

# What Constitutes Successful Adaptation Measures?

## Reflections from the National and Local Context of Nepal



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HI-AWARE aims to enhance the adaptive capacities and climate resilience of the poor and vulnerable women, men, and children living in the mountains and flood plains of the Indus, Ganges, and Brahmaputra river basins. It seeks to do this through the development of robust evidence to inform people-centred and gender-inclusive climate change adaptation policies and practices for improving livelihoods.

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Feedback is welcomed as a means to strengthen these works: some may later be revised for peer-reviewed publication.

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# What Constitutes Successful Adaptation Measures?

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# Acronyms and Abbreviations

BCAS	Bangladesh Centre for Advanced Studies
CAEWRI-PARC	Climate Change, Alternative Energy and Water Resources Institute of the Pakistan Agricultural Research Council
CARIAA	Collaborative Adaptation Research Initiative in Africa and Asia
FGD	Focus Group Discussion
HI-AWARE	Himalayan Adaptation, Water and Resilience Research
HKH	Hindu Kush Himalaya
ICIMOD	International Centre for Integrated Mountain Development
IDRC	International Development Research Centre
INGO	International Non-governmental Organisation
LAPA	Local Adaptation Plans of Action
MCA	Multi-criteria Analysis
NAP	National Adaptation Plan
NGO	Non-governmental Organisation
TERI	The Energy and Resources Institute
VDC	Village Development Committee

# Abstract

Adaptation needs and options contain a wide variety of interventions, reflecting their multi-faceted nature. The study identified elements of successful adaptation measures and criteria for evaluating them for which the method of Multi-Criteria Analysis (MCA) was used. Participatory methods such as focus group discussions and interviews with key informants were included. District level workshops were organized to collate data and information.

The findings showed that elements of successful adaptation options are context-specific, and vary between and among different stakeholder groups and scales of prioritization of evaluation criteria. These criteria also vary on a temporal scale (locally, sub-nationally and nationally). The findings imply that a blanket approach for understanding successful adaptation and evaluating adaptation options is not applicable at all levels. Instead, a context-specific and stakeholder-based understanding and application of the elements of successful adaptation and evaluation criteria will prove more useful for designing effective adaptation options.



# 1. Introduction

Successful adaptation, in our context, refers to any intervention or event that addresses the risks associated with climate change or vulnerability to climate change impacts, reducing them to a predetermined level without compromising economic, social, and environmental sustainability (Doria et al., 2009). According to Adger et al., (2005), successful adaptation is that particular balance of effectiveness, efficiency, and equity through decision-making structures- that promotes learning and is perceived to be legitimate. This is an ideal from which much adaptation invariably diverges in reality, though.

Even so, there are various examples of successful climate change adaptation practices around the globe. These involve a mix of institutional and behavioural responses, typically undertaken with respect to multiple risks. This may happen often as part of existing processes or programmes, such as livelihood enhancement, water resource management, and drought relief (Adger et al., 2007).

Efforts to facilitate successful adaptation face a number of constraints such as barriers to promote the adaptive capacity of vulnerable households and communities (Jones et al., 2011). Understanding the nature of these barriers is important to find strategic ways of dealing with them.

The existence of adaptation constraints and limits means not all adaptation needs will be met, and not all adaptation options will be possible (Noble et al., 2014). It may also mean there is no adaptation option for a particular actor, system, or planning horizon of interest. On the other hand, a seemingly unacceptable measure may be required to serve larger, societal objectives or promote the sustainability of a natural system (Adger et al., 2007).

Adaptation limit is the point at which an actor's objectives or system's needs cannot be secured from intolerable risks through adaptive actions (Adger et al., 2009). Such limits may be further specified as hard and soft adaptation limits. In the case of hard limits, no adaptation options are foreseeable, even when looking beyond a current planning horizon (Moser and Ekstrom, 2010). For soft limits, adaptation options could become available in the future because of changing attitudes or values, or as a result of innovation or other resources becoming available to an actor.

