April 2019

Stories of Climate Change in Himachal Pradesh

Brant William Reymann  
Worcester Polytechnic Institute

David Santamaria  
Worcester Polytechnic Institute

Emma J. Edwardson  
Worcester Polytechnic Institute

Kevin Buffe Baptista  
Worcester Polytechnic Institute

Follow this and additional works at: https://digitalcommons.wpi.edu/iqp-all

Repository Citation

This Unrestricted is brought to you for free and open access by the Interactive Qualifying Projects at Digital WPI. It has been accepted for inclusion in Interactive Qualifying Projects (All Years) by an authorized administrator of Digital WPI. For more information, please contact digitalwpi@wpi.edu.
Stories of Climate Change in Himachal Pradesh

Rohan Agrawal, Kevin Baptista, Emma Edwardson, Rachit Maheshwari, Brant Reymann, David Santamaria

Advised by Dr. Ingrid Shockey & Dr. Gbetonmasse Somasse
Submitted to: Worcester Polytechnic Institute
Indian Institute of Technology - Mandi
Stories of Climate Change in Himachal Pradesh

An Interactive Qualifying Project
Submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
In partial fulfilment of the requirements for the
Degree of Bachelor of Science

By:
Rohan Agrawal
Kevin Baptista
Emma Edwardson
Rachit Maheshwari
Brant Reymann
David Santamaria

April 28, 2019

Report Submitted to: Dr. Ingrid Shockey and Dr. Gbetonmasse Somasse

This report represents work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review. For more information about the projects program at WPI see http://www.wpi.edu/Academics/Projects

Cover photo credits: Brant Reymann
Abstract

Climate change research has focused on scientific data as the driving force in building awareness of climate change. Less has been done to collect climate data from the perspectives of ordinary people. Ethnographic approaches enable citizen science participation in climate change research. We conducted and recorded semi-structured interviews and collected stories of lifelong residents in Himachal Pradesh to assess the perspectives of climate change. These findings communicate subtle perspectives on the experience and indicators of climate change through the stories.
Executive Summary

Climate change is a global problem that must be addressed in the coming years. The United Nations has set 17 sustainable development goals, one of which is for climate action. The goal aims to “strengthen resilience and capacity..., integrate climate change measures into national policies..., [and] promote...effective climate change related planning...in least developed countries” (Goal 13: Climate Action, n.d.). Our project documented experiences of climate change in Himachal Pradesh, a state in Northern India at the foothills of the Himalaya. We hoped to supplement environmental data and inform policy in Himachal Pradesh by providing a platform to showcase the experiences and stories of local residents and their changing climate. We recorded ethnographic stories of lifelong residents, documented audio and visual indicators of climate change, and assessed the perspectives of local experts. By accomplishing these objectives, we obtained a better understanding of personal and community experiences of climate change and gave a voice to the impacts felt throughout Himachal Pradesh.

Background

In the years since India published the National Action Plan for Climate Change in 2008, there have been numerous government-sponsored studies conducted in Himachal Pradesh about agriculture, biodiversity, glaciology, forests and rainfall. The most recent study published, however, was in 2015. In addition, about a quarter of the web-based links are no longer activate. This calls into question the ability of the local government to enact change on a governmental and community level. As a worker on the campus of IIT Mandi stated, his “biggest concern is the lack of knowledge about climate change among the people in the villages. There may be policies in place but that’s not going to the ground level. People on the ground level need to be educated about these changes we are seeing” (IIT Mandi Campus, March 29, 2019). Proper knowledge is key to understanding and dealing with the effects of climate change in vulnerable areas.
Methodology

While scientific studies can provide an in depth look at the effects of climate change, narrative research has the potential to update climate change research and bridge the gap between government literature and observed indicators of social and environmental stress. A narrative or citizen science approach has been used in recent years to humanize science, because narratives are more appealing to non-expert audiences (Dahlstrom, 2014). The stories recorded can communicate the challenges that vulnerable communities face. No two communities are affected by climate change in the same ways, nor do they adapt in the same way. Narrative recordings allowed our project to communicate the experience of climate change through the eyes of another community.

In order to tell the story of climate change, we used semi-structured interviews. We discussed the environmental, social, and economic changes that village residents have seen throughout their lives. Every interview was unique, and did not always follow the questions listed on our interview guide. All interviews were recorded, transcribed, and combined with photography and video to produce profiles for our media platforms: our Instagram account @messagesfrommandi and short videos for climatestoriesproject.org.

“Until the 2000s there was no fertilizers used in orchards. I do not use any type of fertilizers in my fields but neighboring people are using pesticides and chemicals so my crops are being affected and not growing as much. The government is not taking any action on these fertilizers.”

Chansari School, Kullu, Himachal Pradesh, India
**Findings**

Our team visited numerous villages around Himachal Pradesh, where many residents told about their experiences with changes in livelihoods. Farmers no longer grow traditional crops because they do not generate enough income. The lack of snow in recent years has been attributed to the decline in agricultural productivity. A resident of Suda reported that in the past, snow melt would “increase the productivity by three times” (Suda Village, March 16, 2019). Now, it does not snow enough to help crops grow. Furthermore, farmers have moved toward the use of pesticides, a product that was never needed in the past. Some villages additionally reported that young people have started to leave home because agriculture is no longer a sustainable livelihood. In Suda, many residents are leaving the village to find outside work because of the declining productivity of agriculture in the area.

