

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information		
Name	Anmol Bhargava	
Student number	5790824	

Studio		
Name / Theme	Transitional Territories Altered Nature. <i>Poetics of Change</i>	
Main mentor	Taneha K. Bacchin	Section of Urban Design, Department of Urbanism
Second mentor	Nikos Katsikis	Section of Urban Design, Department of Urbanism
Argumentation of choice of the studio	For my graduation project, I am interested in investigating the spatial conditions and conflicts that have emerged due to large-scale infrastructural developments and resource extraction operations, leading to rapid land subsidence in the Himalayan town of Joshimath in Uttarakhand, India. This project aims at reimagining the existing agency of spatial design in the vulnerable Himalayan region. There needs to be a pedagogical shift towards designing with natural processes as well having the ability to regenerate, adapt and integrate diverse functions in the long durée. I believe that these values align perfectly with Transitional Territories' theme of 'Altered Nature. <i>Poetics of Change</i>'. The scope of this research goes beyond the town of Joshimath, and I aim to investigate the critical Himalayan Geographies which have evolved over time to deal with uncertainties and extreme natural hazards. However, the advent of rapid urbanization and anthropogenic appropriation of the Himalayas within the Indian subcontinent have transformed this vulnerable region into a global hinterland, which has further amplified the degree of risk as well as the frequency of disasters in the region. Thus, the aim of this project is to use design as an analytical and evaluation tool to inquire into the socio-metabolic relations between the urban infrastructure developments	

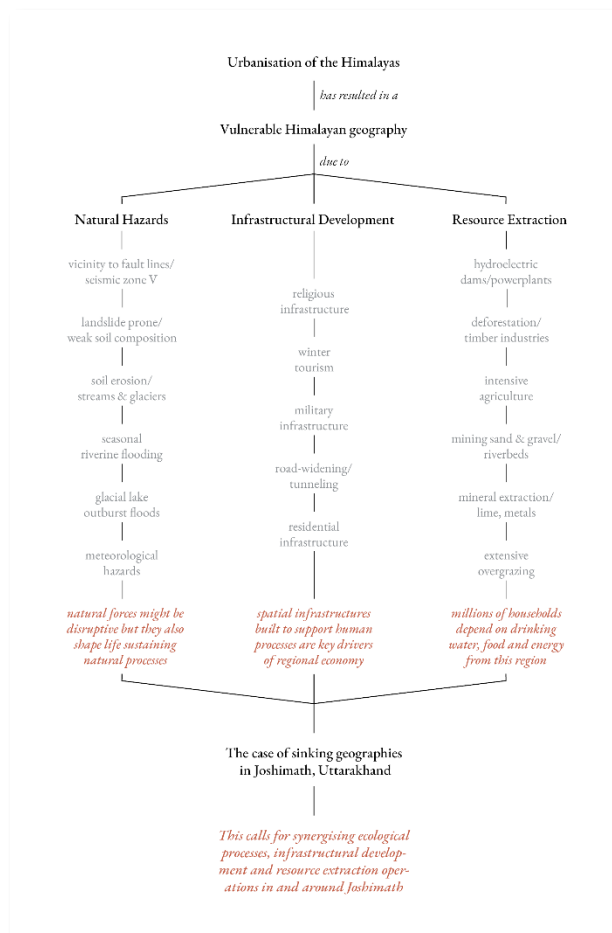
	and their supporting operational landscapes and complex geo-political conflicts that seem imminent in the near future due to energy transition towards renewables, rising demands and resource scarcity within the disputed Himalayan borders and territories. I believe that Taneha's expertise in critical design theory, landscape urbanism, cultural heritage and her knowledge and experience of working in the Indian context for the Water4change(W4C) research program is perfectly complemented by Nikos's expertise in geospatial analysis, urbanization theory and cross-scalar exploration of the productive-extractive processes. Therefore, Taneha and Nikos are the ideal team of mentors to guide me through the course of my graduation project.
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Graduation project	
Title of the graduation project	[Re]-territorialising Joshimath <i>Resuscitating the vulnerable Himalayan geographies in Uttarakhand, India</i>
Goal	
Location:	Joshimath, Uttarakhand, India
The posed problem	Problem Statement The rapid urbanization of the Himalayas has resulted in a 'vulnerable' Himalayan Geography, primarily due to the following three agents: [A] Natural hazards, [B] Infrastructural development, and [C] Resource extraction operations. [A] <u>Natural Hazards</u> 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 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 a 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.

