For the 733rd-734th issues of Headlines Himalaya, we reviewed research papers from five sources and selected eight research papers from five countries. We selected four papers from Nepal and four from other Himalayan Countries (India, China, Bhutan and Pakistan).

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Nepal-Himalaya

ENVIRONMENTAL, ENERGY SECURITY, AND ENERGY EQUITY (3E) BENEFITS OF NET-ZERO EMISSION STRATEGY IN A DEVELOPING COUNTRY: A CASE STUDY OF NEPAL

Shree Raj Shakya, Amrit Man Nakarmi, Anita Prajapati, Bijay Bahadur Pradhan, Utsav Shree Rajbhandari, Maheswar Rupakheti, and Mark G. Lawrence

There is a growing number of national, subnational and even company targets for net-zero emissions of CO_2 in support of the Paris Climate Agreement goals of limiting the global average temperature increase within 1.5°C by 2100. The challenges faced by developing countries in achieving net-zero emissions targets are, however, very prominent due to their common desire for rapid economic growth, improved socio-economic conditions, and greater climate resilience. In addition, this has to overcome many constraints related to the competitiveness, acceptability, and sustainability of proposed and planned low-carbon initiatives. It is thus very important to understand the economic and technical characteristics of net-zero emissions concepts and pathways. The constraints can best be addressed if actual and transparent co-benefits related to these initiatives are identified and reflected during their implementation. Here we employ the Low Emissions Analysis Platform (LEAP) to examine Nepal's recently introduced 'Long-term Strategy for Net-zero Emissions' and to estimate anticipated co-benefits in terms of reducing air pollutants emission and enhancing energy security and energy equity. Under the reference scenario (REF), the annual CO_2 emission is expected to increase from 23 $MtCO_2$ in 2019 to 79 Mt CO_2 in 2050 with significant increase in air pollutants emissions in the range of 60% (Organic Carbon) to 183% (SO_2), increase in energy import dependency, reaching electricity consumption per capita below one-quarter of the world average. Under the 'With Additional Measures (WAM)' strategy scenario, air pollutants would be reduced in the range of 70% (Organic Carbon) to 85% (Black Carbon) respectively, in 2050 as compared to the REF. Similarly, it results drastic improvement in energy security indicators and energy equity. It is expected that the findings of this study will provide useful input to policymakers, private sector, societal actors and researchers in support of successful implementation of the initiatives for sustainable socio-economic transformation pathways.

For further reading: https://doi.org/10.1016/j.egyr.2023.01.055

IDENTIFYING IMPERILLED FISH SPECIES AND POTENTIAL CAUSES OF DECLINE IN THE HIMALAYA BIODIVERSITY HOTSPOT

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Despite the global nature of the aquatic biodiversity crisis, drivers of extirpation vary among regions, making local-level data collection crucial for adaptive management in understudied regions like the Himalaya Biodiversity Hotspot (HBH). As human population growth, economic development and environment change accelerate across the HBH it is important to identify imperilled species and determine any ecological traits that predispose them to extirpation. In the present study, Monte Carlo analysis was used to determine fish species with significant range reductions ('significantly declining species') from the 1980s to the 1990s, and from the 1990s to the 2010s, at 38 sites on Nepal's Kaligandaki–Narayani River (KNR). Relative to a null model under which all species were equally likely to lose individuals between time periods, distributions of 16 of 83 species declined significantly across at least one of the two time periods, and two species, Hamilton's baril (*Opsarius bendelisis*) and the trout barb (*Raiamas bola*), declined across both. Mid-water fishes native to both lowlands and hills were most likely to experience range reduction. International Union for the Conservation of Nature Red List status was not representative of actual population trends, highlighting the critical role of local, long-term data collection and management strategies for effective conservation. *Opsarius bendelisis* and *R. bola* urgently need protection in the KNR to stem current population declines. Conservation efforts here should focus on speciose lower-elevation sites, where many of the 14 other significantly declining species also occur. Overfishing is likely to have contributed to species declines, suggesting that the network of terrestrial protected areas already in place across the HBH can aid aquatic biodiversity conservation efforts owing to their status as fish sanctuaries. Rivers such as the KNR represent

a unique opportunity to conserve an intact, albeit threatened, fish species, before human pressures lead to widespread extirpations of the type documented in many areas of the world.