One of the most reported indicators of climate change was a receding snow line. In Suda, a villager stated that 50 years ago, the village would see one and a half to two feet of snow in the winters, but “now there is no snow, and much less on the mountains” (Suda village, March 16, 2019). At Prashar Lake, located high in the hills of Himachal Pradesh, a trekking guide noted that in the past the area would see seven to eight feet of snow, but now they typically see three to four feet (Prashar Lake, April 6, 2019). Interviewees also told of shifts in agricultural crops and seasons. The growing season for apples has been pushed back by fifteen to twenty days because, “the winter season used to last until April but now it is only until February” (Chansari village, March 30, 2019). Villagers in Suda, Bagi, Chansari, and Prashar agreed that summers have been longer and more severe in recent years. As a result, villagers in Suda have reported that they have now begun to face problems with water scarcity (Suda village, March 16, 2019). The G.B. Pant National Institute for Himalayan Environment and Sustainable Development confirmed the reports of water scarcity in Himachal Pradesh. The head of the institute said in an interview that the rain and snow has not recharged the water table as much as it has in the past. Similar accounts were recorded from a taxi driver who has lived in Mandi for the past 30 years. He indicated that the change in climate patterns has affected farmers adversely. There has been a shortage of rain that is needed to promote crop growth, but when the time comes for harvesting, there is too much rain, further hurting crop production (Prashar Lake, April 6, 2019).
In Palampur, a region where many tea estates are located, an expert at the tea board reported that with the increase in temperature over the past few years there has been a spread of a parasite known as the Red Spider mite across tea plantations (Palampur, April 18, 2019). Rising temperatures were also reported in Suda. In previous years when there was thick snow cover, young plants used to exhibit natural branching leading to more yield. Now, with the decrease in snow, the growing pattern of crops has changed to grow vertically, even causing a thinner tree cover (Suda village, March 16, 2019).

Overall, livelihood patterns are changing, and farmers are concerned about how their future will be affected. The 2018 project had similar findings. In both years, villages reporting decreased snowfall and increasing temperatures, affecting agriculture in the region. Furthermore, there were numerous alliances between reported indicators of climate change from local residents and experts. Respondents at GBPNIHESD and the Tea Board at Palampur reported less snow and rain, a trend reported in numerous villages. Both agencies agreed that the growing season of numerous crops has been changed due to differences in temperature and precipitation. The agreement between respondents shows that climate change has become a pressing problem in Himachal Pradesh, and it gives greater significance to the stories taken from communities.

Although our research was limited in both time and scope, we were able to gather stories about climate change from a number of communities. Our findings reveal that villages are seeing many of the same indicators around Himachal Pradesh. There is an increased sense of urgency in communities that rely on farming for livelihoods. Based on our research, we found that rural areas do not have the resources or knowledge to confront climate change and its effects. A common belief among residents is that there is a lack of government action pertaining to climate change and help for struggling farmers. We concluded that there is a gap between government policy and knowledge in villages. We recommend that further ethnographic research is done in order to give residents a voice to communicate the effects they have felt from climate change, and to increase understanding between local government and rural villages.

**Project Outcomes**

The Instagram posts through the account @messagesfrommandi and and the short videos we recorded for the website climatestoriesproject.org are the main outcomes of this project. We also formulated a set of recommendations. We recommend that further ethnographic research be done in order to give residents a voice to communicate the effects they have felt from climate change, and to increase understanding between local government and rural villages. We also recommend that the government attempt to educate rural communities on environmental policy, as they are the ones impacted most from climate change. The promotion of strong policies to protect the environment would also assist in educating communities around Himachal Pradesh.
Lastly, we recommend that *this project be continued in the future*. The villages of Himachal Pradesh are so diverse, the project should not stop here. The state is extremely vulnerable to climate change, which is why providing a platform for residents’ stories is crucial to spreading awareness on this issue. These communities are facing social, economic, and environmental change that will affect them for years to come, and it is critical that informed decisions are made for future climate change planning.
Acknowledgments

Our team would like to thank the following individuals for their assistance and guidance during the completion of this project:

Dr. Ingrid Shockey and Dr. Gbetonmasse B. Somasse for their insights and contributions on this project and report.

Arpit Dwivedi for his assistance in interviews, translation of media content, and insight on this project.

Dr. Rinki Sarkar for providing our team with a basis of how to conduct interviews.

The editorial team for all their hard work in putting together the booklet.

All interview participants for sharing their experiences on how they have been affected by climate change.

Indian Institute of Technology Mandi and Worcester Polytechnic Institute for the opportunity to take part in this experience.
Authorship

**Rohan Agrawal** contributed to the logistical organization and administration of interviews, the translation between Hindi to English, and the interpretation of findings from interviews.

**Kevin Baptista** contributed to the writing and editing of every section of the report; the analysis of interviews; and the development of media outputs for the climate change stories.

**Emma Edwardson** contributed to the writing and editing of every section of the report; the analysis of interviews; and the development of media outputs for the climate change stories.

**Rachit Maheshwari** contributed to the logistical organization and administration of interviews, the translation between Hindi to English, and the interpretation of findings from interviews.

**Brant Reymann** contributed to the writing and editing of every section of the report; the analysis of interviews; and the development of media outputs for the climate change stories.

