

Project Proposal

Resilient Himalayan Homes Project proposal

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by

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INTRODUCTION

1.1. GENERAL INFORMATION

This research is related to an already existing project, namely the 'Resilient Himalayas Homes' project which is in collaboration with researchers of the Indian Institute of Technology (IIT). The aim of this project is to develop sustainable constructions in line with the distinctive spirit of the culture in the area. This can be developed on the basis of the knowledge of the traditional systems. This system has developed over the years which is of importance for creating plans and adjustments in the future. The sustainable development is facilitated with the help of knowledge of the local community about the ancient traditional building styles. Eventually, this development should lead to the effect that less younger people migrate from the mountain areas to the urban centres and more pride is created within the community. Currently the traditional housing within the region of the Himalayan are facing several difficulties:

- Decreased information about the traditional building constructions including information about the materials.
- An economic incentive to conserve the traditional building styles is missing within the local community.
- The younger generation migrates to the urban centres because livelihood opportunities are lacking in the mountain areas.
- Materials of traditional building styles are scarce.
- The local community does not have a high appreciation regarding their traditional solutions and technology. Their view is that urban centre housing is better than the traditional systems.
- The traditional building systems are part of a development of life styles experienced in the area for centuries and is not just an isolated system. Threats to the development related to the way of living will also influence as a threat to the building styles.

The project aims to tackle these difficulties and create solutions with the help of the knowledge of the local community:

- By gathering more information about the vernacular architecture it is possible to create appropriate solutions and guidelines.
- Creating social and economic benefits as incentive for the preservation of their traditional housing and life style. With the help of the project these incentives can be generated in collaboration with the local community by homestays and eco-tourism.
- With the help of training craftsmen, eco-farming and more livelihood alternatives the migration to urban centres will be addressed.
- The use of traditional materials is not conceived to be sustainable, therefore the project aims to rethink the traditional constructions with the help of evaluations of the use of alternative sustainable materials.
- Evaluating the traditional building styles on the risk of climate changes and explore how to fight these threats.
- Highlight the presence of innovative ideas and awareness within the community because of the development of advanced technologies. The aim of the project is to make the larger public aware of this developed knowledge.

1.2. SITE LOCATIONS

The project will focus on several site locations with different traditional building styles and construction techniques. An explanation of the different styles including the several materials is given for each location including below the explanation images of the houses respectively.

Bisoi village: this village shows examples of traditional timber-dry-stone-masonry constructions. The colors of these houses derive from traditional painting applying natural colors obtained within the area. In this village already several owners of houses collaborate with the project to conserve the traditional housing for homestays. In addition, the collaboration with the community is also focused to include knowledge about bio-diversity and registration for these information in their local language and English to save this information about the area.

Advaita Ashrama Mayavati: special feature of the housing is that Shri Vivekananda stayed here for some time during his travel. Of importance is the process to conserve the house and especially the room where he stayed. With the help of the project it is possible to provide support in technical issues to conserve the main ashram building which already exists for almost 200 years. Furthermore, the materials of the building consist of mud-mortar stone masonry, a wooden roof, balcony and floor construction. The roof construction is build with slate stones.

Woodstock School in Mussoorie: this building had a colonial architecture style and exist for more than 170 years. This building can be taken as an example for the reuse of the traditional building style without the loss of the traditional character. The guidelines of conservation will be formulated during this project. This indicates how they can deal with constructions of this style.

Old-Jubbal village in Himachal Pradesh: this building has a traditional Kath-Kuni construction which are assessed regarding the configuration of the construction and the seismic capacity.

Sarmoli village in Uttarakhand: in this village local woman were supported and helped by Malika Virdi (the Sarpanch of the Van Panchayat) to create sustainable homestays. The buildings have a contemporary architecture style (including few examples of traditional style) and they have put effort in the inclusion of traditional styles. This is aimed at the existing local community with which the project supports by formulating guidelines and help to set up a craftsman school for the preservation of craftsmanship skills in a traditional way.

