

# Headlines Himalaya

July 16 – July 31 (2022)

No. 707 – 708

Editorial Team: Aabha Pokharel and Deepika Bagale

For the 707<sup>th</sup> - 708<sup>th</sup> issues of Headlines Himalaya, we reviewed researches from four sources and selected 11 researches from five countries. We selected four researches from Nepal and seven researches from other Himalayan Countries (India, China, Bhutan, and Pakistan).

Headlines Himalaya, a weekly e-News is an attempt to keep our global readers abreast with the happenings in the Himalaya. Please share it with your colleagues and friends. Also, subscription is free. Enjoy!

**NEPAL**      *ARE WHITE-RUMPED VULTURES (GYPS BENGALENSIS) SCAVENGERS OR PREDATORS AT A VULTURE SAFE FEEDING SITE OF NEPAL?*

*FACTORS INFLUENCING WATER CONSERVATION PRACTICES ADOPTIONS BY NEPALI FARMERS*

*SPATIAL AND TEMPORAL DISTRIBUTION OF ARSENIC CONTAMINATION IN GROUNDWATER OF NAWALPARASI-WEST, NEPAL: INVESTIGATION WITH SUGGESTED COUNTERMEASURES FOR SOUTH ASIAN REGION*

*THE EFFECT OF CEREAL PRODUCTION, CEREAL HARVESTED AREA, AND CEREAL YIELD, AND FOREST ON ECONOMIC GROWTH AND ENVIRONMENTAL PERFORMANCE IN NEPAL*

**INDIA**      *ADAPTIVE CAPACITIES FOR WOMEN'S MOBILITY DURING DISPLACEMENT AFTER FLOODS AND RIVERBANK EROSION IN ASSAM, INDIA*

*LANDSLIDE SUSCEPTIBILITY ZONATION AROUND DHARAMSHALA, HIMACHAL PRADESH, INDIA: AN ARTIFICIAL INTELLIGENCE MODEL-BASED ASSESSMENT*

**CHINA**      *DESERTIFICATION CAUSED BY EMBANKMENT CONSTRUCTION IN PERMAFROST ENVIRONMENT ON THE QINGHAI-TIBETAN PLATEAU*

*SPATIAL DISTRIBUTION OF SOIL HEAVY METALS AND ASSOCIATED ENVIRONMENTAL RISKS NEAR MAJOR ROADS IN SOUTHERN TIBET, CHINA*

**BHUTAN**      *ECOLOGICAL DYNAMICS AND REGENERATION EXPANSION OF TREELINE ECOTONES IN RESPONSE TO CLIMATE CHANGE IN NORTHERN BHUTAN HIMALAYAS*

**PAKISTAN**      *ACCUMULATION OF HEAVY METALS IN WILD PLANTS COLLECTED FROM THE INDUSTRIAL SITES- POTENTIAL FOR PHYTOREMEDIATION*

*HEALTH RISK ASSOCIATED WITH HEAVY METAL CONTAMINATION OF VEGETABLES GROWN IN AGRICULTURAL SOIL OF SIRAN VALLEY, MANSEHRA, PAKISTAN-A CASE STUDY*

### ARE WHITE-RUMPED VULTURES (*GYPS BENGALENSIS*) SCAVENGERS OR PREDATORS AT A VULTURE SAFE FEEDING SITE OF NEPAL?

Ramji Gautam, Nabin Baral, and Hari Prasad Sharma

*Biodiversitas* 23: 3808-3812

Establishing safe feeding sites has been promoted as a strategy to conserve wild vultures following the population crash in South Asia due to the contamination of natural food by veterinary diclofenac. Several feeding sites have been established in the region, including Nepal and it is important to evaluate their effectiveness. One aspect that is not clear yet is whether such safe feeding sites change the behaviors of wild vultures in South Asia. Here, we report incidents of White-rumped Vultures *Gyps bengalensis* attacking live animals at the Vulture Safe Feeding Site in Ghachok village in central Nepal. Even though a carcass was available nearby to feed upon, three White-rumped Vultures attacked an adult cow and a calf at the feeding site. The vultures' attack served as an ancillary cause of the calf's death in this case. These two incidents of vultures' attacking live animals at the safe feeding site may allude to changing behaviors and cast doubt on their status of being classified as an obligate scavengers. The findings suggest alteration of vulture behaviors at the safe feeding site. Further research is needed to test the hypothesis of vulture behavior change.

