# Managing Landscapes Using Conservation Corridors

**Nakul Chettri**, Biodiversity Conservation and Management, ICIMOD, nchettri@icimod.org
**Graeme Worboys**, Vice Chair, IUCN WCPA (Mountains Biome), Gilmore, Australia, g.worboys@bigpond.com

Fragmentation of habitats threatens species' survival and causes loss of biological diversity. Spatial configuration of habitats plays a crucial role in conservation of biodiversity. A good patch connected to neighbouring patches by corridors and stepping stones lowers the risk of extinction among its populations.

Hence, fragmentation could be the greatest challenge to conservation of biodiversity. In heavily fragmented landscapes, species' survival is only likely within a network of patches that are sufficiently connected (Bennett 2003). Conservation biology has demonstrated the necessity of protecting large areas of habitat and maintaining connectivity between natural habitats and across altitudinal gradients, especially in the prevailing conditions brought about by climate change. Connectivity is especially important for wide-ranging and migratory species – such as elephants, large herbivores, and migratory birds – and for the large carnivores at the top of the food chain. Connectivity is also a recognised human response to fragmentation. Historically, whole human populations have migrated across thousands of miles when conditions became unfavourable. Currently, climate change makes it essential to maintain the flow and movement of organisms across the landscape in order to maintain the valuable biodiversity resources of the planet (Williams et al. 2005).

Research into climate change demonstrates how a substantial amount of carbon released into the environment comes from carbon stored in the forests which escapes as a result of deforestation, changes in land use, and soil disturbance. Strengthening vast wildernesses by connecting natural habitats can be useful in a number of ways: it can help store carbon, enhance ecosystem resilience and services, and facilitate conservation of threatened species. Maintaining connectivity between natural habitats and along altitudinal gradients in mountain regions, therefore, is an important strategy in promoting the adaptation of plant and animal species to climate change.

Box 1: **What is connectivity?**

The concept of connectivity has a structural component which is related to the spatial arrangement of habitats or other elements in the landscape; and it has a functional (or behavioural) component that relates to the behavioural responses of individuals, species, or ecological processes to the physical structure of the landscape.

The four types of connectivity are:

1. Landscape connectivity (a human view of the connectedness of patterns of vegetation cover for a landscape);
2. Habitat connectivity (the connectedness between patches of habitat suitable for a particular species, e.g., through a conservation corridor);
3. Ecological connectivity (the connectedness of ecological processes across many scales, including processes relating to trophic relationships, disturbance processes, and hydroecological flows); and
4. Evolutionary process connectivity (referring to the natural evolutionary processes, including genetic differentiation and evolutionary diversification of populations, which need suitable habitats on a large scale and connectivity to permit gene flow and range expansion. Ultimately, evolutionary processes require the movement of species over long distances).

## Landscapes and conservation corridors: an evolving concept

Biodiversity conservation and concomitant promotion of sustainable development is an important challenge for conservation and development communities. Biodiversity conservation requires a comprehensive approach that makes use of both reserve and non-reserve areas. Whole communities often depend for their livelihoods on areas that are deemed 'protected', and these areas cannot exist in isolation. It is necessary to bridge these areas across both natural and national borders in order to meet the needs of the people who inhabit them and the lands surrounding them (the matrix). Today, many conservationists, including parties to the Convention on Biological Diversity (CBD), advocate an 'ecosystem approach' to conservation and to management of the broader landscape matrix: a concept that is still evolving.

