An Environmental Research Abstract

Headlines Himalaya

September 16 – September 30 (2022) **No. 715-716** **Editorial Team: Prakriti Pant and Sangeeta Chand**

For the 715th - 716th issues of Headlines Himalaya, we reviewed researches from four sources and selected five researches from three countries. We selected two researches from Nepal and three from other Himalayan countries (India and Bhutan).

Headlines Himalaya, a weekly research based fact file 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-Himalaya

THE IMPACTS OF CLIMATE CHANGE ON THE IRRIGATION WATER DEMAND, GRAIN YIELD, AND BIOMASS YIELD OF WHEAT CROP IN NEPAL

Santosh Kaini, Matthew Tom Harrison, Ted Gardner, Santosh Nepal, and Ashok K. Sharma

Water 14: 2728

The Nepalese Sunsari Morang Irrigation district is the lifeblood of millions of people in the Koshi River basin. Despite its fundamental importance to food security, little is known about the impacts of climate change on future irrigation demand and grain yields in this region. Here, we examined the impacts of climate change on the irrigation demand and grain yield of wheat crop. Climate change was simulated using Representative Concentration Pathways (RCPs) of 4.5 and 8.5 for three time horizons (2016–2045, 2036–2065, and 2071–2100) in the Agricultural Production Systems Simulator (APSIM). For the field data's measured period (2018–2020), we showed that farmers applied only 25% of the irrigation water required to achieve the maximum potential grain yield. Actual yields were less than 50% of the potential yields. Projected irrigation water demand is likely to increase for RCP4.5 (3%) but likely to decrease under RCP8.5 (8%) due to the truncated crop duration and lower

maturity biomass by the end of the 21st century. However, simulated yields declined by 20%, suggesting that even irrigation will not be enough to mitigate the severe and detrimental effects of climate change on crop production. While our results herald positive implications for irrigation demand in the region, the implications for regional food security may be dire.

For further reading: https://doi.org/10.3390/w14172728

NEXUS BETWEEN ECONOMIC GROWTH, ENERGY USE, AGRICULTURAL PRODUCTIVITY, AND CARBONDIOXIDE EMISSIONS: NEW EVIDENCE FROM NEPAL

Asif Raihan and Almagul Tuspekova

Energy Nexus 7: 100113

Global climate change, exacerbated by greenhouse gas (GHG) emissions, notably carbon dioxide (CO_2) emissions, provides huge risks to the environment, development, and sustainability. This study empirically investigated the dynamic impacts of economic growth, fossil fuel energy use, renewable energy use, and agricultural productivity on CO_2 emissions in Nepal. Time series data from 1990 to 2019 were utilized by applying the autoregressive distributed lag (ARDL) bounds testing approach followed by the Dynamic Ordinary Least Squares (DOLS) method. The ARDL bounds test revealed evidence of cointegration among the variables. The DOLS findings revealed that an increase in economic growth and fossil fuel energy use by 1% for each variable would increase CO_2 emissions by 0.61% and 0.67%, respectively. Conversely, a 1% increase in renewable energy use and agricultural productivity may lead to CO_2 emissions reduction by 3.65% and 0.41% in the long run. The estimated results are robust to alternative estimators such as fully modified least squares (FMOLS) and canonical cointegrating regression (CCR). In addition, the pairwise Granger causality test was utilized to capture the causal linkage between the variables. This article put forward policy recommendations aimed at sustainable development by establishing strong regulatory policy instruments to reduce environmental degradation.