¹



Figure 1.1: Different traditional building styles on site locations

¹[1] Information in 1.1 and 1.2 based on Resilient Himalayan Homes. (2019). Resilient Himalayan Homes, About Us. Retrieved March 4, 2020, from <https://www.resilienthimalayanhomes.com/about-us>

The researched area contains sites within the regions Uttarakhand, in the northern part of India. Figure 1.2 shows the exact site locations in India.

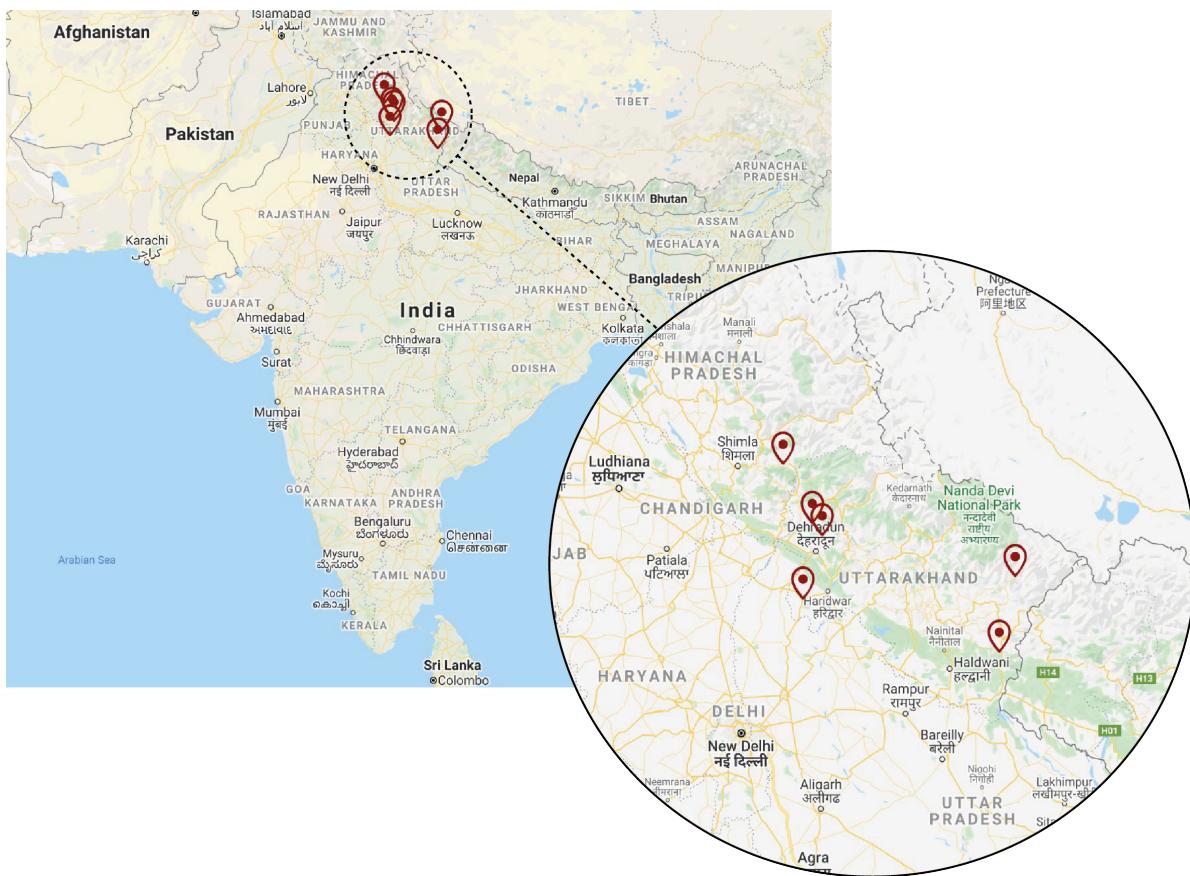


Figure 1.2: Site locations in India [1]

1.3. OBJECTIVE

In collaboration with the IIT and team of the 'Resilient Himalayas Homes' project, the first goal is to understand the development of the different building styles since 1900 with the help of an analysis and information of the local community. In order to achieve this, the main focus within the entire project will be on three domains: structural (Master Building Engineering), logistics (Master Transport Infrastructure and Logistics) and management (Master Construction Management and Engineering). Afterwards, when the different building styles including their materials, constructions and stakeholders are clear, it will be possible to create a future plan on the constructions and how to engage this (engagement plan). This research aims to finally answer the following research question.

