# P12: JAWAHARLAL NEHRU UNIVERSITY

New Delhi, India

*Departments concerned with SUNRAISE-related topics*:
- School of Environmental Sciences
- Special Centre for Disaster Research

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Jawaharlal Nehru University (JNU) is a multi-disciplinary, public university based in New Delhi (India). Established in 1966 and with an approximate number of 9,000 students, it is one of the leading universities in the country and a globally recognised institution for research and teaching. It consists of a single campus covering a surface of 404.69 ha in the heart of New Delhi and organised in 10 schools housing several specialised centres. Schools are conceived as spaces to connect allied disciplines within a single entity and, thus, foster a multi-disciplinary environment for research and training. Work not only at the crossroads among disciplines but also between academics and society is particularly encouraged. Research and training at JNU cover a wide spectrum of thematic areas, going from arts to engineering to environmental sciences to literature, among others. Strong collaboration has also been set up between JNU and universities across the world for the organisation of conferences and conduction of research.

Regarding the sustainability field, the work carried out in the school of environmental sciences and the special centre for disaster research stand out. Especially remarkable is the early engagement of the school of environmental sciences in the provision of a M.Sc./M.Phil. programme in the field (once founded in 1974), becoming the first of its kind at that time in the country. The transdisciplinary character of both the school of environmental sciences and the special centre for disaster research should also be stressed. Work embracing three key functional areas is, for example, undertaken in the special centre for disaster research. These functional areas encompass: 1) natural sciences and GIS; 2) communities, institutions and legal frameworks; and 3) government agencies and administration for disaster management. Sustainability relevant topics included in the research agenda of the school of environmental sciences and the special centre for disaster research are (summarised and shortened):

- Analysis of the different ecological systems of the Indian Himalayan, including those linked to forests, glaciers, surface and ground- water bodies, and the soil; analysis of ecosystemic dynamics and functions at the individual, population and community level, along with the interactions among sets of ecosystems constituting a landscape from the point of view of landscape management; study of above and below-ground biodiversity management;

- Mathematical modelling and/or monitoring of ecosystems, air and water quality, noise pollution and its mitigation through vegetation, energy consumption, the impact of aerosols on the climate, and the biological effects of electro-pollution; air quality studies are developed for point and non-point sources, indoor and outdoor environments, and, among others, related to the urbanisation process;
- Assessment and monitoring of environmental pollution and its impact on biota and the ecology of water bodies and soils; influence of human activity on the landscape;
- Study of the existent challenges and possibilities for urbanisation;
- Vulnerability and risk assessment, including those risks related to climate change; adaptation strategies to climate change;
- Strategies for a sustainable management of landscapes, with a particular focus on the rehabilitation of degraded rural landscapes;
- Strategies for a sustainable development/livelihood of traditional communities.

A wide variety of scientific methods are used for these explorations, ranging from remote sensing to citizen science to field explorations, among others. This (see a more detailed research profile attached) becomes a reflection of the capabilities and intentions of JNU to conduct research and training activities adhering to SUNRAISE research priorities. It should additionally be noted that the current research agenda responds to national policy priorities in the sustainability field and, to a lesser extent, international one. The promoted and undertaken networking activities with governmental and non-governmental agencies spread over the country to develop at least some of the research projects constitutes a proof of the intentions of JNU to meet the specific needs faced by the country. The simultaneous establishment of international cooperation during the carrying out of research with organisations in countries such as Mongolia becomes a proof of the willingness to contribute to the realisation of international goals. This context, along with the results of the carried out surveys/interviews with local stakeholders and JNU' academic staff members, leads us to recommend the following additional multidisciplinary research areas, which might be considered in future research projects. Key subject areas for sustainability highlighted in the international scientific literature and national and international priorities in the field have also been taken into consideration during the definition of the suggested recommendations:

