

# Headlines Himalaya

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Editorial Team: Anupa Sharma and Sumana Chhetri

For the 721<sup>th</sup> -722<sup>th</sup> issues of Headlines Himalaya, we reviewed research papers from five sources and selected 10 research papers from four countries. We selected two papers from Nepal and eight from other Himalayan Countries (India, China, and Bhutan).

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**POTENTIAL IMPACT OF TROPHY HUNTING ON VIGILANCE AND FLIGHT BEHAVIOUR IN BLUE SHEEP (BHARAL: *PSEUDOIS NAYAUR*)**

Sanjay Kandel, Prashant Ghimire, Thakur Silwal, and Matthew Low

*Global Ecology and Conservation* 40: e02317

Conservation management is often integrated into a broader tourism context, and under some conditions allows wildlife trophy hunting to support its goals. In such cases it is generally acknowledged that the direct impact of hunting requires careful monitoring and regulation with respect to the size and dynamics of hunted populations. However, hunting may also affect the behaviour of local wildlife, including their reaction to the approach of humans. Thus, hunting may have broader consequences on tourism and conservation management if animals respond by changing their behaviour in a way that makes them more difficult to monitor or for tourists to observe. We examined the potential impact of trophy hunting on vigilance and flight behaviour of Blue Sheep (Bharal: *Pseudois nayaur*) in Nepal, by comparing their behavioural responses in conservation areas with contrasting management approaches: the Dhorpatan Hunting Reserve (DHR) where male Blue Sheep have been trophy hunted since the 1980 s, and the Annapurna Conservation Area (ACA) where hunting is forbidden. Blue Sheep in the DHR had higher levels of vigilance than sheep in the ACA (10 % versus 8 % of their time respectively). Sheep in the DHR were also much more difficult to approach on foot, with Blue Sheep groups in the DHR having an average flight initiation distance of  $96 \pm 7$  m versus  $39 \pm 3$  m for the ACA, and subsequently moving much greater distances when disturbed (flight movement distance in the DHR versus ACA:  $79 \pm 3$  m versus  $26 \pm 2$  m respectively). These results suggest that hunting impacts on tourism and conservation may extend well beyond the population dynamic consequences of trophy animal removal. These behavioural effects suggest additional consideration is required when balancing wildlife hunting and observation tourism activities in the same area. It would also be valuable to assess the impacts of hunting-induced behaviour changes on the effectiveness of wildlife monitoring in such areas.

For further readings: <https://doi.org/10.1016/j.gecco.2022.e02317>

**MOISTURE, NOT TEMPERATURE, IN THE PRE-MONSOON INFLUENCES *PINUS WALLICHIANA* GROWTH ALONG THE ALTITUDINAL AND ASPECT GRADIENTS IN THE LOWER HIMALAYAS OF CENTRAL NEPAL**

Deepak Gautam, Narayan Prasad Gaire, Mukti Subedi, Ram P. Sharma, Shankar Tripathi, Rajesh Sigdel, Saroj Basnet, Mahamad Sayab Miya, Parveen K. Chhetri, and Xiaojuan Tong

*Forests* 13: 1771

Changing climate can strongly affect tree growth and forest productivity. The dendrochronological approach to assessing the impact of climate change on tree growth is possible through climate–growth correlation analysis. This study uses an individual tree-based approach to model *Pinus wallichiana* (*P. wallichiana*) radial growth response to climate across the physiographic gradients in the lower distributional range of Nepal. This study sampled six sites across the Makwanpur district of central Nepal that varied in elevation and aspect, obtaining 180 tree-ring series. Climate data series were obtained from Climate Research Unit (CRU 4.0). The pair correlation approach was used to assess *P. wallichiana* growth response to climate and site-level physiographic variables such as site-level environmental stress. The study also determined long-term growth trends across the elevation and aspect gradients. Trees at sites with higher elevation and northeast aspect (NEA) were more responsive to winter and spring precipitation, whereas trees with lower elevation and northwest aspect (NWA) were more responsive

to winter and spring precipitation. Basal area increment (BAI) analysis showed the variation of growth at site-level environmental stress, suggesting that the sensitivity of forest ecosystems to changing climate will vary across the lower growth limit of *P. wallichiana* due to differences in local physiographic conditions.

