Communities to Landscapes: Multi-scale approach to climate adaptation in Nepal

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Presentation outline

- Hariyo Ban Program
- Climate vulnerability in Nepal
- Climate adaptation at multiple scales:
  - Community
  - Watershed
  - Local jurisdictions
  - Landscape
  - Species and protected areas
- Lessons

Hariyo Ban Program

Current goal

To increase ecological and community resilience in two biodiverse landscapes in Nepal

Main components

Biodiversity conservation, climate adaptation

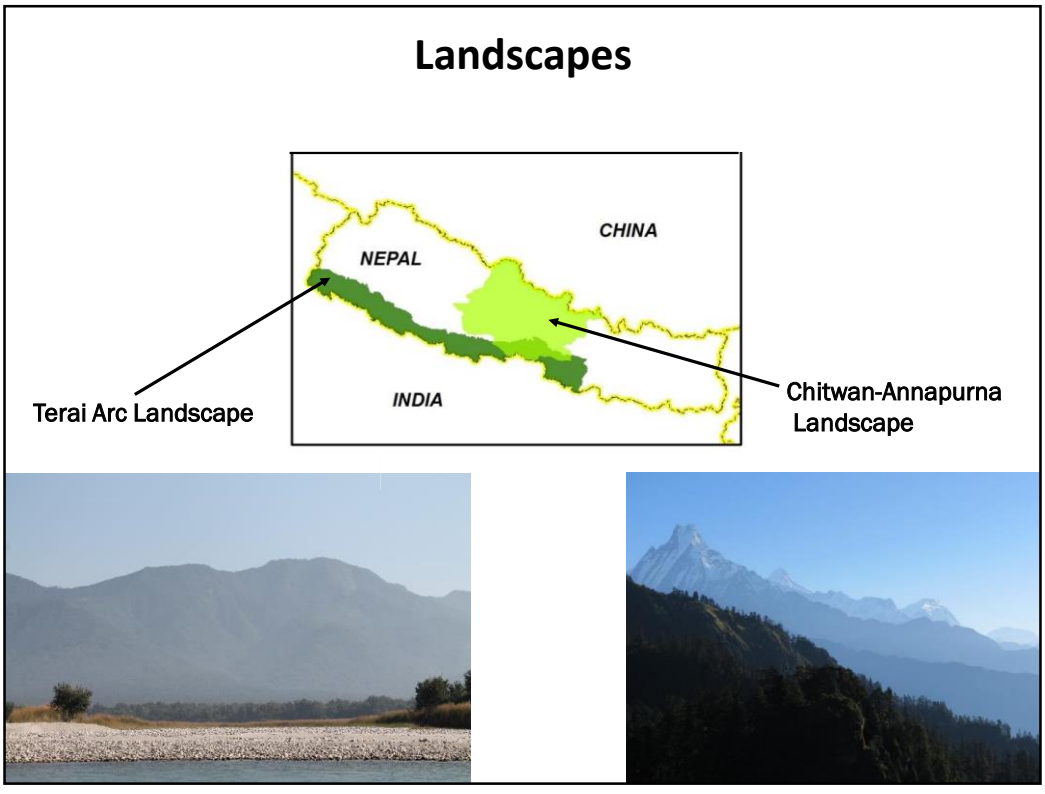
Crosscutting themes

Gender and social inclusion, governance

Multiple partnerships

NGO consortium, government, communities civil society organizations, private sector, academia, donors

Hariyo Ban is a 10-year Program funded by USAID Nepal. It is implemented by a consortium of World Wildlife Fund, CARE Nepal, the Federation of Community Forest Users Nepal, and the National Trust for Nature Conservation.



The Program works in two large landscapes in Nepal –

- **Terai Arc Landscape** in the south, which aims to conserve ecosystems of the Terai and Churia hills in order to ensure integrity of ecological, economic and socio-cultural systems and communities. There is a special focus on wildlife.
- The newly created **Chitwan-Annapurna Landscape** takes a river basin approach, with a foundation of climate-smart conservation and sustainable development practices for biodiversity, sound natural resource management and continued provision of ecosystem services that support equitable and inclusive economic prosperity.

Climate vulnerability in Nepal

Climate change is advancing rapidly in Nepal. The Himalayas are warming significantly faster than the global average, and maximum and minimum temperature extremes are becoming more frequent. The monsoon is expected to become more erratic; extreme rainfall events are becoming more intense, and are likely to keep increasing in intensity (Shrestha et al., 2015). More extreme precipitation increases the risk of floods, soil erosion and landslides in this rugged, fragile, disaster-prone topography, while more erratic precipitation patterns are leading to increased scarcity of water and crop failure. Glacial melt will reduce future streamflow in the mountains. Already local communities are feeling the effects of increased climate variability: for example, an analysis of vulnerability assessments supported by the Hariyo Ban Program in over 200 communities in the Gandaki basin revealed the most common climate hazards/vulnerabilities were increased drought, invasive species and landslides; followed by diseases/pests, uncontrolled forest fire, and floods.

Shrestha, A. B., et al. (eds) (2015). The Himalayan Climate and Water Atlas: Impact of climate change on water resources in five of Asia's major river basins. ICIMOD, GRID-Arendal and CICERO.