For further reading: https://doi.org/10.1016/j.nexus.2022.100113

India-Himalaya

DETAILED TAXONOMIC REDESCRIPTION, DISTRIBUTION, AND REDISCOVERY OF BIRCH EMPEROR MOTH, RINACA LINDIA (MOORE 1865) (BOMBYCOIDEA: SATURNIIDAE) FROM JAMMU AND KASHMIR, INDIA, AFTER A 38-YEAR HIATUS

Afaq Ahmad Dar, Muzamil Syed Shah, Khowaja, and Mohsin Javid

The Journal of the Lepidopterists' Society 76: 203-206

The genus RinacaWalker 1855 was established with the type species Caligula simla (Westwood 1847) from Simlah (=Shimla), India. Rinaca lindia (Moore 1865) was first reported from northeast, India. During the present study, two specimens of Rinaca lindia (Moore 1865) were collected from the Babareshi region of Jammu and Kashmir (J&K), India, after a 38-year absence. The current study reports the rediscovery of Rinaca lindia (Moore 1865) J&K, India, with description of novel morphological characters and, illustration of the female genitalia. Additionally, information on the preimaginal instars, food plants and species distribution are also provided.

For Further Reading: https://doi.org/10.18473/lepi.76i3.a5

PATTERNS AND DRIVERS OF TREE CARBON STOCKS IN KASHMIR HIMALAYAN FORESTS: IMPLICATIONS FOR CLIMATE CHANGE ADAPTATION

Ashaq Ahmad Dar and Narayanaswamy Parthasarathy

Ecological Processes 11: 58

Temperate forests are major carbon sinks because of their high storage potential and low decomposition processes. We quantified tree carbon (TC) storage from 143 plots distributed across three major forest types of Kashmir Himalaya, relative to differences in ecological factors. Combined regression and Random Forest (RF) analysis were used to examine the distribution of TC stock along ecological gradients and recognize the role of driving factors on TC stocks. Among the three forest types, sub-alpine (SA) forest was the primary TC sink, accounting for 228.73 t ha^{-1} of carbon, followed by mixed conifer (MC; 181.29 t C ha^{-1}) and blue pine (BP; 133.04 t C ha^{-1}) forests. The distribution of TC stocks among the three forest types differed significantly ($\chi^2 = 18.87$; $P = 0.000$). Relative carbon stock analysis demonstrated that *Abies pindrow* and *Pinus wallichiana* accounted 91% of TC stocks across the landscape. Basal area, mean diameter at breast height (DBH), elevation, disturbance and precipitation had significant effects on TC stocks in bivariate regression models. The RF model explained 86% of the variation; basal area interpreted 30.15%, followed by mean DBH (17.96%), disturbance complex (10.64%), precipitation (8.00%) and elevation (7.34%).

For further reading: https://doi.org/10.1186/s13717-022-00402-z

Bhutan-Himalaya

SEISMIC VULNERABILITY OF BHUTANESE VERNACULAR STONE MASONRY BUILDINGS: FROM DAMAGE OBSERVATION TO FRAGILITY ANALYSIS

Dipendra Gautam, Nimesh Chettri, Karma Tempa, Hugo Rodrigues, and Rajesh Rupakhety

Soil Dynamics and Earthquake Engineering 160: 107351

A moderate earthquake of local magnitude 6.4 occurred in Sonitpur Assam, India on April 28, 2021. Although the earthquake occurred in India, Bhutan suffered considerable damage to structures and infrastructures, especially in the eastern districts. Due to inherent vulnerabilities of Bhutanese residential buildings, encapsulated in rural stone masonry and rammed earth construction, widespread damages were reported in many districts although the shaking was moderate only. We report the damage mechanisms observed in buildings and infrastructures and juxtapose the mechanisms with seismic vulnerability of Bhutanese residential buildings using analytical and empirical approaches. Finite element analysis is performed to validate the failure mechanisms. Intensity map for the earthquake is constructed based on the damage description and vulnerability curve is derived for rural stone masonry building class using the damage data of 2009, 2011, and 2021 earthquakes. The sum of observations and analyses highlights that the Bhutanese residential buildings are likely to be damaged considerably even by moderate shaking, and their capacities are expected to be far exceeded by strong shaking.

For Further Reading: https://doi.org/10.1016/j.soildyn.2022.107351