- Governance of and vision building for sustainability transformations in mountain areas; alternative promising community-led and top-down governance approaches and tools and their efficacy to trigger change, taking into account the existent power plays among actors and the way they can constrain/enable the transformation process; potential of knowledge exchanges between science and urban and rural communities to prompt vision building and sustainability action; prevailing perspective among communities, decision-makers and other professionals regarding the current and future challenges for the sustainability of the Indian Himalaya and the strategies needed to tackle them;
- Mathematical modelling and monitoring of climate change impacts in urban areas (e.g. exacerbation of the urban heat island effect); consideration of different future climate and urban – rural development scenarios during the analyses (interrelation climate change – land-cover/land-use change); modelling of the potential positive and negative effects associated to different possible sustainable urban development strategies (e.g.

increases in urban green infrastructure, increases in the permeability of sealed surfaces) and, subsequently, evaluation of the technical/ecological feasibility and desirability of each of the strategies;
- Prospects for a sustainable urban landscape, integrating strategies for food production, biodiversity enhancement and water management, among others, within the urban fabric, and the mutual effects among them (in other words, prospects for an integrated sustainable urban planning and management);
- Strategies and tools for climate change mitigation in mountainous regions, including both rural and urban areas; science and management of carbon reduction and sequestration; way measures can be used for both climate change mitigation and adaptation, if properly planned, designed and maintained;
- Human – wildlife interaction/conflicts; conflicts between nature protection and use;
- Ecological and social impact of changes in the prevailing economic activities in Indian mountain communities (e.g. from a subsistence to a tourism-based economy).

In general terms, apart from increases/engagement in particular research thematic areas, a need for increases in the practice-oriented components of the developed research is noted and, thus, becomes desirable. This is especially relevant given the ambition expressed by academic staff members at JNU to develop research targeted at helping in the attainment of the Sustainability Development Goals in the Indian Himalayan Region. Further engagement is advisable in studies going beyond the analysis of certain problems, etc. and critically analysing and testing tools and strategies for the attainment of a more sustainable reality: e.g. a more sustainable urban development. This is of high relevance to provide adequate support from science to the decision-makers and communities in the process of e.g. selection of strategies for sustainability. Work with the communities and governance agencies should, furthermore, continue, if not be intensified. The usage of citizen science approaches (already used in some projects) is particularly advisable, going beyond the mere conduction of questionnaires, surveys, etc. with stakeholders. This might not only enable to better adapt research to the needs faced in practice, but also bring science and knowledge closer to people, which might positively influence the sustainability transformation process in practice.

## Summary of the research profile:

| SUNRAISE-RELEVANT RESEARCH TOPICS |
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| 1. | Research in the different ecosystems of the Indian Himalayan Region ranging from:<br>- Above and below-ground biodiversity management<br>- Glacier monitoring and mapping<br>- Forest resource assessment<br>- Agricultural management<br>- Soil management<br>- Challenges and possibilities of urbanisation |

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| 2. | Sustainable landscape management in the Himalaya from a socio-ecological perspective, including:<br>- Development of traditional communities' areas<br>- Role and needs of human component in influencing the structure and function of landscape |
| 3. | Vulnerability and risk assessment/ multi-hazard mapping and evaluations in the Himalaya |

## KEY PERSONALITIES, POTENTIAL MASTER'S AND DOCTORAL SUPERVISORS

- Prof. Dr. P. K. Joshi – *Research interests: Himalaya; Vulnerability; Remote sensing; GIS*
- Prof. Dr. S. C. Garkoti – *Research interests: Himalaya; Forest; Ecology; Restoration*
- Prof. Dr. J. K. Tripathi – *Research interests: Geology; Earth Processes; Paleoclimate*
- Prof. Dr. K. G. Saxena – *Research interests: Ecology; Natural Resource Management; Sustainable development*
- Prof. Dr. Al Ramanathan – *Research interests: Glacier; Climate change; Geology*
- Prof. Dr. Deep Narayan Pandey – *Research interests: Community based disaster management; Disaster economics; Remote sensing; GIS*