Differential human vulnerability

Some groups of people are particularly vulnerable to climate change:

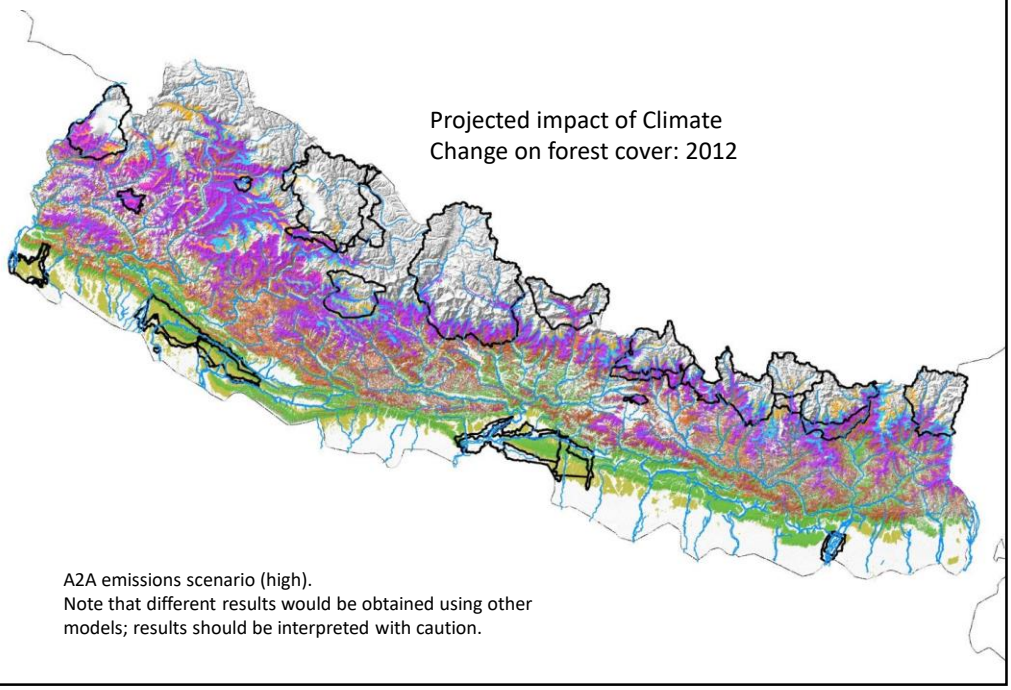
Women who are often not empowered to take action on climate change: they are often excluded from decision making processes in their communities, despite the fact that they play an important roles in farming; managing natural resources such as water and firewood; and looking after their households. Many households are headed by women due to out-migration by men for work.

Poor and marginalized people: who are often similarly excluded from community decision-making processes, and do not have enough capital to enable them to withstand and recover from shocks. They may be forced to live in vulnerable locations with greater disaster risk.

Factors exacerbating ecosystem vulnerability

Non-climate stresses fragment and degrade ecosystems such as forests, wetlands and grasslands, often making them less resilient to the effects of climate change, and less able to adapt. Such non-climate stresses include overharvesting of resources (especially firewood), overgrazing, and poorly planned or poorly coordinated infrastructure development (a growing impact). Combined with the impacts of climate change, this can result in ecosystems being less able to provide ecosystem services that ensure human wellbeing and help people adapt (e.g. by retaining water, providing water supplies and reducing flood risk; reducing the risk of soil erosion and landslides; providing resources during times of stress)

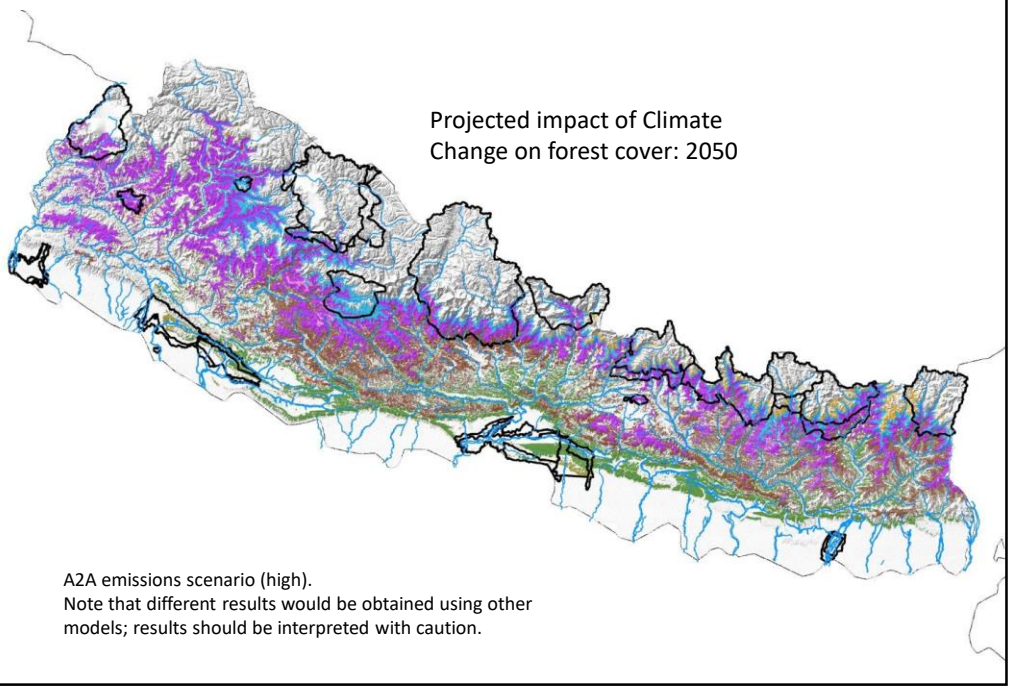
Projected climate change impacts on forests



In the longer term substantial changes to ecosystems are expected in Nepal as climate change continues, including widespread changes in forest types, and shifts in plant and animal species distribution (Thapa et al. 2016). The following time series of maps shows projected resilience of different forest types in Nepal. We used the highest (A2A) IPCC Green House Gas (GHG) scenario to project the distribution of eight ecological vegetation zones modified from the vegetation map prepared by the Department of Forests, Nepal, using a global database of climate variables. The results of this coarse-scale analysis indicate that most of the lower and mid-hill forests in the subtropical and tropical zones are vulnerable to climate change impacts, whereas the temperate upper montane and subalpine forests will be more resilient to climate change.

Thapa, G.J., Wikramanayake, E., Jnawali, S.R.; Oglethorpe, J., Adhikari, R (2016). Assessing climate change impacts on forest ecosystems for landscape-scale spatial planning in Nepal. Curr. Sci., 110, 345.

