

The Kailash Consortium of Academics and Researchers for Experience-sharing (Kailash CAFE)

14–17 June 2022

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Background

The Kailash Sacred Landscape Conservation and Development Initiative (KSLCDI) promotes transboundary cooperation and sustainable development in the Kailash landscape. This landscape is spread over 31,000 square kilometres across Pulan County of the Tibet Autonomous Region of China, Pithoragarh District of India, and four districts – Baitadi, Bajhang, Darchula, and Humla – of western Nepal. Primarily, the KSLCDI focuses on three components: transboundary cooperation, ecosystem management at scale, and resilient livelihoods.

The Kailash Consortium of Academics and Researchers for Experience-sharing (Kailash CAFE) is a digital platform that brings together researchers working across multiple disciplines within the Kailash Sacred Landscape. The UN has declared 2022 as the International Year of Sustainable Mountain Development. In line with this, the Kailash CAFE 2.0 will highlight thematic topics related to mountain ecosystems and the sustainable development of the Kailash Sacred Landscape. Besides, special focus will be on the themes of regional cooperation, biocultural diversity, and post-pandemic recovery.

The first edition of Kailash CAFE, held from 20–23 April 2021, brought together more than 100 people from 10 countries. At that consortium, researchers made presentations on the themes of landscapes and biodiversity, ecosystem services and sustainable livelihoods, culture and heritage, technology, and gender and governance. Some of the research presented at the CAFE were published in a special issue of the journal, *Environmental Challenges*. The following will be the objectives of the second edition of Kailash CAFE which is to be held from 14–17 June 2022.

Objectives

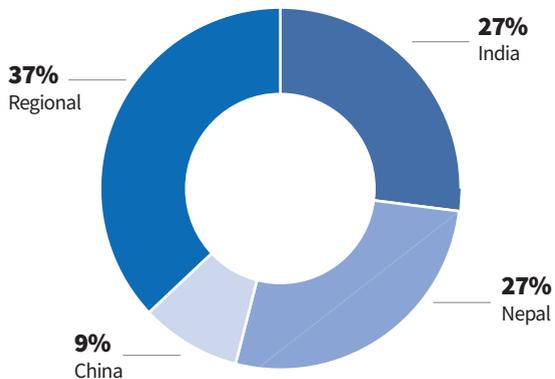
- Share research findings and knowledge from the Kailash Sacred Landscape with a wider audience
- Bring contemporary global perspectives into the landscape
- Build capacity in science communication

Abstracts for oral presentation

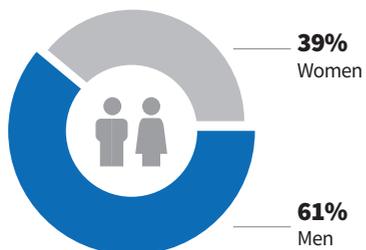
13 Abstracts



Geographic area of research



Authorship



Presenters



Assessing and mapping cultural ecosystem services in the Kailash Sacred Landscape in China

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Abstract

Numerous studies have given due recognition to the importance of assessing ecosystem services and its contribution to human well-being. However, the aspect of cultural ecosystem services (CES) through which people obtain non-material benefits from ecosystems have been rarely given appropriate consideration in ecosystem service assessments, particularly in the case of cultural landscapes. It remains a challenge to evaluate CES because they are often perceived as non-material, subjective, or intangible. This study performed a spatially explicit participatory assessment and mapping of the cultural ecosystem services in the Kailash Sacred Landscape in China (KSL-China) by following the framework of the 10 categories of cultural services established in the Millennium Ecosystem Assessment (MEA). Our results show diverse cultural services and more than 300 points of interest (POI) in the CES sites in KSL-China. In this area, Mt Kailash, Lake Manasarovar, and Burang Town are CES hotspots with their high degree of multiple cultural ecosystem services. The cultural services in this area are mostly related to spiritual and religious values, followed by a rich array of cultural heritage sites, and by pilgrimage and recreational tourism. The study provides spatially explicit information on KSL-China's CES, thereby paving the way for better management and spatial planning of tourist destinations – this will also be helpful in terms of cultural heritage conservation and in fostering multifunctionality in the Kailash Sacred Landscape.

Keywords: KSL-China, cultural ecosystem services, assessment and mapping, spiritual and religious values

The cultural landscape of the Darma Valley: Unfolding the linkages and synergies

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Abstract

There are many distinct types of cultural landscapes that reflect the character of different parts of the world. They express a long and intimate link between humans and their natural environment as combined works of nature and humankind. They are the repository of the knowledge system that enabled man to maintain a symbiotic relationship with nature, thereby creating an ideal environment for long-term survival. These landscapes represent humanity's collective memory. However, in today's fast-paced world of globalization, mass urbanization, and cultural commodification, these cultural landscapes are losing their identity, resulting in a loss of sense of place and local distinctiveness.

Keeping the above in view, this study aims to investigate the cultural landscape of the Darma Valley, which is located between 7,500 and 14,000 feet above sea level; it has a unique topography with subtropical, temperate, and alpine vegetation. Situated within the Kailash Sacred Landscape region, with Tibet to the north and Nepal to the east, the valley has played a significant role in providing access to transborder trade with Tibet. The valley comprises 14 settlements inhabited by the Rung Shaukas, who used to lead a nomadic lifestyle and facilitate cross-border trade. The valley has witnessed significant cross-cultural interactions due to its strategic placement near the border, which has enriched its tangible and intangible resources.

