



Physical Geography in India: A Perspective on the Current Status and Future Prospects

Vishwas S. Kale

Formerly at the Department of Geography, S. P. Pune University, Pune 411007

E-mail: vskale.unipune@gmail.com (Corresponding author)

Abstract: *Physical geography is no longer one of the stronger or important sub-disciplines of geography in many universities in India. This review paper deals with the current status of physical geography in India. The review is primarily based on the examination of the articles published in four Indian geography research journals and the IGI journal before 2014, as well as the post-graduate course contents of some of the university departments in India. An attempt has also been made to list the probable reasons for the decline of physical geography in India. Finally, the paper briefly discusses the future of physical geography in the Indian context..*

Introduction

Physical geography is fundamentally concerned with the complexities of the physical environment in space and time (Inkpen, 2009). Physical geographers have an abiding interest in the geographical distribution of various natural forms, features and phenomena to understand their spatial patterns as well as the associated processes (geomorphic, hydrological, atmospheric, marine and biological) on different spatial and temporal scales. Physical geography is an integral, a key and a large branch of geography. This sub-discipline of geography has a clear identity within the sciences and is extremely broad in subject matter. The three principal subfields of physical geography are geomorphology, climatology, and biogeography. Other subfields generally included under physical geography are soil geography (pedology), hydrology and Quaternary studies (Goudie *et al.*, 1985).

Physical geography has been a prominent component of geography for a long time in UK, Australia, New Zealand and Canada (Gregory, 2000) as well as in some of the European countries and to some extent in China (Fu *et al.*, 2006). Though in the USA the importance of physical geography has declined remarkably since the mid-20th century, physical geographers and geomorphologists dominated the discipline during the first few decades of the last century (Rhoads, 2004).

Today, physical geography in India is in a crisis. In the last few decades, physical geography has almost vanished from the Indian scene and the space separating physical and human geography is growing wider. Given the enormous geo-diversity as well as climatic, pedological and biological diversity in our country this is most surprising and perplexing (Kale, 1993; Kale, 2014). The Indian landmass encompasses virtually

every geomorphic landscape present on the Earth surface — from the spectacular glacier-carved valleys with moraines, vast alluvial and deltaic plains, chain of mountains and a rocky-sandy desert to laterite-capped mesas, waterfalls, gorges, inselbergs, beaches, mangrove swamps, and coral islands (Kale, 2014; Vaidyanadhan and Subbarao, 2014). The region includes the highest, youngest and the most active mountain belt in a collisional setting (the Himalaya). The Indian Peninsula is an ancient landmass characterised by multiple ancient surfaces and valleys underlain by some of the oldest rocks (3-4 billion years) on the Earth. The vast Indus-Ganga-Brahmaputra Plains display distinctive river process and alluvial landforms, ranging from meandering and braided channels, ox-bow lakes and natural levees to floodplains, deltas and alluvial fans. The Western Ghat (Sahyadri) is one of the most spectacular great escarpments of the world. Furthermore, the monsoon climate of India provides several opportunities to study the spatio-temporal variations in monsoon rainfall, extreme rainfall events, droughts, cyclones, depressions and thunderstorms, as well as heat and cold waves. One of the wettest places on the Earth is located over the Meghalaya Plateau (Mawsynram and Cherrapunji, with annual rainfall about 11780 mm) in northeastern India, and the average annual rainfall at Jaisalmer, in the Indian Desert almost at the same latitude in western India, is less than 150 mm. There are a large number of meteorological stations spread across the subcontinent and some of the longest meteorological records are available for the Indian region. Virtually every water-related hazard and geo-hazard is known from the subcontinent. In addition, the Indian region, due to its great geo-diversity, pedo-diversity and climatic diversity, has been identified as a distinct biogeographic region. The Western Ghat (and Sri Lanka) and the

Eastern Himalaya (along with Myanmar) are amongst the world's top twenty five biodiversity hotspots with several thousand endemic plant species and vertebrate species (Myers *et al.*, 2000). In view of the huge variety of research opportunities in our country it is a mystery why this fascinating, exciting and promising branch of earth sciences is disappearing from the Indian scene and why this key branch of geography is not attracting Indian geographers.