For further readings: <https://doi.org/10.3390/f13111771>

## India-Himalaya

### DEVELOPING LANDSLIDE HAZARD SCENARIO USING THE HISTORICAL EVENTS FOR THE KASHMIR HIMALAYA

Bilquis Shah, M. Sultan Bhat, Akhtar Alam, Hilal Ahmed Sheikh, and Noureen Ali

*Natural Hazards* 114: 3763-3785

Landslides are globally ranked one of the deadliest natural hazards. However, there is a consensus among researchers that the overall occurrences and consequences of landslides are usually underestimated. Absence of comprehensive local or national databases in the historical archives about the landslide events leads to underestimations and misinterpretations of impending landslide hazard and susceptibilities in a region. Jammu and Kashmir is locus of landslide hazard; the region is characterised by mountainous terrain and complex geology, extensive unstable and tectonically active slopes, providing favourable environment for the landslide occurrence, particularly along the National Highway (NH-44) that is critical to region's connectivity with the rest of India. However, limited information available on the historical landslides hampers the development of a reliable landslide catalogue for the region. In view of that, the present study focuses on retrieving information on landslide events and their impacts to develop a comprehensive database for the time period of 1990–2020 for Jammu and Kashmir, with a special focus on the Udhampur–Banihal section of the Jammu–Srinagar National Highway (NH-44). This analysis compiled a list of 960 landslide events from a range of secondary sources reported for the area during the selected time period. A hotspot analysis was also performed to understand the spatial distribution and concentration of the landslide events across the region. The annual and seasonal analysis of the events suggests an increasing trend. Moreover, the results reveal that a total of 1000 fatalities and 267 injuries occurred during this period. Out of 20 districts, 16 exhibit relatively higher exposure levels to the landslide hazard and the induced socioeconomic impacts. Most affects were found to have been experienced along the NH-44 with 1234 estimated occurrences reported in 260 days in the past three decades. The catalogue of landslide events and their impacts developed in this study is valuable for the development of landslide early warning system and other landslide hazard mitigation measures for the region

For further readings: <https://doi.org/10.1007/s11069-022-05542-1>

### INTENSIFICATION OF TREE CULTIVATION IN CROPLAND BASED AGROFORESTRY SYSTEMS - ROLE OF SOCIO-ECONOMIC FACTORS

Kamal Kishor Sood

*Indian Journal of Ecology* 49: 1870-1878

Agroforestry is one of the sustainable land uses which have the potential of fulfilling the food as well tree based needs of the increasing population simultaneously from the same unit of the land. Intensification of agriculture

through new high yielding cereal varieties, irrigation, pesticides and fertilisers has many concomitant environmental hazards. Thus emphasis has shifted on intensification of tree cultivation on cropland. The studies on factors affecting tree intensification on cropland are almost non-existent. Hence present study on role of socio-economic factors was undertaken in Mandi district of Himachal Pradesh. Multistage sampling was followed to select the households. The data were collected using a pre-structured schedule and personal interviews with the head of the household. Multistage sampling was used to select households. Tree intensification was defined in terms of the number of trees per hectare on the crop land of the farmers. The farmers were categorised into two groups: low intensity adopters (farmers with 1-78 trees/ha) and high intensity adopters (farmers with >78 trees/ha). The association between the dependent variable (low intensity adopters -farmers with 1-78 trees/ha) and high intensity adopters-farmers (>78 trees/ha) and different independent variables was found using Chi-square test of association. Logistic regression analysis was used to identify the key variables influencing tree intensification. The study shows that education level of the head of household, cropping intensity, household food sufficiency, household livestock holding, quantity of tree produce sold, livestock holding and level of restrictions on grazing after crop harvest significantly and positively influenced the intensification of tree cultivation. However, the farmers with large sized cropland holdings were less likely to go for tree intensification. Based on logistic regression model, more emphasis needs to be given to restrict on-farm grazing after crop harvest followed by encouraging linkage of tree products for better marketing so as to increasing the intensity of tree cultivation in cropland agroforestry systems. The influence of the size of cropland holding had also significant but negatively influence of tree intensification implies small holders are more likely to have more intensification than the larger. Therefore, specific efforts need to be made to encourage large holder to intensify tree cultivation. The study implies that socio-economic factors need to be considered while formulating tree intensification strategies.