The study uses the Cultural Values Model to go beyond the evident physical aspects of the environment so as to unearth the many layers of human meaning and experience linked to it. It attempts to reveal the connections and synergies between various cultural, ecological, socio-economical, and spiritual dimensions that must be safeguarded in order to preserve the valley's cultural identity and the fundamental human ties that exist within the terrain.

Keywords: Cultural landscape, Darma Valley, cultural significance, cultural identity

Beyond conservation: A plea for local landscape conceptions to promote biodiversity in the KSL

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Abstract

On the Nepali side of the KSL lies the Limi Valley and its ancestral pastures. Until 30 years ago, transhumant agropastoralism was at the core of this valley's livelihoods; but this was gradually replaced by employment opportunities in the Tibetan town of Purang (which the Nepalis call Taklakot). Given the recent attention accorded to Limi's biodiversity, both in terms of its fauna and in flora, and the absence of a conservation area in Humla (the district in which Limi lies), we can presume that Humla will soon be considered for one of these protection schemes. However, many of these schemes are still conceived of in terms of a separation between non-human and human realms. This is because the idea of conservation still rests on a conception of "nature" which excludes the human. The remaining pastoral practice in the Limi Valley embodies a notion of the human as enmeshed within a network of interacting beings – from livestock to wildlife to spiritual entities. This conception is framed by religion (a mixture of Mahayana Buddhism, Bön, and animism) as well as by a broader ecological practice of care which is central to pastoral practice in Limi. I argue that this conception favours multispecies coexistence within a shared habitat. This conception has also got the intrinsic potential to promote biodiversity in a better way than a normal conservation paradigm would, that too with the added benefits of social justice and sustainability. Presently, the slow obsolescence of pastoralism in Limi, provoked by the closing of the border with the Tibet Autonomous Region, has led to a certain separation of humans from these multispecies entanglements. This potentially jeopardizes the Limi people's multispecies conception of landscape and the possibility to build upon it to collaborate in nurturing biodiversity. This presentation will sketch what this specific conception consists of and what, within it, can be part of a dialogue that strengthens environmental protection objectives – all in order to lay the ground for fruitful collaborations beyond the top-down approach of many conservation initiatives.

Keywords: Pastoralism, Limi Valley, biodiversity, religion, social justice

Understanding the impact of COVID-19 on tourism in the Kailash Sacred Landscape

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Abstract

Tourism is a significant livelihood strategy for the communities living in the Kailash Sacred Landscape (KSL). The tourism sector in the KSL provides economic opportunities to both direct as well as indirect stakeholders in the tourism value chain. But the onset of the COVID-19 pandemic affected the KSL's tourism industry in a big way, as both cross-border and domestic tourism were impacted due to the closure of international borders and travel restrictions. To understand the impact of the pandemic on the KSL's tourism sector, we conducted a rapid assessment survey that covered socio-economic and environmental dimensions. We used the case study approach by applying an indicator-based methodology. For each indicator, we looked at the pre-COVID and post-COVID scenarios and analysed the effect of the pandemic on the tourism sphere. The information was cross-tabulated with a literature review of published and unpublished research material as well as media documentation. Through this endeavour, we found out that most of the tourism businesses in the KSL, which are micro, small and medium enterprises (MSMEs), were severely affected by the global pandemic. The direct impacts included loss of employment and revenue, while the indirect ones included loss of revenue among the tourism supply chain actors. A range of coping strategies were adopted by the tourism stakeholders to make up for the loss of revenue. For instance, the closure of the China–Nepal international border provided an opportunity to pitch Humla as a new destination for religious tourism. Besides, the frequency of flights to Simikot (Humla's administrative headquarters) was increased as there was a low demand for air travel to other mountain tourism destinations. Our conclusion is that while the landscape's tourism industry is highly vulnerable to external shocks like pandemics and economic crises, it continues to be an important vehicle for socio-economic development.

Keywords: Tourism, Kailash, COVID-19, coping strategies, livelihoods

Livelihoods, health, and sustainability in the post-pandemic recovery milieu: A critical perspective in the context of the Kailash Sacred Landscape-India

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Abstract

The COVID-19 pandemic has had devastating effects on health and livelihoods worldwide, albeit with variation among countries in terms of incidence and death rates. The pandemic showed that the world was unprepared to react promptly to global health threats – most governments delayed taking action. This demonstrates that the typical approaches of governments to risk management fail to address global crises which have cascading large-scale health, economic, and social effects. This unpreparedness not only applies to the management of pandemics but also to the mitigation of the consequences of climate change. Indeed, climate change has been described by the WHO as the greatest global threat to health in the twenty-first century. Thus, it is essential to improve the resilience of our society, both in terms of pandemics and in terms of long-term environmental challenges. As regards post-COVID-19 policies, it is imperative that health and sustainability are placed at the heart of the economy, and the policies ought to aim at achieving multiple goals – those related to health, environmental sustainability, employment, and equitable socio-economic recovery. Given this backdrop, the present paper argues that in order to accelerate ecological restoration in tandem with building livelihoods, a well-calibrated action plan has to be in place. Ecological restoration should not merely be equated with tree plantation. It is also well known that many afforestation projects related to “carbon capture” have focused on exotic monoculture plantations, thereby ignoring community needs for produce such as fruits, fodder, and fuelwood. These schemes have resulted in a form of “carbon colonialism”, which have encroached upon ecological commons and have damaged not only local biodiversity and soil and water resources, but also livelihoods. Future restoration programmes should encompass a wide range of extant ecosystems, ranging from forests to grasslands and wetlands; these programmes should also give due credence to diverse practices such