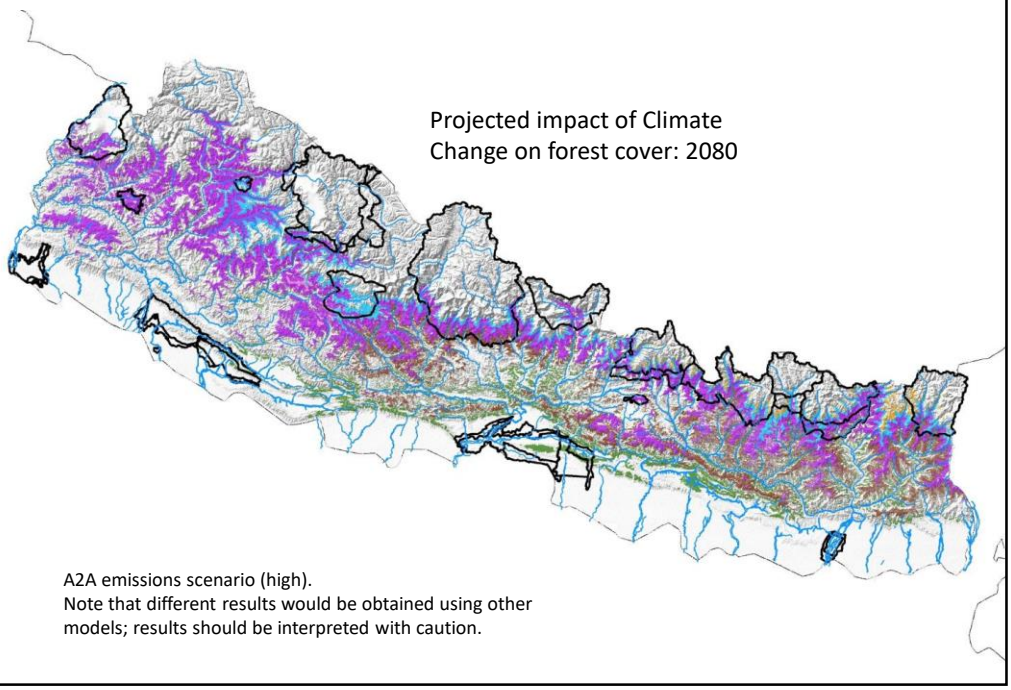
Projected climate change impacts on forests



Projected impact of Climate Change on forest cover: 2050

A2A emissions scenario (high).
Note that different results would be obtained using other models; results should be interpreted with caution.

Projected climate change impacts on forests



Projected impact of Climate Change on forest cover: 2080

A2A emissions scenario (high).
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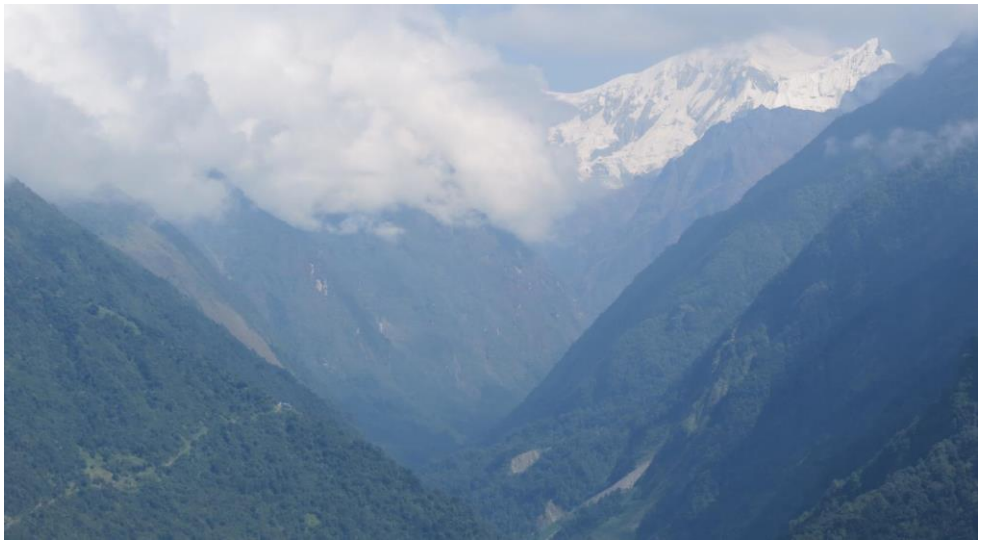
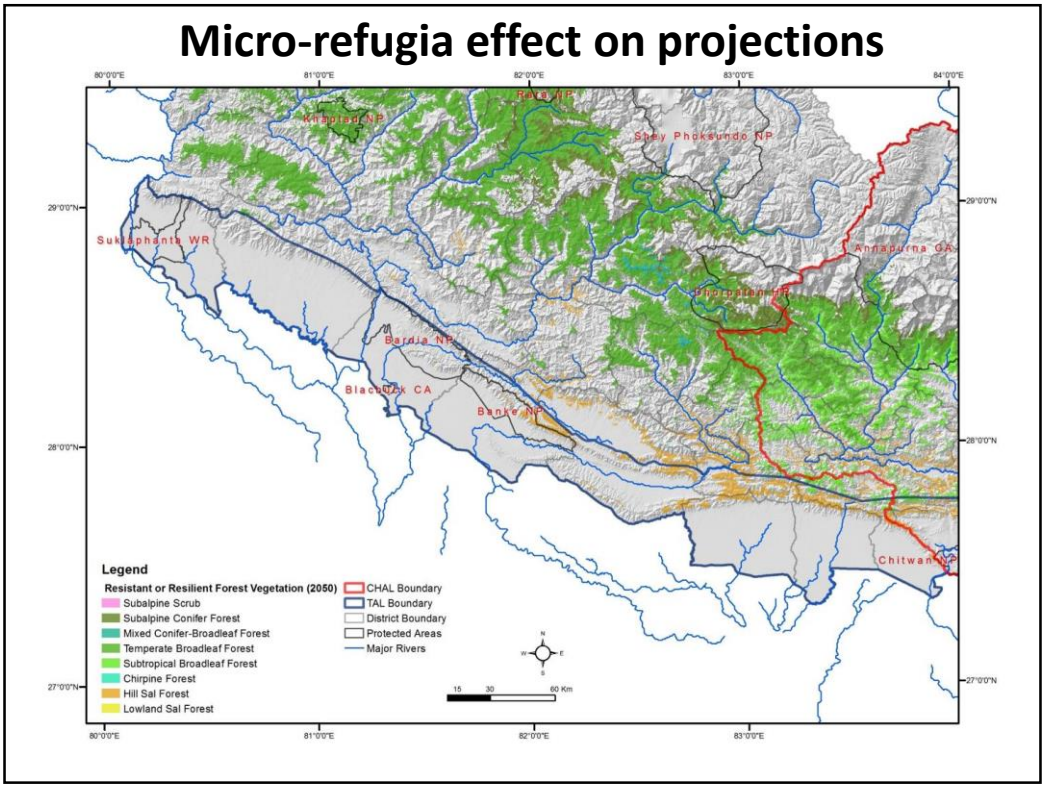
Microrefugia