**David Santamaria** contributed to the writing and editing of every section of the report; the analysis of interviews; and the development of media outputs for the climate change stories.

*Team Photo: (Left to Right) Brant Reymann, Rachit Maheshwari, Emma Edwardson, Rohan Agrawal, Kevin Baptista, Arpit Dwivedi(TA), David Santamaria*
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>iii</td>
</tr>
<tr>
<td> Background</td>
<td>iii</td>
</tr>
<tr>
<td> Methodology</td>
<td>iv</td>
</tr>
<tr>
<td> Findings</td>
<td>v</td>
</tr>
<tr>
<td> Project Outcomes</td>
<td>vi</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>viii</td>
</tr>
<tr>
<td>Authorship</td>
<td>ix</td>
</tr>
<tr>
<td>Chapter 1: Documenting Climate Change Perspectives</td>
<td>1</td>
</tr>
<tr>
<td>Chapter 2: Background</td>
<td>4</td>
</tr>
<tr>
<td> Research and initiatives in Himachal Pradesh</td>
<td>5</td>
</tr>
<tr>
<td> Climate implications for Himalayan regions</td>
<td>5</td>
</tr>
<tr>
<td> Climate change ethnography</td>
<td>6</td>
</tr>
<tr>
<td>Chapter 3: Project Approach</td>
<td>9</td>
</tr>
<tr>
<td> Climate change storytelling</td>
<td>10</td>
</tr>
<tr>
<td> Audio and visual indicators of climate change</td>
<td>12</td>
</tr>
<tr>
<td> Climate change perspectives of local experts</td>
<td>13</td>
</tr>
<tr>
<td>Chapter 4: Results and Discussion</td>
<td>14</td>
</tr>
<tr>
<td> Stories from residents</td>
<td>15</td>
</tr>
<tr>
<td> Indicators of climate change</td>
<td>17</td>
</tr>
<tr>
<td> Perspectives from local experts</td>
<td>18</td>
</tr>
<tr>
<td> Discussion</td>
<td>19</td>
</tr>
<tr>
<td>Chapter 5: Project Outcomes</td>
<td>21</td>
</tr>
<tr>
<td>Appendix A: Interview Guide</td>
<td>26</td>
</tr>
<tr>
<td>Appendix B: Informed Consent Script</td>
<td>27</td>
</tr>
<tr>
<td>Appendix C: Image Gallery</td>
<td>28</td>
</tr>
<tr>
<td>Appendix D: Video Links</td>
<td>40</td>
</tr>
<tr>
<td>Appendix E: Poster</td>
<td>41</td>
</tr>
</tbody>
</table>
List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure A</td>
<td>Dhauladhar snow line</td>
<td>iv</td>
</tr>
<tr>
<td>Figure 1</td>
<td>Remnants of a bridge destroyed by flash flood in Bagi village</td>
<td>2</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Snowline looking out from Chansari village</td>
<td>6</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Interviewing a subject at Prashar Lake</td>
<td>7</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Overview of goal and objectives</td>
<td>10</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Map of villages visited in 2018 and 2019 (Google Earth, 2019)</td>
<td>11</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Interviewing a subject at Prashar Lake</td>
<td>12</td>
</tr>
<tr>
<td>Figure 7</td>
<td>@messagesfrommandi Instagram post</td>
<td>15</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Gallery of @messagesfrommandi Instagram posts</td>
<td>17</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Suda resident hopeful for the future of her village</td>
<td>19</td>
</tr>
</tbody>
</table>
Chapter 1: Documenting Climate Change Perspectives

Photo by Brant Reymann
While climate change trends and projections are on a global agenda, less data has been recorded that reflects the climate change experience for individuals and families. The science behind climate change can be given a voice by documenting first-hand accounts of changes that local residents have observed in their communities. In fact, it is the first step towards gathering strength for policy interventions and for the world to acknowledge the implications of climate change on families and individuals in communities.

With objectives such as the United Nations Sustainable Development Goal for climate action at the forefront of global assessments, understanding what communities are experiencing on a daily basis is crucial to ensure that strong policies are put in place. The climate action goal aims to “promote mechanisms for [...] effective climate change-related planning and management in least developed countries [...] including focusing on women, youth and local and marginalized communities” (Goal 13: Climate Action, n.d.). Furthering this directive for research in Himachal Pradesh is critical as rural communities of this region have begun to feel the effects of climate change, such as the flash flood in Figure 1, and these effects will only worsen in the future.

![Figure 1: Remnants of a bridge destroyed in a flash flood in Bagi village (Photo by Brant Reymann).](image)

While there is an abundance of scientific data, there is less ethnographic data related to climate change. This project joins an expanding effort to document perceptions and experiences of climate change around the world. In 2014, a group of Worcester Polytechnic Institute (WPI) students working in New Zealand collected and analyzed responses from public interviews in order to understand perceptions of climate change (Kodzis et al., 2014). To advance this work, a joint team of students from WPI and IIT launched an initiative in the spring of 2018 to record the voices and stories of climate change in Himachal Pradesh, India (Bergeron et al., 2018). The team recorded risk and resilience in villages around Mandi and used Instagram to promote profiles of the villages. The project continued in Iceland in 2018, where students produced a short film to profile the climate change stories impacting northern latitudes, and will be conducted next year in Japan (2019).
Media serves as a worldwide platform that can express climate change experiences in vulnerable communities. A majority of Himachal Pradesh relies on agriculture for their livelihood, an industry that has been increasingly affected by climate change. Climate change storytelling can voice the struggles felt in these communities. Narrative research can play a crucial role in understanding how climate change affects individuals and families. The stories that result put science on a scale that is humanized. A deeper understanding of the effects of climate change can better government policies and help prevent further environmental effects.