as agroforestry and farmer-managed natural regeneration techniques for replenishing severely degraded soils. For restoration to work effectively, the key is to promote inclusive means of ecological rebuilding, which ought to be envisioned and implemented in collaboration with local communities, thereby serving the local needs for ecosystem goods and services. Ecologically regenerative practices in enhancing agricultural production, local food security, and sustainable land and water use at the village level pave the way for local and global welfare through biodiversity conservation, climate change mitigation, and cognisance of cultural values. By highlighting different success stories, the present paper argues that the challenge is to move away from grand visions like “billion and trillion tree planting campaigns” as the ultimate climate solutions and appreciate the values in diverse ecosystems while planning for landscape revival through rural employment packages.

Keywords: Livelihoods, pandemic, sustainability, restoration, health

Glaciers and glacial lake hazard assessment in the transboundary Kailash Sacred Landscape

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Abstract

Over the recent decades, increasingly accelerated melting of glaciers in the Hindu Kush Himalaya (HKH) has led to the rapid formation and expansion of glacial lakes, thereby increasing the risk of glacial lake outburst flood (GLOF) and posing a threat to downstream communities and infrastructure. Understanding the state of glaciers and glacial lakes in the region is essential, particularly in the Kailash Sacred Landscape (KSL) where the glaciers and glacial lakes serve as an inherent component of the multicultural landscape. Here, we have documented the decadal change in glaciers from the 1990s using a series of Landsat satellite images and scrutinized a potential glacial lake hazard at the catchment level in the KSL. Our methodology for the glacial lake hazard assessment incorporated the multi-criteria decision analysis (MCDA) by using the analytical hierarchy process (AHP), which considered six major criteria to study the past and present conditions of glaciers and glacial lakes, their surroundings, and the potential maximum peak flood discharge from the glacial lakes. The study reveals that the glaciers in the KSL experienced a 25.5 per cent decrement in their surface area in three decades (1990 to 2020). The glaciers situated below 5,500 masl experienced the maximum rate of area loss, while those below 3,500 masl disappeared completely after 2010. The glacial lake hazard assessment shows that the Humla-Karnali basin in the central part of the KSL experienced higher hazards followed by the Kali basin. The southern part of the KSL has glacial lakes with higher density and larger size, and these are more exposed to GLOFs than the glacial lakes in the northern part of the KSL. The study found that retreating glaciers and the decrease in glacier area, and the increase in the formation and expansion of glacial lakes have led to greater uncertainties in terms of freshwater supplies as well as disaster risks; this has further exacerbated the vulnerability of the mountain communities to climate change, thereby threatening the water, food, and energy security of the populace living in the upstream and downstream areas of the landscape.

Keywords: Glaciers, glacial lakes, GLOF, transboundary landscape

Risk assessment of the cultural ecosystem services in the KSL

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Abstract

The Kailash Sacred Landscape (KSL) is a culturally diverse and environmentally fragile transboundary landscape. The KSL is characterized by numerous sacred sites, including high-altitude lakes, snow peaks, and a network of religious places and locations across three countries. The cultural ecosystem services (CES) it offers include local heritage, customs, and norms as well as spiritual, educational, and recreational values. As indicated by many studies, climate change has been posing a serious threat to the cultural heritage and resources of the landscape. Climatic changes – both gradual and rapid – including in the form of extremes in temperature and precipitation, have already affected different components of the region's cultural heritage. There is also the impact of geogenic hazards like floods, landslides, GLOFs, and forest fires. They have played havoc with heritage sites, monuments, archaeological sites, and historical buildings of cultural importance.

Risk is a function of hazard, vulnerability, and exposure. So, to conduct an exercise of vulnerability analysis and risk assessment (VARA), we first need to select the appropriate indicators that can show the impact of these hazards. The indicators have also got to be weighted and normalized for the KSL. Then, calculations have to be made in terms of adaptive capacity, sensitivity, and exposure. By combining these factors, we can determine the final risk to CES in the landscape.

Keywords: CES, VARA, hazards, vulnerability, cultural sites

The current state of traditional indigenous practices in the biocultural domain of the Kailash Sacred Landscape in India

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Abstract

The Kailash Sacred Landscape (KSL) represents unique biocultural diversity as it reflects extreme heterogeneity of biophysical, sociocultural, and indigenous knowledge systems. The KSL in the Indian part is home to diverse cultural groups. Among the five distinct cultural areas in KSL-India, one major area pertains to the highlands, and within this area, one major cultural group is Rung, which is truly transboundary in terms of its geographic distribution and cultural linkages. The Rung culture spreads across the watersheds of Dhauliganga and Kali rivers of KSL-India and some parts of Nepal. The community has established harmonious linkages with nature, due to which they are able to survive successfully in relatively inhospitable terrains and harsh climatic conditions. The present study was carried out to document the major indigenous and cultural practices of the Rung-Shauka people of Pithoragarh District (KSL-India). We found out that the people of this region are involved in pastoral activities which involve seasonal migration; in this process, they are able to develop harmonious linkages with nature. The cultural ethos of the community reflects a deep connection with the sacredness of their landscape, which contributes to biodiversity management and conservation. The Rung people, especially the women, excel in making handicraft products which are knit and woven. The literature review reveals that the highlanders are now increasingly inclined towards modernization, which has led to migration and a declining interest in carrying forward their rich knowledge system. The study has also attempted to analyse the current state of centuries' old practices and how they are being transformed through the processes of social acculturation and homogenization.