We also identified climate microrefugia using terrain-based analyses. Microrefugia in Nepal are areas such as north and north-west facing slopes, and steep sided valleys which will remain cooler and damper as other areas warm up. Species are more likely to persist here as climate change advances.

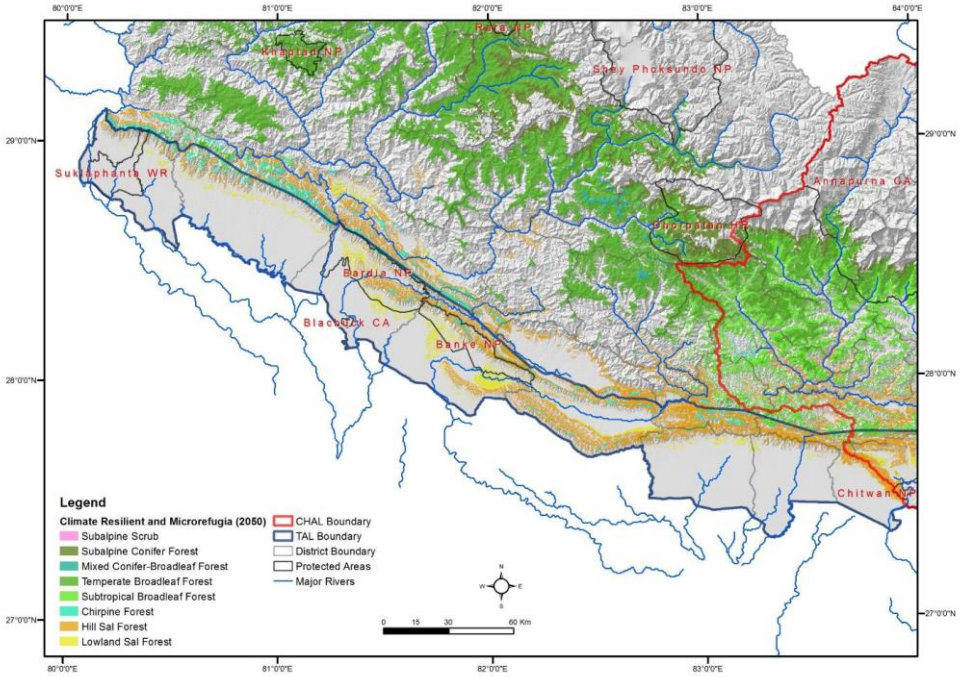
Micro-refugia effect on projections



This map shows the forests in the previous slides which are projected to persist to at least 2050 (note the change in color), based on coarse-scale regional projections. The next slide shows how much more forest is likely to persist when microrefugia are also taken into account. The highly dissected terrain helps to shelter many areas from the regional influences of climate change.

This demonstrates the importance of conserving these resilient forest microrefugia

Micro-refugia effect on projections

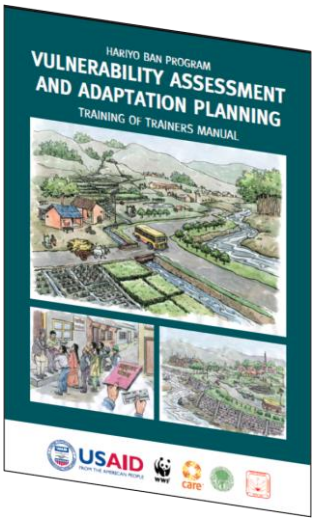


Community level adaptation

The most vulnerable areas/communities were first identified.

In an individual community, Hariyo Ban starts the climate adaptation process by empowering women, poor and marginalized people so that they can participate in vulnerability assessment and community climate adaptation processes, ensuring that their voices are heard and their needs are addressed during adaptation planning and implementation.

Vulnerability Assessment and Adaptation Planning



A participatory process of vulnerability assessment and adaptation planning is followed, that integrates community and ecosystem approaches, and ensures attention to differential vulnerability. It follows the national guidance on adaptation planning, and covers the six main areas in the NAPA as relevant to a particular community: agriculture and food security; water resources and energy; climate-induced disasters; forests and biodiversity; public health; and urban settlement and infrastructure.

In many cases the plans were integrated into community forest operational plans, making them climate-smart

Adapting livelihoods and agriculture

The Program helped build more resilient livelihoods through sound use of forest resources; on-farm adaptation; and development of off-farm livelihoods.
Where there were water shortages, water efficient measures were introduced like drip irrigation, rainwater harvesting and multiple use water systems. Greenhouses helped households produce off-season vegetables and withstand cold spells.

Adapting water supplies and irrigation

Dwindling water supplies was a major vulnerability. The program helped with rainwater harvesting, and improved water storage. Solar water pumping provided water to uphill communities. Wherever possible communities were encouraged to protect recharge areas and catchments.

