ACT

ACTION ON CLIMATE TODAY

LEARNING PAPER

Perceptions of climate change: Applying assessments to policy and practice

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Abbreviations and acronyms

ACT	Action on Climate Today
ADB	Asian Development Bank
CBS	Central Bureau of Statistics
GLOF	Glacial Lake Outburst Flood
GoN	Government of Nepal
ISET	Institute for Social and Environmental Transition
ISET-N	Institute for Social and Environmental Transition-Nepal
LAPA	Local Adaptation Plan of Action
MoPE	Ministry of Population and Environment
NAPA	National Adaptation Programme of Action
NCVST	Nepal Climate Vulnerability Study Team
NCCIS	Nepal National Climate Change Impact Survey
SPARCK	Sharing Perceptions of Adaptation, Resilience and Climate Knowledge

Executive summary and key messages

The National Climate Change Impact Survey 2016 (NCCIS) asked households across Nepal to recall their individual experiences of short-term weather variations, impacts and their adaptation responses. This paper uses examples from Nepal and elsewhere to explore how survey data based on people's perceptions can inform understanding and policy-making on climate change impacts, vulnerability and adaptation. We are able to distinguish four areas of policy and practice where such data has made particularly valuable contributions.

1. Science: Ground-truthing and informing more scientific approaches

- Surveys of local perceptions of climate change provide a human dimension, enhancing understanding and communication when linked to scientific data. Data on perceptions can be used to validate more scientific methods, or be used as a baseline for understanding in cases where historical climate and impacts data is lacking.
- Perceptions-based approaches can help direct scientific measurement approaches pay more attention to measuring the parameters that matter most locally. In Nepal, the NCCIS suggests that changes in windstorms are a critical impact factor for agricultural livelihoods and hence for adaptation needs, in contrast with the traditional focus in climate change modelling on rainfall and temperature data.
- Perceptions can also provide insights into causal relationships between a range of socioeconomic, psychological and institutional factors that contribute to greater or weakened levels of adaptive capacity and resilience.

2. Impacts: Understanding how climate change translates into local impacts

- Unlike top-down assessments and models, data on people's perceptions can reveal the actual impacts of climate change on people's lives and livelihoods. This highlights the ways impacts play out through other development processes.
- Perceptions-based studies are able to improve our understanding of the ways climate change impacts and responses vary in different places, across different cultures, castes, age groups or genders.

3. Adaptation: Improving adaptation policy and practice

- Many adaptation decisions are made on the basis of perceived impacts. Understanding adaptation behaviours can help policy-makers and projects tackle perceived barriers to adaptation and predict future adaptive behaviour.
- Understanding citizens' perceptions of climate change helps explain the local socio-political contexts within which policy-makers, practitioners and researchers are operating. This enables policy-makers to choose their entry points more effectively, even where climate change is not a priority or even perceived as happening.
- Understanding how climate change is experienced and resulting adaptive actions helps policy-makers integrate the differentiated needs of different regions, sectors and groups into the design of adaptation policies and programmes.

4. Education: Sharing knowledge and building awareness

- Climate data is often presented in global terms that are hard to relate to people's lived experience. Perceptions-based data helps raise awareness of climate change causes, impacts and adaptation in ways that are more readily communicated and understood.
- Sharing knowledge based on perceptions can also provide a powerful medium to represent the views of otherwise poorly represented sections of society, such as children and youth.

1. Introduction

Surveys of people's perceptions of climate change started as far back as 1986, when climate change as an issue was only just beginning to gain attention. Public understanding on the fossil fuel sources of human-caused climate change has increased markedly since the turn of the millennium in particular, thanks to growing media attention and alongside heightened attention to policy responses to tackle the problem (Nisbet and Myers, 2007). Much of the academic research on these surveys has focused on the link between personal perceptions of climate change and policies related to climate change (Wolf and Moser, 2011). Whether people think climate change is variously real, human-caused, serious and solvable has proved a good predictor of their levels of support to tackling the issue (Krosnick et al., 2006). The dominance of research on this link reflects government interest in public acceptance that can help legitimise policy actions, and has been focused heavily on the 'mitigation' of climate change through efforts to tackle greenhouse gases.

Climate science and top-down impact data have retained a privileged position in influencing policy-making, including in the assessment reports of the Intergovernmental Panel on Climate Change (IPCC). And yet people's views of climate change causes and impacts critically underpin how they respond to the issue. Understanding people's perceptions of climate change, its impacts and adaptive capacities can therefore help improve action and policy-making on climate change. Initial foundations around understanding the impacts of climate change have been built upon by means of a growing interest in people's 'subjective resilience', or the self-reported factors that people believe make them better able to cope with and adapt to climatic and other changes (Maxwell et al., 2016; Jones and Tanner, 2017).

