HI-AWARE Training Manual

HI-AWARE
Himalayan Adaptation, Water and Resilience Research

CARIAA
Collaborative Adaptation Research Initiative in Africa and Asia

Using the Analytic Hierarchy Process to support decision making on climate change adaptation

Consortium members

BCAS

ICIMOD

teri

WAGENINGEN
UNIVERSITY & RESEARCH

About

This manual is based on the work of the Himalayan Adaptation, Water and Resilience (HI-AWARE) consortium under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) with financial support from the UK Government's Department for International Development and the International Development Research Centre, Ottawa, Canada. CARIAA aims to build the resilience of vulnerable populations and their livelihoods in three climate change hot spots in Africa and Asia. The programme supports collaborative research to inform adaptation policy and practice.

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.

The HI-AWARE consortium is led by the International Centre for Integrated Mountain Development (ICIMOD). The other consortium members are the Bangladesh Centre for Advanced Studies (BCAS), The Energy and Resources Institute (TERI), the Climate Change, Alternative Energy, and Water Resources Institute of the Pakistan Agricultural Research Council (CAEWRI-PARC) and Wageningen Environmental Research (Alterra). For more details see www.hi-aware.org.

Authors

Soumyadeep Banerjee	Email: soumyadeep.banerjee@protonmail.ch
Avash Pandey	Email: avash.pandey@icimod.org
Bal Krishna Jamarkattel	Email: bal.jamarkattel@care.org
Jagannath Joshi	Email: jagannath.joshi@care.org
Barsha R. Gurung	Email: barsha.gurung@care.org
Arabinda Mishra	Email: arabinda.mishra@icimod.org

Acknowledgements

This work was carried out by the Himalayan Adaptation, Water and Resilience (HI-AWARE) consortium under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) with financial support from the UK Government's Department for International Development and the International Development Research Centre, Ottawa, Canada.

HI-AWARE Training Manual

Using the Analytic Hierarchy Process to support decision making on climate change adaptation

Authors

Soumyadeep Banerjee[1], Avash Pandey[1], Bal Krishna Jamarkattel[2], Jagannath Joshi[2], Barsha R. Gurung[2], Arabinda Mishra[1]

Himalayan Adaptation, Water and Resilience (HI-AWARE) Research
Kathmandu, Nepal, July 2020

[1] International Centre for Integrated Mountain Development, Nepal
[2] CARE, Nepal

Published by

HI-AWARE Consortium Secretariat
Himalayan Adaptation, Water and Resilience (HI-AWARE) Research
c/o ICIMOD
GPO Box 3226, Kathmandu, Nepal

ISBN 978 92 9115 692 4 (electronic)

Production team

Shradha Ghale (Consultant editor)
Rachana Chettri (Editor)
Debabrat Sukla (Communication officer, HI-AWARE)
Mohd Abdul Fahad (Graphic designer)

Citation: Banerjee, S., Pandey, A., Jamarkattel, B.K., Joshi, J., Gurung, B.R., Mishra, A. (2020) *Using the Analytic Hierarchy Process to support decision making on climate change adaptation*. HI-AWARE Training Manual. Kathmandu: HI-AWARE

Contents

About the training manual iv

Section 1: Preparation for a workshop on climate change adaptation planning 1–5

Section 2: Conducting the workshop and facilitating the sessions 6–23

Planning workshop on climate change adaptation
Welcome and introductory session
Adaptation planning pathway at the local level
Explanatory notes to the trainer/facilitator

Thematic Session 1: Climate change adaptation
Thematic Session 2: Overview of the Local Adaptation Plan for Action
Thematic Session 3: Introduction to the Analytic Hierarchy Approach
Thematic Session 4: Finalizing the criteria and their relative weights
Thematic Session 5: Pairwise comparison of adaptation options
Thematic Session 6: Presentation of the results of the prioritization exercise
Thematic Session 7: The way forward and closing remarks

Section 3: Evaluation of the climate change adaptation planning workshop 24–26

About the manual

This training manual has been designed based on existing literature on the Analytic Hierarchy Process (AHP) and is set within the Government of Nepal's National Framework on Local Adaptation Plans for Action (LAPA). The content of the manual has been enriched by the feedback of participants from national-level training of trainers (ToT) as well as Climate Change Adaptation and Disaster Risk Reduction Planning Workshops organized in Myagde Rural Municipality, Tanahun district, and Kalilka Urban Municipality, Chitwan district, of Nepal. In coordination with respective municipalities and local NGOs (i.e., GONESA in Tanhun district and Diyalo Pariwar in Chitwan district), these workshops were jointly organized by CARE Nepal, USAID funded Hariyo Ban Programme and International Centre for Integrated Mountain Development's Himalayan Adaptation, Water and Resilience (HI-AWARE) Research on Glacier and Snowpack Dependent Basins for Improving Livelihoods.

This training manual is aimed at supporting decision-makers in government institutions, international agencies, civil society and other development partners at the national and sub-national levels. For example, this training manual would be useful for climate change adaptation decision-makers at the national, provincial and municipality levels in Nepal.

The objectives of this manual are:

- To support adaptation decision-makers in government institutions, international agencies, civil society and other development partners to identify and prioritize adaptation solutions;
- To facilitate transparent communication and support consensus building among various stakeholders (e.g., community members, government officials, civil society, political representatives, academia, private sector and policy organizations) in the context of adaptation planning; and
- To provide practitioners with a manual that could guide them to organize a climate change adaptation planning workshop.

The training outcome would be critical in terms of developing a thought process for the decision-makers on:

- How can transparency be improved in communication among various stakeholders in the context of climate change adaptation planning?
- How can consensus be built among various stakeholders regarding prioritization of adaptation options and strategies?
- How can indigenous populations, socially marginalised groups and women be involved in climate change adaptation planning?

The manual is based on a workshop approach. On one hand, it makes the learning practical and useful for the participants. On the other, it makes it easier for the trainers to effectively facilitate the planning process. The manual aims to assist the prospective trainers/facilitators to organize ToTs and conduct a climate change adaptation planning workshop. It describes essential processes that would contribute to the successful organization of a workshop.

The manual is divided into three sections:

- Section 1 discusses the preparations required for a workshop on climate change adaptation planning and the role of a trainer/facilitator;
- Section 2 provides an overview of the training/planning workshop, including descriptions of various thematic sessions; and
- Section 3 presents the evaluation form.

This manual is a 'live' document. It is assumed that its content will continue to evolve based on stakeholders' feedback received during different ToTs and planning workshops. Based on the local and contextual requirements, the content of the manual could be customised. The trainers/facilitators are free to restructure the sessions and add relevant exercises, case studies, and games.

SECTION 1

Preparation for a workshop on climate change adaptation planning

Preparations for a workshop on climate change adaptation planning

Adaptation planning and decision support tools

Developing countries face a number of challenges in achieving the Sustainable Development Goals. One of the key challenges is environmental change, including those posed by climate change and variability. Between 2005 and 2015, disasters across the world resulted in economic losses worth over USD 1.3 trillion and affected over 1.5 billion people, particularly women, children and people in vulnerable situations (United Nations General Assembly 2015, p.10). Due to frequently occurring extreme weather events, the coping capacity is overwhelmed and long-term socioeconomic development is hampered in many developing countries.

