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Developing Evaluation Criteria through Expert Panel: A Case of Community-based Adaptation to Climate Change in Gandaki River Basin Nepal

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Abstract

The study developed criteria for a successful adaptation to effect of climate change taking case of Gandaki river basin of Nepal. In study area, the forest users have already been implementing some adaptation activities at community level adaptation in past. 20 experts were involved to develop criteria using Delphi techniques. These experts have in-depth knowledge on subject matter and long working experiences in the study area. Based on literature review, the researcher presented 46 criteria to expert panel grouped under six different categories. Six different categories include; technical aspects of adaptation activity, effectiveness in achieving adaptation outcomes, efficiency of cost and benefits, equity for the local beneficiaries, social acceptability and sustainability of adaptation activities in communities. From round one of expert consultation, all 46 criteria were accepted as relevant ($\geq 70\%$ positive response) and 11 more criteria were added by experts. New set of 57 criteria were then presented to the same panel of experts for rating priority. Based on expert prioritization, three criteria were rejected and 54 criteria were accepted ($\geq 60\%$ priority score). The Delphi technique was successfully used in this case study. The set of 54 criteria are recommended as new set of criteria suitable for assessment of community-based adaptation to climate change applicable to forest user communities in Gandaki river basin Nepal.

Keywords: Climate Change, Community-based Adaptation, Evaluation Criteria, Delphi survey

Introduction

Climate change refers to a phenomenon of global environmental change. Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change can be caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions. Climate change is the catch-all term for the shift in worldwide weather phenomena associated with an increase in global average temperatures. Average temperatures have been going up around the world for many decades.

As a result of global warming, the type, frequency and intensity of extreme events, such as tropical cyclones (including hurricanes and typhoons), floods, droughts and heavy precipitation events, are expected to rise even with relatively small average temperature increases. Changes in some types of extreme events have already been observed, for example, increases in the frequency and intensity of heat waves and heavy precipitation events a significant increase to global temperature was already felt during decade of 1980s. The scientific evidence of climate change is now overwhelming making climate change a serious global threat demanding an urgent global response. This painful reality is due to human induced activities, is affecting regional ecosystems, habitat and livelihoods of the human being. The effect of climate change distributes around the globe and fragile ecosystem like one having higher and lower altitudes is significantly affected. No matter how significant are the socks and stresses faced due to climate change, the World population either will mitigate the causes of climate change or finds the ways of adapting their lifestyle and finding the strategies of building resilience from practice against effect of changing climate.

Adaptation refers to an adjustment in ecological or socio-economic system in response to

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observed or expected change in change in climate in order to minimize adverse effects. Adaptation also could be understood as function of vulnerability and adaptive capacity. More the vulnerability of a particular region, ecosystem, community or individuals vulnerability of the ecosystem; more is the requirement of adaptation. Similarly, more the adaptive capacity less is the actual vulnerability. Rural poor population in underdeveloped countries are more vulnerable to the effect of climate change as their livelihood options are dependent on natural resources, which itself is exposed physically to the variation in climate. Temperature rise will affect more the high altitude region like Himalaya considerably as the surrounding ecosystem are linked to snow cover and its melting. Communities residing in such region like in Nepal are highly vulnerable to climate change effects.

Adaptation to climate change may be dealt at various special scales – international, national, individual or local community with collective actions the international adaptation refers to the policy and funding measures at global level to promote adaptation and national adaptation refers more to the country policy and programmes with respect to adaptation. The local community or individual adaptation refers to the specific actions taken by local people or group of people in adapting to effect of climate change, widely termed as community-based adaptation. The community-led process in this regard is widely termed as community-based adaptation. The cases of such local collective adaptation practices are likely to be visible in the cases of forest-dependent communities like community forest users groups in Nepal.

