

Headlines Himalaya

May 15 – May 31 (2020)

No. 603-604 Editorial Team: AratiGurung and AnujDangol

For the 603- 604th issues of Headlines Himalaya, we reviewed journal articles from five sources and selected five researches from three countries. We selected one research from Nepal and four researches from other Himalayan countries (India and Pakistan).

Headlines Himalaya, a weekly research based information 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** LAND USE AND LAND COVER CHANGE DETECTION AND PREDICTION IN THE KATHMANDU DISTRICT OF NEPAL USING REMOTE SENSING AND GIS
- INDIA** ANALYTICAL AND NUMERICAL STABILITY ANALYSIS OF ROAD CUT SLOPES IN GARHWAL HIMALAYA, INDIA
- ASSESSMENT OF SPRING POTENTIAL FOR SUSTAINABLE AGRICULTURE: A CASE STUDY IN LESSER HIMALAYAS
- GEO-ENVIRONMENTAL CONSEQUENCES OF OBSTRUCTING THE BHAGIRATHI RIVER, UTTARAKHAND HIMALAYA, INDIA
- PAKISTAN** ECOLOGY, DISTRIBUTION MAPPING AND CONSERVATION IMPLICATIONS OF FOUR CRITICALLY ENDANGERED ENDEMIC PLANTS OF KASHMIR HIMALAYA

Nepal-Himalaya

LAND USE AND LAND COVER CHANGE DETECTION AND PREDICTION IN THE KATHMANDU DISTRICT OF NEPAL USING REMOTE SENSING AND GIS

SonamWangyel Wang, Belay ManjurGebru, MunkhnasanLamchin, Rijan Bhakta Kayastha, andWoo-Kyun Lee

Sustainability 12: 3925

Understanding land use and land cover changes has become a necessity in managing and monitoring natural resources and development especially urban planning. Remote sensing and geographical information systems are proven tools for assessing land use and land cover changes that help planners to advance sustainability. Our study used remote sensing and geographical information system to detect and predict land use and land cover changes in one of the world's most vulnerable and rapidly growing city of Kathmandu in Nepal. We found that over a period of 20 years (from 1990 to 2010), the Kathmandu district has lost 9.28% of its forests, 9.80% of its agricultural land and 77% of its water bodies. Significant amounts of these losses have been absorbed by the expanding urbanized areas, which has gained 52.47% of land. Predictions of land use and land cover change trends for 2030 show

worsening trends with forest, agriculture and water bodies to decrease by an additional 14.43%, 16.67% and 25.83%, respectively. The highest gain in 2030 is predicted for urbanized areas at 18.55%. Rapid urbanization—coupled with lack of proper planning and high rural-urban migration—is the key driver of these changes. These changes are associated with loss of ecosystem services which will negatively impact human wellbeing in the city. We recommend city planners to mainstream ecosystem-based adaptation and mitigation into urban plans supported by strong policy and funds.

For further reading: www.mdpi.com/2071-1050/12/9/3925

India-Himalaya

ANALYTICAL AND NUMERICAL STABILITY ANALYSIS OF ROAD CUT SLOPES IN GARHWAL HIMALAYA, INDIA

Hari Om Singh, Tariq Anwar Ansari, T. N. Singh, and K.H. Singh

Geotechnical and Geological Engineering (2020)

The rocks of the Himalayan terrain are highly deformed and distorted due to complex geological and tectonics setup. Failures of slopes are always reported along National Highway (NH)-7, in the Uttarakhand Himalayan region, which causes loss of lives, traffic blockage, and destruction of property and also deterioration of the environment gradually. The road cut slope stability analysis of five locations were carried out along NH-7, between Shivpuri to Kaudiyala in Uttarakhand, India. For that a rigorous field investigation was done to collect the geotechnical parameters of slopes and also the potential instability condition of cut slopes were monitored with real time. To know the characteristic of rock mass, the geotechnical data's were studied based on rock mass rating (RMR) and geological strength index (GSI). The kinematics of the blocky (good and fair) rock-mass shows in general wedge, toppling and planar type of failures for different rock slopes. The petrography of representative rock samples was also carried out to see the mineralogical variation in quartzite and phyllitic quartzite. The comparative analysis of different empirical methods for slope stability as slope mass rating (SMR), continuous slope mass rating (Co-SMR), and Chinese slope mass rating (CSMR) shows a decent correlation and revealed that slopes are mostly partially stable, Q_{slope} stability has also been applied to reveal the stability problems and to find out stable slope angle for different slopes. Further to clarify the stability of these slopes, numerical models (LEM and FEM) were applied. The numerical result, (FoS) of different slopes revealed that slopes are stable, critically stable and unstable, with a good agreement between LEM and FEM models. The collective effort of slope stability analysis through analytical and numerical methods will give the better perception to find out the potential remedial measures and optimum slope design.