Through adaptation, humans seek to either moderate the harm or exploit the opportunities associated with actual or expected climate and its effects (IPCC, 2014). Adaptation takes place at different levels: regional, national, sub-national and local. The adaptation decision-making process involves a wide range of stakeholders (e.g., government officials, political representatives, private sector, policy organizations, academia, civil society, community-based organizations, and community members). Considering the uncertainties about the impacts of climate change, disparate requirements of stakeholders, and the need for budget and human resources, prioritizing adaptation options is both an important and challenging task for decision-makers. The National Framework on Local Adaptation Plans for Action (2011) of Nepal identifies prioritization of adaptation options as one of the seven steps for the formulation and implementation of Local Adaptation Plans for Action (GoN, 2011).

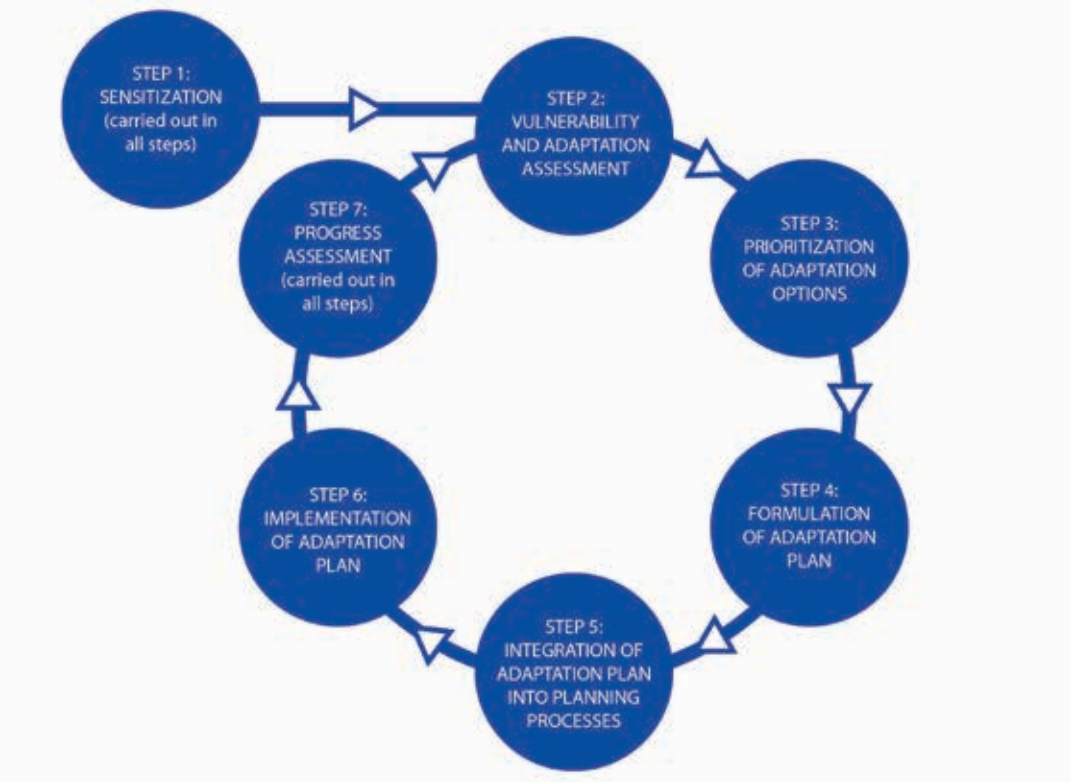

Figure 1: LAPA steps in cyclic order (GoN, 2011)

Adaptation decision making is context-specific. There are different approaches, methods and tools to support adaptation decision making – e.g., cost-benefit analysis, cost-effectiveness analysis, iterative risk management, multi-criteria analysis, portfolio analysis and robust decision making (Bharwani et al., 2013). The choice of approach, method or tool depends on the nature of the problem and the characteristics of the decision-making system. Moreover, adaptation decision making is characterised by uncertainty. For example, a municipality may need to select flood preparedness measures even when they are aware of the uncertainties associated with floods (e.g., incidence, magnitude, return period and location). These uncertainties are further accentuated when institutions have to address the impacts of multiple hazards in the same location.

Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) is a multi-criteria decision making method developed by Thomas L. Saaty in 1977. It is used to analyse a complex decision-making problem, which requires multiple perspectives to be considered. The problem is decomposed into a hierarchy. The AHP is designed to select the best option from a number of alternatives, which are evaluated in the context of several criteria that could be tangible as well as intangible. Overall priorities are developed for ranking the alternatives by using simple pairwise comparison judgements by decision-makers. The AHP evaluates the consistency of judgements (Saaty and Vargas, 2001).

The AHP has been applied to business management, climate change, education, engineering and quality assessment. It is a useful method in situations where it is difficult to quantify or compare elements of the decision, or where consensus-building and communication among stakeholders is constrained by differences in expertise, goals and worldviews (Bharwani et al. 2013).

Training phases

Trainers/facilitators would have to consider three phases of the training:

1) Planning and preparation: Trainers/facilitators would have to decide the aim and scope of the ToT or planning workshop, including contents, duration, participants and overall setting.

Trainers would have to undertake the following actions during this phase:

- Develop the scope, content and structure;
- Incorporate feedback from major stakeholders in content development;
- Prepare details of different sessions;
- Prepare a list of participants with a special focus on gender and social inclusion;
- Organize logistics; and
- Identify facilitators and resource persons.

2) Implementation: ToT or planning workshop organized.

Trainers/facilitators would have to undertake the following actions during this phase:

- Conduct the planned sessions as per the programme;
- Create a conducive environment for co-learning;
- Facilitate interaction between participants;
- Ensure that participants from indigenous groups, socially marginalized groups and women receive opportunities to contribute; and
- Evaluate daily performance, gather participants' feedback and improve the workshop design.

3) Follow-up phase: During this phase, participants, either individually or collectively, use learning from the ToT or planning workshop.

Trainers/facilitators would have to undertake the following actions during this phase:

- Seek feedback from participants about the use of learning;
- Provide technical support to participants as they attempt to utilize their learning; and
- Use the feedback from participants to further enhance the content and design of the workshop.

Materials

Adequate materials need to be organized in order to effectively facilitate the ToT or planning workshop. Use the following checklist to see if the required materials have been organized:

Checklist for materials	Tick
Programme that outlines detailed activities for each day	
Day-wise attendance sheet	
Stationery (e.g., adhesive tape, board pins, flip charts, meta card, permanent markers, etc.)	
Equipment (e.g., audio speaker, computer, LCD projector, microphone, electricity back-up, etc.).	
Reading and audio-visual material for different sessions	
Relevant local reference material (e.g., plans, policies, regulations, budgets, profiles, baselines, reports, etc.)	
Presentations that introduce different sessions	
Study area maps for group exercises	
Evaluation forms	

Trainers/facilitators[1]

Identify trainers/facilitators who could make important contributions during the ToT or planning workshop and thus make it an interesting learning exercise. The trainers/facilitators should:

- Be aware of the background, objectives and contents of the training;
- Have practical experience;
- Have good communication skills;
- Have the ability to understand general behaviour and body language;
- Be able to relate to participants' learning abilities and training needs and read their expectations;
- Be flexible enough to allow participants to learn at their own pace;
- Be polite, respectful, committed, and enthusiastic; and
- Be aware of the local socio-political context.