Amidst an increasing requirement of adaption work in underdeveloped mountainous countries like Nepal, the general development works needs to continue. The demand of adaptation is high, but there is little knowledge on what exactly is the value being added by adaptation as such in terms of reducing vulnerability apart from poverty alleviation being focused by general development activities. Sometime it is a debatable issue that whether adaptation and development as synonymous and it is likely that there is huge overlap between them. This demands an exploration of possible mainstreaming approach of adaptation to the general development at local level also because the funding to adaptation may not be sufficient when separating it from development. Mainstreaming of adaptation to general development is only successful when it successfully fulfills its adaptation function.

Adaptation is defined by the IPCC as ‘an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities’. Various types of adaptation are distinguished, such as anticipatory or proactive adaptation (‘that takes place before impacts of climate change are observed’), reactive adaptation (‘that

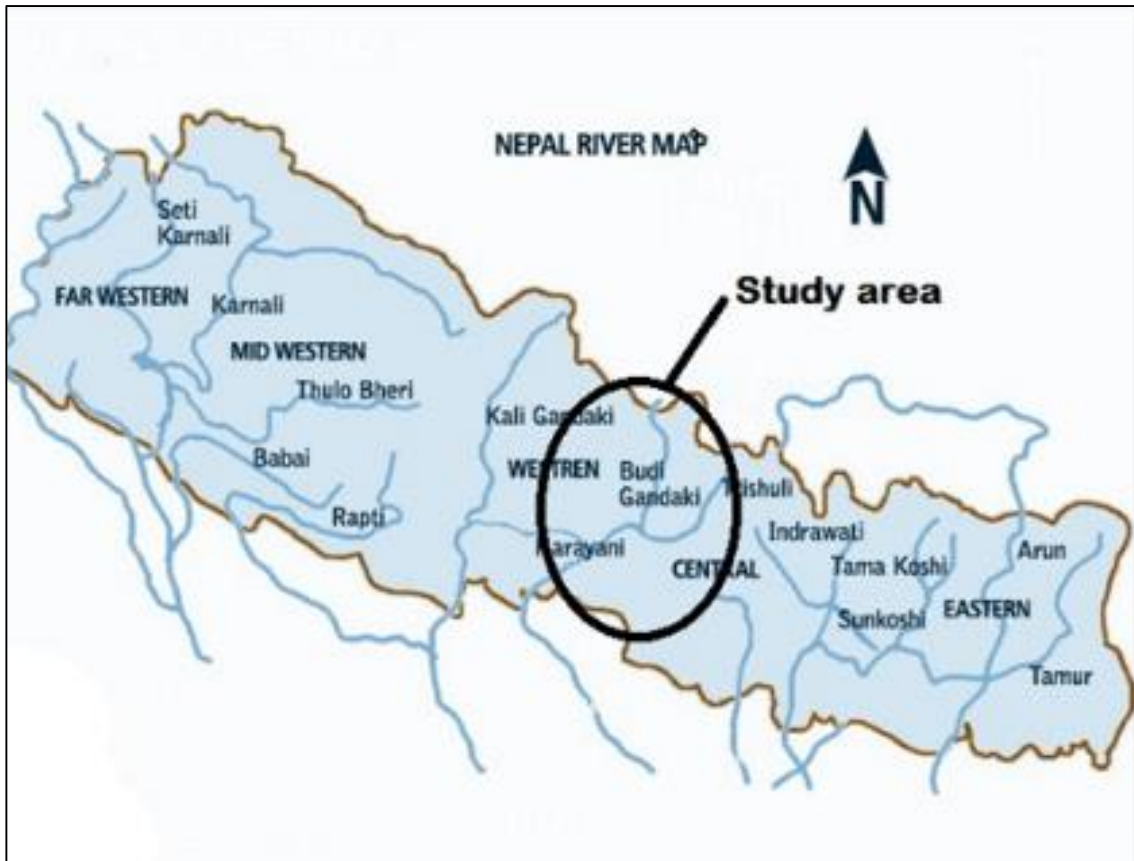
takes place after impacts of climate change have been observed’), autonomous or spontaneous adaptation (‘that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems’) and planned adaptation (‘that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state’).