Increasing ecosystem resilience

Restoration of ecosystems to help them adapt to climate change, and maintain/restore ecosystem services was a common approach. This included alternative energy promotion and fuel efficiency (e.g. biogas, fuel efficient stoves, micro-hydro and solar) to reduce pressure on forests for firewood. Deforested areas were replanted, or protected from grazing to enable natural regeneration. Erosion was controlled. Drying ponds were restored to provide water for people and/or wildlife.

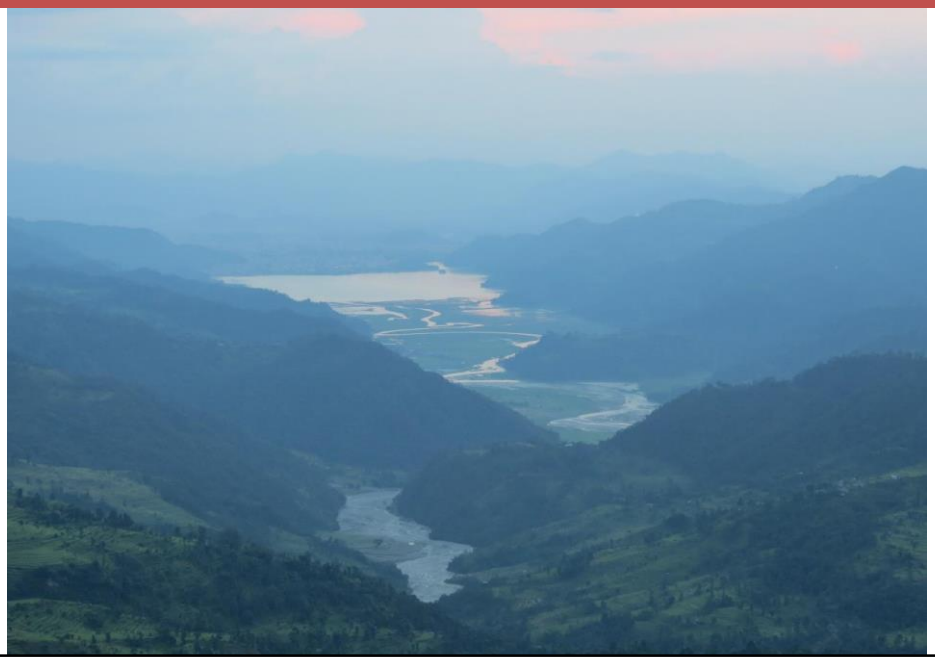
Restoring landslide sites

Landslide sites were rehabilitated using bioengineering, in combination with ‘hard’ measures like gabions where needed. This activity intensified after the 2015 earthquake caused many landslides. These sites were often at risk of further slides as a result of extremely heavy rainstorms.

Reducing vulnerability to floods

The Program also worked at community level on reducing vulnerability to flooding. However, some of the adaptation plans merely addressed symptoms of increased flooding due to climate change (e.g. in one community that had a boat for floods the Program funded lifejackets), without addressing issues upstream that were exacerbating flooding (such as deforestation). Elsewhere, restoring one side of a floodplain to slow down flood water and trap sediment protected one village but put another village on the opposite side of the river at greater flood risk.

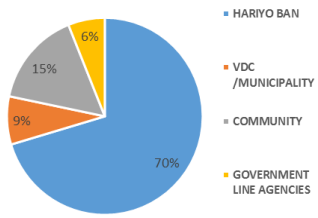
Watershed level adaptation



Stakeholders may risk maladaptation if they do not consider other users of the basin. Often need to tackle upstream issues, e.g. deforestation.
Hariyo Ban Program is facilitating dialogue between upstream and downstream users, and promoting a holistic, climate-smart watershed approach
This includes payments for ecosystem services by downstream users (e.g. in Pokhara, the Hotel Association is making payments to upstream communities for improved land use to reduce sedimentation of Phewa Lake, a major tourism attraction. Heavier rainfall due to climate change can increase the rate of erosion and sedimentation.)

Adaptation at local jurisdictional levels

- Integrating adaptation into Village Development Committee/Municipality planning processes
- Working with new Municipalities (urban and rural)
- Leveraging funding for adaptation



The Program has been working through the Local Adaptation Framework, Local Disaster Risk Reduction Management Guideline and Environment Friendly Local Governance Framework.

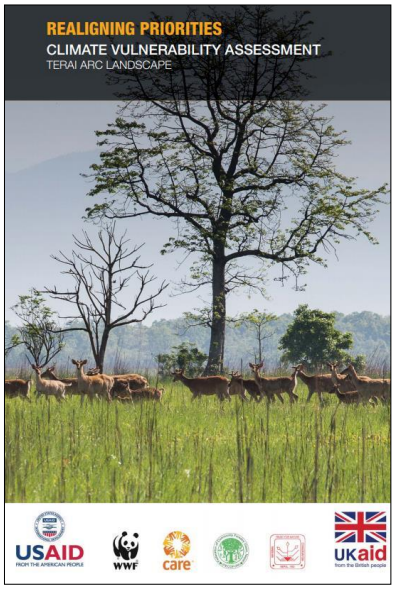
To avoid community and local adaptation plans sitting on the shelf, or competing with disaster risk reduction (DRR) plans, we have worked to integrate DRR and climate adaptation plans, and to mainstream them into the local planning process

Collaboration with Village Development Committees and Municipalities for this (periodic plan, annual plan, sectoral plans)

