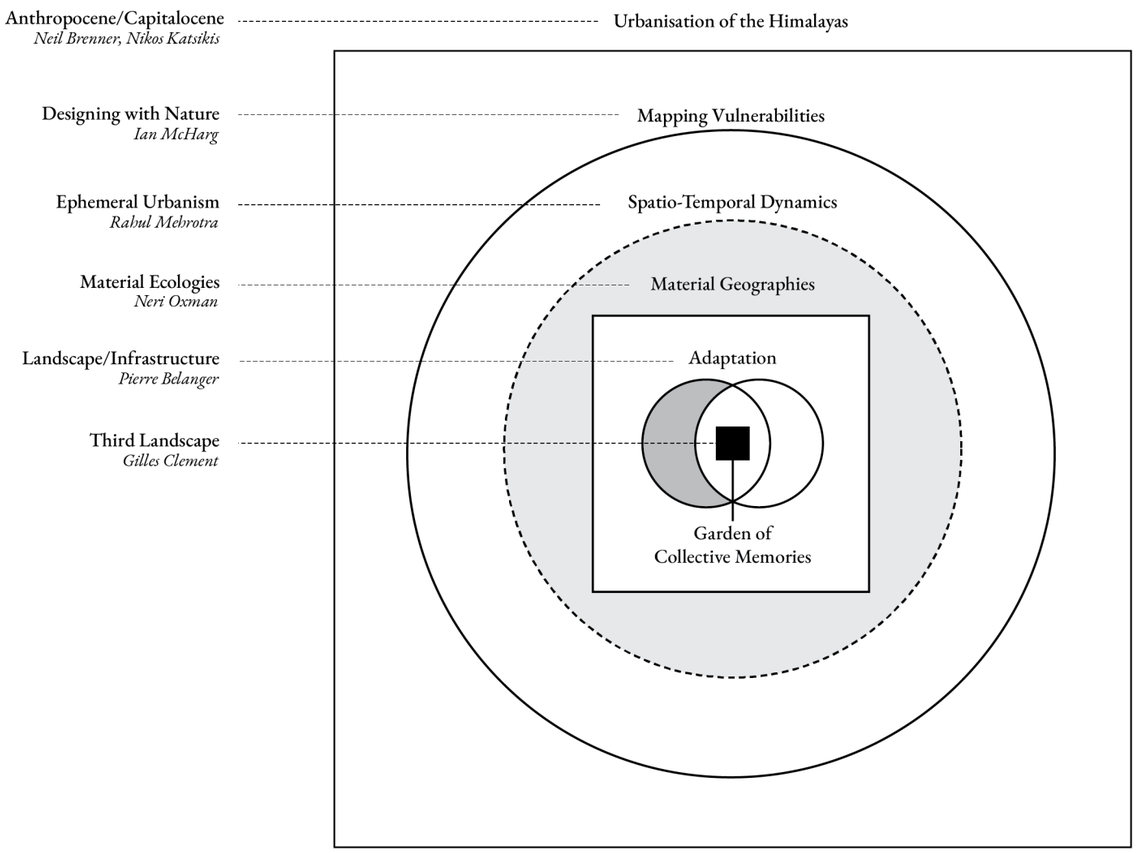


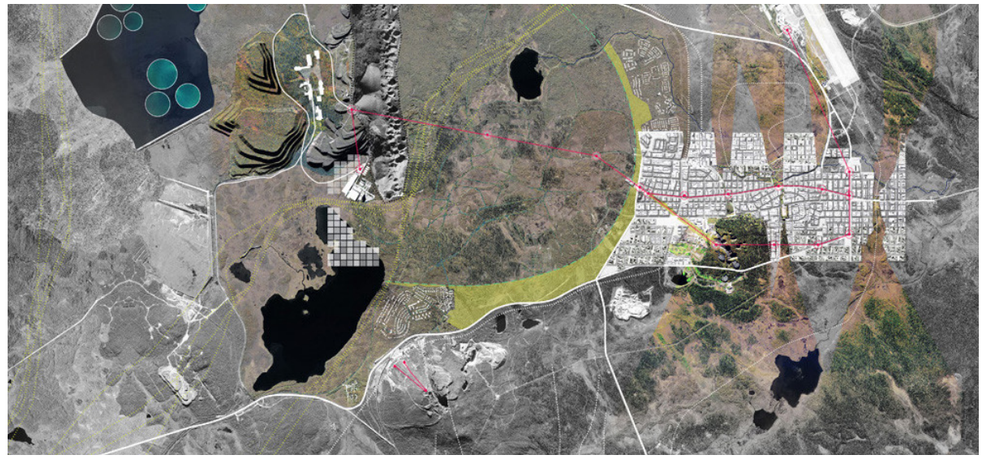
Fig. 23: Theoretical Framework

4.4 Precedents/Case studies

A. Relocation of Kiruna

designed by White Arkitekter, Ghilardi + Hellsten
Location: Kiruna, North Sweden
Type: Parks/Riverbanks
Status: Urban Transformation
Visuals: White Arkitekter, Ghilardi + Hellsten, Tegmark

Kiruna is an urban settlement under unprecedented pressure for transformation, a process that, with the continuing global demand for iron, will most likely not stop at the year 2033. More than any other city in the world, Kiruna will never achieve completeness or an ideal state. It is in the creative orchestration of the transformation processes where Kiruna's master-plan was envisioned. 'Kiruna 4-ever', creates a sustainable vision for the long-term expansion of the city eastwards. It allows for the further development and broadening of Kiruna's mix of cultures and diverse population by creating a welcoming and global city, unique in its placement within the arctic landscape. Future investments in Kiruna are located according to the time scale of the mines deformation. The areas which will be affected by future deformations are mid-term and removable investments. The areas further from the mine that will not be affected by any future deformations are suitable for heavier and long-term investments, such as the railway station, hospital and town hall.



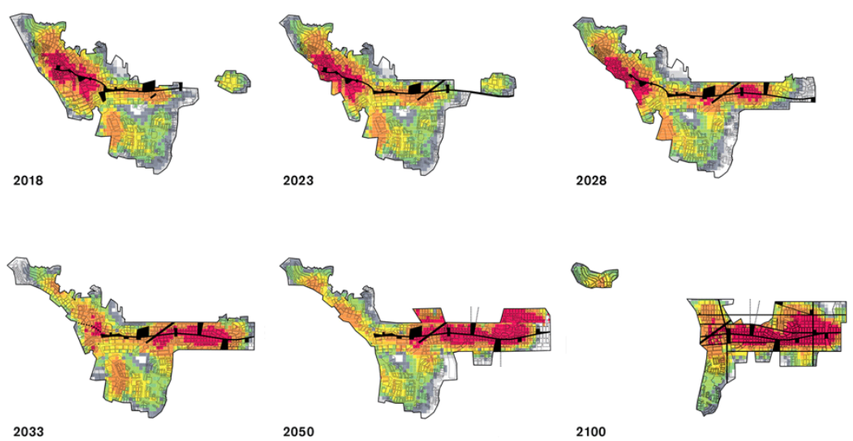


Fig.24: The urban transformation of Kiruna, Sweden

B. Renaturation of the River Aire

designed by Atelier Descombes Rampini + Superpositions
Location: Geneva, Switzerland
Type: Parks/Riverbanks
Built: 2015
Photographs: Superpositions & Fabio Chironi

The project answers questions related to reintroducing nature into artificial landscape and dealing with landscape in rural-urban fringes. It reactivates the old river channel for visitors, masterfully combining new modest elements and simple structures into a powerful experience. The most poetic element is the grid of sand – a platform for the river – a natural force that expresses itself through decomposition. Designed as a ruin, the project is the process; full of play between the grid and the river, man and nature. Renaturalisation is not brought in by force; it occurs. One can imagine the river entering the grid for the first time, like an animal released from captivity, figuring out which way to go and where to settle. The power of this work lies in its honesty, taking us to a much deeper thinking about the relation between man and nature in the age of the Anthropocene.

Fig. 25: The renaturation of river Aire, Switzerland

C. Ephemeral Urbanism, Kumbh Mela

The concept of ephemeral urbanism can be observed at the Kumbh Mela, one of the largest religious congregations in the world, which is periodically held across four river based cities across India. Temporary urban spaces are transformed into a bustling, fully functional city with all basic necessities for the duration of the festival which lasts for a couple of months and attracts millions of pilgrims from across the globe. During the Kumbh Mela, infrastructures such as roads, bridges, sanitation facilities, accomodation services and other forms of essential services are also setup to manage the enormous crowd. The structures are designed in a modular way so that can be easily assembled and disassembled

Fig. 26: Kumbh Mela, Allahabad.(Vera, 2014)

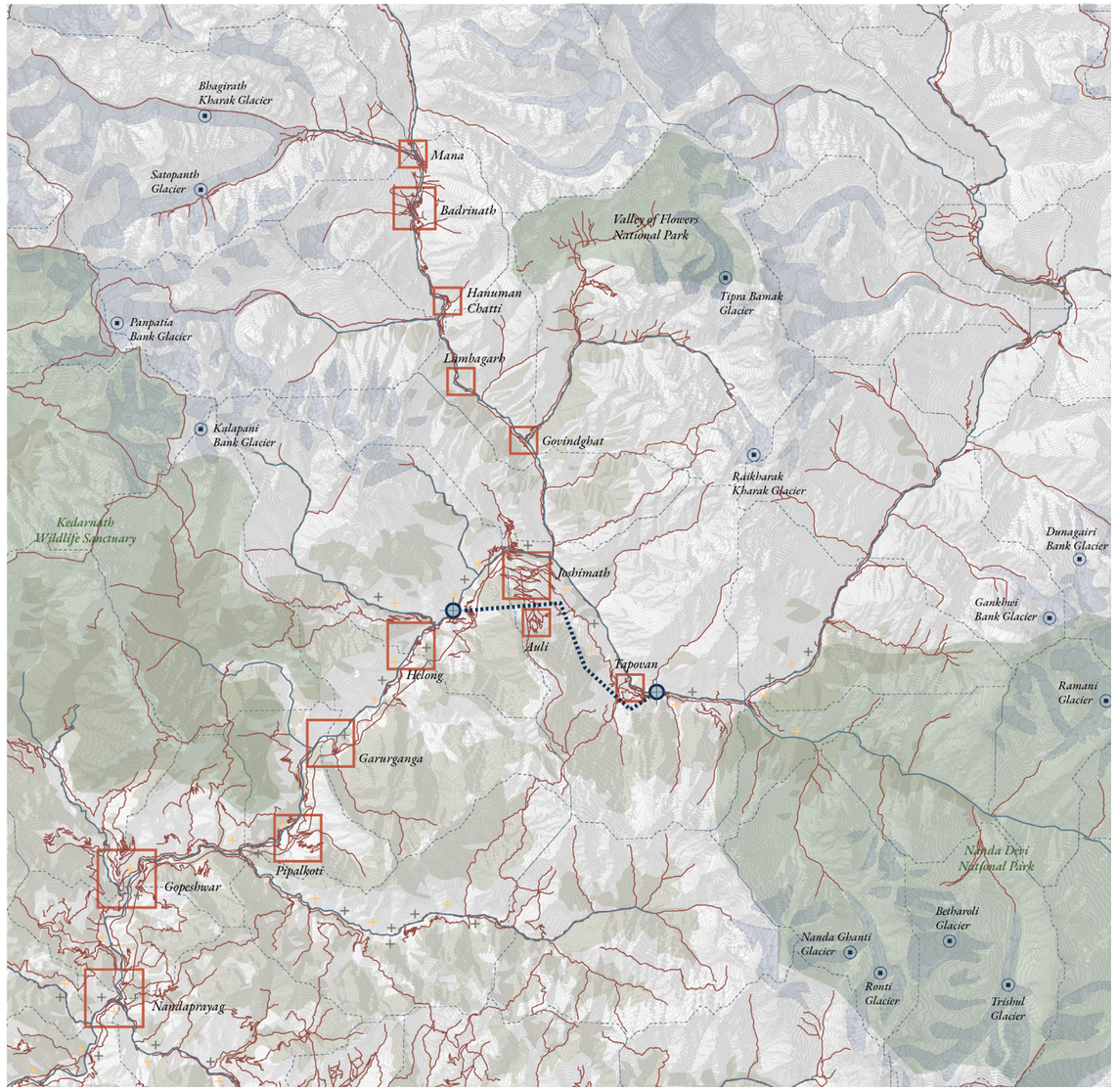
4.5 Analysis of Institutional Reports

Institution	Area of expertise	Hypothesis	Methods of Analysis	Recommendations	Remarks
Central Building Research Institute	structural engineering geotechnical engineering building material &technology	subsidence is caused by geological, geomorphological, hydrological & anthropogenic factors. damage to buildings depends on parameters like: height, area, materials & structural compoenents.	field documentation rapid visual survey hazard zonation mapping	new construction typologies and materials which are resilient planning the phased de-densification spatial framework for town planning in the himalayas	survey was done in a very short time hazard mapping is just obervational, not backed by geotechnical investigations and does not take into consideration the spatio-temporal factors
Central Ground Water Board	groundwater resource assessment hydrogeological investigations	joshimath has 8 natural springs joshimath's ground is porous , hence stores groundwater unplanned infrastructure is built on top of these springs	hydrogeological survey geophysical survey hydrochemical study	A trench along with a retention wall may be constructed at a different topographic level to dissipate g.w. pressure emergence points of springs must be depaved / deinfrastructuralised	seasonal spect of hydrological changes have not been considered spatial implications of hydrological actions have not been discussed
Geological Survey of India	geological mapping geophysical surveys natural hazard assessment	subsidence is caused by geological, geomorphological, hydrological & anthropogenic factors. joshimath is built on an ancient lanslide zone & its soil is weak	geological survey visual documentation geotechnical profiles	need for comprehnsive geological and geotechnical mapping and assessment	survey was done in a very short time
Indian Institute of Remote Sensing	measuring rate of subsidence natural resource management climate change analysis	pathched deformation is observed in the north,west and central region deformation is non-uniform and changes with seasons	radar interferometry continuosly operating reference stations (CORS)	need for more comprehensive satellite based deformation analysis periodically	time period of mapping is short
National Geophysical Research Institute	seismology geohazards assessment	subsidence is caused by geological, geomorphological, hydrological & anthropogenic factors. joshimath is built on an ancient lanslide debris& glacio-fluvial deposit	risk zonation mapping 2D/3D geophysical modelling electrical resistivity studies		no recommendations have been stated
National Institute of Hydrology	hydrological studies flood forecasting water resource assessment	joshimath's ground is porous , hence stores groundwater blockage of sub-surface channels under Joshimath's leading to temporary storage of water within it.	terrain modelling hydrological mapping field sampling & testing	use InSAR to monitor subsidence on Joshimath's noth facing slopes re-planning drainage and waste disposal within the town. periodic monitoring of springs	seasonal spect of hydrological changes have not been considered spatial implications of hydrological actions have not been discussed
Indian Institute of Technology, Roorkee	geotechnical engineering soil bearing capacity	subsidence is caused by internal erosion by subsurface drainage joshimath is built on an ancient lanslide debris& glacio-fluvial deposit	field surveys soil strength testing risk mapping	regulate inflitration of surafce water into the porous soil fabric of Joshimath re-planning drainage and waste disposal within the town.	outcomes of the report are too technical and cannot be translated spatially
Wadia Institute of Himalayan Geology	himalayan geology glaciology seismotectonics	subsidence is caused by high water saturation joshimath is built on an ancient lanslide debris& glacio-fluvial deposit	seismicity monitoring geological surveys electrical resistivity tests	LiDAR mapping and terrain modelling needs to be initiated	outcomes of the report are too technical and cannot be translated spatially
National Disaster Management Authority	disaster preparedness & mitigation	subsidence is caused by geological, geomorphological, hydrological & anthropogenic factors. damage to buildings depends on parameters like: height, area, materials & structural compoenents.	hazard mapping stakeholder interaction recovery planning	Flexible retaining structures like gabion walls at desired location new construction with prefab light weight structures in safe zones creation of a cyclic material ecology restoration of heritage structures	The report does not integrate all the perspectives from different insituions into one.

5. Spatial Analysis & Cartographic Exploration

5.1 Studio Essentials

A series of seminar lectures at the beginning of the Studio Essentials introduced me to the notions of Altered Nature, Scarcity, Ground, Altered Values and so on which provided me with a theoretical base. After grounding these within the context of my graduation project through a set of semantic figures plotted against the scale and time axes, I was able to filter and identify the key subjects, objects and actions that I wanted to focus on amongst the plethora of variables. Thereafter, I developed a taxonomic framework which served as a canvas for the following assignment wherein I developed a set of critical drawings to illustrate the elements that compose the Himalayan Landscape around Joshimath, the ecological and human processes that alter the landscape and how do we define these limits? This was followed by extrapolating this spatial composition back and forth in time to investigate the historical evolution of the region as well as to transpose the existing trends in the future.



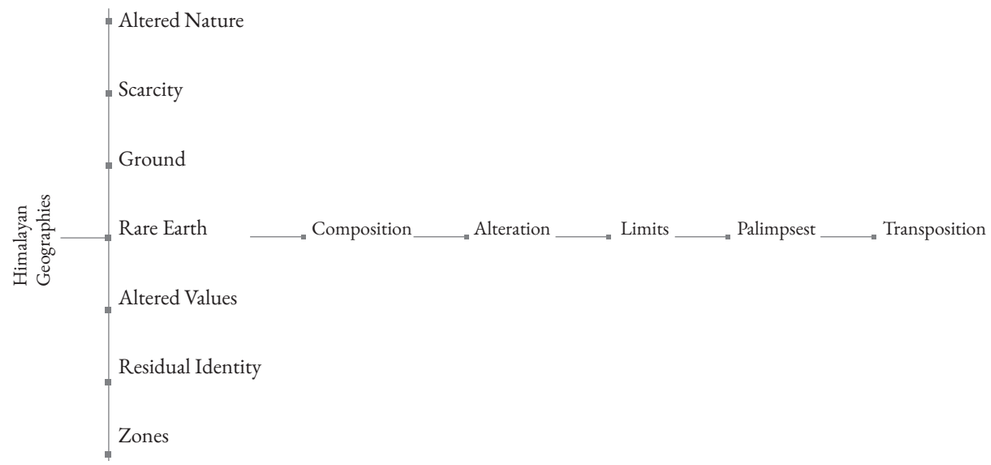
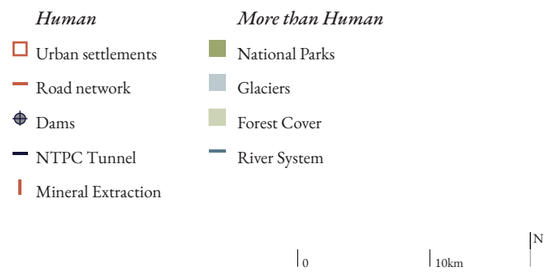


Fig.27: Composition: Elements of the Himalayan landscape

The Himalayan landscapes is composed of Human and more than human elements which either co-exist or at conflicts with each other.



Alterations

A series of seminar lectures at the beginning of the Studio Essentials introduced me to the notions of Altered Nature, Scarcity, Ground, Altered Values and so on which provided me with a theoretical base. After grounding these within the context of my graduation project through a set of semantic figures plotted against the scale and time axes, I was able to filter and identify the key subjects, objects and actions that I wanted to focus on amongst the plethora of variables. Thereafter, I developed a taxonomic framework which served as a canvas for the following assignment wherein I developed a set of critical drawings to illustrate the elements that compose the Himalayan Landscape around Joshimath, the ecological and human processes that alter the landscape and how do we define these limits? This was followed by extrapolating this spatial composition back and forth in time to investigate the historical evolution of the region as well as to transpose the existing trends in the future.

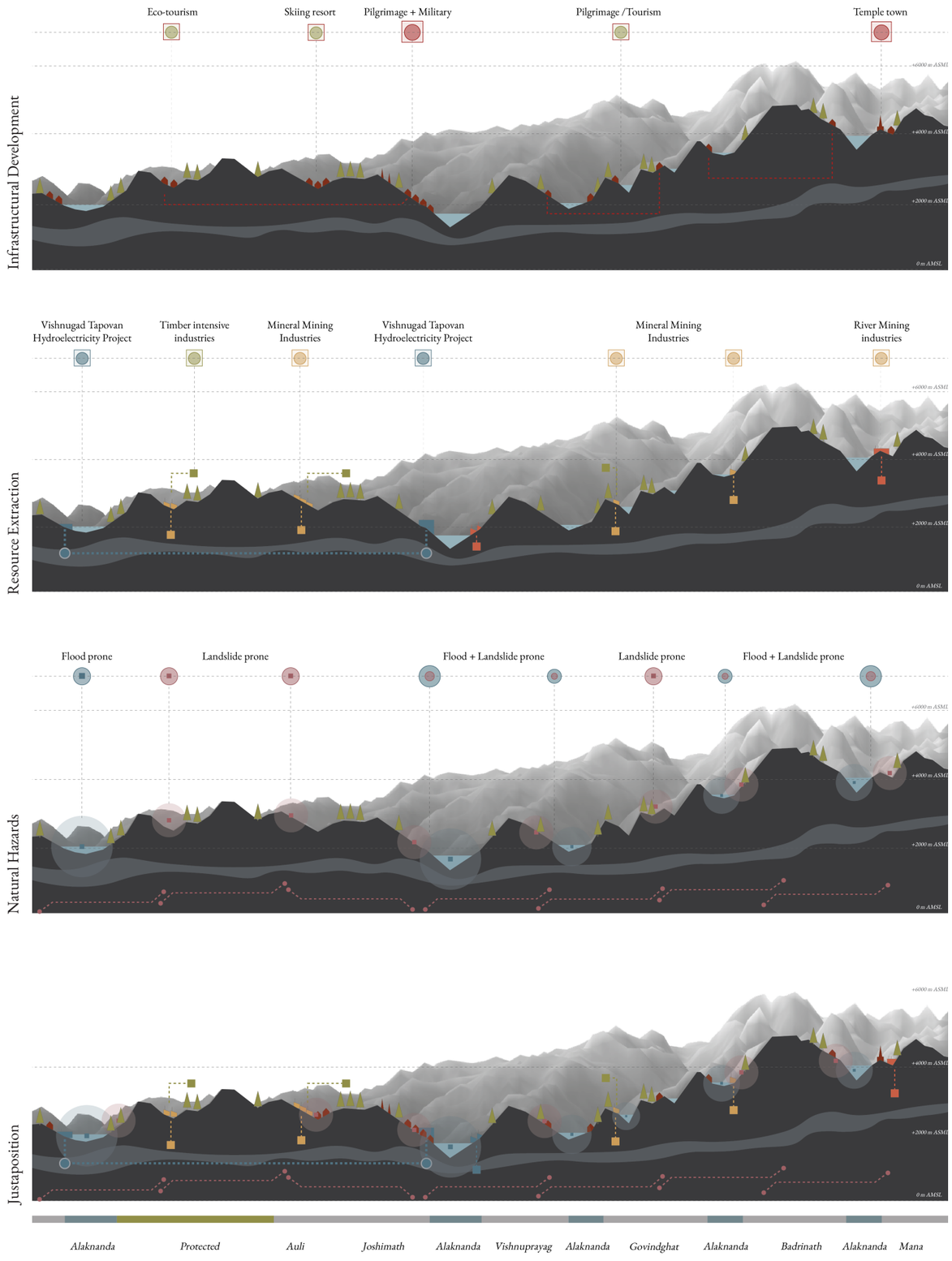


Fig. 28: Alterations : Transformation of the Himalayan Landscape
The following diagram illustrates the transformation of the Himalayan landscape through the processe of tourism, resource extraction and natural hazards.

5.2 Geographical Urbanism

The Geographical Urbanism intensive had a similar structure to the Studio Essentials wherein we were introduced to the concepts of Anthropocene, Urbicene and Capitalocene and how the anthropogenic forces have been transforming the natural ecosystems to fuel their capitalist demands, which amplifies vulnerabilities within fragile landscapes. Thereafter, we delved deeper into the theories of More-than-City and More-than-Human Urbanisation which helped me position and visualize my project within a bigger geographical setting and enabled me to investigate the concepts of socio-ecological metabolism as well as understanding resource flows and extractive operations with the Himalayas serving as a global hinterland for the resource intensive Indian subcontinent.

Through the course of developing my drawing matrix, I investigated Human, City, More-than-Human and More-than-City processes through 4 different scales ranging from an inquiry into the atmospheric and geomorphological processes at the subcontinent scale to the forces resulting in ground subsidence at the city scale of Joshimath. This exercise also put forth pertinent questions about future urbanization and resource extraction in the Himalayas and how will this vulnerable landscape adapt to energy transition as well as rising geopolitical complexities with the discovery of rare earth minerals within its borders.

Fig. 29: Site Location

A. More-than-City / More-than-Human

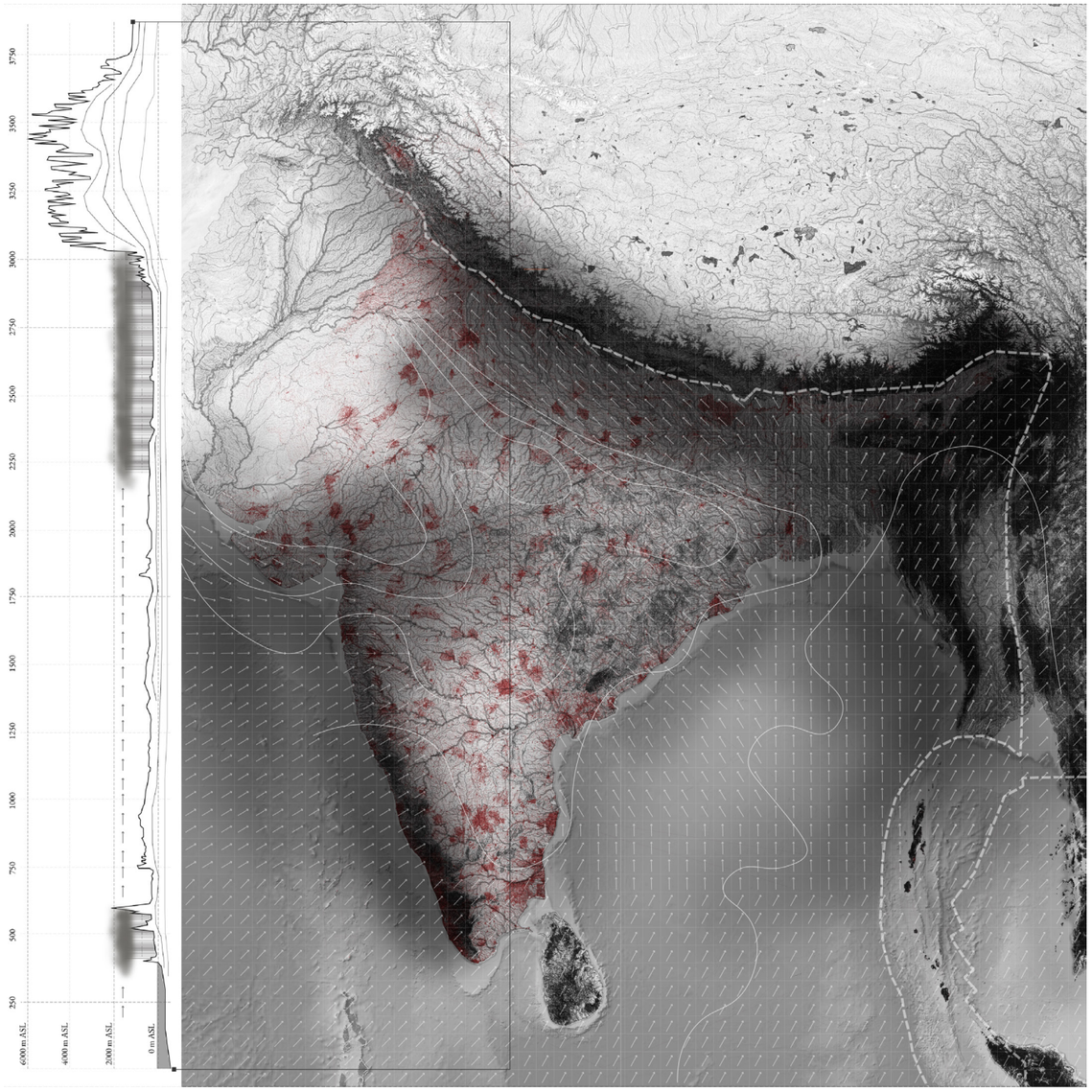


Fig.30: Formation of the Himalayan Geography

The above map illustrates the formation of the Himalayas due to the movement of the tectonic plates and how this geography results in the creeation of natural resources in the region by acting as a climatic barrier to the south-west monsson winds.

- Urban settlements
- Tree cover
- Synoptic Chart
- Monsoon Direction
- Precipitation Intensity
- Tectonic plates
- Rivers Systems
- Hydro Basins

B. More-than-City / Human

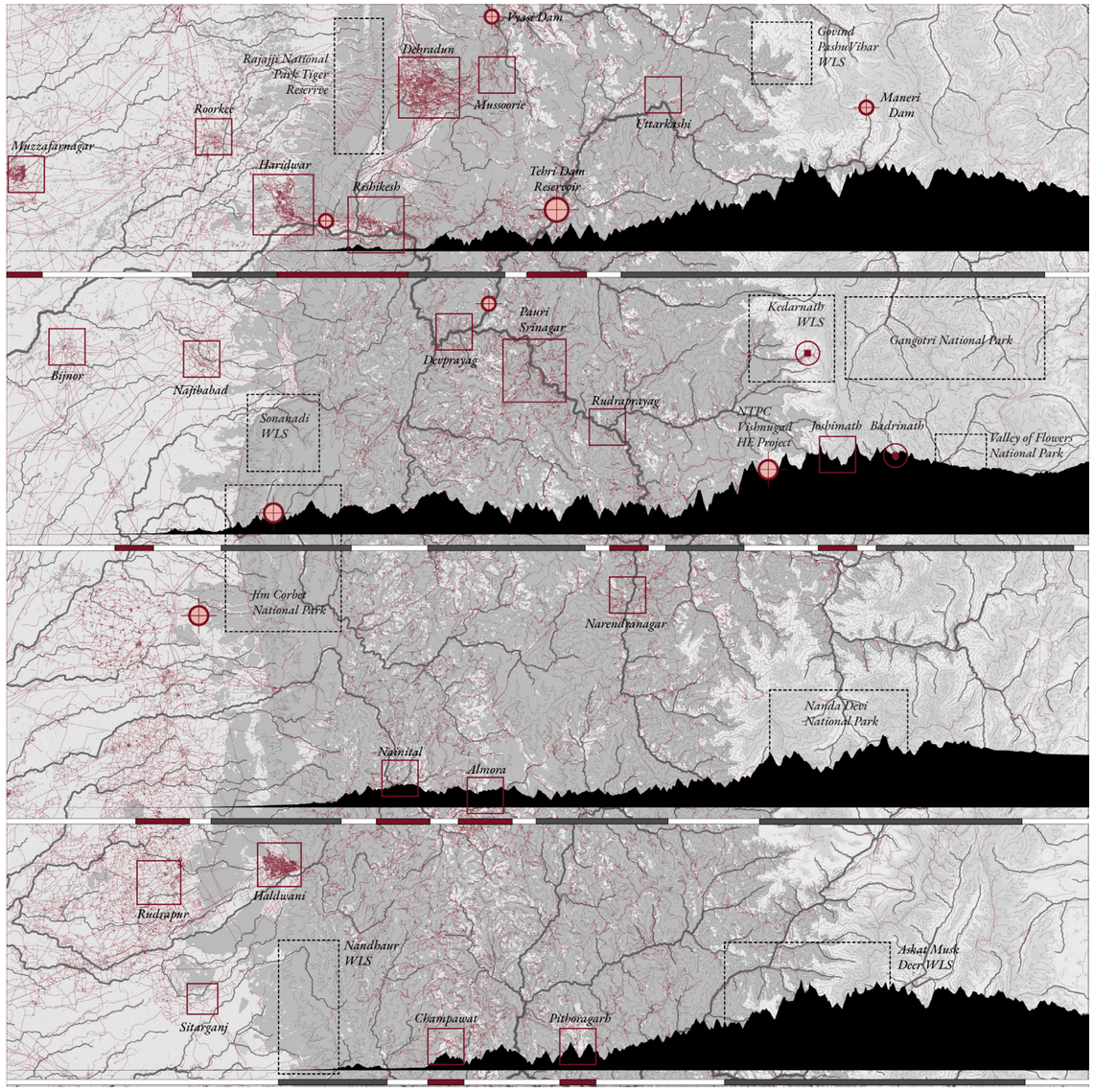


Fig. 31: Dissecting the Himalayan Landscape

The above image illustrates the evolution of human processes in the resource rich 'More than city' of the Garhwal Himalayas. A series of transects are cut across to understand and analyse the relation between the human and more than city processes across the Himalyan Landscape.