For Further Reading: <https://doi.org/10.13057/biodiv/d230757>

### FACTORS INFLUENCING WATER CONSERVATION PRACTICES ADOPTIONS BY NEPALI FARMERS

Dependra Bhatta, Krishna P. Paudel, and Kai Liu

*Environment, Development and Sustainability* 24: 1-23

In developing countries, water conservation practices in agriculture are promoted to overcome the adverse effects of water scarcity. The data obtained from in-person interview surveys of 385 Nepali farm households were analyzed using parametric, semiparametric, and nonparametric models to identify factors influencing water conservation practices. We find that both nonparametric and semiparametric models are more appropriate than a parametric model. The results indicated that off-farm income is negatively associated with the number of practices adopted in a nonparametric model. The results from a semiparametric model show that farmers who had food sufficiency to feed the family in the previous year, access to credit, and agriculture micro-irrigation infrastructure adopt more water conservation practices. These results indicate the potential benefits of formulating appropriate policies and programs to enhance farm production and agricultural income to encourage farmers to adopt water conservation practices for sustainable agriculture in Nepal.

For Further Reading: [10.1007/s10668-022-02510-4](https://doi.org/10.1007/s10668-022-02510-4)

### SPATIAL AND TEMPORAL DISTRIBUTION OF ARSENIC CONTAMINATION IN GROUNDWATER OF NAWALPARASI-WEST, NEPAL: INVESTIGATION WITH SUGGESTED COUNTERMEASURES FOR SOUTH ASIAN REGION

Tunisha Gyawali, Susmita Pant, Keizo Nakamura, Takeshi Komai, and Shukra Raj Poudel

*Environmental Monitoring and Assessment* 194: 1-20

Nawalparasi-West/Parasi is one of the severely affected districts in the Terai lowlands of Nepal by arsenic (As) contamination in groundwater, exceeding standards of 10 ppb (WHO) and 50 ppb (Nepal Drinking Water Standard). This study presents the spatial and temporal distribution of As across 6 km × 10 km region in Parasi via meteorological, hydrogeological, physio-chemical, and sedimentological investigations in 31 communities for about 5 years. In this study, water balance analysis was carried out for understanding the groundwater dynamics in the study area and its contribution to As elution. Gentle flow gradient and little to no infiltration was observed in the central region with relatively impervious silty clayey flood plain, where higher As concentrations were obtained compared to the northern Siwalik foothills and southern parts with coarser sediments. Similarly, higher As concentration (1048 ppb) was recorded in the drier pre-monsoon season than the wet season (529 ppb). The aquifer at 12 to 23 m depth feeding 73% wells in the study area exhibited higher As concentration in reduced environment as opposed to the oxidizing state at 5- to 6-m and 30- to 50-m deep aquifers. Other constituents such as Fe, B, and Cr and their relation with As were analyzed. The results of GERAS model analysis done for health risk assessment are also presented which show that under long-term exposure, the residents in Parasi were undertaking intolerable cancer risk of 1.1 to  $6.4 \times 10^{-3}$ . This study further incorporates socio-economic sentiments vital to analyze, and propose sustainable and cheap countermeasures for immediate implementation to reduce As exposure and health risk in Nepal, which is also highly applicable for other affected regions in South Asian Region.

For Further Reading: <https://doi.org/10.1007/s10661-022-10276-5>

#### **THE EFFECT OF CEREAL PRODUCTION, CEREAL HARVESTED AREA, AND CEREAL YIELD, AND FOREST ON ECONOMIC GROWTH AND ENVIRONMENTAL PERFORMANCE IN NEPAL**

Kalpana Regmi, Jiajun Qiao, Jamal Hussain, and Lochan Kumar Batala

*Economia Politica* 39: 1-24

The study intends to estimate the relationship between forest, renewable energy, and agricultural growth based on three heterogeneous indicators (total cereal production, total cereal harvested area, and total cereal yield) on economic growth and environment performance of Nepal over 1990–2018. The analysis considered potential structural breaks based on available long time-series data and calculated the cointegration relationship between selected variables. The results supported the existence of cointegration in the presence of structural breaks. Similarly, the autoregressive distributed lag approach shows that forests, renewable energy, and urbanization are key factors in improving Nepal's environmental quality. The findings also suggest that forest resources themselves influence economic growth and provide evidence of the resources curse. Renewable energy, agricultural development, and urbanization are factors that help boost the country's economic growth. Consequently, the results also support the existence of the traditional environmental Kuznets curve by controlling for the effects of heterogeneous indicators of agricultural growth. Based on the findings, the study has developed some policies that may be useful for the theory and practice of Nepalese policymakers.

