An Environmental Research Abstract

Headlines Himalaya

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For the 605- 606th issues of Headlines Himalaya, we reviewed journal articles from six sources and selected fifteen happenings from five countries. We selected four happenings from Nepal and seven happenings from other Himalayan countries (India, China, Bhutan and Pakistan). The overall coverage of this issue is Agriculture, biodiversity, Water, Climate and Geology.

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BASIN OF PAKISTAN

Nepal-Himalaya

WHO ADOPTS AGROFORESTRY IN ASUBSTIENCE ECONOMY? - LESSON FROM THE TERAI OF NEPAL

Arun Dhakal and Rajesh Kumar Rai
Forests 11: 565

Agroforestry is recognized as a sustainable land use practice. However, the uptake of such a promising land use practice is slow. Through this research, carried out in a Terai district of Nepal, we thoroughly examine what influences farmers' choice of agroforestry adoption and what discourages the adoption. For this, a total of 288 households were surveyed using a structured questionnaire. Two agroforestry practices were compared with conventional agriculture with the help of the Multinomial Logistic Regression (MNL) model. The likelihood of adoption was found to be influenced by gender: the male-headed households were more likely to adopt the tree-based farming practice. Having a source of off-farm income was positively associated with the adoption decision of farmers. Area of farmland was found as the major constraint to agroforestry adoption for smallholder farmers. Some other variables that affected positively included livestock herd size, provision of extension service, home-to-forest distance, farmers' group membership and awareness of farmers about environmental benefits of agroforestry. Irrigation was another adoption constraint that the study area farmers were faced with. The households with a means of transport and with a larger family (household) size were found to be reluctant regarding agroforestry adoption. A collective farming practice could be a strategy to engage the small holder farmer in agroforestry.

For further reading: https://doi.org/10.3390/f11050565

ASSESMENT OF POSSIBILITIES OF ECOTOURISM DEVELOPMENT AROUND JAGADISPUR LAKE

Kamal Pathak, Hom Bahadur Chhetri, Solank Shrestha, Sandhya Karki, Dinesh Adhikari, Saru Gahatraj, Pawan Karki, and Catherine Mhae B. Jandug
North American Academic Research 3: 313-324

Wetlands cover 5% area of Nepal. There are many natural and artificial wetlands in Nepal. Out of them, Jagadisphur is the largest artificial lake and important wetland, located in Kapilvastu district. Despite the high potential for tourism development and close proximity to the Lumbini World Heritage site, this lake is less known to national and international visitors. Thus, this study was carried out to assess the possibilities of eco-tourism around this lake. Household survey, key informant survey and focus group discussion were carried out to know the people's perception, issues and challenges for tourism development. Collected data were analyzed qualitatively. Jagadisphur along with the other nearby historical places like Sagarhawa, Tilaurakot, Gotihaw, Niglihawa, etc. have a high potential for eco-tourism development. Bird watching was found to be most feasible, followed by the Jeep Safari and boating. Other ecotourism activities like Tharu culture, homestay can also be developed. However, poor tourism infrastructure development, marketing capacity of local people on visitor management, etc. have been addressed as the issues in the study area. However, people and stakeholders are willing to sort out this problem and willing to involve in ecotourism activities. It is recommended that awareness programs by providing various

skill development programs and workshops related to tourism, the information center and involvement of the private sector in the promotion of ecotourism in and around the site.

For Further Reading: https://doi.org/10.5281/zenodo.3831108

THE HYDRO-SOCIAL DYNAMICS OF EXCLUSION AND WATER INSECURITIES OF DALITS IN PERI–URBAN KATHMANDU VALLEY, NEPAL: FLUID YET UNCHANGING

Anushiya Shrestha, Deepa Joshi, and Dik Roth

Contemporary South Asia 28: 1-16

Processes of urbanisation create peri-urban spaces that are socially and institutionally fluid. In this article, we analyse how contestations and competition over declining water resources in peri-urban Kathmandu Valley in Nepal reshape water use, access and rights as well as user communities themselves, by creating and reproducing new and existing exclusions and solidarities. Traditional caste-based discriminatory practices, prohibiting Dalits from physically accessing water from sources used by higher castes, are said to be no longer practiced in Nepal. However, our findings show that, exclusion persists for Dalits even though the characteristics of exclusion have changed. In situations of competing water claims in the research location, Dalit households, unlike higher-caste groups, are unable to exercise prior-use water rights. Their water insecurity is compounded by their relative inability to mobilise political, social and economic resources to claim and access new water services and institutions. By juxtaposing the hydro-social and social exclusion analytical frameworks, we demonstrate how exclusions as well as interpretations and experiences of water (in) security are reified in post-Maoist, supposedly inclusive Nepal.

