REPORT OF THE IUGS NEW ACTIVITIES STRATEGIC IMPLEMENTATION COMMITTEE (NASIC)

ON

RESOURCING FUTURE GENERATIONS (RFG)

28 January 2014

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Annexes

1. Executive summary

1.1. Resourcing Future Generations (RFG) is laudable, but the proposed initiative needs focussing on a few, well constrained and useful outputs deliverable in the short-term. IUGS needs to establish its capacity to bring together interested parties and orchestrate such a project. It might do this by

- Facilitating resource flow assessments by an expert panel/s to evaluate likely shortfalls in supply through the 21st century for selected mineral and other natural resources;

- Developing a few regionally-based projects, working in conjunction with national geosurveys, ICSU GeoUnions,IUGS National Committees and Commissions, university funded departments and others, initially with a focus on minerals data and capacity to undertake responsible development planning. These demonstration projects should encompass new assessments of mineral resource potential and, where feasible, information on water and soil resources, land cover should also be included. They could be conducted example, in parts of Africa, western Europe, China and elsewhere in Asia.

- Working with the International Council for Science (ICSU) and its *Future Earth* initiative to undertake research at the interface of geosciences, social science and economics.

1.2. More generally, the initiative needs to span the geosciences and be truly multidisciplinary. Significant involvement of economists and the social sciences is critical. For success the initiative must engage with and have broad sectoral support, including industry, government and academia. IUGS should carefully evaluate possible links to and collaboration with ICSU and *Future Earth* to determine the scope for partnership.

2. Background

2.1 A report was made to the 66th IUGS Executive Committee Meeting held in Paris from 19 to 22 February 2013, of an informal activity promoted by Jack Hess (GSA), Pat Leahy (AGI), John Ludden (BGS) and Edmund Nickless (GSL) entitled *A Global Geoscience Initiative* (GGI). GGI is an outgrowth of the International Year of Planet Earth and had been promoted with a view to encouraging multidisciplinary activity across the geosciences with the potential to work with social scientists on a grass roots project addressing a contemporary geoscience issue/s of societal concern.

2.2 At the same meeting the IUGS Secretary General, Ian Lambert, tabled a paper proposing an initiative entitled *Resourcing Future Generations* (RFG), identifying three areas where IUGS could bring influence:

i. Capacity building in terms of geological maps/mapping, data management, mineral systems understanding, exploration models, geophysical acquisition programmes and integration of geophysical and geological data, etc.

ii. Enhanced applications of satellite technologies for geological and environmental condition mapping and identifying possible mineral systems.

iii. Geo-governance and education in relation to conflicts between resources (e.g. minerals vs water), and between land uses (e.g. production of resources vs agriculture vs urbanization vs conservation).

2.3 The vision is that IUGS would play a catalytic and coordinating role in RFG, and that appropriate groups amongst its many member countries, and interested affiliate members, would need to be involved to contribute relevant experience and expertise. RFG would harness IUGS strengths, not cut across the many short- to medium-term exploration activities of industry and provide a focus for much of the currently rather *ad hoc* minor requests to IUGS for funding.

2.4 In its closed session, the IUGS Executive Committee (EC) decided to develop an international initiative on meeting future needs for natural resources (RFG). This reflects recommendations of the IUGS strategic plan (http://iugs.org/index.php?page=documents) and the final GGI report http://www.agiweb.org/members/ggi/GGIFinalReport.pdf), both of which recognize that with continuing population growth and the aspirations of developing nations, a priority is to secure new mineral, energy and water resources for the future, while meeting the environmental and social imperatives for sustainable development.

2.5 The EC agreed to establish a New Activities Strategic Implementation Committee (NASIC), comprising a small group of people from different parts of the world with broad knowledge and strategic vision, with a request for a draft report focused on mineral resources to be completed by October 2013. An interim report was submitted to the IUGS Bureau meeting held in Denver, Colorado. The report here is essentially the same but updated to include a suggested programme of work at section 10.

3. The charge

3.1 In an email of 26 March 2013 the Secretary General posed eleven questions to NASIC (Annex A) on which the EC was seeking advice/recommendations.