For further reading: http://dx.doi.org/10.1002/aqc.3914

AN ASSESSMENT OF GOOD AGRICULTURE PRACTICES FOR SAFE AND SUSTAINABLE VEGETABLE PRODUCTION IN MID-HILLS OF NEPAL

Menila Kharel, Nani Raut, and Bed Mani Dahal

The vegetable sector provides immediate income, nutrition, and food security and contributes significantly to the economy of Nepal. In recent decades, the sustainability of the vegetable sector has been challenged due to the unsystematic use of agrochemicals for commercializing production. Adopting Good Agriculture Practices (GAP) could reduce the use of agrochemicals in commercial vegetable production. This study conducted the assessment of GAP in Kathmandu Valley. A mixed-method approach, combining quantitative and qualitative methods, was adopted for the study, which included farmers' surveys, key informant interviews, and in-depth interviews. The results showed that farmers were adopting different GAP, such as cropping practices, livestock integration, soil fertility management practices, and integrated pest management practices. Upon adopting these practices, farmers reduced agrochemicals' use by more than 40%. The critical incentives for surveyed farmers to adopt GAP were soil health improvement, farmers' safety, and reduction in the use of agrochemicals while improving the farm's image. Further, the study revealed that farmers faced several challenges in adopting GAP. Management difficulty (I = 0.9) was identified as the most critical problem, followed by no premium price (I = 0.8), knowledge (I = 0.6), access to GAP inputs (I = 0.5), and other risks (I = 0.04). The study's findings imply that adopting GAP helps reduce the use of agrochemicals, consequently motivating farmers toward safe and sustainable vegetable production. The study recommends market-based solutions such as creating mass consumer awareness, ensuring premium prices with quality assurance mechanisms for making the GAP-based production profitable, and promoting its wider adoption. This is supported by facilitating farmers' access to government subsidies, price incentives, and insurance services and increasing access to GAP inputs. This study aims to generate evidence on a safe and sustainable vegetable production model that will be key to institutionalizing GAP in Nepal.

For further reading: https://doi.org/10.1016/j.jafr.2023.100518

INFLUENCE OF RURAL OUT-MIGRATION ON HOUSEHOLD PARTICIPATION IN COMMUNITY FOREST MANAGEMENT? EVIDENCE FROM THE MIDDLE HILLS OF NEPAL

Rajesh Bista, Sophia Graybill, Qi Zhang, Richard E. Bilsborrow, and Conghe Song

Rural out-migration was a rare socio-economic phenomenon when community forestry began in the 1980s in Nepal. Now, out-migration significantly influences nearly every aspect of rural livelihoods in the country. However, it is unclear how out-migration affects community forestry governance, which is essential for sustainable rural development. Therefore, this paper addresses the following research question: Does rural out-migration affect forest users' participation in community forestry decision-making and management practices? This paper draws on data collected from an extensive survey of 415 households from 15 community forest user groups in 2 Mid-Hill districts of Nepal. The research used ordered-logit regression to model the impacts of out-migration on participation in forest management and decision-making, while controlling for a number of other socio-economic factors. The model results show that total household size and number of internal migrants, together with multiple resource characteristics and institutional attributes, were major factors affecting participation in decision-making and forest management. However, the number of international migrants did not have a significant role in

determining the levels of the participation. This study provides valuable insights for future community forestry policymaking that aims to address the effects of out-migration on community forest management in Nepal.

For further reading: https://doi.org/10.3390/su15032185

India-Himalaya

BIODIVERSITY OF BUTTERFLIES (LEPIDOPTERA: RHOPALOCERA) IN THE PROTECTED LANDSCAPE OF NANDHOUR, UTTARAKHAND, INDIA

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An appraisal of butterfly species composition in terms of comparative diversity richness in various habitat types was conducted in and around the Nandhour Wildlife Sanctuary of Terai Arc landscape in Uttarakhand. During the two years of survey period (March 2018–February 2020), a total of 89 species of butterflies belonging to families Nymphalidae 43 species, Pieridae 15 species, Lycaenidae 13 species, Hesperiidae eight species, Papilionidae seven species, and Riodinidae three species were recorded, of which 46 species represented new records for the Nandhour Landscape. Buterfy diversity and richness were highest in dense moist & open dry riverine forests and lowest in human setlements & agricultural land. No signifcant diferences in the number of species were found in moist mixed deciduous forest, subtropical Chir Pine forest, moist Bhabar Sal forest, moist Shiwalik Sal forest, and plantation forest. Eight species are endemic to the Indian Himalayan Region.