Research question: How can a long-term plan for implementing redesigned earthquake resilient houses be created, taking into account the tradition of vernacular buildings in the Uttarakhand region?

To achieve this objective extensive research will be conducted for approximately two months in the area. Fieldtrips including interviews with the local community will help to receive more precise information about the different building styles on which there will also be elaborated on the soft factors of the development of the construction.
²

²[1] Information in 1.1 and 1.2 based on Resilient Himalayan Homes. (2019). Resilient Himalayan Homes, About Us. Retrieved March 4, 2020, from <https://www.resilienthimalayanhomes.com/about-us>

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PROJECT SCOPE

A scope is important because it will equal the expectations of all involved parties, including the project team members. Additionally, the scope makes sure boundaries are set to limit the amount of work to a realistic quantity, given the length of the project. Therefore, in this scope, clear goals and boundaries for this project are established. The goals are subdivided into project related and process related goals.

2.1. PROJECT RELATED GOALS

- Provide a clear answer to the research question and other imposed objectives of the client.
- Establish a clear connection between the multiple disciplinary aspects to reach an integrated result.
- Finish the project within the set time constraints.
- Create an overview of the development of the different building types over a time period of 1900 until present
- Identify the main drivers of using specific construction methods.
- Using the gained knowledge of the structural concepts behind the different building styles to create a future-proof, structurally feasible design.
- Determine the circumstances for implementation of the selected construction method.
- Establish a stakeholder engagement plan based on the preferred construction method.

2.2. PROCESS RELATED GOALS

- Experience working abroad and in a multidisciplinary team.
- Clear communication within the team and the client, supervisors and partners.
- Possibilities to gain insight and knowledge in the area of interests of the team members.

2.3. BOUNDARIES & CONSTRAINTS

Since this project deals with time constraints and information constraints it is not possible to research every aspect of the history of vernacular buildings. The aspects not mentioned in the goals will not be researched, if not imposed by the client or supervisors. There are some clear boundaries which needs to be mentioned. These boundaries are listed below.

- The assumptions and predictions made in this research will be based on the analysis of the development of the different building types.
- The stakeholder analysis will not look at conflicts but will examine the quality of engagement of the stakeholders in the project.
- The project will focus on the local community within the researched area, see figure 1.2.
- The structural calculations of the new design will focus on static calculations. The earthquake resistance will be considered based on basic assumptions.
- The research will focus on historical developments in construction methods. methods applied in future projects are not taken into account.

During the site visits, in consultation with Marloes van der Zanden and Sanjay Chikermane, a certain amount of houses will be selected according to the set time and information constraints. These houses will function as case-studies. These houses will be investigated on a number of different aspects. These aspects are shown below for each disciplinary with the help of the section of a Kath Kuni House.

