IFS Strategy, Actions and Innovative Programmes

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1. **Envisioning and responsibility** – the strategic vision for the International Foundation for Science

When we consider a vision, a strategy, or a policy, we take on a huge responsibility. If taken seriously, we may find ourselves defining the path to be trodden, the way to travel and ultimately impacting the chances to succeed. As ISPI Africa Programme\(^1\) recently wrote, in the context of economic growth in sub-Saharan Africa: ‘The dilemma between enduring returns or increased fragility largely depends on leadership responsibility and capabilities to pursue strategic and broadminded policies, addressing economic and, above all, social issues in an effectively long lasting prospective’.

When we do this as outsiders, (such as Europeans considering African development) then our responsibility is magnified. It is vital that we include in our deliberations in-depth examination of context, cross-cultural comparisons, and the importance of long-term, experiential immersion in the area of research. Essentially, this emphasises an anthropological approach.

It is fitting then, as we are assembled in Milan, and as the Vitruvian Man reminds us, that Italy has a long tradition of cultural anthropology. In mediaeval Europe, Italians were the first to follow the example of Arab scholars in giving stirring sometimes accurate accounts of exotic countries and cultures (examples include Fra Giovanni da Pian de Carpini in 1245-47 and Marco Polo 1298).

With this responsibility in mind, the new strategic vision for the International Foundation for Science has recently been developed through a time-bound, inclusive, consultative and participatory envisioning process involving in these different ways as many of the IFS constituency as possible.

The cultural anthropologist Margaret Mead once said “Never doubt that a small group of thoughtful, committed, citizens can change the world. Indeed, it is the only thing that ever has.”

We are not changing the world, though we hope that small benefits derive from the work we all do, but we are introducing changes at IFS. It is perhaps a fitting description of IFS over the decades, that it could be said to comprise a small group of thoughtful, committed, citizens of many nations, with an array of backgrounds and motivations and a range of tasks within the organisation.

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\(^1\) Gian Paolo Calchi Novati (Head of Research), Marta Montanini (Research Coordinator), Alessandro Bozzini, Emanuele Fantini, António Francisco, Alice N. Sindzingre
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2. Science as a Human Right and a Transformational Power in sub-Saharan Africa

African growth and development

Whilst Africa is the world’s fastest-growing continent just now, there is a high dependence on export of energy and minerals that still affects the majority of the African economies. Recent favourable commodity prices has increased government profit but the future remains uncertain as export revenues could be volatile and economic growth needs also to impact on poverty reduction.

Some statistics about Africa and African nations can be unreliable, but broadly the numbers suggest that human development in sub-Saharan Africa has made huge leaps\(^2\). Secondary-school enrolment grew by 48% between 2000 and 2008 after many states expanded their education programmes and scrapped school fees. This feeds a growing cohort of potential early-career scientists that auger well for significant scientific development in Africa that we believe is required to underpin human development. Over the past decade health matters have improved, malaria deaths in some of the worst-affected countries have declined by 30% and HIV infections by up to 74%. Life expectancy across Africa has increased by about 10% and child mortality rates in most countries have been falling steeply. A booming economy has made a big difference. Over the past ten years real income per person has increased more than 30%, whereas in the previous 20 years it shrank nearly 10%.

Over the next decade GDP in Africa is expected to rise by an average of 6% a year. War and civil strife have declined dramatically, foreign direct investment is increasing, and more private citizens are engaging with policies and politics, some in civil-society groups, and others in aid efforts or as protesters. However, growing investment, reduced conflict and increased public engagement must translate into effective policy change if we are to see an end to hunger in some African countries, steeply rising agricultural production in others, the start of industrial manufacturing for export, the emergence of a broad retail sector, more integrated transport networks, fairer elections, more effective governments, widespread access to technology even among many of the poor and ever-rising commodity incomes.

Science in developing countries needs to expand

The current low level of scientific support to the developing world in general, and Africa in particular, as well as the substantial need for location specific research in the south means that now\(^3\), more than ever, science in developing countries needs to expand.

Of course, everyone has the right freely to participate in, and to share in scientific advancement, and its benefits. This is enshrined in Article 27 of the Universal Declaration of Human Rights, and more specifically in Article 15 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) which requires states to:

1. Recognize the right of everyone to enjoy the benefits of scientific progress and its applications
2. Conserve, develop, and diffuse science
3. Respect the freedom indispensable for scientific research, and
4. Recognize the benefits of international contacts and co-operation in the scientific field.