This project has expanded its reach in rural villages of Himachal Pradesh. As the responses and effects of climate change are site-specific, there is no template for how communities experience climate change. The goal of our project is to understand the experience of climate change in these rural communities. Toward this end we recorded ethnographic stories of lifelong residents in Himachal Pradesh. We documented audio and visual indicators attributed to climate change by residents. Lastly, we assessed the perspectives of local experts. By accomplishing these objectives, we gained a better understanding of personal and community experiences of climate change and tried to amplify these narratives about the impacts felt throughout Himachal Pradesh.
Chapter 2: Background
**Research and initiatives in Himachal Pradesh**

In response to widespread climate change indicators and new projections for their implications in Himachal Pradesh, the state has taken research and policy initiatives to promote awareness and response. In 2007, the National Action Plan on Climate Change was prepared in order to create a national plan “for addressing the challenge of Climate Change, and the action it proposes to take” (NAPCC, 2008). The plan includes sustainable development strategies to combat climate change and enhance ecological sustainability. This action aligns with the UN’s sustainable development goal on climate action. One of the targets of the climate action goal is to incorporate climate change measures into national policy. India is also working to reform their infrastructure and decrease their carbon footprint while also working to protect vital ecosystems that support life throughout the country. The NAPCC has put forth eight national missions aimed to “promote understanding of climate change, adaptation and mitigation, energy efficiency and natural resource conservation” (NAPCC, 2008).

One of these eight missions is the National Mission on Strategic Knowledge for Climate Change. This mission focuses on correcting the lack of climate change data available in Himachal Pradesh. The International Panel on Climate Change, or IPCC, has released reports detailing climate data in the Himalaya, but there are little to no reports based in Himachal Pradesh (NAPCC, 2008). In the years directly following the NAPCC’s inception there were numerous government-sponsored studies conducted in Himachal Pradesh about agriculture, biodiversity, glaciology, forests and rainfall. The most recent study published, however, was in 2015. In addition, about a quarter of the web-based links are no longer activate. A ten-year assessment on the NAPCC’s eight core missions done in 2018 concluded that all eight missions are behind schedule and lack funding. This calls into question the ability of the government to enact change on a governmental and community level. According to the Global Climate Change Risk Index, published in 2018 by German Watch, India is the twelfth most vulnerable country to climate change impacts (Eckstein, 2018).

**Climate implications for Himalayan regions**

The state of Himachal Pradesh, India lies at the foothills of the western Himalayas, and nearly 90 percent of people live in rural environments (Asian Development Bank, 2010). The communities predominantly rely on agriculture, leaving approximately 80 percent of the residents to depend on rainfall for their livelihoods (Loria, 2016). The area is one of the most sensitive regions in the world for climate change. The cumulative effects of these impacts have created an uncertain future for those living in affected areas and leave open the question of strategies for community survival in fragile ecosystems.

Among the most reported indicators for climate change in Himachal Pradesh are troubling accounts of increasing water scarcity. In fact, there is strong evidence “anthropogenic climate change is one of many stressors of water resources” (IPCC A 2014). Many farms are partly dependent on rainfall to provide crops with water. In Kullu, a district in central Himachal Pradesh, 95% of farmers interviewed reported that the rain from monsoons are insufficient for irrigating crops. Many of the farmers were able to use the regularity of rainfall to their advantage, as well as the snow line, seen in Figure 3. However, many have reported that in recent years the rain has become completely unpredictable (IHCAP, 2016).
In addition to the previously mentioned long term effects, Himachal Pradesh is vulnerable to climate-related disasters such as landslides, cloudbursts and glacial lake outburst floods, or GLOFs (IHCAP, 2017). Landslides can cause direct damage to villages and vehicles on the road, but they can also cause floods by blocking river flow, or damaging dams (IHCAP, 2017). Floods and landslides can be extremely destructive, making it more difficult to adapt to the long term effects of climate change.

Early reports on climate change conclude that environmental effects bring social implications that can be devastating to communities. These effects can disrupt transportation networks, reduce farmers’ crop yield, and cause destructive disasters (IHCAP, 2017). Apples, for example, are an important part of Kullu’s economy, and climate change has had a negative impact on the production cycle. There has been a decreased crop yield and a shift in the location of apple orchards to higher altitudes. Communities are moving away from traditional agriculture, instead cultivating cash crops and joining the tourism industry (IHCAP, 2016). Tourism, however is also at risk due to threats such as floods and landslides; a 2013 flooding in Uttarakhand caused an 85% decrease in tourism, resulting in a US$ 1.85 billion loss to the state’s tourism sector (IHCAP, 2017).

**Climate change ethnography**

While measurements and statistics are important, they lack neglect critical perspectives from the residents themselves. Linking scientific data with stories can create a connection that enriches understanding and empathy. The climate stories recorded in Himachal Pradesh in 2018 indicated that while some residents do not fully understand the scientific basis for climate change, they do have an awareness of deep changes that have occurred at the community level (Bergeron et al, 2018). Ethnographic recordings can be used to update climate change research and bridge the gap between government literature and
observed indicators of social and environmental stress in Himachal Pradesh. By creating synergy between government agencies and villages, residents can better understand the tools and policies that can help them combat environmental, social, and cultural effects of the change and vice versa.