Exploration of criteria on which adaptation becomes successful will be a good start contributing to better understanding of adaptation. The explored knowledge can contribute mainstreaming of adaptation with development need of underdeveloped countries; thereby increasing leverage to the efforts of fighting together against global problem of climate change. Nepal as a country with high Himalayas and associated higher vulnerabilities will be a good place to examine the local adaptation cases with respect to developing criteria on such empirical basis. Result of such examination will provide a basis to move toward with international commitment like a recent conference declaration of mountainous countries where rewards are promised to mountainous communities against implementing effective adaption and ecosystem services.

In a recent study with expert elicitation, de FrançaDoriaa (2009) concludes the definition of successful adaptation as ‘any adjustment that reduces the risks associated with climate change, or vulnerability to climate change impacts, to a predetermined level, without compromising economic, social, and environmental sustainability’. More to this, there are several attempts made in exploring the criteria of successful adaptation to climate change effects. Smit (2000) suggests that the development of criteria of adaptation is linked directly to its assessment.

According to IPCC 2007, adaptation assessment is ‘the practice of identifying options to adapt to climate change and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency and feasibility’. Various review papers suggest that the assessment of adaptation should deal mainly with the broad principles of sustainability together with elements like efficiency, effectiveness, equity, relevancy, flexibility, acceptability and availability. Brooks et al 2005 develops determinants of adaptation applicable to national level.

This study is focused on developing set of criteria on which success of community-based adaptation could be assessed. The Fig. Map of Nepal criteria for adaptation may differ by location as does the effect of climate change. The study takes a case of Gandaki river basin of Nepal which stretches from low altitude district of Nawalparasi to Mountain district of Mustang. In these areas, Forest users have already been implementing some adaptation activities. The criteria are aimed to be suitable for the case of forest user communities.



2. Methods

This study follows research paradigm of post positivism. The study depends on deductive approaches to examine the sustainability criteria. The Delphi technique was used to identify the suitable criteria for assessment of community-based adaptation by the forest user communities. The general list of adaptation elements from the literature review was reduced to 46 criteria and grouped under 6 categories. Based on the primary list of criteria from literature review the Delphi study was used to identify a set of adaptation criteria. The Delphi process was started by documenting the experts' profiles from related field and the format of Delphi surveys is outlined and the results and analysis are presented. The Delphi method has been used in information systems research for identifying and prioritizing issues and making decisions. It is used when a group communication process needs special attention to make is effective while dealing with complex problem. Many researchers have used Delphi with panel of experts in working out and prioritizing the criteria for their research. Orsi et al 2011 used Delphi method in developing criteria and indicators for forest restoration priorities successfully. In the context of forest based tourism in Iran, Barzekar et al 2011 also have used Delphi successfully in generating the criteria and indicators for monitoring. In their different topics though Timsina 2008 in the context of Nepal and Horan 2010 in the context of United Kingdom also have successfully used expert panel to prioritize criteria of their research based on Delphi techniques.

The participant experts for Delphi technique were taken from the various professional and occupational backgrounds equipped with substantial knowledge and working experience in the area of environment, climate change, participatory forestry, and monitoring and

evaluation. The experts' group was diverse with professional backgrounds, their decision-making roles in respective organizations and substantial relevant experience. Twenty experts participated in the Delphi survey. Among them, five were affiliated in the academia sector, four were being worked in governmental sectors, and seven were engaged in different project/NGO/INGO related in climate change and local level adaptation. Four of the experts were from private sectors and or were freelancer. The survey was carried out from different sectors to represent their own views and experiences. Similarly, among twenty experts, fifteen holds higher qualification i.e. Ph.D. in related area, one holds M.Phil. Degree and four holds master's degree with long working experiences on the specific issues of climate change and or participatory forestry.

On the view of experience, the experts had minimum 10 to maximum 35 years of experiences. Average working experiences per experts was 21.6 years which helped development of criteria through in-depth knowledge and experiences.