Current status of physical geography in India

The present status of physical geography in India is a germane question, the answer for which is vital from the viewpoint of the future of physical geography in India. The question could be answered on the basis of the examination and analysis of the data on various 'health' indicators (Gregory, 2000; Thrift and Walling, 2000; Gregory *et al.*, 2002; Rhoads, 2004), such as – the post-graduate curricula, the number of students specialising in various branches of geography, the number of teaching faculty in various university departments and their research interests, the quality and quantity of research outputs, research funding, the department's research vitality, etc. In the present review only two aspects are considered – (a) the history of articles published in four Indian geography research journals, and (b) the post-graduate course content and structure of different universities in India.

History of research articles published: Output indicator

One way to assess the current status and configuration of physical geography is to classify and analyse the data on research articles published in the different research journals (Gregory, 2000; Thrift and Walling, 2000; Gregory, *et al.*, 2002; Rhoads, 2004; Levia and Underwood, 2004). Information

regarding papers under major sub-branches of geography was compiled for four Indian geographical journals, namely the Geographical Review of India (GRI) of the Geographical Society of India, Kolkata, The Deccan Geographer of the Deccan Geographical Society, India, Pune (DGS), the Transactions of the Institute of Indian Geographers (IIG), Pune, and the Annals of the National Association of Geographers, India (NAGI), New Delhi. Except the first journal, all the remaining three are published bi-annually. The Geographical Review of India is a quarterly journal. The Annals of NAGI in the early 1980s had published three issues in a year (Kapur, 2002). These Indian journals, unfortunately, are not published regularly (particularly, GRI and Annals), the quality of papers is highly variable and the research articles published in the journal volumes do not undergo rigorous peer-review. Often there are pesky mistakes in the published articles in Indian geographical journals implying that the concerned editors do not take the proof reading step very seriously.

There may be an element of bias in the classification or categorisation of papers published in the Indian geographical journals due to two reasons. First, the research

publication falls in an over-lapping (fuzzy) area. Second, the title of the paper does not clearly reflect the contents of the paper. Notwithstanding these difficulties, the history of research articles published in the Indian research journals provides a fairly good measure of the importance and configuration of physical geography in India.

Classification of the topics of the published papers shows that the proportion of articles with noteworthy physical geography content varies amongst the four selected Indian geographical journals. About 19–33% of the published papers in these journals could be regarded as physical geography (Table 1). Table 1 also reveals that the geography journal with the highest percentage of contributions in physical geography was the Transactions of the Institute of Indian Geographers. Grouping of the papers under different fields of specialisation included in the ‘Progress in Indian Geography’ (1992–2012) by Singh (2012) reveals that only about 12% of the published articles were related to physical geography. Sivaramakrishnan (2014) based on the categorisation of the papers included in the ICSSR Journal of Abstracts and Reviews in Geography for the period 2000–2009, found that about one-fourth papers in Indian research journals were related to physical geography.

Table 1. Average percentage of papers on topics related to physical geography published in four Indian geographical journals (up to 2014)

Name of Indian Journal	First issue published in	Period considered in this study	Average number of papers on Physical Geography during review period
Geographical Review of India	1936	1970-2013	24%
The Deccan Geographer	1962	1970-2014	23%
Transactions of IIG	1979	1979-2014	33%
Annals of NAGI	1981	1981-2014	19%

