

# Headlines Himalaya

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For the 693<sup>th</sup> - 694<sup>th</sup> issues of Headlines Himalaya, we reviewed researches from four sources and selected seven researches from four countries. We selected two researches from Nepal and five researches from other Himalayan Countries (India, China and Bhutan).

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## Nepal-Himalaya

### AREAS OF SPECIES AND ENDEMICITY OF NEPAL

Mohan Dev Joshi and Chudamani Joshi

*Ecosphere* 13: e3969

In this study, we analyzed the distribution and the spatial pattern of species diversity of vascular plants in Nepal. The aim was to identify and evaluate the occurrence and status of species-rich areas in Nepal using ecological and

environmental drivers. We used 52,973 georeferenced herbarium specimen records, representing 2650 species collected from Nepal. Altogether, 41 environmental variables were used for model development and validation. We used MaxEnt to predict the distribution pattern. All the significant species distribution predictions were then used to develop a species richness and endemism pattern in Nepal. The High Mountain and Himalaya, particularly east and central Nepal, were found to be species diverse and endemically rich areas, whereas western Nepal had lower species richness. We observed that isothermality, slope, rugosity, potential evapotranspiration, precipitation of humid months, temperature annual range, mean diurnal range, and normalized difference in vegetation index of humid months were the most influential environmental and climatic variables. We observed that about 60% of the areas, which had highest richness and endemism values, are still not included in protected areas in Nepal. We quantitatively analyzed the species richness and endemism patterns of Nepal and were able to identify 19 areas of high species diversity and endemism, six of which are newly identified.

For Further Reading: <https://doi.org/10.1002/ecs2.3969>

### **OPPORTUNITIES AND BARRIERS FOR WOOD-BASED INFRASTRUCTURE IN URBAN HIMALAYAS: A REVIEW OF SELECTED NATIONAL POLICIES OF NEPAL**

Alark Saxena, William Cole Buettner, Loker Kestler, and Yeon-Su Kim

*Trees, Forests and People* 8: 100244

Nepal is a landlocked developing nation in a fragile mountain landscape vulnerable to seismic activity. The 2015 Gorkha earthquake highlighted how systemic social issues, such as poverty, rural-to-urban migration, and weak governance, exacerbate devastating impacts of natural disasters. Building wood-based infrastructure (WBI) can increase rural livelihoods through sustainable forest management and reduce rural-to-urban migration, while improving resilience of building and other infrastructure through use of wood. WBI can help Nepal achieve disaster risk reduction (DRR) goals while also reducing greenhouse gas emission and increasing carbon sequestration. We reviewed Nepal's policy landscape to identify the opportunities and barriers for building WBI and increasing urban resilience. Nepal's major policies across wood supply chain from sources to end-products related to WBI were reviewed and analyzed. We found that policies aimed to address sustainable development, disaster risk reduction, and climate change support establishment of WBI while policies for forest conservation limiting forest harvesting, as well as lack of clarity in policies and their implementation, creates barriers. We argue that Nepal's policies for forest conservation should be revised to allow sustainable forest harvesting and create more employment opportunities and income for rural communities to take advantage of expanded opportunities made available through WBI.

For Further Reading: <https://doi.org/10.1016/j.tfp.2022.100244>

## **India-Himalaya**

### **MONITORING MIGRATORY BIRDS OF INDIA'S LARGEST SHALLOW SALINE RAMSAR SITE (SAMBHAR LAKE) USING GEOSPATIAL DATA FOR WETLAND RESTORATION**

Rajashree Naik and Laxmi Kant Sharma

Globally, saline lakes occupy about 23% by area, and 44% by volume. Importantly, these lakes might desiccate by 2025 due to agricultural diversion, illegal encroachment, or modify due to pollution, and invasive species. India's largest saline lake, Sambhar is currently shrinking at a phenomenal rate of 4.23% every decade due to illegal saltpan encroachments. This study aims to identify the trend of migratory birds and monthly wetland status. Birds' survey was conducted for 2019, 2020 and 2021, and combined it with literature data of 1994, 2003, and 2013, for understanding their visiting trends, feeding habits, migratory and resident birds ratio, along with ecological diversity index analysis. Normalized Difference Water Index (NDWI) was scripted in Google Earth Engine. Results state that lake has been suitable for 97 species. Highest NDWI values was 0.71 in 2021 and lowest 0.008 in 2019. Notably, the decreasing trend of migratory birds coupled with decreasing water level indicates the dubious status for its existence. If these causal factors are not checked, it might completely desiccate. Authors recommend a few steps that might help conservation. Least, the cost of restoration might exceed the revenue generation.

