

Looking forward

Future Earth is a new international research initiative that aims to better prepare society for global environmental change and improve global sustainability. *Nature Climate Change* spoke to James Syvitski, Chair of the International Geosphere-Biosphere Programme, one of the member organizations.

■ **You were appointed Chair of the International Geosphere-Biosphere Programme (IGBP) in 2011. What do you think is a key achievement of your time as chair?**

My proudest moment as chair was supporting the transition between IGBP (www.igbp.net) and Future Earth (www.futureearth.info) — that is, merging with DIVERSITAS (International Programme of Biodiversity Science, www.diversitas-international.org) and the International Human Dimensions Programme on Global Environmental Change (www.ihdp.unu.edu). This merger meant that I could offer advice on developing the Future Earth Program. More locally, I was an advisor to the development of one arm of the secretariat of the new organization, which is going to end up in part being where I am at the University of Colorado, in Boulder, Colorado, USA.

■ **Future Earth launched this year, bringing together well-established programmes. What was the reasoning behind the new programme and what is the vision for Future Earth?**

Future Earth is more than just the merging of three programmes, as intended. It will be what it manifests itself to be, but the plan of the Global Environmental Change (GEC) programmes joining is that the synergies between the various disciplines will improve. I think that is beginning to happen and it began before the formality of the merger, probably in the past 10–15 years. The Earth System Science Partnership (ESSP; which previously facilitated joint projects) was meant to do this, but it was limited by a governance structure not up to the task. Although individual programmes within ESSP were (and still are) great, such as the Global Carbon Project (www.globalcarbonproject.org), additional coordination between the four global environmental change programmes was often limited to generic information exchange and issues of project sponsorship.

Another key Future Earth objective is outreach — the GEC programmes weren't able to reach out to all the stakeholders that they needed to, for example, some of



the 32 international science unions and the general engineering community felt left out of important developments and dialogue on global sustainability science. People I have met — such as the past president of the Institute of Electrical and Electronic Engineers, with over 400,000 members — think that their organization has something to contribute. There was a connection with groups, such as the Group for Earth Observation, but it was not tight, even though we were one of their sponsoring members. There were a number of other groups, such as the press, journals and societies, that also wanted to be more directly involved in the discussion, but there was no way for this to occur.

The structures and the focus of the new initiative are set out to bring all contributing scientists throughout the world to the same level, so that there will be little difference in the study of environmental change occurring in different regions. The GEC programmes set out to even the playing field and I think they've accomplished that. For example, IGBP worked to foster interdisciplinary science, such as the role of biogeochemistry in Earth System Science. Future Earth must continue forging new science interactions, in what has become known as transdisciplinarity, moving beyond the natural sciences to forge new research interactions with the social sciences, economics, business and law.

Future Earth should also allow us to tap into new forms of funding. I can't stress how important that is. The GEC organizations were never designed to be fundraisers — IGBP received its money from member countries, but it was not designed to tap into private companies and industry for funding. In recent years, IGBP started to reach out to industrial partners. Future Earth is going to have to take those tail-end initiatives and really run with them. I hope the funding model of reaching out to society in new ways is going to support a long-lasting Future Earth programme.

■ **Future Earth has announced five secretariats, which will be globally distributed. Can you comment on how this approach will help the programme?**

Having a distributed secretariat limits failure and will bring good redundancies to the system. In my role as IGBP chair, I would get to meet secretaries and ministers — where the big money for environmental research is — along with leaders of international development agencies and national academies and find out their concerns and interests. This is where governments and decision-makers are really front and centre with how to use information that they've been able to glean from their own scientists, their own participants contributing to the GEC programmes and other big international organizations. Having that dialogue is just so important. When you have five global hubs and many more regional hubs, this interaction can hopefully grow, shifting from meetings with leaders from just a few countries each year, to a more robust, wider-spread, and ongoing conversation, with decision makers who are interested in environmental sustainability. The hope here is for such interactions to lead to a more active and involved discourse.

Currently, we meet with larger international groups (like the UN Framework Convention on Climate Change), at occasions when the funding countries get together. In these instances, we make a presentation, but that is not the kind of dialogue I want. With a distributed secretariat model, hopefully we can engage in governance like we never have before. I

think there is a misconception that we were already engaged, as our funding comes from member governments and the national science academies in the first place. Yes, there was a back-and-forth exchange, but it was often us pushing our discoveries and their societal implications on them, rather than an engaged dialogue, which is very different. It makes all the difference in the world when you are having one-on-one conversations rather than presentations to an auditorium where there may be the odd question and brief responses, but neither us nor them have a way to engage.