For Further Reading: https://doi.org/10.1080/09584935.2020.1770200

BUTTERFLY-PLANT INTERACTIONS AND BODY SIZE PATTERNS ALONG AN ELEVATIONAL GRADIENT IN THE MANANG REGION OF CENTRAL NEPAL

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Journal of Mountain Science 17: 1115–1127

Butterflies are widely studied due to their key ecosystem functions. For this reason, they are used in ecosystem assessment, formulating conservation plans and in raising the environmental awareness. Quantification of different factors affecting diversity of butterflies is important for their effective conservation. In this study, we investigated abiotic and biotic factors affecting species richness and community composition of butterflies along an elevational gradient in Manang region, central Nepal. We also tested if butterfly species follow the Bergmann's rule. A total of 57 butterfly species belonging to 39 genera and 8 families were recorded in the study area. Out of a total of 127 plant species identified in the study region, only 67 plant species were visited by butterflies as nectar sources. Species richness of butterflies increased with increasing elevation. Species richness was significantly higher in places with shrubs compared to other places and also in autumn than in summer. Species richness of butterflies also depended on composition of plant species occurring at the localities. Butterfly species composition varied among sampling localities. It was also determined by habitat type, elevation, sampling time, plant species and interactions of elevation × time. The relationship between butterfly size and elevation was in the opposite direction than expected according to the Bergmann's rule. In conclusion, protection of butterfly diversity can only be achieved by protecting different habitats across the diverse physiography of the region and different plant

species, in particular herbs and shrubs. Our results do not support the Bergmann's rule for butterflies along an elevational gradient in our region.

For further reading: https://doi.org/10.1007/s11629-019-5381-3

India-Himalaya

PROBABILISTIC ASSESSMENT AND STUDY OF EARTHQUAKE RECURRENCE MODELS FOR ENTIRE NORTHEAST REGION OF INDIA

Avik Paul, Suvam Gupta, Sima Ghosh, and Deepankar Choudhury

Natural Hazards 102: 15-45

Northeast India is seismically most active region in India, and it falls under Zone V which represents the highest seismic risk in the country. This region has been experienced two great earthquakes like the 1897 Shillong (M_w 8.1) and the 1950 Assam earthquake (M_w 8.4) and several large earthquake ($M_w \geq 7$) during last 122 years. Probabilistic approach and number statistical tools have been used by various researchers for finding the future earthquake recurrence rates. Using the earthquake catalogue, Gutenberg–Richter parameter has been estimated to evaluate seismic risk for six different regions: Eastern Himalayan, Indo-Burma region, Bengal Basin, Shillong Plateau, Mishmi Thrust, and Naga Thrust. Assuming that the earthquake occurrence is Poisson model, based on the obtained Gutenberg–Richter (G–R) relations, the probability of occurrence of earthquake of specified magnitude in given time is estimated for six seismotectonic regions. Further in this study, we made an attempt to estimate the probability of earthquake using four known statistical models, namely Exponential, Rayleigh, Weibull, and Pareto. The whole region is divided into six tectonic blocks to estimate the probability of an earthquake ($M_w \geq 5.5$) through the maximization of conditional probability of earthquake occurrence. Time intervals for the occurrence of the next large earthquake in the six regions have been estimated by the maximization of conditional probability of earthquake occurrence. Pareto distribution shows the highest conditional probability compared to other distribution although it shows the lowest recurrence time compared to others. Rayleigh shows the lowest conditional probability, and Exponential shows intermediate probabilities in between Weibull and Pareto distributions. Specified four typical probability density models have been validated with the predicted event in Eastern Himalayan and Naga Thrust for earthquake $M_w \geq 5.5$ recorded event.

For further reading: https://doi.org/10.1007/s11069-020-03909-w

China Himalaya

CHANGING CLIMATE AND THE PERMAFROST ENVIRONMENT ON THE QINGHAI–TIBET (XIZANG) PLATEAU

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Permafrost and Periglacial Processes 31: 396-405

Permafrost on the Qinghai–Tibet Plateau (QTP) has undergone degradation as a result of recent climate change. This may alter the thermo-hydrological processes and unlock soil organic carbon, and thereby affect local hydrological, ecological, and climatic systems. The relationships between permafrost and climate change have received extensive attention, and in this paper we review climate change for permafrost regions of the QTP over the past 30 years. We summarize the current state and changes in permafrost distribution and thickness, ground temperature, and ground ice conditions. We focus on changes in permafrost thermal state and in active-layer thickness (ALT). Possible future changes in ground temperature and ALT are also discussed. Finally, we discuss the changes in hydrological processes and to ecosystems caused by permafrost degradation. Air temperature and ground temperature in the permafrost regions of the QTP have increased from 1980 to 2018, and the active layer has been thickening at a rate of 19.5 cm per decade. The response of permafrost to climate change is not as fast as in some reports, and permafrost degradation is slower than projected by models that do not account for conditions deep in permafrost.

