

Headlines Himalaya

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Editorial Team: Puspa Aryal and Uma Dhungel

For the 677th-678th issues of Headlines Himalaya, we reviewed researches from five sources and selected 10 researches from four countries. We selected three researches from Nepal and seven researches from other Himalayan countries (India, China and Pakistan).

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Nepal-Himalaya

ILLEGAL TRADE IN PANGOLINS IN NEPAL: EXTENT AND NETWORK

Ashish Bashyal, Nischal Shrestha, Ashna Dhakal, Sanjay Nath Khanal, and Sandeep Shrestha

There are two species of pangolins – Chinese (*Manis pentadactyla*) and Indian (*M. crassicaudata*) – in Nepal. Despite being one of the most illegally traded groups of mammals in the world, there is scant information on pangolin trade in Nepal. We synthesized nation-wide information on pangolin seizures for 2015–2020 periods to elucidate extent and network of illegal pangolin trade in Nepal. We recorded a total of 56 pangolin seizures in Nepal in 2015–2020 periods. Pangolin scales were confiscated in all 56 seizures totalling to 154.12 kg along with confiscation of live and dead pangolins, and whole pangolin hide in some seizures. That amount of scales would have fetched up to \$19,922 in local market and the price could reach up to \$116,993 in an international black market. At least 209 pangolins could have been killed and illegally traded in Nepal between 2015 and 2020. Pangolin trade is widespread throughout Nepal with seizures recorded from almost a quarter of all 77 districts almost third of 61 districts where pangolins are found. Most seizures occurred in country's capital Kathmandu ($n = 29$). Additionally, we identified districts adjoining Kathmandu, and districts bordering Nepal-China and Nepal-India as major routes and points in pangolin trade network. A total of 95 people were involved in pangolin poaching that included local residents from 26 districts in Nepal. The pool of convicts was dominated by males and Nepali nationals between 20 and 30 years old. Most major ethnic groups in Nepal were involved in pangolin trade with the highest involvement of people from the Tamang ethnicity (36%). Presence of pangolins is reported from all 18 districts from where seizures were recorded and 26 districts from where convicts originated suggesting active involvement of locals in pangolin poaching and trafficking. We have generated baseline information on illegal pangolin trade in Nepal for 2015–2020. We expect that this information will be helpful to law enforcement agencies to curb existing pangolin trade in Nepal.

For further reading: <https://doi.org/10.1016/j.gecco.2021.e01940>

FIRE DRIVERS AFFECTING FOREST FIRE OCCURRENCES IN THE TROPICAL MIXED BROAD-LEAVED FORESTS OF NEPAL

Krishna Bahadur Bhujel, Rejina Maskey Byanju, Ambika P. Gautam, Ramesh Prasad Sapkota, and Udhab Raj Khadka

Applied Environmental Research 43: 84-99

Forest fires triggered by various natural and anthropogenic drivers are increasing and threatening forest ecosystems across the globe. In Nepal, the high value Tropical Mixed Broad-leaved Forests are prone to fire caused by both natural and anthropogenic drivers. Thus, understanding fire drivers and their effect is important for the sustainable forest fire management. However, the preceding studies on forest specific fire drivers and their effect are limited. This research has identified the fire drivers and assessed their effect to fire occurrences in the Tropical Mixed Broad-leaved Forests of Nawalparasi District, Nepal. Fire drivers were identified and prioritized by participatory approaches. The fire incidences and burnt areas were obtained from the MODIS fire data (2001–2017). The results revealed altogether 20 drivers including eight natural and 12 anthropogenic. Based on the public perception and magnitude of forest fire, among the natural drivers, temperature, precipitation, forest fuel, aspect, elevation and slope were the major drivers. Likewise, among the anthropogenic drivers, forest distance from roads and settlements showed significant effect. The natural drivers, ambient temperature $>30^{\circ}\text{C}$ and annual precipitation <2400 mm, revealed significant impacts on forest fire. Likewise, forests situated at lower elevation (<500 m), and southern and eastern aspects were highly vulnerable to fire. Considering anthropogenic drivers, forest lying within 500 m from the roads and settlements were highly vulnerable to fire. Among the forest types, the Hill Sal Forest was more affected. Future strategies should address the major fire drivers, construction of adequate fire lines and conservation ponds for the sustainable forest management.