For Further Reading: <https://doi.org/10.1007/s11273-022-09875-3>

## China Himalaya

### **A COMPARATIVE ANALYSIS OF PRE- AND POST- INDUSTRIAL SPATIOTEMPORAL DROUGHT TRENDS AND PATTERNS OF TIBET PLATEAU USING SEN SLOPE ESTIMATOR AND STEADY-STATE PROBABILITIES OF MARKOV CHAIN**

Zhenya Li, Zulfiqar Ali, Tong Cui, Sadia Qamar, Muhammad Ismail, Amna Nazeer, and Muhammad Faisal

*Natural Hazards* 111: 1-30

Drought poses a significant risk to human life, agriculture, energy, ecosystem, wildlife, and other aspects of the terrestrial system. Climate warming may increase drought hazards around the globe. This study compares the pre- and post-industrial impact of climate change on the spatiotemporal evolution of drought over the Tibet Plateau region. Two standardized drought indices (SDIs), namely Standardized Precipitation Index (SPI) and Standardized Precipitation Evapotranspiration Index (SPEI), are utilized to characterize drought by averaging the time-series data of precipitation and temperature from 23 climate models of Coupled Model Intercomparison Project 6 database. Sen slope estimates and steady-state probabilities of the Markov Chain are used to assess drought characteristics. This study shows that an increasing trend in temperature has led to increased evaporation. Increasing evaporation had caused expansion in water deficiency; the decreasing trend of SPEI index on almost the entire Tibet Plateau reveals the persistence of future drought. A slight increase has been observed in extreme wet classes in higher timescales. However, the long-term probabilities of extreme drought and extreme wet episodes at the one-month timescale of SPI are equivalent and stable in both periods. The chance of occurrences of severe drought episodes has decreased. Comparatively, a significant increase in the likelihood of severe drought has been observed under the SPEI. Furthermore, the spatiotemporal quantitative comparison reveals that the SPI index is consistent in both periods. However, a significant decline ratio of SPEI values has been observed in the post-industrial period. It is because increasing temperature causes more evaporation. Consequently, the increase in water deficiency is the main reason for increasing drought episodes under SPEI.

For Further Reading: <https://doi.org/10.1007/s11069-022-05314-x>

## **THE DUAL EFFECTS OF POPULATION MIGRATION ON THE ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT GOALS IN TIBET, CHINA**

Ying Pan, Jin Zhu, Zhongxu Zhao, Zhennan Li, and Junxi Wu

*Environment, Development and Sustainability* 24: 1-7

China's urbanization process, premised on the belief that migration contributes to economic growth, has entailed extensive population movement. However, the overall effects of population migration on regional sustainable development goals (SDGs) remain unclear. China's achievement of SDGs hinges on the sustainable development of Tibet, which is economically less developed and ecologically fragile. We established county-level SDG indicators for Tibet using pixel-level maps and statistical data on diverse socioeconomic and environmental topics: GDP, population density, health, employment, agricultural productivity, ecosystem services, and vegetative cover. Our underlying assumption was that regional differences in economic development and Tibet's eco-migration policy have induced extensive domestic migration. Moreover, we assumed that migration affects the achievement of SDGs directly and indirectly through its economic impacts. Accordingly, we developed and tested a conceptual framework using structural equation modeling (SEM). The results revealed that from 2000 to 2015, there was progress toward achievement of all of the selected SDGs, with Tibet achieving an average increased score of 11.0. The hypothesized SEM explained the total SDG score and those of SDGs 1, 2, 6, 11, and 15. Population migration accounted for 16% of the variation in SDG scores. Migration had direct negative impacts and indirect positive impacts on the total SDG score via its effect on economic development. Specifically, population migration had stronger positive effect on out-migration counties than on in-migration counties, with higher SDG scores for the former associated with public services and ecological systems. To reverse the negative impacts of migration on certain in-migration counties, we recommend pursuit of high-quality urbanization, entailing the provision of more educational and medical facilities, livelihood resources, and off-farm jobs for migrant settlers. Promoting grass-based animal husbandry in rural areas could increase rural employment and ameliorate the side effects of migration on the SDGs.