In recent years, an interest has grown in studies on climate change that include a narrative or citizen science approach. A study by Dahlstrom (2014) furthermore found that using narratives to inform is more appealing for non-expert audiences. Moezzi et al. claims that stories, “provide insight, and reframe evidence in ways that more science-ordered formats miss” (2017, p.1). Both sources agree that the use of narratives in research can put science on a scale that is humanized. The stories are relatable, and communicate challenges that are not always seen, catalyzing increased empathy for climate change in vulnerable communities.

Paschen and Ison (2014) found that narrative research in climate change adaptation can construct stories about problems through local knowledge and past experience. The values of the community are then more easily integrated into local policy and management, because how a community understands “past experiences...determines how it understands and practices future adaptation” (p. 1084). In order to record narratives, open ended research questions are best, and images can be a powerful tool for communicating the effects of climate change. An example of a recorded interview is shown in Figure 3. Wozniak et al. suggests that images provide a dramatic visualization of climate change while still being easy to understand and ethically compelling (Wozniak et al, 2014).

![Figure 3: Interviewing a subject at Prashar Lake (Photo by Brant Reymann).](image)

While there is plenty of consensus that narrative and ethnographic research is a useful tool for studying climate change, there is comparatively less data on how audiences perceive and adapt to the effects climate change. Ethnographic study encourages the sharing of these points of view and allows for expression of indicators and stories of those affected
in Himachal Pradesh. Stories build empathy across global communities, allowing for shared experiences and a greater understanding of the problems faced by those in vulnerable communities.
Chapter 3: Project Approach
Here we give an overview of the data and methods we used to complete our project. The goal was to document the experience of climate change in communities in Himachal Pradesh. To accomplish this goal, we outlined three objectives:

A. Record ethnographic stories of residents.
B. Document audio and visual indicators of climate change.
C. Assess the climate change perspectives of local experts.

The objectives and methods are summarized in the flowchart below, and then described in greater detail.

Figure 4: Overview of goal and objectives

**Climate change storytelling**

Our first objective was to conduct ethnographic interviews in Himachal Pradesh. To record these stories we visited rural communities in Himachal Pradesh. We chose some communities specifically because of known climate change vulnerabilities. Figure 5 provides a map of the villages visited in 2018 (in green), along with 2019 (in orange). The map was created using google maps.
Ethnography can “create richly written narratives” using the voice of individuals, something that quantitative research cannot fully achieve (Ward, 2014, p.65). Therefore, because the primary goal of our project was to collect experiences of climate change, we used face to face in-depth interviews, film, and photography to record the narratives. A filmed interview set at Prashar Lake is shown below in Figure 6.
We designed semi-structured interviews to initiate our conversations with residents. Our interview guide is shown in Appendix A. In order to encourage stories, Paschen et. al (2014) states that a “conversational interview technique with open-ended questions” works best (p. 1084). A conversational interview leads to the understanding of “seemingly unrelated socio-cultural or institutional aspects” that influence local perceptions of climate change (Paschen et al., 2014, p. 1084). Therefore, we began interviews by asking residents for consent to use their stories. The consent script is located in Appendix B. The next step in the interview was to ask about where they are from and what they do for a living. We also asked more personal questions about their childhoods and how their lives have changed since then, and if they have any concerns for the future. We asked about changes in livelihood or agriculture patterns in the village. When relevant or interesting stories were told, we asked questions related to the stories. Every interview was different, and did not always follow the questions listed on the interview guide. Less personal prompts included questions about government subsidies and crop yield in the village. Our questions allowed residents to reflect upon social, economic, and environmental change in the community. In order to interview as many residents as possible, we used a sample of convenience or a snowball method of sampling. The stories recorded from the interviews were transcribed and translated. Next, the stories were combined with media such as photography and video to produce profiles for our media platforms: our Instagram account @messagesfrommandi and short videos for climatestoriesproject.org.

Audio and visual indicators of climate change
Our second objective documented audio and visual indicators of climate change to enhance the ethnographic stories recorded from residents. As Berg states that “the array of
possible uses for... video and digital film data have simply grown too large to be overlooked or ignored by researchers” (Berg, 2014, p. 250). We prompted residents to point out or reflect on visual indicators of climate change in their community, and then used film and photography to document the responses. The responses could be prompted with discussions around planting dates or other environmental benchmarks. We then used digital and social media as our platform for presentation, bringing greater depth and clarity to the findings about how climate change has impacted lives in Himachal Pradesh.

**Climate change perspectives of local experts**

Our third objective was to interview climate change experts in order to understand whether scientists and policymakers are in sync with community members. We assessed alliances and discrepancies between observed indicators from local residents and actual perspectives from experts in Himachal Pradesh. To assess interview responses, we dissected transcripts to identify themes that showed shared or disparate responses between experts and residents.
Chapter 4: Results and Discussion

Photo by Brant Reymann
Stories from residents

Our team visited villages and recorded stories from residents primarily through filmed interviews. We found that climate change, global warming, and related terminology are still not well known among villagers, but many had stories about experiences and the impacts of climate change. We combined audio and visual to produce profiles that could be added to one of the platforms for the stories. One quick outlet for our profiles was the Instagram account @messagesfrommandi, where we have posted portraits of residents with a short story they shared (see Figure 7). In this story about climate change, a school principal in Bagi village spoke about the “drastic change” she has seen at her summer home. At one time, she recalls, they could fill baskets of mangoes, but now “there are no mango trees left” (Bagi village, March 23, 2019). She was concerned about the changes in flora and fauna, and what it will mean for future generations.