3. Result and Discussion

3.1 Delphi Round 1 – Relevance of Criteria

In the first round of Delphi survey, the experts were asked to indicate the relevance of all the 46 criteria (grouped under 6 categories) that had been identified from literature review. Experts suggested the relevance of criteria by using 'Yes/No' answer to each of criteria. A few empty rows were provided at the end of each criterion where experts were encouraged to provide other criteria not included in the list. All scores for each indicator were totaled and divided by 20 and multiply by 100 in order to obtain a percentage 'relevance' score for each indicator using

Microsoft Excel.

Table 1: Results of the first round of Delphi technique

Category	# Criteria proposed	# Criteria accepted (score >70%)	Criteria added by experts
Technical aspects of adaptation activity	8	8	<ul style="list-style-type: none"> Activity improves disaster resilience in community Activity design is based on Indigenous knowledge and technology Activity employs low-cost technologies
Effectiveness in achieving adaptation outcomes	8	8	<ul style="list-style-type: none"> Activity is impactful at local level
Efficiency of cost and benefits	6	6	
Equity for the local beneficiaries	7	7	<ul style="list-style-type: none"> Activity discourages social discrimination
Social Acceptability	8	8	<ul style="list-style-type: none"> Participatory decision making process is followed Activity follows demand driven approach
Sustainability of adaptation activities in communities	9	9	<ul style="list-style-type: none"> Activity includes training and capacity building at local level Both long term and short term activities are implemented Activity encourage and strengthen collective action and local democracy Activity is part of local level adaptation plan
Total	46	46	11 criteria

Source: Delphi survey 2016

Overall, the criteria were scored high, with a relevancy above 80% (i.e. at least 16 experts agreeing out of 20 for each of the criteria). As it passes the threshold of 70% set the researcher, all of the 46 criteria were considered important relevant for assessment of community-based adaptation and forwarded to second round of survey. Apart from the selected criteria, 11 additional criteria were suggested by at least one expert and forwarded for second round of survey. These criteria were added to the categories of technical aspect, effectiveness, equity, social acceptability and sustainability. There were no additional criteria suggested under category of efficiency. All together 57 criteria were forwarded to the second round of Delphi survey.

3.2 Delphi Round 2 – Prioritizing Criteria

In the second round Delphi survey, the questionnaires were sent out to the experts by asking them to reply within 25 days. The experts responded during round 1 of survey were

reached for round 2 also. A total of 20 completed questionnaires were received. In this round, the experts were asked to prioritize the set of 57 criteria carried from round one of the Delphi survey. The respondents were the well-known experts of community based adaptation on climate change in the Nepal as well as global perspective. Their views and concerns about adaptation represent the global perspectives of adaptation practices on climate change. Researcher requested experts to determine priority ratings for each criterion on a five point scale as:

- 5 = very highly relevant,
- 4 = highly relevant,
- 3 = relevant,
- 2 = fairly relevant.
- 1 = hardly relevant.

Subsequently, all scores for each criterion were totaled and divided by 100 as total maximum score in order to obtain priority score in percentage form.

Table 2: Results from Delphi Round 2: Criteria Rejected

S.N.	Category, Criteria	Total score	Priority Score %	Status
2	Effectiveness in achieving adaptation outcomes			
2.7	Large number of beneficiaries are covered	59	59%	Rejected
3	Efficiency of cost and benefits			
3.4	Activity attracts new investments e.g. of private sector	56	56%	Rejected
4	Equity for the local beneficiaries			
4.8	Activity discourages social discrimination	55	55%	Rejected

Source: Delphi Survey 2016

To determine the final acceptability of each criterion, 60 percent threshold was set taking average score of 3 (three) out of 5 referring to rating ‘relevance’ as per survey

questionnaire. With this threshold, three criteria were rejected as they received score less than 60% percentages.