4. NASIC core group membership

4.1 The initial NASIC core group approved by the IUGS Bureau was supplemented by the addition of Neil Williams, Ray Durrheim and Roland Oberhänsli early in the process. A full list of the core group members and their affiliations is at Annex B.

5. Advisory groups

5.1 Each member of the core group was invited to establish an advisory group to work with them. The intention in so doing was two-fold: to broaden scientific and technical input to development of RFG and to disseminate information and broaden participation in the proposed initiative. Details of advisory group memberships are at Annex C.

6. What did we do?

6.1 An early task of the working group was to write an article for publication in *Episodes* setting out the concept and purpose of RFG. A copy of the article published in July 2013 is at Annex D.

6.2 We wrote in the same terms to senior contacts in Anglo American and Rio Tinto seeking their views on RFG. Based on those responses we wrote, but in slightly evolved terms, to BHP Billiton.

6.3 We sought to set down the scientific rationale for RFG in a White Paper. Initially we thought that might serve as background to a Pardee Symposium to be held during the GSA Annual Meeting but the development of the programme for that proceeded separately, though in parallel, and it was agreed that the White Paper as envisaged and drafted would more likely to confuse that rather than to inform the Symposium. The latest draft of the as yet incomplete White Paper is at Annex E.

6.4 We have also sought to develop a summary of RFG in accessible language to distribute to those attending the Pardee Symposium, to serve as both as an *aide memoire* and as a basis for inviting their comment in the light of the presentations and discussion. The brochure is at Annex F. The programme with abstracts submitted to the Pardee Symposium is at Annex G. Presentations given at the pardeee symposium are viewable at http://www.geolsoc.org.uk/Policy-and-Media/International/Resourcing-Future-Generations

6.5 While NASIC has focussed its deliberations on mineral resources, it recommends that other natural resources be covered under RFG particularly through collaboration with other ICSU GeoUnions.

7. Method of working

7.1 We have met on ten occasions by Skype and worked in between times through exchange of emails. In addition to the activities described in section 6, we have addressed the eleven questions posed by the IUGS Secretary General in establishing NASIC.

8. Our thoughts on the eleven questions

8.1 *Is RFG a concept worth developing?*

In broad terms, we believe that, if for no other reason, the present generation has a responsibility to those who follow to secure the supply of raw materials and to promote their extraction and use in a responsible, least environmentally damaging way. RFG has the potential to stimulate governments around the world to better frame their resource policies, including resource access, utilization and benefit sharing. It would help in developing a more rational approach to sustainable resource utilization and to eliminate some misconceptions that guide some policy makers.

But to move forward, RFG needs to define its stakeholders. While no natural resource should be excluded from initial consideration, it will be paramount to develop a well-defined affordable programme that is supported by funding, for example, minerals, water, unconventional gas and oil, and so on.

Further, it is an inescapable fact that a high proportion of the resources needed by future generations will be in low income countries anxious to raise their standards of living. Given the right information and skills, such countries could benefit from broadly based planning for delineation and development of their natural resources.

The initiative must avoid elements which could be perceived as interfering rather than adding value to activities currently planned or likely to be planned in the near future by industry. RFG as a whole must appeal to a broad audience including industry, government and academia; and in its execution it must be truly multi-disciplinary across the geosciences and work in a meaningful way with the social sciences including economics.

We wrote to industry seeking advice on potential research topics and activities that could be priorities for RFG in the hope that in presenting each as a 'straw man' would attract constructive comment and criticism, including identification of those activities regarded as most important, 'no go' areas and additional activities that might be included.

It may be that our respondents have misunderstood the intent is not to do everything that is set out and that it is intended to prioritise on the basis of comments received from the various sectors we are trying to interest. There are strands of work within RFG which industry sees as potentially beneficial, but responses from industry are critical of what they perceived to be a lack of focus of the proposed work, doubting its achievability within the proposed ten-year timeframe, questioning whether it duplicates work already going on or commissioned by industry and whether IUGS could deliver such a broad programme. To overcome such views, IUGS must focus on delivering valuable results within a short period of time, possibly as little as two years. Within industry there is no appetite for a program of ten years length.

Importantly, the International Council for Mining and Metals has accepted an invitation for a constructive discussion on RFG.

Other sectors appear to view the proposed effort differently and their views need to be teased out also. IUGS must reach out equally to all sectors and establish priorities that are balanced in terms of commitment and garner universal support for RFG.

