Growing with IGBP

Pauline Dube, one of IGBP's vice-chairs, serves as a link between the African and global research communities studying climate and environmental change. Her career has been shaped strongly by her work with IGBP; in some ways her story is the story of IGBP itself.

Pauline Dube began her research career as a student using remote-sensing data to study land degradation in her native Botswana. Today, as an associate professor at the University of Botswana and a vice-chair of IGBP, Dube studies land-use and land-cover change, the veld fires and climate-change impacts, vulnerability and adaptation across Africa and beyond.

She has spearheaded global-change initiatives, in the process mentoring and providing opportunities for other researchers while forming a vibrant international research community. Most important, she has brought the perspective of developing countries to the work of IGBP and helped to integrate the natural and social aspects of global change.

Joining the IGBP community

Dube's first encounter with IGBP and issues of global change was in 1992 at the first Africa and Global Change meeting in Niamey, Niger. She recalls a presentation linking particulate matter from savannah fires in Africa with the subsequent formation of high ozone concentrations over the Atlantic Ocean. "Really, that just captivated me," Dube says. "I thought, wow, we really do have a global impact!"

In the 1990s, she says, "there were not so many of us" using remote sensing, particularly in African landscapes. She hypothesises that's why Thomas Rosswall, then Director of the IGBP Secretariat in Stockholm, encouraged her to work with IGBP. Rosswall persuaded her to establish an IGBP National Committee – IGBP was striving to be a truly global network at that time – which became the Botswana Global Change Committee (BGCC), and included natural and social aspects of global change.

Through this committee, Dube was to play a significant role in initiating global-change research in Africa. In 1994, she facilitated the first START[1] Regional Workshop, "Global Change in Southern, Central and Eastern Africa", in Botswana. But Dube wanted more than a committee for Botswana. "I felt there was a need to have a scientific project to tie us together, not just a committee," Dube says.

To that end, Dube and her colleagues explored the concept of terrestrial transects[2], championed by IGBP's Will Steffen and others. The result was the Kalahari Transect project, to run from South Africa through Botswana, all the way to the Democratic Republic of Congo. "We needed all the different scientists in different countries to work together – it was a challenge," she says.

The Kalahari Transect project created a robust interactive platform that drew scientists from different parts of the world. Dube recalls a crucial turning point at the African Savannahs and the Global Atmosphere meeting in 1993, in Victoria Falls, Zimbabwe, where she met Chris Justice, a high-profile remote-sensing scientist. At the time, Justice was based at the University of Virginia (he is now at the University of Maryland) and engaged in the IGBP's Data and Information Systems (IGBP-DIS) project[3].

With Justice's encouragement, Dube joined an international team of scientists in the IGBP/IHDP Land Use and Cover Change (LUCC) project, drafting the Miombo Network Terrestrial Transect

Fire and landscapes have been an important topic of Pauline Dube's research during her time with IGBP.

Science Agenda in Zomba, Malawi, in 1995, as part of LUCC[4]. The Miombo Network focused on understanding the effects of global change on the Miombo woodlands and land-use systems of Central Africa, and vice versa.

Parallel to this, START and IGBP combined efforts to establish Africa Regional Networks to encompass the breadth of the different ecosystems on the continent; Dube represented the START Southern Africa Committee (START SAFCOM) at the START Regional Committee for North Africa. For the first meeting in Malawi, in those pre-Internet days, she recalls having to wait weeks to receive information on meeting arrangements.

Around this time, apartheid was coming to an end in South Africa. "Still, some scholars couldn't tolerate that we were going to work with 'white' South Africans," Dube says. "We had many differences but at no time did anyone think of quitting. Everyone was committed and clear that studying and understanding global change in the African context was significant, so despite the dynamics between the scientists, the group kept going."