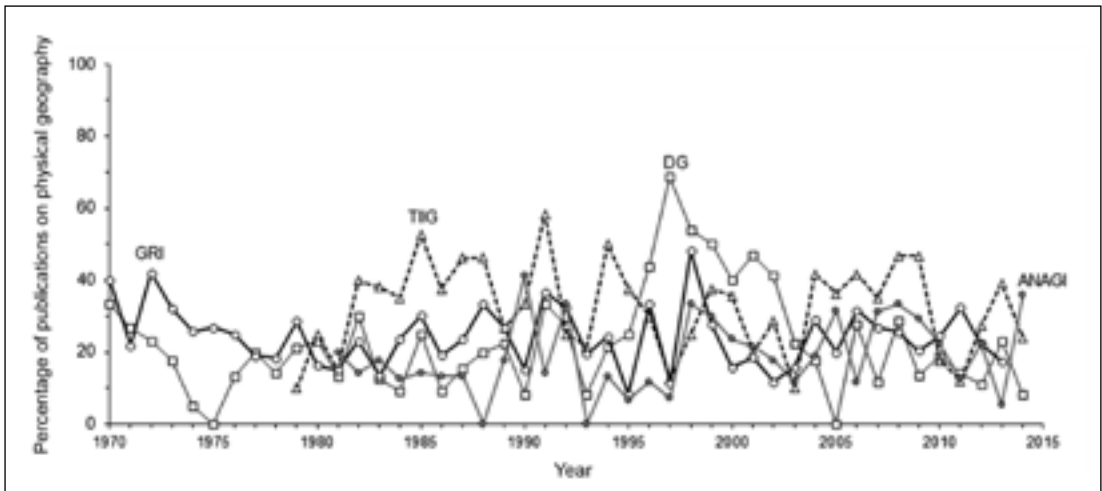


Figure 1. Percentage of total journal contributions in physical geography in four Indian geographical journals. GRI = Geographical Review of India, Kolkata, DG = The Deccan Geographer, Pune, TIIG = the Transactions of the Institute of Indian Geographers, Pune, and ANAGI = the Annals of the National Association of Geographers, India, New Delhi. Note that the papers published in GRI and DG before 1970 are not included in the present review.

Although the temporal trend is highly variable (Fig. 1), a noteworthy increase in the number of papers on topics related to physical geography is seen in the case of the Deccan Geographer (DG) from 1996 to 2002 (Fig. 1). In 1997, a special issue on climatology was published by the DG. For other volumes of the DG the exact reasons for the sudden spurt in the publications on physical geography could not be ascertained.

The Geographical Review of India published the highest number of papers on topics related to physical geography in 1998. The Transactions of the IIG crossed the 50% mark in 1985 and 1991. Examination of the compiled data further reveals a marginal change in the proportion of physical geography articles published in the Indian geography journals since the turn of this century. The analysis also reveals the unbalanced nature of papers within physical geography and the dominance of geomorphology over other sub-branches of physical geography, particularly climatology.

A relevant question in this regard is — why

do Indian physical geographers publish less in the geographical journals compared to other subfields of geography, particularly human geography? One of the likely explanations is that there are fewer physical geographers in the country than human geographers. Another explanation is that Indian physical geographers perhaps prefer to publish in specialised or interdisciplinary journals that reach larger audience. A cursory examination of the contents of the last ten years' issues of four national research journals in earth sciences with impact factor (<1.0), namely the Current Science, the Journal Geological Society of India, the Journal of Earth System Science and the Journal of the Indian Society of Remote Sensing (ISRS), does not provide any evidence in support of the latter argument. Nevertheless, it is important to mention here that scrutiny of the affiliations of the first author or the co-authors of the papers published in the Journal of the ISRS since 2001 indicates that a noteworthy number of papers have been contributed by Indian geographers. Not many of them are physical geographers.

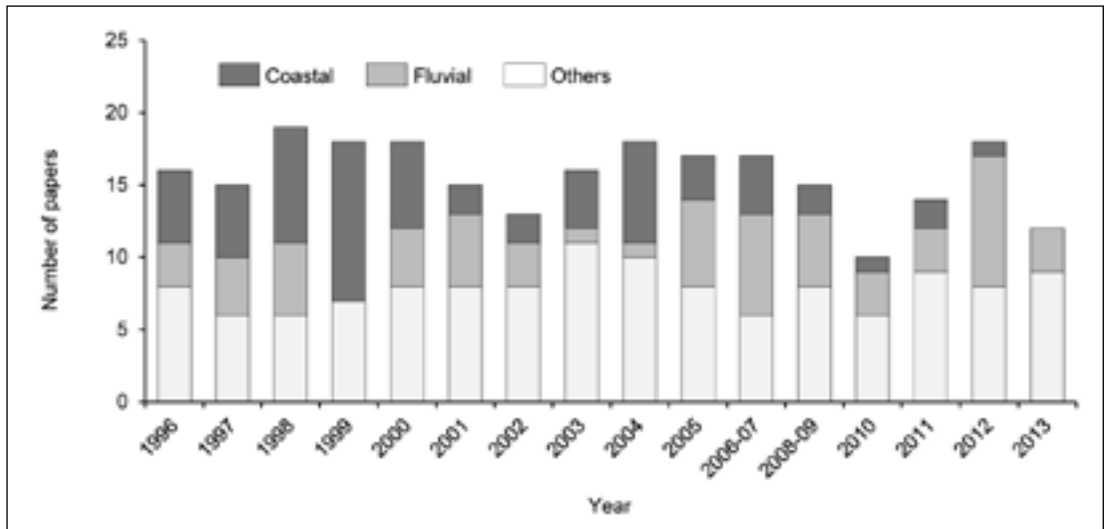


Figure 2. Number of papers on topics related to coastal and fluvial geomorphology in the Indian Journal of Geomorphology, published by the Indian Institute of Geomorphologists (IGI) from 1996 to 2011.