## CURRENT AND PAST PROJECTS

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| Project 1: "An ecological study of paradoxical re-establishment of white oak in chir-pine invaded habitats and change in certain ecosystem processes and services in white oak-chir-pine ecotone areas in central Himalaya" | *Funded by*: The University Grants Commission (UGC) (major research project), India | *Project type*: research |
| | *Keywords*: Carbon; Biomass; Litter | |

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| Project 2: "Urban resilience and adaptation for India and Mongolia" | *Funded by*: Erasmus+ Programme of the European Union | *Project type*: capacity building |
| | *Keywords*: Green and blue infrastructure; Nature based solutions | |

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| Project 3: **"**Network programme on convergence of traditional knowledge systems for integration to sustainable development in the Indian Himalayan region" | *Funded by*: Department of Science and Technology, India | *Project type*: research |
| | *Keywords*: Traditional knowledge; Sustainable development; Himalaya | |

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| Project 4: "Promoting citizen science for creation of a phenology network to track climate change and plant invasions" | *Funded by*: Department of Science and Technology, India | *Project type*: research |
| | *Keywords*: Citizen science; Phenology; Climate change | |

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| Project 5: "Estimating mass balance of glaciers in the Bhaga basin, western Himalaya, using GPR and remote sensing method" | *Funded by*: Ministry of Earth Sciences, India | *Project type*: research |
| | *Keywords*: Glaciers; Himalaya; Mass balance | |

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| Project 6: "Bioclimatic feedbacks of melting Himalayan ice" | *Funded by*: Department of Science and Technology, India | *Project type*: research |
| | *Keywords*: Glaciers; Himalaya | |

## CURRENT AND RECENT PhD THESES

- Anees M. M. "Characterising urban ecosystems in the capital cities of the Western Himalaya" (2021 – awarded)
- Deepika Mann "Spatio-temporal analysis of effects of road network in Central Himalayan region" (2018 – awarded)
- Neha Chauhan "Socio-environmental vulnerability of agricultural communities to climate change in Western Himalaya" (2019 – ongoing)
- Praveen Kumar "Assessing climate change vulnerability and adaptation strategies of socio-ecological systems in the Central Himalaya" (2018 – ongoing)
- Saurabh Kaushik "Understanding eastern Himalaya cryosphere using remote sensing" (2018 – ongoing)
- Sonali Sharma "Regulating ecosystem services in urbanising landscapes of Western Himalaya" (2020 – ongoing)

## RESEARCH AMBITIONS IN RELATION TO SUNRAISE

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| 1. | Development of further research activities in the Indian Himalaya to help in the attainment of the Sustainable Development Goals (SDGs) in the region |

## ENABLERS AND BARRIERS ENCOUNTERED FOR RESEARCH DEVELOPMENT

| Enablers | Barriers |
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| ➢ Networking with other stakeholders (NGOs, etc.)<br>➢ Collaboration with other partner universities<br>➢ Participation in the SUNRAISE project | ➢ Shortage of financial resources<br>➢ Shortage of trained staff members<br>➢ Shortage of political will to support the field<br>➢ Shortage of networking with and among institutions |

## NATIONAL RESEARCH/ POLICY SUPPORTING RESEARCH DEVELOPMENT

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| 1. | National Education Policy 2020 (NEP 2020) |
| 2. | Notification for Academic Bank of Credits (ABC) by the University Grants Commission (UGC) |

## CAPABILITY IMPROVEMENT TARGETED TO FULFIL THE ASPIRED RESEARCH GOALS

*Improvements are desired in*:

- Equipment/ software
- External experts support
- Cooperation with national and foreign institutions

## ENABLERS AND BARRIERS ENCOUNTERED FOR RESEARCH TRAINING

| Enablers | Barriers |
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| - | ➢ Shortage of equipment |