More work, more connections

While she was busy connecting researchers and organising large scientific programmes in Africa, colleagues began to encourage Dube to pursue doctoral research. For her post-graduate diploma and M.Phil. degree in 1989, at the University of Twente in the Netherlands and then at the University of Cranfield (UK) respectively, Dube had assessed land degradation in the rangelands of southeastern Botswana, comparing data from the newly launched SPOT satellite with LANDSAT data.

Her opportunity to follow up on that work came in 1994, with a grant from the International Agricultural Research Centre in Australia, to look at cattle ranching with CSIRO scientists in Alice Springs. While working there, Dube also enrolled at the University of Queensland to pursue doctoral research on human-induced change in the unique Okavango Delta in Botswana, now listed as the 1000th UNESCO World Heritage site. Dube continued linking her colleagues in Botswana with a network of scientists established through IGBP and START, and after finishing her PhD in 2000, she returned home to teach remote sensing at the University of Botswana.

In 1999, while still a student, Dube was invited to assist with the section on desertification in Africa, a controversial subject in the 1990s, for Working Group II of the Intergovernmental Panel on Climate Change (IPCC). "I remember thinking I was going to only assist for a little while, only to find it was a lifelong commitment," she jokes. For the fourth IPCC assessment, she was lead author on the ecosystems chapter and became a coordinating lead author for a special report on managing risks of climate change. She then served as a review editor for the fifth report of the IPCC Working Group II, as one of almost 100 individuals from the IGBP community to be part of the assessment.

Participating in the IPCC can be hard work with little recognition in the academic world, Dube says, but "I

Wendy Broadgate

> **"Science means being objective.**
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> It also means using the past and the present to look ahead. Sometimes society wants something now and doesn't realise it may need something else 50 years from now. As scientists we need to be visionary, if you like, not only to address today's problems but also to address problems that might arise in the future. Science and policy must work together."

was excited to be one of the scientists who received a Nobel Peace prize certificate in 2007." A celebration organised by the UN Development Programme spotlighted her work, "almost getting me to the category of celebrity," she says with a laugh.

A fiery pursuit

In 2000, as Dube was finishing her PhD, several projects were about to catch fire through BGCC, the IGBP national committee. That work would further increase her connections to IGBP and other international efforts.

Working with Justice, Dube quickly became involved with the Southern Africa Fire Atmosphere Research Initiatives of 2000, dubbed SAFARI2000, which kicked off with a meeting at the University of Botswana facilitated by the BGCC. SAFARI2000 brought together leading international scientists interested in studying greenhouse gases, aerosols and pollution. The huge research campaign required specialised aircrafts and large groups of researchers crossing international borders. "To arrange for them to fly over required negotiations with governments," Dube says, plus facilitating research permits, meetings and more.

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As the SAFARI2000 campaign drew to a close, Justice was working through the Global Observation of Forest Cover–Global Land Cover Dynamics (GOFC-GOLD) to put together a group to validate fire data in Southern Africa, fuelled by the launching of the MODIS instrument aboard NASA's Terra and Acqua satellites. Justice and others thought Dube would make a good leader of this group, given her remote-sensing background, and experience with START and IGBP.

At its first meeting in Botswana, the validation group became the Southern Africa Fire Network (SAFNet), hosted by the University of Botswana under BGCC. Dube coordinated SAFNet from 2000 to 2007, as the network grew from six countries to include all 14 Southern African Development Community countries.

In addition to data validation, SAFNet expanded to include policy and community fire-use challenges. "You need to understand why people [are starting burns] even when fire is a hazard, especially if you are going to come up with policy recommendations," Dube says. She set up SAFNet country contact points and encouraged rotating venues among the member countries for their meetings, while making sure policymakers attended. The majority of scientists who served as the SAFNet country contact points have made significant progress with their careers.

The work with SAFNet presented some non-scientific challenges too, Dube says. First the network had no funding. Dube needed to use persuasion and good communication to bring together international and regional fire scientists, policymakers and NGOs working with on-the-ground communities; to inspire and motivate the group; and to come up with a focused science agenda. The emergence at the same time of a Sub-Saharan fire network also called on her diplomatic skills "to make sure we were not wasting time on unproductive battles," she says. With few scientists on the ground, the two networks had to work together. Eventually, GOFC-GOLD introduced the SAFNet model to Australia and

Southeast Asia, to motivate the formation of similar networks.

