GLOBAL GEOSCIENCE INITIATIVES

Background: The activities associated with the International Year of Planet Earth (IYPE) have come to an end. Looking back over the three years of IYPE, there have been many notable successes, particularly in its outreach program. But, because little success was achieved with an IYPE science program, several members of the IYPE board, along with representatives of some other Earth science institutions, started to explore whether there is support within the geosciences community to launch a global geoscience initiative. This followed the 'call to arms' embodied in the Tsukuba Declaration put forward by participants in IYPE and three other International Years: The International Polar Year, the Electronic Geophysical Year, and the International Heliophysical Year.

A Global Geosciences Initiative (GGI), while independent of IYPE and the other International Years, would constitute a fitting legacy, contributing to global scientific understanding and international capacity building, and complementing the outreach achievements of IYPE.

Concurrently with the development of the GGI ICSU has undertaken a visioning process and proposed an Earth system science initiative to enhance global sustainability http://www.icsuvisioning.org/other/grand-challenges/. This is based around the Belmont Forum http://www.icsu.org/1_icsuinscience/ENVI_BELMONT.html which brings many of the major funders of environmental sciences behind an ICSU led initiative centred on the integration of global observation, state of the art measurement and modelling of the Earth system, creation of global interoperable data bases and their translation to government and other public bodies.

The solid Earth component of Earth System Science (ESS) is not strongly integrated in the ICSU/Belmont forum process and there is considerable opportunity and potential for the GGIprogramme to address this.

The vision of the group developing the GGI proposal is that it should:

- be inclusive, and involve a geoscience community which is broad both in terms of discipline
- and nationality;
- have a clear socio-economic context, and global societal relevance;
- focus on a globally significant science theme, and preferably involve global processes;
- attract the support of scientific communities, funding agencies, governments and other
- institutions in many countries, under the umbrella of UNESCO and the ICSU geoscientific
- unions.

The points above fall clearly within the scope of a globally funded ESS initiative.

The proposal

Presentations were made by leading Earth scientists at "town hall" meetings at GSA 2009, AGU 2009, EGU 2010 and AGU "Meeting of the Americas" 2010. A list of the presentations and summaries are published at http://www.agiweb.org/members/ggi/. Although the presentations ranged widely from coastal processes, deltas, resources and their sustainable use to climate change and adaptation, there was a consensus that the focus should be multidisciplinary and have socioeconomic value.

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i) **Minerals and hydrocarbon resources and their associated waste products**: the need for such resources will continue to be driven by population growth and improvements in the standard of living in the developing world. In addition to locating and extracting resources, dealing with the effects of mining on people and the environment and better environmental awareness in coal, oil and gas production is needed. This includes the environmental effects from unconventional resources and the removal of greenhouse gases produced through energy production and other industries. All remain a priority for both society and geosciences. Integration of the resource sector with ESS grand challenges requires more communication between the ESS sub disciplines and better understanding of the economics and social drivers.

There is a perceived or real knowledge gap between many Earth science related industries and environmental scientists and the environmentally conscious public.

Recommendation: that the professional societies in Earth and environmental sciences work closely with industry in ensuring best practice in environmental stewardship of the planet and that the communities work towards enhanced joint actions with the large multidisciplinary professional societies such as AGU, EGU and others. Specifically, this should involve the Unions focussing initiatives (meetings, special publications etc.) on energy and mineral resources and their development under environmentally acceptable conditions.

ii) **Living with natural hazards:** in an ideal world humankind should minimize the risk of living in dangerous areas. However, population growth and a lack of communication and community understanding of hazards and associated risks, results in many tens of thousands being killed on Earth every year. Although better understanding of the Earth system will help predict major catastrophes, a significant role for the geoscientists is to educate local populations to make them aware of the risks and to ready them to react in order to save lives. The deltas of the Planet are especially vulnerable and are areas where fluvial and subsurface processes are particularly suited to integrated approaches from ESS and where a step change in our ability to live in hazardous environments could be made.

Recommendation: that the geosciences agencies to build on the USGS international **Delta Research And Global Observation Network (DRAGON)** ttp://deltas.usgs.gov/ in creating a global network of observatories and modelling of delta systems.

It is noted that **Global earthquake Model (GEM**) http://www.globalquakemodel.org/ is already focused on making significant inroads in understanding and living in arthquakeprone zones.

iii) **Strategic Earth science in Africa through the Africa Alive corridors***:* in addition to the initiatives above a strong appeal was made by a wide community of researchers for a science initiative which would ideally have scope to address, in whole or part, issues of societal importance such as the location and sustainable use of water, energy and mineral resources, climate change and adaptation, and capacity building. It was envisaged that the theme should bridge pure and applied science and appeal to and involve younger people. The Africa Alive

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effort reinforces the role of the geosciences in human history, and in economic and cultural development in the corridors. This brings the geosciences into alignment with the Belmont forum.

A significant focus can be brought behind a possible overarching project with scope to develop a series of separate research initiatives through the Africa Alive corridors

http://www.agiweb.org/members/presentations/TownHallEGU-deWit.pdf

This initiative has the advantage of covering a spectrum of science from discovery research through applied problems which contribute to the economy and to social well being of Africa. At the same time **"Africa Alive corridors"** has the potential to bring considerable outreach and capacity building potential to Africa at a key period when the global economy is emerging from recession and significant refocusing of resources in research is expected through initiatives such as the ICSU sponsored Belmont Forum.

Recommendation: among the wider Earth science community, though there are diverse interests and research priorities, there is enthusiasm for a project such as Africa Alive corridors which has the potential to capture both the imagination and active support of a broad research base. We note that ICSU geosciences unions and other international unions are considering focussed initiatives in Africa.

Quoting from the presentation cited above…

Africa is the geological colossus amongst the continents of the world
it is one of the geological hotspots of the world with the earliest known life forms
it hosts prestigious mineral deposits
it supports intact ecosystems
it is home to about a billio n humans and the cradle of mankind
Africa's people suffer the greatest spectrum of ills anywhere on the Earth.

Africa is the prime target for Earth scientists to address the ICSU grand challenges and at the same time presents an opportunity for new scientific discovery. The 23rd GAC in South Africa offers an opportunity for discussion on initiation of a decadal Earth science programme that responds to the ICSU grand challenges in Earth System Sciences (ESS) and places soli Earth science firmly within the Belmont Forum ESS objectives.

Sponsors: American Geological Institute (AGI), British Geological Survey (BGS), Geological Society of America (GSA) and Geological Society of London (GSL)

Supporting presentations: AGU, EGU, IUGS, YES (Young Earth Scientists); IYPE; USGS; BGS; GEM; UNESCO; Colorado School of Mines; Stanford University; University of California ; University of Cape Town; TWAS (Mexico). **Images** http://cosmographica.com/gallery/index_main.html

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