[1]Modified from Shakya, B., Ali, G., Dorji, T., Bhuchar, S., Lepcha, R.S., Tandukar, D., Gyawali, R., Maharjan, B., Goodrich, C.G., Basnet, D., Saoliang, Y. (2017) Promoting innovative livelihoods ecotourism and value chains for sustainable landscape management – Trainer's manual. ICIMOD Manual 2017/12. Kathmandu: ICIMOD

Resource persons

Identify resource persons who could make important contributions on specific themes (e.g., agriculture and food security, forest and biodiversity, water and energy, climate induced and other disasters, etc.) during the ToT or planning workshop. Ideally the resource persons should:

- Be experts on the subject matter and/or local context;
- Be aware of the background and objectives of the training;
- Be aware of government legislations, policies, programmes and regulations;
- Have practical experience; and
- Have good communication skills.

Logistics

The organizer and the trainer need to ensure that appropriate logistics arrangements are made for the ToT or planning workshop. Use the following checklist to see if the logistics requirements have been addressed:

Logistics checklist	**Tick**
The venue is convenient for the majority of participants. Its size is appropriate for the given number of participants. It is well lit and ventilated. Prior visits should be made to the venue to assess its condition.	
The workshop setting provides a comfortable ambience for learning and the exchange of ideas and opinions among participants, and there is adequate infrastructure to support thematic learning.	
The venue has facilities for audio-visual presentation, and has adequate space for the white board, LCD screen and flip charts.	
The venue has good audio-visual equipment and backup power, particularly if audio-visual presentations are to be used as learning aids.	
Participants are informed well ahead of the event (including additional follow-ups for people from indigenous groups, marginalized communities and women) and the learning objectives are explained to them.	
Confirmations are obtained for the participation of key personnel (e.g., planning officer/executive officer) for the entire duration of the workshop and/or political representatives (e.g. mayor) to ensure that they are available to chair the opening and closing sessions.	
Local partners are available to assist workshop sessions and they are regarded as resource persons.	
Safety measures are in place and participants are informed.	
Participants or the trainees have received proper invitation and pre-training information materials.	
Arrangement for accommodation, food and transportation.	

Further reading

Bharwani, S., Varela-Ortega, C., Blanco, I., Esteve, P., Juarez, E., Trombi, G., Moriondo, M., Bindi, M., Devisscher, T., Taylor, R. and Watkiss, P. (2013). Analytic Hierarchy Process (AHP). Decision Support Methods for Adaptation, MEDIATION Project, Briefing Note 7. Funded by the EC's 7FWP.

Saaty, T. L., & Vargas, L. G. (2001). How to make a decision. In *Models, Methods, Concepts & Applications of the Analytic Hierarchy Process*, pp. 1–25. Boston, MA: Springer.

SECTION 2

Conducting the workshop and facilitating the sessions

Welcome and introductory session

Learning objectives

By the end of this session the participants will:

- Get to know each other
- Get an overview of the scope, objectives and content of the planning workshop

Time

45–60 minutes

A registration desk will be set up to facilitate the participants' interaction with the workshop organizers (hereafter 'organizers'). It is important that interactions between the participants and organizers stay informal. The registration desk would be a starting point for the organizers to make the participants feel comfortable.

An informal setting would help the participants be at ease. For example, a tea stall at the entrance would create a conducive environment for participants to interact with each other.

The welcome and introductory session would be around 45–60 minutes. Welcome remarks would be given by the emcee (preferably the Chief Planning/Executive Officer of the local government). Local government representatives such as the Mayor, Deputy Mayor, Chairperson or Vice Chairperson would be requested to take a seat on the dais. The chief guest (preferably the Mayor, Deputy Mayor, Chairperson or Vice Chairperson) would deliver the opening remarks on the relevance of the workshop in the context of municipality level planning. This would highlight the importance of the workshop and participants' contribution during the event. One of the organizers would provide a brief overview of the workshop's scope and content. Participants would be requested to introduce themselves.

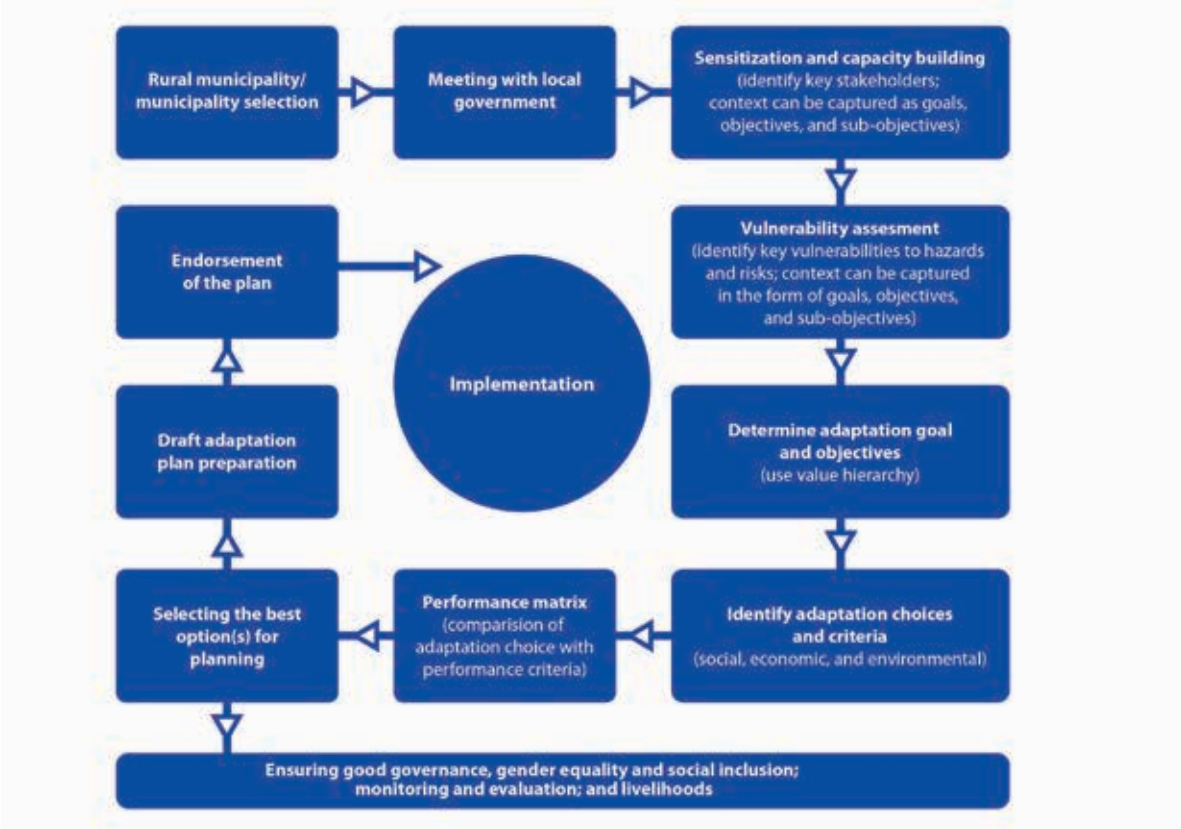

Figure 2: Adaptation planning pathway at the local level

Explanatory notes to the trainer/facilitator

Examples of participant's introduction

1. Brief version (half minute per person)

Participant provides his/her name, address and affiliation to any organization.