As the imbalance in the publications within physical geography is clearly indicated by the dominance of papers on geomorphological themes (Kale, 1993; Sharma and Kale, 2009; Rai, 2012), a simple exercise was carried out to determine the balance of types of investigations within geomorphology by classifying the contents of the only Indian research journal in geomorphology, namely, the Indian Journal of Geomorphology. The Indian Institute of Geomorphologists (IGI) published this bi-annual research journal since 1996.¹

IGI was established in 1987 at Allahabad to provide an annual forum for bringing Indian (geographer) geomorphologists together and to facilitate dialogue amongst Indian physical geographers as well as with Indian geologists on emerging approaches, new developments, and challenges in the field of earth and environmental sciences. There is no such geographers' association/organisation or journal in India exclusively dedicated to research in the field of

climatology, biogeography and/or soil geography (pedology).

The classification of the papers published in the IGI journal between 1996 and 2013 shows that about 51 percent of the papers were on themes directly related to coastal (26%) and fluvial (25%) geomorphology (Fig. 2). Fluvial geomorphology also includes papers on hydrology. A large number of papers are on very general themes such as erosion surfaces and basin relief characteristics, appraisal of natural resources, geomorphic mapping and regionalisation, groundwater resources and water quality, geo-environmental hazards, wastelands, landforms of some or the other region, etc. The number of papers dealing with some or the other aspects of aeolian geomorphology, glacial geomorphology, Quaternary geomorphology, etc. were less than 1%. There is a clear indication of an increase in the application of remote sensing and GIS techniques, though the expected rigour is lacking. Publications on applied aspects, process-oriented studies and

¹ The IGI brought out the Indian Journal of Geomorphology up to 2011, after which it started to publish the Journal of Indian Geomorphology (from 2012).

modelling are few or completely missing. As there are fewer inquiry-based and problem-based research publications, a good number of these publications may not have a lasting impact. In short, Indian geomorphology looks very different from its counterpart in Europe in general and in UK in particular.

A cursory examination of the affiliations of the authors (particularly the lead author) reveals that over the 18-year period (1996 to 2013), workers from seven Indian universities contributed more than half of the papers to the IGI journal. The top seven universities are — the Tamil University/Sastra University (Thanjavur), Pune University (including S.P. College), Calcutta University, Bharathidasan University (Tiruchirappalli), Gauhati University, Allahabad University and the University of Rajasthan (Jaipur).

Further, slightly less than two-third research papers were contributed by geographers and the remaining were authored by non-geographers, mostly geologists from the Geological Survey of India (GSI) and a few university departments such as the Tamil University (Thanjavur), the University of Delhi, the Andhra University (Visakhapatnam), etc.

Post-graduate Curricula

As much as research outputs and funded research projects, pedagogy is also critical in shaping the practice of a discipline, and

examination of the curricula would provide good indications of the importance of this major discipline of geography. One of the ways to get some idea about the current status or ‘place’ of physical geography in the Indian universities at the post-graduate level is to have a look at the number of courses on physical geography offered by some of the old and leading university departments of geography. Accordingly, the post-graduate syllabi of two dozen universities in India were downloaded. There is no particular reason for not including other universities in the present list (Table 2).

A simple exercise was carried out. The total number of courses (core, optional and elective) and the number of courses on physical geography (core, optional and elective) listed under the syllabus structure were counted and the percentage was estimated. The courses (theory and practical) on geomorphology, climatology, hydrology, oceanography, biogeography and soil geography (or pedology) were included under the category of physical geography. Some related courses (such as natural resources, environmental impact assessment, disaster or water resource management, remote sensing, GIS, etc.) were not considered. A brief summary of the results is presented in Table 2. It is very likely that some of the courses listed in the syllabus may not be offered every year by a particular university.