For Further Reading: https://doi.org/10.1002/ppp.2056

SPATIAL-TEMPORAL DIFFERENTIATION OF EOLIAN SEDIMENTS IN THE YARLUNG TSANGPO CATCHMENT, TIBETAN PLATEAU, AND RESPONSE TO GLOBAL CLIMATE CHANGE SINCE THE LAST GLACIATION

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Geomorphology 357: 107104

Eolian sediments, an important paleoenvironmental archive, are widespread in the Yarlung Tsangpo River (YTR) valley of the southern Tibetan Plateau (TP), but their chronology and spatial-temporal differentiation are poorly understood. And it is not clear whether eolian accumulation is controlled by global climate changes, or local paleoenvironment, or both. In this study, we applied quartz OSL dating to 30 eolian sediment samples (sandy loess and eolian sand) from eight profiles in the YTR catchment. Our new dates were combined with 72 previously published eolian sediment ages (OSL/TL and ^{14}C) for the YTR catchment to analyze the response of eolian accumulation to paleoenvironmental changes. The overall dataset has eolian accumulation spanning the period from the Last Interglacial through to the Little Ice Age, ranging from 84.6 ± 8.7 ka BP (possibly as old as 118 ± 11 ka BP) to 0.4 ± 0.1 ka BP, with most occurring since the Late Glacial Period (15 ka BP), which suggests that the preservation of eolian deposits is controlled by geologic recirculation. Probability density function distributions (PDFs) of eolian ages from different parts of the YTR catchment show different age clusters, suggesting that factors controlling eolian accumulation vary across the catchment, so that spatial-temporal disparities are inherent in the system. To investigate the effect of regional and global paleoclimate since the Last Glacial Maximum (LGM) on eolian deposition processes in the YTR, we compared the PDF of ages from the combined dataset with a range of paleoclimate proxies. The PDF shows significant fluctuations since the LGM, including the Younger Dryas cold event. There is no consistent eolian sediment response to changes of the 30°N summer insolation, Asian Summer Monsoon, and westerlies. Phases of strong eolian sediment accumulation in the YTR basin do not show a simple correspondence with the classical global climate curve, suggesting that eolian processes in the alpine valley environment may be modified by local responses to these changes.

For Further Reading: https://doi.org/10.1016/j.geomorph.2020.107104

IMPACT OF CLIMATIC FACTORS ON VEGETATION DYNAMICS IN THE UPPER YANGTZE RIVER BASIN IN CHINA

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Journal of Mountain Science 17: 1235-1250

It is necessary to understand vegetation dynamics and their climatic controls for sustainable ecosystem management. This study examines the vegetation dynamics and the effect of climate change on vegetation growth in the pristine conditions of 58 woodland National Nature Reserves (NNRs) located in the upper Yangtze River basin (UYRB) in China which are little influenced by human activities. Changes in the normalized difference vegetation index (NDVI), precipitation, and temperature in the selected NNRs were observed and analyzed for the period between 1999 and 2015. The relationship between time-lag effect of climate and changes in the NDVI were assessed using Pearson correlations. The results showed three major trends. 1) The NDVI increased during the study period; this indicates an increase in the amount of green vegetation, especially due to the warmer climate during the growing season. The NDVIs in March and September were significantly affected by the temperature of the previous months. Spring temperatures increased significantly ($P < 0.05$) and there was a delay between climatic factors and their effect on vegetation, which depended on the previous season. In particular, the spring temperature had a delayed effect on the NDVI in summer. 2) The way in which vegetation responds to climatic factors varied significantly across the seasons. Temperature had a greater effect on the NDVI in spring and summer and the effect was greater at higher altitudes. A similar trend was observed for precipitation, except for altitudes of 1000–2000 m. 3) Temperature had a greater effect on the NDVI in spring and autumn at higher altitudes. The same trend was observed for precipitation in summer. These findings suggest that the vegetation found in NNRs in the upper reaches of the Yangtze River was in good condition between 1999 and 2015 and that the growth and development of vegetation in the region has not been adversely affected by climate change. This demonstrates the effectiveness of nature reserves in protecting regional ecology and minimizing anthropogenic effects.