8.2 *Are the three areas above where IUGS can bring influence important components of RFG and what else is important?*

In summary, NASIC has identified four fundamental research and application themes for addressing the multi-generational needs for mineral (and other) natural resources under RFG:

i. Comprehensive evaluation and quantification of 21st century supply and demand

ii. Research programmes in enhanced understanding of subsurface as it relates to mineral (energy and groundwater) resources

iii. Research focussed on evaluation of where additional natural resources are likely to be found

iv. Building capacity in developing nations for responsible stewardship of natural resources.

Specific research and training activities should be developed under each of these. The potential projects are many, but the initial emphasis should be on those which can achieve significant results within a few years. Naturally, projects of the highest priority of one sector but may be viewed otherwise by other sectors. Examples of projects for consideration are:

i. making data/metadata more widely available for research and planning applications;

ii. endorsing existing international guidelines/principles for use where nothing more appropriate is available;

iii. up-to-date mineral resource potential research (including the development of less complex but effective resource assessment methodologies) of selected less developed regions;

iv. research on tuning Earth observation data for geological observation. This area needs very careful definition, selection and interaction with providers of global data;

v. training and modelling of large data sets;

vi. using large international meetings to bring people together from developing countries. (Programmes like the European Geosciences Union GIFT initiative are examples of how this might be done with the benefit that those attending return to their home institutions to cascade the experience).

In addition, RFG needs to include research advances and data clearing house efforts which are likely to be more long lasting contributions and also some very tangible products, to be delivered in the shorter term. In terms of capacity building, training in the least developed countries and lesser developed countries is critical. A further thought is that, in addition to the three identified key areas, IUGS could stimulate research in the area of "ore deposit models and systems".

8.3 *Is IUGS – as an apolitical, non-government union representing the international geoscience community – the right organization to take a lead in developing/ coordinating/catalysing RFG as a substantial international programme, given:*

- *IUGS' formal contacts with some 120 member countries(National Committees) and associations with many geosurveys and societies internationally, and*

- *IUGS activities, including support for geoscience training programmes, geoscience standards, participation in Group on Earth Observations (GEO/GEOSS) and ICSU (Codata, WDS) etc?*

IUGS would have the appropriate breadth and acceptance by member countries and the scientific community to oversee such work with the required legitimacy. IUGS

would bring the necessary independence to the results that would be hard to come by from other institutions.

There is potential for IUGS to act as a unifying force but not as the implementer of RFG. For example, IUGS is not capable of conducting research or handling big data sets in its own rght, but it could be instrumental in leading the dialogue to make progress and to ensure collaboration by entities that have those capabilities. On the other hand, it could organise and conduct training and collaboration with others most effectively. In so doing, IUGS would act more as an honest broker in the process and that is perhaps the style of leadership that is needed, but there may be other organisations that can serve that role as well as IUGS.

All that said, we know of no competing organisation proposing to do work analogous to RFG, neither is it obvious that there is one. Nor are we aware of any other organisation with the reach and stature of IUGS that is doing anything similar. While the larger mining houses and many governments are looking at issues of supply and demand for minerals, they will have different objectives (shareholder benefit, security of supply of strategic materials, and so on). At the very least, IUGS can potentially facilitate research, knowledge dissemination and inform debate, not only on scientific but also on ethical matters.

However, among industry there is no acceptance that IUGS is the natural home for such work, and indeed, IUGS has little if any financial resources to undertake such an ambitious programme. While IUGS might be capable of garnering support, and in bringing together the research community, it has little established record in so doing. In addition, privately, some have questioned the impartiality of IUGS inasmuch as the only secure external funding presently available to undertake any of the proposed work comes from a single source.

The quadrennial International Geological Congress should serve to promote RFG.

8.4 *What other groups should be involved, including details of potential contacts?*

RFG will need to include geological surveys, reputable and independent government research institutions, renowned university researchers and other professional associations involved in the themes covered by RFG.

OneGeology Global is revamping/redefining its governance and could be a platform for sharing data. A plan is to push for a community mapping initiative; another, to create a geological surveys institute with some highly selected individuals and problems to address.