2. Longer version (2–3 minutes per person)

Participant provides his/her name, address and affiliation to any organization. A metacard would be provided to each participant. They would be requested to note their expectations from the workshop. These metacards would be put up on a soft board for display. After the workshop is completed, participants could review these cards to check whether their expectations have been met.

Inclusiveness and gender sensitivity

To be inclusive of indigenous groups, socially marginalized groups and women, a strategy could be adopted at the beginning of the workshop. For example:

- Place chairs of two different colours and ask the women to sit on chairs of one colour and the men on the other.
- Ask the participants to sit next to a person they do not know or have not interacted with.
- Through a lottery, allocate seats to the participants to ensure interaction between participants from various social groups.
- The trainer/facilitator could ensure that while asking questions to the participants, he/she encourages persons from disadvantaged groups to share their inputs/feedback.

Thematic session 1: Climate change adaptation

Learning objectives

By the end of this session, the participants are expected to have an overview of the following:

- Observed climate trends and future climate change scenarios
- Impacts of climate change on different sectors
- Climate change adaptation in different sectors

Time

90 minutes

General introduction

A better understanding of the observed climate trends is essential for adaptation planning. An analysis of observed temperature trends in Nepal between 1971 and 2014 indicates that average annual maximum temperature has been increasing significantly over the years (0.056oC/yr). Minimum temperature shows a significant increase only in the monsoon season. Moreover, the warm spell duration is increasing significantly in majority of the districts (Government of Nepal, 2017b). No clear trend was observed for rainfall. Between 1971 and 2014, significant trends in pre-monsoon and monsoon precipitation were observed in a few districts. The precipitation trends during winter and the post-monsoon season were insignificant in most of the districts. In the High Himalayan region, a significant negative trend was observed only in pre-monsoon precipitation. The trend analysis indicated a significant increase in the number of rainy days mainly in the northwestern districts. There was a significant decrease in very wet days and extremely wet days mainly in the northern districts (Government of Nepal, 2017b).

The impacts of changing climate are affecting lives and livelihoods in Nepal. There is a growing risk of drought and water shortage, heat waves, flash floods/floods, glacial lake outburst floods and landslides. These hazards have adverse impacts on agriculture, biodiversity, energy, human health, livelihoods, physical infrastructure and water supply. Since the livelihoods of many people in Nepal are dependent on natural resources (e.g., forest, land, water and soil), climate induced shocks and stressors could negatively affect the wellbeing of these households. For example, a decline in the availability of water due to the drying up of springs could lead to a decline in crop yield and production, decline in food security among subsistence farmers/women farmers, decline in cash income, decline in the quality of fodder, increase in human-wildlife conflict, increase in disease in livestock, increase in the necessity to borrow money and inability to repay existing loans.

It is necessary for participants to understand climate change related risks, including uncertainty. A better understanding of climate change risks would reinforce the need for planned adaptation measures and assist in the identification of suitable adaptation measures. For example, measures to improve water storage, water recycling and reuse, on-farm water conservation, increasing water productivity, water re-allocation, improved irrigation scheduling and moisture control could be considered for addressing water shortage.

Exercise: A presentation or video on climate change impacts and adaptation

The trainer/facilitator would make a presentation on climate change impacts and adaptation with a special focus on Nepal. If possible, a video on this subject could be screened in lieu of a presentation. The duration of the presentation or video should be a maximum of 30 minutes. The presentation or screening would be followed by a group discussion where participants would be encouraged to ask questions. Prior to this session, the trainer/facilitator could coordinate with the resource persons to make this session an interactive one.

Explanatory notes for the trainer/facilitator

- Prepare a presentation or identify a video with a special focus on climate change impacts and adaptation in the area where the workshop is taking place.

- Prior to this session, the trainer/facilitator and resource persons could jointly formulate a set of frequently asked questions (FAQs), which could help to initiate a discussion.

Further reading:

Dangal, R. (n.d.). Disaster risk management: Policies and practices in Nepal. Kathmandu.

Government of Nepal. 2017a. Synthesis of the stocktaking report for the National Adaptation Plan (NAP) formulation process in Nepal. Kathmandu: Ministry of Population and Environment.

Government of Nepal. 2017b. Observed climate trend analysis in districts and physiographic regions of Nepal (1971–2014). Kathmandu: Ministry of Population and Environment.

IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.

Jamarkattel, B.K., Hamal, S.S., Gautam, D.R., Regmi, S.K. & Rijal, D. 2016. Building resilience through integration and mainstreaming of climate change adaptation and disaster risk reduction: Lessons from the Hariyo Ban Program in Nepal. Discussion Paper. Kathmandu: CARE Nepal.

P. Wester, A. Mishra, A. Mukherji, A. B. Shrestha (eds) (2019) The Hindu Kush Himalaya Assessment—Mountains, climate change, sustainability and people. Springer Nature Switzerland AG, Cham.

Synnott, P. (2012). Climate change, agriculture, & food security in Nepal. *Developing adaptation strategies and cultivating resilience. Report prepared for Mercy Corps Nepal*.

Tiwari, K. R., Rayamajhi, S., Pokharel, R. K., & Balla, M. K. (2014). Does Nepal's climate change adaptation policy and practices address poor and vulnerable communities? Journal of Law, 23(Npc 2007), 2224–3259.

UNDP. (2010). Local governance and climate change: A discussion note.

Thematic session 2: Overview of the Local Adaptation Plan for Action

Learning objectives

By the end of this session, the participants are expected to:

- Have an overview of Local Adaptation Plan for Action (LAPA)
- Identify gaps in various thematic sectors of the LAPA

Time

120 minutes

General introduction

Nepal is party to the United Nations Framework Convention on Climate Change (UNFCCC). Nepal had prepared a National Adaptation Programme of Action (NAPA) in 2010. The NAPA and the Climate Change Policy (2011) suggest that the government shall disburse at least 80 percent of the available budget directly for local level implementation of adaptation actions. The NAPA had identified six thematic areas: agriculture and food security, forests and biodiversity, public health, water resources and energy, urban settlement and infrastructure, and climate induced disaster. The NAPA process identified the need to develop Local Adaptation Plans for Action (LAPA) to integrate local people's adaptation needs into the planning system at various levels. The LAPA Framework enables communities to identify risks from climate change induced stressors and shocks, engage effectively in the process of developing adaptation priorities, implement climate resilient plans, and inform and catalyse integrated approaches between sectors. The sector, location, resource availability and distribution system and community's access to public services are considered during the development of a LAPA (Government of Nepal, 2011). With the adoption of the new federal structure in 2017, the VDC-level LAPAs are being integrated and updated to meet the requirements of the new administrative units, i.e. wards of the new municipalities.