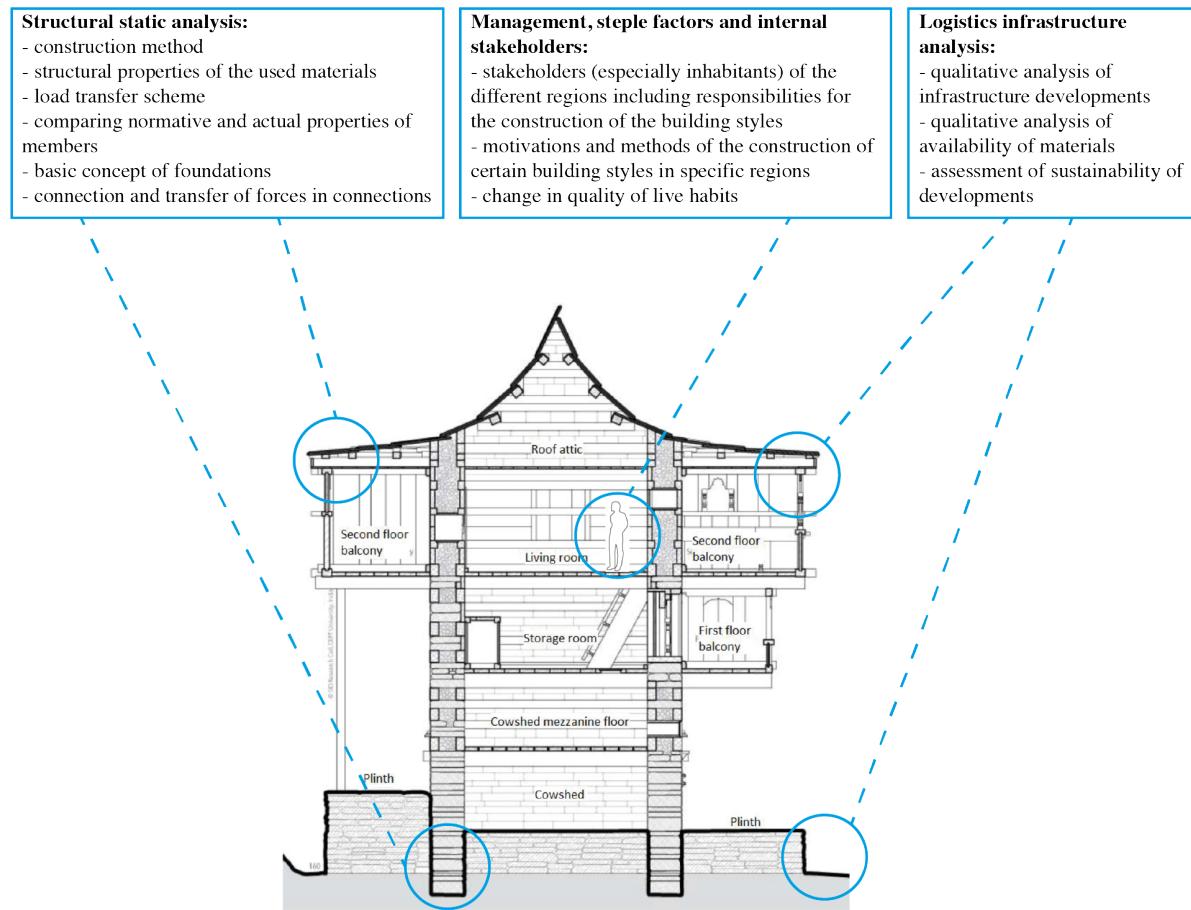


Figure 2.1: Overview research criteria for each disciplinary [2]

1

¹[2] Own figure including section of Thakkar, J., Morrison, S. S. (2008). *Matra: Ways of Measuring Vernacular Built Forms of Himachal Pradesh*. Ahmedabad: SID Research Cell, CEPT University.

3

RESEARCH STRUCTURE

The main focus of the project contains three pillars: structural, management and logistics. These research areas will not produce separate results, but will strengthen each other to achieve the objectives. Throughout the research the areas also have dependencies for example, the structural analysis is needed for the identification of the main drivers by the local community and identification of material logistics.

The final product will be delivered as a report, with four main sections. For start a theoretical background is made. The second section will elaborate on the evolution of earthquake resistant buildings in the researched area. Afterwards the fit for purpose requirements in the Uttarakhand region will be researched. The fourth section takes the form of an implementation strategy for the local community, which clarifies which earthquake resistant construction method should be used for future buildings in the area. .