Table 3: Result of Delphi Round Two: Final Set of Criteria Developed

S.N.	Category, Criteria	Total score	Priority Score %	Status
1	Technical aspects of adaptation activity			
1.1	Activity design is relevant to adapt to identified effect of climate change	81	81%	Accepted
1.2	Activity employs efficient technology	75	75%	Accepted
1.3	Activity is designed to utilize local human resources and natural resources	82	82%	Accepted
1.4	Local capacity exists for formulation and management of the activity	77	77%	Accepted
1.5	Activity have flexibility for adjustments if required	72	72%	Accepted
1.6	Possible to repeat the activity in other geographical areas and population groups	71	71%	Accepted
1.7	Activity is environmentally conducive	90	90%	Accepted
1.8	Activity is supportive or neutral to control of greenhouse gas emissions	76	76%	Accepted
1.9	Activity improves disaster resilience in community	74	74%	Accepted
1.10	Activity design is based on Indigenous knowledge and technology	81	81%	Accepted
1.11	Activity employs low-cost technologies	79	79%	Accepted
2	Effectiveness in achieving adaptation outcomes			
2.1	Outcome of activity can be objectively realized	62	62%	Accepted
2.2	Activity improves local level ecosystem (forest, river, soil etc) helping climate change adaptation	80	80%	Accepted
2.3	Activity improves institutional capacity of community to cope with effects of climate change	77	77%	Accepted
2.4	Activity builds capacity of individuals and families to cope with effects of climate change	78	78%	Accepted
2.5	People experience reduction of vulnerability after this activity (individual, community or ecosystem hotspots)	81	81%	Accepted
2.6	Activity develops robustness of beneficiaries to deal with uncertainty (or gains flexibility)	67	67%	Accepted
2.8	Activity has multiple co-benefits with development outcome (e.g. more food security, water, energy, wellbeing)	73	73%	Accepted
2.9	Activity is impactful at local level	78	78%	Accepted
3	Efficiency of cost and benefits			
3.1	The total (economic) cost of activity is affordable for the local communities	73	73%	Accepted
3.2	The (economic) cost of activity is reasonable compared to benefits	72	72%	Accepted
3.3	Costs are fairly certain for replication of the activity	61	61%	Accepted
3.5	Activity generates employment opportunities for local people	72	72%	Accepted
3.6	Activity benefits are mainly confined to local people	73	73%	Accepted
4	Equity for the local beneficiaries			
4.1	Attention given to target most vulnerable communities or areas	87	87%	Accepted
4.2	Attention given to target poor families as beneficiaries	79	79%	Accepted
4.3	Activity emphasizes on reducing inequality	69	69%	Accepted
4.4	Activity increases access of local communities to resources	69	69%	Accepted
4.5	Activity takes gender and social inclusiveness into consideration	75	75%	Accepted
4.6	Activity discourages maladaptation practices (perverse effect like further increasing vulnerability)	81	81%	Accepted
4.7	Benefits are shared in an equitable manner (e.g. who needs gets the most)	70	70%	Accepted
5	Social Acceptability			
5.1	Activity is acceptable to local culture and social norms	78	78%	Accepted
5.2	All stakeholders likely to be affected are engaged	76	76%	Accepted
5.3	Activity planning and implementation process is transparent	80	80%	Accepted
5.4	Existing institutions (e.g. users group) are made accountable to implement adaptation activity	77	77%	Accepted
5.5	Activity is endorsed by local community leaders (e.g. political leaders, civil society leaders)	67	67%	Accepted
5.6	Local people make decision on choices for adaptation	70	70%	Accepted
5.7	Traditional local knowledge is considered during design and implementation of activity	82	82%	Accepted
5.8	Activity is acceptable to local government	73	73%	Accepted
5.9	Participatory decision making process is followed	85	85%	Accepted
5.10	Activity follows demand driven approach	86	86%	Accepted
6	Sustainability of adaptation activities in communities			
6.1	Activity increases awareness of climate change adaptation	86	86%	Accepted
6.2	Activity is implemented with a long term vision and plan	79	79%	Accepted
6.3	Activity is implemented with leadership of local people	77	77%	Accepted
6.4	Activity is implemented involving local human resources and natural resources as far as available	81	81%	Accepted
6.5	Involved individuals or users group can operate the activity on their own	73	73%	Accepted
6.6	Benefits of adaptation activity continues after implementation phase is over	76	76%	Accepted
6.7	Activity is likely to continue after implementation phase is over	79	79%	Accepted
6.8	Activity implementation process brings institutional change at local level	67	67%	Accepted
6.9	Local users groups or government keeps this activity in their annual plan	81	81%	Accepted
6.10	Activity includes training and capacity building at local level	86	86%	Accepted