Surveys suggest that awareness around climate change is markedly lower in the Global South. While such assessments are less frequent and widespread in the Global South compared with in industrialised nations, growing numbers of large-scale surveys are taking place, in particular across Latin American, Asian and Pacific countries (Brechin and Bhandari, 2011; Capstick et al., 2015). Rather than focusing on the causes of climate change, surveys in these regions have laid much greater emphasis on vulnerability, impacts and adaptation.

The Nepal National Climate Change Impact Survey 2016 (NCCIS) covered 5,060 households across 26 districts, asking household members to recall their individual experiences of weather variations, impacts and consequent adaptation responses (CBS, 2017). There is now interest in where and how different agencies of the Government of Nepal (GoN) can use such data for policy and planning. During the process of completing the NCCIS, the Nepal Central Bureau of Statistics (CBS) asked the Action on Climate Today (ACT) programme to generate more empirical evidence of the value of this kind of data as a tool to inform practical applications and policy-making.

This paper uses examples from Nepal and elsewhere to explore how perceptions-based data can inform understanding and policy-making on climate change impacts, vulnerability and adaptation. While examples of the direct attribution of policy decisions to particular perceptions studies are rare, we are able to distinguish four areas of policy and practice where such data has made particularly valuable contributions:

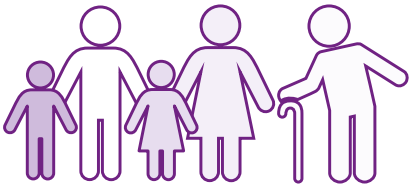
1. **Science:** Ground-truthing and informing more scientific approaches;
2. **Impacts:** Understanding how climate change translates into local impacts;
3. **Adaptation:** Improving adaptation policy and practice;
4. **Education:** Sharing knowledge and building awareness.

4 areas of policy and practice that benefit from perceptions-based data

Science

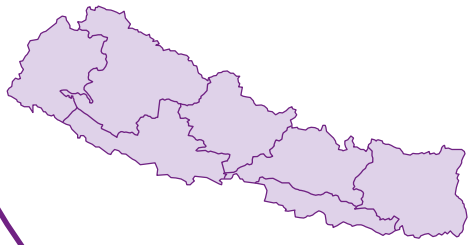
Ground-truthing to inform science

Impact



Recognising climate change in local impacts

Adaptation



Improving adaptation policy and practice

Education

Sharing knowledge and building awareness

2. Nepal Climate Change Impact Survey: Some headline findings

ACT supported Nepal's CBS through Practical Action to conduct the NCCIS. The survey was conducted in 2016 and the findings were published in 2017. The survey covered 5,060 households across 26 of the 75 districts of Nepal. It was based on a perceptions and recall methodology, which relied on household-level qualitative responses, based on individual experiences of short- and longer-term weather variations, impacts and adaptation approaches. The outcome of the survey is expected to be useful for policy and planning through different agencies of GoN, as well as for development agencies and non-governmental organisations seeking to build climate resilience.

Overall, the survey suggests awareness on climate change is low, with just under half of respondents aware of the issue of global climate change (even if they are aware that weather patterns are changing). Awareness is higher in urban areas (56.79%) than in rural areas (46.24%), and is especially low in mountain households (63.59% do not know about climate change). Importantly, not everyone surveyed perceives that the climate has been changing. While the majority of households overall in the survey said the climate had been changing in the past 25 years, 31.79% and 15.38% in the Western Mountain and Eastern Mountain regions, respectively, said there had been no change in the climate.

The causes of climate change are perceived to be more local than global. A total of 41% of households surveyed cited natural phenomena among their list of causes, but 59% thought deforestation was the main cause, 30% named urbanisation and 33% cited other human interventions. This tendency to look to local causes mirrors findings from climate change perceptions studies across African countries (BBC World Service Trust, 2009). In the absence of a widespread understanding that climate changes are occurring all around the world, there is a tendency to look for more proximate and visible causes.

