

20. Is people's perception really important in climate change studies?

Sujata MANANDHAR^{1, 2*} • Vishnu Prasad PANDEY² • Futaba KAZAMA²

¹Department of Civil and Environmental Engineering, Graduate School of Engineering, Tohoku University, (〒980-8579 Sendai, Japan)

²International Research Center for River Basin Environment (ICRE), University of Yamanashi, Yamanashi (〒400-8511 Yamanashi, Japan)

* E-mail: sujata@kaigan.civil.tohoku.ac.jp

This paper examines the importance of people's perception in climate change studies through a case study of *Indrawati River Basin (IRB)* in the mid-hill of Central Nepal. Household questionnaire surveys, focus group discussions and open-ended interviews were held to collect information and analyze people's perception of climate change, impacts and adaptation. Results show that residents of IRB have perceived climate change. They are aware of ongoing changes and its impacts on water and agriculture sector. Nevertheless, adaptation to climate change is only limited to few households and majority are unaware of possible adaptation measures. Analysis of people's perception generates important information of climate change at local level unaddressed by global climate change models. These information can be important knowledgebase while tailoring and informing adaptation plan and policies. Therefore, people's perception is important in climate change studies.

Key Words : *Climate change; Indrawati River Basin; Nepal; People's perception*

1. Introduction

Climate is an average of weather patterns for some particular geographical locality or region over a given period of time 1). Human expectations regarding weather and climate sometimes lead to perceptions of climate change which are not supported by observational evidences 2). Those local perceptions reflect local concerns 3) and focus on the actual impacts of climate change on people's lives, which are dependent on local factors and cannot be estimated through models 4).

Why do we care about the perceptions of local people? Climate change is a form of social ecological system involving factors from different domains interacting on different spatial and temporal scales, which cannot be adequately understood relying on science alone 5). Individual perceptions are not just instrumental in understanding climate change and its impacts but also influential on deciding whether to act or not and what adaptive measures to take over

both short- and long-terms 6, 7). Climate change is already a reality for many people in the developing world. A few micro-level studies depicting the local perception of climate change were conducted in Nepal 8, 9). This study presents people's perception of climate change in *Indrawati River Basin (IRB)*, located in the mid-hill of Central Nepal as a case study. It aims to study the importance of people's perception in understanding and adapting to climate change through the case study.

2. Materials and methods

(1) Study area

IRB originates from snow covered Himalayas (5854m asl) and covers nearly 1229 km². It has a diverse climate, ranging from alpine to subtropical in the lower areas. It is home to nearly 292160 populations. Agriculture is an important livelihood option of around 90% of the population in the watershed.

(2) Methodology

It followed household questionnaire surveys, two focus group discussions and seven open-ended interviews for triangulation. In total 138 households were randomly selected around seven meteorological stations (Panchkhal, Baunepati, Nawalpur, Dubachaur, Dhap, Sermanthang, Tarke Ghyang) in IRB (refer Fig 1). The survey questionnaire was designed to measure perceptions spanning a range of climate change issues. Mostly elderly persons were interviewed as they had much longer experience of climate events. Field work were carried out in January 2013. Household survey data were processed using statistical tools available in PASW Statistics 18 software. In addition to simple descriptive statistics (summation and frequency, contingency tables), Pearson chi-square tests were performed to investigate the relation between people's perception of climate change and climatic parameters. Interview narratives were analyzed by extracting dominant themes under each of the structured interview topics.

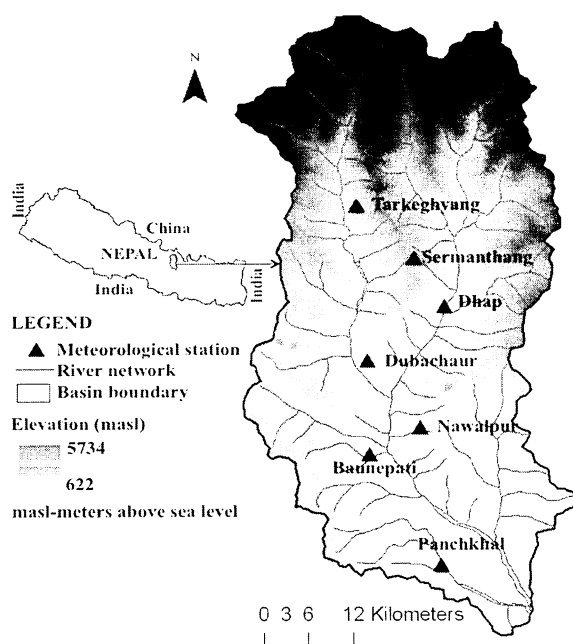


Fig 1. Indrawati River Basin (IRB), Nepal

3. Results and discussion

The results are presented and discussed in detail in this section.