S.N.	Category, Criteria	Total score	Priority Score %	Status
6.11	Both long term and short term activities are implemented	63	63%	Accepted
6.12	Activity encourage and strengthen collective action and local democracy	80	80%	Accepted
6.13	Activity is part of local level adaptation plan	82	82%	Accepted

Source: Delphi Survey 2016

Similarly, 54 criteria were accepted as final set of criteria as they received 60 or more score on percentage.

Eleven criteria were bounded under the category 'Technical aspects of adaptation activity Criteria'. Among them all are accepted as community based adaptation criteria having 81%, 75%, 82%, 77%, 72%, 72%, 71%, 90%, 76%, 74%, 81% and 79% scores and they respectively included criteria named - Activity design is relevant to adapt to identified effect of climate change, Activity employs efficient technology, Activity is designed to utilize local human resources and natural resources, Activity is designed to utilize local human resources and natural resources, Local capacity exists for formulation and management of the activity, Activity have flexibility for adjustments if required, Activity have flexibility for adjustments if required, Possible to repeat the activity in other geographical areas and population groups, Activity is environmentally conducive, Activity is supportive or neutral to control of greenhouse gas emissions, Activity improves disaster resilience in community, Activity design is based on Indigenous knowledge and technology, Activity employs low-cost technologies. No criteria were rejected under this first category.

Under the second category 'Effectiveness in achieving adaptation outcomes', eight criteria were accepted which include: Outcome of activity can be objectively realized, Activity improves local level ecosystem (forest, river, soil etc) helping climate change adaptation, Activity improves institutional capacity of community to cope with effects of climate change, Activity builds capacity of individuals and families to cope with effects of climate change, People experience reduction of vulnerability after this activity (individual, community or ecosystem hotspots), Activity develops robustness of beneficiaries to deal with uncertainty (or gains flexibility), Activity has multiple co-benefits with development outcome (e.g. more food security, water, energy, wellbeing), Activity is impactful at local level with respective scores of 62% , 80%, 77%, 78%, 81%, 67%, 73%, 78% . Only one criteria 'Large number of beneficiaries are covered' is rejected having scored 59%. Two criteria Criteria named 'People experience reduction of vulnerability after this activity (individual, community or ecosystem hotspots)' and 'Activity improves local level ecosystem (forest, river, soil etc) helping climate change adaptation' are highly accepted scoring more than 80%. Criteria named 'Outcome of activity can be objectively realized' and 'Activity develops robustness of beneficiaries to deal with uncertainty (or gains flexibility)' are moderately accepted scoring between 60% to 70%.

The third category is was the 'Efficiency of cost and benefits' included mentioned six criteria. Among them, five criteria named 'the total (economic) cost of activity is affordable for the local communities, the (economic) cost of activity is reasonable compared to benefits, costs are fairly certain for replication of the activity, activity generates employment opportunities for local people and Activity benefits are mainly confined to local people' are

accepted securing scores 73%, 72%, 61%, 72% and 73% respectively. One indictor named 'activity attracts new investments e.g. of private sector' is rejected as it secured score 56% only.

Criteria named 'Attention given to target most vulnerable communities or areas, Attention given to target poor families as beneficiaries, Activity emphasizes on reducing inequality, Activity increases access of local communities to resources, Activity takes gender and social inclusiveness into consideration, Activity discourages maladaptation practices (perverse effect like further increasing vulnerability), Benefits are shared in an equitable manner (e.g. who needs gets the most) under the category 'Equity for the local beneficiaries' which were accepted for new criteria securing the scores: 87%, 79%, 69%, 69%, 75%, 81% and 70%. It showed that two indictors named 'Attention given to target most vulnerable communities or areas' and 'Activity discourages maladaptation practices (perverse effect like further increasing vulnerability)' are highly accepted. Only one indictor named 'Activity discourages social discrimination is rejected having score 55%.