For Further Reading: <https://doi.org/10.1007/s40888-022-00278-4>

### ADAPTIVE CAPACITIES FOR WOMEN'S MOBILITY DURING DISPLACEMENT AFTER FLOODS AND RIVERBANK EROSION IN ASSAM, INDIA

Sneha Kirshnan

*Climate and Development* 14: 1-14

Recurring floods and erosion result in displacement, which adversely impacts women who are 'left behind' when men migrate. Policy and programme measures for disaster response and climate adaptation often perceive women as homogenous, vulnerable groups, instead of addressing underlying structural and conceptual barriers and strengthening their adaptive capacities to disasters and displacement. This article draws upon a political ecology lens to understand gendered recovery processes following disasters across four districts in Assam, northeastern India using empirical research from 2012 to 2018. The findings add nuances to the displacements of women in Assam as being 'climate-induced' by showing the different mechanisms of displacement and how it impacts particular groups of women, as well as their differential ways of coping with these changes. This article draws on sustained long-term qualitative research among rural villagers, particularly women, in Assam where migration is connected to riverbank erosion, exacerbated by the construction of a new embankment, and disrupted due to waterlogging caused by embankments and government relocation schemes in order to construct further dams/embankments.

For Further Reading: <https://doi.org/10.1080/17565529.2022.2092052>

### LANDSLIDE SUSCEPTIBILITY ZONATION AROUND DHARAMSHALA, HIMACHAL PRADESH, INDIA: AN ARTIFICIAL INTELLIGENCE MODEL-BASED ASSESSMENT

Kumari Sweta, Ajanta Goswami, Bipin Peethambaran, I. M. Bahuguna, and A. S. Rajawat

*Bulletin of Engineering Geology and the Environment* 81: 310

Landslide susceptibility zonation (LSZ) is a prerequisite for sustainable development and disaster management, especially in mountainous settings. In recent landslide literature, due to the shortcomings of qualitative, statistical, and probabilistic approaches, artificial intelligence (AI) techniques are widely applied for geographic information system-based LSZ. Dharamshala, state capital of Himachal, is one of India's fastest-growing tourist hotspots in Himalaya where developmental activities are taking place at a rapid pace. Increased pressure of urbanization and re-occurrence of slope instability problems demand systemic landslide hazard evaluation in this area. In this respect, GIS-based LSZ has been attempted for this area using different AI models: fuzzy set procedure (FSP), the fuzzy expert system (FES), and artificial neural network (ANN). To create the landslide susceptibility map (LSM), 9 causative factors and landslide inventory were defined using remote sensing and field data. A total of 12 LSMs were generated, then validated and compared statistically with the help of area under the receiver operating characteristic (ROC) curve and frequency ratio (FR) analysis, and also in terms of spatial distribution quality to depict an accurate map for the study area. The comparative analysis shows that ANN performs better than the other two models, and LSM-ANN-I is the best map for the research area. The northern section, made of

metamorphic rocks like slate and phyllite, with a high slope, is more prone to landslides, whereas the southern part, comprised sandstone, shale, on gentle slopes, has minimal landslide susceptibility.

For Further Reading: <https://doi.org/10.1007/s10064-022-02806-9>

## China-Himalaya

### DESERTIFICATION CAUSED BY EMBANKMENT CONSTRUCTION IN PERMAFROST ENVIRONMENT ON THE QINGHAI-TIBETAN PLATEAU

Tianli Lan, Xiaoxiao Luo, Qinguo Ma, Wangtao Jiang, and Huxi Xia

*Arabian Journal for Science and Engineering* 47: 1-17

Desertification is a process of land degradation embodied in soil water reduction, soil deterioration and vegetation degradation. As an important factor to evaluate the desertification degree, the water content of shallow soil will infiltrate downward when permafrost degrades on the Qinghai-Tibet Plateau (QTP). With the development of transportation facilities on the QTP, embankment construction, which will directly change the surface cover and reduces the water content of shallow soil by degrading the permafrost. In this study, an embankment construction in the permafrost region of the QTP was selected and a hydro-thermo-vapor coupling model for the embankment-permafrost system was established. The mechanism and process of desertification caused by permafrost degradation were analyzed by the variations of geotemperature and soil water. The results show that: (1) embankment construction has increased the heat flowing into the ground, warmed the underlying permafrost and deepened the permafrost table by more than 10 m during 50 years. (2) Accompanied with the permafrost degradation, the shallow soil water migrates downward and accumulates near the deepening permafrost table, showing a funnel-shaped distribution. The average water content of shallow soil under the changed surface has decreased by 5–6% during 50 years, indicating the intensification of desertification. (3) Desertification and permafrost degradation on the QTP is interconnected by the redistribution of soil water. Desertification and permafrost degradation are the mutual promotion process on the QTP.