For further reading: <https://doi.org/10.35762/AER.2021.43.4.7>

HUMAN WILDLIFE CONFLICT AND IMPACTS ON LIVELIHOOD: A STUDY IN COMMUNITY FORESTRY SYSTEM IN MID-HILLS OF NEPAL

Kedar Baral, Hari Prasad Sharma, Ripu Kunwar, Craig Morley, Achyut Aryal, Bhagawat Rimal, and Weihong Ji

Sustainability 13: 13170

Human wildlife conflict (HWC) impacts the livelihood of many rural communities worldwide. This study investigated the impact of HWC on people living near community forests (CF) in Nepal. Using databases provided by the Division of Forest Offices and data obtained from surveys between October 2019 – March 2020, we quantified the financial loss of HWC to the local people. Between 2015 and 2019, 3315, or 27%, of the livestock owned by the survey respondents were killed by wild predators in the Kaski and Tanahun districts. Chicken (*Gallus* spp.) was the most common prey taken (80%), followed by sheep (*Ovis* spp.) and goats (*Capra* spp.) (15%), cows (*Bos* spp.) (2%), pigs (*Sus* spp.) (2%), and buffalo (*Bubalus* spp.) (1%). Leopards (*Panthera pardus*) were the primary predators, followed by golden jackals (*Canis aureus*), jungle cats (*Felis chaus*), yellow-throated martens (*Martes flavigula*), and Himalayan black bears (*Ursus thibetanus*). The financial loss of livestock during this period was USD \$115,656.00, equivalent to USD \$142.61 per household. Crops were also damaged and eaten by wildlife, and 2165 crop-raiding events were recorded between 2015 and 2019. Rice (*Oryza sativa*), followed by maize (*Zea mays*), millet (*Panicum miliaceum*), and potatoes (*Solanum tuberosum*) were the main crops lost. Rhesus monkeys (*Macaca mulatta*) were the most common crop raiders, causing 74% of the damage, followed by Indian field mice (*Mus booduga*) (12%). From 2015 to 2019, crop losses equated to USD \$83,424.00. Forest regeneration on abandoned agricultural land expanded wildlife habitats, enabling wild animals to come within reach of human settlements, which increased the likelihood of HWC events. Although the success of the community forest restoration program resulted in increased forest-cover, marginally increasing biodiversity, the reduced distance between human settlements and wildlife habitat, compounded by a lack of natural prey, may have unwittingly exacerbated HWC in this region. We recommend surveying predator and prey populations in the forest habitat, and implementing a habitat management program to improve prey populations within the community forests. Meantime, we propose establishing a financial relief and insurance program for crop and livestock losses at the local community level to alleviate any financial difficulties to the local communities caused by HWC.

For further reading: <https://doi.org/10.3390/su132313170>

India-Himalaya

ASYMMETRIC RESPONSE OF THE INDIAN SUMMER MONSOON TO POSITIVE AND NEGATIVE PHASES OF MAJOR TROPICAL CLIMATE PATTERNS

Arindam Chakraborty and Priyanshi Singhai

Scientific Reports 11: 22561

The existing theories for the tropical teleconnections to Indian summer monsoon (ISM) are diverse in approaches. As a result, it is impossible to quantify the relative impacts of different tropical climate patterns on ISM, complying

with a single physical mechanism. Here, we show that tropical teleconnections to ISM can be explained through net moisture convergence driven by surface pressure (P_s) gradients surrounding the Indian region. The positive and negative phases of major tropical climate patterns modulate these pressure gradients asymmetrically in the zonal and/or meridional directions leading to asymmetric changes in moisture convergence and ISM rainfall (ISMR). Stronger El Nino droughts than La Nina floods are due to greater decreased eastward moisture flux over the Arabian Sea during El Nino than the corresponding increase during La Nina driven by proportionate meridional P_s gradients. While the equatorial Atlantic Ocean's sea surface temperature in boreal summer and El Nino Southern Oscillation in the preceding winter changes ISMR significantly, moisture convergence anomalies driven by the Indian Ocean Dipole were insignificant. Moreover, while ISMR extremes during ENSO are due to asymmetric changes in zonal and meridional gradients in P_s , non-ENSO ISMR extremes arise due to the zonal gradient in zonally symmetric P_s anomalies.

