For the 579-580th issues of Headlines Himalaya, we reviewed journal articles from five sources and selected 12 happenings from four countries. We selected eight happenings from Nepal and four happenings from other Himalayan countries (China, Bhutan and Pakistan). The overall coverage of this issue is water pollution, disaster, biodiversity, wildlife, climate change and environment.

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POST-DISASTER WASTE MANAGEMENT: LESSONS LEARNT FROM 2015 NEPAL EARTHQUAKE

Nivesh Dugar, Sailesh Karanjit, Nawa Raj Khatiwada, Surya Man Shakya, and Anish Ghimire

Nepal, a landlocked, mountainous country, lies in the Alpine-Himalayan belt. Ranging from an altitude of as low as 70 m to as high as 8848 m, Nepal consists of different topographical features and climate varying according to widespread range of altitude. With these significant variations, the country is highly susceptible to damage from different disasters such as floods, landslides, earthquakes, fire, hailstorm, cloudburst, droughts, famines, and epidemics. It is one of the top twenty countries in the world which is prone to multi-hazard destruction. Hence, according to United Nations Development Program, it has been ranked 4th in the context of vulnerability to climate change, 11th in terms of earthquake, and 30th in relation to flood risks. Changes that are unusual as well as sudden are the reasons humans incur considerable damage to lives and property. Depending upon the nature and severity, disaster creates a large volume of debris and waste, i.e., disaster waste. The waste generated from these unusual events can account for an additional 5–10 times of the solid waste generated normally, and it can have adverse impacts on environmental and public health if not handled carefully. A general overview related to management of debris waste generated from April, 2015 Gorkha earthquake of 7.8 M_w and an aftershock of 7.3 M_w is presented in this paper. Following the lessons from the implementation of Hyogo Framework for Action (HFA), the need for a more focused action within different sections has given rise to four basic prioritized areas in relation to Sendai Framework for Disaster Risk Reduction (SFDRR). Nepal being a signatory to the SFDRR 2015 needs to comply with the obligations and prioritized actions within the allocated time limit. Moreover, there have been numerous works needed to be done to develop national strategic plan of action along with a new disaster management act in accordance with the Sendai Framework. Post-disaster Waste Management can be considered as a mechanism for handling, treatment, reuse, and recycling of disaster-generated debris that must comply to standard technical practice in solid waste management system as well as the emergency response and recovery system. In the aftermath of the Gorkha earthquake, at least fourteen million tons of debris has been generated from 99,331 fully or partially destroyed houses. The characterization of the different types of disaster waste, its management during the post-earthquake scenario, as well as plans and guidelines have been reviewed and reported.

For further reading: https://doi.org/10.1007/978-981-13-7071-7_41

ENVIRONMENTAL CHANGES AND CHALLENGES OF TARAI AND SIWALIK OF NEPAL

P.K. Jha, R.A. Mandal, and K.P. Poudel

Nepal, a country in Central Nepal, has an elevational range of 60-8848 m in an average 180 km north-south distance. The lowland (Tarai and Siwalik) in southern part of the country is quite close to the tropical zone, which once had rich and well-known forest and wildlife area in Asia, but it has been tremendously transformed into an agricultural landscape in the second half of the last century. As a result of anthropogenic interventions, the lowland has witnessed changes in demography, land use pattern, forest, and biodiversity. In the past four decades, variability in climate has become evident, and temperature rise and erratic rain patterns have been recorded. Food security has become a challenging issue. Almost all districts in the tropical zone are vulnerable to climate risk and hazards, and a few districts in Tarai and Siwalik are the most vulnerable in the country. The lowland zone has not yet received due attention for ecological restoration and sustainable development,

particularly in central and eastern Nepal. Strong political will, sound environment and development policies, and effective implementation are direly needed to maintain ecological balance with development. For further reading: https://doi.org/10.1007/978-981-13-8249-9_12

ALTERATION OF GROUNDWATER RECHARGE AREAS DUE TO LAND USE/COVER CHANGE IN KATHMANDU VALLEY, NEPAL

Suraj Lamichhane and Narendra Man Shakya

The consequences of urbanization in Kathmandu Valley (KV) have been observed in various forms such as change in runoff, groundwater recharge, water scarcity, and others. To sustainably utilize groundwater resources by ensuring adequate supply/recharge to groundwater system, land use/cover (LULC) management is required. A set of models and tools such as the Conversion of Land Use and its Effects at Small regional extent (CLUE-S) model for future LULC projection; geographic information system (GIS) for spatial data management and analysis; analytical hierarchy process (AHP) to estimate appropriate weights for different layers that influence groundwater recharge; and in-situ field test and analysis for infiltration rate were used to achieve the objectives. Results showed that built-up area in the KV watershed is projected to change by +21.4%, agricultural land by -20.5%, and forest areas by -0.9% between 2020 and 2050. In terms of recharge area, 6% of open land is projected to convert into impervious area every decade. The projected changes are expected to have implications in terms of depletion in groundwater levels and subsequent consequences in urban water environment, including base flows in rivers.