For Further Reading: <https://doi.org/10.1007/s13369-022-06988-y>

### SPATIAL DISTRIBUTION OF SOIL HEAVY METALS AND ASSOCIATED ENVIRONMENTAL RISKS NEAR MAJOR ROADS IN SOUTHERN TIBET, CHINA

Wanjiang She, Linghui Guo, Jiangbo Gao, Chi Zhang, Shaohong Wu, Yuanmei Jiao, and Gaoru Zhu

*International Journal of Environmental Research and Public Health* 19: 8380

Soil heavy metal pollution is becoming an increasingly serious environmental problem. This study was performed to investigate the contents of surface soil heavy metals (Cu, Zn, Pb, Cd) near six roads in the southern part of the Tibetan Plateau. Multivariate statistics, geoaccumulation index, potential ecological risk, and a human health assessment model were used to study the spatial pollution pattern and identify the main pollutants and regions of concern. The mean  $I_{geo}$  was ranked in the order Cd > Cu > Zn > Pb, with the average concentrations of Cd, Zn, and Cu exceeding their corresponding background levels 4.36-, 1.00-, and 1.8-fold, respectively. Soil Cd level was classified as posing a considerable potential risk near national highways and a high potential risk near non-national

highways, whereas soil Cu, Zn, and Pb were associated with a low potential ecological risk for each class of roads. Furthermore, the non-carcinogenic risk due to soil heavy metals for each class of roads was within the acceptable risk level for three exposure pathways for both adults and children, but the carcinogenic risk attributable to soil Pb exceeded the threshold for children near highways G318, G562, and G219 and for adults near highway G318. Our work not only underscores the importance of assessing potential threats to ecological and human health due to soil heavy metal pollution on road surfaces but also provides quantitative guidance for remediation actions.

For Further Reading: <https://doi.org/10.3390/ijerph19148380>

## Bhutan-Himalaya

### ECOLOGICAL DYNAMICS AND REGENERATION EXPANSION OF TREELINE ECOTONES IN RESPONSE TO CLIMATE CHANGE IN NORTHERN BHUTAN HIMALAYAS

Yeshey Khandu, Anan Polthanee, and Supat Isarangkool Na Ayutthaya

*Forests* 13: 1062

The alpine treeline ecotones are an early indicator of vegetation's response to changes in climate, and the advancement of diffuse treeline ecotones has been associated with mean annual warming temperatures. However, the knowledge of how tree demographic size, age and population distribution, and regeneration decrease with increasing elevation and mean annual temperature remain fragmentary in Bhutan. There was no explanation of how treelines migrate in response to the climate. Therefore, the objectives of this study were to investigate tree demographic size and age and population distribution, as well as the regeneration expansion of treeline ecotones of *Abies densa* trees in response to climate change. Demographic data from thirty transect bands from treeline ecotones and reconstructed mean annual temperatures from tree-rings were used. Regression analysis was used to establish a relationship between elevation/temperature and demographic tree size and age, as well as to determine recruitment frequency distributions and whether these could be driven by climate change. The tree demography indicated that the treeline ecotone in our sampling site is temperature limited. Hence, cooler temperatures at higher elevations should drive decreases in basal diameter, age and recruitment frequencies. From the dendroecological analysis, the diffuse treeline ecotones appear to be climbing on average 1.00 m per year in Northern Bhutan. We also found that the recruitment frequency has increased over recent years (1850–2017), as temperatures continue to rise. The thermal treeline ecotones will be likely to serve as a line of bioclimatic reference against which other zones of bioclimate can be defined. With documented responses of treeline ecotones toward mean annual temperatures, the expectation is that additional warming will continue to influence regeneration expansion in the future. This dynamic response of treeline ecotones towards the climate acts as an indicator of climate change. Information about climbing treelines and altered ecotones should be a vital part of the material for decision makers to consider, to assess impacts and threats to Himalayan alpine biota.