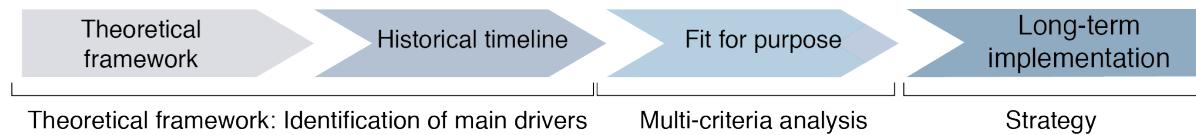


Figure 3.1: Research structure

3.1. THEORETICAL FRAMEWORK

In order to implement a long-term plan on housing structures, theoretical knowledge has to be gained on which external factors can have an influence on the final plan. A deep dive into the prevailing culture and standards in Uttarakhand will be necessary to gain this knowledge. The first part provides this deep dive by categorizing the external factors in multiple categories, specified as follows:

- **Economical**, diving into economical issues which might limit construction expenses.
- **Social**, forming a major part in the research, are the social factors and thoughts which are assumed to have a significant influence on the used construction methods and materials. Additionally the cultural habits and norms are specified in the researched region.
- **Technical**, researching technical possibilities and present knowledge in the Uttarakhand region.
- **Political**, looking for (national, municipal and provincial) governmental influences on construction methods.
- **Legal**, investigating laws and regulations which should be taken into account in construction.
- **Environmental**, looking at how environmental considerations are used in making choices for constructions.
- **Infrastructural**, performing a network analysis on the current (state of the) infrastructure in the Uttarakhand region.

An overview of influencing factors results from this broad analysis. Furthermore, a stakeholder analysis is done using the information from interviews, field trips combined with literature study. This also results in an investigation into logistical accessibility. To understand the links between different stakeholders and available resources a network analysis is done. Accordingly a power, interest, attitude grid and SWOT-analysis are made in this part to further elaborate on the importance of the different roles. Nevertheless, to understand the present use of materials

and stakeholder behaviour an inventory must be made of the currently existing buildings and static analysis. By combining the stakeholders, logistics and static research an overview is made about the nowadays existing culture in Uttarakhand.

3.2. HISTORICAL TIMELINE OF VERNACULAR ARCHITECTURE DEVELOPMENT

It is not only important to understand the present, but also to figure out the evolution of house typologies over the years. The main purpose of this part is to learn from the past to implement into the future. To achieve this goal, a historical timeline (1900-present) will be established with the change in building typologies and critical moments over time. Accordingly the research looks into when building styles (e.g. Kath Kuni, Koti-Banal) settled in Uttarakhand, change in statistics of the beforementioned building styles, infrastructure developments (e.g. cars, trains), law and regulation (e.g. the forest conservation act and British rule) and major incidents (earthquakes, significant historical moments). Research will be done throughout available literature study and databook with stakeholder interviews and community date which is the outcome of field observation and workshops. After data gathering the critical incidents and developments are defined which results into a historical chronology.

To conclude from parts 1 and 2 the main drivers for, for instance image or available resources can be detected from the theoretical framework. The identified main drivers will set the foundation for the implementation strategy.

3.3. FIT FOR PURPOSE

In this section, existing pre-building designs are tested on the performance and sustainability. The design from Marloes van der Zanden is not finished upon completion of this Multi-disciplinary project, so this can not be used in the testing.

The theoretical framework found in the previous steps is input for a multi-criteria analysis. In this analysis, multiple existing (historical) construction designs are tested and evaluated. New combinations of materials will also be tested in the analysis. Also the external features will be used during this part for instance by analysis of change of law. Requirements for settlements are also calculated in this step. A risk assessment is used to identify all possible risks and corresponding strategies (external, design and construction) for using the concerned building methods. A scoring and risk assessment are performed, resulting in the output of part 3. The output will be used to determine the implementation in part 4.

3.4. LONG-TERM PLAN FOR IMPLEMENTING EARTHQUAKE RESILIENT HOUSING

In the last step of the process a long-term implementation plan is presented. This framework shows how to support the community self-sufficiency and how to implement the redesigned Kath Kuni style. This part of the project attempts to map the complex links between the construction, infrastructure and urbanization of the communities. First the future proof design with innovative solutions of use of new materials and/or structural concept is determined. This forms the basis of the second part, which will investigate the options of implementation methods to promote sustainable materials. Then, a stakeholder engagement plan is determined and a stakeholder implementation pathway (technical design (including resources), legal organisational) is finalised. This includes the possible needed changes or developments of infrastructure.