For further reading: <https://doi.org/10.1038/s41598-021-01758-6>

ASSESSMENT OF WATER QUALITY OF A HILLY RIVER OF SOUTH ASSAM, NORTH EAST INDIA USING WATER QUALITY INDEX AND MULTIVARIATE STATISTICAL ANALYSIS

Tanushree Chakravarty and Susmita Gupta

Environmental Challenges 5: 100392

The River Jatinga, Assam, north east India is the only river that caters to the needs of the people of the Dima Hasao district of Assam but lacks information about its water quality. For ascertaining its quality, water samples were collected seasonally from five sites of the river during 2018–2019. Analyses of 13 environmental variables of water following standard methods found most of the variables well within the acceptable limit of drinking water quality standards prescribed by Bureau of Indian Standards/World Health Organization. Water Quality Status (WQS) of the river considering nine parameters (potential of hydrogen, electrical conductivity, total dissolved solid, biological oxygen demand, dissolved oxygen, total alkalinity, total hardness, nitrate, phosphate) was evaluated using Water Quality Index by weighted arithmetic index method. WQS across the sites and seasons were either good or excellent and suitable for domestic, irrigation and industrial purposes. Principal component analysis (PCA) classified the three PCs as I: electrical conductivity, total dissolved solid, total alkalinity, biological oxygen demand (anthropogenic, organic); II: transparency, flow rate, dissolved oxygen (natural); III: nitrate, phosphate (agricultural runoff). For improvement and maintenance of water quality of the river a co-operative participation of the authorities and local bodies is imperative.

For further reading: <https://doi.org/10.1016/j.envc.2021.100392>

China Himalaya

ASSESSMENT OF THE POLLUTION LEVELS OF POTENTIAL TOXIC ELEMENTS IN URBAN VEGETABLE GARDENS IN SOUTHWEST CHINA

Jianing Gao, Dan Zhang, Ram Proshad, Ernest Uwiringiyimana, and Zifa Wang

Scientific Reports 11: 22824

Vegetable gardens are increasingly common in urban areas and can provide numerous societal benefits; however, contamination with potential toxic elements (PTEs) due to urbanization and industrialization is cause for concern. The present study aimed to assess the source of contamination and pollution levels in urban garden soils, as well as the health risks for adults and children consuming vegetables grown in such environments. Various types of vegetable samples and their corresponding soils from 26 community gardens were collected throughout Chengdu City in southwestern China. The results showed that leafy vegetables, particularly lettuce leaves and Chinese cabbage, had relatively higher levels of Cd (0.04 mg/kg FW) and Pb (0.05 mg/kg FW), while higher levels of As (0.07 mg/kg FW), Cr (0.07 mg/kg FW), and Hg (0.003 mg/kg FW) were found in amaranths, tomatoes, and *Houttuynia cordatas*, respectively. The pollution indices revealed that the vegetable purplish soils were relatively more polluted by Cd and As, and the concentrations of these metals in vegetables were correlated with their concentrations in the soils. Principal component analysis grouped the PTEs in two dimensions that cumulatively explained 62.3% of their variation, and hierarchical clustering identified two distinct clusters indicating that Cr originated from a unique source. The health risk assessment revealed that exposure to As and Cd induced the greatest non-carcinogenic risk, whereas Cr was most likely to cause cancer risks. Furthermore, contaminated vegetable consumption was riskier for children than adults. The critical factors contributing to PTE contamination in vegetable gardens were determined to be vegetable species, total soil element content, soil pH, and soil organic matter content. Overall, Cr and As pollution present the greatest concern, and community health care services must enact more effective regulatory and preventative measures for urban gardens in terms of PTEs.