- Urban
- Road network
- Forests
- Cropland
- Snow/Ice
- Protected
- Transects
- Dams
- Temples
- River Systems

C. City / Human

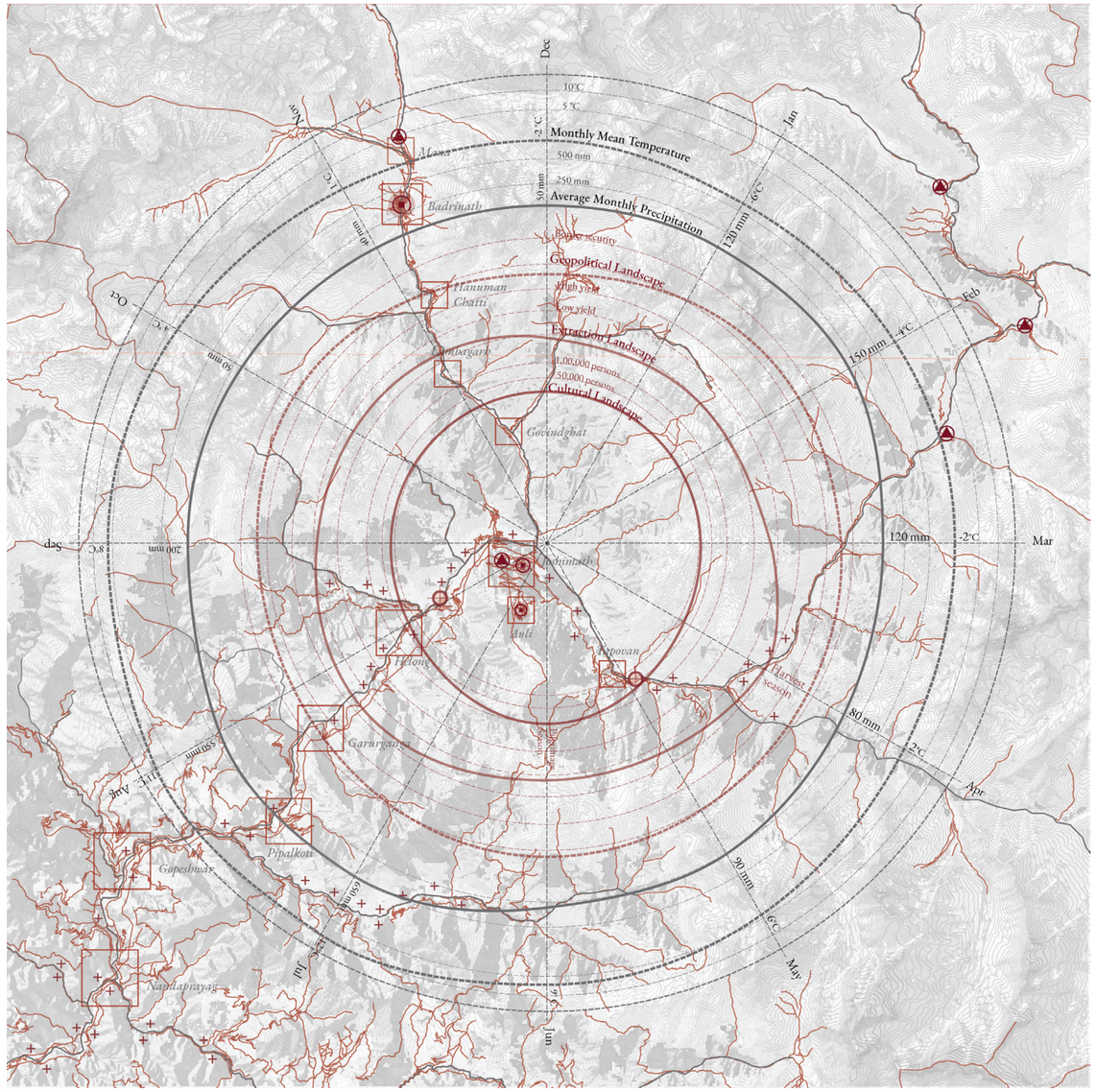


Fig.32: Landscapes of Co-existence

The above map illustrates the various cities and the socio-cultural processes which result in the formation of contrasting landscapes of Culture, Extraction and Geopolitics which are a function of natural processes.

- Urban
- Road network
- Forests
- Cropland
- Snow/Ice
- Protected
- Transects
- Dams
- Temples
- River Systems

D. City / More-than-Human

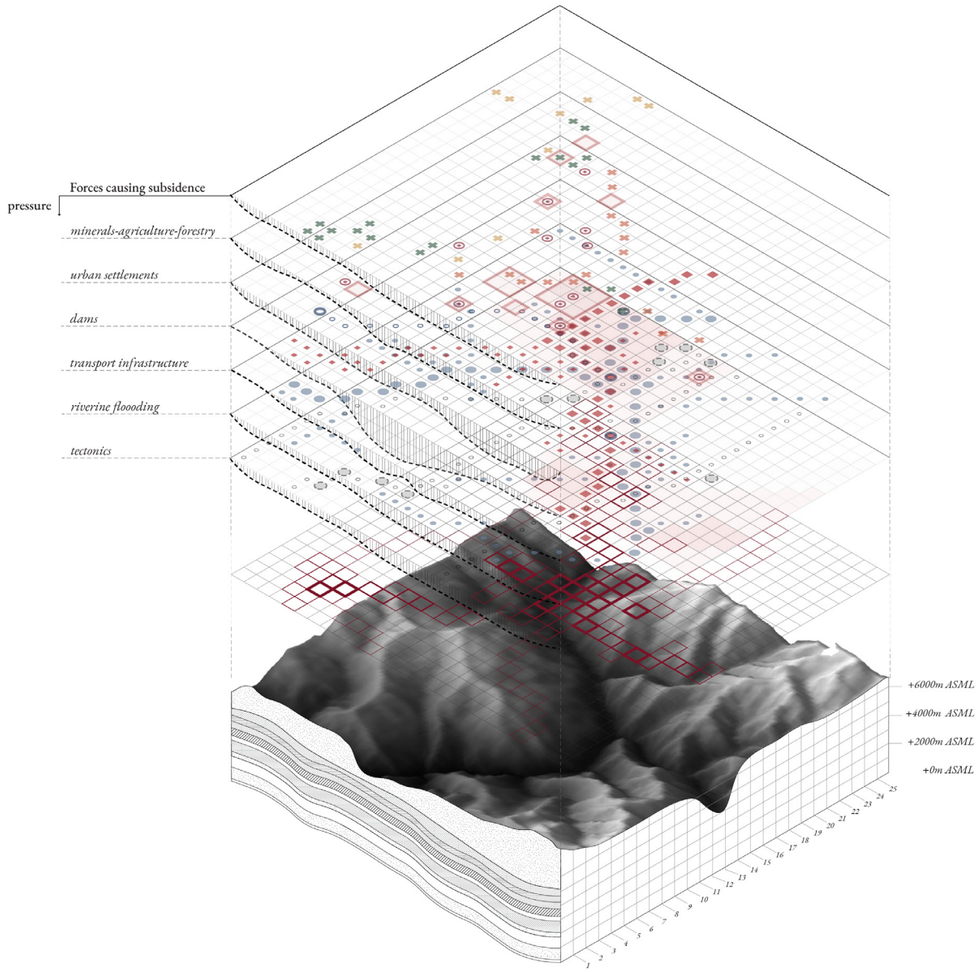


Fig. 33: Spatio-Temporal implicationson the substratum of Joshimath

The following diagram illustrates the various spatio-temporal processes that exert pressure on the ground which is subsiding in Joshimath in Uttarakhand, India.

- Urban
- Tectonics
- Mining
- Hydrology
- Grid
- Dams
- Vulnerable
- Agriculture

5.3 Global Hinterland

A. Urbanisation in the Indo-Gangetic Plains

Urbanisation in the Indo-Gangetic Plains has shaped the demographic, economic and ecological landscape of the area. This region is situated in the northern part of the Indian subcontinent and it is marked by fertile land and abundant water resources from the Ganges and Indus river systems, which have historically supported dense populations and agricultural communities. The current urbanisation trends suggest that the region is likely to undergo a significant population growth, which will be escalated by rural-to-urban migration. This phenomenon will result in the expansion of existing cities and the creation of new urban centres to accommodate the growing number of residents. There will be an exponential increase in the demand for water, food and energy resources to support the thriving urban population. This scenario is likely to result in further operationalisation of the Himalayas in the form of hydropower production and infrastructure development in order to leverage the natural resources, geographical features and its strategic location with respect to international borders.

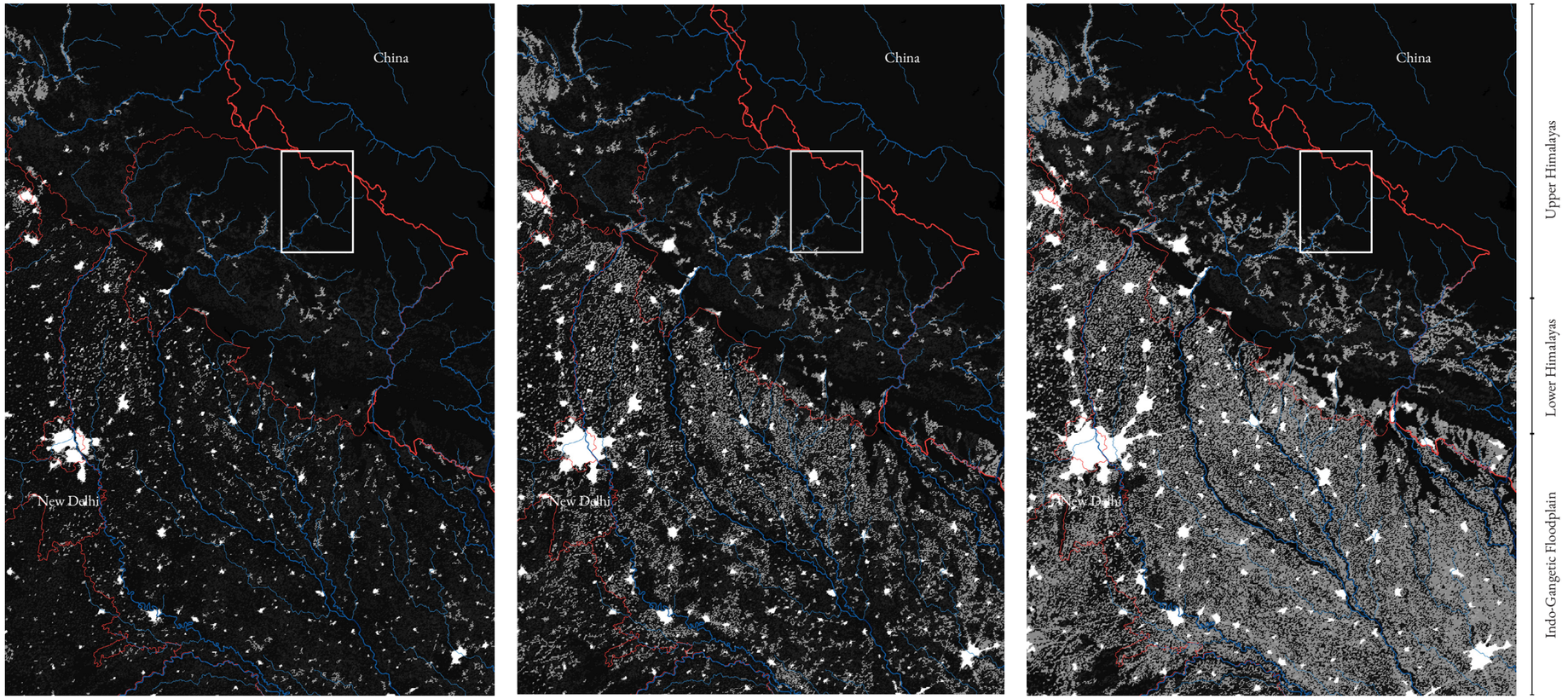


Fig. 34: Urban Growth in the Indo-Gangetic plains

The following map illustrates the morphological changes in the extent of urbanisation in the Indo-Gangetic plains from 1975-2025.

- Urban centres
- Administrative borders
- Hydrological systems

0 100 km N

B. Operationalisationof the Himalayas

The history of urbanisation in the Himalayas dates back to over a thousand years ago wherein a series of temples were constructed within the remote corners of the region and only the most arduous devotees would undertake this pilgrimage. Over centuries, this cultural landscape was shaped by human processes as more and more people started moving from the plains to this resource rich haven consisting of fertile soil, abundant water and food resources, resulting in the development of small agrarian societies within the region, organised within small independent kingdoms. However, with the advent of industrialisation and the smaller monarchies being replaced by capitalist regimes, the Himalayas were steadily transformed into a vast hinterland to supply food, water, hydroelectricity, timber and other raw materials to the bigger urban centres. Moreover, the picturesque setting of the Himalayan towns was overexploited to promote unchecked tourism which resulted in further urbanisation within this vulnerable setting. With the resource extraction operations on the rise in the Himalayan Capitalocene, the global hinterland debate has been set forth: How will the cities and the hinterlands within the Himalayas react to these rapid urbanisation, growing demands and supply chains and how will they adapt to the ongoing transitions in the energy sectors with an increased emphasis on renewable energy sources and rising geopolitical complexities? Will these Himalayan cities continue to grow or will the entire region be transformed into a Global hinterland?

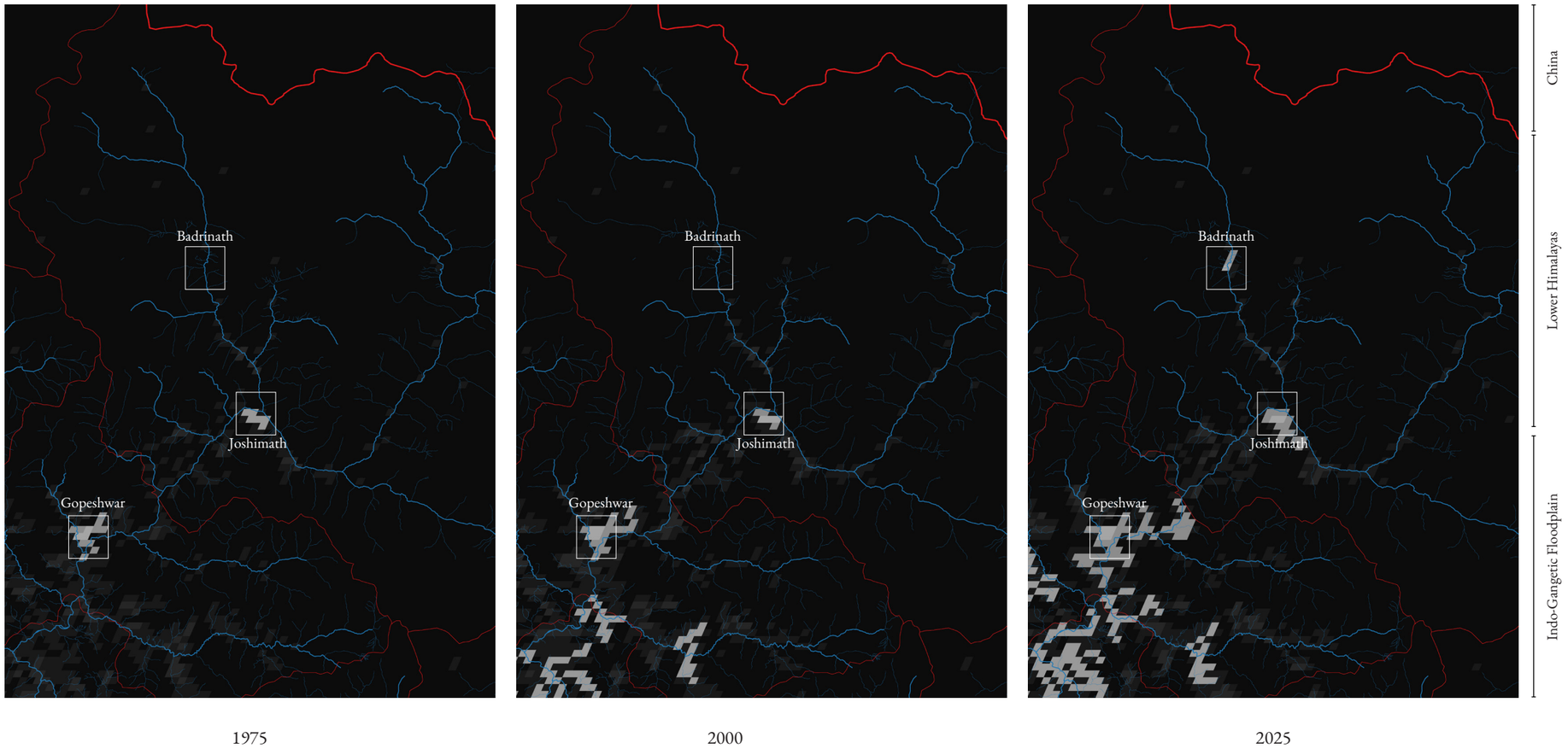


Fig. 35: Urban Growth in the Indo-Gangetic plains

The following map illustrates the morphological changes in the extent of urbanisation in the Indo-Gangetic plains from 1975-2025.

Urban centres
Administrative borders
Hydrological systems

0 10 km N

5.4 Critical Processes

A. Pilgrimage-Tourism-Militarisation

Large scale infrastructural development, such as construction of roads, tunnels, and bridges to support the processes of pilgrimage, tourism, and militarisation has significantly transformed the region. Mobility corridors such as roads and other transportation networks have increased incoming flux and pressure within the fragile region. Tourism infrastructure has mushroomed all around the tourist attractions, and urban settlements continue to expand to support the growing floating population, resulting in ecological degradation.

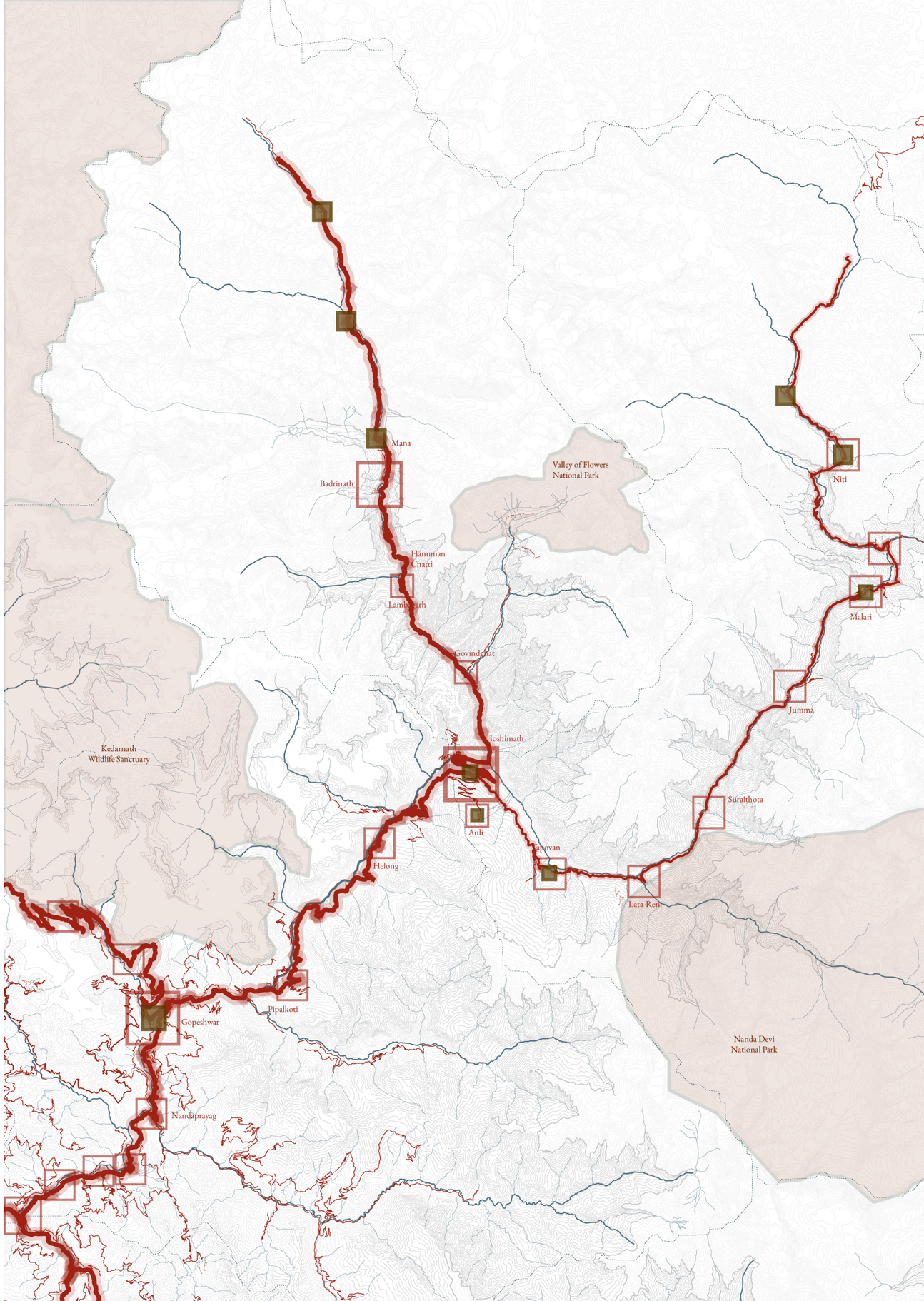


Fig.36: Infrastructure Development in the Himalayas

- Urban settlements
- Road network
- Dams
- Military
- Natural Hazards
- National Parks
- Glaciers
- Forest Cover
- Hydrology

0 10km N

B. Hydropower Production/ Resource Extraction

Hydropower projects such as the Vishnuprayag Pipalkoti were developed within this vulnerable landscape, despite several public protests and concerns over their efficacy and ecological implications. In order to enable the transition towards green energy, the region's rugged terrain has been operationalised for it huge hydropower potential through the sanctioning of countless more hydropower projects. NTPC's Tapovan Vishnugad Hydropower Dam is one such project under construction, that involved blalsting and excavation of a headrace tunnel through fragile geology, resulting in land subsidence in Joshimath. Moreover, diversion of the river water adversely affects downstream ecosystems and groundwater recharge.

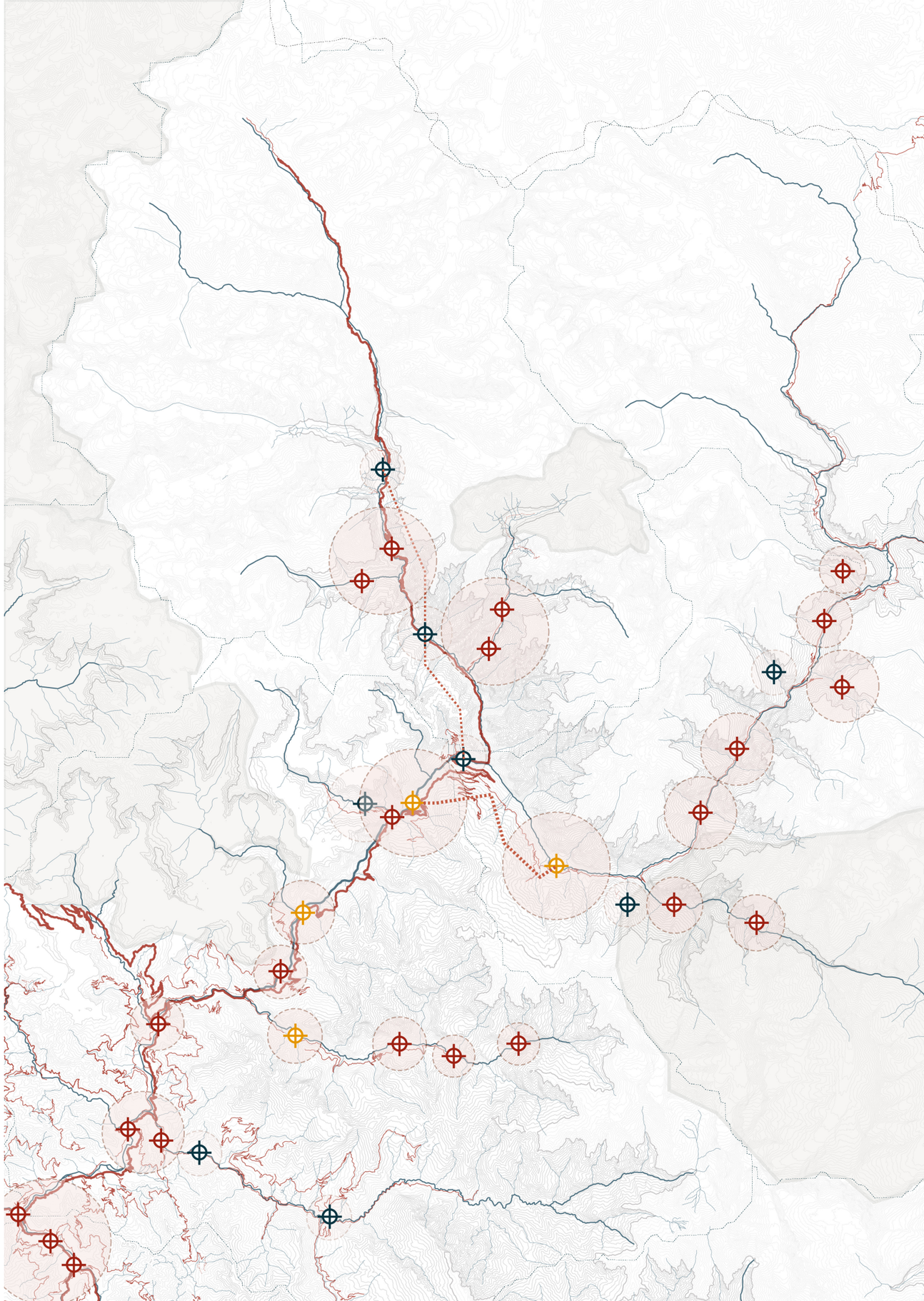


Fig. 37: Resource Extraction in the Himalayas

C. Critical Social Ecologies

The large scale regional processes such as pilgrimage-tourism and hydropower production have resulted in a major occupational shift for the regional population from subsistence agriculture and pastoralism towards overdependance on the seasonal pilgrimage and tourism industry, or even rural-urban migration in some cases.

Fig. 38: Critical Social Ecologies in the Himalayas

- Urban settlements
- Road network
- Dams
- Military
- Natural Hazards
- National Parks
- Glaciers
- Forest Cover
- Hydrology

0 10km N

D. Natural Hazards

These large-scale infrastructure projects and extractive operations have increased the degree of vulnerability of the region which can be observed in the form of landsubsidence subsidence in Joshimath and surrounding region, frequent landslides in the areas which have undergone deforestation as well as fluvial flooding has also become a common sight during the monsoon season.

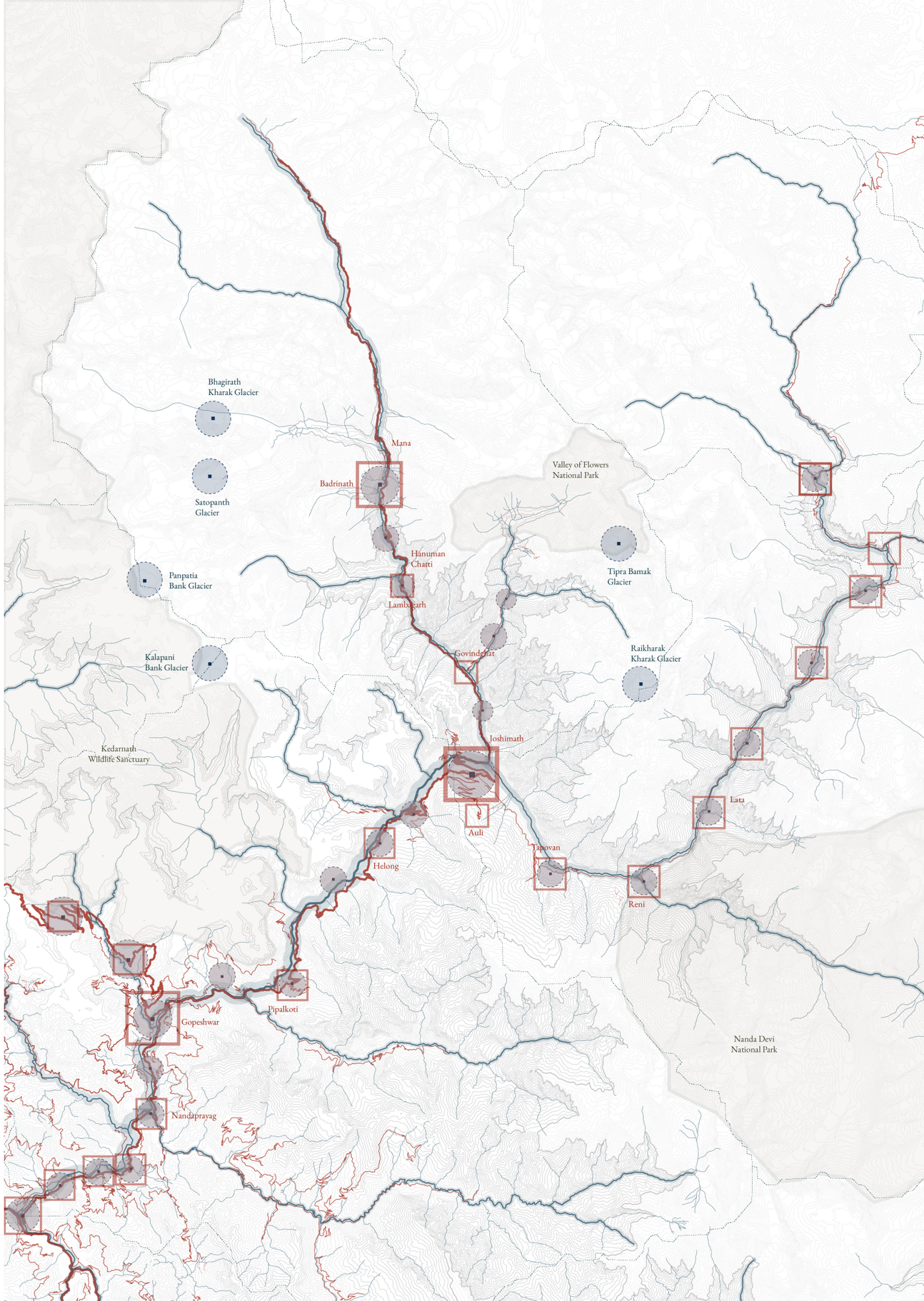


Fig. 39: Natural Hazards in the Himalayas

5.5 Critical Landscapes

The various critical processes are overlaid to analyse the co-relations between intersection of infrastructure, extractive operations, and socio-cultural ecologies within the fragile Himalayan landscape.

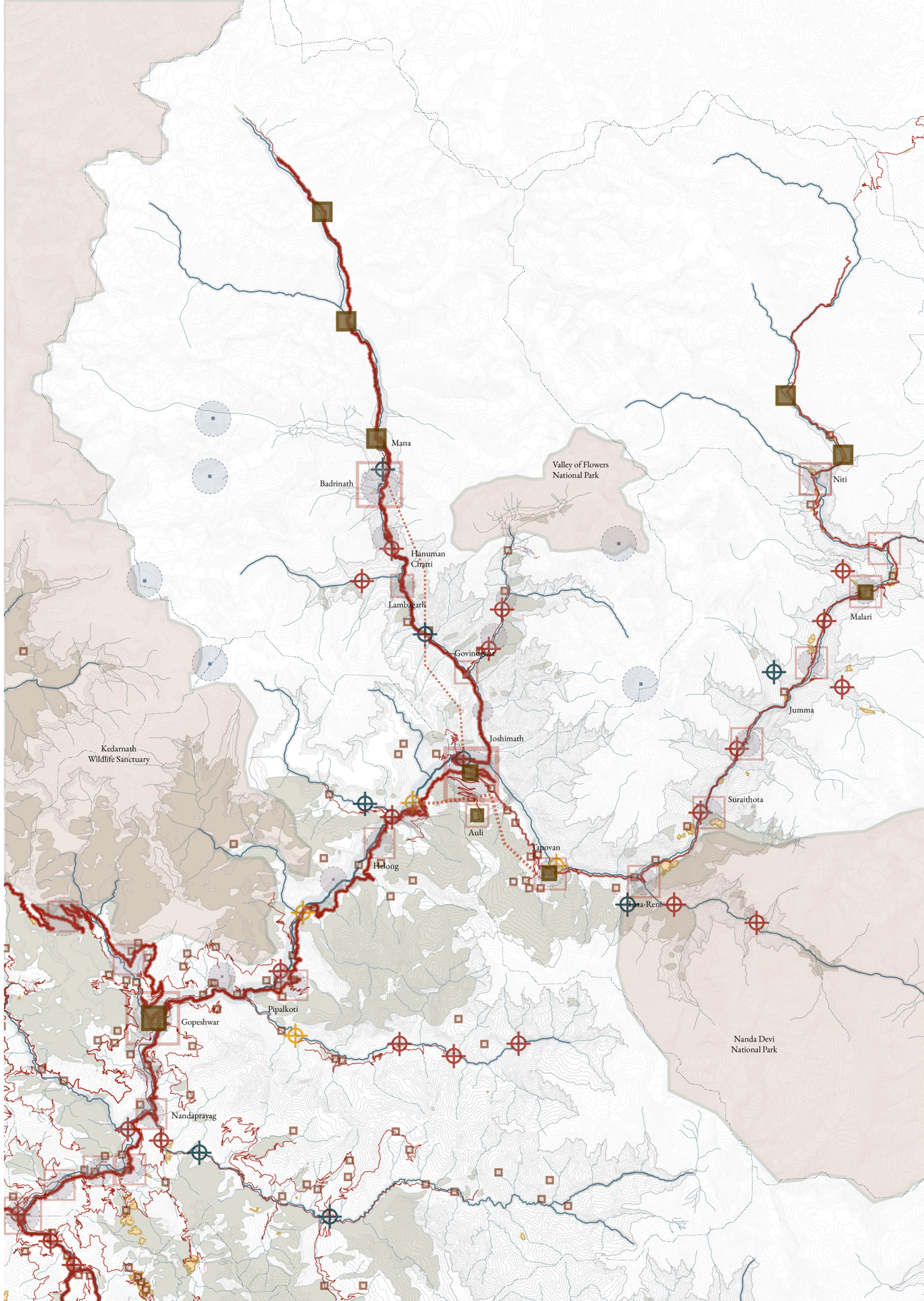


Fig. 40: Critical Landscapes in the Himalayas

The following map illustrates the conflicts between infrastructural development, extractive operations & social ecologies.

5.6 Accumulation

The current trend of urbanisation in the Himalayas to support regional processes of pilgrimage, tourism, militarization, and hydropower production has resulted in the accumulation of infrastructure over this fragile geography over a period of time. These infrastructures operate at a large scale, with a centralised power-structure , which have led in the operationalization of this vulnerable region to support the growing demands of the population living in the bigger urban centres down south. As a result, this vulnerable geography is undergoing socio-ecological degradation.