Keywords: Highlanders, Rung, Shauka, indigenous, Pithoragarh

The dilemma of traditional natural resource management systems in the Nepal Himalaya: A case study from Limi, Humla

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Abstract

The Government of Nepal formally recognizes 63 indigenous nationalities or peoples who account for more than one-third of the country's population. Along with their unique culture and heritage, the indigenous communities are also distinct because of their traditional systems of natural resource management. These systems, which have been in place for centuries, ensure equitable and sustainable use and management of resources. Such systems are of particular importance in remote mountain areas where access is limited and the implementation of formal regulations is very weak. However, despite their significance, the systems have been gradually withering due to various factors. This study aimed to understand the internal and external factors influencing the sustainability of the indigenous natural resource management system in the Limi Valley of Humla District in Nepal. We conducted 20 in-depth interviews and two group discussions with the indigenous community of the Limi Valley and with representatives of governmental and non-governmental organizations. In the process, we discovered that Limi's traditional system of natural resource management is facing serious challenges, especially due to outmigration and overt governmental influence. Moreover, climate change has been adversely affecting the valley's cultural heritage while also adding burden to the Limi people's traditional forms of livelihood. Besides, conflicts over the use of resources have arisen as the traditional resource management rules are not recognized by members of external communities who claim a stake on such resources. In Nepal, there is no clear government policy that formally recognizes traditional resource management systems. This poses a dilemma for the country's many indigenous communities who practise unique traditional systems of resource management. However, in the case of the Limi people, despite the increasing challenges, they are known to value their traditional system and they aspire to conserve it.

Keywords: Indigenous, traditional, Limi, natural resources, cultural heritage

To speak horse in the Himalayas and Argentina: How do horses and humans communicate, and how does this differ in different cultural contexts?

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Abstract

The Himalayas have been home to a wide range of “horse-worlds” as pointed out by several scholars. In Limi, “horsemanship” is an important element of the local cultural heritage. In my undergraduate research in Tibetan Studies, I came across a Tibetan manuscript on horse science. This manuscript is an illustrated compilation tentatively dated to the 18th century, which includes texts from as early as the ninth century. It was collected by Giuseppe Tucci, and an educated guess would situate its origins in Western Tibet, possibly the Kailash region. Both in text and practice, Buddhists classify the horse as a “sentient being” endowed with a “principle of consciousness” similar to humans. This, however, can lie in tension with the “suffering” produced by the practical demands that humans place on horses and the methods used to satisfy them. In autumn 2018, I accompanied a Himal-Connect project to the Limi Valley. During this trip, I came across a living Tibetan horse culture that reflected elements of that Tibetan manuscript and witnessed the opening of a tarmacked road connecting Halji with Purang. These conditions highlight the urgency of researching this valuable and vulnerable equine cultural heritage that may be on the verge of disappearance. With these thoughts and experiences in mind, I worked as a horse “tamer” in Argentina where the horse holds a similar symbolic and practical value. I subsequently developed a PhD research project in anthrozoology that aims to explore how the different cultural dynamics within which the horse is embedded reflects on living equitation practices; it focuses on how horse “sentience” is negotiated when human and horse intentions clash. This paper offers preliminary findings from the research in the Himalayas (Humla) and Argentina (Mendoza) that I am currently carrying out. I believe that within the human–horse relationship, there is a dynamic dialogue grounded in a communicative framework which needs to be put in place contextually. I explore local “horsemanships” in two different fieldwork sites on the opposite sides of the globe, and the way they influence communication between horses and humans. This cross-cultural element not

only allows me to compare a wide range of approaches to horsemanship (with human-horse “language” changing alongside the human cultural context), but also provides a deeper understanding of the embodied knowledge, practices, and skills involved in human–horse connections. In practice, in order to give this tradition a new resilience, I suggest an assertion of the fact that the equine culture is central to western Nepal’s cultural and social heritage. This can be fully appreciated in the many rituals that see the involvement of horses; these can be viewed as a form of intangible cultural heritage that go beyond the instrumental use of horses as a means of transport which is increasingly being superseded by motor vehicles..

Keywords: Horses, humans, equitation practices, cross-cultural study

Harvesting the Himalayan Gold in a time of crisis: A comparison of three countries in the Hindu Kush Himalaya

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Abstract

In the Himalaya, the local communities are dependent on various medicinal plants and aromatic plants for their livelihoods. One such is the Himalayan Gold – yartsa gunbu (*Ophiocordyceps sinensis*), or caterpillar fungus, which is a highly valued medicinal plant found in the northern alpine grasslands of Bhutan, India, Nepal, and the Tibetan plateau of China at an altitude of 3,000–5,000 masl. Every year, a large number of people throng to the highland rangelands of the Kanchenjunga Landscape in Bhutan and the Kailash Sacred Landscape in India and Nepal during April and May to collect this caterpillar fungus. Trading of the fungus gives high economic returns to mountain communities. During the COVID-19 pandemic in 2020 and 2021, the governments of India and Nepal imposed a ban on the collection of this fungus; while the Royal Government of Bhutan implemented a standard operating procedure (SOP) for collectors. In this context, this study focuses on examining the effects of COVID-19 on caterpillar fungus collection and trading at five sites in three countries – Bhutan, India, and Nepal. For data collection, interviews with collectors and key informant interviews were conducted in September–December 2020. For the majority of the respondents, the fungus was a major source of cash income. It was also found that COVID-19 had both positive and negative implications for fungus collection and trading. In 2020, the average number of fungi collected per day by each collector was significantly higher than that in 2019. However, the earnings from the yartsa gunbu collection in 2020 was lower than that in 2019 due to a decline in market prices. The study suggests that governments need to diversify livelihood strategies for poor mountain communities and promote sustainable and resilient mountain development.