Dube worked for SAFNet as a volunteer while holding a full-time job at the University of Botswana. Notably, when she left the network after seven years, four people took over her tasks.

Leading from the front

In 2008, Dube was appointed to serve on IGBP's Scientific Committee. After being involved in various IGBP-related activities for over a decade, this was her first foray into overseeing the programme's scientific and institutional development. Two years later she was appointed as one of IGBP's vice-chairs.

In this capacity Dube had the chance to work with Carlos Nobre, then Chair of IGBP, and João Morais, then Deputy Director for Social Sciences. The two scientists hailed from the global South – Brazil and Mozambique respectively – and Dube felt she had found like-minded colleagues. Together, they spearheaded a synthesis topic on global change and the needs of least developed countries (LDCs), which was embraced by IGBP and its networks. "We thought we needed to contribute something that directly addressed the developing world," she says.

The majority of the world's more than 40 LDCs are in Africa, with a few in the Asia-Pacific region. Getting funding was difficult, for poor regions must rely on the developed world. In the end, Dube says, the process was mixed: IGBP was able to secure funding for the Asia-Pacific component of the project but not for the African one.

"In Africa the problem is that despite all-out effort since the days of Rosswall and START, we failed to establish a strong Africa-wide network to work on global change," Dube laments. "Something similar to the Asia-Pacific Network for Global Change Research, which works to support individuals from developing countries from that part of the world, would have worked wonders."

Looking to the future

With IGBP set to close at the end of this year, Dube is wrapping up her work with an organisation that has been a professional home. "When you ask me about IGBP, you basically ask about my whole career, I have been so into it. All the science and networking activities I was involved in were strongly linked to IGBP. Even just the teaching – getting the material, getting satellite data, knowing whom to contact – has benefited from IGBP-linked networks," Dube says.

Still, Dube could see the need for a change. She was part of the visioning process launched in 2010 by the International Council for Science, IGBP's sponsor, that laid the foundation for re-organising internationally coordinated global-change research. This process and subsequent discussions "gave birth to Future Earth", Dube recalls. "I attended a couple of very hot meetings on these issues. These were difficult times – I had lived with IGBP for so long that it was hard to think about ending the organisation where I had spent much of my professional life."

And yet, as she went through the LDCs synthesis, for example, it was clear that IGBP needed to become more transdisciplinary in its orientation and develop even stronger links with the social sciences.

For now, Dube says, she has been too busy with managing IGBP's closure to think much about Future Earth. But she voices concerns that the new incarnation of global-change research, despite having five hubs, has no substantial presence in the global South. "Capacity-building, something that IGBP has a very good record of, remains a big issue. A hub in South Asia or Africa, for example, would serve to draw international scientists to the developing world, creating a fertile environment," she says.

Before addressing these issues, Dube will spend the rest of 2015 celebrating the organisation that shaped much of her career. For her, the celebrations began in 2013, when IGBP's executive group and Secretariat met for the 26th Officers' Meeting in Botswana and also fêted 20 years of the BGCC. This fall at the annual American Geophysical Union conference in San Francisco, Dube will co-convene a session on adaptation, one of many scientific sessions and other events that will reflect on IGBP's legacy.

"Then maybe next year", she says, "I will start thinking about Future Earth." ▮

As recounted to NAOMI LUBICK.

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REFERENCES AND NOTES

1. START refers to the Washington, D.C.-based capacity-building non-profit organisation, SysTem for Analysis, Research & Training.
2. The transects were undertaken as part of IGBP's Global Change and Terrestrial Ecosystems (GCTE) project.
3. IGBP's Data and Information Systems (DIS) project was launched in 1993.
4. Land Use and Cover Change (LUCC) was launched in 1994 as an IGBP Core Project.