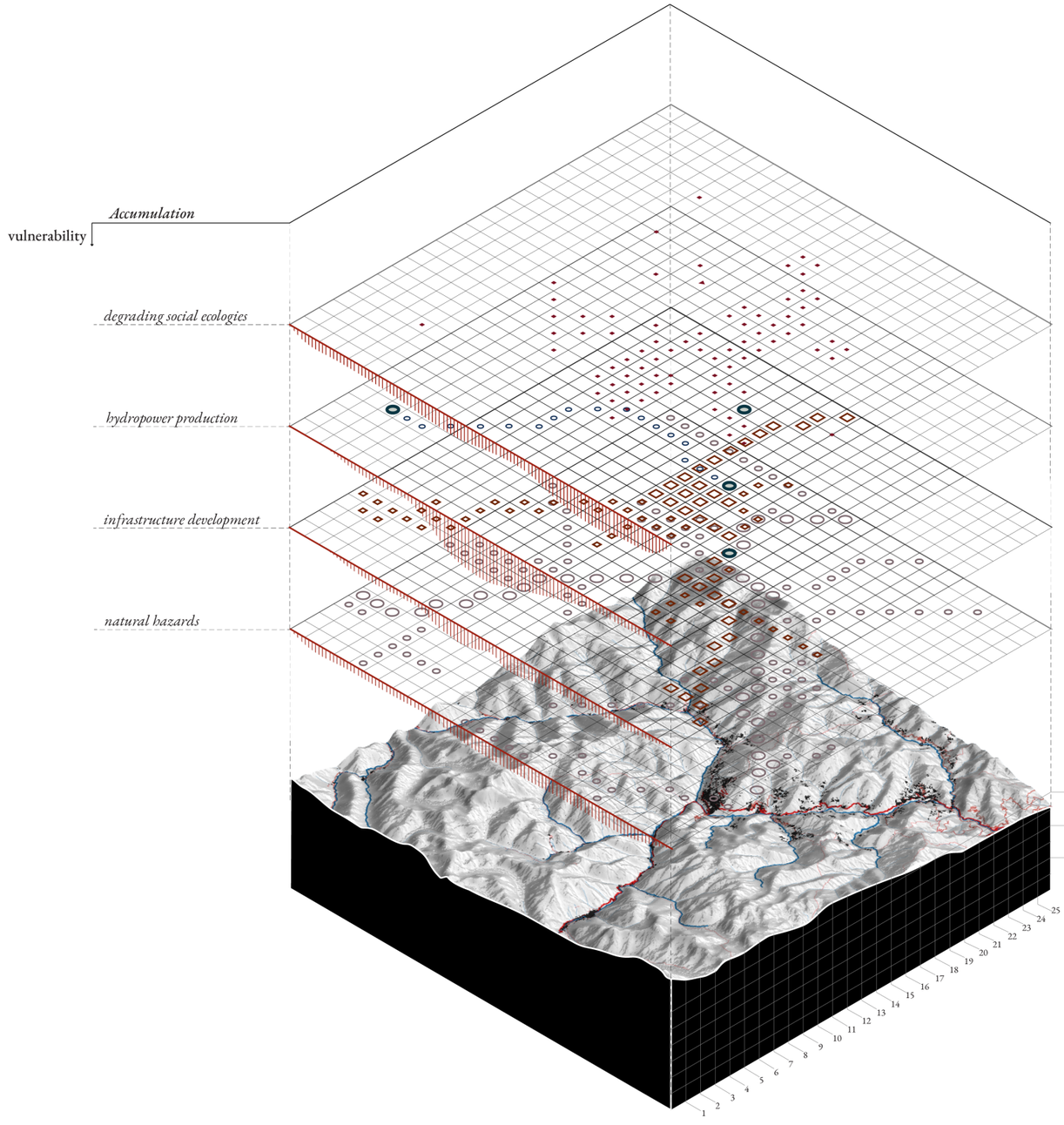


Fig. 41: Accumulation in the Himalayas

- Urban settlements
- Road network
- Dams
- Military
- Mineral Extraction

0 10km N

6. Field trip & Data Collection

6.1 Interviews & Cognitive Mapping

The first part of the fieldwork consisted of a set of interviews with experts from different sectors who have been involved in the relocation of Joshimath. Piyoosh Rautela (Disaster Manager), Atul Sati (Social Activist) and Rakesh Kumar (Urban Planner), were asked a series of questions pertaining to the problem of land subsidence, the factors contributing to this phenomenon and their visions and perspectives for future development in the region were documented in the form of an audio archive..

The round of interviews was followed by interaction with the native population of the region. This involved a discussion with inhabitants of Joshimath, belonging to different fields, to understand the living conditions, the problems of subsidence within the region, and the needs and aspirations of the local populations. For this exercise, Sooraj Kaparwan (Hotel owner and disaster victim), Anil Pandit (Temple Priest) and Hemant Kumar (Taxi driver) were also asked to draw cognitive maps from memory in order to develop an understanding of the important landmarks in and around Joshimath as well as the different scales at which the regional processes operate.

Fig. 42: Interaction with the people of Joshimath.

6.2 Trails & Polaroids

A. Within Joshimath

The structured interviews and interaction with the inhabitants helped in identifying the important landmarks in the town of Joshimath. These subjects were subsequently documented through a series of photographs, video montages and audio recordings at two scales: subjects within the town of Joshimath and subjects around the town. The various spatio-temporal processes which influence each subject have also been investigated and their intensities have been plotted in relation to each other, in the form of a fieldwork catalogue.

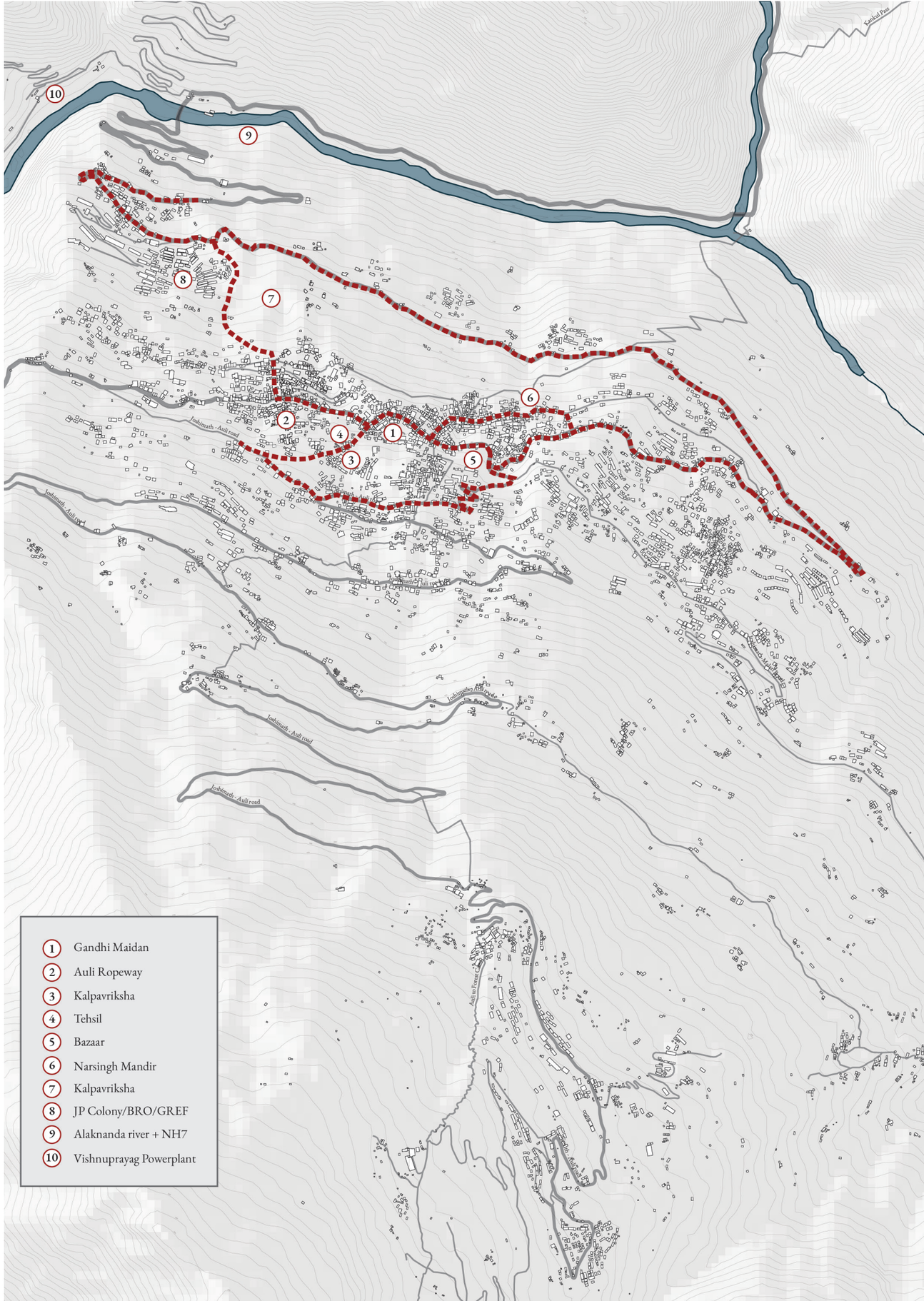


Fig. 43: Mapping trails & landmarks within Joshimath

01 Gandhi Maidan

Gandhi Maidan is a notable public ground and cultural hub in the town of Joshimath. It serves as a central location for public gatherings, community events, cultural activities and sporting events. It plays a pivotal role in the community life of Joshimath by fostering social cohesion and public discourse.

Inhabitants	■■■■■	Economy	■■■□□
Mobility	■■■■□	Ecology	□□□□□
Pilgrimage	■■■□□	Energy	□□□□□
Tourism	■■■□□	Hydrology	■□□□□
Military	■□□□□	Vulnerable	■■■□□

02 Army Heliapad

The Army Helipad in Joshimath serves as a crucial asset for the Indian Army and other defence forces operating in the region. It is used for logistical support of remote military outposts along the Indo-China border, disaster response operation, medical evacuations and it also facilitates infra-structural development by airlifting operations of large and heavy materials and objects.

Inhabitants	■■□□□	Economy	■■■■□
Mobility	■■■■■	Ecology	□□□□□
Pilgrimage	■■■■□	Energy	□□□□□
Tourism	■■■■□	Hydrology	■□□□□
Military	■■■■■	Vulnerable	■□□□□

03 Kalpavriksha

The Kalpavriksha is a 2,500 year old mulberry (Morus Indica) tree in Joshimath. It is a profound symbol of the rich socio-cultural heritage of the deep rooted spiritual traditions and ecological richness of Joshimath. It stands adjacent to the Adi Shankaracharya temple and serves as an important pilgrimage landmark within the town.

Inhabitants	■■■■□	Economy	■■■□□
Mobility	■□□□□	Ecology	■■■■□
Pilgrimage	■■■■□	Energy	□□□□□
Tourism	■■■■□	Hydrology	■■□□□
Military	■□□□□	Vulnerable	■■■□□

04 Tehsildar's Office

The tehsil is an administrative division within the district of Chamoli and the Tehsildar's office serves as the administrative centre for functions such as land revenue collection, maintenance of law and order and implementation of government schemes. It also handles public services, environmental and resource management and local governance.

Inhabitants	■■■■□	Economy	■■■□□
Mobility	□□□□□	Ecology	■□□□□
Pilgrimage	■■■■□	Energy	□□□□□
Tourism	■■■■□	Hydrology	■□□□□
Military	□□□□□	Vulnerable	■■■□□

05 Old Bazaar

The Old Bazaar street in Joshimath is a vital part of the town. Economic and socio-cultural identity. The market not only serves the everyday requirement of the residents but also fosters social interaction and cultural exchange, thus serving as a hub for traditional businesses, cultural festivals, owing to its central location.

Inhabitants	■■■■□	Economy	■■■■□
Mobility	■■■□□	Ecology	■□□□□
Pilgrimage	■■■■□	Energy	□□□□□
Tourism	■■■■□	Hydrology	■■□□□
Military	■□□□□	Vulnerable	■■■□□

06 Narsingh Temple

Narsingh Temple is a historically and spiritually significant temple dedicated to Lord Narsingh, an avatar of Lord Vishnu and was built by the Hindu priest Adi Shankracharya in the 98th century AD. It serves as the winter seat for the Badrinath deity and is an integral part of the socio-cultural festivities within the town as well as an important pilgrimage spot.

Inhabitants	■■■■□	Economy	■■■■□
Mobility	■■□□□	Ecology	■■□□□
Pilgrimage	■■■■■	Energy	□□□□□
Tourism	■■■■□	Hydrology	■■□□□
Military	■□□□□	Vulnerable	■■■■□

07 Terraced Landscape

The terraced landscape in the town of Joshimath is a distinctive feature of the historical transformation of the region's mountainous terrain to accommodate agricultural practices, soil and water management systems within the region, thereby forming a harmonious relationship between the people of the region and the local ecology.

Inhabitants	■■■■□	Economy	■■■■□
Mobility	■■■■□	Ecology	■■■□□
Pilgrimage	■■■□□	Energy	■■□□□
Tourism	■■■□□	Hydrology	■■■■□
Military	■■□□□	Vulnerable	■■■□□

08 Administrative Landscape

The institutional landscape of Joshimath consists of a diverse set of elements which perform and manage administrative, educational and religious functions along with infrastructural development and energy production. These institutions play a critical role in the town's governance, social development, cultural preservation, material needs and economic growth.

Inhabitants	■■■■□	Economy	■■■■□
Mobility	■■■■□	Ecology	■■■□□
Pilgrimage	■■■■□	Energy	■■□□□
Tourism	■■■■□	Hydrology	■■■■□
Military	■■□□□	Vulnerable	■■□□□

09 Alaknanda River

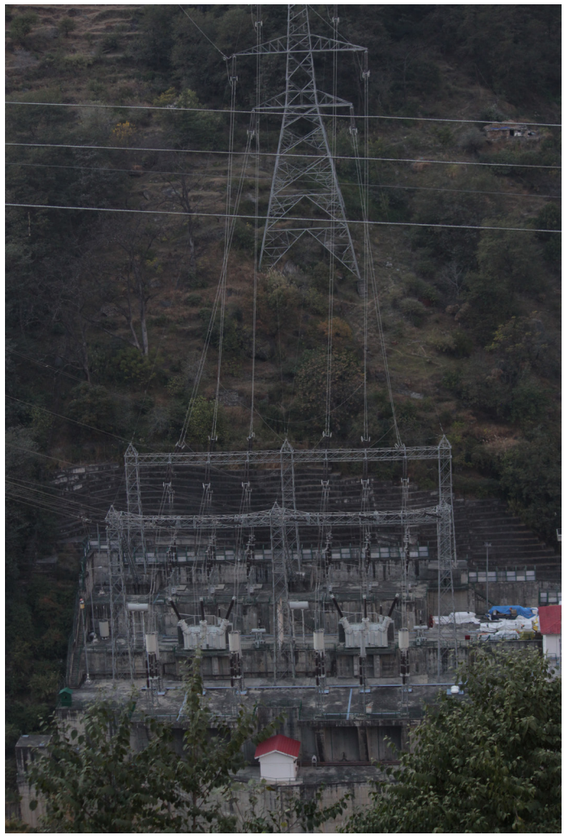
The Alaknanda River is central to the life within Joshimath, influencing its geography, culture, economy and ecology. Its water sustains agricultural practices within the region as well as numerous pilgrimage spots have developed along the river which support pilgrimage processes and tourism in the region.

Inhabitants	■■■■□	Economy	■■■■□
Mobility	■■■■□	Ecology	■■■■■
Pilgrimage	■■■■□	Energy	■■■■□
Tourism	■■■■□	Hydrology	■■■■■
Military	■■■□□	Vulnerable	■■■■□

10 Jaypee Vishnuprayag Hydropower Project

The Vishnuprayag Hydroelectric project is a run-of-the-river hydroelectric project which harnesses the hydro potential of the Alaknanda river and generates 400 megawatts of power. The infrastructure includes a dam, tunnel and a powerhouse. This project has resulted in negative implications on the river ecosystem, community displacement and increased seismic and flood risk in the region.

Inhabitants	■□□□□	Economy	■■■□□
Mobility	■□□□□	Ecology	□□□□□
Pilgrimage	■□□□□	Energy	■■■■■
Tourism	■□□□□	Hydrology	□□□□□
Military	■■■□□	Vulnerable	■■■■□



B. Around Joshimath

The second part of this exercise focuses on the documentation and analysis of the numerous socio-cultural subjects, productive and extractive landscapes around the town of Joshimath. These subjects were subsequently documented through a series of photographs, video montages and audio recordings. The various spatio-temporal processes which influence each subject have also been investigated and their intensities have been plotted in relation to each other, in the form of a fieldwork catalogue.

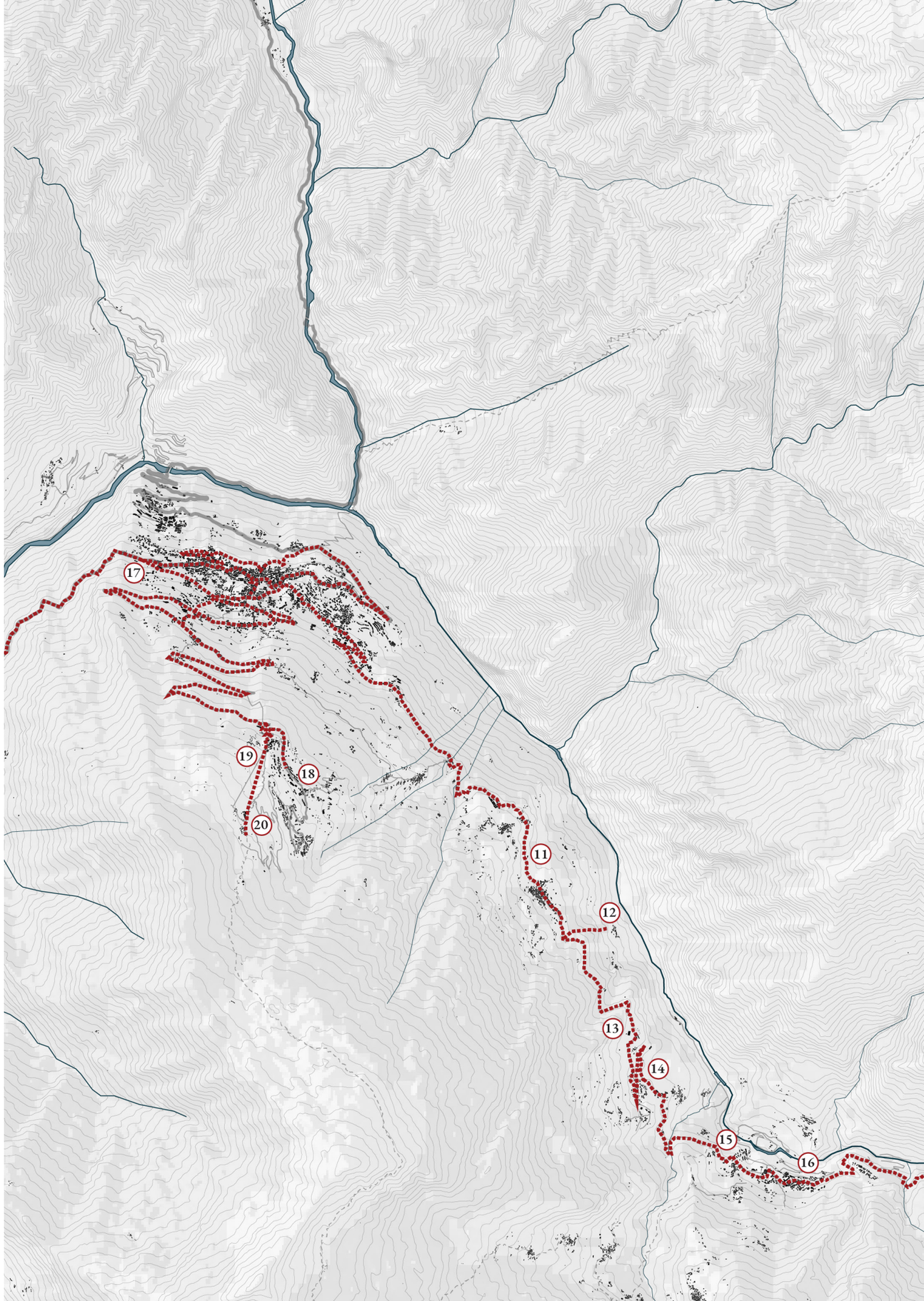


Fig. 44: Mapping trails & landmarks around Joshimath

11 Agricultural Terraces

The Alaknanda River is central to the life within Joshimath, influencing its geography, culture, economy and ecology. Its water sustains agricultural practices within the region as well as numerous pilgrimage spots have developed along the river which support pilgrimage processes and tourism in the region.

Inhabitants	■■■■□	Economy	■■■■□
Mobility	■■■■□	Ecology	■■■□□
Pilgrimage	■■■□□	Energy	■■□□□
Tourism	■■■□□	Hydrology	■■■■□
Military	■■□□□	Vulnerable	■■■□□

12 Hydrological Processes

The hydrology around Joshimath is a complex interplay of glacial melt, monsoonal rainfall, groundwater availability .Anthropogenic appropriation of these resources for large scale hydropower generation have created severe imbalance in the regional social ecologies.

Inhabitants	■■■■□	Economy	■■■□□
Mobility	■■■■□	Ecology	■■■■□
Pilgrimage	■■■■□	Energy	■■■■□
Tourism	■■■■□	Hydrology	■■■■■
Military	■■■□□	Vulnerable	■■■■□

13 Infrastructure Development

Construction activities in the form of road expansion and widening, new river bridges and built infrastructures are a constant sight in the region which is undergoing rapid urbanisation to support various large scale extractive processes

Inhabitants	■■□□□	Economy	■■■■□
Mobility	■■■■■	Ecology	□□□□□
Pilgrimage	■■■■□	Energy	■■□□□
Tourism	■■■■□	Hydrology	□□□□□
Military	■■■■□	Vulnerable	■■■■■

14 Relocation initiatives

Rapid land subsidence in Joshimath forced the government to relocate the affected population to the neighbouring villages of Dhak, Pipalkoti and Gauchar. Prefabricated, modular housing is proposed /under construction in these villages.

Inhabitants	■■■■■	Economy	■■■□□
Mobility	■■■□□	Ecology	■□□□□
Pilgrimage	■■□□□	Energy	■□□□□
Tourism	■■□□□	Hydrology	■■□□□
Military	■■■□□	Vulnerable	■■□□□

15 Global Hinterland

Growing energy demand in the Indian subcontinent has resulted in the creation of multiple large-scale hydropower projects within this vulnerable region and many more are proposed/under construction to support the green energy transition.

Inhabitants	■□□□□	Economy	■■■■□
Mobility	■■■■□	Ecology	□□□□□
Pilgrimage	■■■■□	Energy	■■■■□
Tourism	■■■■□	Hydrology	□□□□□
Military	■■■■□	Vulnerable	■■■■■

16 Tapovan Vishnugad Hydropower project

The controversial 520 MW run of the river project situated on the Dhauliganga River near Tapovan has resulted in massive ecological degradation in the form of land subsidence in Joshimath as well as deadly flash floods which took more than a hundred human lives in 2021.

Inhabitants	■□□□□	Economy	■■□□□
Mobility	■□□□□	Ecology	□□□□□
Pilgrimage	■□□□□	Energy	■■■■■
Tourism	■□□□□	Hydrology	□□□□□
Military	■■■□□	Vulnerable	■■■■■

17 Forestry & Horticulture

Alpine villages and hill stations such as Auli, situated near the town of Joshimath have rich forest reserves as well as ideal climatic and soil conditions to practise horticulture and terrace farming.

Inhabitants	■■■■□	Economy	■■■■□
Mobility	■□□□□	Ecology	■■■■□
Pilgrimage	■■□□□	Energy	■■□□□
Tourism	■■■□□	Hydrology	■■■□□
Military	■■□□□	Vulnerable	■■□□□

18 Military Infrastructure

The controversial 520 MW run of the river project situated on the Dhauliganga River near Tapovan has resulted in massive ecological degradation in the form of land subsidence in Joshimath as well as deadly flash floods which took more than a hundred human lives in 2021.

Inhabitants	■■■□□	Economy	■■■□□
Mobility	■■■■□	Ecology	■■□□□
Pilgrimage	■■□□□	Energy	■■□□□
Tourism	■■□□□	Hydrology	■□□□□
Military	■■■■■	Vulnerable	■■□□□

19 Winter Tourism

Alpine resort towns such as Auli attract thousands of tourists during the winter who flock to this region for adventure sports, skiing, trekking and mountaineering. Temporary accommodation facilities such as prefabricated huts are set up during peak season to accommodate the influx.

Inhabitants	■■■□□	Economy	■■■■□
Mobility	■■■■□	Ecology	■■□□□
Pilgrimage	■■■□□	Energy	■■■□□
Tourism	■■■■□	Hydrology	■■□□□
Military	■■□□□	Vulnerable	■■■□□

20 Seasonal Infrastructure

To support winter tourism and National winter games, infrastructure such as the artificial lake has been developed to freeze water and create ice for skiing and other snow based sports organised in the region.

Inhabitants	■■■□□	Economy	■■■■□
Mobility	■■■■□	Ecology	■■□□□
Pilgrimage	■■■□□	Energy	■■□□□
Tourism	■■■■□	Hydrology	■■□□□
Military	■■□□□	Vulnerable	■■■□□

7. Framing the Project

7.1 Scenarios

A. Continuity / Accumulation

This speculates a future condition in which we continue to build large-scale infrastructure and extractive operations within the vulnerable Himalayan landscape, resulting in the complete degradation of social ecologies of the region.

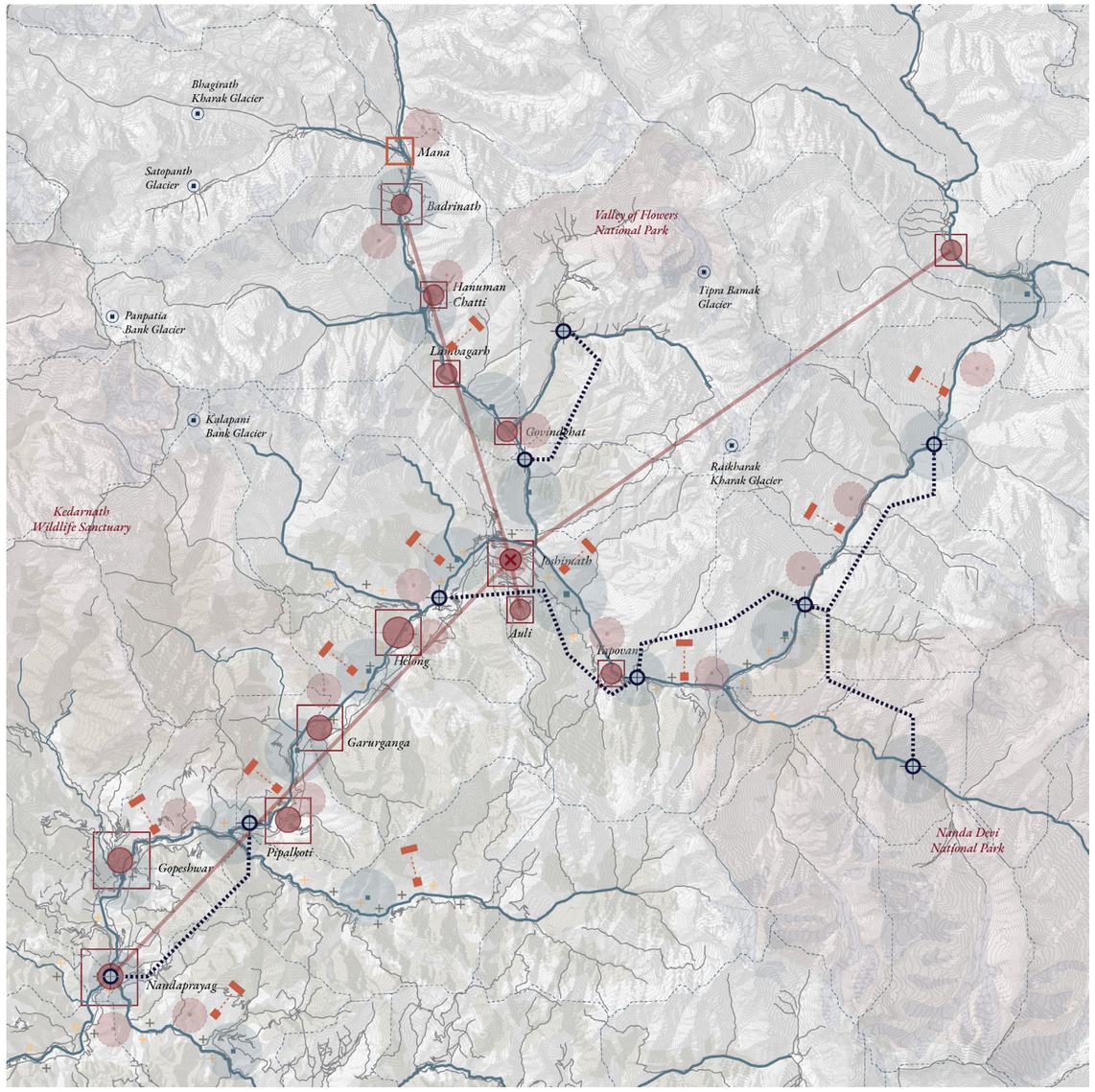
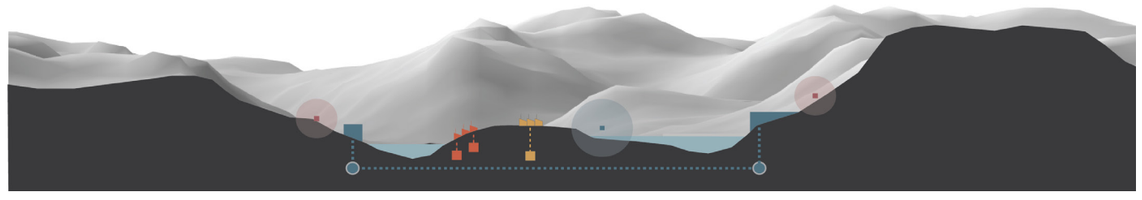


Fig. 45: Continuity/ Accumulation

- Urban settlements
- Road network
- Dams
- Military
- Mineral Extraction
- National Parks
- Glaciers
- Forest Cover
- Hydrology

0 10km N



B. Preservation / No extraction

This speculates a future condition wherein we adopt a conservative approach and stop all large scale processes such as pilgrimage, tourism and energy production in the region. The ecology will thrive, but the socio-economic condition will go down drastically.

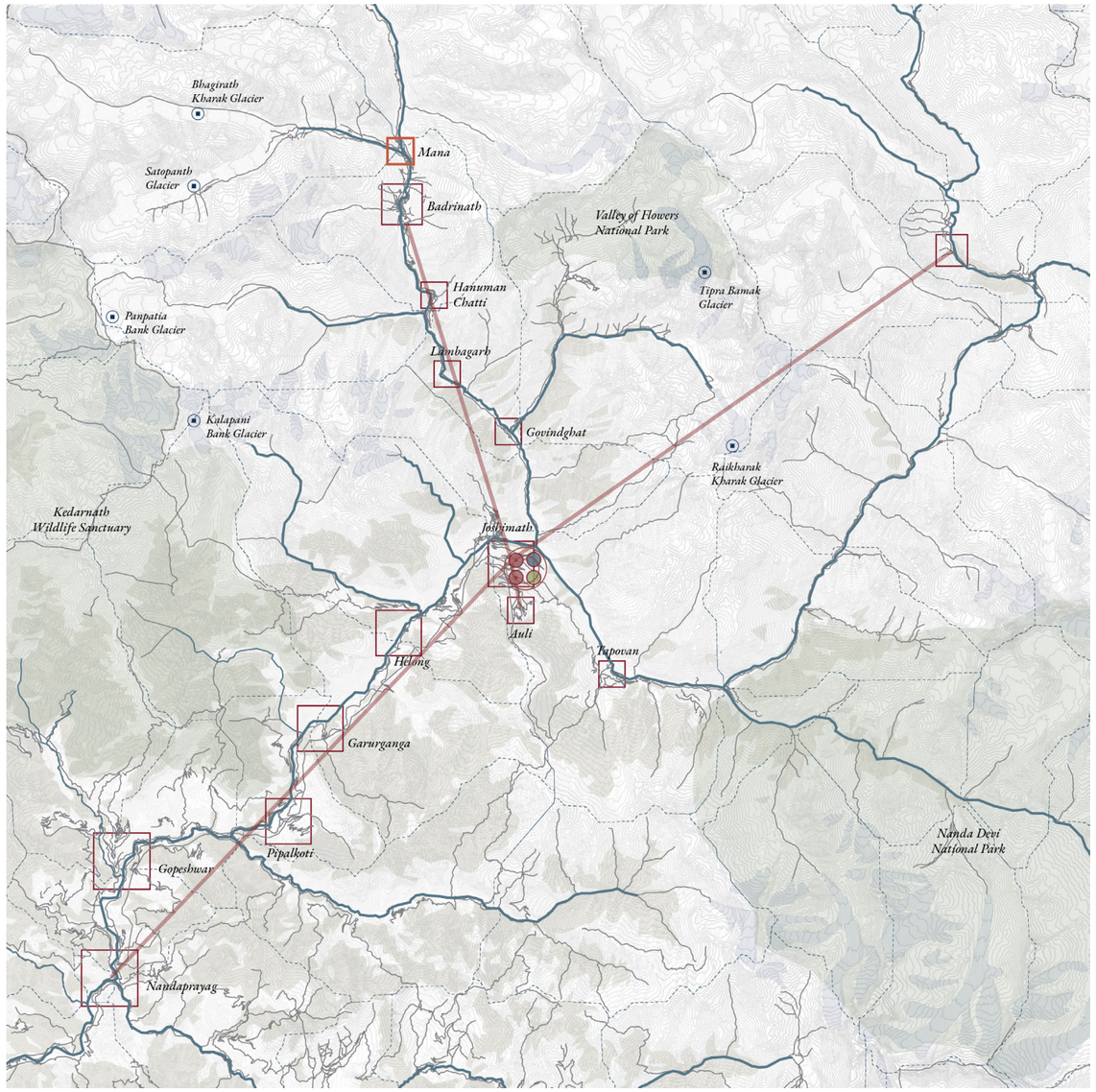
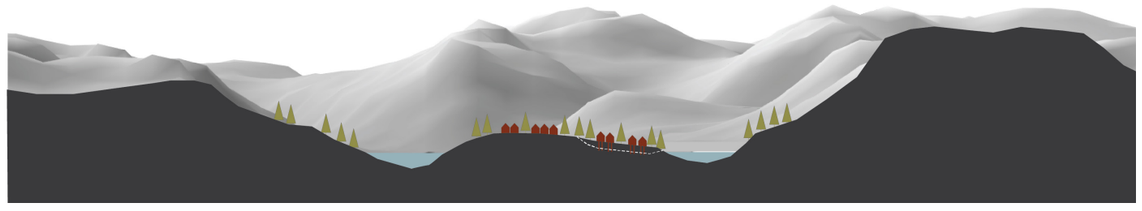


Fig. 46: Preservation

- Urban settlements
- Road network
- Dams
- Military
- Mineral Extraction
- National Parks
- Glaciers
- Forest Cover
- Hydrology

0 10km N



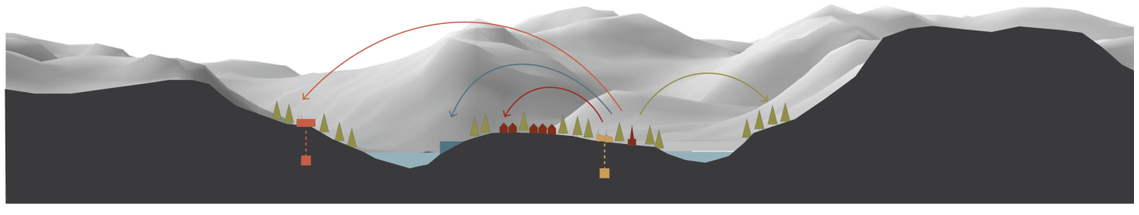
C. Synchronise

This speculates a future condition wherein the various spatio-temporal processes are synchronised using the concepts of ephemerality and material geographies. In this scenario, the needs and aspirations of the region are prioritised, resulting in economic, ecological, and social growth.