The identification of successful adaptation options can be challenging, partly due to the rate, uncertainty, and cumulative impacts of climate change (Noble et al., 2014). How adaptation is framed will determine how adaptation options are selected (Fünfgeld and McEvoy, 2011). Selection and prioritization of options is important, because not all of them will be possible owing to constraints such as insufficient local resources, capacities, and authority. The viability of adaptation options is further dependent on a time scale and the climate scenario, keeping in mind that selecting adaptation options is an iterative process (Noble et al., 2014).

To mainstream and scale up adaptation, it is useful to have mechanisms for evaluating the benefits of adaptation strategies (McNamara and Buggy, 2017). There is a need to define what successful adaptation looks like in practice if we are to track adaptation (Ford et al., 2013). Brooks et al., (2011) suggested that the criteria by which success might be assessed include feasibility, effectiveness, efficiency, acceptability/legitimacy, and equity (Adger et al., 2005; Ford et al 2013; Noble et al., 2014; Stern, 2006; Yohe and Tol, 2001), to which they added sustainability (Fankhauser and Burton, 2011). Effective integration and coherence with wider national policies and development goals is another, often-sought criterion (The World Bank, 2010).

Effectiveness is the capacity of a system to adapt to achieve its objectives. It involves a reduction of impacts, exposure, or risks, the avoidance of danger, or the promotion of security (Adger et al., 2005). Whilst effectiveness relates to adaptation outcomes, it also relates to the adaptation process, including capacity building, information exchange, and social learning.

Equity in this context usually focuses on the distributional consequences of environmental decisions– from the uneven spatial impacts of environmental change to the distribution and consequences of political and social change (Tompkins and Adger, 2003). Adaptation action is appropriate if it is commensurate with the nature and magnitude of the impact it is intended to address (Noble et al., 2014).

Because of the contextual nature of vulnerability and adaptive capacity, the criteria for defining successful adaptation options and their evaluation vary across spatial scales. Criteria outlined in literature- such as effectiveness, efficiency, equity, particularly applied on an international scale, may or may not be applicable in a national and local context. So it has to be customized and designed according to local and national stakeholders' suggestions.

There is inadequate research in Nepal to guide policy makers and practitioners on how to identify successful adaptation, certainly at the local level, and how to evaluate it. Our paper aims to fill the gap by identifying local and national level criteria and indicators for successful adaptation strategies for the Gandaki river basin in Nepal.

The development of customized and context-specific criteria to identify successful adaptation practices is useful for least developed countries like Nepal to ensure the effectiveness of investments in climate change adaptation. The current trend of such investments shows that adaptation interventions are designed without due consideration of how they would address risk and impact induced by climate change on top of existing development challenges (Regmi et al., 2015). In the absence of an understanding of what constitutes a successful adaptation, policy makers and practitioners adopt ad-hoc development measures first and a blanket approach to design and implement adaptation.

These are some major benefits of identifying evaluation criteria:

- they help to understand what constitutes successful adaptation;
- they enable local and national stakeholders to distinguish between regular development activities and climate change adaptation interventions;
- they help practitioners identify focussed and targeted interventions that address additional risks and vulnerability of households and the livelihood systems they depend on;
- the outcome of our action research gives running projects and programmes a different lens for looking at risk and vulnerability posed by climate change, by improving the adaptation planning cycle. It will help them channel their resources effectively and efficiently for adaptation practices that are successful in enhancing the resilience of human and natural systems; and
- finally, the criteria could be used to document successful adaptation strategies in river-basins, which may be fed into the National Adaption Plan (NAP), Local Adaptation Plans of Action (LAPA), and other climate-change policy interventions in the Hindu Kush Himalayan (HKH) region.

## 2. Methodology

The research adopted a multi-scale and multi-phase data collection process. Data collection was carried out at community, district, and national levels, in three phases involving key actors.

There are various methods to evaluate adaptation options. Some commonly used tools are cost-benefit analysis and multi-criteria analysis (MCA). The latter allows assessment of various adaptation options against a number of criteria with each criterion having a weight (De Bruin et al., 2014). A key strength of MCA is that it helps tackle complex problems by breaking them down into smaller components. It does so by enabling systematic incorporation of quantitative and qualitative evidence with more subjective judgements based on stakeholder preferences or political priorities (Dixit and McGray, 2013).

