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Abstract

Geologists are becoming more socially involved professionals as their activities are increasingly focusing on social safety, ensuring that societal interactions with the planet are done in an environmentally friendly, safe and sustainable way. As a consequence, geologists need to be aware of the ethical perspectives of their profession and this awareness is most successfully enhanced through professional collaborations and a strong community. Unfortunately, these are lacking in Bangladesh, largely as a result of only very few geologists employed in a small subject sector that is much undervalued, partly as most people perceive the local geology to be rather monotonous and the potential valuable contributions of geologists not being appreciated. Still, there is much scope for geological sciences to perform vital services in Bangladesh, from both a societal and an environmental perspective. Geologists can serve other professionals such as agriculturists, economists, environmentalists, engineers, doctors, policy-makers as well as general people in a scientific way. Ensuring that these services are developed appropriately requires a leading role of geoethics to provide a relevant philosophical context and guidance.

Keywords

Bangladesh • Development • Geoethics • Geoscientists • Society

6.1 Introduction

Geological sciences originate in an environment where it was mainly seen as an outdoor science, focusing on remote locations and the search for valuable materials. Recently, however, geology has evolved more towards the realms of social sciences, with activities directly impacting on society making the work of geologists much more conspicuous (Peppoloni 2012). Geologists are now dealing with the safeguarding and well-being of societies in the face of

natural and anthropogenic anomalies, alongside their more traditional roles of discovering geo-resources for the material comfort and development of humankind. This orientation towards social sciences has recently led to recognition that there is a need to put their motivation and dedication in the context of an ethical code of conduct (Lucchesi and Giardino 2012). Compared to the rest of the world, Bangladesh has a limited breadth of geo-scientific work. It occupies one of the largest deltas (Fig. 6.1) in the world and supports a large population (more than 160 million) at one of the greatest population densities, globally. It does so with very limited natural resources and has to deal with frequent, severe hazards resulting in national-scale disasters—a situation which appears to get worse as global climate and environmental change progresses. These hazards retard the economic growth and development of the country in every possible way.

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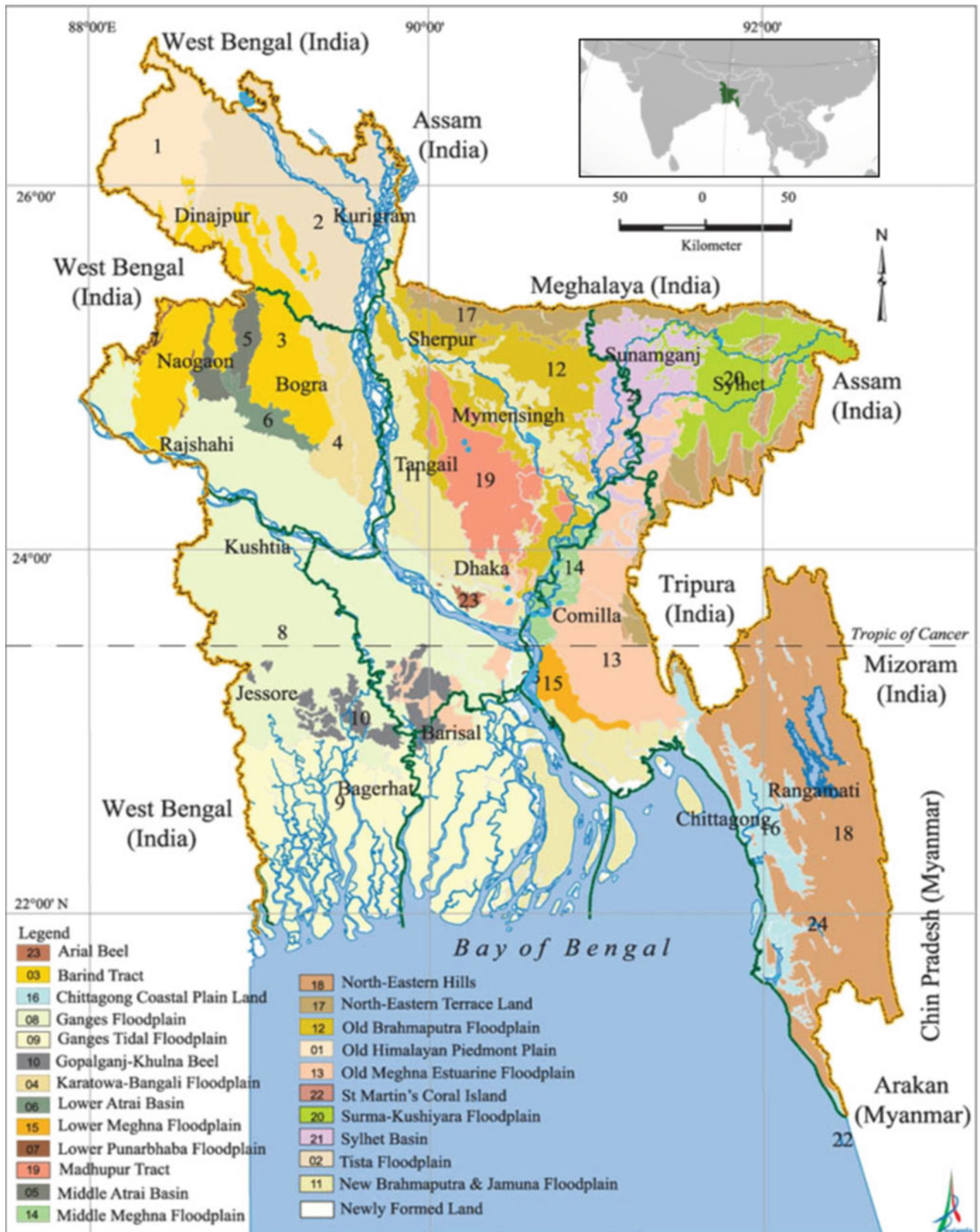