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A role for us all is to ensure that we commit to promoting Article 15 (ICESCR) and engaging scientists in the effort to uphold the right to the benefits of scientific progress.

Time to harness the transformational power of science, technology and communications

Charles Dickens begins his novel ‘A Tale of Two City’s’ with a description of the time: ‘It was the best of times, the worst of times, the age of wisdom, the age of foolishness...’. Dickens refers here to 1775 and the context of the French revolution. However, the phrase also provides a fitting description of our own time.

Not only in African, but globally environmental degradation is increasing, biodiversity reducing, the climate is changing – these are huge global challenges (...the worst of times). Conversely, there is a global consensus to eradicate extreme poverty and hunger, and an increasing appreciation of the planetary boundaries within which humanity can operate sustainably, and the social boundaries that underpin a just way to manage inclusive and sustainable economic development (...the best of times).

However, these challenges require committed coordinated actions, good governance and a host of new innovations. We will need to draw on exceptional individual and collaborative actions, and to harness the transformational power of science, technology and communications in order for our generation to safely and fairly ensure the stewardship of our natural resources.

3. A vision in support of academic freedom, local research and the facilitation of intellectual responsibility of African scholars

Intellectual freedom to research

Scientists in the developing world are well placed to identify the challenges they face, and able to propose transformational research, to build their resilience to global volatility, to engage in global negotiations, and to innovate for sustainable futures.

We do not prescribe what people should research. We believe it is vital that young researchers have the opportunity to propose research which they identify can address problems in their country of origin, relevant to the needs of the country, supported through a demand-led, long-term, predictable research granting and capability enhancing support programme across a broad spectrum of biological and water resources.

Supporting the best early-career scientists

IFS believe that a sound basis for investment in expanding developing country science is to select and support the best early-career scientists who are based in the developing world. Young people today constitute the largest youth cohort in human history, with the vast majority in developing countries. The scientists of tomorrow must contribute to securing affordable food, water and energy to a rising population, where their scope for action is constrained by the urgent challenge of environmental sustainability.

In the next decade, individual and collaborative research conducted by developing country scientists needs to contribute to a global endeavour to reduce poverty and support sustainable development. Support by the International Foundation for Science will strengthen the possibilities for early-career
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scientists to productively engage in this enterprise and for their research to find utility in innovation and policy domains.

Our mission therefore is to contribute towards strengthening the capability of young men and women scientists in developing countries to conduct relevant and high quality research and their individual agency to put it into use.

Through a careful highly selective process, we endeavour to support promising young scientists from developing countries to become future lead scientists and science leaders. They will receive support early in their careers to produce new research findings, relevant to developing countries and of assured quality according to current academic principles. Importantly, unsuccessful applicants receive substantive feedback on their proposals and are encouraged to reapply.

IFS are not about funding or sharing science from the developed world.

Instead thousands of IFS grantees in the developing world are researching and publishing about the aspects of biological and water resources that they have reason to value:

The niche of IFS is to support young developing country researchers in a science career. We do not fund tertiary education as such. We aim to support the immediate post-Masters and post-PhD years which are vital in science careers. It is during this time that the expertise, skills and passion for research developed through postgraduate study are cemented, additional skills and greater confidence developed, first publications achieved, and new research conceived and initiated.
**Small is beautiful**

Applicants can receive up to three research grants. We offer small research grants, 12,000 USD for individual research grant proposals and from 45-75,000 USD for small consortia to conduct collaborative research. Through our Individual Research Approach, early-career scientists learn how:

- To write research grant proposals.
- To administer a budget.
- To schedule their research.
- To write up and share their findings.
- To build on their previous work and propose and conduct follow up studies.

Through our Collaborative Research Approach, early-career scientists learn how:

- To use dedicated social networking platforms and associated tools and applications.
- To find like-minded colleagues.
- To assemble small consortia.
- To negotiate roles in collaborative research.
- To communicate internationally/cross culturally/addressing linguistic barriers.
- To negotiate around intellectual property, access to shared data, publication targets.
- To navigate inter-institutional bureaucracies.
- To add value to the skills and endeavors of others.
- To write up and share their collaborative (often interdisciplinary) research findings.