8.5 *Who would be leaders/champions of RFG, including details of potential contacts?*

The initiative should be lead by highly reputable researchers and project managers in the respective fields. They may come from academia, geological surveys or research institutions. Leaders will need to be able to bring support and mobilize resources for the project. Key appointments should be initiated in mid-late 2014.

Geosurveys, established training groups, researchers working on enhanced exploration targeting deep exploration, governments of interested lesser developed countries, mining companies and associations, UNESCO, IUGS and other

geounions, IGCP if revamped to become in part a RFG research programme. But, in addition, there is a role to engage with professional and scientific societies as well as social scientists including economists. Obvious candidates among the scientific and professional organisations are the Society of Economic Geologists, Society for Geology Applied to Mineral Deposits (SGA), The International Council on Mining and Metals (ICMM), Society for Exploration Geophysicists, and so on. But locally, there are research and capacity building programmes. For example, in Africa, AfricaArray, west African exploration initiative, African network of science institutions and opportunities to develop at regional levels elsewhere need to be explored. RFG could be of considerable interest to the African Mining Vision.

Within ICSU, IUGG has regional offices in Africa for example on natural hazards and disasters and the ICSU/ ROA is developing science plans to address global change, human health and well-being, and energy.

In Europe, projects such as OneGeology, European KIC on raw materials and EUROMINE may have a role to play.

There has been considerable discussion within the committee about any role for ICSU and whether RFG should or could have any role within *Future Earth*. While the desirability of working with the social science and economic communities and others is recognised, it is not obvious how active ICSU would be in brokering such collaboration. Indeed, there may be more potential for IUGS itself to work with selective geounions, in particular, IUGG, and to seek separately involvement of individual social scientists or social scientific societies.

8.6 *What would be needed to attract geosurvey interest/support?*

Primarily, demonstrable evidence of the relevance of RFG to individual geosurvey national and international programmes. But also relevant, tangible, short-term products and other deliverables, which clearly show how the proposed work relates to development aid with argument that will allow and explain why national organisations can help less developed countries.

RFG will need to raise awareness and prominence to the issues it intends to address and propose pragmatic programmes with palpable outcomes that benefit individual geosurveys. Training of staff and other capability building initiatives may also be a key catalyst to gather support from surveys.

Links to OneGeology might be attractive as well as a World Bank initiative to scope/define work related to ‘African corridors’ and release of existing data could be powerful if promoted as RFG.

8.7 *What would be needed to attract industry interest/support?*

RFG will need to demonstrate tangible benefits that could improve efficiencies of delineation of new natural resources and assist in development planning as appropriate. For example:

i. Construction and population of better geological datasets, in particular for less explored terrains;

ii. Making available new data and conceptual models;

iii. Better access to regions of interest;

iv. A better trained workforce in lesser developed countries;

v. Helping to address community opposition to exploration and mining.

In addition, timely products and support for governance-related issues. That would depend on the building on the established contacts with senior staff in Anglo-American, BHP Billiton, Rio Tinto and Vale. If RFG is to progress, it needs to do so in consultation with representatives in those and other companies with a view to identifying activity that a consortium of investors would support. A focus or perhaps more immediately relevant programme could be one that dealt with supply and demand issues, but more importantly, one aimed at winning the argument at a local level about the social license to mine. That aspect of getting societal acceptance in potentially conflicting situations is increasingly important and will become paramount within the next 1-2 decades.

It is particularly important to win support from international funding agencies such as World Bank. This requires that theyare convinced of the beneficial role of RFG in responsible development planning involving finding and developing natural resources.

8.8 *What would be needed to attract others including international funding agencies, researchers etc?*

RFG will need to raise awareness of the prominence and urgency of the issues it intends to address, and also demonstrate key support from renowned researchers and institutions. Relevance to millennium goals such as training and capacity building, genuine opportunities for development through responsible resource production, coupled with a clear expression of need with identifiable benefit both socially and economically. In addition, demonstrable scientific excellence and timeliness of proposed project work, as funding agencies must be convinced that RFG will bring the highest scientific input and encourage inter- and trans-disciplinarity as well as addressing socio-economic interests.