Social acceptability is an important aspect in different cultures, society and groups. This category carried ten criteria in Delphi technique. They were: Activity is acceptable to local culture and social norms, All stakeholders likely to be affected are engaged, Activity planning and implementation process is transparent, Existing institutions (e.g. users group) are made accountable to implement adaptation activity, Activity is endorsed by local community leaders (e.g. political leaders, civil society leaders), Local people make decision on choices for adaptation, Traditional local knowledge is considered during design and implementation of activity, Activity is acceptable to local government, Participatory decision making process is followed and Activity follows demand driven approach. All criteria were accepted having more than 60% score. Among them, criteria named 'Activity planning and implementation process is transparent, Traditional local knowledge is considered during design and implementation of activity, Activity follows demand driven approach and Participatory decision making process is followed' were strongly accepted securing 80% and above. No criteria are rejected under this category.

All activities should be created, practiced and adapted for sustainability which stands for vital factors in our universe. So the study placed thirteen criteria under this category as: Activity increases awareness of climate change adaptation, Activity is implemented with a long term vision and plan, Activity is implemented with leadership of local people, Activity is implemented involving local human resources and natural resources as far as available, Involved individuals or users group can operate the activity on their own, Benefits of adaptation activity continues after implementation phase is over, Activity is likely to continue after implementation phase is over, Activity

implementation process brings institutional change at local level, Local users groups or government keeps this activity in their annual plan, Activity includes training and capacity building at local level, Both long term and short term activities are implemented, Activity encourage and strengthen collective action and local democracy and Activity is part of local level adaptation plan. Under this category of 'Sustainability of adaptation activities in communities', all criteria are accepted securing scores of 86%, 79%, 77%, 81%, 73%, 76%, 79%, 67%, 81%, 86%, 63%, 80% and 82% respectively.

Adaptive capacity is context-specific and varies from country to country, among social groups and individuals, and over time, but is ultimately connected to social and economic development (Smit & Wandel, 2006; IPCC, 2007). The capacity to adapt is influenced by a society's productive base, which includes natural and man-made capital assets, social networks and entitlements, human capital and institutions, governance, national income, health and technology, including multiple climate and non-climate stress as well as development policies.

Various studies have suggested a general set of criteria for adaptation at various scales (Brooks et al 2011 Adger et al 2005). The general criteria include categories of Feasibility, effectiveness, efficiency, social acceptability and sustainability as major elements of adaptation criteria. In addition, Brooks et al 2011 also paid attention to criteria of addressing maladaptation. Adger et al 2005 adds that the governance of adaptation should be considered as who decides for adaptation. Consideration of wider sustainability concerns was also taken as common criteria by de FrancaDoriaa et al 2009. Adaptation Fund focused livelihoods as one of the major criteria.

From previous literatures and as stated by Adger et al 2005, it is evident that the adaptation and its criteria may vary across various scales i.e. international, national, community or individual collective actions. The set of adaptation criteria may be different based on sector too. As Lemos 2007 states, the adaptation methods are those strategies that enable the individual or the community to cope with or adjust to the impacts of the climate in the local areas. The set of criteria developed in this study are unique to community level adaptation and it is a new set of criteria for forest-dependent communities in Nepal. Use of Delphi techniques has been successful in case of Nepal and in case of developing adaptation criteria in this study as it did with criteria and indicators for forest restoration, for forest based tourism in Iran, and in the context of United Kingdom.

Conclusion

With two rounds of Delphi survey with panel of experts, set of 54 criteria (as per table 2) were developed which are suitable for assessing community-based adaptation to climate change. These criteria were developed based on reference to adaptation activities being practiced by forest user communities in Gandaki river basin of Nepal. The developed criteria address six different elements of adaptation as: Technical aspects of adaptation activity, Effectiveness in achieving adaptation outcomes, Efficiency of cost and benefits, Equity for the local beneficiaries, Social Acceptability and Sustainability of adaptation activities in communities.

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