The criteria for evaluating adaptation options and the scale of rating were pointed out by beneficiaries from communities, local government bodies, and Non-Government Organization (NGO) groups. The assessment included:

- Selecting case study sites;
- Organizing focus group discussions inviting knowledgeable key persons (women and men) and ditto households;
- Identifying criteria for evaluating adaptation options including the scale of assessment;
- Preparing an inventory of adaptation measures; and
- Applying MCA to identify, categorize, and rank feasible options.

Ranking of adaptation options followed stakeholders' perceptions. It provided them an opportunity to discuss and reach a consensus about it. It was ultimately based on criteria weighting. A Likert scale of 1-5 was used, where 1 was regarded by local people as the lowest, 3 the medium, and 5 the highest rank. The scores and weights were based on stakeholder judgement. In this approach, the criteria were arranged along one axis of the matrix, while the adaptation options had been arranged along the other axis. Figure 1 provides detailed steps to identify the criteria and ranking adaptation options.



**Figure 1:** Process of multi-criteria analysis

We selected 4 locations in the Gandaki river basin, which covered upstream, mid-stream and downstream areas. This river basin was used for our study because of our affiliation with a project that was being implemented there.

These are the methods in detail we used for our research:

- **Discussion with communities:** Focus group discussions were organized with selected groups in the villages, who had been implementing climate change adaptation practices. They came from one Village Development Committee (VDC) in each of the 4 districts, Baglung, Kaski, Chitwan, and Nawalparasi. The idea was to discuss with them criteria and indicators of successful adaptation options/strategies. In all 15 persons were selected per VDC representing women and men from various locations and ethnic groups.
- **Discussion with local stakeholders:** Meetings were organized in VDCs in 3 districts, Chitwan, Kaski, and Baglung. At this level, the purpose was to get inputs from local government bodies and practitioners for the criteria to assess successful adaptation options/strategies.
- **Discussion with district-level stakeholders:** Here, the idea was to discuss the findings from the community level with district-level stakeholders to refine the criteria. A half-day meeting was organized to that effect.
- **Discussion with national-level stakeholders:** A half-day meeting was organized at the national level as well, to identify nationally applicable criteria.

# 3. Findings

## 3.1. National Perspective on the Criteria for Evaluating Adaptation Options

The discussion with policy makers and practitioners working in the field of climate change in Nepal revealed that there are no specific guidelines, criteria, and tools to evaluate adaptation options. Some brought up that, due to lack of research and publications on elements of successful adaptation, many activities tagged as climate change adaptation have not yielded positive results.

A policy making official from the Ministry of Climate Change said: 'There is actually confusion on what constitutes a good adaptation, since many of the current activities we have promoted, look like development activities. We need clear guidance and criteria for understanding the elements of a successful adaptation strategy.' At an interview, a representative from a development agency also raised the problem of the current gap in understanding adaptation strategies. She said: 'We also have a problem really identifying the impact of our adaptation projects. Most of the activities look like a continuation of development activities.'

The issue of attribution in climate change is evident in Nepal. Many adaptation projects look like regular development projects due to lack of clear understanding on what constitute successful adaptation strategies. Most practitioners in an international non-government organization said in an interview: 'There is an issue of attributing development interventions to adaptation. We can clearly see that many development interventions are labelled as climate change adaptation measures. Although they are effective in the short run, they have not really addressed climate change, and lack medium and long-term perspectives on how to address climate risk.' A female professional of an international organization added: 'It is now the right time for practitioners like us to come up with a good understanding of what constitute successful adaptation interventions.'

The discussion with policy makers further revealed that successful adaptation measures should be more incremental and sustainable. A key informant of the Ministry of Population and Environment said: 'A successful adaptation option or strategy contains elements of reducing disaster risk and of building the capacity of national and local government agencies and communities to respond effectively to climate change.' For development agencies, it entails a strategy to reduce climate risk and enhance local resilience. Participants from an INGO working on a nation-wide base defined it as 'the practice, which effectively reduces the risk and impact of climate change.'