Table 2. Percentage share of the courses on physical geography at post-graduate level in some leading Indian Universities Based on all courses (core, optional and elective) listed under the syllabus of different Indian universities in 2014).

Share of courses on Physical Geography	Name of the Indian University
Less than 20%	AMU, Bangalore, Baroda, BHU, Delhi, Himachal, JNU, Mysore, Osmania, Punjab, Rajasthan
20-33%	Allahabad, Andhra, Kurukshetra, Kashmir, NEHU, North Bengal, Rohtak, Shivaji
33-50%	Burdwan, Calcutta, Jammu, Mumbai
More than 50%	Pune

Although the overall pattern is somewhat uneven, it is clear from Table 2 that in about 50% of the university departments the share of courses on physical geography is less than one-fifth. The proportion of physical geography courses listed under the syllabus structure of only five university's geography departments is more than one-third. Pune University geography department is the only department in the country that gives almost equal weightage to the courses on physical and human geography.

Causes of the decline of physical geography in India

The alarming decline in the relative strength and importance of this key branch of geography could be attributed to multiple reasons. To list the exact reasons is not an easy task, and readers may disagree with some of the inferences made. Nevertheless, an attempt is made to mention below some of the foremost reasons for the present place of physical geography in India

(a) The conviction that physical geography has its affinities with geological sciences and atmospheric sciences, rather than geography. Although geomorphology, climatology and pedology are practised within physical geography, some basic knowledge of the complex physical and chemical processes, statistics, mathematics, etc. is required to understand, assess and evaluate geomorphic, atmospheric, and biological processes. Further, for geomorphologists some understanding of the local and regional geology and tectonic setup of the study area is indispensable. Geography students from non-science streams often find it difficult to comprehend the concepts in geomorphology, meteorology, hydrology and pedology. Most geographical studies do not go beyond calculation of the percentages or some simple ratios/ indices

or correlation. Multivariate statistical approach is largely lacking. Even a cursory examination of the research papers published in Indian research journals during the first one and half decades of the 21st century will confirm this fact. Often it appears that the quantitative revolution in geography of the mid-20th century is yet to arrive in India.

(b) The realisation that physical geography (particularly geomorphology) is becoming more science-based, multi-disciplinary and high-tech in nature. At the international level, as a result of the explosion in the availability of information and research activity, physical geography has experienced number of changes in the concepts, approaches and methods. Further, geomorphology has become increasingly multi-disciplinary, as geomorphologists have begun to appreciate the full scope of this sub-discipline and the fact that many complex geo-environmental issues could be solved only through interdisciplinary teamwork. For a long time, geomorphology in India was based on the analysis of data generated from topographical maps and simple field observations. However, in recent years the geomorphic enquiry is more and more based on accurate and rigorous field measurements, laboratory analysis, image processing, radiometric dating and computer modelling. This necessitates knowledge of various new tools, techniques and methods, and dialogue with scientists from cognate fields (geologists, geochemists, statisticians, engineers, computer modellers, geo-archaeologists, etc.). Although most major Indian universities have geology (or environment sciences) department, there is limited interaction or collaboration between geographers and geologists or scientists from other related disciplines.