Keywords: COVID-19, yartsa gunbu, caterpillar fungus, Kailash Sacred Landscape, Kanchenjunga Landscape

Women in informal trade: A case of the Kailash Landscape

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Abstract

In underdeveloped and developing countries, the informal sector is the primary source of employment for women. From street vendors and domestic workers to subsistence farmers and seasonal agricultural workers, women make up a disproportionate percentage of workers in the informal sector.

In essence, to promote and engage women traders/entrepreneurs in cross-border trade, CUTS International has done a study on Building Resilience of Mountain Traders of the Hindu Kush Himalaya (HKH) region, supported by ICIMOD. The study was conducted in four transboundary landscapes – Hindu Kush Karakoram Pamir Landscape (HKPL), Kailash Sacred Landscape (KSL), Kangchenjunga Landscape (KL), and Landscape Initiative in the Far Eastern Himalaya (HI-LIFE). The overall objective of the project is to facilitate and further strengthen women’s roles in trade within ICIMOD’s transboundary landscapes.

This paper will present the findings of the capacity building programme and gender sensitization study conducted in the Kailash landscape. The capacity building programme was attended by 103 women traders/entrepreneurs from Dharchula, India, and Darchula, Nepal. Apart from this, focus group discussions were held with women/traders/ entrepreneurs, customs officials, and security officials near the border checkpoints at Jhulaghat, Dharchula, and Banbasa, in order to examine personal attitudes and beliefs as well as the realities of women in informal trade along the India–Nepal border.

A comparative analysis of women in informal trade in the HKH and the Sub-Saharan Africa (SSA) region revealed that the problems faced by cross-border women traders are similar in nature. The findings underlined the interdependency of the people of India and Nepal for their daily needs. Most of the traded goods are forest and agricultural produce like spices, vegetables, and pulses. It was also found that the trade at Dharchula and Banbasa is vibrant in comparison with that at Jhulaghat.

The participation of women in informal cross-border trade is vital as far as the local economy is concerned. The study concludes with various recommendations such as information dissemination through campaigns, development of common checking points, periodic media campaigns, and engaging with customs and border agencies to promote gender-friendly cross-border trade practices.

Keywords: Cross-border, informal trade, gender sensitization, checking points

Spring restoration through sustainable land management in the mid-hills of the Indian Himalaya

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Abstract

Of the estimated three million springs in the Indian Himalayan region, roughly 60 per cent have dried up or become seasonal. This phenomenon is occurring across the entire Himalayan region, threatening water security, biodiversity, and livelihoods in both mountain and downstream areas. Rapid population growth has brought about extensive land-use changes, mainly through cultivation, large-scale deforestation, and overexploitation of forest resources. These land-use changes are impacting spring flows, which is further exacerbated by climate change and rainfall variability. The trend of “too much water” followed by “too little water” is increasing floods and droughts. There is an urgent need to restore springs with effective recharge interventions; however, action has been stalled by the lack of coherent perspectives and knowledge on the interrelations of land use, surface run-off, and groundwater regimes in the Hindu Kush Himalaya (HKH).

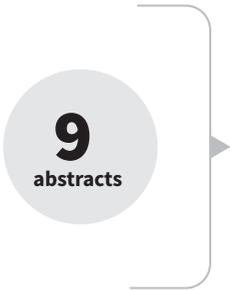
In the north Indian state of Uttarakhand, at least 50 per cent of the springs have reportedly dried up. With support from regional experts and local land users, this study demonstrates that springs flows can be preserved or increased through locally adapted sustainable land management practices in springsheds, such as by afforesting with broadleaf trees and grasses, establishing recharge structures (infiltration ponds, trenches, check dams), and protecting indigenous water harvesting structures (naula and dhara). The study used ground-based knowledge to classify and analyse land-use types; it also applied the Soil Conservation Service-Curve Number (SCS-CN) method and a water-balance approach to estimate run-off, groundwater recharge, and potential spring discharges. Built on basic, systematic field mapping and springshed delineation by varying factors (land use and cover; soil type and slope), features such as run-off, groundwater, and spring discharge calculations were deduced against the available water-flow data for springsheds in the study area. The results

give clear evidence that spring recharge is dependent on monsoon rainfall to sustain year-round flows; they also emphasize the need to improve sustainable forest management, water harvesting, and regenerative agriculture practices. The described approach has the potential to improve the management of spring restoration, spring monitoring, and land-use planning. Upscaling these practices will not only benefit the mountain communities, but also contribute to water and resource security in the downstream regions.