Exercise: Identification of gaps in sector-specific adaptation options and strategies (group work)

The trainer/facilitator could present an overview of adaptation options and strategies identified in the LAPA, including gaps in sector- or location-specific information. The duration of presentation would be a maximum of 20 minutes. This presentation of adaptation options and strategies would be followed by a group exercise. The primary objective of the group exercise would be to address the gaps in information about adaptation options/strategies and their locations in the LAPA. Participants would be encouraged to provide relevant information to address these gaps. Participants would be divided into sector-specific groups. For example, these sectors could be agriculture and food security, forest and biodiversity, water and energy, climate induced and other disasters, human health and livelihoods, and urban settlement and physical infrastructure. Sector specific information could also be presented in a chart. Each group could be provided the relevant chart during the group exercise. These charts could be a useful visual aid for identifying missing information as well as for documenting new information in a systematic way. A facilitator should be identified for each group to guide the group exercise. Maximum duration of the group work would be 60 minutes.

Once the group exercise is completed, group presentations could be organized in a world café style. Each group would present only the major findings and collect feedback from other participants. Afterwards, the participants would move to the next group to repeat the same process. Photo: Identifying the strategies within the LAPA and adding missing information in the area of agriculture and food security during the planning workshop in Myagde Rural Municipality, Tanahun district, Nepal.

Explanatory notes for the trainer/facilitator

- A presentation on LAPA and Nepal's involvement in the UNFCCC would be helpful for participants to understand the background.
- Prepare a chart with location specific information on adaptation options and strategies for each sector.

- Ensure that while organizing participants into sector-specific groups there is representation of indigenous persons, socially marginalized and women in each group.
- Include relevant officials from the municipality, experts from local educational institutions and NGOs and political representatives in each sector-specific group.
- Ensure that each group has participants from different municipal wards.
- Ensure that someone familiar with the theme/sector facilitates the group exercise. For example, a forest official or representative of community forest users' group could facilitate the forest and biodiversity group.
- It is advisable to invite relevant representatives from the private sector.
- If there is no LAPA for a municipality:

  required socioeconomic and bio-physical data should be collected, vulnerability assessment should be conducted and adaptations strategies/options/solutions should be identified prior to this planning workshop

  a LAPA from a neighbouring municipality could be used as an example/template to facilitate group discussions.
- Give 6 minutes for each group to present only the main findings. If they exceed the given time, politely ask them to finish the presentation. This can be done with a time-keeper who notifies the presenter on the amount of time left.
- Encourage indigenous persons, people from socially marginalized groups or women to present the major findings of the group exercise.

Further reading:

Peniston, B. (2013). High mountains adaptation partnership: A review of Nepal's Local Adaptation Plans of Actions (LAPA). *High Mountains Adaptation Partnership. USAID and The Mountain Institute, 8*.

Bahadur, T., Air, A., Uprety, B. K., & Midha, N. (2017). Nepal's approach to climate change adaptation with Local Adaptation Plans for Action (LAPAs): A water resource perspective. Retrieved from https://www.gwp.org/contentassets/731a9cc2fdde482abe2ce1622034d595/wacdep-case-study-nepal.pdf

Government of Nepal, 2011. National framework on local adaptation plans for action. Government of Nepal, Ministry of Science Technology and Environment, Singha Durbar.

Thematic session 3: Introduction to the Analytic Hierarchy Approach

Learning objectives

By the end of the session participants will have an understanding of:

- The Analytic Hierarchy Approach (AHP)
- How the AHP could help in prioritizing adaptation options and strategies

Time

60 minutes

General introduction

The AHP is a multi-criteria decision-making method that could be applied to complex problems involving multiple scenarios, criteria and stakeholders. In this decision-making process, the importance of an option is compared to another in the context of a given criterion Both tangible and intangible elements could be considered in this method. For example, to address water shortage, how important is water recycling compared to the construction of water storage infrastructure in terms of economic cost? The derived priority scales are then synthesized and the various weighted scores are aggregated.

Based on Saaty (1980), the following steps are suggested:

- Define the adaptation challenge ('problem').
- Prepare an inventory of the adaptation options and strategies ('alternatives') to be evaluated.
- Identify the criteria and sub-criteria for evaluating the adaptation options and strategies.
- Develop the decision hierarchy, and identify the top-level criteria, the intermediate criteria, and the set of options (Figure 3).
- Undertake a pairwise comparison that compares one adaptation option with another to ascertain the importance of the former in the context of a criterion. The Saaty's scale is used to conduct the pairwise comparison (Figure 4) and construct a set of pairwise comparison matrices (Figure 5). These matrices are used to compare the alternatives (e.g., adaptation options) with respect to each criterion, and the criterion with respect to the goal.
- Use a spreadsheet or software (e.g., ExpertChoice) to calculate relative priorities. The aggregation of relative priorities to produce overall priorities (final evaluation metrics), which add up to 1.0, is the final step.

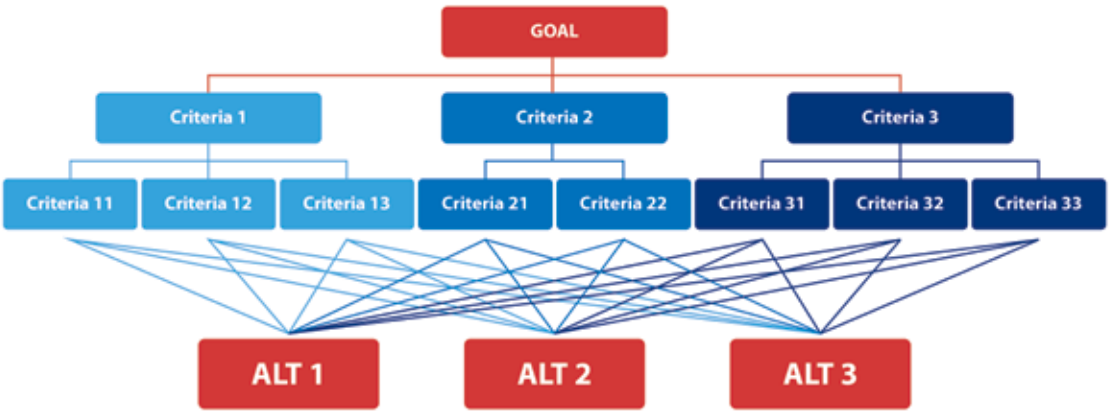

Figure 3: A decision hierarchy

Value	Definition
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extreme importance
2,4,6,8	Intermediate value

Figure 4: Semantic scale of Saaty (Source: Saaty, 1980)

Key strengths	Potential weaknesses
Can be applied to complex problems where decision elements are difficult to quantify or not directly comparable. Relatively simple approach and produces simple rankings that are easy to communicate. Does not require information on economic benefits and monetary valuation, and so it is applicable to areas that are difficult to value (e.g. ecosystems), difficult to quantify (e.g. equity) or that are contentious. Can accommodate a wide range of disciplines, opinions and groups of people who do not normally interact.	Results change as new options/alternatives are considered in the analysis. Becomes complicated if many criteria and options are considered. Some criteria are not independent, so this can complicate or bring bias into the process of assessment. Subjective scale can lead to biases and it is subject to human error The use of software can conceal conflicting value judgments.