Fig. 47: Synchronise

- Urban settlements
- Road network
- Dams
- Military
- Mineral Extraction
- National Parks
- Glaciers
- Forest Cover
- Hydrology

0 10km N



D. Positioning

The scenario of synchronising the various spatio-temporal processes is chosen and their status quo is analysed, in order to define a position upon them, within the regional vision. The processes of pilgrimage and tourism are the main economic drivers and they have historic socio-cultural significance within the region Some of the pilgrimage and tourism hotspots are seasonal and carry untapped socio-economic potential.. Therefore, these processes need to be upgraded, regulated and carried out within predefined limits. The process of Militarisation and border control has resulted in increased vehicular accessibility until the Indo-China border and it shall continue to operate in the future as per the prevalent geopolitical situation. The development of large-scale, centralised hydropower projects in the region to facilitate the transition towards green energy production has resulted in major socio-ecological implications within the fragile Himalayan landscape. The proposed hydropower projects need to be withdrawn and alternate methods of decentralised, green energy production such as terraced solar farms, micro hydropower plants and biomass production should be undertaken. The existing and under construction dams should be repurposed and they need to be integrated with regenerative operations to heal the degraded ecology. Regional socio-economic processes such as agriculture, pastoralism and forestry are integral to the regional identity and they need to be upgraded, by integrating traditional situated practices of the region with technology and research to upscale and reinvigorate these practices, to facilitate a transition from the current extractive economy to a knowledge based economy.

Drivers of Change	Status quo	Positioning	Regional Vision
Pilgrimage	- Main economic driver - socio-cultural significance	- continue - define limits	*'Devbhumi' - Land of God*
Tourism	- seasonal & underdeveloped - untapped socio-economic potential	- upgrade , connect - define limits	*Himalayan Resort towns* *Haven for Winter Sports* *Promoting Regional culture*
Militarisation	- increased vehicular accessibility - army helps in disaster rescue operations	- continue - define limits	*Secured & Resilient Territory*
Green Energy	- major socio-ecological implications - more projects are proposed / under construction	- repurpose existing projects - switch to alternate methods of green energy production that are decentralised & fulfill regional demands	*Green Energy Hub with reduced ecological degradation*
Agriculture	- primary occupation / regional identity - steadily reducing due to erratic weather / migration	- upgrade and increase yield - integrate with other practices such as energy production, forestry	*Agriculture and Horticulture Hub*
Forestry & Landscape Maintenence	- strong social communities & traditional practices - deforestation due to large infrastructural projects	- upgrade and empower community - integrate with other practices such as energy production, agro-tourism	*Ecological Regenaration*
Technology & Research	- technological revolution is transforming India through digital accessibility & social media network. - pilot projects integrating technology & research to upscale regional practices are gaining momentum.	- upscale & integrate with other practices such as energy production, agro-tourism.	*Knowledge Economy*

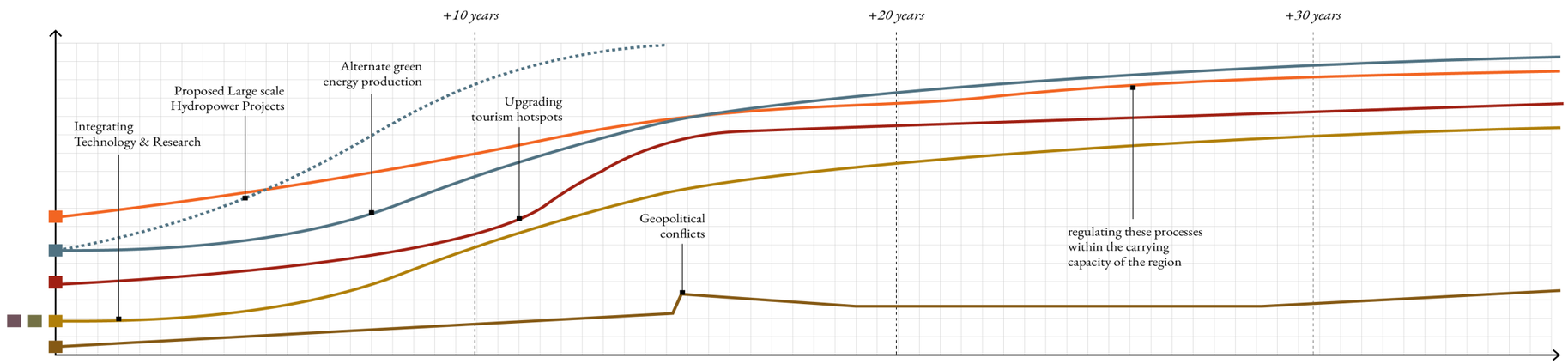
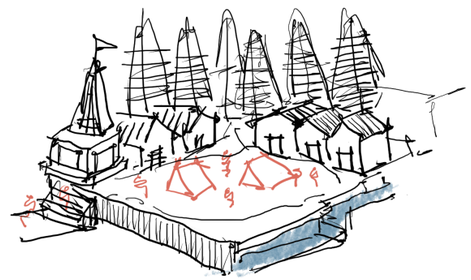


Fig. 48: Drivers of Change in the Himalayas

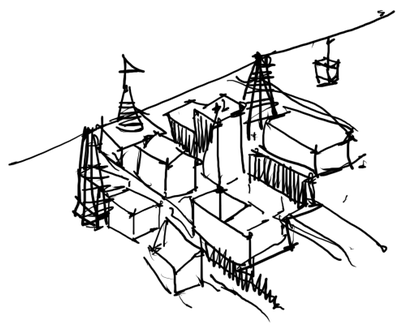
7.2 Conceptualisation

A. Ephemerality

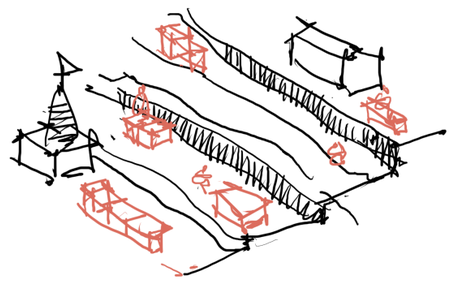
Ephemerality in urbanism refers to the temporary, transient, and short-lived aspects of urban spaces and interventions. This concept emphasises the creation and utilization of urban environments that are designed to exist for a limited time, responding to specific needs or events. Ephemeral urbanism brings flexibility, adaptability, offering unique solutions for such complex and critical landscapes.



1800 CE : ephemeral
500 inhabitants
100 floating population



2023 CE : urban jungle
20,000 inhabitants
20,000 floating population

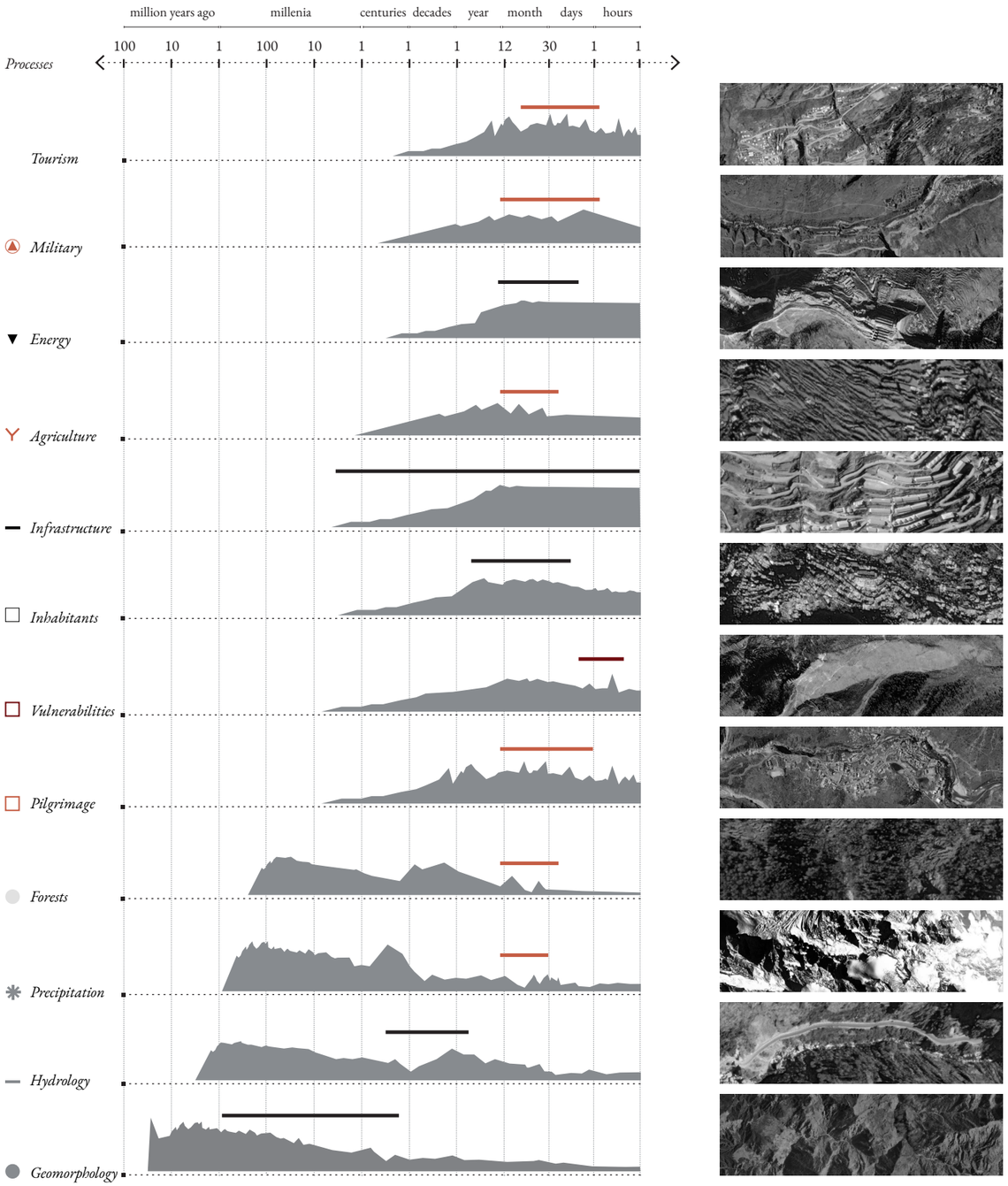


2050 CE: back to the ephemeral?

Fig. 49: Historic evolution of the built environment in Joshimath, Uttarakhand

B. Spatio-Temporality in the Himalayan landscape

The various human and more than human processes are plotted against the geological time gradient to illustrate how they have evolved over different times. On the basis of the spatio-temporal dynamics of these processes, they are classified into perennial, seasonal and uncertain.



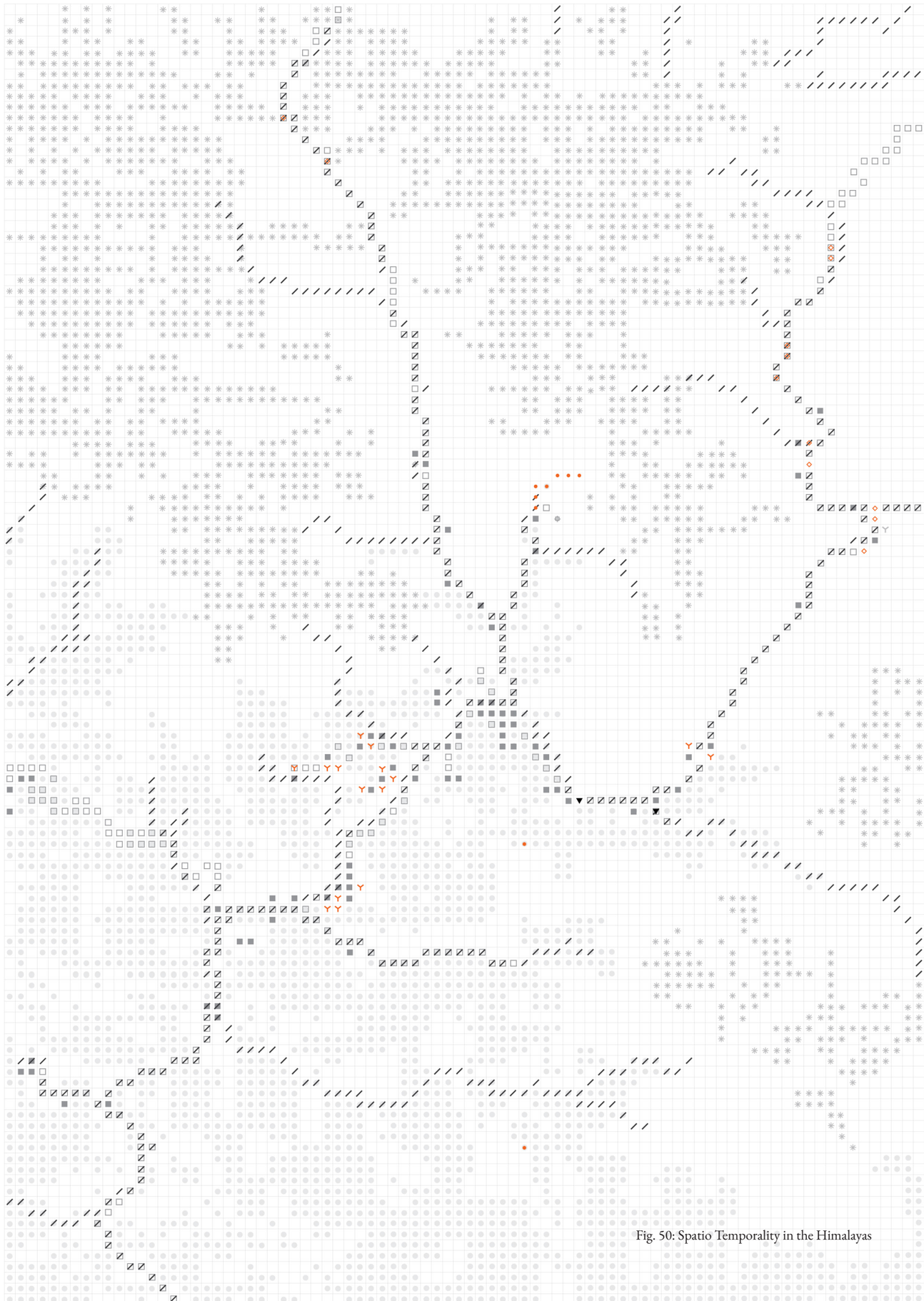


Fig. 50: Spatio Temporality in the Himalayas

C. Material Geographies

Material ecologies in urbanism refer to the study and application of materials in the built environment, focusing on the sustainability, lifecycle, and ecological impact of these materials. This approach considers how materials interact with their surroundings, contribute to ecological balance, and support sustainable urban development. It encompasses the selection, sourcing, usage, and disposal of materials within urban spaces, aiming to create more resilient, sustainable, and integrated urban ecosystems. Within the context of the region under investigation, the natural and man made materials which constitute the human and the more than human environment are identified and spatially mapped.

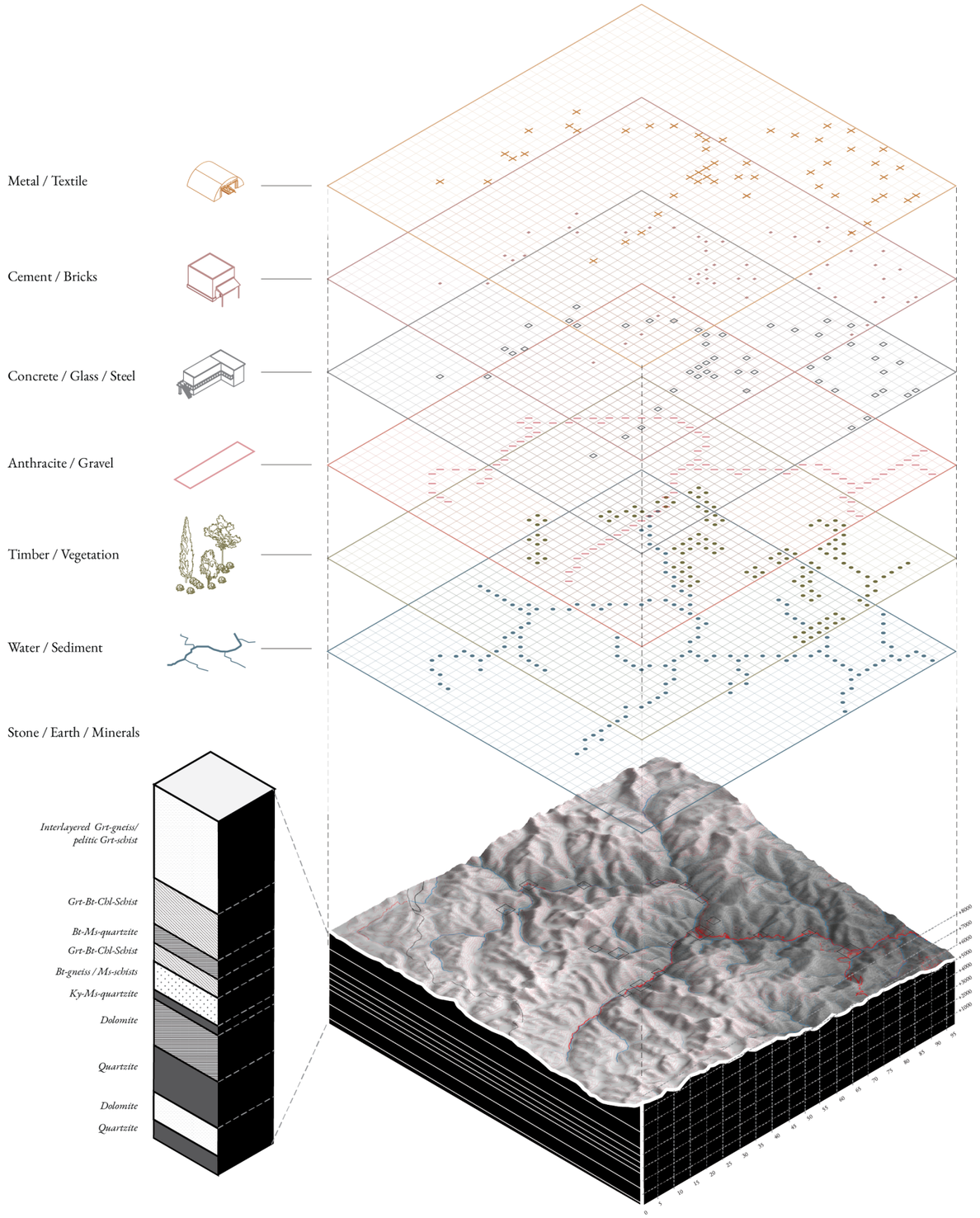
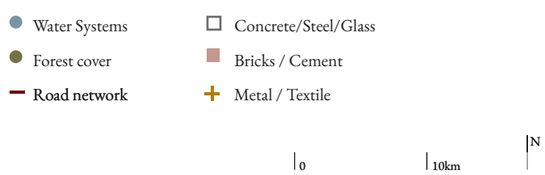


Fig. 51: Material Geographies within the Himalayan Landscape

The following diagram spatially maps the locations of the numeous natural and man made materials present within the region.



D. Material Flows

The materials located within the context are synchronised into a spatio-temporal program based upon the seasonalities of the processes existing within the region.. The numerous flows constituting the material cycle are analysed from start to end: extraction, production, distribution, consumption and disposal. Thereafter ,this program proposes a series of spatial actions comprising of periodic reuse, recycling, repurposing and readaptation of existing materials and infrastructures to produce new spatial configurations to cater to pilgrimage, tourism, militarisation, green energy production, landscape resilience and reinvigoration of vulnerable social ecologies within the region. These configurations manifest in the form of strategies and spatial interventions which follow a temporal program, within the cross-scalar vision for the region.

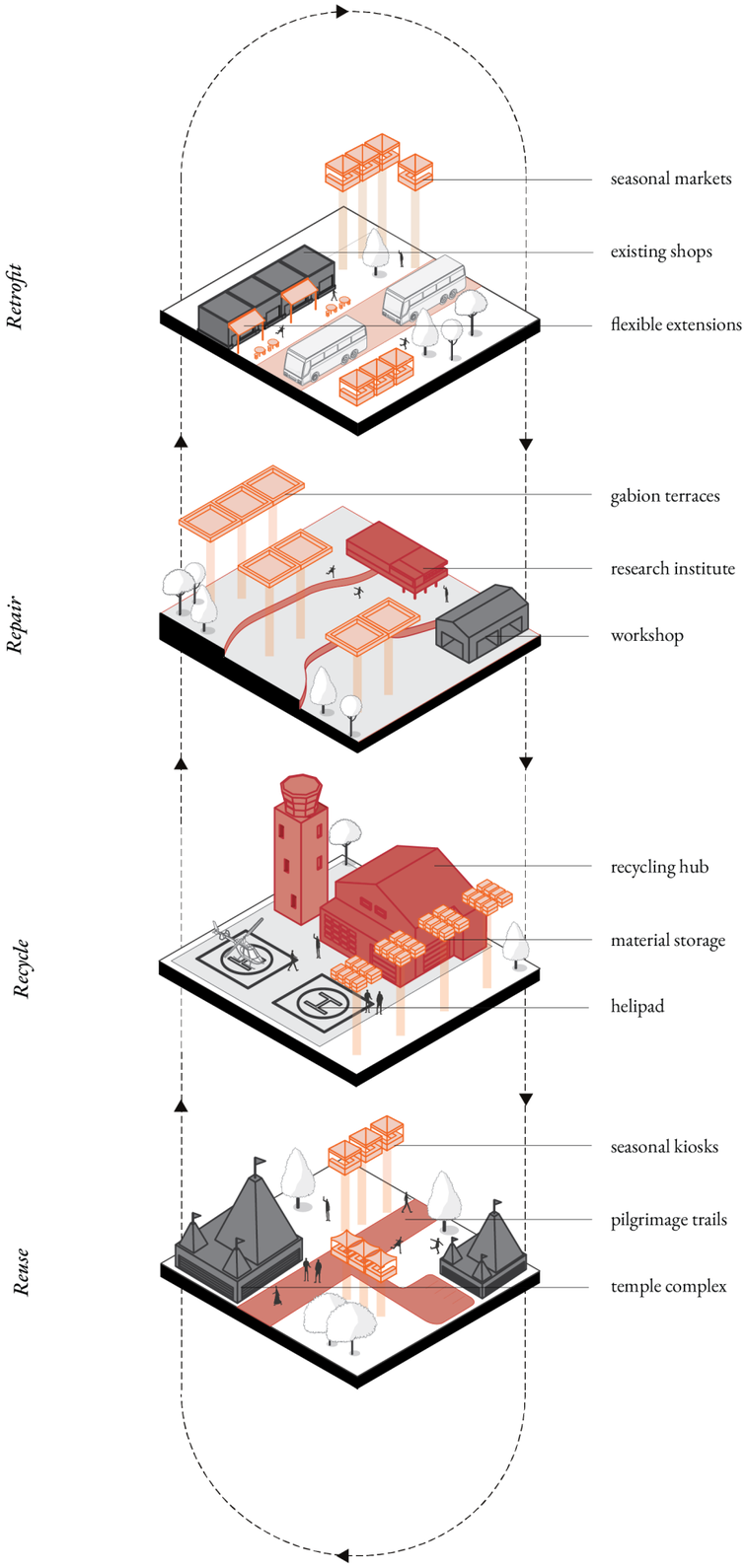


Fig. 52: Flows of Materials & Infrastructures

7.3 Regional Vision & Strategy

A series of regional strategies are developed to remediate the critical processes which aim at decentralising power and prioritising the region, through the spatio-temporal synchronisation of the processes of Urbanisation within the context.

A. Seasonal networks

Within the desired scenario, the processes of pilgrimage, tourism and military will continue to operate as they are integral to the socio-economic sustenance of the region. The extent of urbanisation of these pilgrimage/tourism hotspots is governed by the carrying capacities of the context. In order to decongest and disperse the population influx during peak season, a network of secondary attraction points is developed around a tourist hotspot and is connected to the main centre through ephemeral mobility networks. These networks can later be dismantled and their materials are reconfigured to serve different functions at varying locations within the context, using the concept of material ecologies.

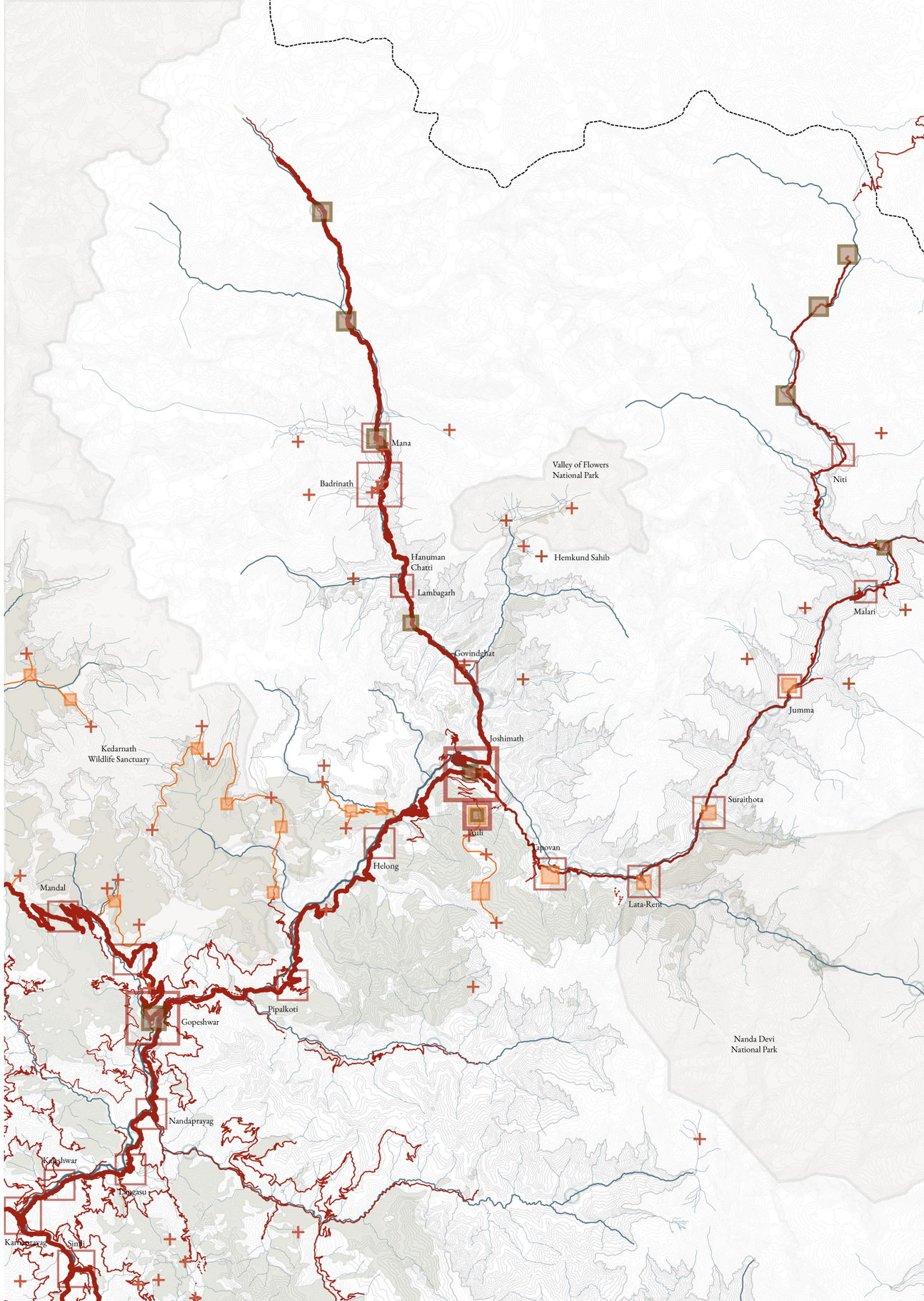
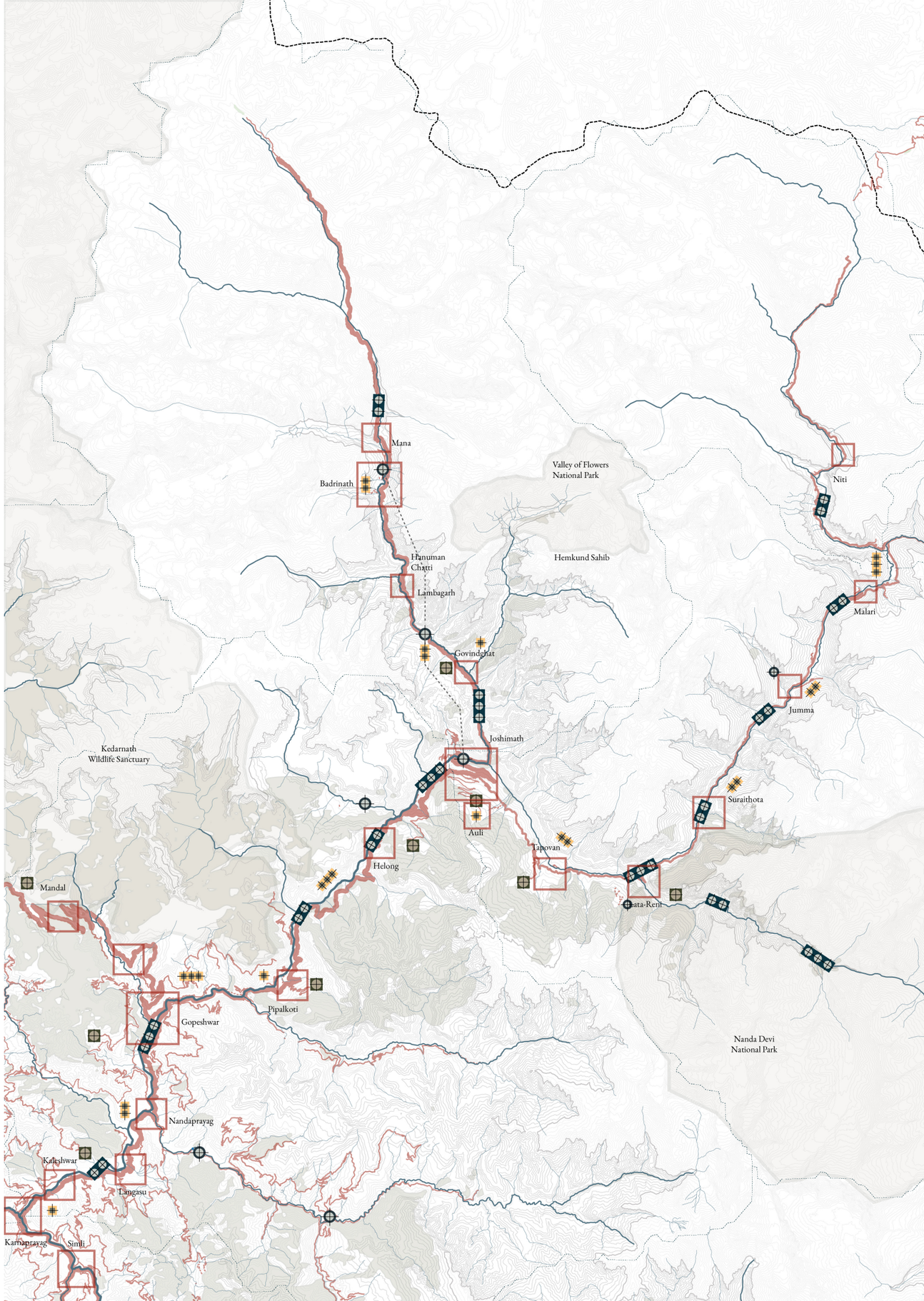


Fig. 53: Seasonal networks in the Himalayan Landscape
The following map illustrates the development of seasonal networks to support the processes of pilgrimage, tourism and militarisation.