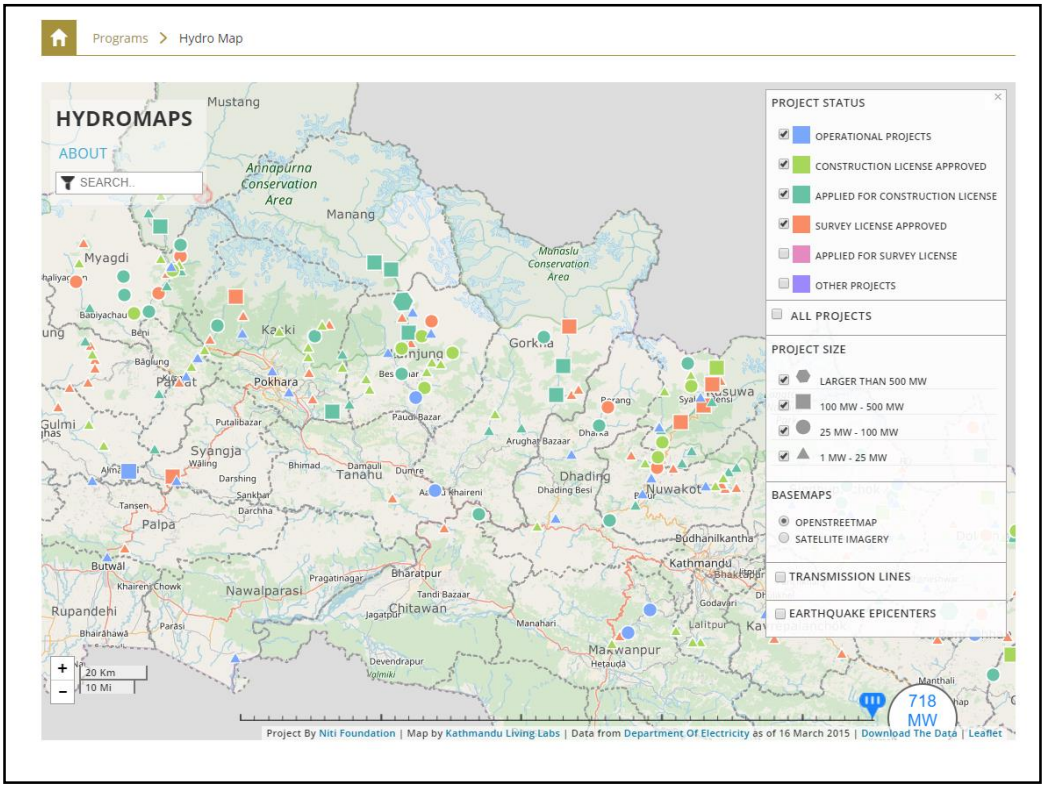
This helps ensure long-term sustainability of efforts beyond the life of the project, and also leverages funding for adaptation.

With the reorganization of government under the 2015 Constitution, new Municipalities have been created which are on a larger scale than Village Development Committees, creating new opportunities for approaches at watershed level and for leveraging support. A large amount of capacity building is needed at the new Municipality level to ensure climate adaptation is mainstreamed in municipality plans.

River basin/landscape level adaptation



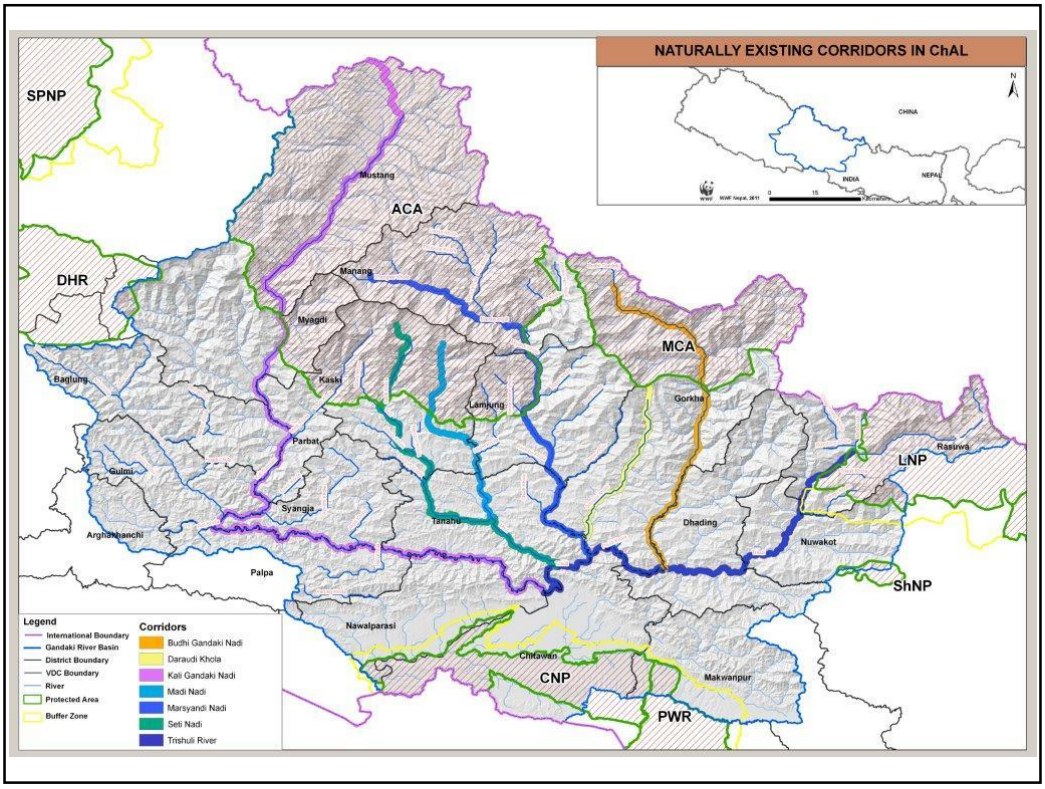
The program looked at climate vulnerability at the level of the two landscapes, since there are some adaptation functions that cannot be completely covered through smaller scale watersheds and local government



Hydropower is expanding rapidly in Nepal as part of much needed development. However, it is vulnerable to climate change, being at risk from erratic and heavy precipitation, flooding, soil erosion, landslides and sedimentation. Multiple dams on the same river stem can confound problems, especially if they are storage dams. Planning for climate change scenarios is needed, including closer collaboration and communication in planning, design and operation of hydropower units, taking into account the needs of downstream communities and ecosystems. Hariyo Ban has been funding an environmental flows study in part of the Gandaki basin and has also been working with hydropower operators and upstream communities and local authorities.