Central in this part is to inform and involve the future generations about the redesigned architecture style. By embracing the unique character of Uttarakhand a future perspective for the local community and even possibilities for tourism will arise. Because of the importance of the stakeholders data for this last part is detected from the previous literature studies and databook including outcomes of field observation, stakeholder interviews and possible workshops with the local community.

4

SCHEDULE

Below the schedule of the project is shown. Preceding these weeks an extensive literature study will be conducted, because less time will be available when doing research on site and processing the received data. The main sequence of the project will be first understanding the different building styled related to the domains of structural, logistics and management. This can be achieved with the help of a short field trip including site views and interviews with the local community. These data will be processed and an analysis will be conducted with the goal to create a timeline. Afterwards, the longer field trip will take place to gather more and detailed data with the goal to eventually create a fit for purpose plan for the future. Finally, if all information is complete, a long term implementation plan can be created.

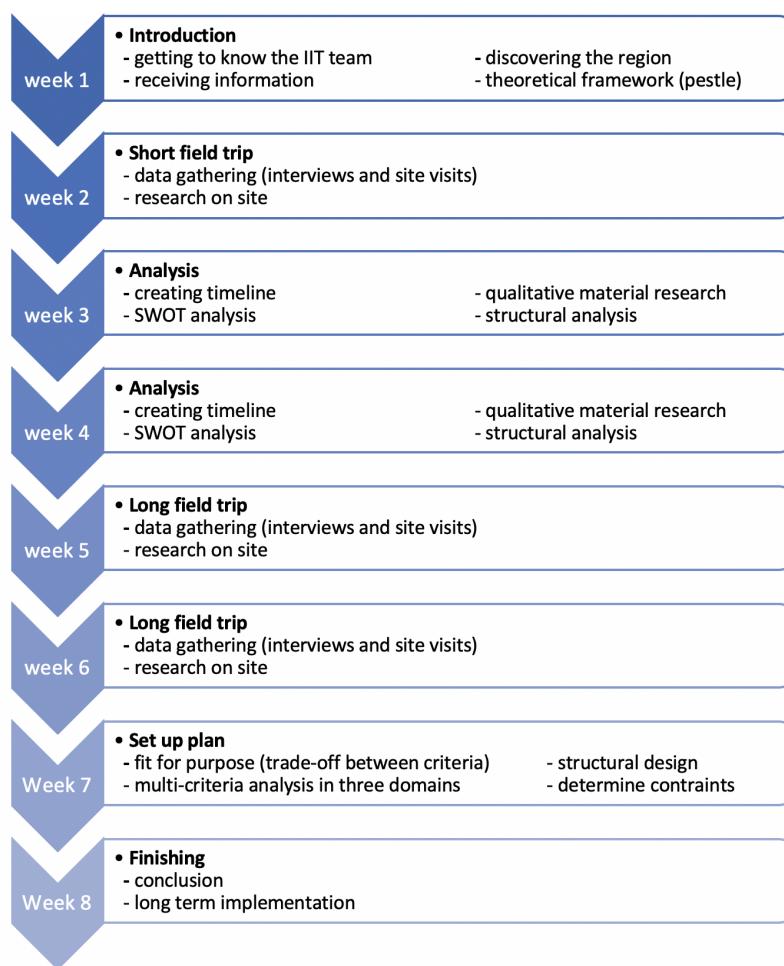


Figure 4.1: Project schedule

5

COMMUNICATION AND INFORMATION

Communication is the key in order to develop an effective collaboration. Collaboration is important between the project members, but also with external members like our supervisors. Every supervisor and team member have their own quality and thereby opportunity to strengthen the result. This chapter is elaborates about the communication style during the process.

