Science in developing countries

A silent revolution

Reporting from the World Science Forum, Hanns Neubert senses a sea change in attitudes towards the role of science in reducing poverty. Governments are spending more; young people are choosing science careers. Yet poor people will not benefit without genuine collaboration and knowledge sharing.

summary

- Sub-Saharan African states (excluding South Africa) spend an average of 0.4% of their gross domestic product on science and technology but have promised to increase this to 1% by 2010.
- Developing countries are responsible for a mere 22% of global scientific publications. Yet China's share rose from 0.9% in 1994 to 7.6%, second only to America, in 2007.
- The Rwandan government, despite years of conflict, has made leaps and bounds in science and technology development.
- Strategies are needed to integrate science and technology into development planning, including international collaboration, information exchange and sharing best practices.

Big changes are taking place in science in developing countries. Devastating health problems, malnutrition, war and conflict, climate issues and inadequate governance – in Africa especially – headline the news. And when the media reports on science and technology (S&T) in developing countries, the brain drain seems to be of most concern. But there are signs of a silent revolution.

This became clear during the World Science Forum in Budapest, Hungary, in November 2009. The 'Davos of science' is a bi-annual gathering of the world's science leaders: politicians, funders and academics. Around 600 people involved in science and technology from nearly 80 countries spent three days debating the future of science. Concerns about funding in the shadow of the global financial crisis set the scene in the run-up to the forum. Yet, it soon became clear that delegates were not so anxious about the financial situation. Instead, making the best use of science, integrating it more effectively into society, and the role of the social sciences and S&T in developing countries took centre stage.

Even representatives from developing countries, although mainly present as spectators, recognized signs of improvement in their relationships with the global science community, despite their concerns about the brain drain. I talked to some of them during the conference.

Speakers in the session 'science funding in a changing global economy' reported that the rapidly developing countries in South America and Southeast Asia have increased their expenditures considerably on S&T in the last decade, outstripping their rise in economic performance. As is the case with developed countries, there is a strong correlation between a country's investment in research and its level of development. Many sub-Saharan African countries, however, have failed to keep their spending on science in line with their impressive growth rates, which have, of course, slowed down recently due to the global financial crisis.

On average, sub-Saharan Africa (excluding South Africa) spends 0.3% to 0.4% of its gross domestic product (GDP) on S&T despite the 1980 Lagos Plan of Action in which African presidents decided to increase spending to 1%. sub-Saharan states again committed themselves to this 1% goal in 2006, which they will achieve in 2010.

But what looks like failure, appears in a better light if we consider economic growth rates. Spending on S&T in sub-Saharan Africa (excluding South Africa) rose from US$1.8 billion in 2002 to US$2.8 billion in 2007. This part of Africa once had some excellent universities, such as the University of Khartoum, Sudan. But political turmoil and cuts in funding robbed Africa of academic competence, in particular as older professors retired without a younger generation to take their places.

Brain gain

The Gambia, one of the least-developed countries with only 1.6 million inhabitants, is convinced that investing in S&T is >

By **Hanns-J. Neubert**, president of the European Union of Science Journalists' Associations, based in Hamburg, Germany, and a journalist writing for www.sciencecom.eu

the only way forward. Despite the brain drain, Lamin Faye, minister for basic and secondary education, was overjoyed with the single brain gain she recently achieved. Muhammadou M.O. Kah, now vice-chancellor and president of the University of The Gambia, returned after 25 years. Abroad, he was professor of information technology and communication at a number of US and Arab universities. He has also worked for the World Bank and was the founding dean of the American University in Yola, Nigeria.

Faye admits: 'We cannot compete. Our youth are leaving for Europe and we have no internet connection. But we have to start somewhere and I am happy with Professor Kah's engagement.' Kah himself is optimistic: 'As with most universities in Africa there are well educated, ageing scientists here too. They have inadequate laboratories and simply cannot do science any more. But we can get these resources going again and train the next generation'.

As more funds are allocated, however, the shortcomings become clear. Jakaya Kikwete, president of Tanzania, announced in April 2008 that the country would raise its S&T budget from 0.3% to 1% of GDP in 2010. 'A critical issue, however, is to decide what kind of research to support', says Hassan Mshinda, director general of the Tanzania Commission for Science and Technology. Science institutions receive money from government departments but without a proper funding system in place: 'Before new funding starts to flow the distribution system must be updated', Mshinda warned. Spending the increased resources effectively will involve giving more to some institutions than to others, which in turn could create tensions between regions and local authorities.

Rwanda is a success story of sorts. Now a beacon of progress in Africa, it has emerged from the terrors of genocide, thanks to its investments in S&T and despite the fact that 90% of the population lives on subsistence farming. Rwanda spent 1.6% of its GDP on science and technology in 2008 and hopes to achieve 3% in 2012, a figure that even some European countries have not reached. Rwanda's biggest success is its education system. Enrolment in primary education has doubled. In secondary education it has risen seven-fold and in higher education more than tenfold since 1999. In addition, centres of excellence have been built: the Kigali Institute of Science and Technology and high-quality secondary schools, such as the Ecole Technique Officielle in Gitarama, for example. In addition, every school and hospital will have a high-speed internet connection by the end of 2009. Fibre optic cables are being put in between South Africa and Sudan and will soon link with satellite communications systems in Rwanda's 30 districts.