B. Green Energy Production

The large scale, centralised hydropower projects which have been proposed within the region to tap upon its hydropower potential are withdrawn as they have severe implications on the socio-ecological conditions of the region. Projects such as the Tapovan Vishnugad Dam are decommissioned and their material are repurpose to create a decentralised network of micro, mini and small hydropower plants of varying capacities to provide energy to the remote corners of the river valley. Alternate means of green energy production are created by tapping into the abundance of resources within the context. The terraced landscape is integrated with solar panels, on the basis of the aspect of the hillshade, providing energy to the surrounding built environment. Since the region has a rich forest reserve, a network of biomass power plants is also created to produce more energy. Once the local energy demands of the region are fulfilled, the excess energy is thereafter exported downstream to the bigger urban centres in the subcontinent, generating revenue within the Himalayan landscape.

Fig. 54: Decentralised Green Energy Production in the region
The following map illustrates the development of decentralised means of green energy systems to support the regional social ecologies.

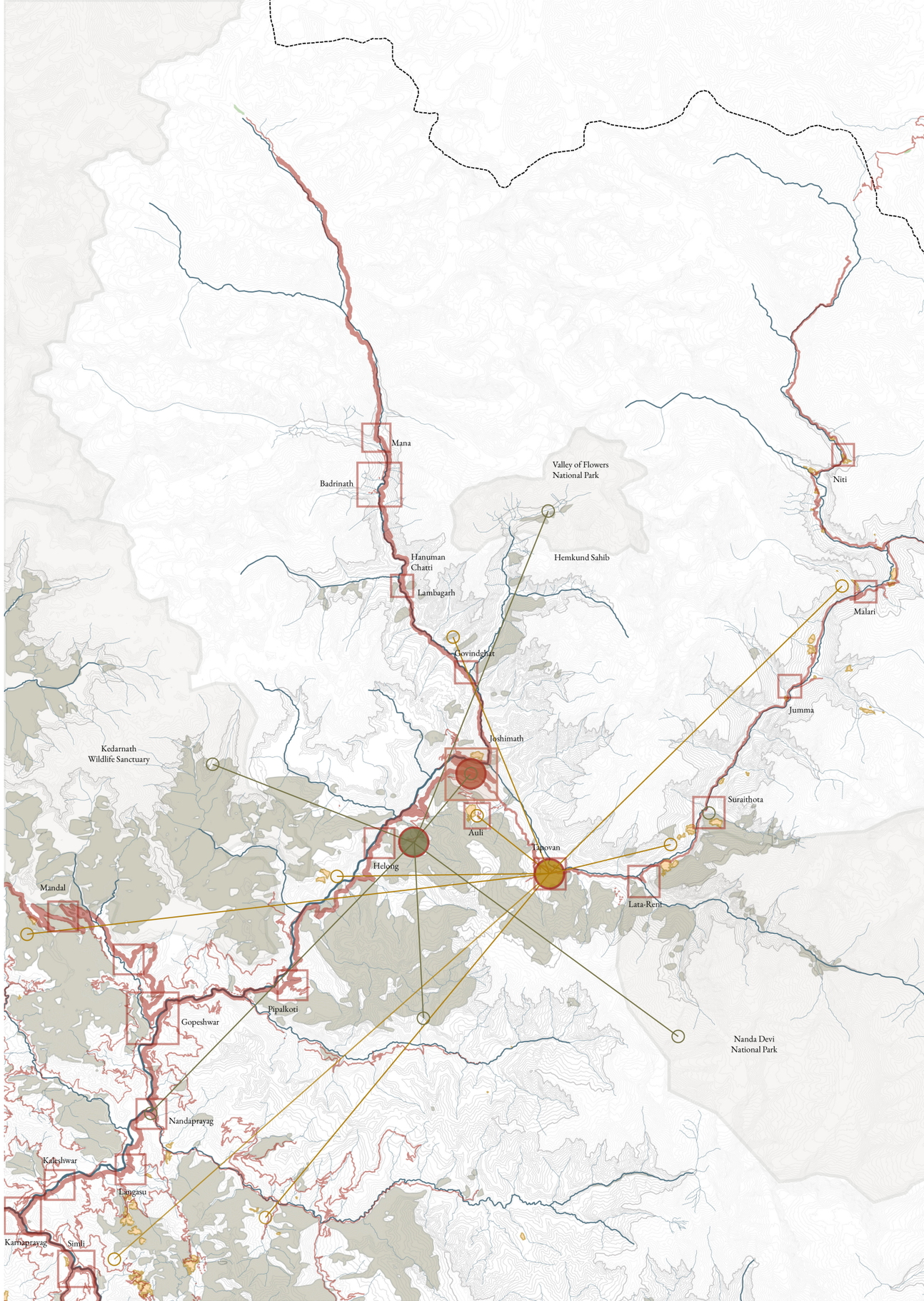


C. Regional Economies & Knowledge Hubs

Agriculture and Forestry, the primary economies of the region, are reinvigorated by the integration of technology and research to upgrade and upscale these industries. A new industry for reusing, recycling, repurposing and repairing the material ecologies of the region is introduced into the context. A network of Production & Knowledge hubs is proposed for each of these regional economies which consists of a primary hub supported by a system of decentralised sub-stations dispersed around the region. The primary hubs include a Agricultural Production and Research Institute at Tapovan, a Material Recycling Hub in Joshimath and a Forestry Institute at Helang, which are supported by sub-stations dispersed around the regional social ecologies.

Fig. 55: Network of Regional Economies & Knowledge Hubs

The following map illustrates the development of decentralised means of green energy systems to support the regional social ecologies.



D. Landscape Resilience, Materiality & Mobility

The negative implication of natural hazards such as floods, landslides and earthquakes as well as large scale extraction processes such as infrastructure development and green energy production, a series of spatial interventions are proposed to remediate and repair the Himalayan landscape. This is often integrated with another program such as co-production of green energy with landscape resilience through development of terraced solar farms which hold together the loose soil particles and regulate the flow of water falling on it. Spatial structures developed for regional economies such as agriculture, forestry and the material production industry further add a degree of resilience to this vulnerable Himalayan Landscape. At the tectonics scale, the new built environment is developed following a strict building code for morphology, vernacular materiality, resilient construction techniques and water sensitivity.

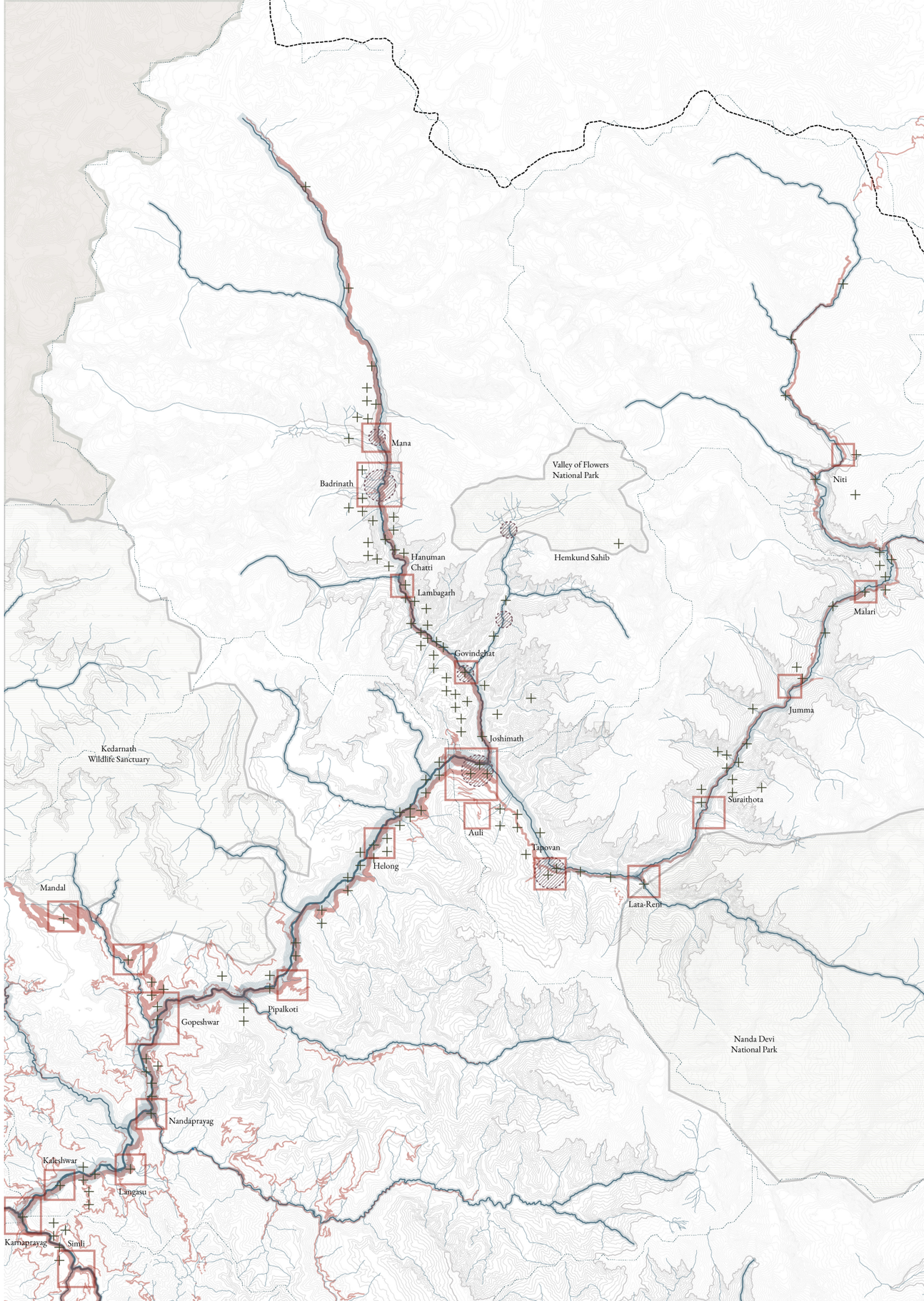


Fig. 56: Resilient Landscape and Material Flows

The following map illustrates the development of resilient structures to counter natural hazards and support regional economies and processes.

E. Integrated Vision & Strategy

The vision and strategies which aim to develop seasonal networks, decentralised green energy production, regional knowledge hubs and landscape resilience in the region are overlaid on top of another to synthesise an inter-scalar vision and strategy map for the region.

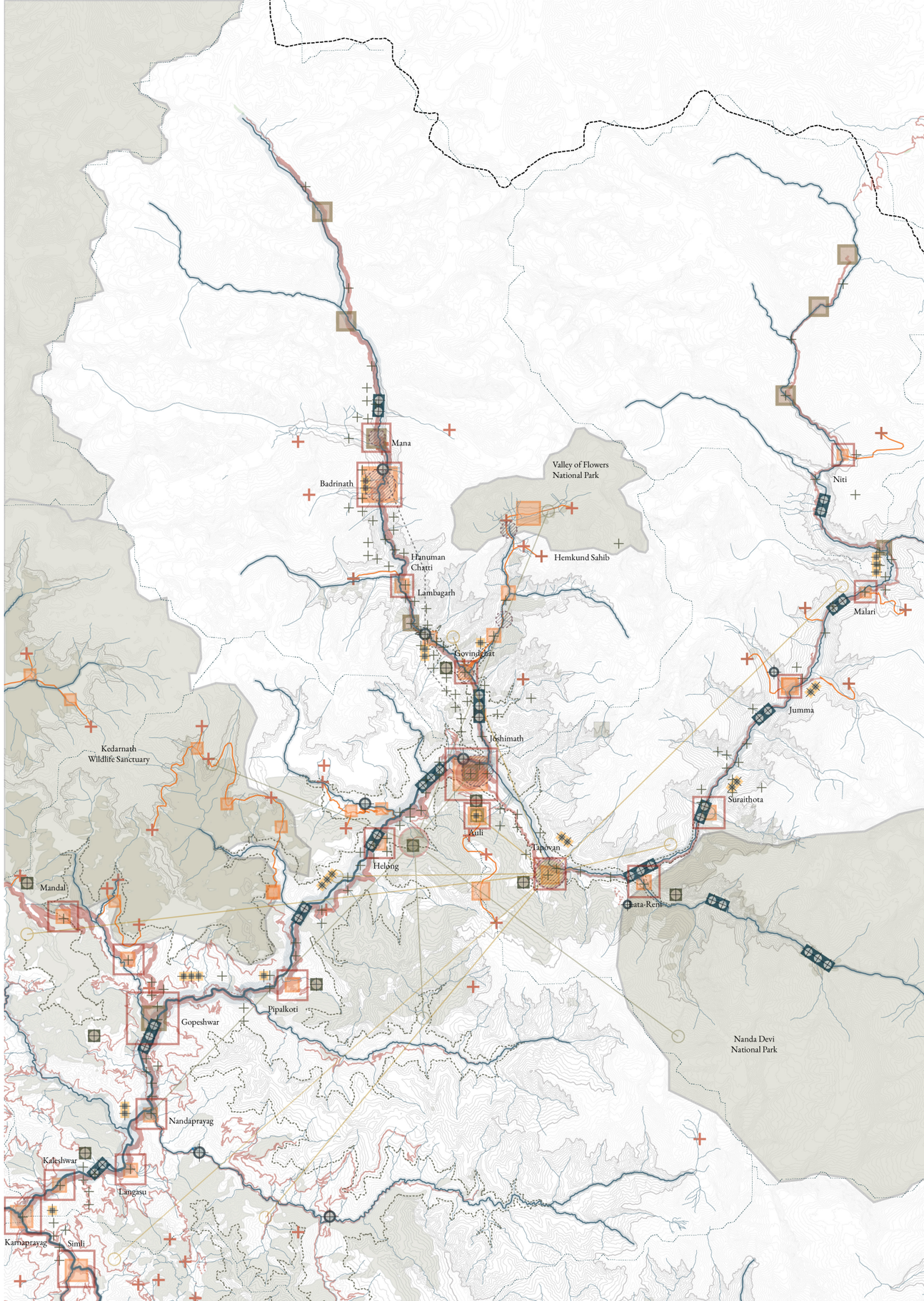


Fig. 57: Integrated Vision & Strategy Map

The following map illustrates the development of resilient structures to counter natural hazards and support regional economies and processes.

7.4 Operations

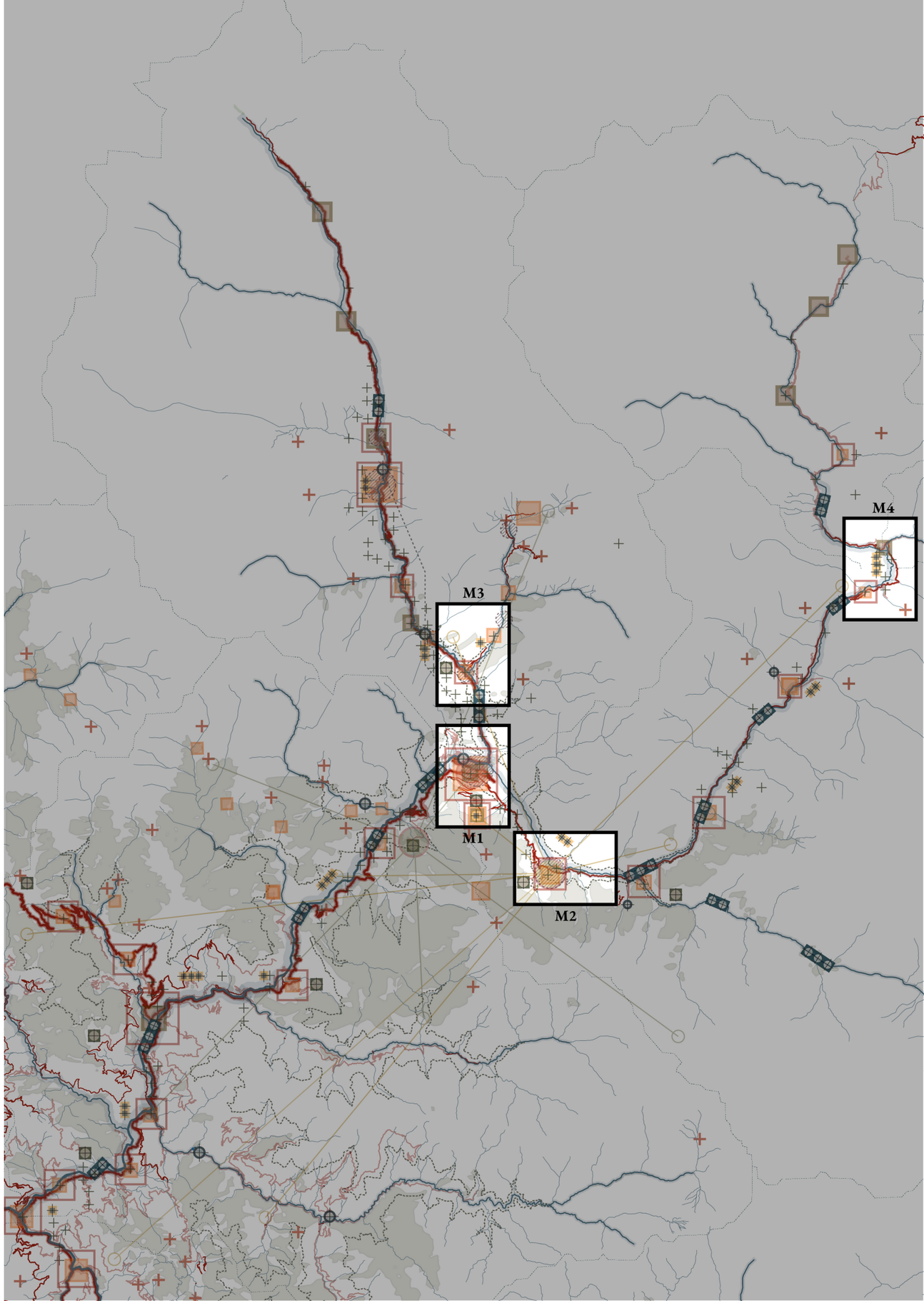
A. Catalogue of Operations

A Catalogue of Operations is developed which cater to the various spatio-temporal processes within the region. The spatial logic of situating a certain operation at a specific location is stated along with a list of key locations within the region.

Spatial Operations /M	Processes / L	Spatial Logic	Key Locations
Infrastructure for Inhabitants		- geologically safe zones - along pilgrimage/tourism route - near agricultural production	M1 M3
Pilgrimage/Tourism Infrastructure		- proximity to cultural heritage - along pilgrimage/tourism route - duration of the activity - stability of ground	M1 M2
Conservation of Cultural Heritage		- location of cultural heritage - stability of ground - pilgrimage/tourism route	M1 M2
Ecological Restoration		- stability of ground - topography / hydrology - vegetation / landcover	M1 M2 M3
Mobility networks & Material Flows		- stability of ground - topography / hydrology - vegetation / landcover - seasonalities	M1 M2 M3 M4
Military Infrastructure		- borders / strategic locations - accessibility / mobility	M1 M4
Regional Economies & Knowledge Hubs		- mobility networks - seasonality - vegetation/landuse - proxmity to settlements	M1 M3 M4
Decentralised Green Energy Production:		- topography / hydrology - solar incidence - vegetation/landuse - proxmity to settlements	M1 M3 M4

Fig. 58: Catalogue of Interventions

The following map illustrates the development of resilient structures to counter natural hazards and support regional economies and processes.



B. Spatialising Operations / M1 / Joshimath-Auli

The set of operations are spatialised within the towns of Joshimath and Auli. The following graph illustrates the temporal nature of these seasonal operations and proposes interlinkages in the form of material flows and programmatic transformations within them to synchronise these within the context.

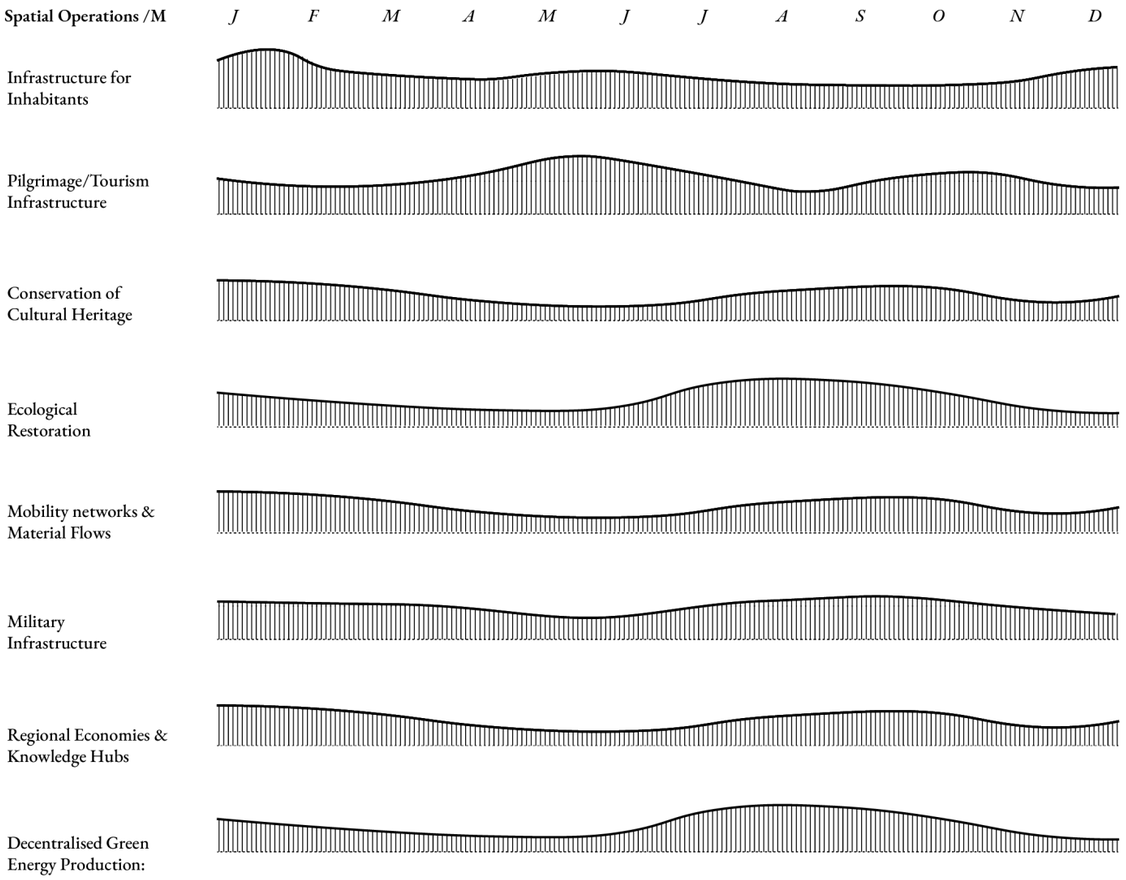
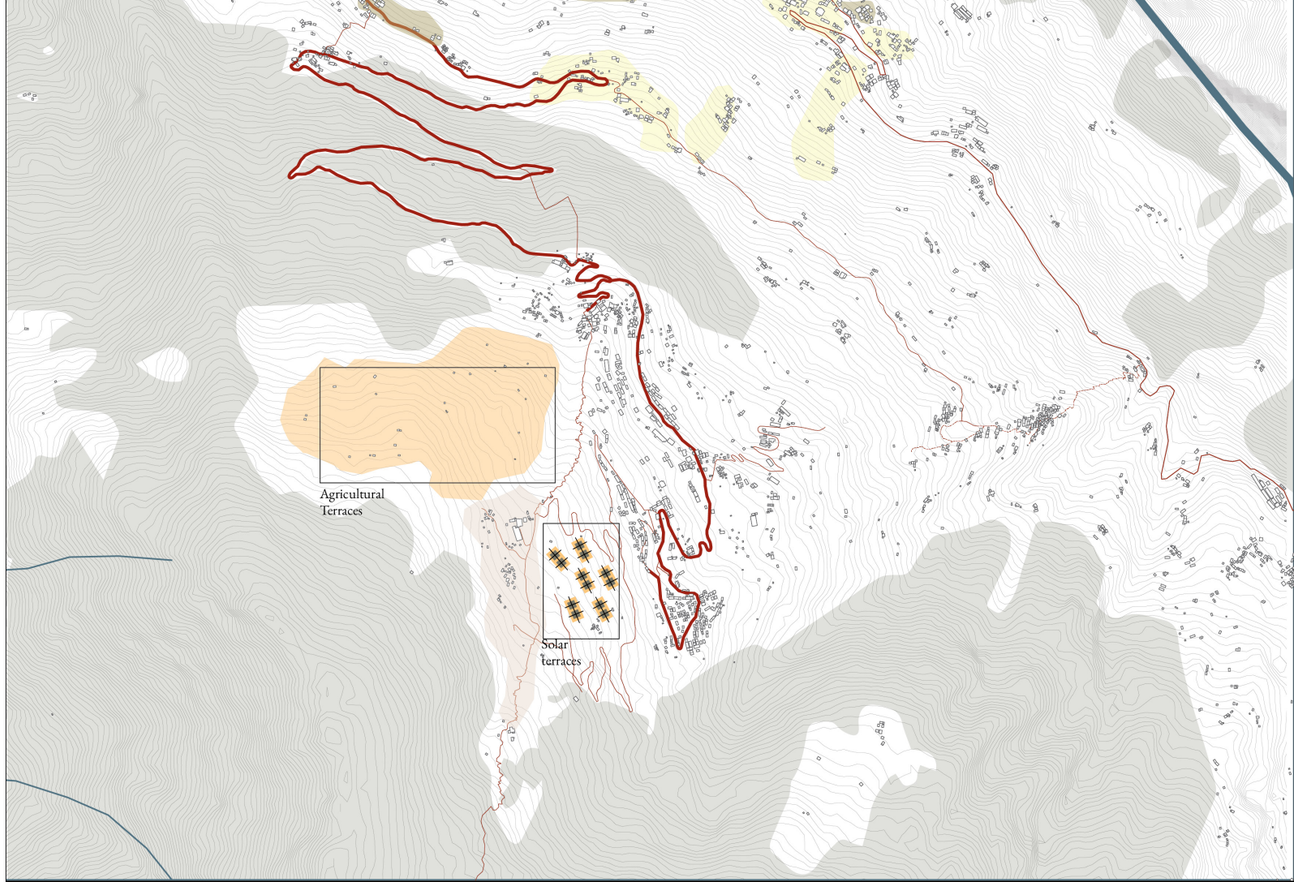


Fig. 59: Spatio-Temporal Operations in Joshimath & Auli

The following map illustrates the temporal nature of the spatial operations proposed within the region of Joshimagh and Auli.



C. Scales of Interventions

The cross-scalar strategic framework is operationalized through four scales: Territorial (L), Landscape (M), Ensemble (S) and Object (XS) scales. At the Territorial scale, a regional strategy is developed which remediates the critical Himalayan Landscape by synchronising the spatio-temporal processes of urbanisation within the context. Thereafter, a spatio-temporal Catalogue of Operations is developed for the Territorial Scale and these are spatialised within the landscape of Joshimath and Auli. This is followed by the development of a palimpsest for the city of Joshimath to illustrate the spatial infrastructures which are added, subtracted and persisted with. Within this frame, a set of key interventions are identified and these are further developed as 3Design Experiments at the Ensemble Scale. Each design experiment contains a set of anchor points (Objects) which are either elements integral to the socio-cultural landscape of Joshimath or a spatial infrastructure such as Material Recycling Centre and Infrastructure for rehabilitating the displaced population within Joshimath.

Object scale / S
- 10m - 100m
- Materiality
- Tectonics

Ensemble scale / S
- 200m x 300m
- Design Experiment
- Spatial Transformation
- Material Flows

Landscape scale / M
- 30kmx 20km
- Catalogue of Operations
- Palimpsest / Joshimath

Territorial scale / L
- 150kmx 100km
- Urbanisation Processes
- Regional Strategy

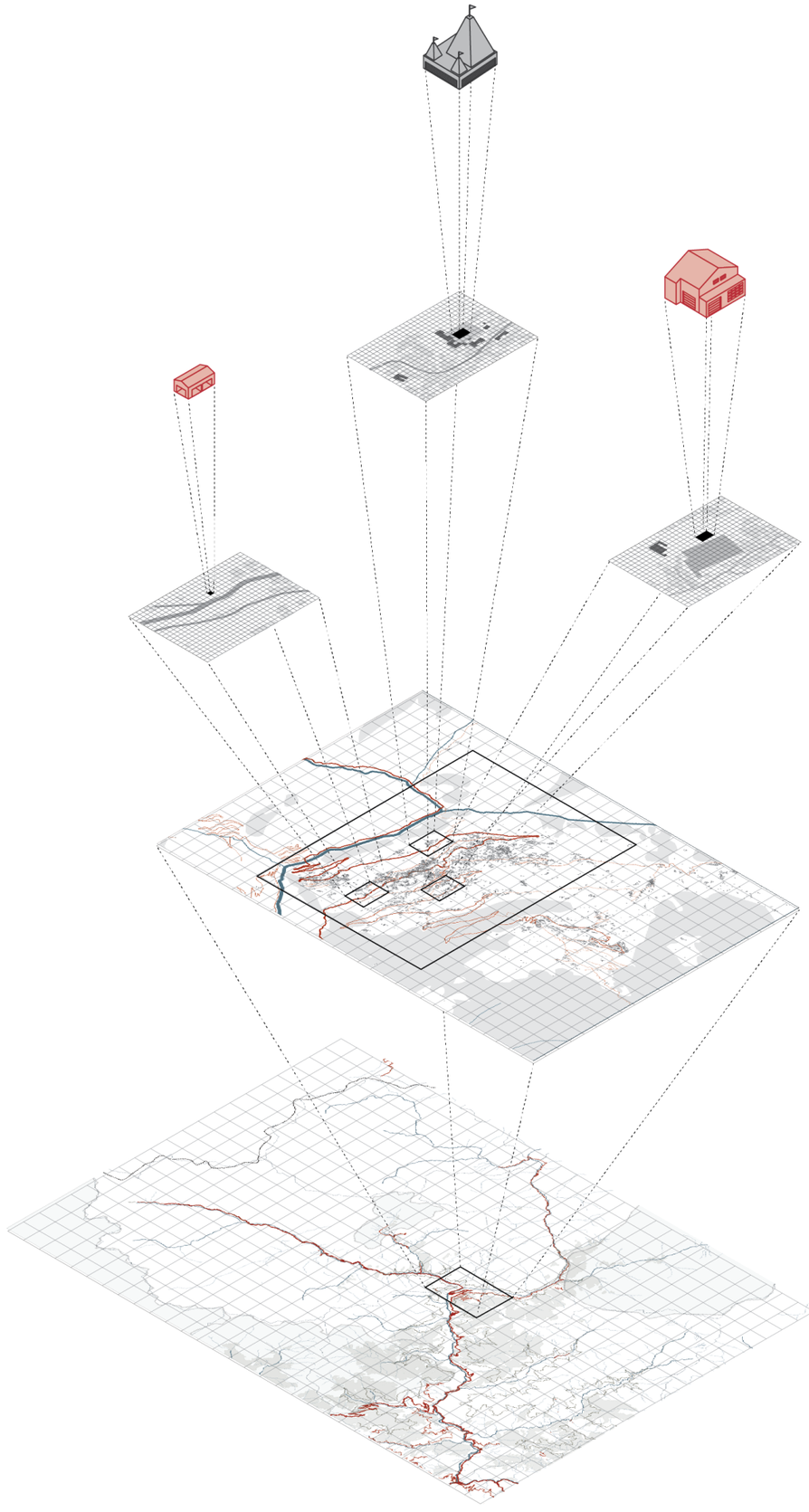


Fig. 60: Scales of Interventions

D. Joshimath town
i. Satellite view / 2024

Fig. 61: Satellite view / Joshimath

Fig. 62: Land subsidence in Joshimath

The following map illustrates the land parcels within Joshimath where rapid ground subsidence has been observed January 2023 onwards.

Buildings
Road network
Natural Springs
Land subsidence
Hydrology
Tree Cover

0 1km

N

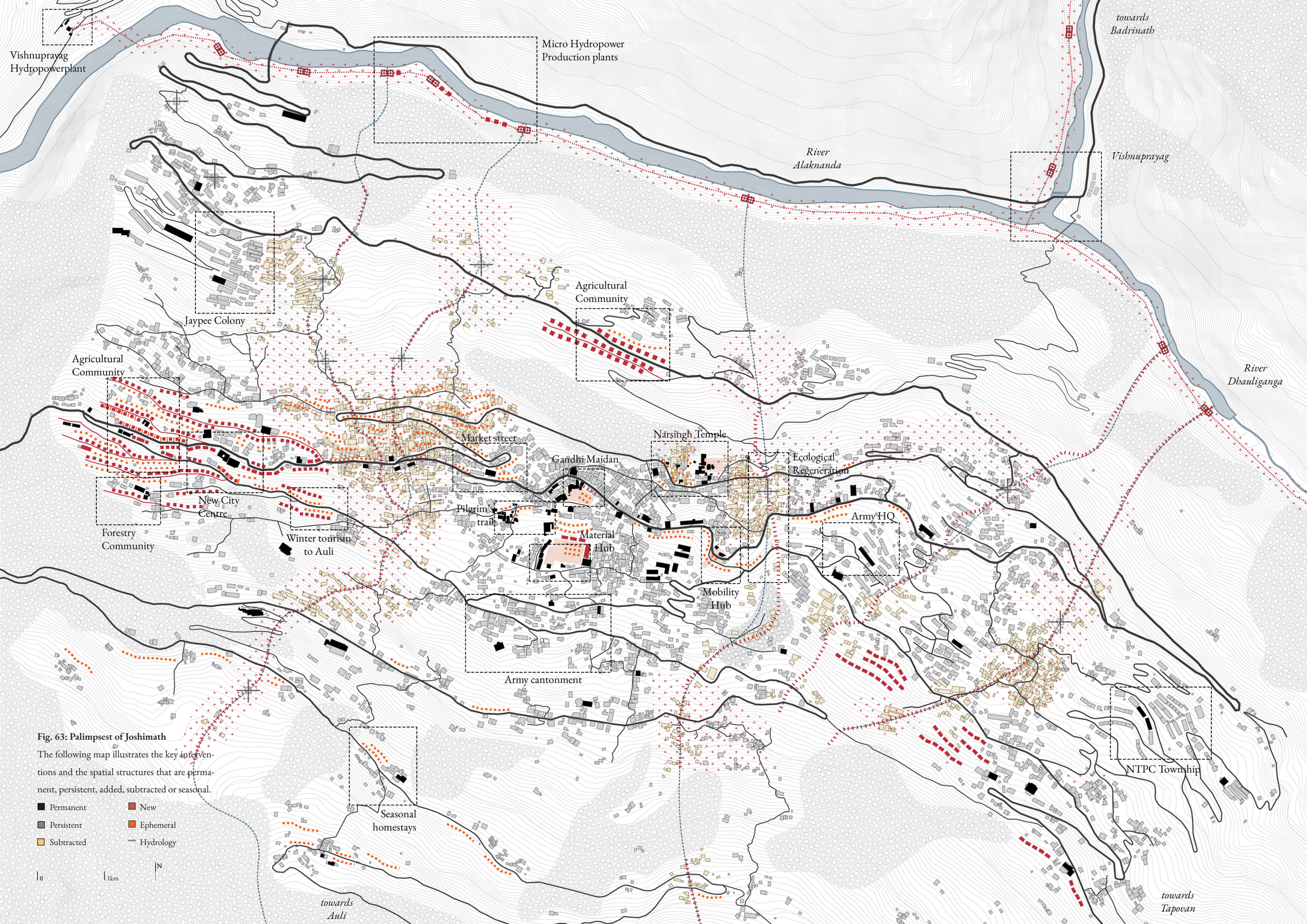


Fig. 63: Palimpsest of Joshimath

The following map illustrates the key interventions and the spatial structures that are permanent, persistent, added, subtracted or seasonal.