5.1. EXTERNAL COMMUNICATION AND INFORMATION

Website	https://www.resilienthimalayanhomes.com
Email	mdp.rhh@gmail.com
RHH Facebook	MDP Resilient Himalayan Homes
RHH LinkedIn	MDP Resilient Himalayan Homes

For communication about general project information (e.g partners and funds) the team will use the RHH email: mdp.rhh@gmail.com. The personal email addresses of group members is applied during contact with supervisors. Overall project information can be found on the website of Resilient Himalayan Homes. During the project it is possible for our partners, family and friends to follow our development due to weekly updates. Small summaries of the updates can be found on our Facebook, Instagram and LinkedIn. The more extensive weekly reports can be requested in person.

5.2. INTERNAL COMMUNICATION AND INFORMATION

Data sharing	Google drive
Progress	Action list Google drive
Formatting	Latex (Overleaf)
Documentation	APA-style

Main communication between team members is on WhatsApp. Documents are shared on Google Drive and progress is tracked in an excel action list. The project is written in Overleaf (LateX) The beforementioned platforms are always accessible for every team member. The citation style is APA-style.

5.2.1. MEETINGS

During the preparation time in the Netherlands the team has weekly meetings on Wednesday to discuss the process. The meetings are to give updates about last weeks tasks, discuss progress and assemble new upcoming tasks to group members. It is their responsibility to gather this information for the next meeting.

In India, the weekly work sessions will be prolonged. Also a new element is introduced in the beginning of the week: the performance dialogue. This short interactive sessions gain structure and insight into activities, communicate effectively and get involvement with other members. Every member tells briefly what his or her tasks are this weeks and makes this visible by writing it on the week chart.

During our project supervisors receive weekly updates by email. If unforeseen circumstances arise, this may be upgraded.

6

RISKS

6.1. SCOPE CREEP

A commonly known problem in complex projects is derivation of the initial scope. The three different aspects of the project all have their own focus point, but the potential of researching more subjects. With the consequence of possible extension of the project scope, with the final result of scope creep. Through all different influences of the surrounding and results easily the scope increases whereby on the end the project becomes no longer manageable.

Changes do not always have to be bad, but the team has to be straight in their intentions. During the weekly meetings the entire team has to be aware of the scope and requirements. If so change in scope is needed: the whole team and supervisors have to be on board.

6.2. TIME

In the pre-phase of the project we made a project planning. Accordingly with the planning we have 8 weeks to complete the project, but in association with the risk of scope creep this can be a never ending story. A lot of work have to been done in a short amount of time and some fixed deadlines like the trips cannot be prolonged, causing little time for time exceeded. This only cannot be to long, because of the visa requirements.

Time management is crucial. We believe that our project planning is realistic and it is possible to stick to the schedule. Incorporated in the project planning is slack to deal with the potential unforeseen delays. Another mitigation measure is to adjust the structure of the project. Due to difficulties with information gathering in the first parts of the project it might happen that delay results in not enough time to finish parts 3 and 4. When this happens the team will focus on delivering a well-researched introduction of new regulation or material instead of a long-term implementation plan. As a last resort it is also possible to postpone the deadline with 1 week.

6.3. COMMUNICATION INFORMATION

In a team with different disciplines and qualities it is possible to forget the bigger picture: the combined research. In the begin phases members will work mostly individual, but this does not mean communication can be neglected: single pieces must become whole. With open and honest communication there is the least chance of getting communication problems in between the team members. Another crucial factor is the communication with the supervisors in the Netherlands.

In the project, the management of information will be settled as mentioned in Chapter 5. It is important to be aware of the importance of good communication and information supply. In combination with this all members should be transparent with information sharing and criticism. This will be discussed during the performance dialogues and weekly meetings.

6.4. CULTURAL CLASHES: THE INVISIBLE BOUNDARIES OF OUR WORLD

A project with an international interest always inherits more concerns and risks. Cultural differences can be there in an explicit and in-explicit way. An explicit factor is shown in the language barrier with the local community and authorities. This might show in regulations only provided in Hindi or difficulties with corresponding with the local community. Also, less clear factors like working together and mindset may involve difficulties.