The survey presents a wide range of perceived climate induced disasters in the country, but drought dominates, cited by 86.1% of households. This is followed by disease/insects (43.4%),

Drought prone area in Nawalparasi, Nepal.

hailstorms (32.5%) and flooding (28.1%). Flood reporting is fairly low, perhaps reflecting its incidence only in certain catchments. Forest fires are the main perceived climate-related disaster in the Far-western hills and Far-western mountains. Windstorms are a major climate-related disaster in some regions, observed by 77.2% households in the Far-western mountain region, 51.2% in the Eastern Terai and 37.8% in the Central Terai. Hailstorms are observed as a main climate-induced disaster in the Far-western mountain (90.9%), Far-western hill (73.9%) and Eastern mountain regions (57.8%).

The survey also shows some disagreement over the direction of change for many impacts. Other than for drought, temperature, sporadic rain and disease/insects (which all show strong agreement on increased incidence in the past 25 years), many other factors are perceived by some households to have increased and by others to have decreased. Food insecurity is frequently linked to climate-related events, especially drought (33% of households), hailstorms (26%) and disease/insects (22%). The impacts of such events are not felt evenly across society. Poorer households reported losing the most working days as a result of drought: households in the lowest income quartile had missed 11 days per year on average compared with under 4 days for households in the highest income quartile.

A wide range of on-farm adaptation measures have been implemented in recent years. The most popular are the use of inorganic fertilisers (60.46%), mixed cropping (55.47%) and improved seed varieties (53.50%). Despite a growing global emphasis on insurance, its use in agriculture in

A lady with her child in Western Nepal.

Nepal was reported by less than 1% of households, suggesting its reach is extremely limited. Changing food consumption habits is the top off-farm measure, reported by 70.64% of households, although this could be classed as a coping response rather than as an adaptation to change. Most reported adaptation measures suggest incremental changes, with the exception of the shift to non-agriculture-based employment, which is especially reported in urban areas (51.25% of households).

3. Science: Ground-truthing and informing climate data

Perceptions-based surveys provide a complementary source of data on climate change to measurements taken by means of more conventional scientific methods, such as weather stations and climate models. In many countries and regions, surveys are the only reliable source, as historical data on weather and climate is poor or lacking altogether. This is especially true of countries such as Nepal that have experienced protracted civil conflict, and where damage to and neglect of weather stations are combined with a lack of technically trained staff and labour-intensive methods of tracking and recording data (Mason et al., 2015).

In areas where data does exist, perceptions-based surveys can be used to 'ground-truth' scientific data to assess its validity. Surveys can also help ensure scientific monitoring targets the parameters and formats of data that are of most use to decision-makers and to the people who have to adapt to the changing climate.

This section compares the results of the NCCIS with observed historical climate data and trends in Nepal. Drawing on examples from around the world, it then considers how the survey data could help inform the collection of scientific climate data in the future to enable the co-production of knowledge that will be of most use to adaptation decision-making. Perceptions-based data on climate change can both validate and inform measurements taken by means of more scientific methods. This section briefly reviews results from the NCCIS on temperature, precipitation and extreme events, comparing them with this scientific data to determine points of convergence and divergence.

The headline finding from this exercise is that, of the variables selected, there is indeed a high degree of convergence/agreement between the perceptions of respondents and the findings from more scientific data records.

The Nepal National Adaptation Programme of Action (NAPA) (GoN, 2010) draws on a detailed analysis of temperature data from 1976 to 2005, reporting a trend of observed warming for Nepal of approximately 0.4°C–0.6°C per decade, although this varies across the country. This general trend is reflected in the results of the NCCIS, with 89% of respondents perceiving that the temperature has been increasing over the past 25 years. Global and regional climate model projections suggest this trend will continue in Nepal, rising by 1.4°C by 2030, 2.8°C by 2060 and 4.7°C by 2090 (NCVST, 2009). Subsequent perceptions-based surveys could track this projected warming trend.

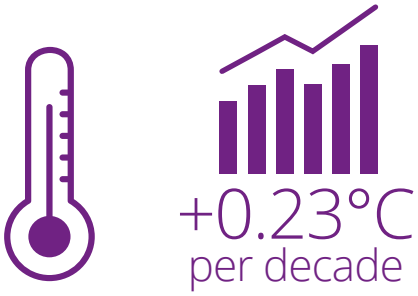
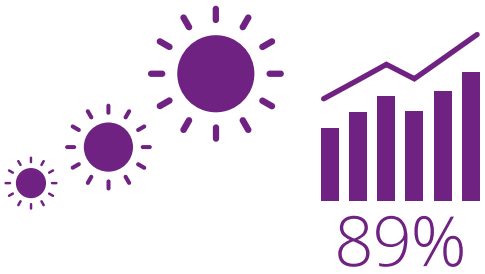
A number of questions in the NCCIS address precipitation, and this data can be compared with scientific empirical data. Scientific records suggest average rainfall in Nepal has decreased significantly, by an average of 3.7 mm (-3.2%) per month per decade, with this decrease particularly significant during the monsoon period between June and September (World Bank, 2011).[1] This matches the perceptions reported in the NCCIS: 91% of households reported that rainfall in the monsoon had decreased in the previous 25 years. Nepal's NAPA reports that annual precipitation data shows a general decline in pre-monsoon precipitation in Far-western and Mid-western Nepal, and a few pockets with declining rainfall in the Western, Central and Eastern regions. While the NCCIS does not ask respondents specifically about 'pre-monsoon' rainfall, 91% and 90% of respondents feel that monsoon and winter rainfall have declined, respectively.