8.9. *Are there likely to be sensitivities arising from having countries with different socio-economic philosophies, stages of development and resource requirements as active participants in RFG (e.g. China, Russia, India, Kazakhstan, Mongolia, US, Canada, Australia, Latin American countries, South Africa, and developing nations in Africa and elsewhere) – and how could any such issues be dealt with?*

Resource nationalism is still strong around the world. In this context, some countries tend to protect their basic information and may not be willing to share data. The initiative will need to be framed in a way to accommodate different views about the subject, whilst working to a common goal. A starting point would be to construct some form of risk register to determine a tactical approach prior to implementation. Moving forward, RFG will need to deal with sensitive issues including economic colonialism, and resource nationalisation. That will command considerable tact and diplomacy and it will be imperative to set the right tone from the start.

More generally although many will commit in principle to joint research projects, in practice sharing national resource data is frequently a barrier to collaboration.

8.10 *What is the general approach and indicative timeline recommended to develop and implement RFG, given that the Pardee Keynote Symposium on Resourcing Future Generations that IUGS is convening for the GSA meeting in late October 2013, and the proposed global summit on Resourcing the Future, to be hosted in China in late-2014?*

The approach is sensible.

It is understood that recommendations from the NASIC core group will be considered by the IUGS Executive Committee at its February 2014 meeting in Goa where a decision will be made regarding initial RFG projects with a view to launch at the Chinese meeting on resources to be held probably in conjunction with China Mining, in October 2014. It would be sensible to try to complete a science and business plan prior to the China Summit which could serve as RFG launch event. It should be launched with a proposal of a few, relevant topics, deliverable within a short time frame, and set with the context of a possible larger programme .

In parallel there are opportunities to:

i. maintain momentum using international meetings such as the European Geosciences Union to build interest within the wider geoscientific community;

ii. encourage ICSU to recognise future resource needs within *Future Earth*.

8.11 *Would there be mutual benefits if IUGS (and partners) were to develop RFG under another over-arching initiative(s), such as the well-funded and broadly-based Future Earth (http://www.icsu.org/future-earth) which is being implemented by an ICSU-led alliance?*

The proposed socio-economic aspects of RFG should benefit from incorporation into the ICSU *Future Earth* but many other elements will be conducted outside of any over-arching international programme. We are not convinced that ICSU is well able to broker effort regarding RFG. It would be of considerable benefit if appropriate elements of RFG were recognised as components of *Future Earth*, particularly projects under Themes 1 and 4, and this would potentially provide access to funds. RFG must not be seen to be in direct competition with *Future Earth*.

9. **The way ahead**

9.1 More work needs to be done to articulate the role of IUGS in relation to RFG and to show how the proposed work complements rather than duplicates the work of others.

9.2. Given that IUGS has firstly to establish and demonstrate its ability to influence and orchestrate a project such as RFG, an approach might be to encourage work to be done on a regional basis before any attempt is made to present a global programme. There could be opportunities to develop projects focussed on western Europe where funding might be available, for example, from the European Union to support such activity. Similarly, there could be scope for regionally-based programmes in parts of

Africa, China and other parts of Asia. As IUGS does not itself undertake work but encourages others to do so, there could be scope to use funds presently allocated to IGCP to kick start a limited number of RFG-related projects. Unless IUGS is able to demonstrate convincingly its ability to encourage and oversee a project as complex as that proposed under RFG, other potential funders such as geosurveys, academies, science foundations and others are unlikely to offer support.

9.3. The Chinese government has been approached for funding for RFG, particularly for resource flows research and the organisation of the late 2014 RFG "launch" meeting in China. If confirmed this would give early impetus to Theme 1.

10. Proving the concept

10.1. In the longer term the ambition of RFG, if approved by the Executive Committee, is to look at the roles of raw material supply, energy and water in sustaining future generations. But in the shorter term the emphasis will be on the future supply of raw materials. Of the four possible identified themes, this means RFG should concentrate on Theme 1, estimating future resource supply and demand, and Theme 4, which links to capacity building and working with other communities, in particular to the social sciences, to explain the need for and to secure the skilled work force necessary for resource exploration and development. NASIC will continue to consider how Themes 2 and 3 can be progressed but in the short term they are only likely to proceed if done in conjunction with Theme 4.