For further readings: <https://doi.org/10.55362/IJE/2022/3749>

## China Himalaya

### THE IMPACT OF LAND USE AND LAND COVER CHANGES ON THE LANDSCAPE PATTERN AND ECOSYSTEM SERVICE VALUE IN SANJIANGYUAN REGION OF THE QINGHAI-TIBET PLATEAU

Xinyi Duan, Yan Chen, Lingqing Wang, Guodi Zheng, and Tao Liang

*Journal of Environmental Management* 325: 116539

Decades of intensifying human activities have caused dramatic changes in land use and land cover (LULC) in the ecologically fragile areas of the Qinghai-Tibet Plateau, which have led to significant changes in ecosystem service value (ESV). Taking the ecologically fragile Sanjiangyuan region of the Qinghai-Tibet Plateau as the research object, we focused on understanding the impact of LULC changes on the Sanjiangyuan's landscape pattern and its corresponding ESV, which was combined with a Markov-Plus model to predict LULC changes in 2030. The results showed: (1) from 2000 to 2020, the LULC of Sanjiangyuan has changed to varying degrees, respectively. In the central and southern regions where animal husbandry is the mainstay activity, the area of grass land converted to bareland had expanded; (2) from 2000 to 2010, the total regional ESV increased sharply. However, the total amount of ESV decreased from 2010 to 2020; (3) the overall ESV in the study area was observed to be trending

down and is expected to decrease by approximately 4.25 billion CNY by 2030; (4) the fragmentation and complexity of regional landscape patterns will negatively affect local ecosystem stability and biodiversity. Overall, there is a strong temporal and spatial correlation between LULC and ESV. This study will provide a reference for the local government to provide targeted and sustainable land management policies, thereby promoting the improvement of the Qinghai-Tibet Plateau regional ecology value.

For further readings: <https://doi.org/10.1016/j.jenvman.2022.116539>

### **SPATIAL VARIATIONS AND INFLUENCING FACTORS OF SOIL ORGANIC CARBON UNDER DIFFERENT LAND USE TYPES IN THE ALPINE REGION OF QINGHAI-TIBET PLATEAU**

Ziwei Wang, Laiming Huang, and Mingan Shao

*Catena* 220: 106706

Understanding soil organic carbon (SOC) distribution and influencing factors are important to accurately assess soil carbon sink potential and ecosystem quality. However, variations and controls of SOC content and stock under various land use types in the alpine region of Qinghai-Tibetan Plateau remain challenging. In this study, soil properties (pH, bulk density, porosity, clay content, soil organic carbon, soil water content, total nitrogen, total phosphorus, available nitrogen and available phosphorus) and environmental parameters (annual average temperature, annual average rainfall, normalized differential vegetation index, altitude, slope, surface roughness, longitude and latitude) were determined across a 600 km east–west transect in the Tibet alpine region for investigating the distribution characteristics and controls of SOC for three land use patterns — farmland (FA), forestland (FO) and grassland (GR). Results indicated that SOC content in the 0–30 cm decreased with increasing soil depth at different reduction rates under various land use types. The average SOC content and stock in GR was significantly higher than that in FO and FA due to the existence of mattic epipdon in GR under high altitude. The non-consideration of gravel content in soil can lead to an overestimation of SOC stock of 0–30 cm soil layer by 15.37 %, 16.70 % and 17.43 % for FA, FO and GR, respectively. Soil properties and environmental conditions simultaneously affect the spatial distribution of SOC under various land use patterns. Pedotransfer functions (PTFs) using multiple regression were used to forecast SOC content in the studied alpine region, which had a better predictive performance than previous published PTFs in the plain area, especially when SOC contents were higher than 40 g kg<sup>-1</sup>. Our study provides a foundation to build SOC prediction models for other alpine regions in the world, where SOC contents generally exhibit a wider range than the plain areas.