For further reading: https://doi.org/10.1016/j.ejrh.2019.100635

EFFECTS OF LAND USE AND LAND COVER CHANGE ON ECOSYSTEM SERVICES IN THE KOSHI RIVER BASIN, EASTERN NEPAL

Bhagawat Rimal, Roshan Sharma, Ripu Kunwar, Hamidreza Keshtkar, Nigel E. Stork, Sushila Rijal, Syed Ajijur Rahman, and Himlal Baral

The provision of ecosystem services is directly related to the type of land use and land cover and management practices in a given area. Changes in land use and land cover can alter the supply of ecosystem services and affect the well-being of both humanity and nature. This study analyses the spatiotemporal variations of land use and land cover and quantifies the change in three important ecosystem services (food production, carbon storage, and habitat quality) in the Koshi River Basin, Nepal during 1996–2016 by using freely available data and tools such as, Landsat satellite images and the Integrated Valuation of Ecosystem Services and Trade-offs (InVEST) model. During the observed time period, there was an overall gain in urban areas (190 sq.km), forests (773 sq.km) and grassland (431 sq.km); loss of cultivated land (220 sq.km) and shrub lands (847 sq.km), mostly occurring in the lowlands (≤1000 m). As a result of the land cover changes, while food production and carbon storage showed a declining trend, overall habitat quality in the basin increased. There is a need to design novel and effective landscape approaches that address local realities and that will aid the maintenance of ecosystem services. We recommend landscape level planning to improve urban and agricultural sectors and focus on halting the loss of ecosystem services.

For further reading: https://doi.org/10.1016/j.ecoser.2019.100963

CLIMATE CHANGE IN NEPAL: POLICY AND PROGRAMS

Luni Piya, Keshav Lall Maharjan, and Niraj Prakash Joshi

Socio Economic Issues of Climate Change (2019): 35-51

This chapter sums up the climate change policies and programs, status of greenhouse gas emissions, trend of weather variables and other aspects of climate change in Nepal. Nepal started addressing the issues of climate change in its policy documents from 2002; however it has been struggling to develop specific policy instruments to implement the climate policy paradigms. The country achieved reduction in the GHG emission in recent years mainly through the promotion of alternative energies and forest conservation facilitated by international climate regimes. There is a consistent increase in temperature with marked spatial differences in its trend. Precipitation, however, shows large interannual variations with negative trend. Precipitation is expected to get more intense in the future. The increased temperature and more erratic precipitation are expected to impact the glacier in the Himalayas, livelihood assets through increased incidence of water-related disasters, human health, and agriculture sector.

For further reading: https://doi.org/10.1007/978-981-13-5784-8_3

CROSS-SECTIONAL SERO-PREVALENCE OF TULAREMIA AMONG MURINE RODENTS OF NEPAL

Narayan Acharya, Krishna Prasad Acharya, and Ishwari Prasad Dhakal

Comparative Clinical Pathology 28 (2019): 517-523

In April of 2015, a massive earthquake and hundreds of aftershocks stroked entire country. Geophysical disasters not only create economic crisis but also cause changes in disease ecology. Tularemia is a zoonotic disease with range of pathogenicity in different animal species. This study was designed to identify the disease status of tularemia in different species of murine rodents of Chitwan District of Nepal. Once the rodents were recovered from metal traps, they were euthanized by injectable anesthesia overdose followed by cervical dislocation. Blood was collected from the heart, and serum was isolated. Presence of tularemia antibodies in the serum was tested by using immunochromatographic test kit containing bacterial lipopolysaccharides. Of the total 80 serum samples tested, 1 sample was found tularemia positive, i.e., apparent prevalence 1.25% (95% CI, i.e., normal approx. CL, − 1.18 to 3.68%) and the true prevalence 0.5024% (95% CI, i.e., Blacker CL, 0 to 5.45%). Likewise, 23.75% (95% CI, i.e., normal approx. CL, 14.42 to 33.08%) of the animals were found with a few to numerous whitish/grayish or yellowish foci and 13.75% (95% CI, i.e., normal approx. CL, 6.2 to 21.3%) of animals with cystic lesions in their liver parenchyma. The location's prevalence was 3.70% for Bharatpur, while nil for the rest of the areas and the difference was statistically insignificant (*$P > 0.05$). This evidence of existence of *Francisella tularensis* in Nepal is expected to evoke public interest at different levels. Food and commodities contaminated with secretions and excretions of rats and mice are strongly suggested to avoid as a safety measure to rodents born infectious diseases.