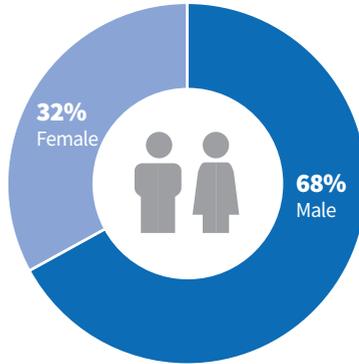
Keywords: Spring restoration, drought mitigation, mountain watershed management, surface water hydrology, traditional practices

Abstracts for lightning talk

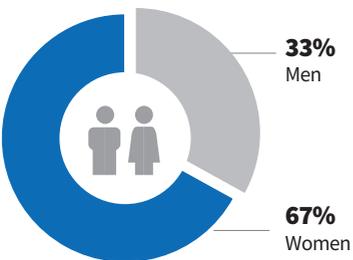
9 Abstracts



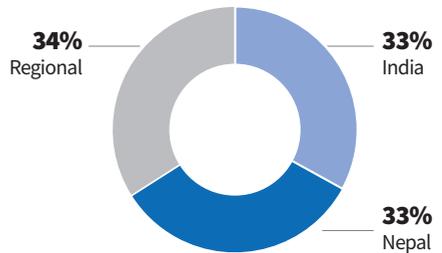
Authorship



Presenters



Geographical area of research



Vulnerability assessment of forests in West Himalaya, India

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Abstract

The Himalaya, one of the hotspots of global biodiversity, is often described as a landscape where diverse cultural groups thrive alongside diverse natural resources. The region is recognized as a rich provider of a wide range of ecosystem services which are vital for supporting the lives and livelihoods of billions of people living in the highlands and lowlands. However, the Himalayan ecosystem is considered highly vulnerable to environmental perturbations and anthropogenic disturbances. Consequently, the communities dependent on ecosystem services are affected at various levels. Based on different indicators, this study focused on assessing forest vulnerability using vegetation data and spatial mapping along an elevation gradient of 700–4,000 masl; this gradient comprised 37 sites in the Pithoragarh District of India's west Himalaya. The study concludes that the temperate and mixed forests in the region have higher vulnerability, whereas the subtropical pine, broadleaf, and subalpine forests have lower vulnerability. The forest vulnerability map that was developed in the study was verified by a significant positive relationship ($r = 0.80$, $p < 0.001$) with ground-based forest vulnerability. The spatial forest vulnerability maps developed in the study provide a realistic profile of sensitive forests; this can be utilized to build adaptation measures and management plans for the identified vulnerable forest types of the western Himalaya in general and the Pithoragarh District in particular.

Keywords: adaptation measures, forest vulnerability, management plans, temperate forest, western Himalaya

Quantifying the spatio-temporal variability of carbon fluxes in the foothills of North-western Himalaya, India

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Abstract

The forest resources of the Himalayan region are functionally diverse and their contribution to terrestrial carbon dynamics is significant. However, there has been a lack of accurate information on the spatio-temporal variability of carbon fluxes which arise due to the diverse functional behaviour of the forests and their carbon-sinking capability. In the present study, the eddy covariance (EC) tower data and remote sensing (RS) data were used to parameterize and calibrate various ecosystem models, and the spatio-temporal variability of carbon fluxes over the North-west Himalayan (NWH) foothills of India was estimated.

The forests at the two EC tower sites located at Barkot and Haldwani, Uttarakhand, in the NWH foothills of India were found to be net carbon sinks. The mean net ecosystem exchange (NEE), ecosystem respiration (RE), and gross primary productivity (GPP) for 2016 to 2020 at Barkot were found to be -722.26, 2443.74, and 3166.01 gCm⁻²year⁻¹, respectively. At Haldwani, the mean NEE, RE, and GPP for the same period were found to be -456.23, 1891.46, and 2347.69 gCm⁻²year⁻¹, respectively.

To test the efficiency of productivity modelling approaches, the temperature greenness (TG) model (empirical), light-use efficiency (LUE) model, and biome-BGC (process-based) model were selected. These models were parameterized and calibrated using the EC tower data. To test the effect of RS data integration in the biome-BGC model, data on the Global Land Surface Satellite (GLASS) leaf area index (LAI) was integrated into the model. A comparative analysis of the modelled GPP, which was obtained using these approaches, and the EC tower-obtained GPP of the two plant functional traits (PFTs) revealed that the biome-BGC model with the integration of RS data performed the best for moist and dry deciduous PFTs. Hence, this approach was used to map the spatio-temporal variability of carbon fluxes from 2001 to 2018 in the moist and dry deciduous PFTs of the NWH foothills via gridded inputs of meteorological forcing from ERA5 and GLASS LAI data.

The present study offers a detailed insight into the applicability of multi-source data, including EC and RS data sets, in combination with various modelling approaches to map the spatio-temporal variability of carbon fluxes. The region-specific values of the critical parameters used in different models in terms of the optimum temperature for photosynthesis, conversion coefficient, and LUE_{max} are imperative for the region-specific parameterization of these models. As there has been a lack of reported values of these important parameters in the Himalayan region, the study attempted to report these parameters for two major PFTs of the NWH foothills. The study also underlines that the RS-based input has the potential to improve the estimates of carbon fluxes using the process-based model. It also shows that the forests of the NWH foothills are carbon sinks. This foregrounds their potential to offset anthropogenic CO₂ emissions and thereby mitigate climate change.