Studies of the Himalayas in Nepal have linked rising temperatures from climate change with an increase in the risk of glacial lake outburst flood (GLOF) (Regmi and Pandit, 2016). Within the NCCIS, 63% of respondents agree that incidents of GLOF have increased over the past 25 years. Bartlett et al. (2010) examine climate change impacts in the water sector and argue that erratic rainfall during the monsoon influences flooding, landslides and erosion, and reduces groundwater reserves as a result of excessive surface runoff. In the NCCIS, 62% of all respondents agree soil erosion has increased over the past 25 years, while 78% reported increases in landslides.

A recent GoN report suggests that, as a result of climate change, extreme weather events, particularly cloudbursts, thunder and dry spells,

1 Citing the Intergovernmental Panel on Climate Change Fourth Assessment Report and United Nations Development Programme Climate Profiles.

Rainfall and temperature – data and perception

Scientific data	Household perception
	
Average rainfall in Nepal decreased by 3.7 mm (–3.2%) per month each decade since 1960, most significantly during the monsoon (World Bank, 2011)	91% of households said that rainfall during the monsoon has decreased over the past 25 years (NCCIS)
	
In Nepal, annual average temperatures have risen by 0.23°C per decade on average between 1991 and 2015. (World Bank Climate Change Knowledge Portal)	89% of respondents perceive that the temperature has been increasing over the past 25 years (NCCIS)

and the losses and damages they cause, have been increasing (MoPE, 2017). This is confirmed in the NCCIS, with 57% of people agreeing there has been an increase in thunderstorms and 99% reporting an increase in drought over the past 25 years. The disproportionately high number of respondents who believe droughts have increased in frequency is significant, with the winters of 2007/08 and 2006/07 unusually dry. In a period of 36 years, from 1971 to 2007, more than 150 droughts events have been reported in Nepal, affecting more than 330,000 ha of agricultural land, mainly in the Terai, Western hills and Western mountains (NCVST, 2009).

Some empirical analysis finds an increasing trend of disasters occurring as a result of flood hazards in Nepal. Floods that have occurred in major rivers in recent years have in many cases broken records as the biggest floods in the past 50 years. Examples are floods in the Mahakali (2013), Babai (2014), Rapti (2014 and 2015) and Karnali (2015) rivers. The largest ever flood of the Karnali River occurred between 14 and 15 August 2015 in what was a 1-in-450-year flood (some studies claim it was a 1-in-1,000-year flood) (ISET et al., 2015). This flooding trend is reflected in the perceptions-based data: 62% people reported an increase in flooding over the past 25 years.

As well as validating scientific data, perceptions-based surveys can help inform scientific approaches to assessing impacts and adaptation. This can include providing baselines where recording has historically been poor or non-existent, but also reorienting scientific assessments towards factors that are of the most importance with regard to assessing impacts, vulnerability and adaptation (see Box 1). Surveys among local communities in Canadian Arctic regions have suggested that changes in wind speed frequency and direction are crucial determinants of climate change impacts, particularly for hunting due to navigational problems and safety out on the ice (Krupnik and Jolly, 2002). These findings helped scientists to look

beyond the impacts of changes in temperature and precipitation to also integrate wind as a more important parameter in their work.

This finding is reflected in the NCCIS in Nepal, which indicates that changes in windstorms are a critical impact factor for agricultural livelihoods (see Box 1) and hence for adaptation needs—even though climate change modelling has traditionally focused more on measuring rainfall and temperature data.

Perceptions-based data can also provide an indication of causal relationships with a wide range of socioeconomic, psychological and institutional factors that contribute to greater or weakened levels of adaptive capacity and resilience (Jones and Tanner, 2017). Scientific assessment of climate change and its impacts may not focus on the climate parameters that are the most important to people and their livelihoods. Perceptions-based surveys can help direct scientific measurement approaches to pay more attention to measuring the parameters that matter most locally, and therefore to policy-makers seeking to support adaptation.