7.5 Design experiments

A. S1 / Topos / Repairing socio-cultural landscape

The following design experiment investigates the cultural landscape of Joshimath through the lens of Topos. The land parcel around Narsingh Temple, which is under the high risk zone for land subsidence, is chosen as a paradigmatic area to show the spatial transformation of the frame in accordance with the desired future scenario.

Inhabitants	■■■■□	Economy	■■■■□
Mobility	■■□□□	Ecology	■■□□□
Pilgrimage	■■■■■	Energy	□□□□□
Tourism	■■■■□	Hydrology	■■□□□
Military	■□□□□	Vulnerable	■■■■□

Fig. 64: Urban sprawl around Narsingh Temple, Joshimath

i. Existing condition

The frame under investigation consists of the religious landmarks within Joshimath: Narsingh Temple complex, Catholic Church and a Sikh Temple. There is an arterial street which connects these to the main market street of Joshimath and facilitates the movement of pilgrims and tourists. A plethora of multistoried buildings have been constructed on the highly vulnerable terraced landscape which house residential and commercial functions.

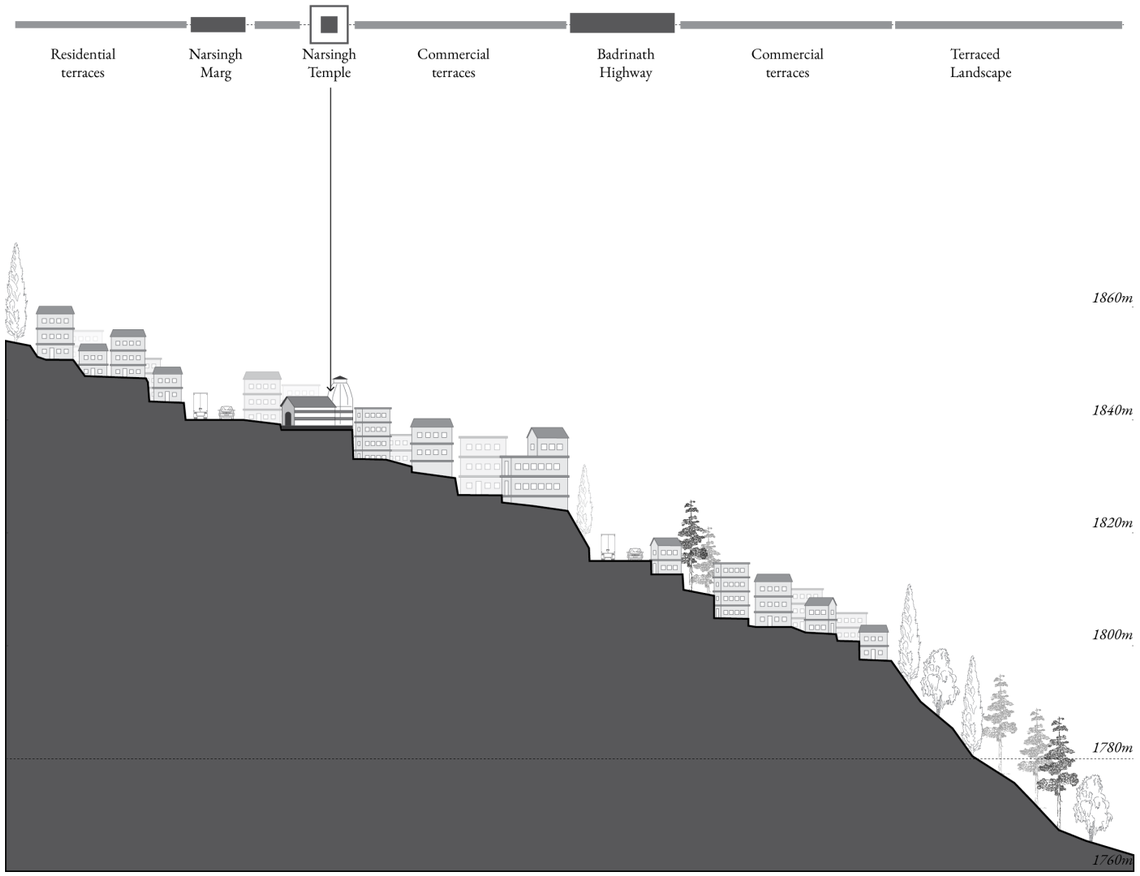


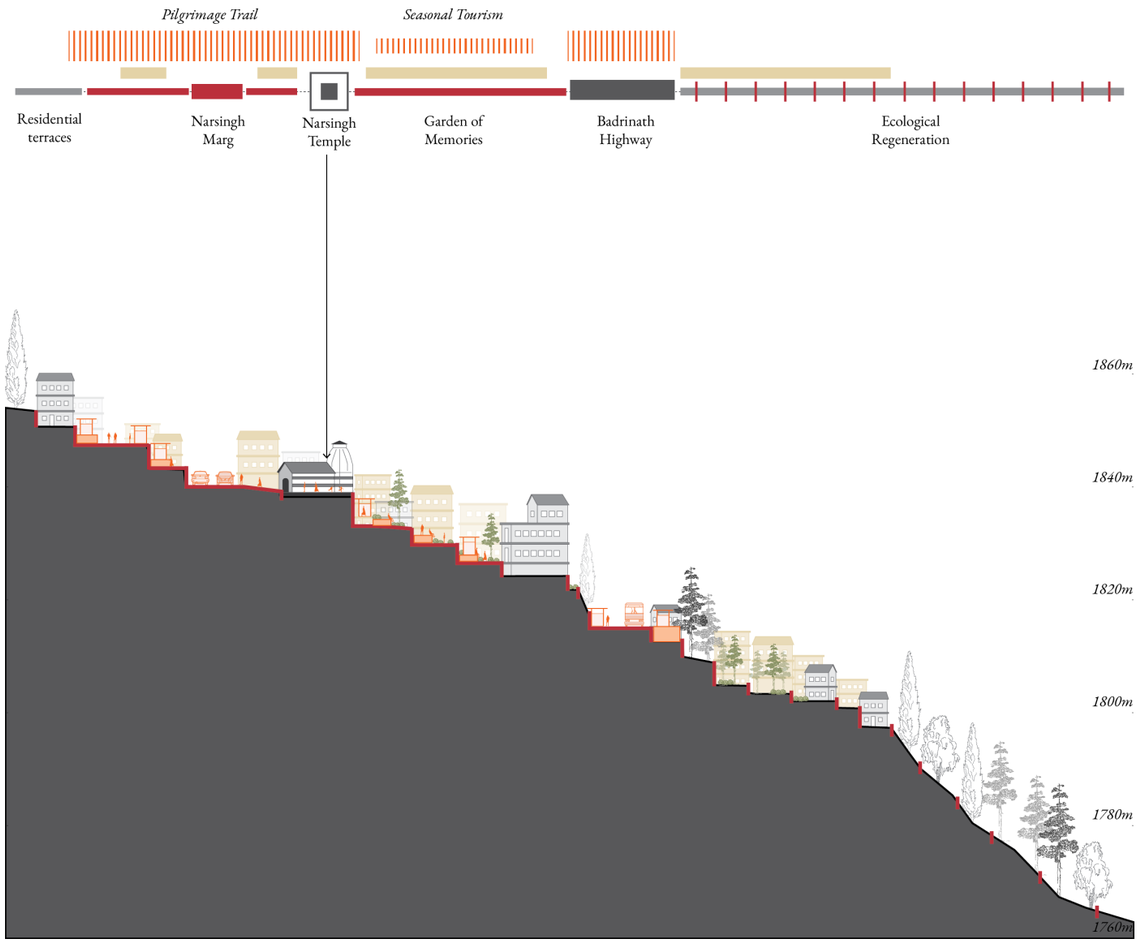
Fig. 65: Existing condition

Permanent

Persistent

ii. Transformation

The encroachments around the arterial street are strategically cleared to create a public avenue around the historic landmarks. A similar design action of clearance is followed along the terraced landscape, with a few persisting structures that are left untouched for the natural processes to take over, following the approach of the planetary garden. The terraced landscape and the socio-cultural landmarks are supported by a series of ephemeral structures which facilitate the processes of pilgrimage and tourism during peak season and are reconfigured to support other programs during winters and monsoon seasons.



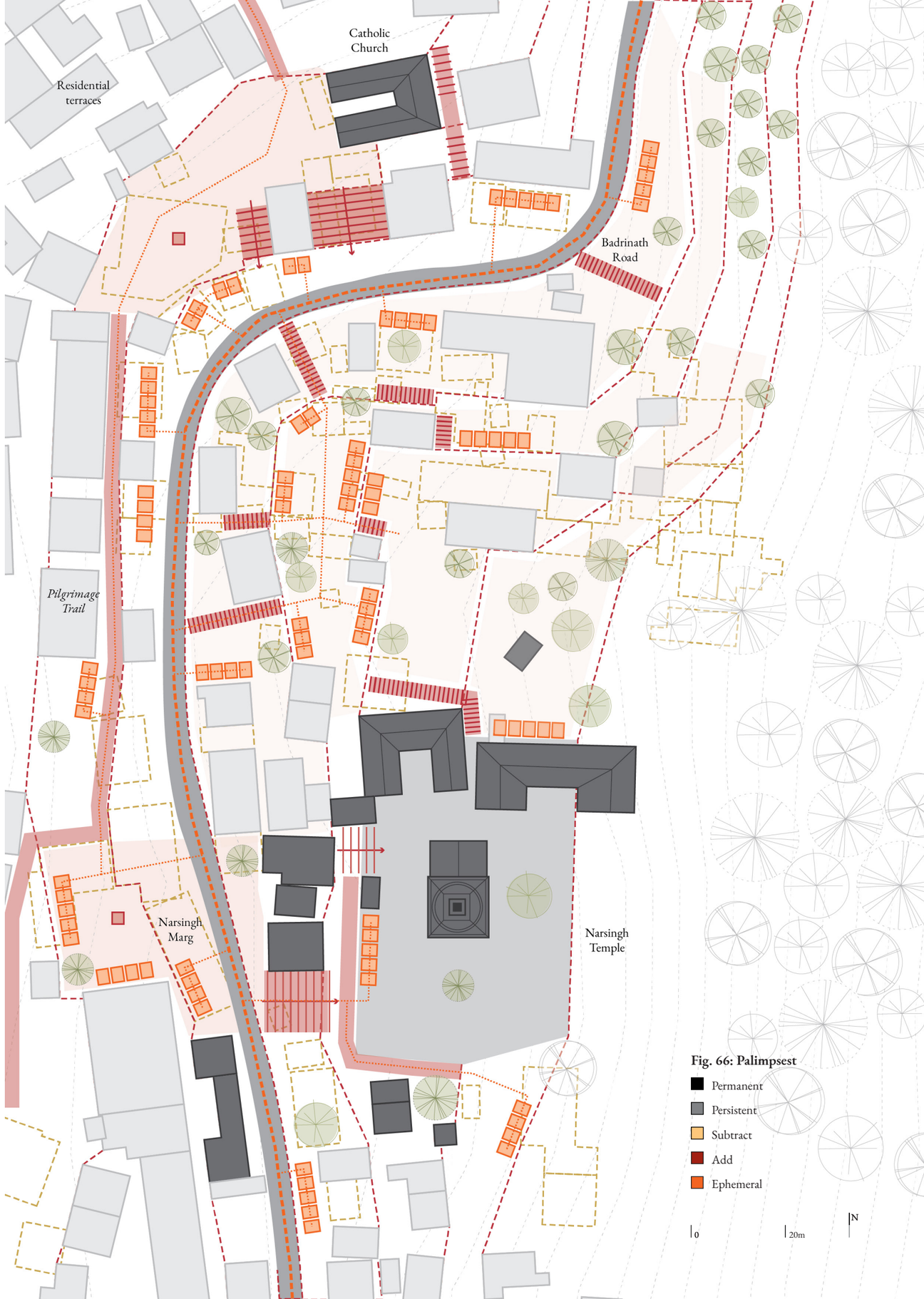


Fig. 66: Palimpsest

B. S2 / Habitat/ Relocation of inhabitants

The following design experiment investigates the social and productive landscape of Joshimath through the lens of Topos. The land parcel in the western part of the city, which has been tested to be geologically stable, is chosen as a paradigmatic area to illustrate the development of rehabilitation infrastructure for the displaced population of Joshimath.

Inhabitants	■■■■■	Economy	■■■■□
Mobility	■■■□□	Ecology	■■■■□
Pilgrimage	■■■■□	Energy	■■■□□
Tourism	■■■■□	Hydrology	■■■□□
Military	■□□□□	Vulnerable	■□□□□

Fig. 67 : Prefabricated structures along the Terraced Landscape in Joshimath

i. Existing conditions

The frame under investigation consists of agricultural terraces which are cut through by two mobility corridors: Badrinath highway and the road to Auli. These transport networks are sparsely populated by multistoried structures which primarily cater to incoming pilgrims and tourists. Some of the terraces are too steep for habitation or cultivation and they are home to alpine trees and shrubs.

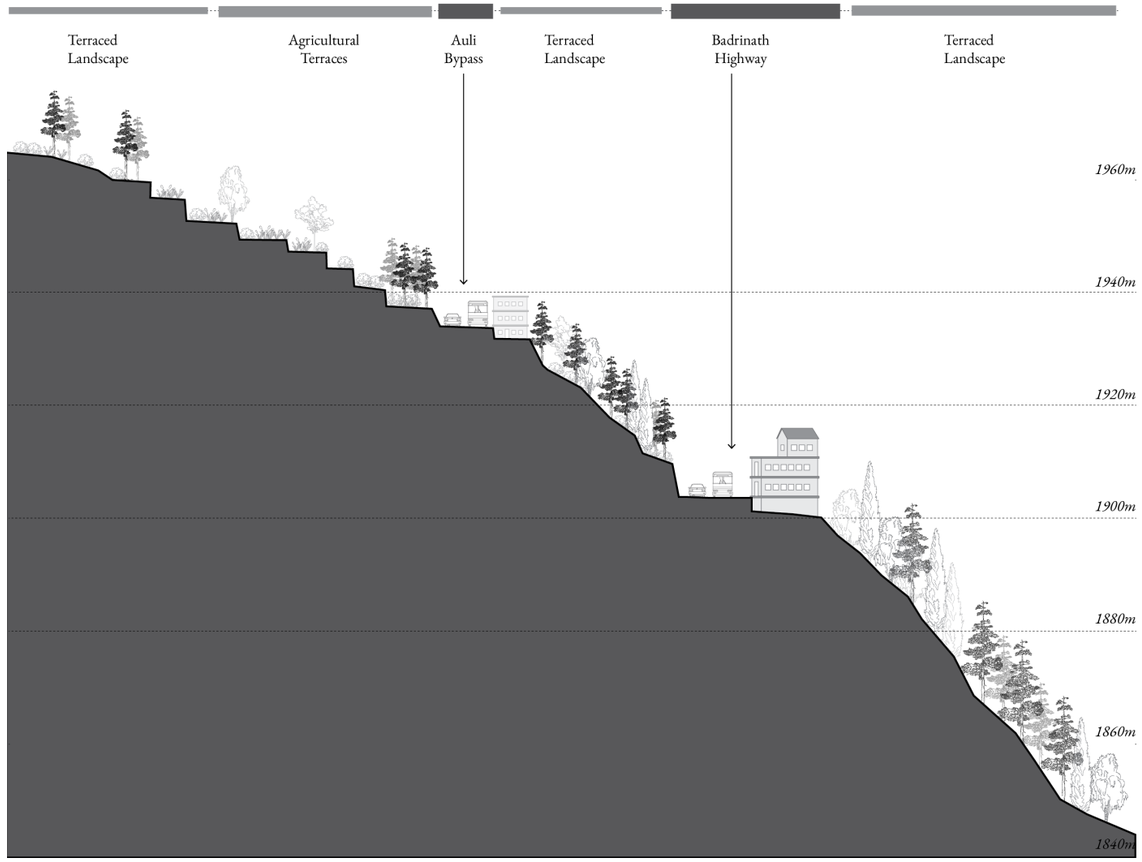
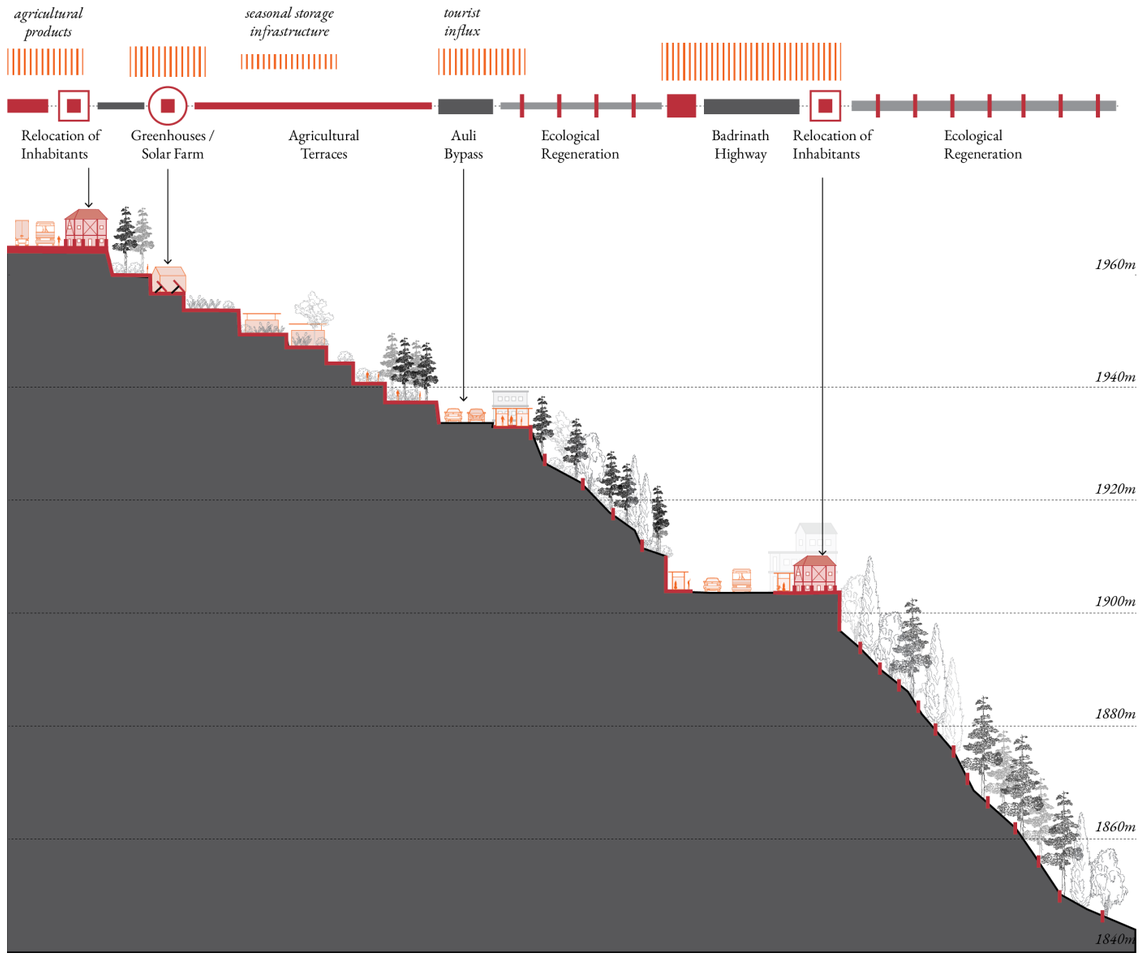
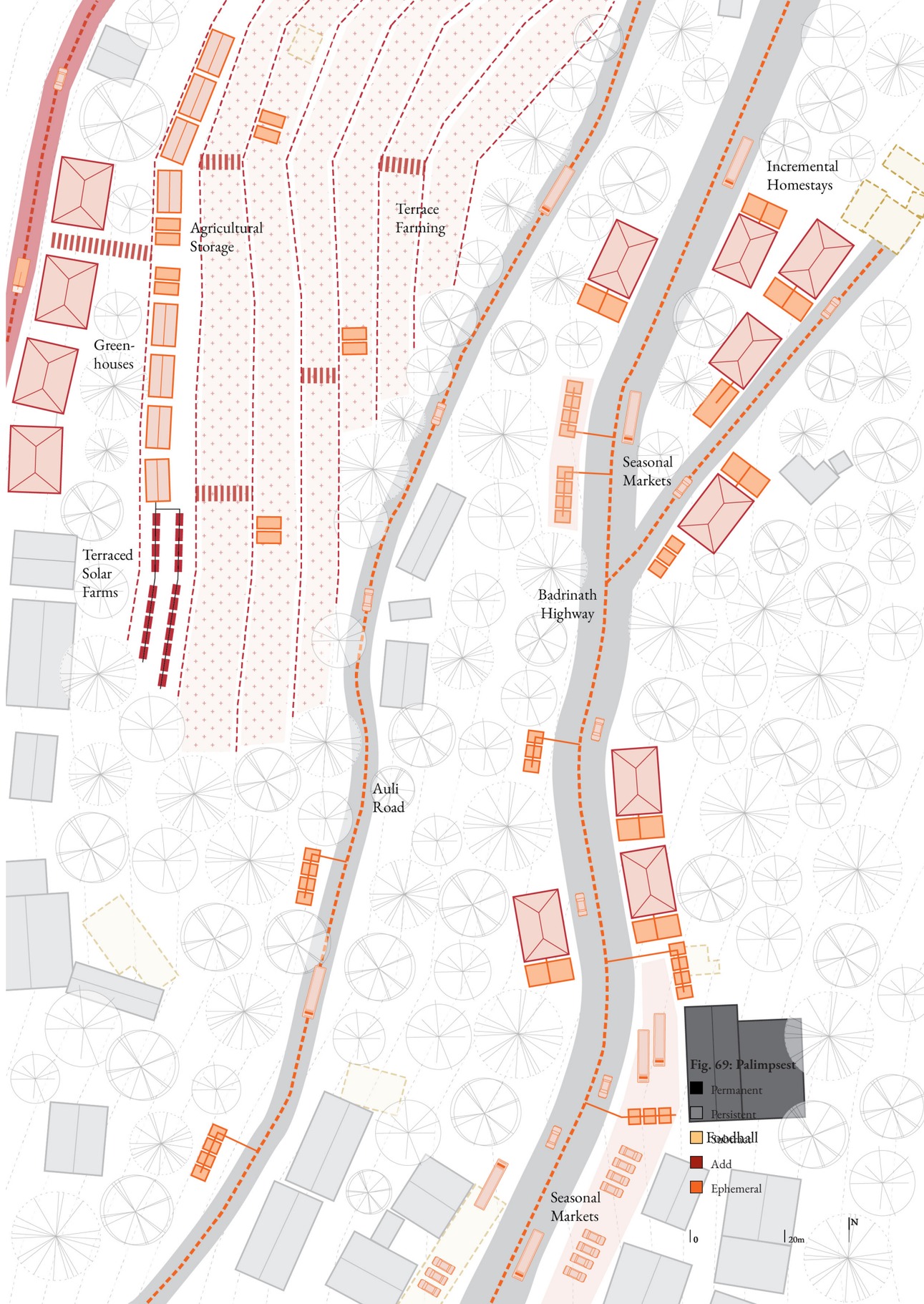


Fig. 68: Existing condition

ii. Transformations

The displaced population in Joshimath which practises agriculture is accommodated within the newly constructed housing along the agricultural terraces. A network of green-houses along with a localised solar farm are developed to upscale agricultural production and reduce fluctuations due to erratic climatic conditions. Additional mobility networks are constructed to connect the houses and agricultural terraces to the main arterial road of Joshimath. Inhabitants who depend on tourism are rehabilitated along the Badrinath highway. A system of ephemeral infrastructures is proposed which has the capacity to accommodate tourist influx during pilgrimage season along the mobility corridors without exerting excessive pressure on ground and these structures can be easily dismantled and reconfigured to serve alternate functions at a different location during the off-peak season.





C. S3 / Matter / Material Recycling Centre

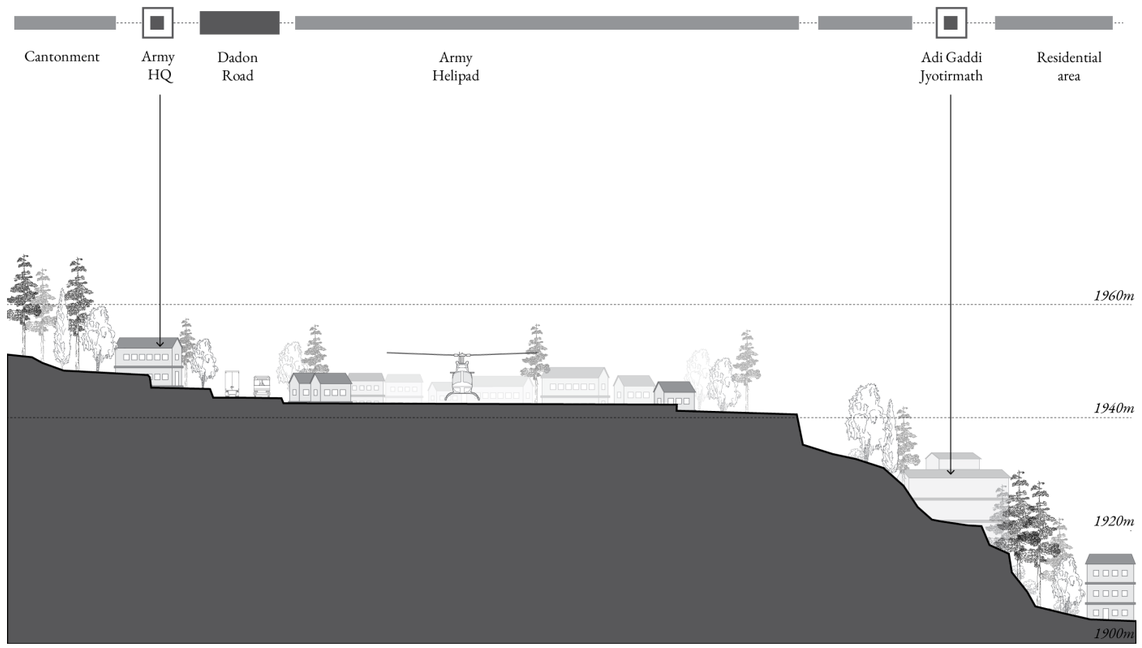
The following design experiment investigates the military landscape and material flows within Joshimath through the lens of Matter. The land parcel in the army cantonment which houses the helipad, is chosen as a paradigmatic area to illustrate the development of a Material recycling hub which facilitates the transition towards new material geographies within the desired scenario.

Inhabitants	■□□□□	Economy	■■■■□
Mobility	■■■■□	Ecology	■■■□□
Pilgrimage	■■□□□	Energy	■■■□□
Tourism	■■□□□	Hydrology	■■□□□
Military	■■■■■	Vulnerable	■■□□□

Fig. 70: A cricket match being played at the Army Helipad in Joshimath

i. Existing conditions

The frame under investigation illustrates the military infrastructure within the upper terraces of Joshimath. An army helipad has been created to facilitate mobility of troops, weapons as well large materials and equipment which is difficult to transport via roads. The helipad is surrounded by the army head office, residential quarters and mobility hubs wherein the army trucks are deployed. On the northern end of the helipad, the Adi Shankaracharya Gaddi is situated which is an important pilgrimage spot within the religious landscape of Joshimath.



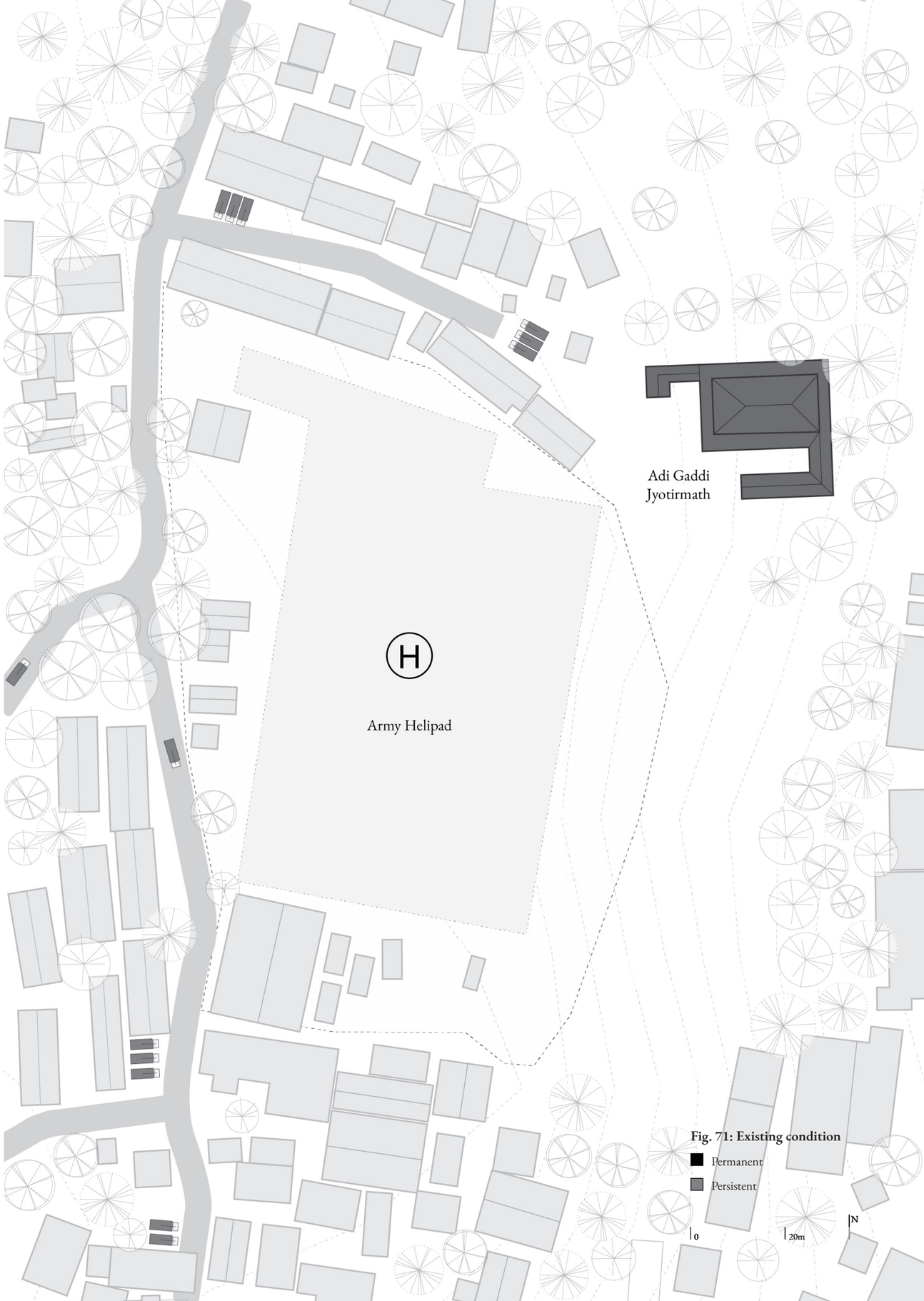
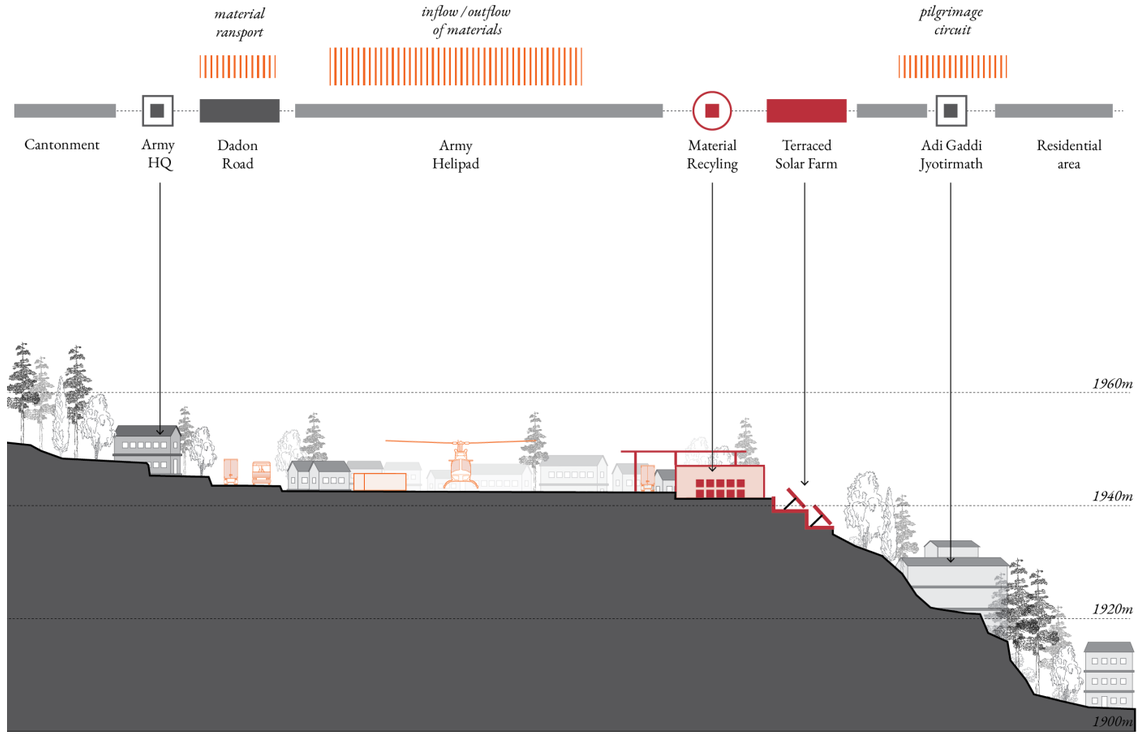


Fig. 71: Existing condition

ii. Transformations

A material recycling hub is established next to the army helipad wherein both natural and man made materials such as stone, earth, steel, concrete, glass etc is stored, processed and recycled into various forms of building blocks which are thereafter transported to different parts of the region via road networks or helicopters. The terrace adjacent to the helipad is transformed into a solar farm which generates energy for the recycling centre as well as adds a degree of resilience to the vulnerable terraces. Seasonal storage containers are added/ moved around the helipad to offer flexibility in case there is a surplus demand or supply. Moreover, the building blocks produced within the recycling facility are used to construct ancillary infrastructures in the region, such as medication caves and seasonal kiosks around the Adi Gaddi Jyotirmath pilgrimage circuit, to support religious activities.