Keywords: Carbon flux, ecosystem respiration, forest resources, net ecosystem exchange

Structure, composition, and the regeneration status of oak forests in a part of the Kailash Sacred Landscape, Western Himalaya, India

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Abstract

The temperate broadleaved forests of the Himalayan region are dominated by different species of oak (*Quercus spp.*), which play an important role in maintaining ecosystem stability. In this study, four types of temperate broadleaf forest dominated by banj oak (*Quercus leucotrichophora*), rianj oak (*Q. lanuginosa*), moru oak (*Q. floribunda*), and kharsu oak (*Q. semecarpifolia*) were assessed between 1,770–2,965 masl in the Gori Valley, a part of the Kailash Sacred Landscape (KSL), Western Himalaya. A total of 120 quadrats of 10x10 m size were placed in 30 forest sites at different altitudes using standard phytosociological methodologies. Overall, 26 tree species belonging to 16 families were recorded. The tree density ranged from 450–1000 indi./ha⁻¹ with a total basal area of 21.6–74.5 m² ha⁻¹. Across the forest communities, the sapling density ranged from 360–960 indi. ha⁻¹ and the seedling density from 40–1840 indi./ha⁻¹. The *Q. floribunda* forest had the highest species richness and diversity (16 and 1.58±0.14 respectively), whereas the *Q. semecarpifolia* forest had the lowest (5 and 0.79±0.13 respectively). The study revealed that the moderately disturbed sites of *Q. lanuginosa* showed fair regeneration, while highly disturbed sites showed poor regeneration. The high-altitude oaks (*Q. semecarpifolia* and *Q. floribunda*) exhibited poor regeneration and these need to be protected from livestock grazing. Considering the significance of these overexploited oak forests, proper management and conservation strategies need to be developed for their maintenance and sustainability.

Keywords: Anthropogenic pressure, forest structure, Gori Valley, oak, regeneration

Effect of tree diversity and stand structure on aboveground biomass along the elevation gradient in the forests of far-western Nepal

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Abstract

The association between biodiversity and ecosystem function (BEF) is a widely discussed topic in ecological research. Specifically, plant diversity increases aboveground biomass (AGB) or productivity through niche partitioning and facilitation, as well as through resource-use efficiency. Moreover, such diversity is also responsible for higher forest functionality through the heterogeneous stand structure.

In the present study, the direct and indirect effects of elevation, stand density, individual diameter at breast height (DBH), height variation, and taxonomic diversity – in terms of species richness, species evenness, Shannon's species diversity or Simpson's dominance – on AGB were evaluated through an analysis of biophysical tree data from 101 forest plots (each size = 0.05 ha) along an elevation gradient ranging from 218–1,850 masl in the forests of the Sudurpashchim Province in Nepal. Besides, structural equation modelling (SEM) was applied to evaluate the direct and indirect effect of elevation and diversity indices on AGB.

The results showed that the variation in AGB was best explained by higher stand density, whereas species diversity had a declining effect on AGB. Interestingly, tree DBH and height variation showed negligible contribution to AGB. These results may exhibit the prominent role of the selection effect or of competitive exclusion or environmental filtering in regulating species diversity, stand structural complexity, and AGB in the studied forests.

Even though compact stand density is responsible for higher forest functionality, the study argues that species diversity and stand structure complexity are also crucial to biodiversity conservation and sustainable forest management.

Keywords: aboveground biomass, biodiversity and ecosystem function, DBH variation, species diversity

Prioritizing areas of conservation for the Ganges river dolphin

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Abstract

The endangered Ganges river dolphin is a flagship megafauna species that inhabits the Ganges–Brahmaputra–Meghna and Karnaphuli–Sangu river systems, as also the Sundarbans Delta. However, despite having a wide geographic extent of occurrence, its habitat continues to shrink in much of its distribution range. In this study, we used an ensemble modelling approach to investigate the spatial distribution of the Ganges river dolphin in relation to hydrological, climatic, physiographic, land-cover and anthropogenic variables in its entire habitat range. We identified about 6060 sq km of river segments in the range as priority areas for Ganges river dolphin conservation based on high-habitat suitability. The study helps to prioritize locations and river stretches in the range for designation as potential special protection areas where measures can be employed for the long-term conservation of the species.

Keywords: Ganges, protection areas, river dolphins

DEED Model: A decision tool for farm management in the mid-hills of Nepal

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Abstract

This dissertation follows a farm-level study conducted in order to identify resource endowment and monitor the ecological and economic performance of the mixed farms of Subeda and Kotedewal Village Development Committees (VDCs) of Bajhang District in the far-western mid-hills of Nepal. The DEED (Describe, Explain, Evaluate and Design) framework was used to observe the ecological performance, focusing on soil organic matter (SOM) and the nitrogen dynamics. The selection of representative farms from each community was based on the total land area, area under major crops and their productivity, use of internal and external resources, and the available farm-feed sources per year; this was followed by soil analysis. It was found that farming was the major source of livelihood of the people who participated in the survey. The central components of the local farming system comprised livestock and access to natural resources in order to feed them. The contributions of common natural resources were high in both the communities. The application of farmyard manure (FYM) was higher in Kotedewal (11.48 Mt/ha/yr) compared to Subeda (9.86 Mt/ha/yr). The soil analysis report showed that the SOM content of the farms at Subeda VDC were higher (3.56 per cent and 2.15 per cent), while it was lower in Kotedewal VDC (1.18 per cent and 1.28 per cent). The report also showed that the nitrogen content in the farms of Subeda were higher (0.54 per cent and 0.39 per cent), while it was lower in Kotedewal VDC (0.18 per cent and 0.21 per cent). This study concludes that the ecological and economic challenges faced by the farmers can be overcome by using appropriate soil and manure management practices.