Figure 7: @messagesfrommandi Instagram post.

Many local residents told about their experiences of changes in livelihoods. The shifts in climate, combined with shifts in economy have pushed farmers away from traditional crops and toward cash crops, such as apples, barley, and wheat. Villagers in Chansari and Suda reported that they no longer grow traditional crops such as korda, saraya, and rajma because they are not productive enough to generate sufficient income. Residents of Suda reported that snow melt would “increase the productivity by three times” (Suda village, March 16, 2019). Now the village gets very little snow, if any, and agricultural productivity has subsequently suffered. Farmers have also started to use pesticides in order to increase the productivity of their crops. In Chansari, a farmer stated that his “crops are not growing as much” as his neighbors because they use pesticides and he does not. He also uses artificial sprays in order to fertilize his soil, something that was never needed in the past (Chansari village, March 30, 2019).
Another cause of decreased agricultural production reported by villagers has been the increase in temperature of the region. In the village of Bagi, school teachers reported that the “the summer season has now increased,” which has led to less snow in the region (Bagi village, March 23, 2019). In Mandi Town, a resident said that during her college years, she would walk to school on foot as summers were not as intense, but now things have changed. Summer temperatures have become too harsh to the point where she is no longer able to walk on the roads because of the heat (Mandi Town, April 18, 2019). In Chansari, a villager stated that he thinks the days are getting warmer because of “deforestation and factories... in the nearby region and because of pollution” (Chansari village, March 30, 2019). The village resident believed that the government should plant more trees to fight the pollution.

Another troubling story was told at Prashar Lake. A priest, whose family have been priests for generations, talked about changes in snowfall and temperature. He expressed concern for the future of the temple, which is around 800 or 900 years old. The priest was “scared that the temple will be affected by climate change, because it is sacred and the carvings are very old” (Prashar Lake, April 6, 2019). Even the lake water is no longer as clean as it was in the past. The changes in climate have negatively affected the wellbeing of the temple and the community around it.

Moreover, some villages reported that young people have started to leave home. Agriculture is becoming a less sustainable livelihood. In Suda, many are leaving the village to find outside work because of the declining productivity of agriculture in the area. Younger generations have left to get better educations as well. While villagers support younger generations pursuing a higher education, they also expressed concern for the future population. Similarly, a school principal in Bagi reported that children have a greater desire to study in the urban areas such as Mandi, which contributes to a decline in the interest of the agricultural lifestyle.

Many of these stories told by villagers were abbreviated and profiled on our Instagram account, which is shown in Figure 8. In addition some of our best portraits and field work pictures are featured in the Image Gallery in Appendix C.
Indicators of climate change

Perhaps because we were visiting in early spring, one of the most reported changes was a receding snow line. The village of Suda sits at 1560 meters with a nearly panoramic view of the Dhauladhar range. Here, a villager stated that 50 years ago, Suda would see one and a half to two feet of snow in the winters, but “now there is no snow, and much less on the mountains” (Suda village, March 16, 2019). The villager also pointed to another indicator of climate change. In previous times, snow cover on seedlings would result in natural branching of plants, but that has changed. Now, with no snowfall, young plants grow straight instead of the natural branching pattern as before (Suda village, March 16, 2019). This change greatly affects crop yield. The agricultural productivity of the village has subsequently suffered from the associated lack of snowmelt in recent years. Villagers in Chansari, a village high in the hills around Kullu, also reported decreased snow and a receding of the snow line, despite noting that 2019 received a normal amount of snow for the village after many years. At Prashar Lake, located high in the hills of Himachal Pradesh, a trekking guide noted that in the past the area would see seven to eight feet of snow, but now they typically see three to four feet (Prashar Lake, April 6, 2019). Even with the differences in geography and location, villages are seeing less and less snow over the years.

Many interviews told of shifts in agricultural crops and seasons. For example, in Chansari, where many apple farmers live, villagers told of a shift in the growing season for apples. A shop owner in Chansari stated that the growing season has been pushed back by fifteen to twenty days because, “the winter season used to last until April but now it is only until February” (Chansari village, March 30, 2019). In the past, apples had been grown in the valley of Kullu, but in recent years
apple farms have all left for higher elevations due to the warming temperatures. At the same time, a Prashar Lake priest who is also involved in agriculture reported that among his apple trees, “there is no flowering and no apples growing” (Prashar Lake, April 6, 2019).

Villagers in Suda, Bagi, and Chansari also agreed that summers have been longer and more severe in recent years. Residents in Chansari have been attributing the length in the season to human activities such as deforestation and an increase in urban development throughout the region (Chansari village, March 30, 2019). Similarly, as the length of summers have increased, villagers in Suda have reported that they have now begun to face problems with water scarcity, which they attribute to the changes in the climate of the region (Suda village, March 16, 2019). Similarly, at Prashar Lake, a trekking guide noted that he has observed a decline in the water level of a body of water used for drinking near his home (Prashar Lake, April 6, 2019). He observed the change over the course of the past 10 years.