Awareness and concern about climate change: 40 to 80% respondents in Panchkhal Nawalpur, Dhap, Dubachaur, Tarkeghyang, Sermanthang and Baunepati have heard about climate change. Their understanding and

awareness of climate change is through various sources (Media, friends/neighbors, school/university education and self experience). In Panchkhal and Baunepati located close to capital (Kathmandu), understanding and awareness of climate change is highly influenced by media while in Tarkeghyang located in a high elevation (2480 masl), it is exclusively through self experience. Majority of households heard about climate change in last ten years, some in last five and relatively few in recent years. More than 50% households in all study locations strongly believe that climate change is real and matters a great deal except at Tarkeghyang, where most respondents have no idea. It is possibly because most inhabitants of Tarkeghyang rely on food supplies from lower areas and less reliant to climate dependent agriculture.

Perception of climate change: An overwhelming majority of households at IRB perceived changes in various climatic parameters over the last 25 years, however distinct changes are observed over the last decade. More than 70% households have noted a delay in the onset of rains in recent years at all locations. Majority of respondents have also reported increasing drought over the recall period in all study locations except Dhap. Having access to water for irrigation in Dhap, only few households have perceived increasing drought. Some observations are notably related to which location people lived in, and to the considerable differences in environmental conditions among locations.

Warmer or colder in winter, cooler or hotter in summer, and decreasing or increasing frost are the main evidences by which climate is judged as getting warmer or colder. Majority of respondents at Panchkhal and Baunepati have commented on colder winter while at other locations, warmer winter is more consistently mentioned. Majority of respondents in all study locations except Panchkhal indicate that the frost is decreasing in past fifteen years. Respondents have common opinion towards decreasing winter rainfall throughout the basin since last six years. Respondents of Dubachaur, Tarkeghyang, and Sermanthang (receiving annual snow) report that the amount of snow has declined both in their surrounding and nearby mountains since past ten years. The chi-square test showed significant results for all tests made between people's perception of climate change and changes in

the climate parameters (temperature, precipitation intensity, and precipitation timing at 5% level of significance, which confirms that respondents have perceived climate change. Serious extreme events such as flood, landslide, heavy snowfall are not reported besides severe drought in *IRB*. 30 and 49% respondents opine that climate change will definitely and might continue respectively, while remaining 21% are uncertain about it. Ongoing changes worry residents of *IRB* as are expressed in the following statements:

“Start of the rainy season is lot harder to predict nowadays, whenever it is supposed to be rainy it remains dry, and whenever it is supposed to be dry rain occurs.” (Women, 63 years- Panchkhal)

“The mountains are not white and shining anymore, our children’s may not be able to see its glory in coming days.” (Man, 72 years- Tarkeghyang)

“I am worried that the land will be changed to desert if the rain disappears this way.” (Women, 59 years- Nawalpur)

“If the snow disappears from the mountains, there will be famine.” (Man, 82 years- Dubachaur)

Perceptions of climate change impacts: Due to the steep topography there are large differences among study locations in proximity. It is therefore to be expected that impacts of climate change in both water resources and agriculture vary with location. The majority of all the reported impacts however are negative except few. 60, 80 and 90% respondents in Sermanthang, Nawalpur and Dubachaur respectively report increasing water scarcity problems, which is mainly due to decreasing rainfall and limited access to glacier/snow-melt water in hill tops. Respondents in Tarkeghyang and Dhaph also report the decrease in available water sources but they still have sufficient water for various uses. This is possibly due to low population density in Tarkeghyang and abundant water supply from various natural springs and glacier/snow-melt water sources in Dhaph. In contrast to this, most rivulets and streams at Baunepati and Panchkhal- downstream of *IRB* have dried up along with decreasing rainfall, 65 and 75 % respondents correspondingly are already facing water scarcity problems. One of the respondents from Baunepati adds “If the water availability decreases in this fashion, there will certainly be more social conflicts and clashes between families and neighbors”.