Box 1: Windstorms in Nepal perceived in the NCCIS

Climate change modelling tends to focus primarily on future temperature and rainfall projections, yet perceptions data can reveal other hydro-meteorological parameters that are important in the context of local vulnerability, impacts and adaptation. The NCCIS reveals the importance of wind and hailstorms. Windstorms are a major climate-induced disaster observed in the Terai belt (38.1%), reported by a high percentage of households in Eastern Terai (51.2%) as well as Central Terai (37.8%). In the Far-western mountain region, the majority of households (77.2%) perceive windstorms as the main climate-induced disaster. Similarly, hailstorms are observed as the main climate-induced disaster in Far-western mountain (90.9%), Far-western hill (73.9%)and Eastern mountain (57.8%) regions. Higher percentages of households (60.17%) reported hailstorm impacts in the Eastern mountain region.

4. Impacts: Understanding how climate change translates into local impacts

Perceptions reveal the actual impacts of climate change on people's lives and livelihoods, highlighting issues that are locally regarded as important. Commonly, top-down assessments do not pick up these local factors (Crona et al., 2013). For example, modelling the impact of climate change on agriculture using crop sensitivity and rainfall trends/projections may fail to take into account that farmer responses will be guided more by their perceptions of rainfall change than by the results of scientific studies. Studies on perceptions can better identify the impacts that are perceived as being the most significant locally (Jones and Tanner, 2017).

Risk perceptions also vary between countries. Global perceptions studies have suggested that people in Latin America and Europe perceive higher risks from climate change when they understand that humans are the major cause. In many African and Asian countries, however, risk perception is most strongly associated with experience, notably with tangible changes in local temperatures (Lee et al., 2015). The use of perceptions studies such as the NCCIS to understand these lived experiences is therefore vital.

While scientific climate studies can report on changes in rainfall or river flooding regimes, such studies do not always reveal how different groups feel these impacts differently. Perceptions-based studies are able to improve our understanding of the ways in which climate change impacts and adaptive responses vary in different places, across different cultures, castes, age groups or genders. For example, perceptions studies in India have shown how heat-waves and growing water scarcity have had specific impacts on women, who have to travel longer distances to fetch water, leading to health issues (dehydration and heat stroke) and reduced work efficiency (Singh and Chudasam, 2017). In Nepal, households with lower levels of education or income, as well as female respondents, reported greater impacts of climate change.

Father and son ploughing field and sowing seeds in Nawalparasi, Nepal.

Perceptions can also vary between urban and rural areas. These differences are illustrated in the NCCIS, where more households of urban areas (56.79%) than households of rural areas (46.24%) have heard of climate change. Impacts also differ, with decreases in water quality reported more in urban areas (80% of households) than in rural areas (68%), while a higher percentage of households in rural areas (36%) than in urban areas (22%) reported facing food scarcity as a result of drought.

Survey data can also help us understand how people access information about the climate and how this is interpreted and acted upon. This varies by region as well as by urban/rural location. In Nepal, the NCCIS shows that knowledge about climate change comes mainly from the radio (especially in rural areas), the television (especially in urban areas) and conversations with friends and neighbours, which may have integrated indigenous knowledge.

Studies elsewhere in the world demonstrate the importance of informal networks for information and knowledge exchange. Household surveys in Uganda have found that the most common sources of this climate information is people's own or indigenous knowledge (Chaplin et al., 2017). Research in the Arctic regions has drawn on such traditional knowledge of weather to both substantiate and inform scientific evidence of climate change (Riedlinger and Berkes, 2001). Work on perceptions of climate in Kenya has shown how pastoralists use indigenous knowledge about rainfall variability to interpret scientific information

A farmer working on his farm in Western Nepal.

such as weather forecasts (Speranza et al., 2010). Nevertheless, there is still a research gap in relation to work on reconciling differences between traditional and scientific knowledge, acknowledging different ways of understanding change (Wolf and Moser, 2011).

5. Adaptation: Improving adaptation policy and practice

Many scientific climate impact studies take an 'impacts-led' approach, overlaying projected changes in climate onto climate-sensitive sectors in order to understand impacts and to model different adaptation responses (Tanner and Horn-Phathanothai, 2014). For example, studies of climate change and food security have compared projected future levels of rainfall, temperature and carbon dioxide concentrations to determine changes in crop yields and agricultural production (Parry et al., 2004). Such modelling can then simulate the effect of different adaptation options on these future yield and production levels.