For further reading: https://doi.org/10.1007/s00580-019-02895-1

COMMUNITY ENGAGEMENT IN NATURAL HERITAGE CONSERVATION STEWARDSHIP, NEPAL

Rajendra Narsingh Suwal

Archaeology, Cultural Heritage Protection and Community Engagement in South Asia (2019): 121-135

Suwal highlights damaging factors linked to the nationalization of forests in Nepal that coincided with the campaign to eradicate malaria in the Terai from the mid-1950s onwards and with the colonizing of areas of low population to increase agricultural production. As a result there was a loss of natural habitat that threatened plant and wildlife. Recognizing the danger, the government initiated programmes that established protected areas and buffer zones and community forest stewardship as self-sustaining mechanisms. Suwal argues that well-planned community engagement processes, linked to longer term local economic benefits, encouraged

people to support and engage in natural heritage protection. Suwal notes the positive role NGOs, such as the World Wildlife Fund, have played in supporting community in activities such as community stewardship and eco-tourism.

For further reading: https://doi.org/10.1007/978-981-13-6237-8_9

UNDERSTANDING THE EFFECT OF SOCIO-ECONOMIC CHARACTERISTICS AND PSYCHOSOCIAL FACTORS ON HOUSEHOLD WATER TREATMENT PRACTICES IN RURAL NEPAL USING BAYESIAN BELIEF NETWORKS

D. Daniel, Arnt Diener, Saket Pande, Sylvia Jansen, Sara Marks, Regula Meierhofer, Madan Bhatta, and Luuk Rietveld

About 20 Million (73%) people in Nepal still do not have access to safely managed drinking water service and 22 million (79%) do not treat their drinking water before consumption. Few studies have addressed the combination of socio-economic characteristics and psychosocial factors that explain such behaviour in a probabilistic manner. In this paper we present a novel approach to assess the usage of household water treatment (HWT), using data from 451 households in mid and far-western rural Nepal. We developed a Bayesian belief network model that integrates socio-economic characteristics and five psychosocial factors. The socio-economic characteristics of households included presence of young children, having been exposed to HWT promotion in the past, level of education, type of water source used, access to technology and wealth level. The five psychosocial factors capture households' perceptions of incidence and severity of water-borne infections, attitudes towards the impact of poor water quality on health, water treatment norms and the knowledge level for performing HWT. We found that the adoption of technology was influenced by the psychosocial factors norms, followed by the knowledge level for operating the technology. Education, wealth level, and being exposed to the promotion of HWT were the most influential socio-economic characteristics. Interestingly, households who were connected to a piped water scheme have a higher probability of HWT adoption compared to other types of water sources. The scenario analysis revealed that interventions that only target single socio-economic characteristics do not effectively boost the probability of HWT practice. However, interventions addressing several socio-economic characteristics increase the probability of HWT adoption among the target groups.

For further reading: https://doi.org/10.1016/j.ijheh.2019.04.005

China Himalaya

NATIONAL DIGITAL SOIL MAP OF ORGANIC MATTER IN TOPSOIL AND ITS ASSOCIATED UNCERTAINTY IN 1980'S CHINA

Zongzheng Liang, Songchao Chen, Yuanyuan Yang, Ruiying Zhao, Zhou Shi, and Raphael A. Viscarra Rossel

Accurate digital soil maps of soil organic matter (SOM) are needed to evaluate soil fertility, to estimate stocks, and for ecological and environment modeling. We used 5982 soil profiles collected during the second national soil survey of China, along with 19 environment predictors, to derive a spatial model of SOM concentration in the topsoil (0–20 cm layer). The environmental predictors relate to the soil forming factors, climate, vegetation, relief and parent material. We developed the model using the Cubist machine-learning algorithm combined with a non-parametric bootstrap to derive estimates of model uncertainty. We optimized the Cubist model using a 10-fold cross-validation and the best model used 17 rules. The correlation coefficient between the observed and predicted values was 0.65, and the root mean squared error was 0.28 g/kg. We then applied the model over China and

mapped the SOM distribution at a resolution of 90 × 90 m. Our predictions show that there is more SOM in the eastern Tibetan Plateau, northern Heilongjiang province, northeast Mongolia, and a small area of Tianshan Mountain in Xinjiang. There is less SOM in the Loess Plateau and most of the desert areas in northwest China. The average topsoil SOM content is 24.82 g/kg. The study provides a map that can be used for decision-making and contribute towards a baseline assessment for inventory and monitoring. The map could also aid the design of future soil surveys and help with the development of a SOM monitoring network in China.