Fig. 6.1 Physiographic features of Bangladesh (Source Banglapedia and Wikipedia)

In addition, a lack of proper geological and geotechnical practice leads to widespread damage to infrastructure and construction taking a heavy toll on both lives and livelihoods. Therefore, sustainable development is a term that makes much sense in the context of Bangladesh. To achieve this, now more than ever, is the time for the Bangladeshi geo-scientists to really contribute to the well-being of their fellow countrymen and step forward with their service offers. This can be best achieved through applying in a meaningful way the vision of geoethics (Peppoloni and Di Capua 2012).

6.2 Some Notable Features of Bangladesh

Bangladesh is a land of rivers situated in the tropics, in the northeastern corner of the Indian Subcontinent in southeast Asia. It occupies the Bengal Basin, which is one of the largest sedimentary basins of the world. The basin accommodates a thick (± 22 km) Early Cretaceous-Holocene sedimentary succession (Curry 1991; Curry and Munasinghe 1991). The country lies in the close proximity of two major thrust bounded tectonic subduction zones; the Himalayan subduction zone in the north and the Burmese subduction zone (Maurin and Rangin 2009) in the east which form the Himalayan orogeny (Alam et al. 2003) and Indo-Burman orogeny (Rahman and Faupl 2003) respectively. The country is bounded by low lying Tertiary hills in the north and east. The rest of the country is mostly low lying plain land drained extensively by the Ganges–Bhramaputra–Meghna river system, which forms the world’s largest fluvio-deltaic system, the Bengal Delta which is one of the largest deltas of the world, ending up in the Bay of Bengal to the south (Alam et al.). The Bay of Bengal hosts the Bengal Fan, which is the largest submarine fan in the world (Curry et al. 2003). The southern part of Bangladesh is fringed by the Sunderbans, which is the largest mangrove forest and only tiger mangrove land in the world (Manna et al. 2010). This low lying subsiding plain of Bengal may thus aptly called a land of water where the hazardous natural phenomena as landslide, flooding, inundation, cyclone,

drought, frequent earthquakes, sea-level rise, saline-water/ sea-water encroachment, coastal erosion, river-bank erosion (Fig. 6.2) etc. actively shape the livelihood and economy of the country. Although Bangladesh is gifted with plenty of natural resources as fresh water, fish stock, livestock, grazing fields, agricultural resources, largest sandy coastline, largest mangrove forest, the progresses of the country is consistently hindered by the disasters caused by the natural hazards mentioned above. The situation is further complicated by the high density of population of Bangladesh. Thus, an understanding of the low-lying deltaic system is very important for the sustainable development of the country taking the soft, subsiding landscape into consideration in a background of changing climate and land submergence due to sea-level rise.

6.3 Problems Regarding the Professional Reputation of Geoscientists in Bangladesh

The influence of a particular subject area on the performance of a society is very much dependent on the renown of this field of study within a country, and how well it is supported by an appropriate number of skilled professionals of high repute and standing. Unfortunately, in Bangladesh the field of geology as a scientific discipline is not that well recognized, both among the general public and, more importantly, also among the policy-makers. There are only few professional geologists in the country and they are not provided with sufficient power or influence to make significant contributions to policy making. Although, individually, these geology professionals are very talented, these talents are not recognized in their own country and many have greater success when they go abroad for work or higher studies.