- (c) The belief that geomorphology, like geology, is an empirical science as well as a field science and hence intensive and rigorous fieldwork and field-based measurements/ monitoring are some of the fundamental requirements for successful research. With the advent of spatial technologies (GIS and Remote Sensing) and advances in computers there is increasing preference amongst young geographers for lab-based studies rather than field-based studies, which involve physical hardships and numerous challenges. The computer-based developments have changed the mind-set of post-graduate and research students, and more and more geography students now prefer to use and analyse remote sensing data rather than generate data in the field.
- (d) Emerging trend for (super) specialisation in certain sub-fields of the disciplines, which demands rigorous training. With the explosion in the information, knowledge and research activity, the inevitable response has been to focus or specialise more in a narrower, well-defined and specific area of research (Goudie, 1986). However, specialising in a highly scientific or technique-oriented field of a discipline is not a very favoured situation, because this demands not only familiarity with the terminology (and jargons) but also with the fundamentals, concepts and techniques.
- (e) Indian geographers' inclination seems to be towards more data-rich sub-disciplines, such as population geography, agricultural geography etc. Although some data such as climatic and hydrological data collected by national agencies are available, studies in physical geography in general and geomorphology in particular require generation of primary data in the field or the laboratory by the researcher. This involves considerable amount of effort on the part of the researcher. Geomorphic data are available for analysis only after multiple field visits and surveys, field measurements, sample collection, sample analysis; field monitoring over different periods of time depending upon the nature of the problem, etc. Needless to say, often (armchair) geographers find this type of exercise very time consuming, dull and tedious.
- (f) Weak link between physical and human geography, and limited interaction between Indian physical and human geographers. One of the several reasons for the decline of physical geography in India could be that the Indian physical geographers have not ventured into the domains of human geography and have not taken sufficient cognisance of the socio-economic factors in their work. In spite of the fact that environmental concerns have moved to centre stage in the last few decades, not many physical geographers have shown keen interest in scientifically and systematically investigating the society-nature nexus.
- (g) Great difficulty in publishing in mainstream international peer-reviewed research journals, with high impact factor, in core or multi-disciplinary research areas of physical geography or geo-sciences with large readership, such as the *Progress in Physical Geography*, *Earth Surface Processes and Landforms*, *Geomorphology*, *Catena*, *Hydrological Processes*, *Annals of the Association of American Geographers*, *Transactions of the Institute of British Geographers*, *Singapore Journal of Tropical Geography*, etc. It is also true that on a few occasions the papers are not accepted citing the reason that it is only a good regional/local study. In the field of climatology the task is even more daunting, because of the

overwhelming dominance of physicists, statisticians, mathematicians and modellers. It is pertinent to mention here that only a handful of Indian geographers have been able to publish their articles in one of the oldest (albeit with a lower impact factor) international journal, namely *Zeitschrift für Geomorphologie*. Majority of the papers published in this peer-reviewed journal in the last 1–2 decades were authored by Indian geologists and not by physical geographers. Publications in high impact factor journals and SCI journals with large readership has become imperative because, unlike yesteryears, now the individual research productivity and academic performance is evaluated in terms of total number of citations and H-index.

It is pertinent to mention here that several of the issues discussed above are not new. Neither do they apply only to physical geography, nor are they unique to the Indian situation. More or less, similar trends and patterns were observed in the geography departments in the west, particularly in the USA (Rhoads, 2004) and to some extent in the UK (Gregory *et al.*, 2002). However, there has been a revival of interest in physical geography to a considerable extent in these countries, particularly UK, because of the advent of studies on landscape processes, the growing research collaborations between physical geographers and scientists in other disciplines and quick adaptation of new technologies (Gregory *et al.*, 2002; Rhoads, 2004). This has undoubtedly raised the visibility of physical geography research in these countries.

What is the future of physical geography in India?

All the available data and evidence suggest that physical geography is no longer one of the stronger or important sub-disciplines of

geography or earth sciences in India. The debate about the future of physical geography in India is going on for quite some time now. Several possible scenarios have been suggested. Following Gregory *et al.* (2002), three probable future scenarios for physical geography in India could be envisaged:

- (a) The status quo,
- (b) Disappearance of physical geography into other disciplinary areas, and
- (c) A renaissance of a more integrated physical geography,

Under the first scenario, the present decline of physical geography continues, the space between human and physical geography grows wider, and the key branch remains as a minor component of geography or completely disappears. At the current rate, the first scenario is likely to become a reality in the near future. The second scenario, although undesirable, is already taking place. While climatology and soil geography have been virtually captured by workers from other disciplines, geomorphology is gradually slipping away from the hold of geographers. Even though real geomorphology is being largely neglected by Indian geographers, geologists as well as hydrologists, engineers, geophysicists, environmental scientists, ecologists and geo-archaeologists have recognised its importance and value, and are increasingly using geomorphic concepts, tools and techniques in various sub-fields, ranging from hydro-geology, tectonic geomorphology and structural geology to river restoration and flood management. Even a cursory glance at the research publications in some leading national research journals (the *Current Science*, the *Journal Geological Society of India*, the *Journal of Earth System Science*, the *Himalayan Geology*, and the *Journal of the Indian Society of Remote Sensing*) as well as international journals (*Zeitschrift für Geomorphologie*, *Geomorphology*, *Catena*, the *Journal of Asian Earth Sciences*, etc.) will

provide enough evidence in support of this inference.