[B] 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.

[C] Extractive operations 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 three agents are directly contributing to the ongoing issue of rapid land subsidence in the town of Joshimath which calls for the creation of a synergy between ecological processes, infrastructural development, and resource extractive operations within this vulnerable Himalayan geography.



research questions and	Main Research Question How can we synergise spatial development, ecological processes, and resource extraction operations within the vulnerable Himalayan Geography in and around Joshimath, Uttarakhand through the agency of spatial agency of design? Analysis sub questions • How have the geomorphological processes and the natural ecosystems shaped one another in the longue durée in the Himalayan landscape? • How has the anthropogenic appropriation of natural ecosystems for spatial development and resource extraction shaped the cultural landscape of the region and resulted in the creation of critical landscapes in around Joshimath? • How have the various perennial and ephemeral landscapes evolved over time and how do they co-exist spatially and re-organize periodically within this vulnerable Himalayan Geography? • How have the critical natural and human processes spatially contributed to the creation of vulnerable, sinking geographies within the region? Design sub questions • How to program the transition from the existing state of extreme vulnerability & uncertainty in and around Joshimath to a new form of territorialisation of seasonal material ecologies by learning and adapting in the longue durée? • What are the strategies to displace, accommodate, re-adapt and relocate human and ecological processes within the vulnerable, ephemeral
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	landscapes and seasonal economies around the town of Joshimath? • What actions/seed interventions within the agency of spatial agency can synergise infrastructural development, resource extraction operations and ecological processes in the region? • How can these strategies and interventions be projected on the territorial scale in the form of a spatial framework of these ephemeral landscapes of coexistence within the vulnerable Himalayan Geographies?
design assignment in which these result.	[A] Design goals, synthesis & outcomes: • <u>Scenarios</u>: Using the notion of designing for uncertainty, subjects such as subsidence, infrastructural development and extraction are transposed to their extreme limits through scenario-making and their spatial implications are analysed and mapped thereafter. • <u>Catalogue of Geo-technical solutions</u>: The historic evolution of the socio-cultural evolution of the vulnerable landscape of the region is analysed and the various techniques to deal with this fragility, from traditional to contemporary ones, are mapped and documented. • <u>Catalogue of Seasonal Material Ecologies</u>: The spatio-temporal material ecologies existing within the region are mapped and thereafter translated into a framework wherein these can function as the building blocks of the temporal infrastructures which support the seasonal regional economies. • <u>Adaptive trans-scalar strategic framework</u>: The vulnerability of the landscape is embraced and instead of countering it, an adaptive framework of material ecologies and temporal infrastructures is formulated which can kickstart a transition from

	the current state of extreme vulnerability to a future state of synergy. • <u>Design experiments</u>: Using one of the scenarios, a set of visions, actions, conditions, and processes are defined which are followed by a series of design experiments through multiple scales and typologies such as de-densification & renaturation of old Joshimath town, relocation of new settlements and adaptive transformation of extractive ecologies. • <u>Policy framework</u>: A set of policies are formulated to implement the various design objectives through multiple scales and in a phased manner. • <u>Mix-media visualisations & physical models</u>: A series of experimental visuals, collages and physical models are created for a more comprehensive understanding and analysis of the context as well as to be able to communicate the research findings to the audience. [B] Other outcomes: • <u>Atlas of Critical Cartographies</u> which comprises of various spatial analyses & investigations done through the course of the project. • <u>Audio & Visual Archive</u> which consists of voice recording of the various stakeholders as well as visual pieces in the form of photographs, video montages, field sketches and cognitive maps developed during fieldwork. • <u>Theoretical Synthesis</u> which includes multiple literature reviews, case studies, theoretical underpinning, and critical analysis of the institutional reports on the ground subsidence in Joshimath.
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Process

Method description

The methodology of the project is divided into 4 components: Literature & Research framework, Spatial Analysis & Cartographic Exploration, Fieldwork & Data Collection and Design Synthesis.