While impact models can help provide general assessments of impacts and comparability across regions, the guidance they provide is of limited use for adaptation at local scales, given high levels of uncertainty. These impacts-led approaches also tend to underplay the social dimensions of vulnerability and adaptation, thereby narrowing the range of adaptation options considered. For example, an assessment of agriculture based on a crop yield model is more likely to consider new irrigation systems or the introduction of pesticides or crop hybrids, than management-based options, women's rights, land tenure or off-farm market opportunities (Burton et al., 2002).

By contrast, perceptions-based surveys improve understanding of real-life, on-the-ground, strategies used for coping and adapting. This reflects the differences in impacts, vulnerability and adaptive capacity for groups of people and contexts, and highlights the links between poverty and vulnerability (Eriksen and O'Brien, 2007). Decisions on adaptation are not made on purely technical grounds; wider socio-political structures and decisions shape action and behaviour, and decision support systems for adaptation need to recognise these processes in order to propose and implement appropriate policies (Eakin et al., 2017). Perceptions data captures the diverse risk preferences and characteristics of different actors that form the basis of decision-making. Such data thereby focuses analysis on the diversity of adaptation options required for different contexts, for different people, places and timescales. It

Women carrying fire wood in Nawalparasi, Nepal.

also reflects local and indigenous knowledge and technology used to manage and adapt to climate change impacts. Understanding these differences can help target and actively involve vulnerable and marginalised groups such as women and children to ensure their needs are understood and met.

For example, survey data has demonstrated how enhancing women's access to climate information is more likely to result in the household undertaking beneficial adaptive actions, unlike when information access is extended only to men (Ringler et al., 2014). Critically, however, the data on gender differences from data on perceptions needs to go beyond simply understanding differentiated impacts, and also be carried forward into processes for supporting adaptation actions. A recent analysis of national-level climate change policies found that, while most policies acknowledge the specific vulnerabilities of women, far fewer acknowledge the potential of women as active partners in ensuring climate-resilient development (Fisher and Mohun, 2015).

Adaptation decision-making also reflects locally relevant factors such as indigenous knowledge and belief systems that would not otherwise show up in scientific studies, as illustrated in Mustang, Nepal (Box 2). While the NCCIS asked primarily about historical trends and experiences, perceptions-based data can also be forward-looking. Predictive exercises have drawn on survey data on perceived impacts of adaptation decision-making behaviour to model future behaviour and understand how best to support individual and household measures (Box 3).

Perceptions-based surveys on adaptation decision-making can also uncover errors in commonly held assumptions about how people respond to climate change. For example, research in small island developing states of the South Pacific has shown that, contrary to narratives around climate change leading to outmigration, locals do not cite coastal flooding as a reason for moving away from the islands (Mortreux and Barnett, 2009). Similarly, surveys can help policy-makers and projects understand and tackle perceived barriers to adaptation and predict future adaptive behaviour. In Climate Asia's India survey, more than half of people surveyed reported that they were experiencing impacts of climate change but were struggling to respond. Poorer people often felt they did not have the technical and financial resources to respond, but many felt it was the responsibility of government, civil society or other institutions to deal with these issues (Climate Asia, 2014).

A woman farmer watering her crops in Western Nepal.

Box 2: Indigenous knowledge of lamas in Mustang, Nepal

Research has found that indigenous knowledge is central to perceptions of weather and climate change in Mustang, Nepal. The predominantly Buddhist inhabitants of this area strongly believe in their religious leaders, or 'lamas'. Farmers consult lamas before starting agricultural activities such as planting or harvesting of crops. Lamas combine spiritual guidance with experiences of weather and climate to fix the date and time of the day for ploughing and give advice on the direction the jhopa (a hybrid between yak and lowland cattle) should face while ploughing and on who should be the first to start ploughing and sowing. Farmers synchronise the planting of crops in their fields to share risks. Farmers' believe that, when they perform farm activities according to the lama's instruction, the weather and climate will favour them, there will be no pests or diseases and the harvest will be good.

Source: Manandhar et al. (2011).