## Himalayan initiatives

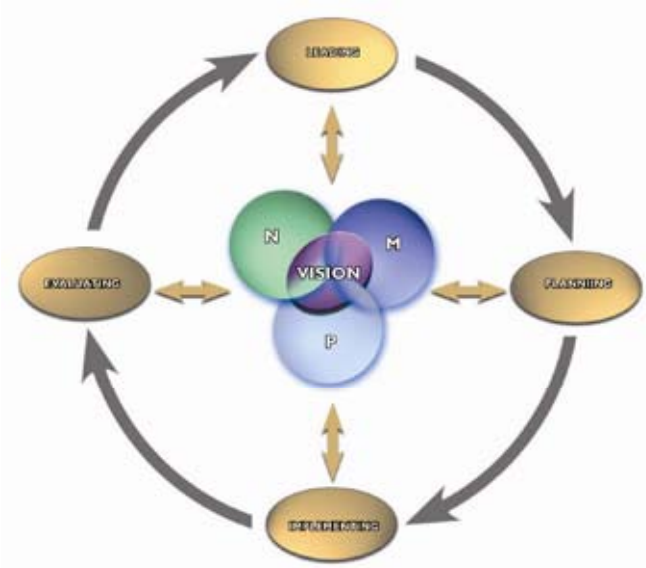
ICIMOD, The Mountain Institute (TMI), the World Wide Fund for Nature (WWF), and the International Union for Conservation of Nature (IUCN), as well as other partners, have been instrumental in introducing the concept of 'transboundary landscapes' and 'conservation corridors' for the HKH region. These complexes stretch from east to west, wet to dry, and low to high-altitude areas and are part of a series of experimental transboundary (mountain) landscapes such as the Mount Everest complex and the Kanchenjunga landscape. ICIMOD is promoting the idea of five additional transboundary landscapes and four transects. These will improve connectivity across Himalayan ecosystems and encourage cross-border research that can lead to an improved understanding of the impacts of climate change in the region. This initiative is part of a comprehensive approach to 'Connectivity Conservation' (see Box 1). Researchers worldwide have shared their findings to formulate a global connectivity conservation framework (Worboyes et al. 2009 in preparation). This framework includes protection, retention, and rehabilitation of natural connections among habitats and within ecosystems at the landscape level. The three main functions will be (1) conserving habitats for movement of species and maintenance of viable populations; (2) conserving and enhancing ecosystem services; and (3) promoting and enhancing local welfare by conserving and using natural resources.

> "Five additional transboundary landscapes and four transects will improve connectivity across Himalayan ecosystems and encourage cross-border research"

The framework takes into consideration that connectivity conservation areas will need active management to deal with more frequent, extreme, and human-induced threats such as climate change (see Figure 1).

Conservation corridor between Toorsa Strict Nature Reserve and Jigme Dorji National Park in Bhutan, showing villages along the fringes

Figure 1: **A conceptual framework for connectivity conservation management (N = nature context; P = people context; M = management context)**




Box 2: **Suggested measures for meeting climate change**

Managers' strategies for promoting resilience in protected Areas

1. Inventory–taxa surveys to know what you have. Be alert for unusual sites / communities, refugia
2. Sustain the slow variables (e.g., soil resources and the species' pool) that accumulate slowly and provide buffers
3. Sustain both ecological legacies (e.g., old forest growth, woody debris) and cultural legacies (e.g. people's connection to land)
4. Relieve the stresses that drive adverse change (e.g., pests, invasive species, pollution)
5. Increase the effective size of the protected area where and when possible (e.g., enlarged core protection zone and buffer zone with nature-friendly land use)
6. Protect altitudinal gradients
7. Restore or facilitate recovery of missing keystone species (e.g., wolf, beaver)
8. Build linkages across multiple scales from hedgerows to landscape-scale connectivity corridors (stepping-stones may also be valuable)
9. In connection with connectivity, think big, think bio-regionally, think even on a continental scale
10. Cooperate to develop common approaches with adjacent or nearby protected areas. Transborder cooperation is especially important
11. Increase interchange with and education of stakeholders about interventions planned
12. Develop flexibility and ability to move in new directions as scenarios change, employ adaptive management, treat crises as opportunities for constructive change
13. Think outside the box

Source: Lawrence S. Hamilton, provided at the IMBC, October 2008

Innovative, integrated responses across landscapes by land management authorities and property owners (see Box 2 for suggested measures) will be essential. The connectivity conservation strategy envisages a different kind of land stewardship that can be financed by a carbon economy and from payments for water. This concept has captured the imagination of many who see the direct national (and possibly international) benefits of individual, local conservation responses. Connectivity conservation could facilitate national responses to climate change and contribute to provision of clean air and clean water which will benefit local communities and help conserve many valuable species.

## Conclusion

The conservation of large areas of natural lands that interconnect protected areas is critical for the survival of threatened species and those needing a wide habitat range so that they can survive and adapt to climate change: it is especially critical for species threatened with extinction. Climate change causes biomes to shift: connectivity conservation can help to maintain functioning, resilient, ecosystems; to enhance natural catchments; and to promote clean water supplies. In its entirety, connectivity conservation will result in improved air quality and lead to reduced emission of greenhouse gases by sequestering carbon from the atmosphere. This means that food production, economic security, and environmental integrity will be strengthened.

## References

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