# Need for streamlining career opportunities in forestry education

Despite excellent forestry tradition in India, the extent of forest cover, forest quality and forest products has declined with time. The latest estimate shows that the contribution of gross goods and services provided by forestry sector puts its contribution to Gross Domestic Product (GDP) at just 2.37%. To mitigate the adverse situation, skilled manpower is required so that a proper action plan can be made based on research inputs and guiding principles. Thus courses on forestry and its related fields like wood science and technology, wildlife, agro-forestry, biodiversity conservation, participatory forest management are of immense importance from policy and application point of view.

The task of forestry education, training and extension is under the supervision of the Ministry of Environment and Forests (MoEF), Govt of India. The Indian Council of Forestry Research and Education, Dehradun, an umbrella organization under the Ministry, is actively engaged in forestry research and knowledge dissemination through its eight research institutes and three advanced centres all over India. Training to frontline foresters is provided by the Indira Gandhi National Forest Academy, Dehradun and the Directorate of Forest Education (DFE) through its four State Forest Service colleges. The Ministry has several autonomous organizations like Wildlife Institute of India, Dehradun; Indian Plywood Industries Research and Training Institute, Bangalore and G.B. Pant Institute of Himalayan Environment and Development, Almora affiliated to it. These organizations are working actively in the field of forestry research, training and extension.

There are also around 45 Central and one State university in India which provide under-graduate courses (some of which are of four-year duration), and 16 universities which provide postgraduate courses in forestry education and extension. Masters-level specialization includes subjects like forest economics, wood science and technology, computer applications in forestry, biodiversity conservation, community forestry, wildlife, etc.

To explore career opportunities, postgraduate students are highly dependent upon research fellowships provided by these institutes, which however do not provide a secure career option as there is no intake of skilled manpower. The dependency is really high as forestry has not been included in the subject list of examinations held by UGC (NET). On the other hand, Agricultural Research Service exams conducted by Agricultural Scientist Recruitment Board have not recruited any scientists in forestry and related streams for the last two years.

Students from these research institutes are dependent upon career opportunities provided by small NGOs where they are bound to work in project-oriented environments with short-term career prospects. Though leading organizations are also involved, due to the corporate set-up their prime intake is of managers and not researchers. The opportunities provided by pulp and paper industries are also limited in scope.

The Indian Institute of Forest Management, Bhopal, an autonomous institute under MoEF, provides postgraduate managerial diploma in forestry but looking at its past placement records, it can be inferred that significant manpower goes to the corporate sector.

Regular examinations in the forestry sector of the Indian Forest Services are tough to crack due to less number of posts and being open to *all* science graduates. Examinations conducted by State Forest Services are not regular and are held only on the availability of posts. This overall scenario presents a difficult situation to all forestry graduates regarding career opportunities. Hence it is of immense importance to take proper governmental and institutional initiatives to work out a timely solution to this bottleneck situation.

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# National geochemical background survey

With the passage of time, there has been a paradigm shift in earth science studies. Today, major earth science thrust areas converge to studies relating to earth resources, palaeoclimate, geological hazards, sustainable development and environmental issues. Geochemical studies play an important role as far as environmental issues, including public health (medical geology) and agriculture are concerned.

Bioavailability of chemical elements in proper combination and concentration is pivotal to the survival and quality of life. Excessive or deficient quantities of certain elements may pose a threat to health and can adversely affect agriculture. Systematic determination of the abundance and spatial distribution of elements on the surface and shallow sub-surface of the earth is the key to assess health risk and land-use planning. In this regard, knowledge of natural geochemical background concentration of elements in water, soil and sediments is a prerequisite to assess and predict short term and long term environmental pollution.

In order to assess pollution from anthropogenic sources, it is essential to establish the background concentration of elements. Assessment of geochemical background assumes added significance with increasing environmental awareness and is urgently needed for environmental legislation and decision-making. In general there is a failure to reach to a strict definition of the term 'geochemical background'. The term, however, in many cases is used to imply 'threshold' or 'maximum expected likelihood' concentration. Since understanding the term is crucial in pollution investigations to separate geogenic input from anthropogenic ones, there is an urgent need for an unequivocal, internationally agreed upon definition of the term and the methodology adopted for the purpose.