By understanding perceived climate impacts and adaptive behaviour, decision-makers can design policies and projects that can support adaptation most effectively, efficiently and equitably. As noted above, basing actions only on the evidence provided by modelled or scientifically measured impacts may mean we fail to understand how climate impacts translate on the ground, different adaptation needs and how decision-making on adaptation actually happens. For example, studies of farmer perceptions in Nepal have demonstrated the limits of adaptation action by individuals, suggesting where more collective public action by governments and others is needed to address adaptation needs (Manandhar et al., 2011). Other work in Nepal has shown that the mix of newer adaptive responses and long-standing 'traditional' practices demonstrates that state policy will always play a role in people's ability to respond to water scarcity and flood, even when policy signals have been unclear or implementation is weak or non-existent (Pradhan et al., 2012). Such insights would not necessarily be revealed by impact modelling with a more standardised approach to adaptation actions.

Data on perceptions of climate change can play an important role in ensuring more inclusive decision-making processes on adaptation (see Box 4). Participatory methods are now commonly used to create household and community risk assessments that inform adaptation plans. Analysis of various national Red Cross societies has shown that such risk assessments can help in integrating global climate change into a bottom-up and place-based approach by fostering community engagement

Box 3: Using perceptions-based studies to predict adaptation behaviour

Ali and Syfullah (2017) study the perceived severity and impact of sea-level rise on beel (lake/marsh) communities that are enclosed by polders in south-west Bangladesh. They consider two scenarios: one of 30.5 cm permanent inundation and one of 61 cm permanent inundation. For the 30.5 cm scenario, local populations expect a significant decrease in their livelihood resilience, but also express confidence in their ability to cope with the situation by using local adaptation techniques and enhancing the maintenance of sluice gates. However, the permanent inundation of 61 cm is perceived as beyond local adaptive capacity, forcing migration to nearby towns in search of new economic activities.

Similarly, in their study of people's response to the impacts of drought in Telangana state, India, Singh and Chadasama (2016) argue that understanding perceptions is crucial. The study uses data on perceptions and adaptive responses using fuzzy cognitive mapping, enabling the researchers to run simulations for future drought scenarios with various bundles of adaptation strategies. Underpinned by perceptions-based survey data, this work enables policy-makers to evaluate the effectiveness of different adaptation options in providing resilience to drought.

Box 4: Local adaptation planning processes in Nepal

Nepal has been a global innovator in bringing national adaptation planning down to the local level. While many national adaptation plans have included stakeholder engagement processes, these have often been one-off consultation exercises limited by institutional structures, political will, time and resources. The creation of NAPAs under the UN climate change agreements has been critiqued for being largely top-down, with weak integration into local development plans and insufficient targeting to deliver benefits for the most vulnerable households (Huq and Khan, 2006; Ayers, 2009; Agrawal et al., 2012).

Responding to some of these challenges of linking national adaptation planning to local strategies and needs, GoN explored new mechanisms known as LAPAs (Local Adaptation Plans of Action) to pilot local and community-based adaptation plans that could in turn inform national planning (Regmi et al, 2016). This process started top-down, initially developing a government-ratified framework, followed by linking national agencies with regional and local units to create planning, funding and resources channels for local communities. Crucially, the LAPA process relied on a participatory toolkit (using a variety of risk assessment and ranking, visioning and implementation methods) to elicit perceptions of impacts, vulnerability and capacity at village/municipal level in order to design adaptation priorities for support. This local buy-in was vital to secure legitimacy for the process and its successful roll-out (Chaudhury et al., 2014).

in climate risk reduction (van Aalst et al., 2008). Such assessment on the ground can also ensure people and their livelihoods are front and centre of adaptation decisions, ensuring adaptation becomes a rights-based issue (Tanner et al., 2015a). This is especially critical in the context of increasingly popular systems-based approaches to resilience, where researchers have highlighted the danger that trade-offs between people and the needs of the urban system will be made without those people who are likely to be affected having any voice in decisions regarding the trade-offs being made (Friend and Moench, 2015).

Part of the challenge of designing effective and inclusive adaptation actions discussed above lies in linking climate change to other drivers of decision-making. Perceptions data reveals the lived realities that link climate variability and change with wider development processes. These linkages can be vital to develop entry points for adaptation that are consistent with both risk perceptions and other development goals. This acknowledges that adaptation decisions are not made based on climate signals alone, and that decisions often reflect short-term time horizons rather than the medium- to long-term timescales associated with most climate model projections (Wilby and Dessai, 2010). Perceptions data can thereby inform the development of 'low regrets' measures that tackle existing development deficits while at the same time building in adaptive capacity for longer-term change.