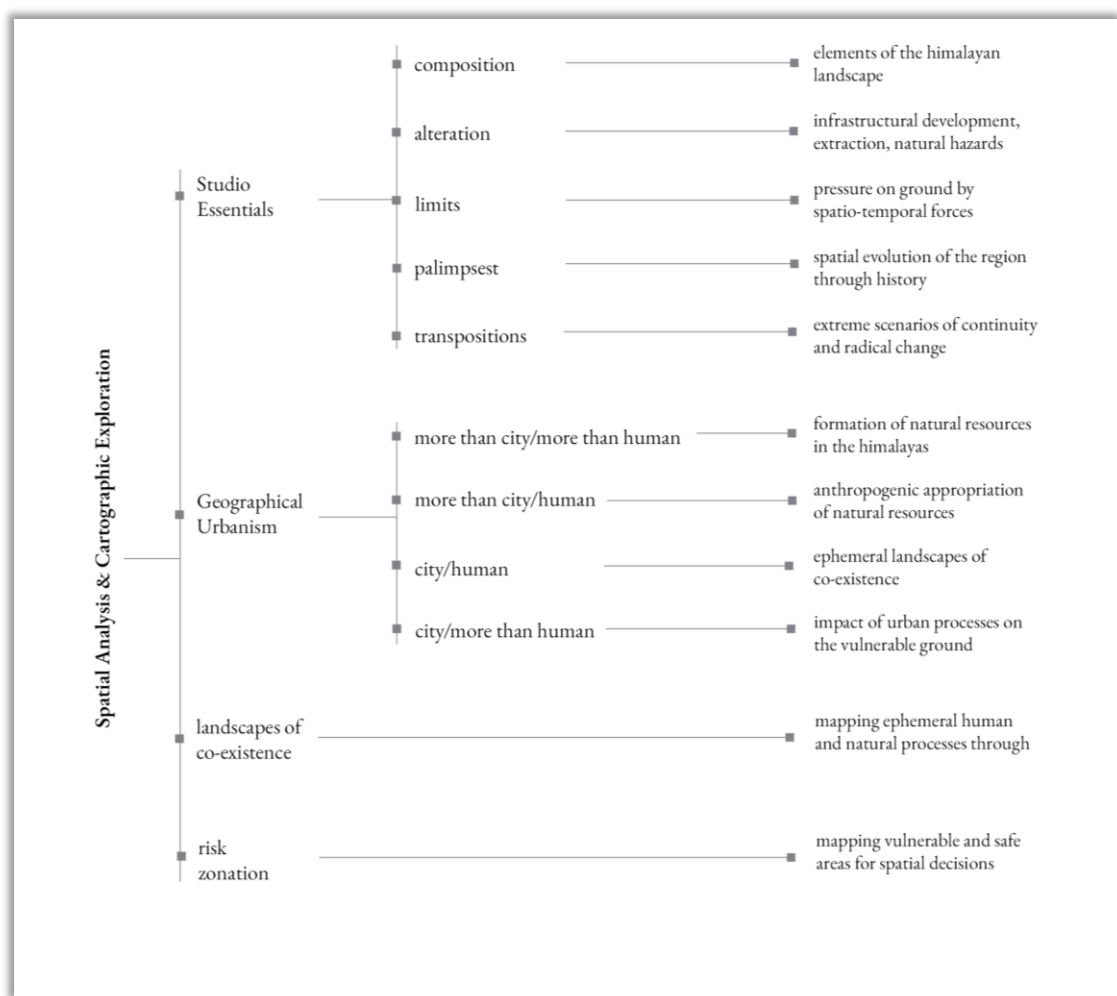
[A] Literature & Research framework:

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.