For further reading: https://doi.org/10.1016/j.geoderma.2018.08.011

PHYTOCHEMISTRY, TRADITIONAL USES AND PHARMACOLOGY OF RHODODENDRON ARBOREUM: A REVIEW

Som K. Madhvi, Manik Sharma, Javaid Iqbal, and Mohd Younis

Research Journal of Pharmacy and Technology (2019): 4565-4574

The tree *Rhododendron arboreum* belongs to family Ericaceae. It is distributed in North America, Europe, Australia, Thailand, India, Nepal, Myanmar, Sri Lanka, Bhutan, Pakistan, China and Tibet. It is rich in various nutrients, minerals and used for various purposes such as refreshing drinks, food colouring agent, decorations and firewood. Traditionally, it is used for the treatment of blood dysentery, nasal bleeding, asthma, stomachache, blurry vision, fever, heart problems, diabetes, gout, coughs, piles and liver disorders. In this review, we have an attempt to highlight over Botany, ethnopharmacy, nutrition profile, Phytochemistry, biological activities and toxicity of Rhododendron arboreum reported so far. The phytochemical research on this plant led to the isolation of phenolics, triterpenoid, flavonols, flavonol glycosides and sterols. The crude extracts and isolated compounds of this plant exhibited various biological activities such as antidiabetic, adaptogenic, antidiarrheal, antiinflammatory, antinociceptive, antioxidant, anticancer and antimicrobial. Therefore, further studies should be carried on extracts and isolation of compounds, in order to explore the full potential of this plant.

For further reading: 10.5958/0974-360X.2019.00785.6

Bhutan-Himalaya

LIVESTOCK DEPREDATION BY SNOW LEOPARD AND TIBETAN WOLF: IMPLICATIONS FOR HERDERS' LIVELIHOODS IN WANGCHUCK CENTENNIAL NATIONAL PARK, BHUTAN

Yonten Jamtsho and Om Katel

Pastoralism 9 (2019): 1–10

Human-wildlife conflict (HWC) is a serious problem in many parts of the world, and Bhutan's Wangchuck Centennial National Park (WCNP) is no exception. Located in the remote alpine areas of the eastern Himalaya, wildlife species such as snow leopard (SL) and Tibetan wolf (TW) are reported to kill livestock in many parts of the Park. Such depredation is believed to have affected the livelihoods of high-altitude herding communities, resulting in conflicts between them. This study provides analysis on the extent of livestock depredation by wildlife predators such as SL and TW and examines its implications for the livelihoods of herding communities of Choekhortoe and Dhur regions of WCNP. Using semi-structured questionnaires, all herders (n = 38) in the study area were interviewed. The questions pertained to livestock population, frequency of depredation and income lost due to depredation in the last five years from 2012 to 2016. This study recorded 2,815 livestock heads in the study area, with an average herd size of 74.1 stock. The average herd size holding showed a decreasing trend over the years, and one of the reasons cited by the herders is depredation by SL and TW and other predators. This loss equated to an average annual financial loss equivalent to 10.2% (US$837) of their total per capita cash income. Such losses have resulted in negative impacts on herders' livelihood; e.g. six herders (2012-2016) even stopped rearing

livestock and resorted to an alternate source of cash income. The livestock intensification programmes, including pasture improvement through allowing controlled burning, and financial compensation, may be some potential short-term solutions to reduce conflict between herders and predators. Issuing permits for *cordyceps* (*Ophiocordyceps sinensis*) collection only to the herders and instilling the sense of stewardship to highland herders may be one of the long-term solutions.

For further reading: https://pastoralismjournal.springeropen.com/articles/10.1186/s13570-018-0136-2

Pakistan- Himalaya

APPRAISAL OF URBAN HEAT ISLAND DETECTION OF PESHAWAR USING LAND SURFACE TEMPERATURE AND ITS IMPACTS ON ENVIRONMENT

Rashid Mehmood and Muhammad Atif Butt

Journal of the Indian Society of Remote Sensing 47 (2019): 1091–1096

Last couple of decades witnessed a rapid escalation in urban temperature of Peshawar city and its neighboring localities. This alarming condition gave birth to climatic term urban heat island-created drastic alteration in surface temperatures. In this study, thermal infrared remote sensing data have been employed to map out and monitor such micro-climatic variation in temperatures in land use/land cover exposed surface to the environment. To assess these outcomes resulting from human activities, Landsat TM data band 6 was subjected through ERDAS Imagine 2013. For further processing, ARC GIS helped a lot in making maps to pinpoint the heat island in and around the city. Moreover, a relationship of land surface temperature with urban sprawl, environmental and industrialization was established. This study has shown a substantial upsurge in temperature about to 1°–3°. Urban sprawl and industrialization at the edges are accounting for these conditions. Urban and industrial data have also reinforced the fact being drawn from remotely sensed data. Hence, evaluation of land surface temperature data captured through remote satellite has proven to be effective tool not only for monitoring and analyzing temperature but also for assessing its adverse impacts on the environment and climate.

For further reading: https://link.springer.com/article/10.1007/s12524-018-0924-6