National level stakeholders also looked at limits of adaptation. Most participants (90%) in a focus group discussion pointed out the following limiting factors: lack of technology access, limited funding, low capacity at national and local levels, and inadequate information and knowledge. The remaining mentioned the behaviour and action of stakeholders and individuals as limiting factors.

Participants at a national stakeholder workshop organized in Kathmandu discussed criteria for evaluating adaptation options. Most favoured context-specific criteria that can assess the effectiveness of interventions. They listed the following criteria:

- Effectiveness: a) linkages to climate change and non-climate change; b) knowledge (scientific and local); c) scale;
- Efficiency: a) human; b) natural; c) cost (cost/benefit);
- Sustainability: a) capacity (human/technical); b) responsiveness; c) awareness; d) resources (financial, natural); e) institutions/agency; f) acceptance; g) appropriateness; h) duration ;
- Equity: a) gender and social inclusiveness; b) participation; c) focus on poor;
- Resource efficiency (cost effectiveness) and governance (transparency and accountability);

- Risk of maladaptation (now or in future);
- Building adaptive capacity: increase adaptive capacity and resilience of communities and natural systems;
- Acceptability (political, bureaucratic, community, and private sector); and
- Sustainability (continuity, long-term feasibility, larger adoptability, future consideration).

In interviews with policy makers and practitioners at the national level, most were of the opinion that for adaptation to be effective it has to address climate risk and impact from hazards, improve the livelihood of vulnerable households, and contribute to building the adaptive capacity of local people. For example, policy makers working in government ministry said ‘for adaptation to be successful, it has to directly contribute in reducing climate risk and help the communities with skills and knowledge to respond effectively.’

Representatives from a UN organization thought that ‘good adaptation practices are those that reduce the cost of losses caused by climate-induced disasters and enhance the capacity of households to recover from such losses.’ The respondent from the INGO observed: ‘In my opinion, successful adaptation has to have strong elements of addressing risk and vulnerability of households.’

National level policy makers and practitioners (over 90%) were found to give more emphasis to effectiveness and efficiency as important criteria for a successful adaptation strategy. They also identified risk reduction, contribution to livelihood, and equity as major criteria.

Respondents among policy makers from government agencies consider that successful adaptation strategy would be effective when it is cost-effective in terms of technology and practice while addressing climate change impact.

### 3.2. District Level Perspective on Criteria for Evaluating Adaptation Options

Here, respondents came mostly from local government bodies, for example, district officials from agriculture, forestry, and livestock services. They thought there is a dearth of knowledge on the basic elements of successful adaptation. For this reason, they have a big problem identifying and prioritizing adaptation options. Over 90% of respondents observed that good adaptation practices should enhance local skills and people’s capacity to respond to climate change impact and manage risks; contribute to better livelihoods of vulnerable women and men, poor and marginalized households; and improve their biophysical environment.

NGO representatives felt that good practices should be linked very closely with addressing climate risk and building adaptive capacity of household and communities including local government. More than 60% feel that successful adaptation practices have to directly attribute to climate change and specifically address climate related issues such as impacts from hazards. The rest 40% felt that adaptation has to have strong livelihood and capacity building component. According to them, the successful adaptation should be linked to development. All the respondents, however, felt that successes of adaptation can be achieved if communities risk-bearing capacity is improved and their response mechanism is strong and viable.

A district level workshop held at Chitwan looked at constraints and limits of adaptation. Lack of knowledge, information, and skills regarding how to respond to climate change effectively were mentioned as factors. Also, lack of technological and financial resources to support and sustain adaptation were considered limiting factors. The workshop also identified evaluation criteria and prioritized adaptation options according to their relevance and applicability. Table 1 lists criteria recommended and prioritized by district level stakeholders in Chitwan district of Nepal. The field testing of these criteria was carried out by district level stakeholders in Gaidi of Devchuli municipality in Nawalparasi District.