For Further Reading: <https://doi.org/10.3390/f13071062>

### ACCUMULATION OF HEAVY METALS IN WILD PLANTS COLLECTED FROM THE INDUSTRIAL SITES- POTENTIAL FOR PHYTOREMEDIATION

I. Ahmad, I. Gul, S. Irum, M. Manzoor, and M. Arshad

*International Journal of Environmental Science and Technology* 19: 1-12

The decontamination of heavy metals contaminated industrial soil is challenging. The use of wild plants is an environment friendly and economical solution. In this study, phytoremediation potential of wild plants collected from the Hayatabad Industrial estate, KPK, Pakistan was evaluated. Total 17 plant species which belongs to 11 family were collected. Plant and soil samples were acid digested and heavy metals including nickel (Ni), copper (Cu), chromium (Cr), cadmium (Cd) and lead (Pb) were analyzed. pH of collected soil ranged between 7.20–8.13, and the dominant soil textures were clay loam, loam and sandy loam. Results showed that among all collected plant species, *Erigeron conyzanthus* L and *Chenopodium murale* showed maximum concentration of multi-heavy metals in roots. Collected plant species were not able to accumulate higher concentration of heavy metals in shoots and therefore no plant species was heavy metal hyperaccumulator except *Solanum xanthocarpum* and *Argemone Mexicana* accumulated  $> 1000 \text{ mg Pb kg}^{-1}$  and  $300 \text{ mg Cr kg}^{-1}$  in aerial parts, respectively. *Solanum xanthocarpum* showed maximum metal extraction ratio (%) for all heavy metals. Among all collected plant species, maximum plant species showed translocation factor  $> 1$ . Present study showed that collected plant species have ability to transfer heavy metals from roots to shoots and could be used for the phytoremediation of multi-metals contaminated soil.

For Further Reading: <https://doi.org/10.1007/s13762-022-04340-3>

### HEALTH RISK ASSOCIATED WITH HEAVY METAL CONTAMINATION OF VEGETABLES GROWN IN AGRICULTURAL SOIL OF SIRAN VALLEY, MANSEHRA, PAKISTAN - A CASE STUDY

Muhammad Asif Tahir, Hamayun Shaheen, and Bala Rathinasabapathi

*Environmental Monitoring and Assessment* 194: 551

Monitoring of heavy metals in agricultural soils and the crops grown in them is essential to design mitigation strategies to reduce toxic heavy metals in diet and food chains. We determined chromium (Cr), arsenic (As), cadmium (Cd), and lead (Pb) concentrations in the soil–plant system from agricultural fields of Siran Valley, Mansehra, Pakistan, to assess their potential health risk. Although the concentrations of the heavy metals in soils were within the permissible limits for agricultural soils, heavy metal concentrations in many of the vegetables exceeded the recommended safe values. Among the six leafy vegetables tested, all had greater than safe limits for As, four also for Cr and two also for Cd. As level was greater than safe limits in all five fruit and flower vegetables, two had Cr, and one had Pb also at unsafe levels. Among the five tuber, bulb, and root vegetables, As was higher than safe limits in all and Cd in one. The transfer factor in all three categories of vegetables followed the descending order  $\text{Cd} > \text{As} > \text{Cr} > \text{Pb}$ . Daily intake of metals were within limit set by USEPA for all heavy metals except As. The health risk indices for Cr, As, Cd, and Pb indicated that values greater than 1 for As suggest that the vegetables studied here pose a risk of chronic arsenic poisoning, but other heavy metals do not pose such a risk. Our study reinforces the need for mitigation strategies to reduce unsafe levels of heavy metals in vegetables.

For Further Reading: <https://doi.org/10.1007/s10661-022-10210-9>

## Highlight of the Issue

### **Are bacteria the solution of plastic pollution?**

Non-degradable nature of plastic has become very problematic worldwide, especially in freshwater. In the context of rising plastic pollution, the recently published finding revealed the natural bacteria that breaks down the plastic first before any leaf or litter. The rapid growth of bacteria was observed in the lake with remains of plastic bags. Bacteria was said to have utilized the plastic derived compound first despite of the availability of natural matter. Record of naturally occurring bacteria with a high capacity to break down the carbon compounds in plastics lights the beam of hope to tackle plastic and environmental pollution. If there can be extensive use of the microbes identified in this study, it can prevent further damage to the environment.

<https://www.cam.ac.uk/research/news/natural-clean-up-bacteria-can-remove-plastic-pollution-from-lakes>

[Sheridan, EA et al: 'Plastic pollution fosters more microbial growth in lakes than natural organic matter.' Nature Communications, 2022. DOI: 10.1038/s41467-022-31691-9](#)