For Further Reading: <https://doi.org/10.1007/s10668-022-02286-7>

## **EFFECT OF GRAZING EXCLUSION ON ECOSYSTEM SERVICES DYNAMICS, TRADE-OFFS AND SYNERGIES IN NORTHERN TIBET**

Yixuan Liu, Shiliang Liu, Yongxiu Sun, Jian Sun, Fangfang Wang, and Mingqi Li

*Ecological Engineering* 179: 106638

The relationships between different ecosystem services are key to regional ecological stability and security, and their trade-offs and synergies are affected by many factors, especially on the Qinghai-Tibet Plateau (QTP), which is susceptible to human activities. Northern Tibet, located on the QTP, has built fences for grazing exclusion in recent years. However, how grazing exclusion affects the ecosystem service variability and their mechanism remains still unclear. Based on the net primary productivity (NPP) quantitative index method, hotspot analysis, geographically weighted regression (GWR) model, this study analyzed the effects of grazing exclusion with fencing on ecosystem services dynamics, trade-offs and synergies. Results showed that the values of biodiversity conservation, water conservation and soil conservation were all higher in the fencing region than in the non-fencing region. Most counties experienced increasing trends in the fencing region with higher biodiversity conservation, water conservation in the fencing region than that in the non-fencing region from 2006 to 2015. Except for the relationship between soil conservation and water conservation in the non-fencing region in Cuoqin county in 2015,

the relationships among all ecosystem services were synergistic, and the overall trends were weakening. The county number percentage with higher synergistic relationships in the fencing region than that in the non-fencing region showed gradually increasing trends. Land use intensity, grazing intensity, precipitation and altitude were the main factors that affecting spatial heterogeneity of three ecosystem services in the non-fencing region, while distance to road, distance to town, land use intensity and temperature were the main influencing factors in the fencing region. This study contributes to exploring the effect of grazing exclusion on ecosystem services and their relationships, thus providing guidance for the formulation of grassland restoration measures.

For Further Reading: <https://doi.org/10.1016/j.ecoleng.2022.106638>

## Bhutan-Himalaya

### ETHNOBOTANICAL STUDY OF WILD EDIBLE FRUITS IN EASTERN BHUTAN

Pema Yangdon, Tetsuya Araki, Yen Yen Sally Rahayu, and Kunzang Norbu

*Journal of Ethnobiology and Ethnomedicine* 18: 27

In the past, wild edible fruits (WEFs) were a significant source of food and nutrition in Bhutan. These nutrient-rich species can enhance food security and alleviate poverty in Bhutan. However, recent developments like the introduction of improved fruit varieties, changes in dietary choices, and infrastructure development are expected to influence indigenous knowledge and consumption of WEFs. We aimed to document the species diversity of WEFs and their uses in eastern Bhutan and examine how the knowledge and consumption of WEFs vary with socio-demographic factors. A total of 97 households in two districts were selected to participate in the survey. A semi-structured questionnaire was used to interview a selected adult from each household. Comparative analysis of indigenous knowledge and consumption of WEFs among the socio-demographic factors was performed using one-way ANOVA and a Chi-square test on R software. The present study reported 52 species of WEFs belonging to 35 families. The prevalence of WEF consumption was found to be 42%. WEF consumption differed significantly between districts, age groups, and indigenous knowledge levels. Similarly, indigenous knowledge of WEFs was significantly associated with districts and age groups. Eastern Bhutan has a rich diversity of WEFs, but their consumption has been decreasing. Recent agricultural and infrastructure developments may have impacted the consumption and indigenous knowledge of WEFs in this region. Thus, domestication and agro-processing of WEFs should become a major focus in Bhutan to utilize their nutritional value and potential economic benefits to enhance food security in the country. Additionally, incorporating WEF-related knowledge in the school curriculum is essential to educate younger generations on WEFs.

For Further Reading: <https://doi.org/10.1186/s13002-022-00526-8>