The third future is revival of integrated physical geography in India, with a greater emphasis not only on the scientific aspects but also on the spatial aspects of man-land relationship or human-environment interaction. In the last few decades, environmental concerns and the impacts of human activity on natural systems have attracted the interest of many geo-scientists including physical geographers. However, physical geography as an academic discipline has not been a major player in applied research as was expected. However, a resurgence in geomorphology is taking place due to the advent of remote sensing (RS) and geographic information system (GIS) techniques, technical advances in computing and data acquisitions (e.g. GPS and DGPS), and the availability of digital terrain models (DEM/ DTM). Spatial technologies have enabled physical geographers to prepare and analyse variety of maps on different spatial scales that would be logistically impractical earlier. These have enabled development of new applications in geo-hazard (floods, landslides, soil erosion) studies, biomass change studies, environmental studies, watershed management, coastal zone management, etc. However, in spite of these developments, the present status of physical geography in India is far from satisfactory. The obsession with drainage basin morphometry, unfortunately, continues in the field of geomorphology and landscape process studies are completely neglected. In climatology, the studies are limited to simple analysis of rainfall and temperature trends, and studies in soil geography and biogeography are few and far between.

Its high time Indian geographers also recognise the importance of this basic branch of geography. Needless to say, serious efforts are needed to revive interest in physical

geography at the college/ university level. Although physical geography in general and geomorphology in particular has partly resuscitated as a result of the advent of spatial technologies and studies of landscape processes, it is not likely to survive in the geography departments in India or gain recognition as a major discipline unless the research is concerned with dynamic landscape processes, geo-hazards and environmental issues; and the research is strongly based on physical, chemical, and biological principles; and unless appropriate statistical and mathematical techniques are employed in the analysis.

One way to revive interest is physical geography at the post-graduate level is to strengthen and expand existing courses on physical geography and introduce new advance courses (theory as well as practical) on contemporary issues, such as — physical science of climate change, earth surface processes, tectonic geomorphology, geo-hazard/ disaster management (floods and landslides in particular), applied soil science, water, river and coastal management, digital geomorphometry, biogeography of tropical environments, India's geoheritage, planetary geomorphology, geomorphology of India, etc. with greater emphasis on the scientific aspects and latest techniques of evaluation, assessment and management. It would be beneficial if the course on climate change is included as a core course in the penultimate or final semester and the reading material includes all the assessment reports of the Intergovernmental Panel on Climate Change (IPCC). It is exceedingly important that these courses on physical geography be taught only by qualified teachers, who are trained as physical geographers and/ or have done research in any of the major fields of physical geography. This could be achieved only by appointing reasonable number of physical geographers at least in the large university

departments of geography in India. There is also a need for providing good, standard textbooks to the geography students with plenty of Indian examples and case studies.

Another desirable trend is increased collaboration of physical geographers not only with scientists in other disciplines, but also with human geographers and social scientists. Collaboration with geologists, engineers, biologists, archaeologists, etc. would help in better understanding of the complex dynamics of environmental systems and to devise appropriate ways of managing these complexities. Similarly, interaction between human and physical geographers will be more meaningful if the physical geographers take sufficient cognisance of social factors and cultural issues in their work and vice versa.

Furthermore, the ongoing trend of publications in non-referred Indian journals or in journals with lower impact rankings is not likely to elevate the status of physical geography in India, but is likely to seriously jeopardise the future standing of physical geography. Another disturbing trend has been the growing tendency amongst young geographers to publish in open-access journals (that incorrectly claim high impact factor). The publishers of these journals collect hefty fees from authors to pay for the so-called peer review process. According to one report, over 300 such 'predatory' open accesses publishers have sprung up in the last 2–3 years, mainly in India and China (Butler, 2013). Indian physical geographers, like their counterparts in UK and elsewhere, should publish only in the Science Citation Index (SCI) research journals listed by Thomason Reuters with broader readership, higher visibility, and higher number of citations.

In order to increase international visibility of Indian physical geographers in particular and Indian geographers in general it is not only important to publish in high impact factor research journals and strengthen courses

on physical geography at the post-graduate level, but also to get involved in study areas abroad, collaborate with international groups, participate in international scientific programs and play an important role in wide range of international organisations and global research programs. To summarise, multi-pronged efforts are needed by Indian physical geographers to revive physical geography in India and acquire greater visibility at the national and international level in the coming years.