Whilst small grant schemes are notoriously expensive to administer compared to larger scale projects, they play a special and vital role in the early career path of scientists. Applications to IFS have always been rigorously assessed by international specialists, with detailed feedback to all applicants. Unsuccessful applicants have received valued counselling early in their research careers, whilst those that succeeded have gained confidence from the international recognition of their ideas and from the opportunity to manage whole research projects and associated budgets. More strategically, the provision of grants is complemented by capability enhancing support. This includes equipment purchasing support and thematic workshops, commonly with partner organisations, such as Proposal Writing, Science Writing and Science Communication, and travel grants to share research results. IFS therefore plays an almost unique duel role for young developing country scientists.
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**IFS Research Areas**

To frame the scope of IFS Research Areas, and to explain the context upon which our support to research will be assigned, we draw on two concepts: “planetary boundaries” and “social boundaries”, which appropriately combined together may help to define ‘a safe and just space for humanity’.

The planetary boundaries concept for estimating a safe operating space for humanity with respect to the functioning of the Earth System was developed by an international panel of scientists in response to challenges on new thinking about global sustainability. Briefly, it identifies nine planetary boundaries that cover the global biogeochemical cycles of nitrogen, phosphorus, carbon, and water; the major physical circulation systems of the planet (the climate, stratosphere, ocean systems); biophysical features of Earth that contribute to the underlying resilience of its self-regulatory capacity (marine and terrestrial biodiversity, land systems); and two critical features associated with anthropogenic global change (aerosol loading and chemical pollution).

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5 Sverker Molander, Martin Scheringer, Thomas Backhaus. 2012. Planetary boundaries for chemical pollution. 6th SETAC World Congress Berlin and Lorraine A. Remer, NASA GSFC; Mian Chin, NASA GSFC; Philip DeCola, NASA HQ; Graham Feingold, NOAA ERSL; Rangasayi Halthore, NASA HQ/NRL; Ralph A. Kahn, NASA GSFC; Patricia K. Quinn, NOAA PMEL; David Rind, NASA GISS; Stephen E. Schwartz, DOE BNL; David G. Streets, DOE ANL; Hongbin Yu, NASA GSFC/UMBC. 2008. Atmospheric Aerosol Properties and Climate Impacts (executive summary) 8 pages The U.S. Climate Change Science Program
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The addition of social boundaries to the planetary boundaries model was proposed in a subsequent paper to show its interaction with the social network and to define a desired environment for human development, a so-called ‘Safe and Just Space for Humanity’⁶. In this vision, the environmental ceiling forms an outer boundary, beyond which are many dimensions of environmental degradation. In each planetary boundary, gradual changes in certain key control variables (e.g., biodiversity, harvesting, soil quality, freshwater flows, and nutrient cycles) can trigger an abrupt system state change when critical thresholds have been crossed. The social foundation forms an inner domain, below which are many dimensions of human deprivation. Between the two tiers lies an area – shaped like a doughnut – which represents an environmentally safe and socially just space for humanity to thrive in. Researching within this space demands of us all, far greater consideration of equity – within and between countries – in the use of natural resources, and far greater efficiency in transforming those resources to meet human needs.

Recent elaboration of our strategy

In keeping with the strategic philosophy of ‘working together’, a recent elaboration, of the IFS approach to individual research grants and capability building, has been the introduction of a supported and mentored Collaborative Research Approach. Like the Individual Research Approach, collaborative grants are small scale, limited to 3-5 collaborators and the emphasis is on young scientists learning-by-doing.

Research collaboration can bring mutual benefits of intellectual and social influence to collaborators⁷. Collaboration can help to address the challenges posed by the ever widening range of skills required by increasingly complex research demands. Collaboration can also bring potential benefits to scale, scope and efficacy of research outcomes especially where interdisciplinary collaboration is involved. Research collaboration is promoted by: informality, proximity and parity amongst collaborators. It is our experience already from our pan-African collaborative research pilot that digital social networking can significantly promote collaboration independent of proximity.