Table 1: Key strengths and weaknesses of the AHP approach. (Source: Bharwani et al., 2013, p.3)

Exercise: Present an overview of the Analytic Hierarchy Process (plenary)

The trainer would make a presentation on the AHP approach. The presentation could also highlight how the sector-specific options and strategies identified in the LAPA could be organized as a decision hierarchy. Maximum duration of this presentation would be 20 minutes. Questions from the participants are to be taken and answered clearly.

Explanatory notes for the trainer/facilitator

- Prior to this session, the trainer/facilitator and resource persons could jointly formulate a set of frequently asked questions (FAQs) to initiate the discussion.
- Ask the participants about key takeaways from the day. Use this feedback to refine the design of the remaining days of the workshop.

Further reading:

Bharwani, S., Varela-Ortega, C., Blanco, I., Esteve, P., Juarez, E., Trombi, G., Moriondo, M., Bindi, M., Devisscher, T., Taylor, R. and Watkiss, P. (2013). Analytic Hierarchy Process (AHP). Decision support methods for adaptation, MEDIATION Project, Briefing Note 7. Funded by the EC's 7FWP

Orencio, P.M. and Fujii, M. (2013). A localized disaster-resilience index to assess coastal communities based on an analytic hierarchy process (AHP). *International Journal of Disaster Risk Reduction* 3 (2013) 62–75.

Saaty, T.L. (1980) The Analytic Hierarchy Process. McGraw-Hill, New York.

Day 2 – Thematic session 4: Finalizing the criteria and their relative weights

Begin the day with a brief recap of Day 1.

Learning objectives

By the end of this session participants would:

- Have an understanding of pairwise comparisons
- Identify criteria, rank these criteria and estimate the relative weight of criteria

Time

60 minutes

Exercise: Identify criteria and estimate their weights (plenary)

The primary objective of this plenary exercise is to identify 3–5 criteria that would be used to prioritize adaptation options or strategies for each sector. The trainer/facilitator would facilitate a plenary discussion to identify the criteria (e.g., economic costs, time/workload or sustainability). Once the criteria have been identified, a pairwise comparison of these criteria would be conducted. The values obtained from pairwise comparison would be processed to obtain numerical priorities or weights for the criteria. Finally, the trainer/facilitator would present the criteria and their weights. The table below shows the conversion of pairwise ranking into weights.

Table 2: Stakeholders' ranking of the criteria

	Economic costs	Time/workload	Sustainability
Economic costs	1	5	1/7
Time/workload	1/5	1	1/5
Sustainability	7	5	1

Table 2.1	Economic costs	Time/workload	Sustainability
Economic costs	1	5	0.1
Time/workload	0.2	1	0.2
Sustainability	7	5	1
	8.2 (sum of column values)	11	1.3

Table 2.2	Economic costs	Time/workload	Sustainability
Economic costs	(1/8.2)	(5/11)	(0.1/1.3)
Time/workload	(0.2/8.2)	(1/11)	(0.2/1.3)
Sustainability	(7/8.2)	(5/11)	(1/1.3)

Divide cell value by sum of column

Table 2.3	Economic costs	Time/workload	Sustainability	Average of row values
Economic costs	0.12	0.45	0.11	0.23
Time/workload	0.02	0.09	0.15	0.09
Sustainability	0.85	0.45	0.74	0.68
				1.0 (sum of columns)

Tables 2.1, 2.2 and 2.3: Show calculation of weights

Table 3: Stakeholders' prioritization of the criteria

Criteria	Priority
Economic cost	0.23 (w1)
Time/workload	0.09 (w2)
Sustainability	0. 68 (w3)

Explanatory notes for the trainer/facilitator

- Ensure that while organizing participants into sector-specific groups, there is representation of indigenous persons, the socially marginalized and women in each group.
- Include relevant officials from the municipality, experts from local educational institutions and political representatives in each sector-specific group.
- It is advisable to invite relevant representatives from the private sector.
- Arrange flipcharts for displaying the criteria and weightage.
- Assign rapporteurs for this session as the rationale for identifying and ranking of criteria is crucial information. It may be needed for future reference.
- Ensure that women, indigenous persons and socially marginalized groups can provide their feedback.
- Though there is no limit to the number of criteria, it is advisable to identify 3–5 criteria. One set of pairwise comparison of adaptation options/strategies would be conducted for each criterion (see Figure 4).

Thematic session 5: Pairwise comparison of adaptation options

Learning objectives

By the end of this session participants will be able to:

- Complete pairwise comparison of adaptation options and strategies for each sector

Time

120 minutes

Exercise: Pairwise ranking of adaptation options and strategies (group work)

The primary objective of this group exercise is to prioritize adaptation options or strategies for each sector. As earlier, participants would be divided into sector-specific groups (e.g., agriculture and food security, forest and biodiversity, water and energy, climate induced and other disasters, human health and livelihoods, and urban development and physical infrastructure). Prior to the exercise, sector specific metrics of adaptation options and strategies would be provided to each group (see Figure 5). One set of pairwise comparison of adaptation options and strategies would be conducted for each criterion. For example, if three criteria have been identified (e.g., economic cost, time/workload and sustainability), then three separate sets of pairwise comparison of adaptation options and strategies would have to be done (see Figure 5). A facilitator would be identified for each group to guide the group discussions. The duration of this group exercise would be a maximum of 75 minutes.

Economic cost	**Introducing drought resistant crops**	**Use plastic sheets to reduce loss of soil moisture**	**Training on organic farming**
Introducing drought resistant crops	1	7	1/5
Use plastic sheets to reduce loss of soil moisture	1/7	1	1/5
Training on organic farming	5	5	1

Time/workload	**Introducing drought resistant crops**	**Use plastic sheets to reduce loss of soil moisture**	**Training on organic farming**
Introducing drought resistant crops	1	5	3
Use plastic sheets to reduce loss of soil moisture	1/5	1	¼
Training on organic farming	1/3	4	1

Sustainability	**Introducing drought resistant crops**	**Use plastic sheets to reduce loss of soil moisture**	**Training on organic farming**
Introducing drought resistant crops	1	3	1/5
Use plastic sheets to reduce loss of soil moisture	1/3	1	1/6
Training on organic farming	5	6	1

Figure 5: Pairwise comparison of options for improved cropping practices

This group exercise would be followed by group presentations organized in a world café style. Each group would present the sector-specific pairwise comparisons and collect feedback from other participants. Afterwards, the participants would move to the next group to repeat the same process.