Acknowledgements

I am indebted to Professor R. Vaidyanadhan, Professor K.R. Diskhit, Professor Sunando Bandyopadhyay and Professor Veena Joshi for reviewing an earlier version of this paper and for their very helpful comments. I am thankful to Ms Pallavi Kulkarni for her assistance in compiling the data on four Indian geographical journals. Thanks are also due to Dr. Deepali Gadkari (Mumbai University), Dr. Praveen Pathak (Delhi University), Professor Sunando Bandyopadhyay (Calcutta University), and Dr. Somasis Sengupta (Malda Women's College, Burdwan University) for providing the contents of some of the missing journal volumes.

References

- Butler, D. (2013) Investigating journals: The dark side of publishing. The explosion in open-access publishing has fuelled the rise of questionable operators. *Nature*, 495, 433–435.
- Fu, B., Lu, Y., Chen, L. and Li, J. (2006) Progress and prospects of integrated physical geography in China. *Progress in Physical Geography*, 30, 659–672.
- Goudie A.S. (1986) The integration of Human and Physical Geography. *Transactions of the Institute of British Geographers*, 11, 454–458.
- Goudie, A.S., Atkinson, B.W., Gregory, K.J., Simmons, I.G., Stoddart, D.R. and Sugden, D.A.

- (eds.) (1985) *The Encyclopaedic Dictionary of Physical Geography*. Oxford. Blackwell: 528p.
- Gregory, K.J. (2000) *The changing nature of Physical Geography*. Arnold, London: 368p.
- Gregory, K., Gurnell, A. and Petts, G. (2002): Restructuring Physical Geography. *Transactions of the Institute of British Geographers*, 27, 136–154.
- Inkpen, R. (2009) Development: Sustainability and Physical Geography. In: Clifford, N., Holloway, S., Rice, S. and Valentine, G., (eds.) *Key Concepts in Geography*. Sage Publications, London: 378–391.
- Kale, V.S. (1993) A Review of Physical Geography in South Asia. *Singapore Journal of Tropical Geography*, 14: 212–228.
- Kale, V.S. (ed.) (2014) *Landscapes and Landforms of India*, Springer, Dordrecht: 271p.
- Kapur, A. (2002) Indian Geography: Voice of Concern. Concept Publishing Company, New Delhi: 438p.
- Levia, D.F. and Underwood, J. (2004) Hydrological Research and the Status of Physical Geography Journals: Increasing the Impact of Physical Geography in the Academy. *The Professional Geographer*, 56: 345–34.
- Myers, N., Mittermeier R.A., Mittermeier, C.G., da Fonseca G.A.B. and Kent J. (2000) Biodiversity hotspots for conservation priorities. *Nature*, 403: 853–858.
- Rai, S.C. (2012) *Geomorphology*; Singh, R. B. (ed.) Progress in Indian Geography. A Country Report, 2008-2012, 32nd International Geographical Congress, Cologne, Germany. Indian National Science, Academy, New Delhi: 48–54.
- Rhoads B.L. (2004) Whither Physical Geography? *Annals of the Association of American Geographers*, 94: 748–755.
- Sharma, H.S. and Kale, V.S. (eds.) (2009) *Geomorphology of India*. Prayag Pustak Bhavan, Allahabad: 568p.
- Singh, N. (2012) Towards Fresh Woods and New Pastures — The case of Indian Geography. Special Issue of *Transactions of IIG*: 19–36.
- Sivaramakrishnan, L. (2014) Trends in Geographical Research in India. *Annals of NAGI*, 34: 19–29.
- Thrift N. and Walling, D. (2000) Geography in the United Kingdom 1996–2000. *The Geographical Journal*, 166: 96–124.
- Vaidyanadhan, R. and Subbarao, K.V. (2014) *Landforms of India from Topomaps and Images*. Geological Society of India, Bangalore: 135p.

Date received: 18.04.2022

Date accepted: 20.04.22

Note: This paper was presented in the National Symposium *Re-Orienting Teaching & Research in Geography*, organised by the Indian Institute of Geographers at the Department of Geography, Savitribai Phule Pune University, Pune, from 26 to 28 December 2014.