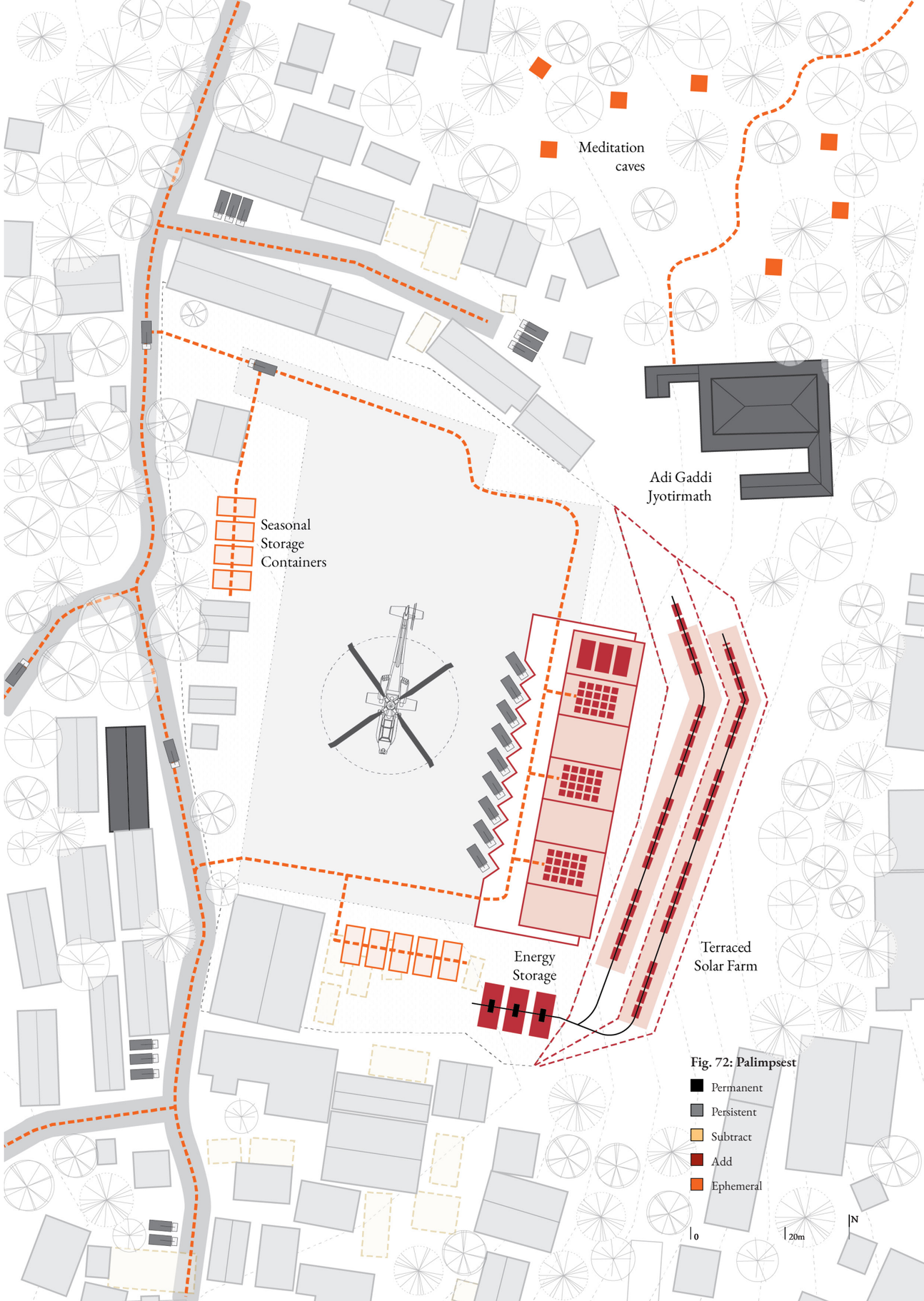


Fig. 72: Palimpsest

7.6 Projections

i. Spatio-Temporal Flows

A spatio-temporal program is developed to establish the flow of materials and the spatial operations of reusing, repurposing, retrofitting and recycling which facilitate the addition, subtraction and maintenance of fixed and ancillary infrastructures which cater to numerous processes such as pilgrimage, tourism, militarisation, agricultural and energy generation, ecological regeneration, landscape resilience and so on.

The following diagram illustrates a set of key spatial interventions which are proposed within the town of Joshimath. These interventions support periodic processes which only last for certain time periods of the year with varying intensities. Therefore, a temporal logic of material production, consumption, reuse and recycle is proposed.

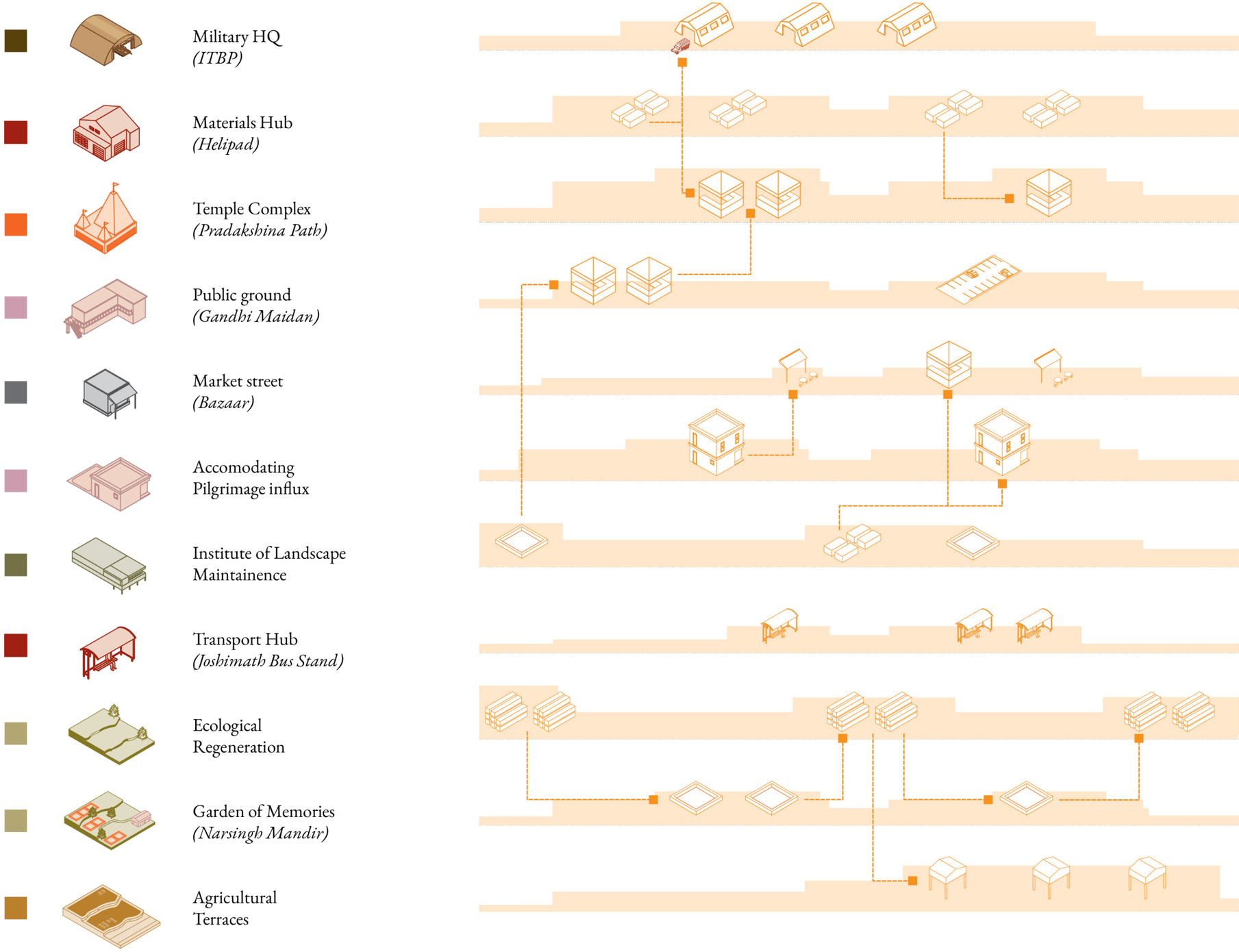


Fig. 73: Temporal Flows between key interventions in Joshimath

B. Spatio-Temporal Synchronicity

Thus, this project hypothesises an alternative approach of Spatio-Temporal Synchronicity which synergises the various ephemeralities within the critical processes in the region, through the agency of Spatial Design. A series of strategic operations are undertaken to synchronise the ephemeral processes within the material geographies of their context by adding, repurposing or removing infrastructures to serve a certain program during a certain time period which are further recycled and displaced to a new site to cater to a new process/program. Thus, the existing practice of accumulating infrastructures is acted upon by a set of Reductive operations which follow a spatio-temporal program.

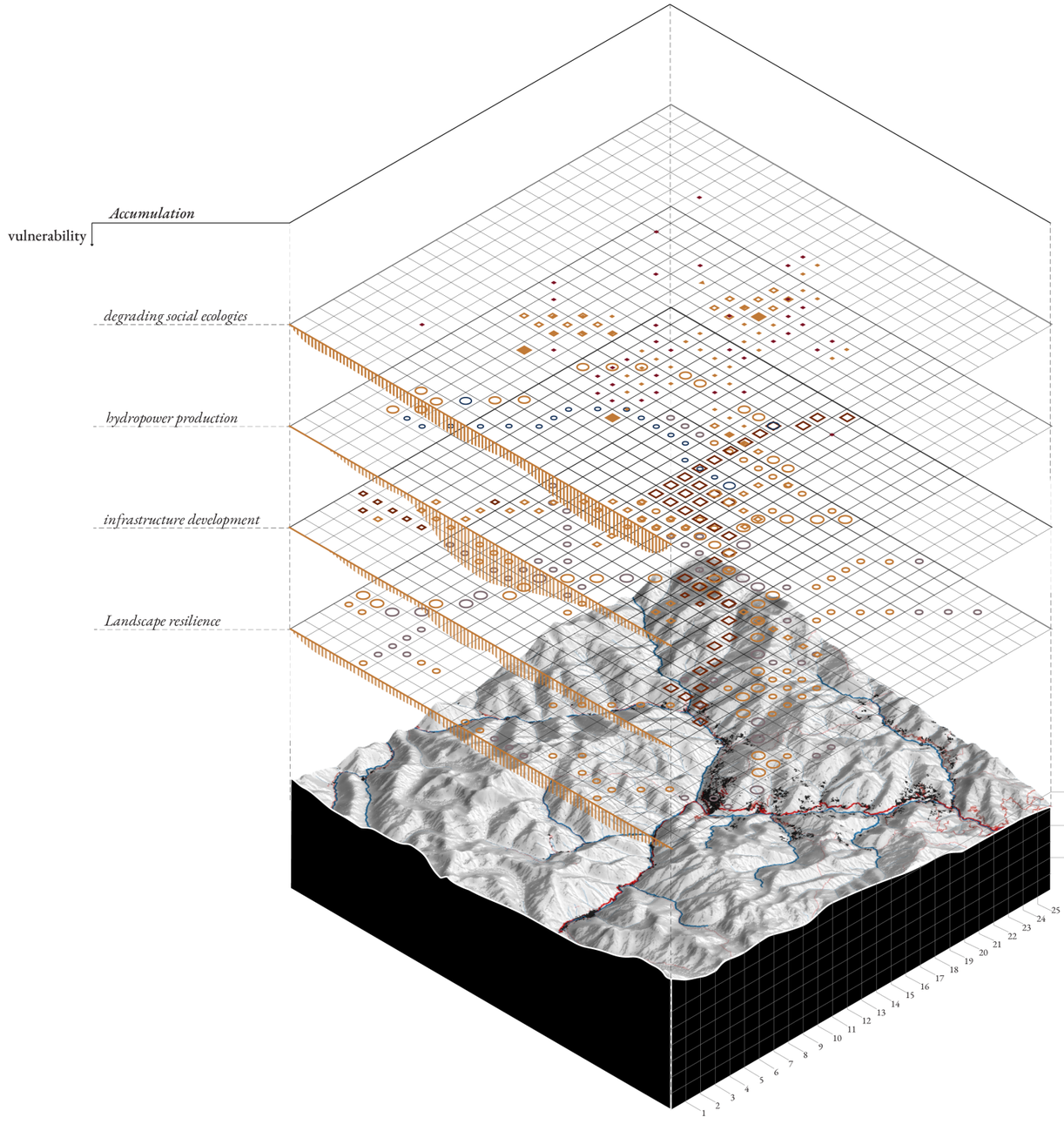


Fig. 74: Spatio-Temporal Synchronicity

- Urban settlements
- Seasonal network
- SHP
- Social Ecologies
- Ephemeral

0 10km N

7.7 Implementation

A. Phasing & Implementation

The project has been envisioned for a period of 30 years and the spatial operations have been divided into the following: pilgrimage-tourism, green energy production, socio-economic revitalisation and landscape resilience, with the town of Joshimath chosen as the testing ground for the pilot projects. Firstly, the displaced population within the town is relocated depending on their primary source of income: tourism or agriculture. Operations pertaining to pilgrimage and tourism are initiated by retrofitting the cultural heritage along with the infrastructure which supports these seasonal processes, such as tourist accommodation, mobility networks and hubs. The production of green energy includes the repurposing of the NTPC Dam into a series of micro hydropower plants using recycled matter from the dam. The decline in the energy curve is substituted by a decentralised network of terraced solar farms, biomass production and micro hydropower plants along the terraced himalayan landscape. The vulnerable social economies of the region are revitalised by the introduction of key interventions such as agricultural production facility at Dhak, Timber processing industry at Helang and a Material Recycling Centre next to the Army Helipad in Joshimath. Parallely, a set of reparative and resilient operations are undertaken to heal the subsiding landscape within Joshimath and rejuvenate the ecological systems through water sensitive spatial interventions.

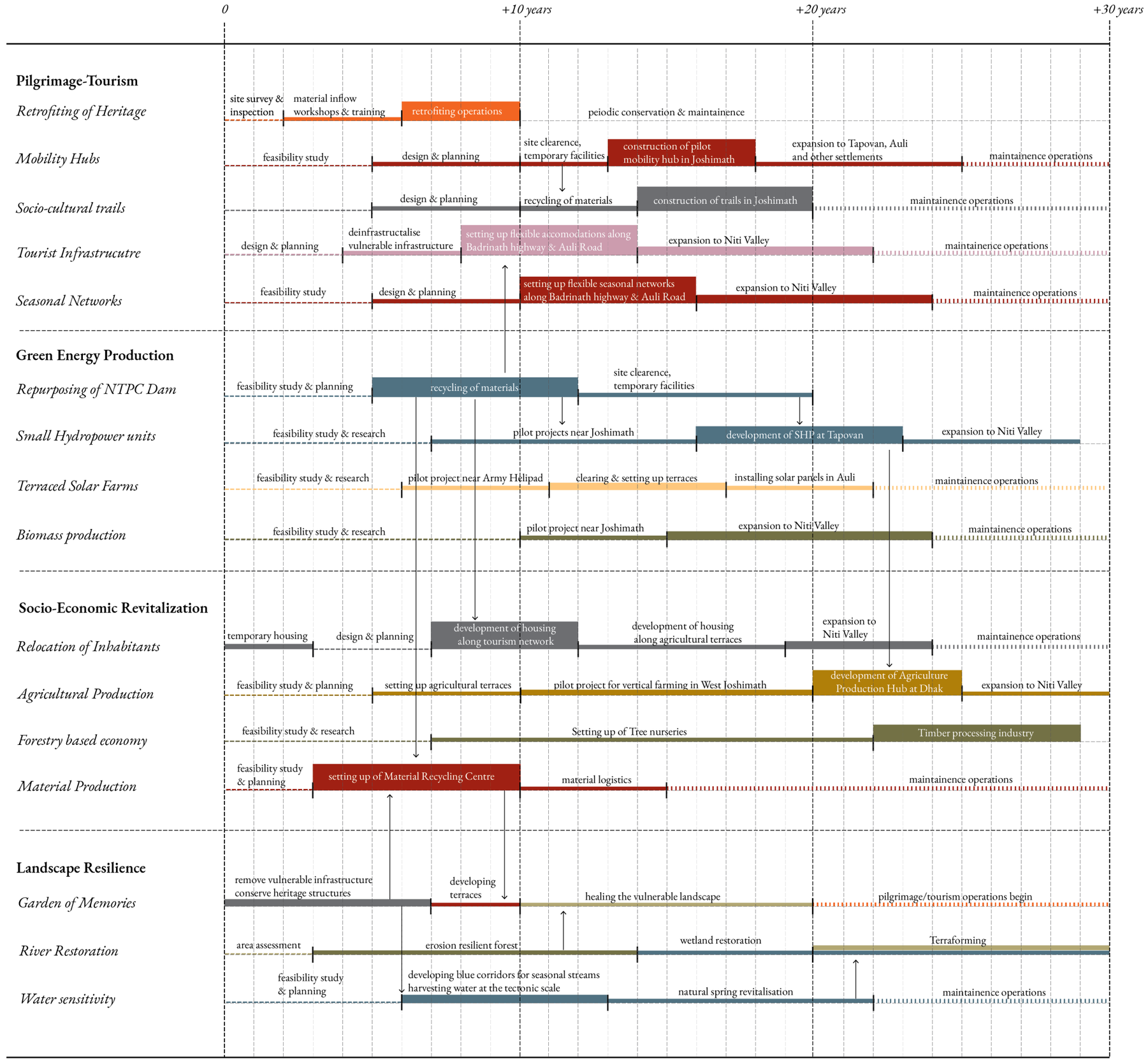


Fig. 75: Phasing Timeline for Spatial Operations in Joshimath

B. Governance

In the current scenario, governance regarding infrastructural development and energy production is highly top down , with the central government taking most of the executive decisions regarding future development within the vulnerable region. The entire structure is systematically influenced by political, economic and individualistic propagandas, with little to no grassroots involvement in the form of community lead initiatives or research institutes. Coupled with the complications within the bureaucratic processes between the central and state government, the interests and demands of the regional population are either underrepresented or overlooked, resulting in ecological disasters and a loss of regional identity. Within this prevalent reality of altered nature, there needs to be a paradigmatic shift from the current structure of governance to one which involves active participation from the local communities, research organisations, governmental service department and educational institutions. This trans-scalar collaboration between societal, scientific and institutional bodies of knowledge can forge new path dependencies that can respond to the processes of urbanisation and their implications on the landscape dynamics of the region.

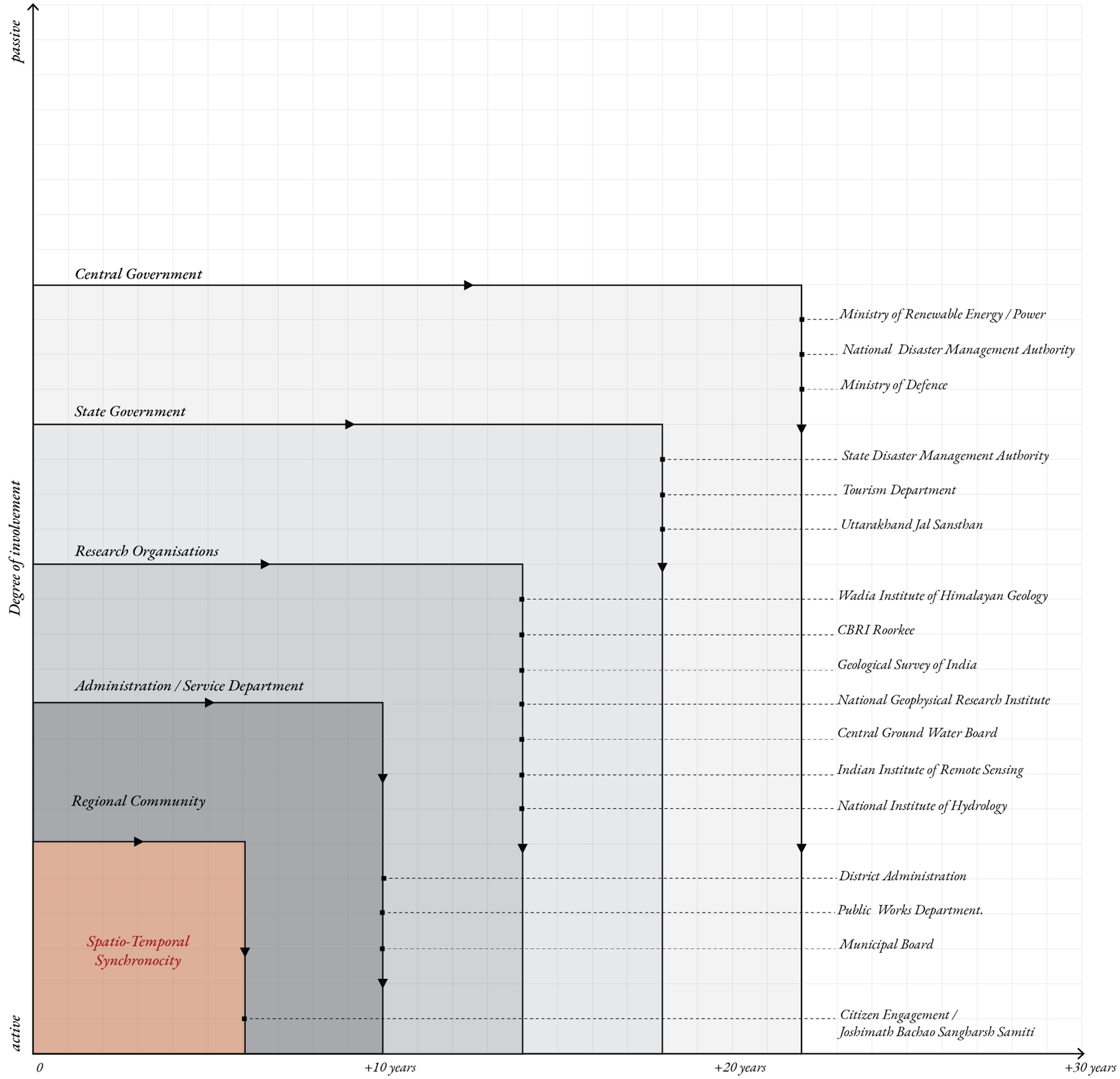
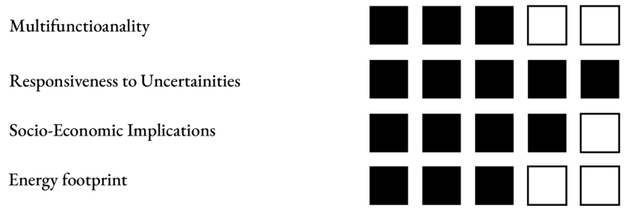
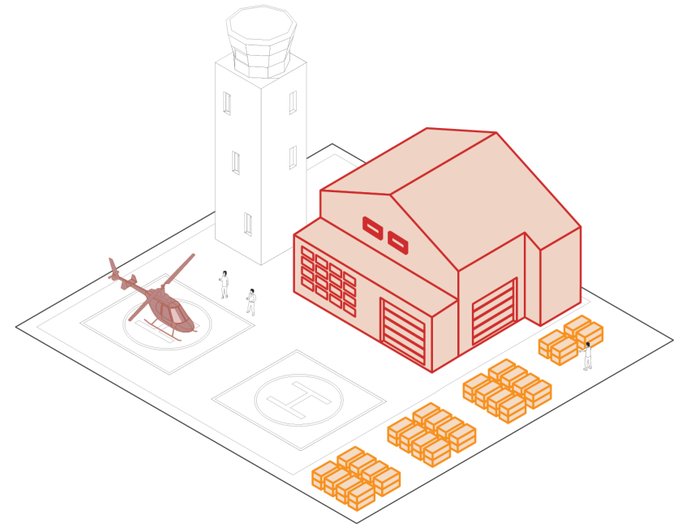


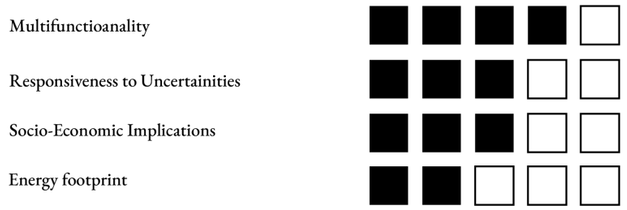
Fig. 76: Proposed shift in Governance

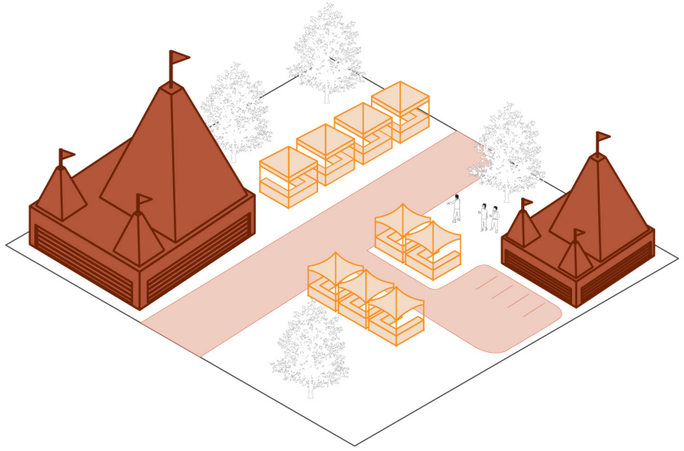
7.8 Critical Evaluation

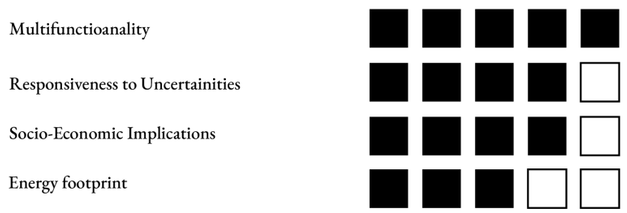
The key spatial interventions are evaluated on the basis of a matrix of parameters which assess the performance of a certain intervention and how well it responds to the goals set within the regional strategy. The evaluation parameters are multifunctionality, responsiveness to uncertainties, socio-economic implications and the energy footprint of the intervention. 'Multifunctionality' of the intervention determines its degree of flexibility to accommodate a diverse set of spatial programs to support the regional spatio-temporal processes within the region. 'Responsiveness to uncertainties' evaluates the intervention's adaptive capacity to respond to extreme situations like land subsidence and flooding, which are prevalent within the region under investigation. The parameter of 'Socio-economic implications' determines the social and economic impact of the intervention upon its context. ' Energy footprint' determines whether the intervention produces/ consumes energy. Based upon the performance of the spatial interventions within the evaluation matrix, the interventions are reconfigured in relation to one another.











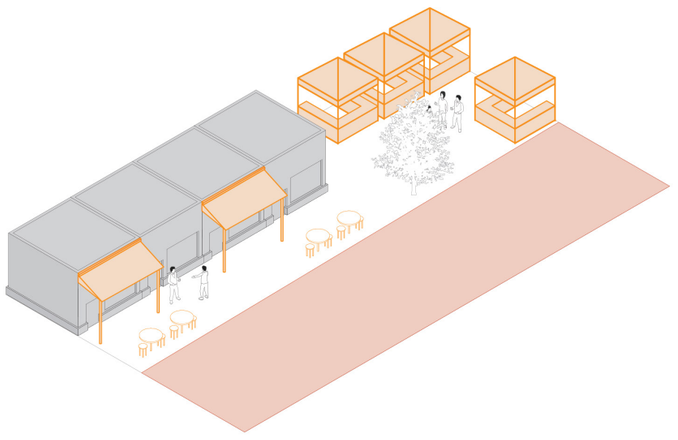


Fig. 76: Critical Evaluation of Spatial Operations

7.9 New Continuum

A. New Material Reading

The approach of Spatio-Temporal Synchronicity is the key transferable takeaway of this thesis which is based upon a critical understanding of the material geographies and flows within the region which is shaped by seasonal processes of urbanisation, operating at multiple scales. This approach questions the notion of constantly building and accumulating more and more built infrastructures upon the fragile Himalayan landscape. These built infrastructures are designed for permanence and are produced using materials from far-off places which are challenging to transport and dispose of within this remote location. Therefore, the project proposes a paradigmatic shift in the spatial logic of building these infrastructures as well as a 'Material Cartography' of the proposed new continuum. This reading represents the temporal nature of the various natural and man-made materials that constitute the landscape and how they are built and unbuilt within the regional geography.