Collaboration can improve productivity, acceptability, impact, influence, citation rates and salary. Collaborative roles include: proposer(s) and/or fund raiser(s); frequent or substantial contributors; those responsible for the main elements of the research; and those responsible for key steps. We identify to early-career scientists seven types of benefit expected from the Collaborative Research Approach: sharing of knowledge, skills and techniques; tacit knowledge transfer; learning social and team management skills; sourcing creativity; intellectual companionship; greater scientific visibility; and pooling equipment. We also identify five specific costs incurred by this approach: finding collaborative partners; financial costs; time costs; administration and reconciling different financial systems; management cultures and mechanisms. We aim to ameliorate some of the costs through: an on-line collaborative social media environment providing a plenary workspace for use by all prospective applicants and potential collaborators – to find each other; private work spaces for emerging teams - to define and propose collaborative research, and later for successful teams of grantees – to collaborate on-line. Each of these work spaces are equipped with appropriate ‘apps’ and tools and complemented by subject specific and technical mentoring to support working in

⁷ Breaking Fences May Make for Good Neighbours in Collaborative Research An IFS paper by Graham Haylor produced in conjunction with the launching of the IFS Collaborative Research Approach in October, 2012. [Available online]: www.ifs.se/publications
collaboration. In addition, to reduce some of the financial costs to collaborative researchers, a specific budget for team coordination costs is made available against specified team requirements. Finally, awareness raising and advice is provided vis-à-vis reconciling different financial, administrative and regulatory institutional environments.

A further elaboration of the IFS approach to capability building, later this year, will be the introduction of a Contributing Innovation Approach. IFS operates at the interface of science and sustainable development. We contribute to, and are supported by, science academies and development organisations. IFS believes that science holds the potential to transform the contemporary global challenge and it can provide the evidence for policy change and the basis for international development impact. Recognising that research products are just a starting point in the broader process of putting research into use and enabling innovation, we identified two key challenges to be addressed in this context. The first is to begin to build capabilities and competencies at an early stage in science careers that help to put research into use in developing countries. A key capability requirement for researchers in this context is the understanding of the political and incentive context for the uptake of research by entrepreneurs, industry, and medicine, and in policy and decision-making. Within the ten-year strategy IFS aims to introduce courses on Understanding of the political and incentive context for science use to better prepare researchers for engaging with others to put research into use.

Related to this, on a very practical level is capability in Science communication for impact, through support in science writing as well as media development (drama, film, mobile phone and internet, web 2.0 applications) to influence policy and practice.

However, to put research into use often requires a champion who is able to navigate complex business, political and institutional landscapes, building networks of practitioners and policy actors willing to advocate and promote the approach – and this is unlikely to be the originator of the research. Therefore the second challenge is that of building links and brokering networks and alliances that support demand for and use of research. This will include working with partners towards establishing more supportive policy and institutional environments that can create effective demand for appropriate research products, and building links to society at large, and the business community, including networks, science fairs and conferences. Unlike our approach to individual and collaborative research which are based around competitive research grants, contributing innovation is about networking and building capability to make a difference.

4. Complementing research funding with advocacy

There is widespread consensus in Africa today that no society can properly develop itself on a sustained basis without mobilizing and effectively deploying indigenous knowledge and research capacities. Building from the 2005 ‘Science and Technology Consolidated Plan of Action’, the African Union (AU) and its’ New Partnership for Africa’s Development (NEPAD) are urgently seeking to grow Africa’s domestic capacities to identify, analyze, and resolve development challenges. The extent to which Africa is going to harness, develop and apply science, technology and innovation and to use rigorous data and evidence to achieve economic change and sustainable development will be determined by the nature of policies and institutions that its countries put in place at national, regional and continental levels.
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In the coming year, we aim to influence scientific equipment policy development and change, and we aim to galvanize political will to achieve this. We will draw on the learning from a recent 3.5 million USD IFS project in Nigeria and Madagascar, where we supported learning about the identification, procurement, installation and maintenance of scientific equipment the so-called PRISM project. Working in collaboration with the Pan-African, African Academy of Sciences (AAS) and focusing on research communications from the PRISM project, we will encourage uptake of equipment recommendations in three African countries: Ethiopia, Ghana and Kenya, as well as stimulating Pan-African interest through the Forum for Agricultural Research in Africa (FARA) to aim to influence scientific equipment policy to support strategic development of research.

If you are interested to know more about IFS please visit www.ifs.se

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