For further reading: <https://doi.org/10.1038/s41598-021-02069-6>

THE 'PERFECT' CONVERSION: DRAMATIC INCREASE IN CO₂ EFFLUX FROM SHELLFISH PONDS AND MANGROVE CONVERSION IN CHINA

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Sustainability 13: 13163

Aquaculture, particularly shellfish ponds, has expanded dramatically and become a major cause of mangrove deforestation and “blue carbon” loss in China. We present the first study to examine CO₂ efflux from marine aquaculture/shellfish ponds and in relation to land-use change from mangrove forests in China. Light and dark sediment CO₂ efflux from shellfish ponds averaged at 0.61 ± 0.07 and 0.90 ± 0.12 kg CO₂ m⁻² yr⁻¹ (= 37.67 ± 4.89 and 56.0 ± 6.13 mmol m⁻² d⁻¹), respectively. The corresponding rates (-4.21 ± 4.54 and 41.01 ± 4.15 mmol m⁻² d⁻¹) from the adjacent mangrove forests that were devoid of aquaculture wastewater were lower, while those from the adjacent mangrove forests (3.48 ± 7.83 and 73.02 ± 5.76 mmol m⁻² d⁻¹) receiving aquaculture wastewater markedly increased. These effluxes are significantly higher than those reported for mangrove forests to date, which is attributable to the high nutrient levels and the physical disturbance of the substrate associated with the aquaculture operation. A rise of 1 °C in the sediment temperature resulted in a 6.56% rise in CO₂ released from the shellfish ponds. Combined with pond area data, the total CO₂ released from shellfish ponds in 2019 was estimated to be ~12 times that in 1983. The total annual CO₂ emission from shellfish ponds associated with mangrove conversion reached 2–5 Tg, offsetting the C storage by mangrove forests in China. These are significant environmental consequences rather than just a simple shift of land use. Around 30% higher CO₂ emissions are expected from aquaculture ponds (including shellfish ponds) compared to shellfish ponds alone. Total annual CO₂ emission from shellfish ponds will likely decrease to the level reported in early 1980 under the pond area-shrinking scenario, but it will be more than doubled under the business-as-usual scenario projected for 2050. This study

highlights the necessity of curbing the expansion of aquaculture ponds in valuable coastal wetlands and increasing mangrove restoration to abandoned ponds.

For further reading: <https://doi.org/10.3390/su132313163>

Pakistan- Himalaya

MODELLING POTENTIAL DISTRIBUTION OF SNOW LEOPARDS IN PAMIR, NORTHERN PAKISTAN: IMPLICATIONS FOR HUMAN–SNOW LEOPARD CONFLICTS

Wajid Rashid, Jianbin Shi, Inam ur Rahim, Muhammad Qasim, Muhammad Naveed Baloch, Eve Bohnett, Fangyuan Yang, Imran Khan, and Bilal Ahmad

Sustainability 13: 13229

The snow leopard (*Panthera uncia*) is a cryptic and rare big cat inhabiting Asia's remote and harsh elevated areas. Its population has decreased across the globe for various reasons, including human–snow leopard conflicts (HSCs). Understanding the snow leopard's distribution range and habitat interactions with human/livestock is essential for understanding the ecological context in which HSCs occur and thus gives insights into how to mitigate HSCs. In this study, a MaxEnt model predicted the snow leopard's potential distribution and analyzed the land use/cover to determine the habitat interactions of snow leopards with human/livestock in Karakoram–Pamir, northern Pakistan. The results indicated an excellent model performance for predicting the species' potential distribution. The variables with higher contributions to the model were the mean diurnal temperature range (51.7%), annual temperature range (18.5%), aspect (14.2%), and land cover (6.9%). The model predicted approximately 10% of the study area as a highly suitable habitat for snow leopards. Appropriate areas included those at an altitude ranging from 2721 to 4825 m, with a mean elevation of 3796.9 ± 432 m, overlapping between suitable snow leopard habitats and human presence. The human encroachment (human settlements and agriculture) in suitable snow leopard habitat increased by 115% between 2008 and 2018. Increasing encroachment and a clear overlap between snow leopard suitable habitat and human activities, signs of growing competition between wildlife and human/livestock for limited rangeland resources, may have contributed to increasing HSCs. A sound land use plan is needed to minimize overlaps between suitable snow leopard habitat and human presence to mitigate HSCs in the long run.