Once the presentations are completed, the trainers/facilitators would use a spreadsheet or software to calculate relative priorities from the pairwise rankings. The table below shows how pairwise ranking is converted into relative priorities.

Economic cost	**Introducing drought resistant crops**	**Use plastic sheets to reduce loss of soil moisture**	**Training on organic farming**
Introducing drought resistant crops	1.00	7.00	0.20
Use plastic sheets to reduce loss of soil moisture	0.14	1.00	0.20
Training on organic farming	5.00	5.00	1.00
	6.14 (sum of column values)	13.00	1.40

Time/workload	**Introducing drought resistant crops**	**Use plastic sheets to reduce loss of soil moisture**	**Training on organic farming**
Introducing drought resistant crops	1.00	5.00	3.00
Use plastic sheets to reduce loss of soil moisture	0.20	1.00	0.25
Training on organic farming	0.33	4.00	1.00
	1.53 (sum of column values)	10.00	4.25

Sustainability	**Introducing drought resistant crops**	**Use plastic sheets to reduce loss of soil moisture**	**Training on organic farming**
Introducing drought resistant crops	1.00	3.00	0.20
Use plastic sheets to reduce loss of soil moisture	0.33	1.00	0.17
Training on organic farming	5.00	6.00	1.00
	6.33 (sum of column values)	10.00	1.37

Divide cell value by sum of column

Figure 6: An illustration of converting pairwise rankings into relative priorities

Economic cost	**Introducing drought resistant crops**	**Use plastic sheets to reduce loss of soil moisture**	**Training on organic farming**	**Average of row values**
Introducing drought resistant crops	0.1628	0.5385	0.1429	0.2814 (v1)
Use plastic sheets to reduce loss of soil moisture	0.0233	0.0769	0.1429	0.0810 (v2)
Training on organic farming	0.8140	0.3846	0.7143	0.6376 (v3)

Time/workload	Introducing drought resistant crops	Use plastic sheets to reduce loss of soil moisture	Training on organic farming	Average of row values
Introducing drought resistant crops	0.6522	0.5000	0.7059	0.6194 (v4)
Use plastic sheets to reduce loss of soil moisture	0.1304	0.1000	0.0588	0.0964 (v5)
Training on organic farming	0.2174	0.4000	0.2353	0.2842 (v6)

Sustainability	Introducing drought resistant crops	Use plastic sheets to reduce loss of soil moisture	Training on organic farming	Average of row values
Introducing drought resistant crops	0.1579	0.3000	0.1463	0.2014 (v7)
Use plastic sheets to reduce loss of soil moisture	0.0526	0.1000	0.1220	0.0915 (v8)
Training on organic farming	0.7895	0.6000	0.7317	0.7071 (v9)

Figure 7: An illustration of the conversion of pairwise rankings into relative priorities

Finally, the aggregation of relative priorities to produce overall priorities (final evaluation metrics), which add up to 1.0, is the final step.

	Economic cost	Time/workload	Sustainability	Weighted priority
Introducing drought resistant crops	0.2814 (v1)	0.6194 (v4)	0.2014 (v7)	0.2574 ((v1*w1)+(v4*w2)+(v7*w3))
Use plastic sheets to reduce loss of soil moisture	0.0810 (v2)	0.0964 (v5)	0.0915 (v8)	0.0895 ((v2*w1)+(v5*w2)+(v8*w3))
Training on organic farming	0.6376 (v3)	0.2842 (v6)	0.7071 (v9)	0.6531 ((v3*w1)+(v6*w2)+(v9*w3))

Note: For w1, w2 and w3 refer to Thematic Session 4: Finalising the criteria and their relative weights

Explanatory notes for the trainer/facilitator

- This is the most important session of this planning workshop. Therefore, the trainer/facilitator needs to ensure that all the participants have a good understanding of how to undertake the pairwise comparisons.
- Ensure that while organizing participants into sector-specific groups there is representation of indigenous persons, the socially marginalized and women in each group.
- Include relevant officials from the municipality, experts from local educational institutions and political representatives in each group.
- Ensure that each group has participants from different municipal wards.
- It is advisable to invite relevant representatives from the private sector.

- Identify a rapporteur for each group to document the discussions. In particular, it would be important to document the reasons for consensus as well as differences of opinion.
- Arrange voice recorders to record the proceedings of group work (if possible).
- Encourage women, indigenous persons or socially marginalized persons to present the results.
- Give 5 minutes for each group to present only the main findings. If they exceed the given time, politely ask them to finish the presentation. This can be done with a time-keeper who notifies the presenter on the amount of time left.
- Ask the participants about key takeaways from the entire day.
- Use the feedback to refine the workshop design.

Day 3 – Thematic session 6: Presentation of the results of the prioritization exercise

Start the day with a brief recap of Day 2

Learning objectives

By the end of this session participants would have:

- An overview of the adaptation prioritization in the municipality.

Time

90 minutes

Exercise: Presentation of the prioritization of adaptation options and strategies (plenary session)

The primary objective of this session is to present sector-specific prioritization of adaptation options and strategies and to gather feedback from the participants. Since participants would have been divided into several groups, a plenary discussion would improve ownership of the results, help to clarify any lingering confusion and make the planning process more transparent.

The facilitator would present the prioritized adaptation options and strategies for each sector. The sector-specific presentation could be followed by a brief discussion to collect participants' feedback. Allocate 15 minutes to document feedback from the participants and then move to the next sector.

It is hoped that the municipal planning process would consider the outputs of this prioritization exercise while formulating their adaptation plan, preparing their annual budget and allocating resources (see Figure 1).

Left to right: a) Chairperson and Vice Chairperson of Myagde Rural Municipality, Tanahun district; b) Workshop participants in Myagde Rural Municipality; c) Vice Chairperson makes a presentation at the workshop

Kalika Municipality, Chitwan

Goal: Commitment of Kalika Municipality, Resilient Community and the Ecosystem

Agriculture & Food Security	
Goal: Local and adaptive improved seeds and technology for self reliant and commercialized production of healthy and nutritious food	
Options and strategies	Priorities
Target group focused program, awareness on insurance	0.45
Awareness, capacity building (Knowledge, skills) group/cooperative formation and strengthening, marketing	0.20
Use/promotion of improved technology (plastic tunnel, irrigation, lift irrigation, solar lifting, organic farming, IPM etc	0.17
Selection of adaptive variety (local and improved seeds) and diversification of crops	0.14
Agro-forest bio diversity conservation, plantation, removal/management of invasive species	0.04

Forest & Biodiversity	
Goal: Contribution to resilience through conservation and utilization of forest and bio-diversity	
Options and strategies	Priorities
Awareness, capacity building, group formation, strengthening and social mobilization	0.36
Target group (poor and forest dependent) oriented policy and programs, Relief support to victims of human wildlife conflict, Coordination and collaboration among SHs	0.36
Conservation/Protection (fireline, anti-poaching/smuggling, conservation of focal and endangered species, water source protection etc)	0.12
Effective implementation and monitoring of forest management	0.11
Infrastructure like; Nursery, plantation, ponds,	0.06