For further reading: https://doi.org/10.1007/s11629-019-5649-7

CONTROLS ON GEOMORPHIC CHARACTERISTICS OF THE XIAOHEI RIVER BASIN IN THE UPPER LANCANG-MEKONG, CHINA

Zhen-kui Gu, Hui Fan, Jun-peng Lou, and Kun Yang

Journal of Mountain Science 17: 1032-1044

Understanding the evolution of the fluvial geomorphology in an orogenic belt provides valuable insight into the relationship between upper crustal deformation and surface processes. The upper Lancang-Mekong River is in an area experiencing both uplift and erosion. The related processes provide a steady sediment supply to the lower reaches of the river and play an important role in the regional environmental changes. The Xiaohei (Weiyuan) River Basin is an important sub-basin in this area, which is characterized by large-scale topographic fluctuations, active tectonics and erosion, and anthropogenic activities. These different factors introduce numerous complexities to the local surface processes. In this study, we investigate and quantify the controls of geomorphic evolution of the Xiaohei River Basin. We located and mapped the main knick-zones within the channels and examined the main genetic factors, such as faults and stratigraphic differences. The results show that the areas with the lowest uplift rates are characterized by a low steepness index and are located in the southeastern part of the basin. The stream power of the mainstream increases downstream, with an average value of ~122 W/m. The erosional activity of the various stream channels is intense. Overall, the basin tends to expansion, with only local instances of inward contraction. Our analysis confirms that a number of the geomorphic evolutionary characteristics of the Xiaohei River Basin are transient. In addition, the future potential for the increasing the number of dams and the hydropower development in the basin may weaken the expansion trend of the basin over a long period of time.

For further reading: https://doi.org/10.1007/s11629-020-5977-7

Bhutan-Himalaya

CONSEQUENCES OF CLIMATE CHANGE IMPACTS AND INCIDENCES OF EXTREME WEATHER EVENTS IN RELATIONS TO CROP PRODUCTION IN BHUTAN

Ngawang Chhogyel, Lalit Kumar, and Yadunath Bajgai

Sustainability 12: 4319

Being a country in the Himalayas, Bhutan is highly prone to the vagaries of weather events that affect agricultural production and the subsequent livelihood of the people. To identify the main issues that affect crop production and the decisions of farmers, a survey was conducted in three different agro-ecosystems in Bhutan. Our key findings indicate that farming and the decisions of farmers were largely affected by different climatic and non-climatic factors. These were in descending order of importance: irrigation availability > farm labor > crop seasonality > crop damage (climatic) > land holding > crop damage (wildlife) > crop damage (diseases and pests). The most important consequences of climate change impacts were the drying of irrigation sources (4.35) and crop losses due to weather events (4.10), whereas land fallowing, the occurrence of flood and soil erosion, weed pressure and changes in cropping pattern (with mean ratings of 2.53–3.03) experienced lesser consequences. The extreme weather events, such as untimely rains, drought and windstorms, were rated as the 'most common' to 'common' occurrences, thus inflicting a crop loss of 1–19%. These confirm our hearsay knowledge that extreme weather events have major consequences on irrigation water, which is said to be either drying or getting smaller in comparison to the past. Therefore, Bhutan must step up its on-ground farmer-support system towards improving the country's food production, whilst embracing climate smart farm technologies for adapting to the impacts of change.

For Further Reading: https://doi.org/10.3390/su12104319

Pakistan- Himalaya

WATER RESOURCES MANAGEMENT STRATEGIES FOR IRRIGATED AGRICULTURE IN THE INDUS BASIN OF PAKISTAN

Muhammad Muzammil, Azlan Zahid, and Lutz Breuer

Water 12: 1429

Agriculture of Pakistan relies on the Indus basin, which is facing severe water scarcity conditions. Poor irrigation practices and lack of policy reforms are major threats for water and food security of the country. In this research, alternative water-saving strategies are evaluated through a high spatio-temporal water footprint (WF) assessment (1997–2016) for the Punjab and Sindh provinces, which cover an irrigated area of 17 million hectares in the Indus basin of Pakistan. The SPARE: WATER model is used as a spatial decision support tool to calculate the WF and establish alternative management plans for more sustainable water use. The average water consumption (WF_{area}) is estimated to 182 $km^3\ yr^{-1}$, composed of 75% blue water (irrigation water from surface water and groundwater sources), 17% green water (precipitation) and 8% grey water (water used to remove soil salinity or dilute saline irrigation water). Sugarcane, cotton, and rice are highly water-intensive crops, which consume 57% of the annual

water use. However, WF_{area} can be reduced by up to 35% through optimized cropping patterns of the existing crops with the current irrigation settings and even by up to 50% through the combined implementation of optimal cropping patterns and improved irrigation technologies, i.e., sprinkler and drip irrigation. We recommend that the economic impact of these water-saving strategies should be investigated in future studies to inform stakeholders and policymakers to achieve a more sustainable water policy for Pakistan

For further reading: https://doi.org/10.3390/w12051429