Empirical observations and personal experiences have revealed a rather unpleasant picture. The general public does not have much knowledge of the science of geology; often it is confused with ‘zoology’ as this sounds similar and is one of the major scientific disciplines of the national

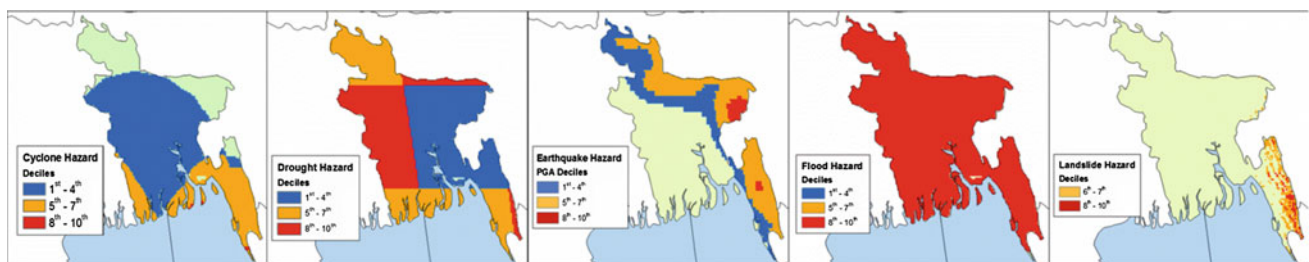


Fig. 6.2 Different hazard maps of Bangladesh (Source <http://www.ldeo.columbia.edu/chrr/research/profiles/bangladesh.html>)

curriculum. When it is explained to them the general interpretation is still one aligning it with soil science or geography, rather than appreciating it as a scientific discipline on its own. As a consequence, it is difficult to approach the public from a geological perspective and inversely, the people thus remain largely unaware of the beneficial services that geological knowledge can provide. Most frustratingly, it is not only the general public that has this mindset. Also other professionals and policy makers who may directly benefit from the services on offer by geologists have demonstrated little interest in this regard. This includes professionals such as civil engineers, public health officials, agriculturalists, environmentalists, etc.

This situation may be partly explained by the lack of opportunities to study geology in a national context. Geology as a full-time course curriculum starts at the undergraduate level and only three public universities (University of Dhaka, Jahangirnagar University and University of Rajshahi), out of almost fifty, offer geology degree courses. Although there are many specialized universities and institutions for medical, engineering, agricultural and other technical disciplines, there are none for geology. There is not even one geological institute—a very alarming situation. Even more alarming is the situation that for some 50 years now private universities are developing an increasingly strong position and none of these offer geology as a full-time course. At best, some of these universities offer highly specialized and commercially viable topics such as disaster management.

The number of geology students is very small, only some two hundred students graduate each year in a country of some 160 million people. The limited appreciation of the subject also limits the job opportunities on offer for our wonderful topic of geology as the job sector is not that flourished. This remains a self-reinforcing situation where too few graduates are produced by a restrained academic environment to make an impact on a job situation where their skills are under-appreciated and where only the very few can progress to attain positions of influence to change the status quo.

Interestingly, the above situation could possibly be related to the overall geology of the country. Bangladesh is a low-lying deltaic plain that does not offer much in terms of bedrock geology. Almost the entire country is covered by recent alluvial deposits, amounting to some 82 % of the land area. Some 10 % comprises Pleistocene terrace levels and the remaining 8 % comprises an undulating landscape with outcrops of sedimentary rocks of Quaternary age (Islam and Uddin 2002). There are no volcanoes, no igneous or metamorphic rocks exposed, no deserts, no ice nor glacial activity. It is a rather small country with a monotonous landscape, a monotonous stratigraphy and a poor economy and this situation does not help in the development of a flourishing geological science environment in a holistic

way. As a result, where it is being practiced, geological sciences have developed in rather idiosyncratic way, rather than covering the full breadth of topics on offer. Thus, the already small community is shrinking further and many graduates and professionals prefer to study abroad and take up employment there, rather than serve their nation.