The discussion with practitioners in Baglung District revealed that successful adaptation practices should be judged according to their overall contribution to safeguard the lives and livelihoods of communities and improve their capacity to respond to impacts more effectively in the future. An NGO worker said: ‘Adaptation options need to

**Table 1:** Criteria for evaluating adaptation options and their prioritization at district level

Criteria	Description	Priority ranking
Addressing specific climate change risk and impact	Able to address the issues of drought, flooding, heat stresses, cold waves, landslide, glacier lake outburst flood, etc.	1
Reducing the losses and damages from climate change impact	Able to reduce financial, human, and physical losses from climate change impact. For example, reducing the cost of losses from crop failure	2
Improving the well-being of vulnerable households and communities	Contribution to diversification of livelihoods and increase of risk recovery capacity	3
Efficient technology and practices	Low-cost and affordable by households and communities. It also includes resource efficiency	4
Context-specific and applicable (socially acceptable)	The technology and practice has to be context-specific and applicable	5
Sustainability of the practices and mobilization of local resource	Able to continue and expand to other geographic areas based on use of local resources	6
Equitable practices and ownership by group affected	Gender inclusive and socially equitable. Poor people, women, and marginalized groups have to benefit from them. For example, acquire ownership of some property	7

have elements of risk reduction and improving the livelihood of poor and marginalized communities. A government official observed: 'We think adaptation should provide knowledge and skills for households to respond to climate hazards or any weather variability'. Respondents from government offices in Kaski considered reducing disaster risks, improving livelihoods, conserving biodiversity, and building knowledge and skills of community's important criteria for evaluating adaptation options.

According to a female respondent 'adaptation is considered successful, if it can help us to deal with environmental stresses such as monsoon variability, water stresses, resource degradation and losses from disasters.' The chairperson of an NGO working in the district observed: 'We want a technology and practices in adaptation that safeguards our important resources such as wetlands, our livelihood resources such as food crops, and our nature.' A private sector respondent said: 'For me, adaptation practices should be measured against their ability to address issues we are facing from the weather, climate, and other natural events, and the effectiveness of a practice in making investment more secure in the context of climate change.' According to a professor of the Institute of Forestry, 'a successful adaptation practice should be measured in terms of its ability to build human and ecosystem resilience.'

### 3.3. Local Perspective on the Criteria for Evaluating Adaptation Options

There were local-level consultations through focus group discussions and interviews with key informants in Jugeedi VDC and the Panchakanya Water User group in Ratnanagar Municipality in Chitwan District and the Rupa lake watershed in Kaski District. It became clear that communities prioritize criteria that include both- addressing climate risk and enhancing the socio economic capacity of households. Also, communities were of the opinion that adaptation activities should help raise household incomes, provide options for diversifying livelihoods, increase skills and knowledge, and enhance access to resource and equitable benefit sharing of resources. The criteria for evaluating adaptation options suggested by communities are presented in Table 2.

The common line in the 3 locations is that any adaptation activities have to help improve socio economic conditions and livelihoods of the local people, including employment opportunities. Most key informants thought adaptation activities should target particularly households with low incomes, and/or prone to disaster and climate risk. A female respondent in Jugeedi VDC said: 'Adaptation should target the poor and women and especially farmers who have faced losses from disasters and other extreme events.' The key informants in Rupa lake watershed area also said

**Table 2:** Agreed criteria for evaluating successful adaptation practices at community level for 3 villages

Priorities	Jugedi village, Chitwan	Ratnanagar municipality- Chitwan	Rupa lake, Kaski
1	Contribution to improve the economic condition of poor and marginalized, and vulnerable households (income diversification)	Contribution in improving the economic condition of poor and marginalized groups	Contribution in poverty reduction mostly increasing income status of poor and marginalized households
2	Contribution in improving the social status of poor and marginalized households (unity and collective action)	Contribution in addressing specific climate related risk such as in water and agriculture	Able to address the direct and indirect impact of temperature rise, rainfall variability, and extreme events (drought, landslide)
3	Support in disaster and climate risk reduction	Contribution in reducing the risk and impact of climate change	Contribution in addressing climate related hazards, risk, and impact, particularly in water resources and agriculture
4	Management of local resources	Contribute in conservation and management of biodiversity including food crops	Provide solutions to manage critical watersheds, wetlands and biodiversity rich resources including water and agriculture
5	Contribution in improving employment for climate change vulnerable households	Generate employment opportunity in the village	Support in creating rural employment, particularly targeting vulnerable households
6	Improve the skills and knowledge of households and communities to respond effectively to climate change risk and impact	Contribution in sensitizing and enhancing the knowledge of community on climate change issues	Transfer skills, knowledge, technology, and resources to help communities adapt to the changing climatic situation

‘adaptation is for poor so if it improves their live and provide good support, then it is successful otherwise how can we say it as successful practice’.