Perspectives from local experts

Our experts confirmed many of the same observations made in the villages, including worrisome trends such as the migration of apple orchards to higher altitudes. At the G.B. Pant National Institute of Himalayan Environment and Sustainable Development, we learned some prime examples of climate change seen from the government perspectives. The head of the institute explained that Kullu valley, where the institute is based, used to have the most productive apple orchards, but now “production has moved along the Beas river 3500 km” away (GBPNIHESD, April 3, 2019). Now, fruits such as pomegranates, peaches, mangoes, and citrus fruits are grown in the valley. The shift in crops is a glaring indication of how climate change is affecting livelihoods in Himachal Pradesh.

A scientist at GBPNIHESD also discussed the changes in climate patterns in recent years. The snowfall pattern has been changing, with less and less snow in recent years. The average temperature has been increasing, shortening the length of the winter season overall. At the Tea Board in Palampur, an official also stated that temperatures have increased, leading to a “decline in the production of crops” (Palampur, April 18, 2019). The rising temperature has brought a resurgence of the red spider mite, an insect that can be devastating to tea crops. The changing temperatures have also pushed back the flowering season for crops, which has affected farming patterns in the region.

The decline in snowfall and rainfall has also lead to water scarcity in Himachal Pradesh. The snow and rain helps to “recharge the water table, but apart from this year (2019)...the rainfall was relatively less” (GBPNIHESD, April 3, 2019). An officer at the Tea Board in Palampur reported a similar trend in water scarcity. In the Palampur region, rainfall and snowfall, which has lowered the water table
(Palampur, April 18, 2019). Many of the indicators reported by local residents were also reported by experts in the region, painting a complex picture of indicators and their interrelationship with communities in Himachal Pradesh.

Discussion

Our findings suggest that villages we visited are seeing many of the same kinds of indicators around Himachal Pradesh. There is an increased sense of urgency in communities that rely on farming for livelihoods. Agricultural patterns are changing, and farmers are concerned about how their future will be affected. The 2018 project had similar findings. In both years, villages reporting decreased snowfall and increasing temperatures, affecting agriculture in the region. Furthermore, there were numerous alliances between reported indicators of climate change from local residents and experts. Scientists at GBPNIHESD and experts from the Tea Board at Palampur reported less snow and rain, a trend reported in numerous villages. Both agencies reported that the growing season of numerous crops has been changed due to differences in temperature and precipitation. The agreement between respondents shows that agricultural shifts have already become a pressing problem in Himachal Pradesh, and it gives greater significance to the stories about the future of family farming taken from communities.

Social change indicators were apparent in both studies as well. Villagers report seeing the younger generations moving into urban areas to pursue their education as they witness a decline in agriculture throughout the region. This is not always seen negative. In Suda Village, a resident stated that she does not “want the kids to stay” and she remained hopeful for the future of the children.

![Figure 9: Suda resident hopeful for the future of her children (Brant Reymann).](image)

Our study took a different approach from the 2018 study by looking at government policy and expert opinions on climate change in the region. Interviews revealed that many residents think there is a lack of government action pertaining to climate change and helping struggling farmers. In Chansari, an apple farmer stated that he gets no subsidy from the government, even though his crop has struggled in recent years. His neighbors have started
to use pesticides, but he refuses to. He told us that “the government is not taking any action on these fertilizers,” which pollute the environment (Chansari Village, March 30, 2019). An interview at G.B. Pant National Institute of Himalayan Environment and Sustainable Development, we heard a similar story. A respondent told us about the growing use of pesticides in Himachal and how they are harmful to health, but he did not tell us of any plan to mitigate pesticide use. He also stated that the government does have an environmental management plan, but he worried that “it is not being followed” (GBPNIHESD, April 3, 2019). We talked about numerous programs, but less about government climate action plans or other environmental management plans. In another interview, a worker on the campus of IIT Mandi, who has lived in Himachal Pradesh all his life, stated that while there may be government policies about climate change, it’s “not going to the ground level” (Kamand, March 29, 2019). He did not believe that enough villages know about climate change and what the government is doing to fight it. These findings confirmed that there is a gap between government policy and awareness in villages. In many of our interviews, respondents did not understand climate change terminology, much less the legislation in place to mitigate it. The reported indicators of climate change are troubling, but so is the gap in understanding between the government and rural villages.
Chapter 5: Project Outcomes
Climate change is a global problem, and while it is being studied at a scientific level, there is not enough connections with the lives of individuals at the ground level. Rural and remote communities in the arc of the Himalaya are particularly vulnerable. Based on our research and interviews, we found that rural areas do not seem to have the resources or knowledge to confront climate change and its effects. Himachal Pradesh is a state full of unique culture and vibrant residents, whose lives are tied to the landscape for livelihoods and sustainability.

To that end, it seems important that more effort be made to **build partnerships between communities** to share what they have felt from climate change. Partnerships between rural communities can link residents to share their experiences and help plan for the future. Outreach between communities can further inform and develop climate change action plans currently in place. The problems faced by communities in the Himalaya must be made visible in order to further the process of change and adaptation.