The most important mitigation measure in this is treat everyone with respect and understand that there are differences. Be interested in the local community and put time and energy into getting to know the local customs. Furthermore, the team will have a guide to translate and guide them through the area. Associated with the language barrier, who hope to work closely with the experts of the IIT Roorkee to learn from their previous methods of communication like workshops instead of interviews.

6.5. HEALTH AND SAFETY

In India there are several issues concerning health and safety. Relating to this topic India has been in the news for immoral behaviour to woman and the embassy warns for restricted areas. Also health issues can cause problems for instance hygiene is totally different in the India. Furthermore, the team also have to deal with the possibility of further spread of the COVID-19 virus.

In the beginning all team members must receive their vaccinations and take precautionary measures. These measures consist of registering on the study abroad on Osiris and following a safe travel training session at TU Delft. Another important point regarding to health and safety is treating the local people with respects and seek information before departure about their culture and country. Nevertheless, an incident can always happen. That is why it is important to also have the phone number and address of the Dutch embassy, TU Delft emergency centre and family contact numbers.

6.6. ALTERNATIVE DATA GATHERING

For data gathering the team will make use of different techniques. The main preferred research method consist out of literature study combined with interviews with the local community. Because of the language barrier (6.4) it might not be possible to obtain enough knowledge from this research therefore also expert interviews with the embassy and IIT Roorkee could be done. Additional, also the interview technique could be changed to surveys and lastly our own observations may be used.

The risk of failure of the used methods to execute the research always lurks. Therefore, possible failure scenarios are researched, the result is as follows:

- No access to the buildings/researched area is granted.
- Interviewed people are not willing to help in our investigation.
- Interviewed people do not understand the posed questions/do not answer in the desired manner.
- Interviewed people are indoctrinated by external influences, invalidating their answer.
- The research does not result in a satisfactory outcome, or does even result in no useful information at all.

First start the team will work closely together with the IIT Roorkee to learn from their previous research. Not all risk can be detected from the past therefore also this scenario is described. Several ideas arose from the before mentioned risks, with corresponding types of study which can be performed. These are listed below.

- Adjusting interviewing techniques correspondingly, when the used techniques do not prove to be effective enough. In the first trip during our stay, it can be tested whether the used interviewing techniques are sufficient.
- Literature study beforehand will increase the chance of success, since the time in India spent on literature study will be reduced in that way.
- Expert interviews can be executed when the result from the local community is not satisfactory. These interviews can be executed with university employees, or governmental experts on municipal, provincial or even national level.
- Working with our own observations and assumptions to direct the research into the right path.
- When interviewing, presenting photos can add clarity to the questions asked for the local community, probably improving the usefulness of the answers.
- During the site visits and trips, the team will wear t-shirts with their name and the organization on it, to emit a more open attitude to the local community.

7

FUNDING

7.1. BENEFITS OF FUNDING

To be able to cover our expenses during the project we are getting in contact with companies who can help with the funding. Becoming our partner will offer various benefits for these companies.

7.1.1. REACHING OUT TO OTHER STUDENTS

- Company name and description mention on the project website
- Social Media post(s) (Facebook, LinkedIn) about the company.
- Banner with company logo on posted pictures during the stay in India.
- Open presentation at Delft, University of Technology including company name, logo and description.
- Description, this includes the logo on the presentation leaflets.

7.1.2. KNOWLEDGE

- Networking event: open presentation with all supporting partners
- Presentation at the location of your choice.
- Receiving the final report.

7.2. BUDGET ESTIMATION

To estimate the necessary amount of funding we have put all our expenses and expected income in one table to create a clear overview. This table is not a final version. It will be updated regularly to maintain the overview. The expenses and income of the project during our visit are shown in table 7.1

Category	Expenses	Income
Plane tickets	€ 2.500,-	-
Transfer from airport to IIT Roorkee and back	€ 150,-	-
Accommodation during site visits	€ 750,-	-
visa	€ 400,-	-
Transport during site visits	€ 500,-	-
living expenses	€1.500,-	-
Total	€ 5.800,-	-

Table 7.1: Budget estimation