10.2. The proposed RFG initiative has been introduced to various audiences including ICSU in the context of *Future Earth* and to the so-called ICSU GeoUnions at their meeting in Turkey in November 2013. Discussions will continue in relation to Theme 4 (and possibly also Theme 1) and *Future Earth.* The early discussions with the GeoUnions and *Future Earth* leadership were positive, as reflected in the status report of December 2013 at Attachment 1.

10.3. It is proposed that the President and Secretary General contact Sospeter Muhongo, the Tanzanian Minister for Energy and Minerals concerning the scope for multi-disciplinary work in selected demonstration regions of Africa. In parallel approaches to Gabi Schneider (Director, Namibian Geological Survey and current Chair of African Geosurveys), and the Geological Society of Africa (through President, Aberra Mogessie).

10.4. Subject to progress, an announcement about RFG project/s in Africa at the CAG25 meeting (http://www.cag25.or.tz/) to be held in Dar es Salaam during August 2014.

10.5. RFG will continue to be promoted as the opportunity arises at suitable international scientific meetings but during the coming year a more systematic programme is proposed, subject to the agreement of the IUGS Executive Committee including:

i. The annual meeting of the European Geosciences Union, Vienna, Austria, April, possibly as part of a 'Great Debate' or a dedicated scientific session;

ii. Subject to funding, RFG might be formally launched during the China Mining meeting to be held in October 2014 coupled to a session on resource flows ;

And in the longer term at

iii. IGC 35, Cape Town, South Africa, August/September 2016;

iv. Inter IGC meeting, Vancouver, Canada, October 2018.

To be effective it will be necessary to have good promotional material describing in plain language the RFG concept, its scope and phasing.

10.6. Discussions with industry have revealed a level of scepticism about RFG and the ability of IUGS to oversee such an ambitious project. In part this may be due to a failure to adequately explain the scope of the project and how it will interface with and not duplicate the work of industry. Of the four themes there is some interest within industry for a sharply focussed projected centred on Theme I and greater enthusiasm and support for Theme 4. A meeting should held with senior industry representatives through ICMM to discuss issues.

10.7. The intent of Theme 4 may have been misunderstood and we recommend that it is re-titled: "**Building capacity in developing nations for responsible stewardship of Earth resources".**

10.8. Consequently, and subject to the agreement of the IUGS Executive Committee, it is proposed to consult with various interested or potentially interested parties to explore how they might work together under the RFG banner, to build support for and to shape the forward programme in the light of their collective advice.

- Industry
- Geosurveys
- Departments of state responsible for industry and overseas development as well as quasi governmental agencies such as International Development ministries, the European Union, the World Bank, Commonwealth Secretariat and so on
- International initiatives including OneGeology, CGMW, UNESCO

Potentially collaborative bodies include:

- International Council for Science (ICSU)
- UNESCO's Earth Science Division
- OneGeology – (supported by IUGS)
- Commission for the Geological Map of the World (CGMW) – (affiliated with IUGS)
- Commision for the management and Application of Geoscience Information (CGI) – (affiliated with IUGS)
- Geoscience Information in Africa (Giraf) Network – (affiliated with IUGS/CGI and UNESCO)
- Geological Society of Africa (GSAf) – (affiliated with IUGS)
- International Mining for Development Centre (IM4DC)
- Geosurveys
- Industry – (e.g. International Council for Mining and Metals)
- Major research groups involved with natural resources

- Africa Mining Vision (AMV)
- African-European Georesources Observation System (AEGOS) – (IUGS involved through GEO/GEOSS)
- African Association of Women in Geosciences (AAWG) – (affiliated with IUGS)
- AfricaArray – (supported by IUGS)
- West African Exploration Initiative (WAXI)
- Coordinating Committee for Geoscience Programs in East and Southeast Asia (CCOP) – (affiliated with IUGS)
- European Innovation Partnership on Raw Materials (EIP)
- ERA-MIN (Network on the Industrial Handling of Raw Materials for European Industries)

Those conversations will be framed in the context of delivering the millennium goals sustainably.

11. Conclusions

11.1 A potentially valuable initiative but IUGS needs to establish its credibility at the outset by encouraging regional, focussed projects with recognised valuable outputs which can be delivered over a two- to three-year time frame.

12. Acknowledgements

12.1 I am grateful to my colleagues on the NASIC Core Group, to those who have contributed views through our Advisory Groups and to industry colleagues whose forthright comments and criticism has been invaluable in clarify our thinking and in developing our advice to the IUGS Executive Committee.