Water & Energy	
Goal: Access to adequate fresh water (for drinking and irrigation) and renewable energy resources	
Options and strategies	Priorities
Development and enforcement of policy/plan/system	0.53
Awareness, capacity building, social mobilization	0.25
Resource conservation/ Watershed services management	0.15
Use/Promotion of technology and alternative energy	0.06

Climate induced and other disasters	
Goal: Climate and Disaster Resilient Community and Environment	
Options and strategies	Priorities
Policy and plans (crop and livestock insurance, community health insurance, emergency fund establishment, minimum standards, land use plans etc)	0.51
Awareness and capacity building (early warling system, CCA/DRR learning centre, Human resource: volunteer, taskforce) and their coordination	0.19
Use of improved technology and varieties for adaptation (off seasonal/tunnel farming, adaptive variety for flood and droughts etc)	0.15
Biological and or bio-engineering measures, plantation of bamboo, broom grass etc and low cost soil conservation measures,	0.08
Construction of physical infrastructure, (check dam, spur, river training etc)	0.07

Human/Public health and Livelihoods	
Goal: Healthy life and Equitable/Resilient Livelihoods	
Options and strategies	Priorities
Awareness and capacity building (regular sanitation/WASH, health check up treatment and nutrition)	0.39
Target goup focused programs, income generation activities	0.21
Epidemic control, emergency response management	0.14
Water resource conservation, collection, quality test, purification, sanitation and efficient use of water	0.14
Equitable policy provisions and practices (including insurance)	0.12

Urban Development & Physical Infrastructure	
Goal: Sustainable development (Environmental, systematic and disaster safe/reistence) through community participation	
Options and strategies	Priorities
Awareness, communication and capacity building	0.48
Preparation and implementation of policy/plans/standards	0.20
Resource conservation, management and utilization	0.12
Improvement in/construction of Environment friendly, disaster resistance, climate friendly infrastructures (Drinking water, irrigation, roads etc)	0.11
Sanitation and waste management	0.10

Figure 8: Results of the prioritization from the planning workshop in Kalilka Municipality, Chitwan district, Nepal

Explanatory notes for the trainer/facilitator

- Senior representatives of the municipality such as the Mayor, Deputy Mayor, Chairperson or Vice Chairperson should be invited to this session.
- Ensure that relevant officials from the municipality, experts from local educational institutions and NGOs and political representatives are present during this session.
- It is advisable to invite relevant representatives from the private sector.
- Ensure that indigenous persons, socially marginalised groups and women have ample opportunity to share their feedback.
- The facilitator should ensure that any dissenting opinion is properly documented.
- The facilitator should clarify to the workshop participants that this exercise is only a means to prioritize the adaptation options. It is in no way intended to exclude or ignore any option.

Thematic session 7: The way forward and closing remarks

Time

45 minutes

This session would run for around 45 minutes. Senior representatives of the local government (e.g., municipality) such as the Mayor, Deputy Mayor, Chairperson or Vice Chairperson would be requested to take a seat on the dais. First, the Chief Planning/Executive Officer of the municipality will present the way forward in terms of how the workshop outputs (i.e., prioritized adaptation options) would be used in the municipality level planning (including a timeline). Relevant officials from the municipality, experts from local educational institutions and civil society, representatives of the private sector and political representatives would be given 2 minutes each to provide their feedback. Closing remarks would be made by the chief guest (preferably the Mayor, Deputy Mayor, Chairperson or Vice Chairperson).

Participants pose for a picture after the completion of the planning workshop in Kalilka Municipality, Chitwan district, Nepal

Explanatory notes for the trainer/facilitator

- Ensure that the Chief Executive/Planning Officer of the municipality is the moderator of this session.
- Encourage people who have spoken less to provide their feedback.
- Hang the charts of group exercise and other workshop outputs on the walls of the meeting room.
- Ensure that the seating arrangement allows all the participants to clearly see the charts.
- Ensure that indigenous persons, socially marginalised groups and women have ample opportunity to share their feedback.
- If the participants had used metacards to document their expectations from the workshop during the introductory session, consult a few participants to review whether these expectations have been met.
- The facilitator could provide a tentative date for sharing the workshop report (draft) with stakeholders.

SECTION 3

Evaluation of the climate change adaptation planning workshop

Dear participant,

Please indicate your views on the items listed below. Your responses – whether positive or negative – are valuable to us. Your responses will remain anonymous and confidential.

Please circle the number against each statement as applicable.

A General information

1. Which of the following best describes your main role in this workshop?

a. Participant

b. Observer

c. Resource person (e.g. organizer, presenter, facilitator)

d. Other, please specify _____

2. How much of the workshop were you able to attend?

a. All of it (everyday, all sessions)

b. Most of it (most days and sessions)

c. More than half

d. Half or less

3. Are you

Male Female

4. What is your nationality? _____

5. In which district and municipality do you live? _____

6. In which sector/type of organization do you work? _____

(Government, NGO, private, research, etc.)

B About the event

	Satisfactory	Good	Very Good	Excellent
7. The event met my expectations.	1	2	3	4
8. The workshop increased my understanding and knowledge about adaptation planning.	1	2	3	4
9. The event objectives were met.	1	2	3	4
10. I will benefit from the knowledge I gained.	1	2	3	4
11. I would like to continue engaging in these areas.	1	2	3	4

C Effectiveness of the event

I will be able to apply the ideas and learning from the workshop to:

Further train/coach/ mentor my staff/students	Better perform my job responsibilities	My studies/better understand the subject and related issues	Others (Please specify)

D Resource persons	Satisfactory	Good	V. Good	Excellent
12. The presenters were knowledgeable.	1	2	3	4
13. The quality of presentations was good.	1	2	3	4
14. The presenters/facilitators met the objectives.	1	2	3	4
15. Good audio-visual aids were used.	1	2	3	4
16. Participation and interaction was encouraged	1	2	3	4
17. Adequate time was provided for questions.	1	2	3	4
18. Prioritization was well justified.	1	2	3	4

E Social inclusion	Satisfactory	Good	V. Good	Excellent
19. Gender and social inclusion in the workshop	1	2	3	4

F Geographical inclusion	Satisfactory	Good	V. Good	Excellent
20. Participants from various wards	1	2	3	4

G Overall rating	Satisfactory	Good	V. Good	Excellent
21. How do you rate the workshop overall?	1	2	3	4

F Additional comments

22. Which of the activities did you find the most useful?

a. b. c.

23. In your opinion, what could be done to improve the workshop in future?

a. b. c.

a. Other comments:

Himalayan Adaptation, Water and Resilience (HI-AWARE) Research
c/o ICIMOD
GPO Box 3226, Kathmandu, Nepal
Tel +977 1 5275222
Email: hi-aware@icimod.org
Web: www.hi-aware.org

ISBN 978 92 9115 692 4 (electronic)