For further reading: <https://doi.org/10.3390/su132313229>

GROUNDWATER QUALITY AND AVAILABILITY ASSESSMENT: A CASE STUDY OF DISTRICT JHELUM IN UPPER INDUS, PAKISTAN

Hifza Rasheed, Naveed Iqbal, Muhammad Ashraf, and Faizan ul Hassan

Environmental Advances 7: 100148

People's well-being and their economic development are linked to the availability and accessibility of water. The PindDadan Khan tehsil located on the right bank of River Jhelum is a classic example of water stressed confronting water quality and quantity issues. To evaluate usable potential and qualitative variations of groundwater, an integrated approach involving geophysical, water quality and risk assessment techniques was used. Accordingly,

groundwater potential zones were categorized. A small shallow fresh groundwater pocket with acceptable water quality (<1.5 dS/m) for a depth between 15 m to 50 m exists in the eastern part of the study area. The groundwater of remaining tehsil was highly saline (TDS: 3852.23±5091.54 mg/L with maximum level up to 23164.03 mg/L). The quality of domestic wells at these 82 sites was unsafe (90%) due to salts, bacteriological contamination (71%), fluoride (45%), arsenic (5%), and nitrate (4%). Compared to these, public water supply schemes show comparatively lower salts (total dissolved solids of 144-2690 mg/L). However, arsenic was found beyond the WHO Drinking water guidelines (10 µg/L) in 65% sources which may pose serious cancer risks for 2 to 5 persons (maximum 12 persons) per 10,000 populations. The study reveals that the freshwater in the study area is scarce and of vulnerable quality and require integrated water quantity and quality management. Our results also suggest that in arid to semi-arid regions, scoring factors based on salinity levels and relative size of the saline zone should be incorporated into indicators of water access and availability.

For further reading: <https://doi.org/10.1016/j.envadv.2021.100148>

QUANTIFYING THE HEALTH AND WEALTH BENEFITS OF REDUCING POINT SOURCE POLLUTION: THE CASE OF THE SUGAR INDUSTRY IN PAKISTAN

Sanaullah Panezai, Ubaid Ali, Alam Zeb , Muhammad Rafiq, Ayat Ullah, and Shahab E. Saqib

Sustainability 13: 13252

Air pollution is among the major causes of death and disease all around the globe. The prime impact of ambient air pollution is on the lungs through the respiratory system. This study aims to estimate the health cost due to air pollution from a Sugar Mill in the Mardan district of Khyber Pakhtunkhwa, Pakistan. To determine the impact of pollution on respiratory illness, primary data were collected from 1141 individuals from 200 households living within a 3 km radius of the mill. The Household Production Method was used to derive the reduced-form Dose–Response Function and the Mitigation Cost Function for assessing the impact of pollution on health and then estimating the monetary cost associated with mitigating such illnesses. The results indicate that about 60% of the respondents living in the surrounding area of the mill suffered from different respiratory illnesses. The study estimates that by reducing the suspended particulate matter (SPM) level by 50%, the expected annual welfare gains to an individual living within a 3 km radius of the mill are US \$20.21. The whole community residing within a 3 km radius of the mill will enjoy an estimated welfare gain of PKR. 70.67 million (US \$0.511 million). If the pollution standard limits prescribed by the World Health Organization are followed, the expected monetary benefits to all the individuals living within a 3 km radius of the mill are PKR. 114.48 million (US \$0.27 million) annually.

For further reading: <https://doi.org/10.3390/su132313252>