Perceptions of climate change also reflect socio-political contexts within which climate scientists and adaptation policy-makers operate (Wolf and Moser, 2011). Understanding these perceptions can therefore help policy-makers choose their entry points more effectively, even where climate change is not a priority or even perceived as happening. This builds on growing emphasis on the development co-benefits of disaster risk reduction and adaptation projects such as flood barriers that double as road networks in Bangladesh, or the biodiversity and livelihood benefits of ecosystem-based adaptation in Vietnam (Tanner et al., 2015b). Such policy interconnections and entry points are highlighted in recent perceptions-based research in the Middle-mountains of Nepal, which shows the interrelationship between climate impacts, farmland abandonment and a shift away from agro-livestock activities (Pandey, 2017). This has demonstrated to policy-makers the need to connect migration and climate change adaptation policies with agriculture and land use policies, in order to be able to restrict farmland abandonment, as well as with the provision of incentives for agricultural restoration.

6. Education: Sharing knowledge and building awareness

Data from around the world suggests that willingness to respond in different ways to climate change impacts may depend on how people understand the causes (Wolf and Moser, 2011). This has been extensively researched with regard to willingness to adopt or support policies to mitigate the causes of climate change, but also applies to adaptation. Household-level analysis in the Karamoja region of Uganda shows that, while droughts are seen as the most common climatic shock over the past five years, nearly two thirds of household respondents do not perceive any changes in climate, and half do not think the climate will continue to change over their lifetime (Chaplin et al., 2017). In Nepal, the NCCIS does not explore linkages between perceived climate change and actions but this represents an avenue for future enquiry.

Equipping people with locally appropriate information and awareness about climate change can in turn support better adaptation decision-making (see Box 5). Perceptions-based material can also help share knowledge by bringing to light the perspectives of sections of society that would otherwise not be represented. For example, working with ActionAid, children in Nepal successfully used participatory videos about perceived climate change impacts to gain adaptation funding for a bridge to help children get to school during the monsoon season. The videos and a report supported an on-going dialogue with the national government on child rights and climate change, where it was agreed that children needed to be a priority group in Nepal's NAPA (ActionAid, 2008).

Climate data is often presented in global terms that are hard to relate to people's lived experience. Perceptions-based data helps raise awareness of climate change causes, impacts and adaptation in ways that are more readily communicated and understood. In the Pacific, studying local perceptions of climate change has helped better prepare teachers to integrate content on climate change within formal school curricula and improved the capacity of the media to communicate about climate change issues effectively (SPARCK, 2014).

The NCCIS reveals that the main source of information on climate change is the radio, followed by the television. It is important to acknowledge that analogue media remain vitally important in a world dominated by an assumed access to the internet. Information disseminated and discussed by means of these media can be made more locally appropriate through engagement with perceptions-based studies in order to develop content that resonates with local issues and priorities.

The same is true for school curricula. A recent review of the status of climate change content in the secondary and university curricula, commissioned by the Nepal Ministry of Science, Technology and Environment, concluded that course materials did not adequately cover climate change. As a result, under GoN's 2014 programme on mainstreaming climate change, the Pilot Programme on Climate Resilience has been working with the Ministry of Education, the Curriculum Development Centre and three universities—Kathmandu University, Pokhara University and Tribhuvan University—to integrate new information on climate change into the secondary and university curricula (ADB, 2015). Crucially, such formal learning channels will interact with informal information exchange; neighbours and friends were reported as the third most common source of information on climate change in the NCCIS.

Box 5: Using local perceptions to inform climate change adaptation strategies in Nepal

A recent study in the Budhi Gandaki River Basin, Nepal, documented the preferences of local people in the context of climate change variability. The results were designed to help concerned government decision-makers to devise workable interventions in the form of adaptation strategies for managing future droughts. The study concludes that a multi-purpose reservoir upstream that can store water in the monsoon may help reduce flooding, and collected water can be used for other purpose during the dry season. The study suggests that, when people are equipped with more information, they will plan better in the long run and formulate long-term strategies.

Source: Devkota et al. (2017).

7. Conclusion

This paper has set out the potential of survey data on perceptions of climate change, impacts and adaptation to feed into policy and practice. There are significant entry points for such data in complementing more scientific approaches, for understanding salient impacts on development and for developing locally appropriate adaptation options that meet with development priorities and objectives. Perceptions can also help improve education, awareness-raising and dialogue on climate change. Nevertheless, examples of findings from surveys or participatory methods to elicit perceptions directly influencing discrete policies or adaptation actions are still relatively scarce. The NCCIS provides an important baseline from which scientific findings can be challenged, adaptation actions can be intelligently supported and awareness-raising materials can be tailored.

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