For further reading: <https://doi.org/10.1007/s10706-020-01329-y>

ASSESSMENT OF SPRING POTENTIAL FOR SUSTAINABLE AGRICULTURE: A CASE STUDY IN LESSER HIMALAYAS

Vikram Kumar and Sumit Sen

Applied Engineering in Agriculture 36: 11-24

With increasing population and restricted water and land resources, there is a growing concern for better planning of the available water and land resources. In the mountainous regions or mountains, there is limited land with uncertain water availability as the rainfall patterns pose a major threat to the livelihood of the people. Therefore, it becomes necessary to quantify and manage the available water resources in a sustainable way. People in the

Himalayas are mainly dependent on the springs for drinking water, but not much attention has been dedicated to the development and conservation of these springs. A spring in the Tehri-Garhwal district of Uttarakhand state of India, has been continuously monitored to quantify the available water for domestic use and agriculture. In this study, an attempt is made to understand the potential of a spring for agricultural water use by evaluating the crop water requirement and potential improved strategies to increase the water productivity. Analysis proves that crop evapotranspiration is higher (946-1062 mm) for crops with extended duration (165-180 days) as compared to evapotranspiration (92.91 mm) of short duration (60 days) crops. The total water requirement for major crops in the area is 6411.35 mm and the monitored spring has the potential to supplement this water requirement. Adopting the system of rice intensification to increase the rice yield (by 49%), increases the water productivity. The sensitivity analysis of benefit to cost suggests that, an increase in the crop yield by 30% can increase the revenue in the study area by Rs.3687197, which is 217% more than the input costs. Therefore, it is essential to optimize the available water and area for irrigation to achieve the global water security for increasing population. Further, utilizing springs as potential irrigation sources will support rural community in meeting domestic water requirement and achieving environmental sustainability. Findings of this study will help in planning and implementing management strategies that are resilient in the face of future changes and improve the economic condition of farmers.

For further reading: <https://doi.org/10.13031/aea.13520>

GEO-ENVIRONMENTAL CONSEQUENCES OF OBSTRUCTING THE BHAGIRATHI RIVER, UTTARAKHAND HIMALAYA, INDIA

S. P. Sati, Shubhra Sharma, Y. P. Sundriyal, DeepaRawat, and Manoj Riyal

*Geomatics, Natural Hazards and Risk*11: 887-905

The Bhagirathi Valley is investigated to understand the impact of various barrages and dams on natural river flow. The multiple barrages and dams in the valley (downstream of the Bhatwari Village) have obstructed/disrupted natural flow of the river which has adversely impacted geomorphological and ecological functions of the river. Besides, it is observed that during and after the implementation of the hydropower projects, the terrain stability was severely affected due to creation of fresh landslide zones, destruction of forest and rural infrastructures including the marginal agricultural lands. The study observes that lack of detailed geological, geomorphological and ecological investigation prior to the execution of the hydropower projects led to the terrain instability. Further, dearth of detailed scientific studies was responsible for the lack of comprehensive engineering/bioengineering measures and catchment area treatment plans as also the measures for reservoir rim slope stability. Taking cognizance from the Bhagirathi valley, present study calls for a detailed multidisciplinary study in the Himalayan valleys where the rivers are likely to get impounded for harnessing hydropower.

For further reading: <https://doi.org/10.1080/19475705.2020.1756464>

Pakistan- Himalaya

ECOLOGY, DISTRIBUTION MAPPING AND CONSERVATION IMPLICATIONS OF FOUR CRITICALLY ENDANGERED ENDEMIC PLANTS OF KASHMIR HIMALAYA

AabidHussain Mir, SumiraTyub, and Azra N.Kamili

During the last few decades, human-driven activities have led to indiscriminate habitat destruction and exploitation of many plant species in Kashmir Himalaya. As a result, many species have become threatened and are struggling for survival. Of particular concern are the endemic and critically endangered species which have the highest risk of the extinction, hence warranting immediate conservation actions. Therefore the current study was carried out to understand the distribution, ecology and conservation implications of the four critically endangered endemic plants of Kashmir Himalaya. Habitat distribution modelling showed that the suitable potential areas for the species occurred from subalpine to alpine meadowlands with an elevational range of 1500–4600 m asl. The output of the MaxEnt model and field surveys have revealed that their highest potential distribution is in Panchari, Khrew, Ramnagar, Pahalgam, Gurez, Sonamarg, Gulmarg and Kishtwar forest ranges. Based on the field explorations and herbarium records, *Saussureacostus* (Falc.) Lipsch have 27 distribution areas, *Gentianakurroo* Royle 18, *Lilium polyphyllum* D. Don 12 and *Aconitum chasmanthum* Stapf have 15. Precipitation of the driest month and annual mean temperature played an important role in the distribution of the studied species. The species started their lifecycle with the onset of the spring season, flowered in summer, fruit in autumn and senesce in the winter season. Under natural conditions, the number of days required for germination ranged from 180 to 210 where cold stratification played a pivotal role. Since last few decades, the populations of these species have been shrinking in their natural habitats due to over-exploitation for medicinal purposes and habitat destruction through amplified humanoid interferences like the expansion of agricultural land, road building, grazing and urbanization. Thus there is an urgent need to come up with positive strategies to save whatever is left and plan long term rescue measures not only to protect these species from extinction but also to reintroduce them along with framing the plans to supply sustained raw materials for medicine.

For further reading: <https://doi.org/10.1016/j.sjbs.2020.05.006>