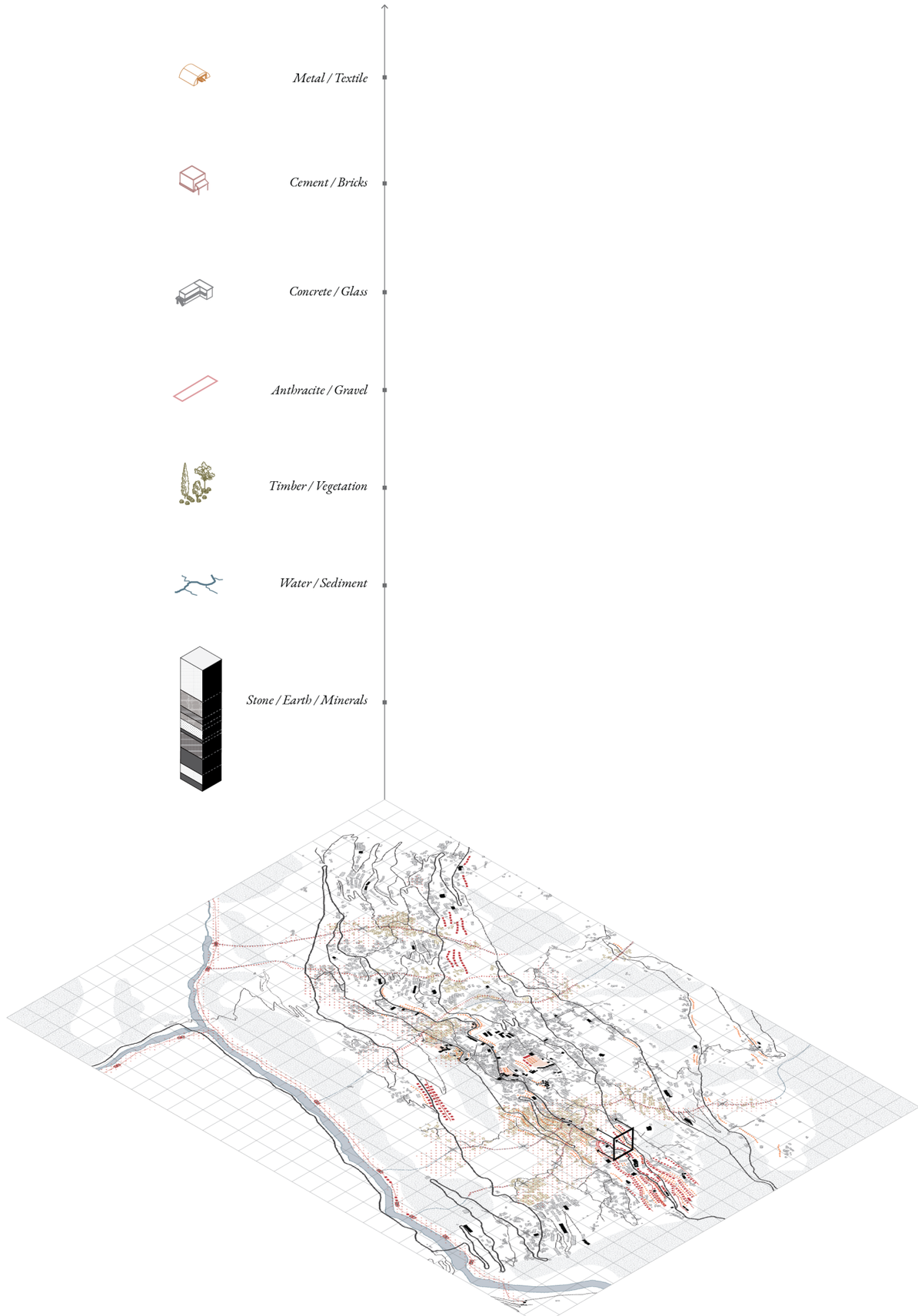
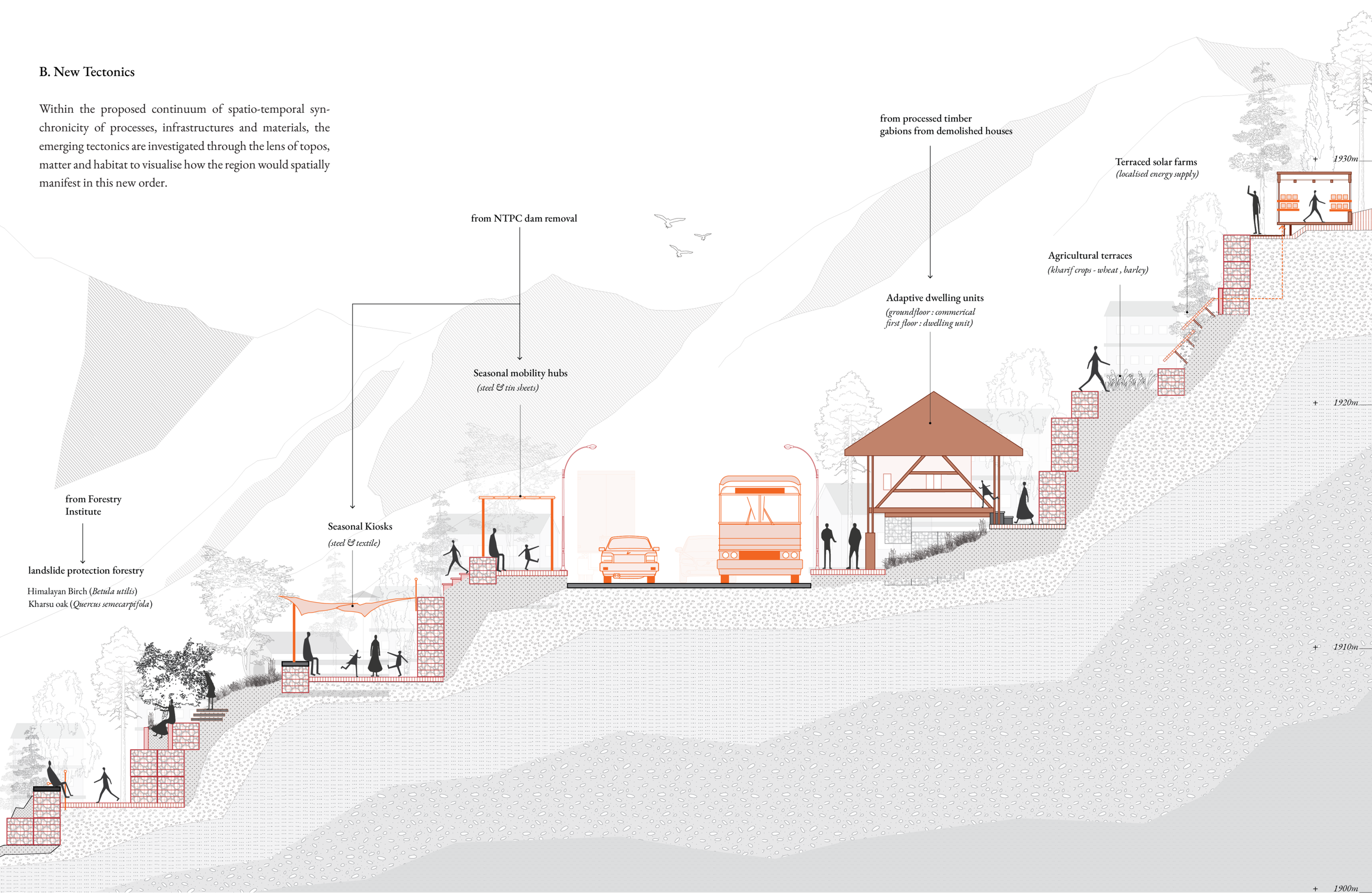


Fig. 77: New Material Reading, Joshimath

B. New Tectonics

Within the proposed continuum of spatio-temporal synchronicity of processes, infrastructures and materials, the emerging tectonics are investigated through the lens of topos, matter and habitat to visualise how the region would spatially manifest in this new order.



8. Conclusions

1. What is the relation between the graduation project topic, the Urbanism master track, and the master programme?

This graduation project deals with synergizing infrastructural projects, resource extraction operations and ecological processes within the sinking geographies of the Himalayan town of Joshimath where rapid ground subsidence has rendered thousands of people homeless and has put the population of the entire town at risk. Although these problems traditionally belong to the fields of earth sciences, social science and disaster management, the intersection of these topics presents challenges that can be effectively addressed through the spatial agency of design. By undertaking this project as my graduation thesis, I aim to utilize the potential of urban design and its inherent ability to promote cross-disciplinary collaboration and integrate diverse fields effectively within such vulnerable territories. The core issue around which the project revolves is the anthropogenic appropriation of nature, thus resulting in 'altered nature', which also happens to be the theme of the Transitional Territories graduation studio. Through the course of my journey until now in the Urbanism track, I have been well- trained at working through varying scales and contexts, from designing climate adaptive strategies in the dense urban fabric of Rotterdam to s spatial vision and strategy for North-West Europe. Moreover, for my graduation project I aim to work from the lens of landscape urbanism and the project intervenes at the architectonic scale, thus lying at the intersection of the different tracks from the AUBS program.

2. How did your research influence your design/recommendations and how did the design/ recommendations influence your research?

This graduation project deals with synergizing infrastructural projects, resource extraction operations and ecological processes within the sinking geographies of the Himalayan town of Joshimath where rapid ground subsidence has rendered thousands of people homeless and has put the population of the entire town at risk. Although these problems traditionally belong to the fields of earth sciences, social science and disaster management, the intersection of these topics presents challenges that can be effectively addressed through the spatial agency of design. By undertaking this project as my graduation thesis, I aim to utilize the potential of urban design and its inherent ability to promote cross-disciplinary collaboration and integrate diverse fields effectively within such vulnerable territories. The core issue around which the project revolves is the anthropogenic appropriation of nature, thus resulting in 'altered nature', which also happens to be the theme of the Transitional Territories graduation studio. Through the course of my journey until now in the Urbanism track, I have been well- trained at working through varying scales and contexts, from designing climate adaptive strategies in the dense urban fabric of Rotterdam to s spatial vision and strategy for North-West Europe. Moreover, for my graduation project I aim to work from the lens of landscape urbanism and the project intervenes at the architectonic scale, thus lying at the intersection of the

3. How do you assess the value of your way of working (your approach, your used methods, used methodology)?

At the very beginning of this project, I started investigating into the state of turbulence in the Himalayan town of Joshimath which was had undergone land subsidence at a rapid rate, which resulted in the cracking and shifting of buildings, roads and other forms of infrastructures, thereby severely impacting the lives of the inhabitants of the city. Through literature review of existing institutional reports, news articles and research papers in journals, I identified the factors which were contributing to this state of vulnerability within the town and started looking into measures/solutions to these. However, through a series of lectures on 'Lines of Inquiry', I was introduced to theories such as Anthropocene/Capitalocene and the idea of Material Geographies to critically read, analyse and reframe the project. This was followed by a set of cartographic exercises wherein I spatially analysed the various human and more than human processes that operate at varying scales and time periods and how they have culminated into a state of accumulation of infrastructures and resource extractive operations In order to synergise and synchronise these, I started investigating their spatio-temporal dynamics using the concepts of Ephemeral Urbanism, which refers to the manifestation of temporary, transient and short-lived urban interventions that respond to specific functions and needs. This was followed by a field trip to the town of Joshimath and surrounding areas, wherein I interacted with the inhabitants of the regions and developed a catalogue of cognitive maps as well as archived their voices, in order to understand their needs and aspirations. I also interviewed scientists, administrators and activists who have been working within this context to understand their perspectives, challenges and visions for the region from different fields of expertise. Parellely, I researched about the traditional knowledge systems and socio-cultural practices of the region and tried to visually document them during my field trip through a set of pictures and video montages. Thereafter, I developed a methodology which proposes a paradigmatic shift in the model of urbanisation within this vulnerable Himalayan Geography: from a state of accumulation towards a condition of spatio-temporal synchronicity within the program. flows and material geographies of these processes. This methodology was further translated into a cross scalar regional strategy and a catalogue of operations and design interventions which illustrate the spatial manifestation and the material reading within this new order.

4. How do you assess the academic and societal value, scope, and implication of your graduation project, including ethical aspects?

Professional Relevance

This project proposes a specific approach to address, assess, and design within areas of extreme vulnerabilities, resulting from the human appropriation of nature. The project proposes a spatial framework which requisites a high level of ephemerality and flexibility, adapting to the specificities of the context at hand as a spatial designer. The approach adopted carefully navigates through the paradigm shifts which the discipline of urban design and planning has undergone, translating them into the approach proposed for extremely vulnerable landscapes in the longue durée.

Social Relevance

The problem of rapid ground subsidence in the town of Joshimath has left thousands of people homeless and has put the population of the entire town at risk. The case of Joshimath is not a standalone one and there are hundreds of similar villages and towns within the fragile Himalayan landscape that have been put under extreme risk due to rapid urbanisation, infrastructural development, and extraction operations. The following project proposes a spatial framework and strategy that can synergise these processes and program a smooth transition for these risk societies.

Scientific and Academic Relevance

The scientific relevance of my graduation work includes the integration of various scientific fields with the discipline of Urbanism to understand their spatial implications. Through the course of this project, I have read multiple scientific papers and institutional reports on the rapid ground subsidence in Joshimath, ranging from the field of lithology, geo-tectonics, hydroecology, geophysics, material ecologies, meteorology and so on. This has resulted in a collection of multidisciplinary literature reviews as well as a critical analysis of the varying perspectives that they offer and a synthesis of their implications on the agency of spatial design and vice versa.

Ethical considerations

This project is nestled between the 'Drivers of Urbanisation'; large scale spatio-temporal processes such as pilgrimage, tourism, militarisation and hydropower production in the Himalayas which impose pressure on the regional economies and the socio-cultural ecologies of the region. The Himalayan region has been operationalized to meet the demands of the growing population through infrastructural development, resource extraction within this fragile landscape that has put the lives of millions of inhabitants as well as ecological processes at risk. Therefore, this project clearly defines its manifesto wherein it prioritises the needs and aspirations of the regional population. This is facilitated by decentralising power and large scale spatial infrastructures which pose a serious challenge to the socio-ecological landscape of the region. The regional community shall regulate these spatio-temporal processes at a local level by synchronising these through the actions of recycling, reuse, repair, addition or removal of material geographies which are constantly managed and moved around to serve specific functions at specific sites. This new will enable the clearance of unnecessary infrastructure which has accumulated over this fragile landscape over centuries, thereby facilitating ecological regeneration as well as socio-economic welfare of the region.

5. How do you assess the value of the transferability of your project results? What are the limitations of this project?

Transferability of project results

The project culminates in a series of outcomes which are alternative methods of reading, analysing, mapping, thinking and projecting within critical environments. The project in its essence, proposes an alternate model of urbanisation in the Himalayas; a paradigmatic shift from the current state of accumulation of infrastructures and extractive operations to a future conditions wherein the spatial logic of accommodating to these spatio-temporal processes and pressures is synchronised using the concepts of Ephemeral Urbanism and Material Geographies. This approach has also taken inspiration from the situated nomadic practices within the region such as migration and building ephemeral infrastructures for seasonal processes and it would be interesting to project this model to other processes within the region in practice. Critical Cartographies has been extensively used as a method of research by design and it has culminated in a series of drawings which spatially depict the processes of urbanisation and the emerging criticalities. This method helped in coming up with innovative ways of curating and aligning discrete sets of information together and constantly informed by research and design decisions. These methods of mapping and projecting can be easily transferred to other projects in a similar context. Theoretical synthesis which is a compilation of the numerous literature reviews, case studies and theories and concepts researched within the project can also be easily transferred. The outcomes of Design Synthesis such as scenarios, cross-scalar strategy, catalogue of operations and design experiments can also add value to other projects, especially in terms of how they materialise the design methodology into a tangible form. Last but not the least, the outcomes of the field trip can also be used as creative means of investigating and documenting the context and the human processes it entails.

Limitations of the project

While this graduation project successfully achieves primary research objectives, several limitations must be acknowledged. Firstly, the project's scope was limited by time constraints , which restricted the extent of on-site data collection and analysis, as I could visit the site just once in person. Observations and analysis on the spatio-temporal dynamics of the site and its material reading were carried out during a week of fieldwork and the rest was extrapolated from literature review of secondary data sources. Secondly, reliability and availability of geotechnical as well as demographic data for this region was limited due to its precarious condition and this may have impacted the quality and depth of the technical analysis. Moreover, external factors such as data access restrictions and unforeseen weather disruptions, also hindered some aspects of the research process.

9. References

A. Books/Reports

1. Atkinson, E. T. (2014). The Himalayan Gazetteer. Natraj Publishers.
2. Bremner, L. (2022). Monsoon as method. assembling monsoonal multiplicities. Actar D Inc.
3. Bélanger. (2017). Landscape AS Infrastructure: A base primer. Routledge.
4. CBRI. (2023). (rep.). Mitigation, recovery & reconstruction of subsidence zone in Joshimath: Safety assessment of buildings.
5. CGWB. (2023). (rep.). A Hydrogeological Investigation Report on Land Subsidence in Joshimath Town, Chamoli District, Uttarakhand.
6. Clément, G., Morris, S., & Tiberghien, G. A. (2015). The Planetary Garden: And other writings. University of Pennsylvania Press.
7. Ellis, E. C. (2014). Ecologies of the Anthropocene. Global Upscaling of Social-Ecological Infrastructures. New Geographies, 6, 20-27.
8. Encyclopædia Britannica, inc. (2024, January 13). Himalayas. Encyclopædia Britannica. https://www.britannica.com/place/Himalayas
9. GSI. (n.d.). (rep.). Preliminary Report on the Recent Event of Ground Subsidence at Joshimath, District Chamoli, Uttarakhand.
10. IIRS. (2023). (rep.). Report on satellite based deformation analysis of Joshimath town.
11. IIT Roorkee. (2023). (rep.). The Geotechnical Investigations for determining the Shear Strength Characteristics and Bearing Capacity of the Soil in the Joshimath Region.
12. McHarg, I. L. (2005). Design with nature. John Wiley & Sons.
13. Mehrotra, R., Vera, F., Mayoral, J., Sennett, R., Burdett, R., & Mori, A. A. (2022). Ephemeral urbanism: Does permanence matter? ARQ ediciones.
14. NGRI. (2023). (rep.). Geological & Geotechnical studies to understand shallow subsurface strata at Joshimath, Chamoli, Uttarakhand.
15. NIH. (2023). (rep.). Identification of source and causes of the gushing water in the premises of Jaypee colony in the night of 02 january, 2023.
16. NDMA. (2023). (rep.). Post Disaster Needs Assessment - Joshimath Landslide and Subsidence Crisis .
17. Oxman, N. (2010). Material-based design computation.
18. Roorda, C., Wittmayer, J., Henneman, P, Steenbergen, F.van, Frantzeskaki, N. Loorbach, D., Transition management in the urban context: guidance manual, DRIFT, Erasmus University Rotterdam, Rotterdam, 2014
19. Virilio, P. (2009). Bunker Archeology. Princeton Architectural Press.
20. WIHG. (2023). (rep.). Study of Ground Subsidence in Joshimath following the events of January 2023.

B. Research Papers/ Journal articles

1. Bera, B., Saha, S., & Bhattacharjee, S. (2023). Sinking and sleeping of Himalayan City Joshimath. Quaternary Science Advances, 12, 100100. https://doi.org/10.1016/j.qsa.2023.100100
2. Bisht, M. P. S., & Rautela, P. (2010). Disaster looms large over Joshimath. Current Science(Bangalore), 98(10), 1271.
3. Brenner, N., & Katsikis, N. (2021). Hinterlands of the capitalocene. Global Urbanism, 34–48. https://doi.org/10.4324/9780429259593-6
4. Hussain, A., Sarangi, G. K., Pandit, A., Ishaq, S., Mamnun, N., Ahmad, B., & Jamil, M. K. (2019). Hydropower development in the Hindu Kush Himalayan region: Issues, policies and opportunities. Renewable and Sustainable Energy Reviews, 107, 446–461. https://doi.org/10.1016/j.rser.2019.03.010
5. Oxman, N., Ortiz, C., Gramazio, F., & Kohler, M. (2015). Material ecology. Computer-Aided Design, 60, 1–2. https://doi.org/10.1016/j.cad.2014.05.009
6. Shano, L., Raghuvanshi, T. K., & Meten, M. (2020). Landslide susceptibility evaluation and hazard zonation techniques – A Review. Geoenvironmental Disasters, 7(1). https://doi.org/10.1186/s40677-020-00152-0
7. Sati, V. P. (2023). Pilgrimage to the Himalaya: Historical Perspectives and Present Scenario. Journal On Tourism & Sustainability, 6(2), 39-48
8. Rautela, P. (2005). Ground subsidence: A silent disaster in Himalaya. Disaster Prevention and Management: An International Journal, 14(3), 395–406. https://doi.org/10.1108/09653560510605054

C. Websites / Online articles

1. Ahmad, O. (2023, February 14). India's disregard for the hidden waters of Himalayas may be one cause of disasters like Joshimath. Scroll.in. https://scroll.in/article/1043534/indians-disregard-for-the-hidden-waters-of-himalayas-may-be-one-cause-for-disasters-like-joshimath
2. Al Jazeera. (2023, February 27). Photos: India's sinking Joshimath Town Faces Grim Future. https://www.aljazeera.com/gallery/2023/2/27/photos-inside-joshimath-indias-sinking-himalayan-town
3. Agrawal, G. (2023, April 20). Joshimath crisis: Choosing economy over ecology. JLRJS. https://jlrjs.com/joshimath-crisis-choosing-economy-over-ecology/
4. CNA Insider. (2023, July 18). After joshimath's collapse, what will happen to the people of India's Mountain Towns? | insight. YouTube. https://www.youtube.com/watch?v=AJA2ioHYN4Q&t=228s&ab_channel=CNAInsider
5. Chakraborty, R. (2022, April 7). Moving mountains: Weathering climate change and land politics in the Indian himalaya. Center for the Advanced Study of India (CASI). https://casi.sas.upenn.edu/iit/ritodhichakraborty
6. Jha, R. (2023, February). Observer research foundation | ORF. https://www.orfonline.org/wp-content/uploads/2023/02/ORF_IB_616_Lessons-from-Joshimath-Need-for-Himalayan-Development-Model.pdf
7. Nimick, S. R. and E. (2019, August 11). Multi-criteria decision analysis and GIS. ArcGIS StoryMaps. https://storymaps.arcgis.com/stories/b60b7399f6944bca86d1be6616c178cf
8. Rathee, D. (2023, January 17). The truth of joshimath | sinking city of uttarakhand | Dhruv Rathee. YouTube. https://www.youtube.com/watch?v=7RuNk6L9ekk&ab_channel=DhruvRathee
9. Sengupta, A. (2023, January 14). Why joshimath is sinking? what are the reasons? | geography. YouTube. https://www.youtube.com/watch?v=oEkLUWdrt-8&ab_channel=AmitSengupta

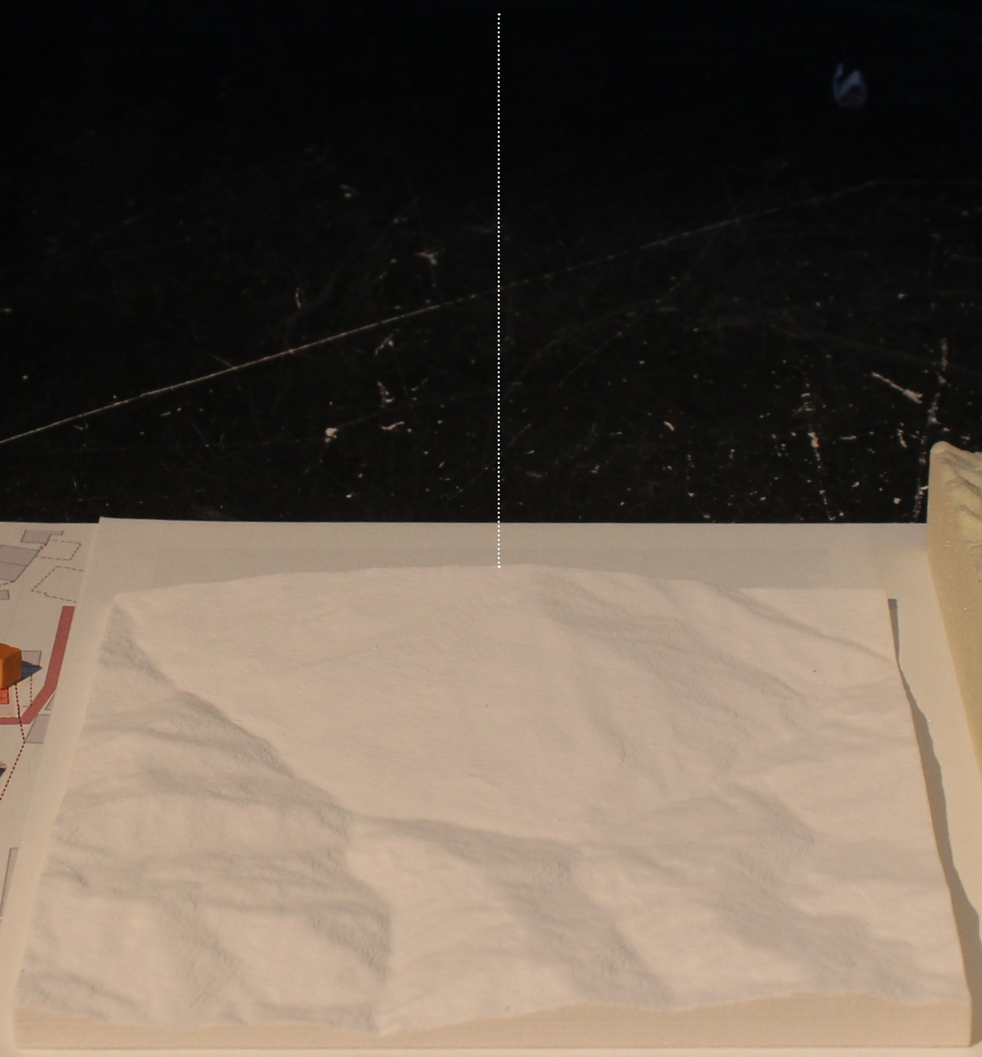
10. Appendix

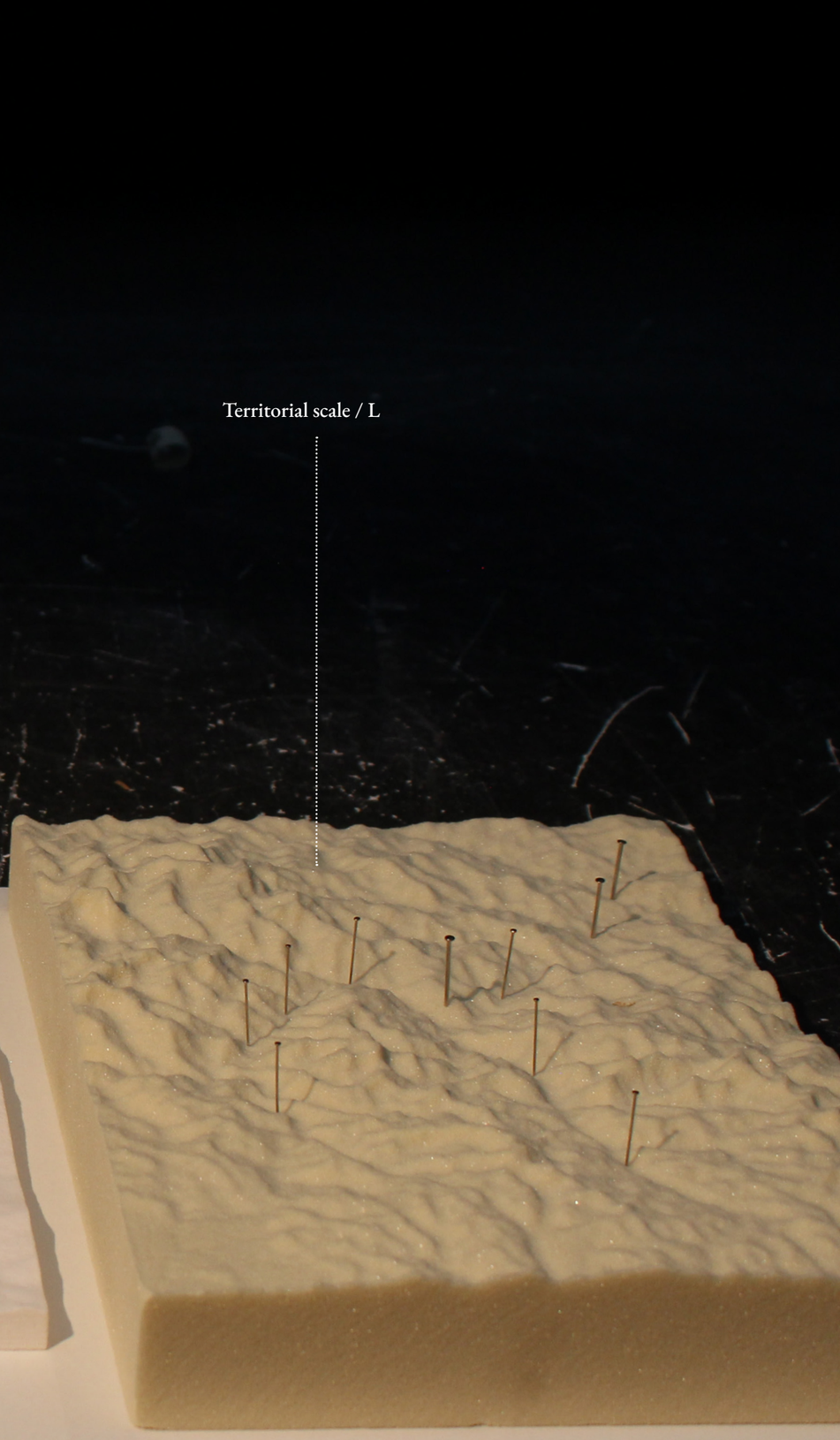
Physical Models

Ensemble & Object / S

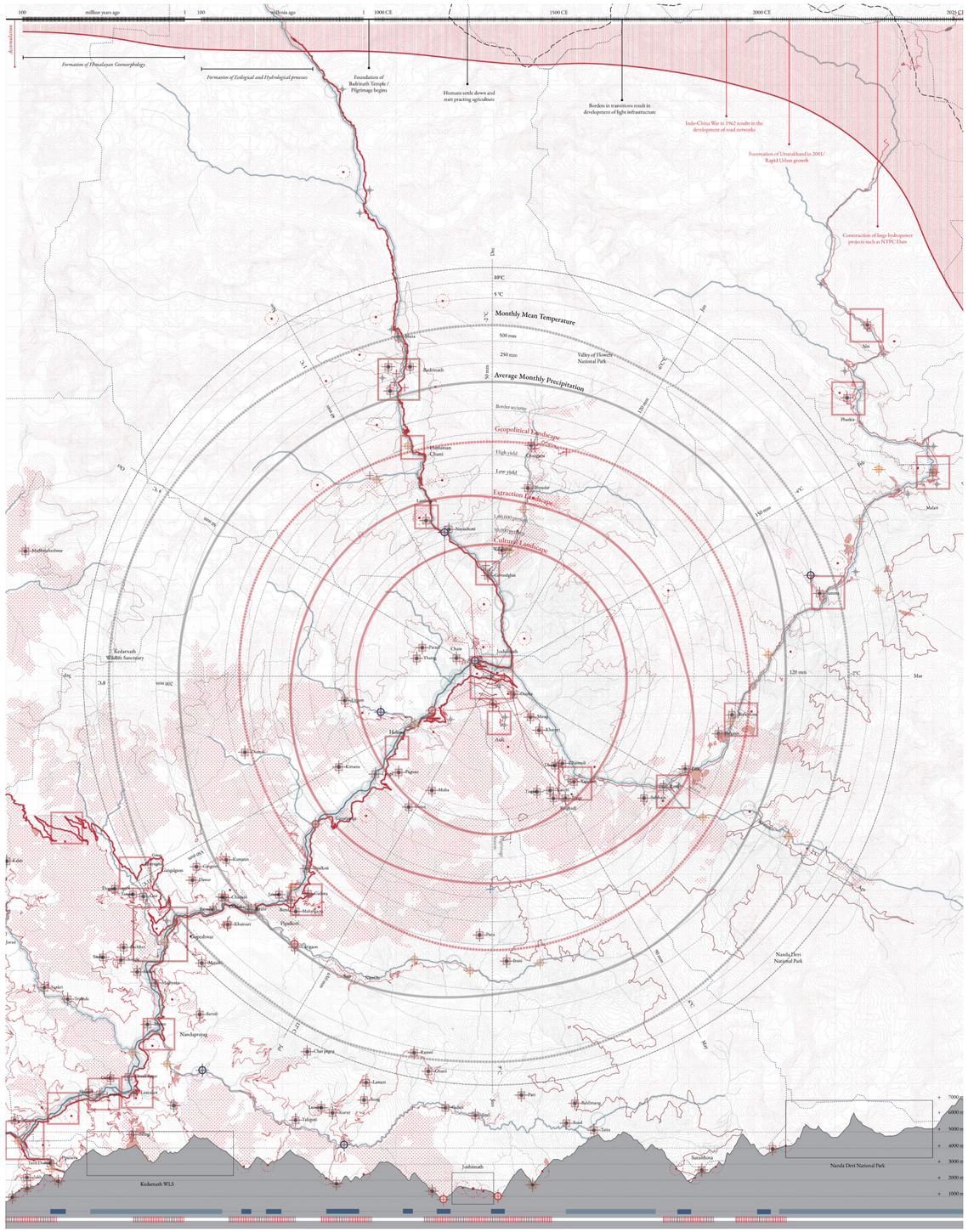
Landscape scale / M

Territorial scale / L

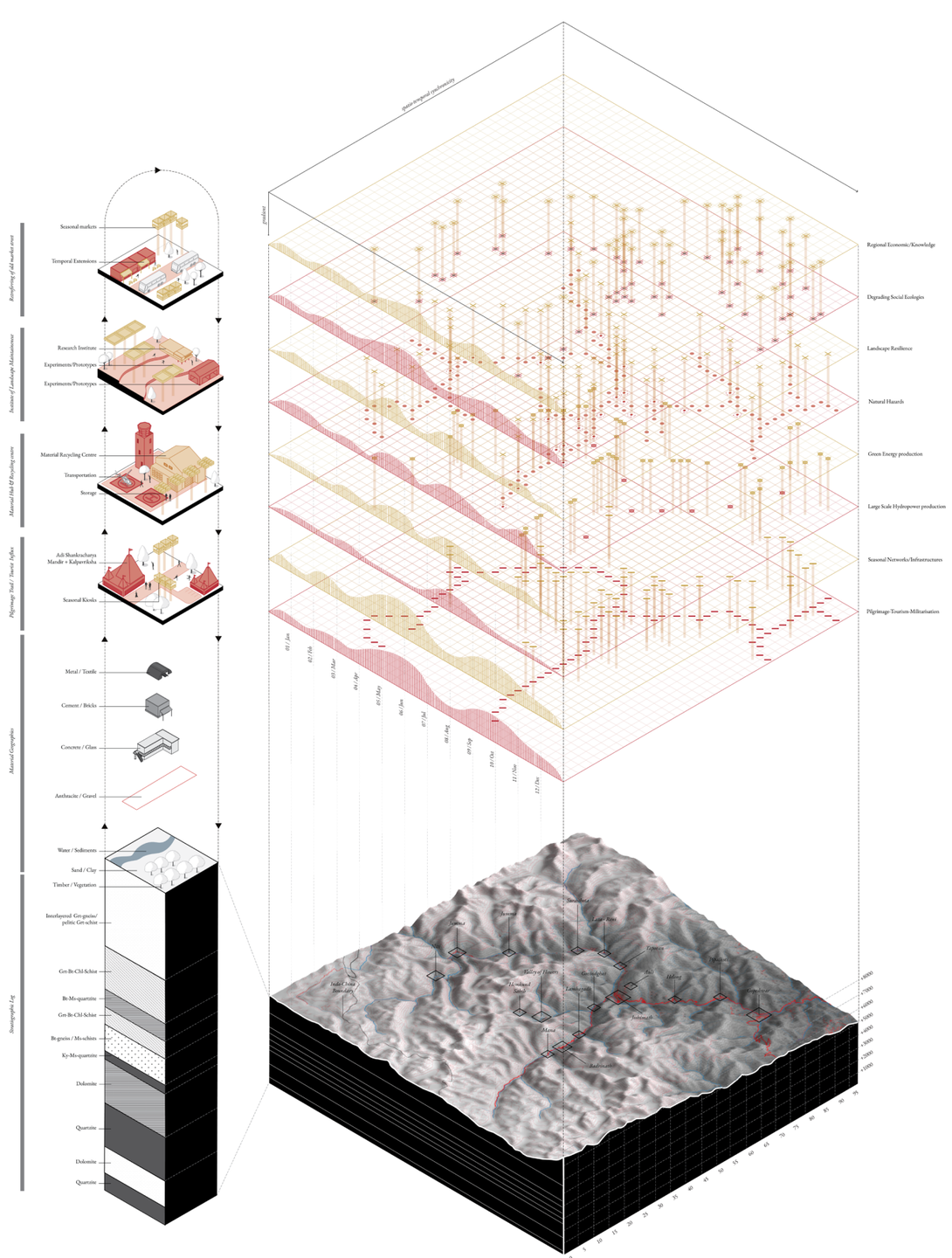




Critical Environments Exhibition / Posters



Critical Landscapes: Accumulation in the Himalayas



Spatio-Temporal Synchronicity