We encourage the state and local government to **make a stronger commitment** to extend their reach further into rural communities, as these are the ones impacted most from climate change. These communities have less awareness on climate change adaptation strategies, including programs and policy in place to help rural communities fight the ramifications of climate change. The promotion of strong policies to protect the environment would assist in educating and supporting communities around Himachal Pradesh. We encourage the government to take steps to establish new policy and enforce old policy to fight the effects of climate change.

Finally, we recommend this project continue to **give voice to fragile Himalayan communities**. The villages of Himachal Pradesh are diverse and changing rapidly, and the project should not stop here. Instagram and the Climate Stories Project are global media platforms, and they have the potential to highlight lives affected by climate change around the world. Climate Stories Project is only one of many forums that can be used to amplify the experiences of rural communities. The Climate Reality Project, started by Al Gore, could provide an additional forum for these kinds of data to be heard. Social media can build connections across political lines, enable shared futures, and play a crucial role to participate in the challenges that lie ahead.

In conclusion, climate change is affecting us all, but some will feel the consequences earlier and more dramatically than others. The Himalayan region is particularly vulnerable. Recording stories from fragile communities places an essential bridge across the gap between communities and government agencies. Citizen science includes participation at all levels, as the realities expressed will inform more effective climate change related planning and management in marginalized communities. The Himalayan arc is at a crucial point in climate change planning. These communities are vibrant and unique places that need to be protected from the effects of climate change.
References


Climate Change. (2009). Retrieved from The World Bank website:
http://web.worldbank.org/archive/website01291/WEB/0_CO-78.HTM


https://doi.org/10.1073/pnas.1320645111


study in Kullu District, Himachal Pradesh.

https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-PartA_FINAL.pdf
Retrieved from: http://ihcap.in/?media_dl=584

https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-PartB_FINAL.pdf


Appendices

Appendix A: Interview Guide

Introductory Questions for Unscheduled Village Visits
- What is your name/ what does your name mean?
- What is the name of the village and what does it mean?
- How many people live in the village?
- What are the occupations of people in the village/ What is your occupation?
- How long have you lived in the village?

Interview Questions
1. How has your life changed over time? Tell us how it was to live in the village when you were young.
2. Do you fear for the future of the children in the village?
3. Have farming or livelihood patterns changed over the years?
4. Do you think there is a high risk for events such as landslides or floods in the area? Have you seen an increase or decrease in the number of these events?
5. Do you ever experience droughts or water shortages?
6. Have you ever heard of “climate change” or “global warming”?
7. Can you show us something in your village that you think is an indicator of climate change?
Appendix B: Informed Consent Script

We are a group of students from Worcester Polytechnic Institute in Massachusetts and IIT Mandi. We are conducting interviews to learn more about local observations and opinions regarding climate change and how it affects communities in Himachal Pradesh. Your participation in this interview is completely voluntary, and you may withdraw at any time for any reason. Your answers will be kept confidential unless you permit otherwise. If any question is unclear, please ask for clarification. You do not have to answer a question if you do not wish to. If you are interested, a copy of our results can be provided upon the conclusion of the study.

Do we have your permission to include your name and other specific identifying information?
   Yes ☐    No ☐

Do we have your permission to take notes, and publicly quote you, with your pre-approval for each quote, in this interview?
   Yes ☐    No ☐

Do we have your permission to record this interview?
   Yes ☐    No ☐
Appendix C: Image Gallery

Store Owner, Chansari Village (Photo by Brant Reymann)
Priest, Prashar Rishi Temple (Photo by Brant Reymann)
Gahana, Suda Village (Photo by Brant Reymann)
Elder Farmer, Suda Village (Photo by Brant Reymann)
Meena, Secondary School Principal, Bagi Village (Photo by Brant Reymann)
Priest, Bijli Mahadev Temple, Kullu (Photo by Brant Reymann)
Tea Farmer, Wah Tea Estate, Palampur (Photo by David Santamaria)
Elder Farmer, Bagi Village (Photo by Brant Reymann)
School Teacher, Bagi Village (Photo by Brant Reymann)
Priest, Prashar Rishi Temple (Photo by Brant Reymann)
Dr. Samant, G.B. Pant National Institute for Himalayan Environment and Sustainable Development (Photo by Brant Reymann)
Appendix D: Video Links

The videos will be uploaded to https://www.climatechangestories.org but can also be found on the page this report was retrieved from and the following link: https://www.dropbox.com/sh/z3jo9c0c7tgr3jd/AAAAFQNwb3jWxw7aPBYTJ1ala?dl=0
Appendix E: Poster

The Story of Climate Change in Himachal Pradesh

Abstract

Climate change continues to be driven by scientific data and the growing awareness of its impacts. However, there has been a growing interest in using qualitative methods to understand the experiences of those affected by climate change. We conducted a 22-month, longitudinal, ethnographic study of 4 villages in Himachal Pradesh. Our findings provide insights into the experiences of climate change and the strategies used to adapt. The research aims to bridge the gap between scientific knowledge and practical adaptive strategies.

Stories

Why Stories Matter

Narrative cinema is more appealing to audiences. The values of connection can be more easily integrated into local policy and management.

Methodology


d - Regional

d - National

d - Global

Indicators of Climate Change

- Receding Snowline
- Orchard Altitude Increase
- Water Scarcity
- Shift to Chemical Farming
- Seasonal Shifts
- Increase in Temperature