People at the 3 locations also talked about the limits of adaptation. According to the respondents from the Panchakanya User Group, such limits are mostly caused by the weak governance of institutions and a lack of external support. Respondents from Rupa lake watershed thought that adaptation limits are more related to technology and finance. Respondents of Jugedi said ‘Adaptation limits are mostly related to the inability of a local institution and/or state agencies to respond to climate change adequately. This may be caused by a lack of knowledge, resources, and capacity.’

The group discussion in Jugedi focused on both types of evaluation criteria: for autonomous adaptation- followed by farmers since generations, and planned adaptation- supported by an INGO and local government agencies working in the area. Participants first identified the criteria (Table 3, column 1), then worked toward a collective consensus on them. Next, they listed the adaptation activities they were practicing in their villages based on the relevance to climate change.

Afterwards they discussed the scoring methods. They preferred the scale from 1-5, in which 1 refers to the least and 5 to the highest contribution of activities against criteria set. After identifying the scale, they listed the adaptation practice in one row and 7 criteria. After that, they had a discussion and provided weightage to each criterion against the adaptation practices as listed in Table 3.

The outcome of the FGD showed that farmers’ field school and improvement of irrigation facilities are the two major successful adaptation practices as perceived by local people. It also showed that river bank protection, plantation in degraded lands, mixed cropping, and veterinary training were also considered as adaptation practices.

**Table 3:** Scoring of adaptation practices according to criteria

Adaptation practice	Criterion one	Criterion two	Criterion three	Criterion four	Criterion five	Criterion six	Criterion seven	Total score
Farmers' field school	4	4	4	3	4	4	5	28 (80%)
River bank protection including check dams	2	2	5	3	4	4	3	23 (66%)
Plantation in degraded lands	3	3	4	3	4	2	3	22 (63%)
Weather station to record temp., rainfall	1	1	2	1	1	3	3	12 (34%)
Mixed cropping (vegetables and food crops)	4	4	2	4	4	4	2	24 (69%)
Improvement of irrigation facilities	4	4	4	4	4	4	5	29 (83%)
Veterinary training to farmers	4	3	1	4	3	4	1	20 (57%)
Wooden bridge	1	1	4	2	2	2	2	14 (40%)

Significantly, although weather stations and a wooden bridge construction had contributed to address climate risks, communities scored them below average. They thought these technical options were not leading to successful adaptation. Even stronger; although the station had been installed to provide skills and knowledge to local people to record data and to give useful weather information for farming decisions, people almost rejected this facility. The Secretary of the Village Development Committee explained: 'The weather station was not suitable, since it required continuous monitoring, recording, and the application of daily weather data was not useful for the farmers.' The chairperson of the farmers group in the village also said: 'We could not really see any benefits of weather stations, why it was installed, and what support it provided.'

There were also some development interventions that came up as adaptation practices. It is evident from the Table that mixed cropping and veterinary training were perceived as giving the least contribution to address climate risk directly, although they had helped increase income and diversify livelihoods. Interestingly, farmers prefer them as successful adaptation practices nevertheless. A female respondent explained: 'We prefer interventions that have social and economic significance also; mixed farming may contribute to address risk in the long run but that is not visible now.'

## 4. Discussions

An important finding is that adaptation has to be incremental and transformative. The definition of successful adaptation given by the stakeholders consulted in this research clearly indicates the necessity of addressing not just climate risk but also other drivers of poverty and vulnerability such as income inequality, biodiversity loss, land degradation, social exclusion, and equitable benefit sharing. Wise et al., (2014) pointed out that implemented actions have been mostly incremental and focused on proximate causes. There are very few reports of more systemic or transformative adaptation. Successful adaptation needs are dynamic and context-specific, and vary between and among different stakeholder groups and individuals (Noble et al., 2014).

