Globalize geoscience

Developing countries lag far behind, in terms of scientific — including geoscience — output. Failing to spread the know-how means that the world is missing out on great intellectual potential.

The map of the institutional homes of our authors (Fig. 1) shows colour all over the world. The highest densities of these institutions are found in North America and Europe, and all of the BRICS countries (Brazil, Russia, India, China, and South Africa) are represented. But many developing countries — particularly in places like Africa, the Middle East, and Central and Southeast Asia — don't have a single co-author on any *Nature Geoscience* publication.

The map is a stark illustration of the scientific community's mixed track record in developing scientific capacity outside of existing regions of scientific excellence. As Bruce Hewitson outlines in his Commentary on page 497 of this issue, this is not for lack of trying. In his experience, basic skill training — which is relatively easy to deliver — is not enough. For long-term impact, capacity building programmes need to develop scientists' confidence in their ability and initiate a dynamic, supportive academic environment.

Educating young people to be scientists can be difficult, even within the most respected scientific institutions in the world. The task is infinitely more difficult under the kinds of conditions that prevail in many developing countries. Institutions in these countries find it difficult to attract world-class researchers who can pass on their knowledge, and are often faced with legacies of being under-funded and under-supplied. And internal and external politics can make it difficult for early-career scientists to develop and maintain a stable research programme.

The challenges are greatest in countries plagued by political and economic instability. But a lack of basic scientific infrastructure can span entire regions. In some areas of sub-Saharan Africa, technical supplies or qualified repair technicians for specialized equipment may not be found within thousands of kilometres. In those regions, it is difficult to maintain even a basic laboratory and build a research programme with the sort of momentum that leads to a healthy publication record and international funding. Grants received in partnership with overseas or international research institutions can create a flurry of training activity and new acquisitions. But all too easily trainees' new skills and equipment can fall into disuse when the funding ends, and the international collaborators move on to other projects.

As efforts to build scientific capacity around the world continue, we benefit from the knowledge accumulated during a long history of failed or only modestly successful attempts — at least in terms of producing sustained improvements. One key difficulty is the retention (or return) of trained scientists to the developing world. This brain drain is now being countered by building institutions in developing countries with cutting-edge resources and a stimulating academic environment.

Examples from other scientific disciplines include the Square Kilometre Array in South Africa (www.skatelescope.org) and the H.E.S.S. gamma-ray observatory in Namibia (http://www.mpi-hd.mpg.de/hfm/HESS); Biosciences east and central Africa (http://hub.africabiosciences.org) has introduced next-generation high-output genomic sequencing and bioinformatics platforms to the region, hosting training workshops and fellowships for regional scientists and students to pursue projects at their centre in Nairobi, Kenya. Efforts to expand excellence beyond traditional centres have been made in the Earth sciences, too: for example, AfricaArray (http://www.africaarray.psu.edu) created a seismic network consisting of dozens of permanent seismic stations across the continent, which it is using as a training and capacity building platform.

The geosciences have an important role to play in the developing world: local knowledge will be key to helping societies address a range of environmental stresses and geohazards, from earthquakes to typhoons to climate change and variability. Research priorities in developing countries tend to be more applied, to better address these societal needs. For capacity development activities to have lasting value, they must be engage with the research interests of the targeted individuals or institutions.

It is also important that the international scientific community does not ignore the scientific knowledge that already exists in many developing countries. Making contacts and maintaining communities across borders can be challenging, particularly for scientists at institutions with budgets too limited to support much international travel, and it's easy for existing expertise to go untapped.

As our map illustrates, there is some high-impact research being produced in institutions in the developing world. Just as clear is the immense gap between developed and developing regions. As long as billions of people don't have a viable pathway to training in the geosciences, the world could miss out on the next Alfred Wegener, Carl-Gustav Rossby, or Alfred Redfield, and would be a poorer place by far. ❐

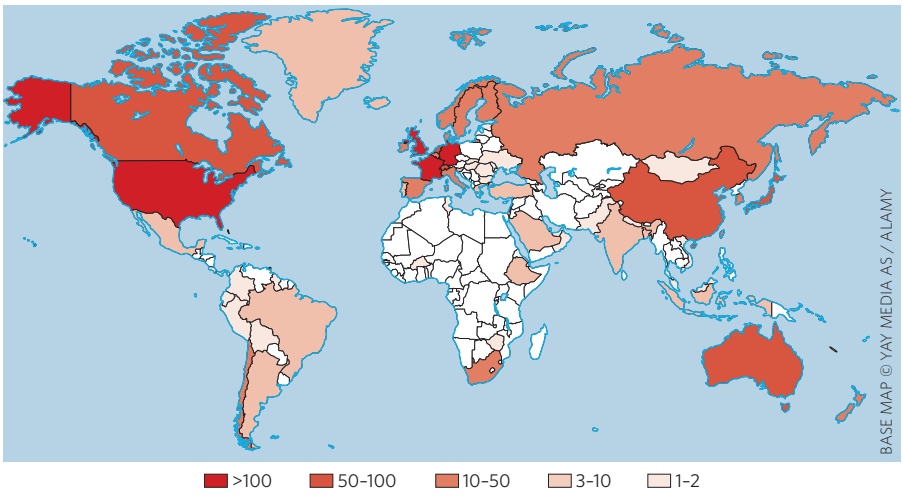

Figure 1 | Global distribution of *Nature Geoscience* author affiliations, January 2008 to May 2015. Colours correspond to the number of publications in *Nature Geoscience* with at least one co-author affiliated with an institution based in that country.