The most frequently mentioned negative impact of climate change in agriculture is a crop failure due to more unpredictable weather patterns/increasing rainfall variability. Explanations of interrelated changes also fall in this category, for example increased insect, pathogens attacks on crops are seen to be caused by a decrease in the amount of rainfall. Weed infestation, species loss and spread of livestock epidemic are less frequently mentioned by respondents, but may well increase in the future. Majority of respondents report delay in sowing and harvesting of crop (eg:maize) due to late rainfall. Some have even sowed maize thrice in 2012 but can only harvest half amount than in a normal year due to recurring drought. Many of them, however, have identified that poor irrigation facilities, low fertility and lack of labor have also contributed to low production in *IRB*.

The increasing summer heat is regarded as uncomfortable by the people in the lower elevations of *IRB* (Panchkhal, Baunepati, Nawalpur, Dubachaur, Dhaph), causing people to feel dizzy, and flies and mosquitoes to proliferate. In contrast, at the higher elevations (Sermanthang and Tarkeghyang) where winters used to be extremely cold with snow fall, the temperature increase and snow decline meant that people do not need to collect so much firewood for heating their homes, have to shovel less snow and can comfortably move and spend more time outside. This is a few positive impacts documented during our study.

Perceptions of climate change adaptation: Majority of respondents in Panchkhal, Nawalpur, Dhaph, Dubachaur, Tarkeghyang, Sermanthang and Baunepati do not change any practices not knowing how to change them. Almost all respondents in Panchkhal, Nawalpur, Dhaph, Sermanthang, and Baunepati are willing to make contribution either in cash or labor in order to undertake any adaptation measures (such as infrastructures development, changing crop variety, tree plantation, etc.) whereas in Dubachaur and Tarkeghyang 70 and 83% respondents are willing to make contributions respectively.

Various adaptation measures (such as reduced domestic water consumption, improved irrigation facility, kitchen waste water harvesting, rainwater harvesting, building water reservoir or pond, utilizing private wells, increasing water storage capacity) are undertaken to cope with climate change

impacts on water resources at different study locations. However, adaptation of specific measures is limited to certain location and households only. Utilization of private wells and increasing water storage capacity are only practiced at Panchkhal. The question on change in frequency of irrigation water use does not apply to rain-fed areas of Sermanthang. 100% respondents at Tarkeghyang and majority of respondents at Baunepati, Dhap, Nawalpur and Panchkhal do not change frequency of irrigation mainly due to lack of water, while 55% respondents at Dubachaur have increased frequency of light irrigation to save their crops from drying in some plots. Lack of technical knowledge and government support, and topographical constraints in irrigation development are three main difficulties expressed by respondents in adapting changes in water resources.

No changes in farming is the most commonly cited answer in Nawalpur, Dhap, Dubachaur, Tarkeghyang, Sermanthang and Baunepati while 62.5% respondents in Panchkhal have applied both farm and non-farm adjustments. Farm adjustments include crop diversification, tree plantation and changing farming system whereas non-farm adjustments include business and other employment works, migration, borrowing money, selling assets and religious practices. 25, 26, 40, 40, 25, 20 and 21 respondents in Panchkhal, Nawalpur, Dhap, Dubachaur, Tarkeghyang, Sermanthang and Baunepati have undertaken farm level response. Furthermore, 12.5, 16 and 11% respondents in Panchkhal, Nawalpur and Baunepati have undertaken non-farm responses.

4. Conclusion

Local people in *IRB* have realized that the climate is changing or at least they are aware of an increased variability in the climate. It establishes that the people living in the study area very much observed these changes, which are happening and affecting their lives in one or other way. However, majority of respondents do not change any practices not knowing how to change them, indicates a need to plan adaptation strategies to deal with future uncertainties of climate change. In this way

examination of people's perception have provided information on local climate change unaddressed by global climate change models which are important for tailoring and informing adaptation policies.

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