Submitted, on behalf of NASIC,
Edmund Nickless, Chair
28 January 2014

Attachment 1

Proposal for GeoUnions contributions to *Future Earth*

Drafted by Ian Lambert, SG IUGS

Introduction

The ICSU GeoUnions meeting in Antalya, Turkey, 16-18 November 2013, discussed potential GeoUnions contributions to the ICSU-led *Future Earth* initiative. The GeoUnions maintained that *Future Earth* - would be severely compromised unless it involves geoscience inputs – it must take into account ongoing activities such as mining, agriculture and forestry, which need to be incorporated into holistic development planning.

Ian Lambert gave a presentation on a new initiative being scoped by IUGS: *Resourcing Future Generations (RFG).* His presentation focussed on mineral resources, but it emphasised that the other resources - energy, water, soils, vegetation, human - should be included.

RFG is predicated on the observation that the growing global population and the aspirations of less developed nations mean that the natural resources identified to the present are far below what is required to sustain societies for the 21st century. Finding and developing the additional resources needed presents extremely difficult challenges, given that most of the obvious resources have been identified.

This argument, and the Earth science inputs required, has recently been acknowledged in principle by *Future Earth* leadership, in communications with IUGS.

IUGS' New Activities Strategic Implementation Committee has identified four fundamental themes for addressing the multi-generational needs for mineral (and other) natural resources under RFG (paragraph 8.2):

i. **Comprehensive evaluation and quantification of 21st century supply and demand**

ii. Research programmes in enhanced understanding of subsurface as it relates to mineral (energy and groundwater) resources

iii. Research focussed on evaluation of where additional natural resources are likely to be found

iv. **Building additional capacity and other actions to facilitate delineation and responsible development of natural resources in less developed nations.**

Specific activities are to be developed under each of these. The potential projects are many, but the initial emphasis should be on projects which can achieve significant results within a few years.

Ian Lambert proposed that the boldened subsets of RFG be considered for collaboration between the GeoUnions, and developed into a proposal/s under *Future Earth*. Theme 4 (capacity building and responsible development) requires collaboration between the

GeoUnions and it appears to be particularly relevant to *Future Earth*. Theme 1 (resource flows) would also benefit from collaboration given the numerous inter-dependencies, and appears relevant to *Future Earth*.

Funding required for leadership, coordination, training and capacity building could be sought, including from organisations such as World Bank, on the back of ICSU and with UNESCO backing. UNESCO has expressed interest in discussing opportunities for collaboration in RFG.

Discussion of proposed GeoUnions collaboration under *Future Earth*

Although all 4 themes are required for a successful RFG, theme 1 and theme 4 are particularly aligned with the goals of *Future Earth*. The following are some preliminary thoughts relative to the scope of potential collaboration under *Future Earth*.

Theme 4: Data and skills for responsible development.

Responsible development of natural resources in less developed regions has been hindered by generally inadequate infrastructure, governance, geoscience data/knowledge and trained workforce necessary to undertake the large scale assessments and development planning needed to responsibly and equitably supply future generations. There is a need to clearly articulate needs and aspirations for less developed nations- moving beyond the paradigm of development aid, which has clearly not worked over the past 50 years – by looking to partnerships based on specific needs. The major reasons for bad economic and social outcomes have included corruption, ineffective regulation, incompetence and lack of regional planning – all of which need to be overcome.

Availability of relevant datasets and competent officials are key requirements for sustainable development planning and are not specific to a particular natural resource. For example, the geoscientific data, skills and infrastructure required for locating mineral and energy resources have wider public-good applications in regional development, underpinning:

- Delineation of water resources
- Environmental protection/rehabilitation
- Building cities and infrastructure
- Understanding soils and landforms
- Mitigating hazards and risks
- Mapping biodiversity domains

The GeoUnions are invited to collaborate in providing enhanced data layers required for regional development planning, including in relation to:

- Geology and geophysics
- Mineral and energy occurrences
- Water
- Soils
- Land cover and other remotely sensed data, including for environmental condition, and geological and resource mapping
- Digital elevations
- Land use

- Landform evolution
- Socioeconomic considerations.