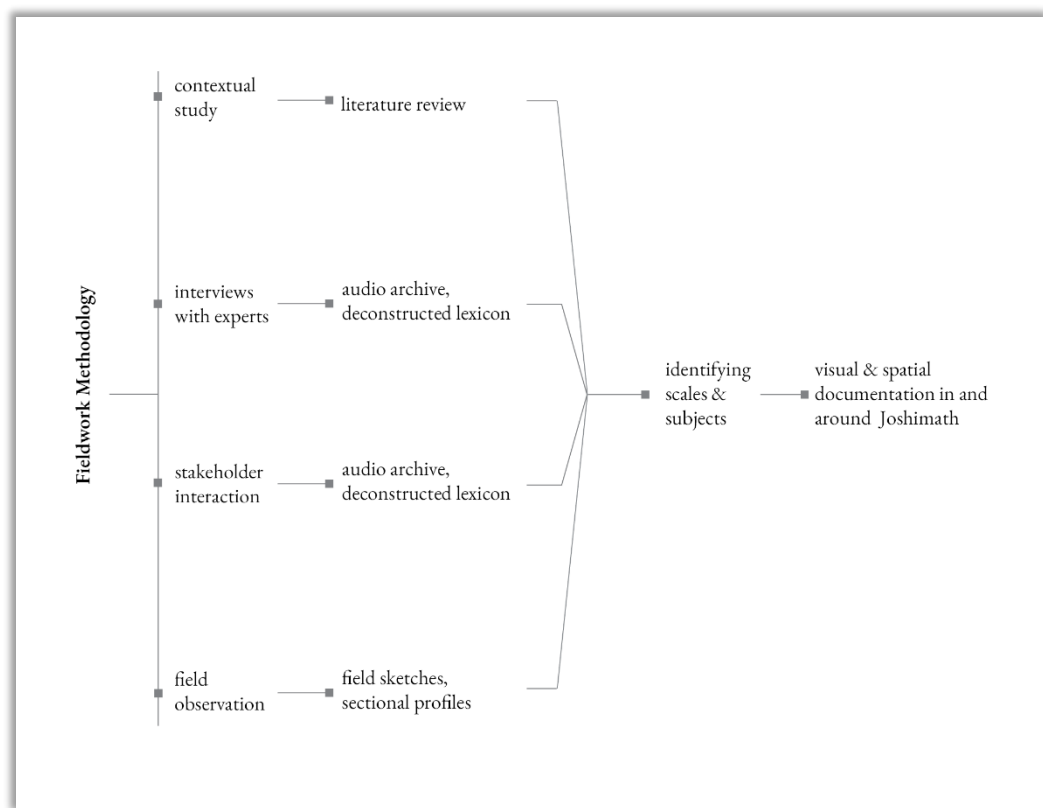
[B] Spatial Analysis & Cartographic Exploration:

The spatial analysis and cartographic exploration methods employed through the course of the project can be divided into 4 categories: Studio Essentials, Geographical Urbanism, Landscapes of co-existence and Risk zonation mapping. 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, the multiple ephemeral human and natural processes that constitute this vulnerable Himalayan landscape are mapped through space and time. Finally, a risk zonation map is created to identify highly vulnerable and relatively safer land parcels within this region which can assist in the strategy and design phase.



[C] Fieldwork & Data Collection:

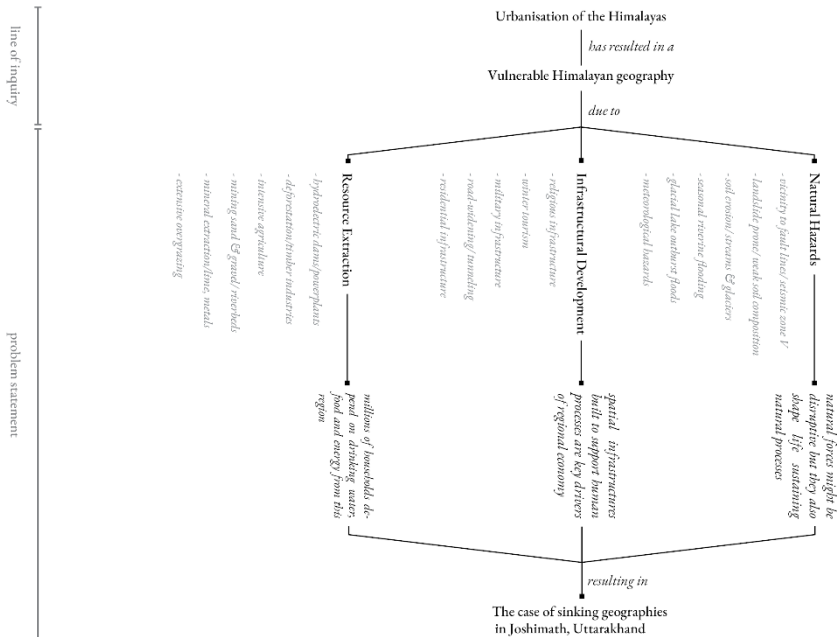
For fieldwork and data collection, the following four methods to collect data were employed: contextual study through literature review, interviews with experts, stakeholder interaction and field observation techniques. Through the series of interviews, an archive of the 'voices of the people' along 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.