Building infrastructure resilience

Roads are opening in many areas of Nepal, improving access to remote areas. However, many roads are being constructed without adequate planning and design, resulting in serious impacts to settlements, water supplies, farms and forest in some places. This is a particular problem with local roads. More intense rainstorms as a result of climate change will make this situation worse. Sound routing and design of new roads within landscapes, and restoration of degraded road sites, is badly needed. The program has piloted this work with some local authorities. Inappropriate extraction of construction materials (e.g. in fragile areas) is also an issue.



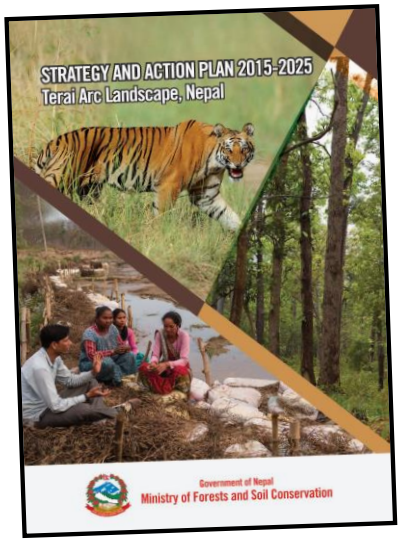
Many biodiversity corridors in the Chitwan-Annapurna Landscape run north-south along river valleys, and are currently used by many bird and fish species for seasonal migration. As climate change advances species will tend to move to cooler, damper places, often at higher altitudes. The valley corridors will be very important for this. However,

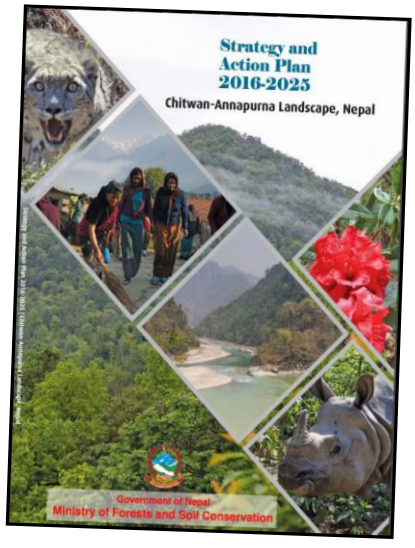
Confluence of the Seti and Trishuli Rivers

Restoring climate corridors

However, many of the forest corridors are fragmented by different land uses. Hariyo Ban is working with government and local communities to restore some of the more important corridors. In the Seti/Trishuli corridor, poor local communities have been practicing slash-and-burn agriculture. The District Forest Officer has been working with them to establish broom grass, which binds the soil, and provides fodder, fuel and grasses which are made into sweeping brooms. Sale of brooms improves the economy of the local communities, who no longer have to farm extensively. Soil erosion and runoff are reduced. Under their leasehold forestry agreements communities restore areas of forest. This contributes to restoring the corridor.

Mainstreaming adaptation into landscape strategies

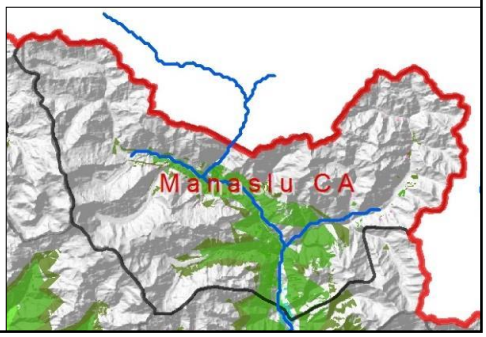




Climate adaptation was mainstreamed into the revised Strategy for the Terai Arc Landscape, and into the strategy for the new Chitwan-Annapurna Landscape, using results of climate vulnerability assessments and adaptation experience at multiple levels.

Protected area adaptation

MANASLU CA VULNERABILITY ASSESSMENT	VULNERABILITY SCORE	RANK
SPECIES		
Musk deer	1.79	1
Snow Leopard	2.07	2
Grey Wolf	2.14	3
Vultures	2.14	3
Brown bear	2.21	4
Blue Sheep	2.21	4
Abies spp (Talis patra)	1.86	1
Taxus spp (Lauth Salla)	1.86	1
NTFPs (Ban lasun, Kutki, Jatamansi, Nirmasi, Yarsa gumba)	1.86	1
Blue pine (Gobre Salla)	1.93	2
Birch (Bhoj Patra)	2.00	3
ECOSYSTEMS/HABITAT		
Alpine scrubs	1.62	1
Rangelands	1.62	1
Glaciers, snow and glacier lakes	1.89	2
Wetland (rivers, rivulets, springs, ponds, lakes)	2.00	3
SOCIAL SECTOR		
Chumchet VDC	1.67	1
Bhi VDC	1.78	2
Sridibas VDC	2.06	3
Kutang Valley	1.78	1
Nubri Valley	2.22	2
Tsum Valley	2.06	3
LIVELIHOODS		
NTFP	1.67	1
Agriculture	2.00	2
Livestock	2.27	3
INFRASTRUCTURE		
Micro hydro	1.33	1
Rural road (Chhekampar)	1.83	2
Settlement	1.83	2
Monasteries	1.83	3



Protected areas generally cannot change their boundaries in response to climate change, and may risk losing particular species and ecosystems because of climate change. Identifying climate vulnerabilities and mainstreaming resilience building and/or adaptation measures into management plans helps guide climate-smart management. Where people live inside protected areas, or influence them from outside, community adaptation should be an integral part of the process.