The Rwandan government has focused on promoting demand-driven research that addresses critical challenges such as increasing agricultural production, improving public health and protecting the environment. King Faisal Hospital in Kigali will become a centre of excellence for medical research and healthcare, including using telemedicine – communication and information technologies – to deliver clinical care. President Paul Kagame is convinced that: 'Africa must either begin to build its scientific and training capabilities or remain an impoverished appendage to the global economy.'

The Chinese Academy of Sciences and the American Association for the Advancement of Science (AAAS) reported on their success in S&T investments. The increase in the number of articles authored by Chinese academics appearing in international peer-reviewed journals is impressive. According to Mohamed H.A. Hassan, executive director of the Academy of Sciences for the Developing World, Trieste, Italy, China's accounted for just 0.9% of scientific articles worldwide between 1981 and 1994. But China then climbed to eighth place in 2000 with a share of 3.6%. By 2007, it had jumped to second place with a 7.6% share, trailing only behind the United States. Developed countries are responsible for 78% of global science publications, with 22% originating from developing nations. However, China, India and Brazil account for more than 10% while Africa contributes only 1.4%, of which South Africa and Egypt are responsible for more than half.

Developing countries still need support. Some see it as payback time for the highly trained and skilled people developed countries have gained from the developing nations. To the 80-odd countries handicapped by poor scientific capacity, Hassan would like to see developed countries contribute to the following: at least one internationally recognized university; increased investment for universities; a national science foundation; national technology innovation centres; and a national academy of sciences to foster international collaborative research and provide expert advice.

Collaboration and partnership

Greater collaboration between rich and poor countries would help. As Dong-Pil Min, chairman of the Korea Research Council of Fundamental Science and Technology, remarks: 'We are reasonably well-prepared to exchange ideas and share our knowledge across national borders. However, the benefits of knowledge are not readily and evenly allocated across the globe.

The United States is, as usual, the leading investor in such programmes. The Global Technology and Innovation Fund, recently launched by the Overseas Private Investment Corporation, for example, will provide US$25 to US$150 million for a range of research projects with developing countries. European science foundations, on the other hand, do not usually fund institutions in developing countries. However, the European Union (EU), not that visible at the Forum, is gradually doing more. The Africa-EU Joint Strategy and Action Plan, signed in December 2007, will support research into science, space technology and the information society.

The Consortium for Science, Technology and Innovation for the South was launched the day before the forum began. Eighteen ministers from the G77 countries celebrated the event. The consortium will provide a platform for science and technology ministries and research councils, in particular, to interact with scientists and work out how to

Doing science in Africa. A chemistry student at Cheikh Anta Diop University, Senegal, 2007.

devise national and regional strategies for science-based development: promoting South-South and South-North collaboration and encouraging information exchange on best practices are some examples.

Career choices

Young people are increasingly interested and think S&T can solve society's problems. During a break in the Science and Youth session, delegates discussed a recent project – the Relevance of Science Education, managed by Professor Svein Sjøberg at the University of Oslo. Initial results show that interest among 15-year olds (girls and boys) in entering a career in S&T is highest in developing countries, with Uganda, Ghana, Swaziland, Malaysia, Philippines, India and Bangladesh at the top of the list. In developed countries such as Norway, the UK and Ireland young people are turning their backs on science careers, especially girls; in Japan very few 15-year olds are interested in following a science career.

S&T is gaining in popularity in developing countries and media coverage is growing. Popular science magazines such as Nigeria's *Science Times*, the online magazine *Science in Africa* from South Africa, or the information service, SciDev.Net, are gaining readers. More coverage is given to science in the papers, on the radio, the TV and through news agencies as the World Federation of Science Journalists reports (WFSJ).

Responding to increased demand for science stories in developing countries, WSFJ journalists launched a two-year mentoring project, 'science journalism co-operation', to train budding science journalists. The project brought together 60 aspiring journalists from Africa and the Middle East and 16 experienced colleagues from Africa, America, Europe and the Middle East between 2006 and 2007. As a result, at least two new popular science magazines have been launched in the last 12 months, more articles on science issues are being published, research is more thorough and writing styles have improved. Similar projects are now underway in South America and Asia.

The cold, rainy, cloudy skies over Budapest by no means dampened the heady atmosphere of hot debate over the future of science and technology. Putting aside their funding concerns, delegates debated how to support the silent revolution in the South – the growing awareness that science and technology can contribute to solving health problems, malnutrition, climate change and other social and economic challenges of the 21st century. ■

- World Science Forum: www.sciforum.hu
- Academy of Sciences for the Developing World: https://twas.ictp.it
- Relevance of science education: www.ils.uio.no/english/rose
- World Federation of Science Journalists: www.wfsj.org

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