[D] Design Synthesis:

(refer to 'Design goals, synthesis & outcomes' which has been answered previously.)

Project Framework Summary:



How can we synergise spatial development, ecological processes and resource extraction operation within the vulnerable Himalayan Geography in and around Joshimath, Uttarakhand through the agency of spatial agency of design?

Analysis sub-questions

How have the geomorphological processes and the natural resource shaped the landscape in the longer durée in the Himalayan landscape?

literature review

chronometric mapping

weather modelling

terrain modelling

palimpsest of the Himalayan landscape

cartographies of the atmosphere, geomorphology & the substrate

How have the anthropogenic appropriation of natural ecosystems and spatial development and resource extraction shaped the landscape of the region and resulted in the creation of critical landscapes in around Joshimath?

literature review

chronometric mapping

counter mapping

interviews to experts

cartographies of the critical processes in the region through time

How have the various perennial and ephemeral landscapes evolved over time and how do they co-exist spatially and re-organise periodically within this vulnerable Himalayan Geography?

literature review

chronometric mapping

ethnographic fieldwork

visual documentation

spatio-temporal cartographies of the landscapes of co-existence

fieldwork booklet, audio and visual archive of the subjects

How have the critical natural and human processes spatially co-existed in the creation of vulnerable, sinking geographies within the region?

literature review

multi-criteria decision analysis

counter mapping

interviews to experts

spatio-temporal cartographies of risk zonation & critical processes

fieldwork booklet, audio and visual archive of the subjects

Design sub-questions

How to program the transition from the existing state of extreme vulnerability & uncertainty in and around Joshimath to a new form of territorialisation of seasonal material ecologies by learning and adapting in the longer durée?

scenario making

integrated vision & strategy

transition management

literature review

seasonal cycle of material ecologies

scenarios

adaptive trans-scalar strategic framework & planning machine

catalogue of ephemeral material ecologies

What are the strategies to displace, accommodate, re-adapt and relocate human and ecological processes within the vulnerable, ephemeral landscapes and seasonal economies around the town of Joshimath?

geo-technical psychological solutions

integrated vision & strategy

design experiments

literature review

seasonal cycle of material ecologies

design proposals

risk zonation & critical processes

catalogue of geo-technical solutions

What actions/seed interventions within the agency of spatial agency can synergise infrastructural development, resource extraction operations and ecological processes in the region?

integrated vision & strategy

design experiments

literature review

seasonal cycle of material ecologies

design proposals

policy interventions

mix-media visualisations & physical models

How can these strategies and interventions be projected on the territorial scale in the form of a spatial framework of these ephemeral landscapes of co-existence within the vulnerable Himalayan Geographies?

integrated vision & strategy

projective mapping

policy interventions

projective mapping

trans-scalar landscapes of co-existence

policy interventions

line of inquiry

problem statement

research question

sub-research questions

methods

projected outcomes

Literature and general practical references

The bibliography so far consists of the following:

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B. Journal Articles / Research Papers

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C. Online Articles /Websites/Videos

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Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

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 a 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. What is the relevance of your graduation work in the larger social, professional, and scientific framework.

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, adopting 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 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.