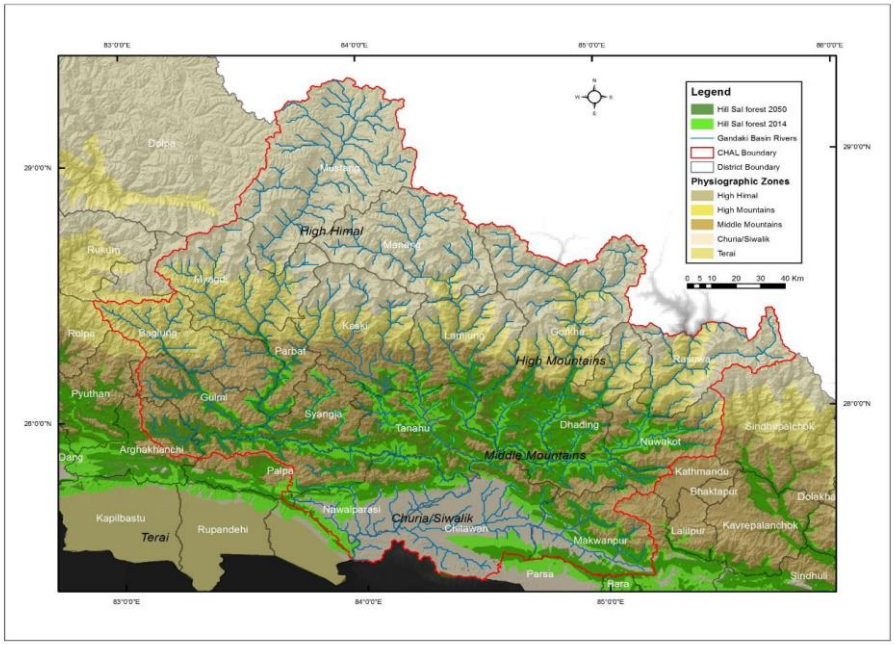
Species adaptation

Individual species of plants and animals have very different levels of resilience or vulnerability to climate change. The Program has worked with government to integrate climate change into species management. For threatened wildlife species, the approach includes establishing replicate populations (e.g. swamp deer, black buck, water buffalo). Blackbuck used to be common in southern Nepal, but hunting and habitat loss resulted in one small population remaining in the wild, in a small reserve at Khairapur. Hariyo Ban supported the government and National Trust for Nature Conservation to create a new population in part of the former range, in Suklaphanta Wildlife Reserve. In the meantime, Khairapur suffered severe flooding in 2014, and a large proportion of the population was lost, demonstrating the value of replicate populations. The warden subsequently built mounds for the blackbuck to retreat to during floods. This was partially successful during the 2017 floods; modifications are planned to make the mounds more effective in the future.

Which tree species to plant?

Unlike annual agricultural crops, trees live for many years. Conditions at a particular site may no longer be suitable for currently growing species in the coming decades. Which species should be selected for planting? The Program is working on general guidance for tree species selection.

Projected distribution of Hill Sal in 2050



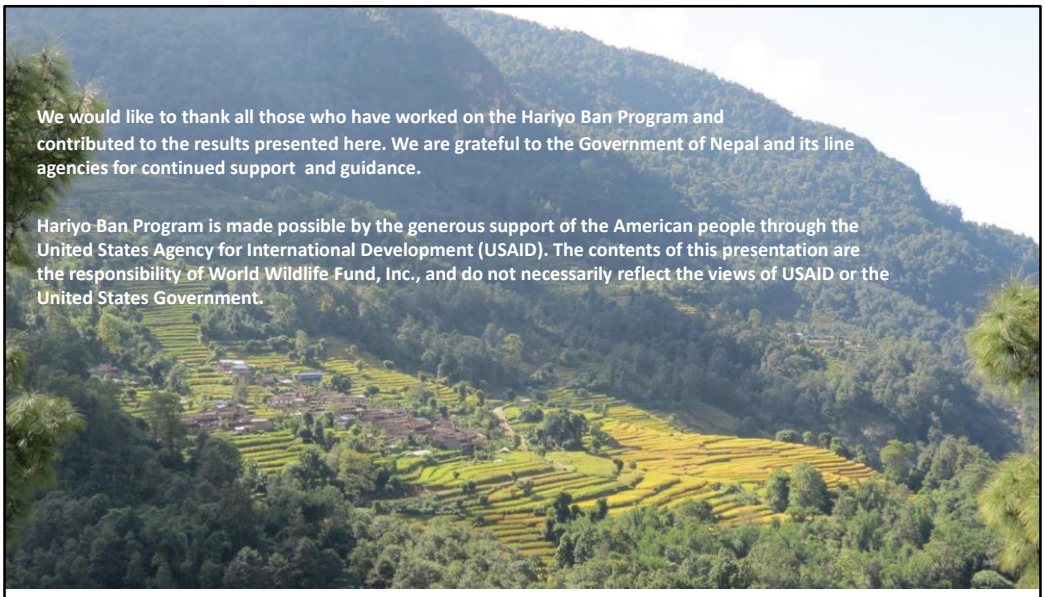
Using IPCC A2A GHG scenario

A projection using the IPCC A2A GHG scenario and taking microrefugia into account predicts that the Hill Sal forests will move further northwards and upslope into the middle mountain zone along the river valleys and upslope within the Churia. Reforestation of higher slopes in catchments, including along the Churia, can include Sal, along slopes with <2,000 mm of rainfall and no frost. The species appears vulnerable in low-lying areas where there are no microrefugia. It is important to triangulate though, through direct observation and other means (e.g. germination and establishment tests).

Some tree species may migrate uphill slower than the pace of climate change due to limited seed dispersal. Species with limited distribution and narrow tolerance ranges may be particularly at risk, as may fire intolerant species. Assisted tree migration is an option, but extreme care should be used in making decisions because of possible adverse impacts, especially if the species is moved far outside its existing range.

Major lessons on multi-scale adaptation

- Enables focus on the most vulnerable people, working at scale across disciplines to reduce vulnerability
- Enables integration of ecosystem and community adaptation, helping to avoid maladaptation
- Provides a flexible, phased, no-regrets approach in light of future uncertainty
- Requires a high level of participation and collaboration
- Presents challenges where natural boundaries do not coincide with jurisdictional boundaries



We would like to thank all those who have worked on the Hariyo Ban Program and contributed to the results presented here. We are grateful to the Government of Nepal and its line agencies for continued support and guidance.

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Hariyo Ban Program

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