■ **How will Future Earth help member countries and their scientists in undertaking research and applying the knowledge to change policy?**

Let's use India as an example. India is well-established in the natural sciences, particularly atmospheric chemistry (no doubt due to black-carbon pollution and effects on human health and climate itself) and energy (improving the power grids to meet demand while still burning coal). These are strengths of theirs, but the atmosphere doesn't acknowledge borders, so they need to work with the countries around them — this gets into politics because they may not get along with those countries, and historically there may be less engagement with east Africa, for example. Getting India and their neighbouring countries to engage on issues of the environment is no small task and this one small example may give you an indication of the excitement we can have. A regional office of Future Earth could help facilitate such interactions as well as get social scientists involved. If we could bring together the efforts of social and natural scientists within India, it would basically facilitate 20% of the world's scientific effort, which is no small achievement.

Some countries have more intimate linkage between government and industry, for example, where governments have a controlling interest in major corporations — they might be one and the same, or separate but integrated. Whereas in Western countries, if you want to talk to industry you go straight to them — you don't have to go to the government and then to the company. Close ties between government and industry do make direct environmental messaging possible, and my excitement for such possibilities is only limited by my age.

My advice for young researchers is that each individual should stay somewhat narrowly focused, particularly in the early stages of their career, and establish themselves in one area of research. It would be really bad if the enthusiasm of people like me is expressed in ways that indicates

to them that they have to pepper themselves by having a little bit of this and a little bit of that. Future Earth is about creating networks so individuals can draw on the knowledge and skills of others. Only then can transdisciplinary science get advanced.

■ **So Future Earth is trying to facilitate the establishment of networks?**

Yes, that is correct. I recently attended a meeting in Indianapolis titled 'Rivers in the Anthropocene'. It brought together equal numbers of natural and social scientists and even included the fine arts. It blew everyone's mind — it was so exciting to see what each community brought to the table, to learn from one another and to get over our reluctance to have this conversation. So I think that's why I'm excited about changing the structure of academia.

■ **Water security and management is an area of concern for many countries. What research or collaboration is needed to move forward?**

We don't have enough collaborative efforts like the Mekong River Commission (www.mrcmekong.org), which is a multi-country commission, simply because one large river impacts many countries. One country doing something, such as building dams, impacts those below — this is an ongoing and developing issue. All the major rivers need this upstream–downstream balance to be worked out. This is just one example where the dialogue can continue.

Individual research communities need to come together. This is where Earth systems science is so important, as you can't focus on one region or one part of the system — it's all interconnected. On the other hand, we do need to focus on where people live, as it doesn't really matter what is happening with the intensification of the hydrological cycle if there is no water available for people to live. The dialogue also has to reach outside the research community. For example, we need to bring in engineers, who are happy to re-plumb the entire Earth surface, but this has consequences that are not considered when the focus is on solving a local or regional problem. We need to include engineering practice into the big picture, so that solutions to local problems do not engender regional or global problems. Globally, we are still building dams at an alarming rate, which are solving and generating problems at the same time — hydroelectricity solves the problem of burning coal and is a rich resource, but it has impacts. We need to look at the big picture and realize that these problems can only be solved by reaching out to others — this is where Future Earth can help.

Water security can't be achieved without both the natural and social sciences. The two can't be separated, even though the natural science perspective is concerned with tracking, for example, units of discharges, whereas social scientists aren't focused on definitive numbers — what are the units for well-being? The dialogue between the two communities regarding water security has to be such that the natural scientists understand what is needed and expected from a social science perspective and the social scientists must work to develop measures that are less difficult to quantify. There needs to be a bridging of the gap for natural scientists to understand that quantification isn't the only measure and there are quality aspects that need to be in place.

Humankind is very good at solving its own problems without waiting for science, or governance, to catch up. Scientists really have to understand this level of decision-making; providing results that are tailoring advice to governments may not always be the best way forward. Development agencies have become good at knowing when to skip some government discourses *per se*, and more directly have their experts communicate with local residents. Such projects allow for a more direct dialogue between scientists and the local stakeholders.

■ **How has environmental research changed? And what is needed?**

'Climate norms' were developed in the 1930s, in Warsaw, for agriculture. At that time, there was limited understanding of Earth science and the climate system, but it was understood that there was variability in the system and that averages could be obtained over long enough periods of time. This allowed the development of regional climate norms, and these have been revisited over time to update to the new norm. Statistically, none of it makes sense any more. Getting a norm is the wrong approach, as now we are in a period of change, we are outside of normal. Past statistics can't be used to work out what will happen in the future. Climate models are created based on the means, meaning the tails are impossibly hard to obtain. This is a problem as the tails are what will kill the most people and do the most damage to humanity.

For local communities to prepare and adapt, we need to have information at the tails and at the local level. This is what everyone is waiting for, but it is challenging. Another issue is quality of information; for example, knowing that it will rain more is one thing, but knowledge about the precipitation intensity is what is needed. It is all about the nuances that need to be worked on.

INTERVIEW BY BRONWYN WAKE