For further readings: <https://doi.org/10.1016/j.catena.2022.106706>

### **ENHANCING SUSTAINABILITY OF VEGETATION ECOSYSTEMS THROUGH ECOLOGICAL ENGINEERING: A CASE STUDY IN THE QINGHAI-TIBET PLATEAU**

Qing Yu, Hongwei Lu, Tianci Yao, Yuxuan Xue, and Wei Feng

*Journal of Environmental Management* 325: 116576

Ecological engineering is an important measure to promote ecosystem adaptation and restoration to deal with environmental change and human disturbance. To assess the effectiveness of ecological construction and analyze the influencing factors of ecosystem changes in the Qinghai-Tibet Plateau (QTP), this study detected the spatial changes and dynamic hotspots of vegetation ecosystems in the ecological construction regions of the QTP (QTPE) and regions without ecological construction (QTPWE) using hot spot analysis and comprehensive dynamic degree

model. Then the random forest (RF) model and geographical weighted regression model were used to study the degree and spatial heterogeneity of impacts of climate and human activities on normalized difference vegetation index (NDVI). Results showed that the vegetation restoration of the QTPE was obvious during 2001–2018 as the area of the increasing NDVI accounted for 74.15%. In addition, the effects of climate and human activities on NDVI of vegetation ecosystem showed significant spatial heterogeneity. The RF model showed that population density was the most significant factor affecting ecosystem vegetation in the QTPE, and its relative importance was between 26.1–32.6%, followed by downward shortwave radiation (7.9–16.8%). However, climate factors still had the greatest impact in the QTPE, with the relative importance of precipitation and temperature being 45% and 15%, respectively. These findings provide a scientific basis for the restoration and management of vegetation on the QTP, and are of great significance for the deployment of future ecological engineering projects.

For further readings: <https://doi.org/10.1016/j.jenvman.2022.116576>

### **HIGH-RESOLUTION MAPPING AND DRIVING FACTORS OF SOIL ERODIBILITY IN SOUTHEASTERN TIBET**

Wu Yu, Yefeng Jiang, Wandong Liang, Dan Wan, Bo Liang, and Zhou Shi

*Catena* 220: 106725

Quantifying the spatial distribution of soil erodibility ( $K$  factor) in the Qinghai-Tibet Plateau is essential for global soil erosion management. However, many  $K$  factor maps have a coarse spatial resolution at the regional scale, and high-resolution mapping is still a challenge. Quantitative analysis of the influence of environmental factors such as soil, topography, climate, and vegetation, and human activities on the  $K$  factor is also lacking. Therefore, we mapped the high-resolution (90 m) spatial distribution of the  $K$  factor values in southeastern Tibet using a random forest model with multiple environmental variables, based on remote sensing, ground observations (114 sampling points), and gridded datasets. The  $K$  factor estimates based on soil particle size composition and organic carbon content ranged from 0.09 to 0.35, showing moderate variation. The random forest model yielded a coefficient of determination  $> 0.9$  and provided detailed information on the spatial distribution of  $K$  factor values, especially in large unsampled areas. The predicted  $K$  factor values tended to be high in the eastern area and low in the western area. Partial least squares path modeling showed that soil physical properties such as fractal dimension and mean weight diameter of aggregates had the largest influence on the  $K$  factor (path coefficient 0.695). Climate and topography also had a considerable influence on the  $K$  factor (path coefficient  $-0.489$  and  $-0.469$ , respectively), while the influence of vegetation and human activities was minimal. Accordingly, the random forest model is an effective tool for high-resolution spatial distribution mapping of the  $K$  factor with limited sampling data.

For further readings: <https://doi.org/10.1016/j.catena.2022.106725>

### **A CALCULATION MODEL FOR GROUND SURFACE TEMPERATURE IN HIGH-ALTITUDE REGIONS OF THE QINGHAI-TIBET PLATEAU, CHINA**

Mingtang Chai, Nan Li, Furong Liu, Yu Gao, Yanhu Mu, and Wei Ma

*Remote Sensing* 14: 5219

As a major parameter in the energy balance of the ground surface, temperature represents the level of exchange of energy and moisture between the ground and air. The Qinghai-Tibet Plateau (QTP) has the permafrost region with the highest altitude and the largest area in low–middle latitude of the world. The variation in ground surface temperature has an impact on the existence and development of the permafrost. Therefore, the analysis of the