There are many approaches to define geochemical background, but the most practical way to define the term would be to describe the natural concentration and variation of an element in a particular natural medium. The background may not be a single value, but a range of values. Whatever be the definition, the question remains as to how to obtain the background value in the present human-influenced environment. As things stand today, there seems to be no unquestioned and commonly agreed method for establishing the background values.

A quick literature survey will reveal that many approaches to assess the background are in vogue. A few of these include: (i) considering world average shale[1] or upper continental crust composition as reference; (ii) concentration of elements in samples from the most pristine parts of the catchment area[2]; (iii) statistical methods[3]; (iv) concentration of elements in international rock[4], soil and water standards and (v) concentration of elements in the sample, chosen from a population of collected samples, which appears to be least affected by human interventions[5]. Since assessment of pollution is as good as the reference material chosen to represent the background, there is need for standardization of assessment of background concentration. It is quite possible that a particular material may appear polluted based on a criterion to assess the background, whereas if we choose another criterion to assess the background, it may prove to be unpolluted. I came across such a situation while carrying out pollution assessment of the floodplain sediments of the river Hindon, a tributary of the river Yamuna. The floodplain sediments appear to be unpolluted if we consider world shale as representing background concentration of elements. But if the sample, chosen from a population of collected samples, which appears to be least affected by human intervention, is considered to reflect the background concentration, the floodplain sediments appear to be polluted considerably.

Therefore, it is of paramount importance to initiate a nation-wide geochemical background survey. Once the geochemical background of soil, water and sediments of a particular region is known, issues concerning medical geology, agriculture, environment and land use would be better understood. This will also help formulate a robust environmental legislation of the country.

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# Need to strengthen geoscience education vis-à-vis new Earth Commission in India

India has set up a new Earth Commission and renamed the Union Ministry of Ocean Development as the 'Ministry of Earth Sciences', to incorporate all researches on land, ocean and atmospheric systems[1], with a view to take up an integrated approach of the earth system sciences. The Ministry intends to network institutions, research centres and operational agencies involved in earth sciences, oceanography and remote sensing through a series of programme offices vis-à-vis various structural changes required to address functional flaws. Now the policies will be executed through a newly planned Earth System Organization, similar to Indian Space Research Organization[1].

This should be welcomed as an important and timely step in view of our commitment to achieve full development by 2025. Since India has the world's fastest growing population to feed, its basic priorities are not atomic/chemical warfare but drinking water, energy, food and housing. Fortunately, we have adequate natural resources in the form of minerals and metals, and fuels beside fertile fields, supporting climate with sufficient rain and forests. What else is needed is how to achieve sustainable growth with minimum anthropogenic stress that our 'mammoth population' will exert on regional and global environment. Similarly, we ought to be prepared to face natural disasters like floods, cloudbursts, cyclones, earthquakes and tsunamis. On the other hand, our backwardness has led us to a chaotic picture by and large. This is due to knowledge being confined to a few individuals at the top, whose research does not meet the specific needs of the people[2], or to a minimum knowledge of the earth system, the very 'crucible' where social, industrial and environmental phenomena are taking place. The managers, who exploit natural wealth, are not fully aware of methods (to check environmental impact) that are being practised in the rest of the world under international laws, framed to keep the earth intact. Background of geoscience education and geology makes us service-oriented and realize that sustainable growth could be achieved only by protecting the environment.

Although geoscience education in India began when the British visualized needs of geological organisations in 17th and 18th centuries, it was restricted mostly to explore, exploit and export minerals. Its applications in civil engineering, town-planning, water-resource management, terrain evolution with the help of Geographic Information Systems or Geographic Positioning System have emerged with evolved computation techniques. However, since geology is not taught in schools in India, a large majority of the population remains ignorant of possible dangers and enough attempts are not being made at popularization of this science.

The need of the hour is to promote geoscience education in our region/country by giving a background knowledge of the earth system, to make our youth nature-oriented. For example, in 1999, the Department of Applied Geology, Dr Harisingh Gour University, Sagar, organized