For further reading: http://dx.doi.org/10.11609/jott.7519.15.1.22448-22470

China Himalaya

SPATIOTEMPORAL VARIATION IN THE LAND USE/COVER OF ALLUVIAL FANS IN LHASA RIVER BASIN, QINGHAI–TIBET PLATEAU

Tongde Chen, Juying Jiao, Wei Wei, Jianjun Li, Ziqi Zhang, Haizhen Yang, and Huifang Ma

Alluvial fans are an important land resource with agricultural potential in Qinghai–Tibet Plateau. The spatiotemporal variation in land use/cover is an important indicator to understand the value of alluvial fans and protect and make scientific use of such fans. In this study, the spatiotemporal characteristics of land use/cover are determined by analysing the land use/cover changes of alluvial fans in the Lhasa River Basin (LRB) at different times, counties/districts, altitudes, and gradients. Results show that the area of cultivated land and the artificial land provided by alluvial fans for LRB has continuously increased. In 2000, 2010, and 2020, 17.72%, 21.84%, and 24.17% of cultivated land and 7.89%, 7.51%, and 25.24% of artificial land in LRB were provided by alluvial fans, respectively. At all altitudes and slopes, cultivated land and artificial land are increasing but the increasing part is basically due to the massive loss of grassland. The spatiotemporal changes in all land use/cover types of alluvial fans were dominated by human activities, although they were also influenced by natural factors to some degree.

For further reading: https://doi.org/10.3390/agriculture13020312

Bhutan-Himalaya

HOW DOES CONSERVATION LAND TENURE AFFECT ECONOMIC IMPACTS OF WILDLIFE: AN ANALYSIS OF SUBSISTENCE FARMERS AND HERDERS IN BHUTAN

Yeshey, Rodney J. Keenan, Rebecca M. Ford, and Craig R. Nitschke

Trees, Forests and People 11: 100378

Protected areas (PA) to conserve wildlife are the cornerstone of biodiversity conservation but they can also result in increased human-wildlife conflict (HWC), which poses a serious challenge to jointly achieving sustainable development goals of food security and biodiversity conservation, particular in regions with high conservation values and subsistence farmers. In the Himalayan Kingdom of Bhutan, expanding PAs and other conservation efforts have led to increased wildlife populations that are causing more damage to crop and livestock and impacting on the livelihoods of subsistence farmers and herders. In this study, we used a social-ecological systems framework to quantify the intensity this impact and associated economic losses with identified wildlife species and compared differences between livelihood types (crop farming versus livestock husbandry) and land tenure (inside versus outside protected areas). Results indicated that Meso-scale wildlife species that are not the focus of conservation caused higher economic losses. Approximately 43% of total economic loss through crop depredation was attributed to wild pig (*Sus scrofa*) and 56% of the total economic loss through livestock predation was caused by wild dogs (*Cuon alpinus*). Losses borne by respondents whose livelihoods depend mainly on livestock were significantly higher, with a mean loss equivalent to US$1328 per household per annum, than those depending on crop production (US$171 per household per annum). Economic losses incurred through crop and livestock depredation were significantly higher for the respondents residing inside PAs, which is attributed by those households to a perceived increase in wildlife populations because of conservation policies. Interventions for prevention and mitigation of these impacts should recognize these varying unintended effects of wildlife and be better targeted at groups living in different parts of the landscape. These include expanding compensation scheme to losses caused by wild dogs and pigs, supporting ecotourism ventures within PAs to diversify income options and introducing control measures for these animals.

For further reading: http://dx.doi.org/10.1016/j.tfp.2023.100378

Pakistan- Himalaya

EXPLORING THE NEXUS BETWEEN LAND USE LAND COVER (LULC) CHANGES AND POPULATION GROWTH IN A PLANNED CITY OF ISLAMABAD AND UNPLANNED CITY OF RAWALPINDI, PAKISTAN

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Heliyon 9: e13297

For the last three decades, Islamabad - a planned city, and Rawalpindi - an unplanned city, have experienced massive land use and land cover changes. The main objective of this study was a comparative assessment and quantification of LULC changes in relation to population growth and urbanization from 1990 to 2021 with the help of satellite imagery and population data in planned and unplanned cities. For classification four land-use land cover classes: built-up, vegetation, bare land, and water were selected. Maximum likelihood algorithm and confusion matrix were employed for classification and accuracy assessment. Results revealed that built-up increased from 5.7% (52 km²) to 25.7% (233 km²) and 3.7% (60 km²) to 14.1% (228 km²) from 1990 to 2021 for Islamabad and Rawalpindi, respectively. Where in the bare land decreased from 42.2% (382 km²) to 18.1% (164 km²) in Islamabad and 65.5% (1058 km²) to 32.1% (518 km²) in Rawalpindi. Vegetation showed an increment of 4.7% for Islamabad and 24.5% for Rawalpindi. Surface water bodies decreased in both study areas. Population growth showed a strong positive correlation with the built-up class and a strong negative correlation with the bare land class for both cities.

The outcomes of this study may be helpful in policymaking for better planning and management of land use land cover and urban sprawl in the context of sustainable development goals.

For further reading: https://doi.org/10.1016/j.heliyon.2023.e13297