ground surface temperature in the QTP is significant to reflect the energy exchange in permafrost regions. This paper collected solar radiation data and calculated the conversion coefficient from total solar radiation to long-wave radiation of the ground surface on different underlying surfaces. The ground surface temperature was inversely calculated and modified based on the reception of solar radiation on different underlying surfaces. A simplified calculation model of ground surface temperature was built to reflect the ground surface temperature on different underlying surfaces of the QTP. The calculation results were compared with MODIS and showed good fitness, providing a systematic and reliable method for calculating the ground surface temperature on the QTP. The above model plays a significant role in the estimation of soil moisture, ground surface energy and water balance.

For further readings: <https://doi.org/10.3390/rs14205219>

## Bhutan-Himalaya

### DENDROCLIMATIC RECONSTRUCTION OF MEAN ANNUAL TEMPERATURES OVER TREELINE REGIONS OF NORTHERN BHUTAN HIMALAYAS

Yeshey Khandu, Anan Polthanee, and Supat Isarangkool Na Ayutthaya

*Forests* 13: 1794

The Himalayan region is likely particularly exposed to climate change indicated by the high regional rate of change. The number of high-resolution, well-calibrated, and long-term paleoclimate reconstructions are however regrettably few, to set this change in a longer-term context. The dendroclimatic reconstructions over Himalaya that do exist have only reconstructed summer season temperatures, and rarely or never attempted to reconstruct mean annual temperatures. The paucity of long meteorological records is a matter of concern when developing chronologies of climate sensitive tree-ring data in Bhutan, but the chronologies would theoretically be of high potential for extending short meteorological records back in time using trees in high-elevation ecotones. The objectives of this study were to explore dendroclimatic signals in tree-ring width chronologies of *Abies densa* growing in these extreme ecotones and to reconstruct, if possible, annual temperatures over Northern Bhutan. A point-by-point regression analysis revealed that the regional composite chronology was significantly and positively correlated with temperatures of all months of the current year, i.e., January to December. The chronology was highly correlated with annual temperatures (calibration period  $R = 0.67$  and validation period  $R = 0.50$ ;  $p < 0.001$ ) allowing a reconstruction of temperature over Northern Bhutan (NB-TEMR). The NB-TEMR reveals some common variations with summer temperature reconstructions of the Northern Hemisphere as well as the Himalayan region, particularly w.r.t to the recent warming trend. The reconstruction covers the period of 1765 to 2017. This reconstruction reveals a warming trend since 1850 with higher rates of warming 1935 to 2017, but with a pause around 1940–1970. The warming is consistent with reduced volcanic activity and increase of greenhouse gases. We anticipate that our new reconstruction of annual mean temperature could be an important contribution for future climate change studies and assessments of climate models.

For further readings: <https://doi.org/10.3390/f13111794>

## Highlight of the Issue

## **COP27 Climate Negotiations: A Roadmap to Alleviate Climate Crisis**

The 27th Conference of the Parties (COP27) of the United Nations Framework Convention on Climate Change (UNFCCC) is being organized in Sharm El-Sheikh, Egypt from 6<sup>th</sup> November to 18<sup>th</sup> November 2022. This year marks the 30<sup>th</sup> anniversary of the adoption of the UNFCCC, which is the parent treaty of the 2015 Paris Agreement. The United Nations has been convening world leaders to discuss on combating climate change for nearly three decades. COP27 seeks to accelerate global climate action through emissions reduction, scaled-up adaptation efforts and enhanced flows of appropriate finance. According to COP27 Egypt, the developing countries' yearly investment, which is around \$500 billion at the moment, would need to increase to \$1 trillion with help from investors, developed countries and development banks to combat climate change impact. Moreover, it is being predicted to hit \$2.4 trillion by 2030. Global leaders are constructing roadmaps to protect the most vulnerable countries from climate disasters in this convention. We hope this convention would produce a clear and accepted vision for all countries to combat climate change for long run.

<https://energytracker.asia/climate-negotiations-agenda-at-cop27-2022/?>

<https://thehimalayantimes.com/world/cop-27-developing-countries-need-1-trillion-a-year-in-climate-finance>

<https://cop27.eg/#/vision#goals>