The finding at the local level clearly shows that criteria for evaluating adaptation options differ at scales and vary from context and group level. A blanket approach of using a fixed set of criteria to evaluate adaptation options will not be productive, because it will not correctly reflect and represent local realities and extent of impact and effectiveness of adaptation interventions. The findings support earlier statements that successful climate change adaptation should be evaluated according to location-specific and context-specific criteria (Adger et al., 2005; Smit et al., 2003).

From the findings it was revealed that examining the social dynamics and outcomes of adaptation moves beyond simply accounting for the economic costs and benefits of adaptation. We need to consider the social acceptability of adaptation options, the institutional constraints for adaptation, and the location of an adaptation event in the wider context of economic development and of the evolution of societies in future. This is in line with Adger et al., (2005) and Doria et al., (2009) who argue that successful adaptation has to be also judged based on the socio-cultural and institutional context. Adaptations are typically undertaken in response to multiple risks, and often as part of existing processes or programmes, such as livelihood enhancement (Adger et al., 2007).

Bidsbroek et al., (2013) argued that considerable barriers can emerge in developing and implementing climate change adaptation strategies. The findings in this research also showed that at national, district, and local level policy makers, practitioners, and communities identified technological, financial, behavioural, institutional, and governance factors as major constraints for adaptation.

## 5. Conclusion

Our literature review of criteria for evaluating successful adaptation options almost matched with the national level stakeholders' suggestive list of evaluation criteria. However, it was found that, national level, stakeholders were more interested in specifying criteria as effectiveness, efficiency, and equity in more meaningful and practical ways. Besides the 3 general criteria, they emphasized criteria such as: Poor and gender focused; Risk of maladaptation (whether or not adaptation has any risk of future maladaptation); and Increase in adaptive capacity and resilience of communities and natural systems.

At district level, a different set of criteria was identified by local stakeholders to evaluate adaptation options. It included reducing loss and damage, addressing climate risk of vulnerable households, effectiveness of responses, equity and efficiency.

Local level stakeholders more emphasized criteria such as the ability of an adaptation practice to reduce risk and impact of climate change including the losses from that impact. They stressed that the criteria should be resource efficient, inclusive, and equitable, so they should target poor people, women, and marginalized and vulnerable groups. They also thought that appropriate technology and its ability to improve the livelihoods of communities should be an important element of a successful adaptation practice.

The local level stakeholders mostly the communities and households perceived that any successful adaptation activities should not only reduce the risk and impact of climate change but also improve their social, economic and livelihood conditions. Communities emphasized that adaptation should generate income and employment locally. They also thought that a successful adaptation practice should enhance their knowledge and skills to respond to the risk and impact of climate change.

Looking at the 3 levels of criteria indicated by stakeholders working with different scales, it appears that these criteria are context-specific and different according to the level of stakeholders and their priorities.

National level stakeholders looked more at the effectiveness and efficiency of the technology and practices, whereas the local-level stakeholders focused more on reducing risk and enhancing the socio economic capacity of households to deal with climate stresses.

At community level specifically, people put greater emphasis on the integrated nature of adaptation that can reduce climate risk, build capacity of households, and help conserve and protect local resources and livelihood assets. The discussion with communities also brought out that interventions that only reduce climate risk and do not contribute to livelihoods, are not regarded by them as successful adaptation. This clearly shows the links of climate change with development.

Further, the findings showed what national, district, and local stakeholders consider the success elements of adaptation. Our research suggests that a successful adaptation intervention is effective, efficient, and equitable in terms of addressing climate risk and improving the livelihoods of poor, marginalized, and vulnerable households. Successful adaptation interventions at sub-national level should give more priority to risk reduction and building adaptive capacity.

We conclude then that a successful adaptation practice should embrace the twin objectives of addressing climate risk and enhancing the livelihood of poor and vulnerable households— at the same time. This is an important lesson for the design of adaptation interventions such as for the NAP (National Adaptation Plan) and Local Adaptation Plans of Action (LAPA) in Nepal.

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