6.4 Opportunities and Scopes: Not All Hopes Are Lost

Recent issues, including environmental degradation, climate change and natural hazards have opened up new avenues of research and study for geologists. This deltaic lowland of large rivers and wetlands provides for extensive river and aquifer systems that play critical roles in the nation's socio-economic, cultural and environmental conditions. As a result, there is tremendous scope for the application of hydro-geo-sciences such as hydrology, hydrogeology and hydro-geochemistry. These major areas of study still offer plenty of room for future development.

As a developing country, Bangladesh needs further investment in infrastructure development. However, there have been several recent incidents of buildings being damaged or even collapsing (Fig. 6.3) due to limited or even absence of appropriate geological understanding and application of engineering geological practice (GSB). There is thus a need to integrate these disciplines into general development of the country.

Bangladesh is situated in the tropics and occupies an active tectonic hotspot of the Indo-Burmese-Eurasian plate junction. As a result it is frequently plagued by a number of geo-hazards including earthquakes, landslides, floods, cyclones, storm surges, river bank erosions, saline water encroachments, coastal landscape changes, tsunamis etc. and Bangladesh has long been known as a land of natural hazards. Risk management (e.g. Fontana et al. 2012) and disaster management (Parkash 2012) form the modern developments of applied geological disciplines that need appreciation in the context of Bangladesh. There is also a lot of scope for further development of water resource management and land resource management.

The country is suffering from river water withdrawal by its neighbor and there are disputes concerning the maritime borders (ITLOS). The resources and environmental quality of the Bay of Bengal, to the south of Bangladesh, are yet to be fully studied and appreciated. In these cases, geo-political practices can play vital roles.

Medical geology is another important new development that has great potential to address issues of public health. Bangladesh experiences one of the largest outbreak of arsenic contamination of the world (Kinniburgh and Smedley 2001). Other health issues related to geological



Fig. 6.3 Example of building collapse (Source The Economist)

causes can be well served by professional geologists trained in medical geological applications.

A further area where geologists should find employment is alongside social development professionals developing proper resource management practices and disaster management/mitigation strategies. Proper resource management is essential for a developing economy such as Bangladesh that has a rapidly growing population and a relatively small land mass. Furthermore, as an agriculture based economy, there are plenty of opportunities for agricultural geological work in Bangladesh.

That these opportunities exist is clear, but to make these work in practice requires the coordinated efforts of geoscientists and professional in Bangladesh to convince policy-makers and communicate with the general public. Moreover, as many of the above mentioned fields are multidisciplinary, there is an urgent need to communicate with scholars and professionals from other fields. Geoethics can play a pivotal role in this regard as it provides formal and substantial value to the commitment of science for the benefit of citizens and institutions (Peppoloni and Di Capua 2012).

6.5 The Possible Roles of Geoethical Values in the Duties of Bangladeshi Geoscientists

Bangladeshi geologists can benefit themselves from the philosophies offered by geoethics (Graziano 2012) and the Hippocratic oath for the geologist (Matteucci et al. 2012). These highlight that there are other vital roles to fulfill well beyond the professional arena. First of all, their learning and appreciation of the vitality and practical application of their profession in a social context will be highly beneficial. Getting acquainted with and applying the ideas and values of professional ethics and the duties and responsibilities these carry for the well-being of their fellows will help enhance their reputation. Communicating these with society, including other professionals and policy-makers, in a proactive way will help further strengthen the geologists' professional dignity and honor. Geologists must endeavor to create demands on their professional services among the general public. A key point could be the issue of proper land management and resource use (Badiali and Piacente 2012) as the population of Bangladesh continues to grow rapidly

against an increasingly constrained land resource. A balance between these two conflicting drivers must be achieved to sustain social, cultural and environmental harmony and peace. Another demand of geoethics is that there should be greater awareness among as many people as possible and this demand can be addressed by involving the general public through grass-roots education and the generation of more geo-professionals.

The fact of taking care of the Earth is largely a duty of geologists as they are the ones who pierce her for resources and know the consequences of such activities along with the effects of other natural and anthropogenic disturbances and are capable of providing possible mitigation strategies. A full appreciation of this duty is a must for them. So, they should play the role to guide the society toward a safer and sustainable future where geoethics comes to play with its visions of responsibilities and ideals. It is up to the geologists to step forward and take the leading role where there is a call of duty that stems from the teachings of geoethics.

6.6 Conclusion

Geology is no more a routine work and geologists are no more just resource explorers. They need to serve the society in every possible way and thus their duty spread beyond traditional roles. This is a matter of mass awareness where geoethics come into play and this is particularly true in the context of Bangladesh.

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