Keywords: DEED, ecological and economic challenges, farming, natural resource

Understanding resilience in livelihood transitions: A case from Dadeldhura, Nepal

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Abstract

Livelihood transitions are happening across the mountains of the Hindu Kush Himalaya (HKH). Some of the key reasons behind this are globalization, male outmigration, changing youth aspirations, non-remunerative agriculture system, and the sectoral focus of governmental policy and programmes, besides promotion of cash crops and vegetable farming by NGOs. Dadeldhura in far-west Nepal exemplifies such a shift. Due to high male outmigration, agriculture feminization, and the raiding of cereal crops by wild animals, the farmers in Dadeldhura are moving away from livelihoods based on traditional drought-tolerant cereal crops to high-value vegetable farming. Even as vegetable farming continues to be a lucrative business, there are future constraints in it in terms of water demand and/or market shocks which might lead to maladaptation. Therefore, understanding the major drivers of socio-economic and ecological changes, including climate change impacts, from the viewpoint of systemic thinking becomes crucial in planning and designing adaptation and resilience-building programmes. However, measuring the quantum of resilience remains a challenge due to evidence gaps in understanding about resilience of what and to what. In addition, socioecological complexities with non-linear interactions between and among the several drivers of change limit our knowledge on the nature of feedback in the system; and the uncertainty around climate change only adds to this complexity.

The transitions in livelihood in Dadeldhura could be one form of adaptation to address the current needs, but in the longer run, this could push the farming communities to a more vulnerable state. As there will be increased drought frequencies due to climate change, it may lead to the collapse of vegetable-based livelihoods. Currently, the farmers are fetching high income from vegetables, but this is highly prone to market shocks due to the heavy dependence on the demand

and supply in Indian markets. This system will not thrive unless there is proper policy support on irrigation infrastructure and a sustainable market mechanism. There should also be high level of awareness among the farmers so that they can maintain traditional crop diversity, along with vegetable farming, to minimize risks. We have thus identified three dynamic areas of changes that should be continuously monitored to build system resilience: a) changes in source of vulnerability at a temporal scale; b) human aspirations for increased income with bearing on labour availability in farming; and c) trade-offs between aspirations for higher income and increase in vulnerability while transitioning from one livelihood to another.

Keywords: Adaptation, agroecosystem, resilience building, systemic thinking, vulnerability

Community-driven open mapping in the Asia-Pacific Region

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Abstract

The Open Mapping Hub Asia-Pacific (AP Hub) was established in early 2021 to advance the open mapping movement in the Asia-Pacific region. The hub engages open mapping organizations and communities in the region to facilitate exchange of ideas and expertise across 25 countries and to drive high-quality, ethical, and local data-use cases by enabling knowledge exchange via numerous programmes. To fulfil its strong aspirations, the Open Mapping Hub Asia-Pacific is working on: identifying, recognizing, nurturing, and collaborating with key institutions, groups, and individuals working in OSM (OpenStreetMap) to promote the effective use of OSM data and connect it to the everyday lives of people; to bring data, technology, and people together; and to develop itself as a platform for regional public good for our shared benefits. The aim is to highlight these aspirations and to conduct hub programmes in order to support these, along with some use cases from partnering organizations and communities to demonstrate how community-driven open mapping can support local projects within the region.

Keywords: Community-driven open mapping data, Open Mapping Hub Asia-Pacific, OpenStreetMap

Disaster mitigation in landslides using machine learning

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Abstract

Civil engineering structures are being challenged by nature to maintain an equilibrium. With increasing pressure from deforestation, floods, and earthquakes, landslides pose a critical danger to roads, buildings, and other civil engineering structures. This study focuses on the effects of chemical, hydraulic, mechanical as well as thermal aspects that alter the natural stability of slopes which, in turn, are contributing factors to landslides. These processes often leave an observable difference in the slope. With a grasp on the behaviour of such interlinked phenomena, a model using a machine-learning algorithm to identify such changes using image processing is proposed. Firstly, we present the effects of chemical weathering on the landslide that decreases the shear strength of the rock and evokes the swelling behaviour of clay which initiates the landslide. Secondly, the focus is on rainfall-induced landslides where the pressure introduced inside the slope induces instability. Likewise, the warming of the earth has triggered a change in climate around the world, leading to the increased likelihood of heavy rainfall. Lastly, mechanical loads such as stresses on the top sections of roads as well as earthquake-induced loads often lead to some observable differences in the previous and current states of the slope. Major emphasis will be on discoloration and the cracks in landslides due to chemical weathering. These differences from various viewpoints are noted in pictures from previous and current conditions and fed into the machine-learning algorithm. A case review from around the world is also done and the possible causes of landslides are discussed. The health of the structure is also monitored through this procedure and the likelihood of a landslide is predicted. There are also suggestions on how to prevent landslides to save lives and capital. This project is being done on a small scale and changes and modifications to the model are ongoing.

Keywords: Chemical, deforestation, hydraulic, landslides, mechanical, machine learning



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