IUGS suggests that this could begin with demonstration projects in a restricted number of regions and that it should cover all natural resources and involve data compilations, research and training, consideration of current/potential land uses and impacts, and integrated socioeconomic evaluations.

Theme 1: Resource flows

IUGS plans to cover long-term global minerals and energy flows, including changes in the relative importance of commodities. Other GeoUnions are invited to consider whether they could contribute evaluations for water, soils, vegetation, etc. It is envisaged that resource flows would be conducted through Delphi-type approaches, with participating experts drawing on data and views assembled by a dedicated group for each resource type.

Actions

1. Each of the GeoUnions consider whether and how they could participate in semi-autonomous projects under the broad RFG umbrella: in particular contributing data and expertise to Theme 4, and also to Theme 1.
2. Consider the merits of pursuing incorporation of the proposed collaborative projects under *Future Earth*, as suggested.

As IUGS will be considering RFG in some detail at its Executive Committee meeting in early February, 2014, it would be helpful if other GeoUnions could provide (at the least) short statements expressing interest in principle in participating in the planned collaborative projects, or otherwise, and any initial thoughts they wish to share **by 30 January 2014**. (IUGG has already done so, nominating contacts). More detailed proposals could be developed by mid-2014.

Advisory groups

1. NORTH AND CENTRAL AMERICA:
    a. Pat Leahy (NASIC Member)—Hydrogeology, General Geology, Geological Surveys;
    b. Jack Hess – Hydrogeology, Scientific Societies, Karst Systems;
    c. Jim Franklin—Economic Geology, government, industry consulting;
    d. Jon Price—Economic Geology, Geologic Mapping, Government, Mining;
    e. Murray Hitzman –Economic Geology, academia, industry consulting;
    f. Larry Meinert –Economic Geology, resource assessment, government;
    g. The final individual we are seeking will be an individual who can provide expertise on the situation in Mexico and Central America. Ideally, it will be someone with strong industry ties.

2. SOUTH AMERICA:
    a. Marcio Godoy (NASIC Member).

3. AUSTRALIA/OCEANIA:
    a. Ian Lambert (NASIC Member); Natural resource management; economic geology, geochemistry; advice to government
    b. Peter Cook; Former head of BGS, CO2 Cooperative Research Centre
    c. Lynton Jaques; Economic geology, exploration trends, sustainable resource use
    d. Paul Dirkes; Economic geology, training, needs of developing nations
    e. Margaretha Scott; Mineral potential, economic geology
    f. Robin Evans; mining engineering, training in mining for development
    g. Mitch Hooke.Minerals Council of Australia

4. CHINA/INDIA/MONGOLIA:
    a. Anjian Wang (NASIC Member);
    b. Orchir Gerel, Mongolia
    c. Harsh Gupta, India?

5. ACADEMIA:
    a. Roland Oberhänsli (NASIC Member).
    b. Manfred Strecker, Germany
    c. Sakae Sano, Japan

6. GEOSURVEYS:
    a. John Ludden (NASIC Member);
    b. Bruno Goffe, CRNS;
    c. Oleg Petrov, VSEGEI, Saint Petersburg;
    d. Arvanitidis Nikolaos (GTK) KTD Finland;
    e. Nick Arndt, as a cross over member with Neil/Ian's group.

7. ECONOMIC GEOLOGY:
    a. Neil Williams (NASIC Member).

8. INDUSTRY:
    a. Edmund Nickless (NASIC Member);
    b. Andrew Mackenzie – CEO, BHP;
    c. Graham Brown – Group Head of Geosciences, Anglo American.

9. AFRICA:
    a. Mxolisi Kota (NASIC Member).

10. GEOPHYSICS/AFRICA:
    a. Ray Durrheim (NASIC Member);
    b. Professor Judith Kinnaird, University of the Witwatersrand Johannesburg;
    c. Professor Kim Hein, University of the Witwatersrand Johannesburg;
    d. Professor Qasim Jan, COMSTECH Secretariat, Pakistan;
    e. Dr Felix Toteu, UNESCO, Nairobi, Kenya;
    f. Dr Sospeter Muhongo, Minister of Minerals and Energy, Dar es Salaam, Tanzania;
    g. Professor Moctar Doucoure, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa.