

Resourcing Future Generations:



OPEN CALL FOR PROPOSALS



Resourcing Future Generations (RFG) is a major initiative of the International Union of Geological Sciences (IUGS)¹. It was launched in 2013 to bring world attention to the challenges of sustaining resource supplies and to outline a pathway to the future, including a route to nation-building and poverty alleviation through resource development². The RFG initiative includes a diverse group of geoscientists, economists, and environmental and social scientists drawn from a range of institutions with diverse private and public experience in exploration, mining, processing, environmental protection, and sustainable development. RFG aspires to be a fundamental service to humanity, not to vested interests in resource development.

IUGS now invites bids for small top-up grants to take forward discrete pieces of work in support of RFG. Details of the application process are below. The invitation is open to all though, in the event of equally judged applications, preference will be given to those from adhering members or affiliated organisations of IUGS³. The closing date for the first round of applications is noon UTC 31 May 2016. A second round will be announced after the 35th IGC⁴. Applications will be decided on the basis of excellence, novelty, timeliness and relevance to RFG by an awards panel comprising members of the RFG Core Group⁵.

A Global Effort to Meet the World's Future Needs Head-on

The 20th century and early part of this century saw a dramatic increase in living standards and improvement in the quality of life for many of the world's poorest. That improvement has been underpinned by the ubiquitous use of metal and mineral resources in technology and infrastructure. The demand for raw materials to satisfy the higher standards of living that the developing world has every right to expect is apparently insatiable and challenges from where these materials are to come. To maintain this trajectory while addressing climate change and rising world population, sustainable sources of raw materials are required, by both developed and developing countries (see figure 3).

Regardless of whether known supplies are enough to cover demand in the near term, efforts must be made now to forestall unpredictable yet inevitable supply shortages in the decades to come — shortages that would dramatically impact deployment of low-carbon technology to mitigate climate change as envisaged by the Paris Accord agreed at COP 21 (see figure 4).

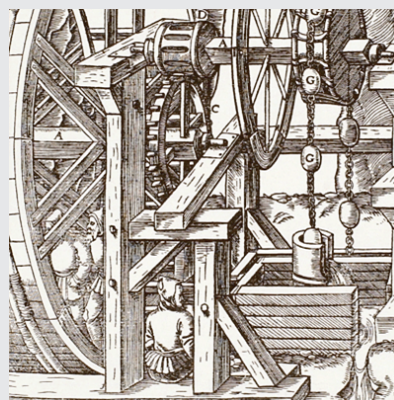


Figure 1

Winding gear and shaft, from 'De Re Metallica' (Agricola, 1556)

Figure 2

Bingham Canyon, Utah



When Georgius Agricola wrote "De Re Metallica" (On the Nature of Metals (Minerals)) in the 16th century, he could not have foreseen how the scale and technology surrounding mineral extraction would evolve. Mining has progressed from being a small-scale artisanal activity (Figure 1) to a highly technological one on a vast scale – as at Bingham Canyon, Utah (Figure 2), a mine 4km wide and 1.2km deep.

REMIT OF THE CALL

Applications are invited for

- Novel work on an aspect of RFG, which develops an ongoing piece of work or an already separately funded research grant;
- Organising and running a workshop to promote RFG or an RFG theme.

All awards must start by 1 August 2016 and the work completed and outcomes reported by 31 January 2017. Grants will average \$3000, though exceptionally a larger sum may be awarded.

Application procedure

Applications must describe the work proposed and how it will advance one of the three themes of RFG

- Balancing resource supply and demand in the 21st century;
- The challenge of mineral supply: Accessing new resources from the Earth;
- Building additional capacity to facilitate responsible development in less developed nations.

The work must be capable of completion within 6 months of the agreed start of the award. Applications are to be submitted electronically as a word document stating:

- i The name, position and host institution/body of the principal investigator together with the names and affiliation of any co-workers;

- ii The title of the project together with a brief description of the proposed work (no more than 200 words);
- iii The work proposed (in no more than 2000 words) including the research question to be addressed (if appropriate), the technical approach to be adopted, why it is important and timely, a project management plan, foreseen outcomes and how they link to and the benefits arising to RFG;
- iv Details of the funds sought with outline budget and how it links to existing research grant or other existing funding support.

Submissions should be completed in single-spaced typescript of minimum font size 11 point Arial or another sans serif typeface of equivalent size to Arial 11, with margins of at least 2 cm. References must also be presented in a minimum font size of 11 point. Arial Narrow and Calibri are not allowable font types as they are smaller and any proposal which has used either of these font types within their submission will be rejected. Applicants referring to websites should note that the Awards Panel may choose not to use them.

Assessment procedure

The main assessment criteria will be the scientific and technological excellence of the proposal together with consideration of the novelty. Applications will be assessed by an Awards Panel comprising recognised experts, assisted, if necessary, by written external peer review. Principal investigators may be invited to respond to reviewers' comments.

Call timetable

Call opens	1 April 2016
Deadline for proposals	Noon (UTC) 31 May 2016
Assessment panel	June 2016
Grants awarded	July 2016
Grants start	1 August 2016
Report submitted	31 January 2017

Applicants will be informed as soon as possible of the funding decision. Awardees will be required to provide a written report.

Contact details

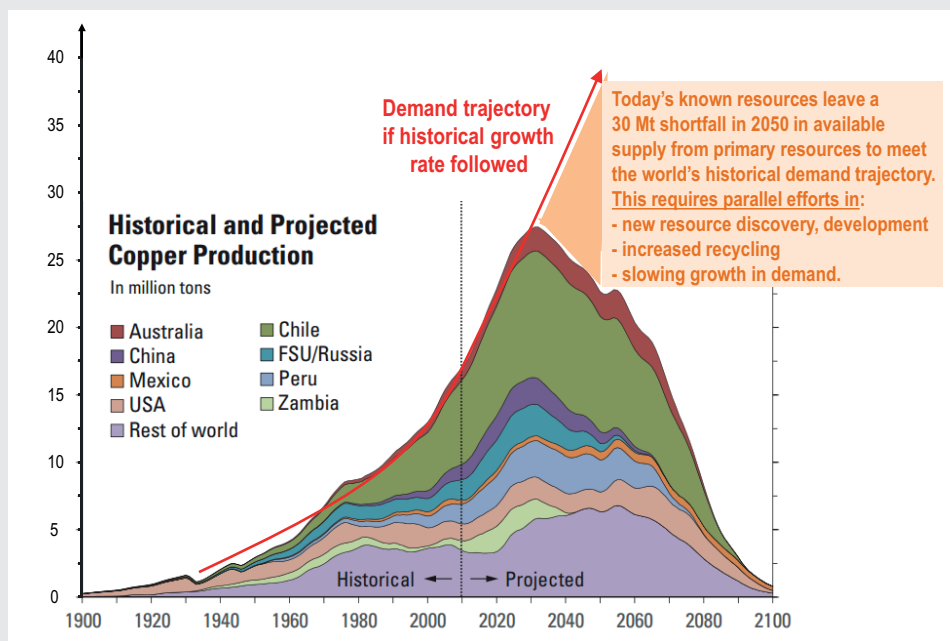
Grant applications should be sent to edmund@geolsoc.org.uk. Questions of clarification may be sent to the same address.

Figure 3

Primary Copper Production
– Historical & Projected.
Modified from Kerr 2014 and
Northey et al 2014

A growing global population and continuing urbanisation will significantly increase demand for the basic metals required for future infrastructure development, such as copper, especially in the developing world. The same is true of many other bulk metals.

Copper is a key component in building construction, power generation and transmission and the production of industrial machinery and equipment. As can be seen in figure 3, even optimistic current projections see a peak in supply likely to occur around 2030. Without action, demand will outstrip supply. Recycling has an important role to play, but given that resources may remain ‘locked away’ in infrastructure for 80-120 years, its contribution will be limited for the foreseeable future, necessitating continuing primary production at scale. New reserves must be found to fill this entirely predictable gap.



Progress so far

Since the launch of RFG in 2013, we have held Town Hall discussion events at meetings of AGU and GSA, published an article in *Episodes*⁶ and a brochure⁷.

In October 2014 at the China Mining meeting in Tianjin, we launched *Resourcing Future Generations White Paper: Mineral Resources and Future Supply*⁸.

In July 2015, with support from IUGS, the International Council for Science and the United Nations Educational, Scientific and Cultural Organisation, a group of seventeen geoscientists and social scientists, including economists, met on retreat at the Goche Ganas Nature Reserve near Windhoek, Namibia. The discussion and our recommendations are brought together in a 78-page report⁹ and summarised in a one-page briefing note for legislators, policy advisers and opinion formers¹⁰.

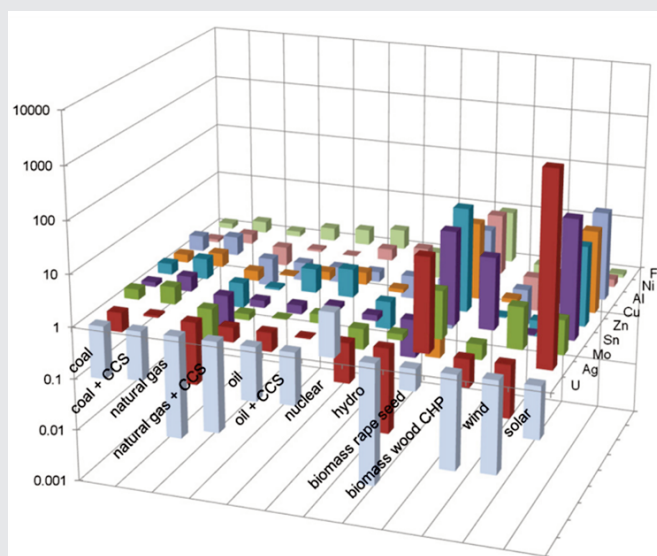


Figure 4

Demand for selected metals in different power generation technologies.
Source: Klein, 2012

As we move from carbon-intensive forms of energy (coal, natural gas and oil) towards more environmentally friendly forms (biomass, hydro, wind and solar), there will be steep increases in the quantity (between 2 and 100 times as much) and variety of metals we need for power generation. Figure 4 illustrates demand for iron, nickel, aluminium, copper, zinc, tin, molybdenum, silver and uranium for different power technologies. Wind turbines also require rare earth elements for magnets, and PV solar cells depend on cadmium, tellurium, indium, gallium, germanium and ruthenium. Transmission systems and innovative energy storage technologies will also bring new mineral demands.

Resourcing Future Generations:



WORK PLAN FOR 2016



Action is needed now to address future supply problems that are unpredictable in time and detail, but foreseeable and inevitable. Over the coming year we will continue to raise awareness of RFG with stakeholders such as the International Union for Conservation of Nature and Natural Resources and the International Resource Panel (IRP) of the United Nations Environment Programme, and those with relevant experience and expertise, both within and beyond IUGS (including in other communities such as engineers), by:

- i** Promoting the White Paper and report of the Namibian workshop in the context of the Paris Accord after COP21;
- ii** Seeking to work with partner organisations and link to existing initiatives. Horizon 2020 could be a mechanism if there was willingness by the EU to raise the issue at a G8/G20 meeting;
- iii** In the UK, working with government officials and advisors, in particular through the Government Office of Science. There will be parallels in other countries, in particular in Germany and the USA;
- iv** Building links with high technology industries as 'users' of critical materials;
- v** Engaging with industry, governments, national geological surveys and funding agencies through multiple approaches seeking their participation and that of the wider research communities;
- vi** Considering if there is scope to address social issues and to engage with different audiences (possibly straddling bodies such as the United Nations Environment Programme, UNESCO, the World Bank, the World Economic Forum and the International Council on Mining and Metals);
- vii** Working with UNEP International Resources Panel on its proposed review of future mineral and metal supply in the circular economy;
- viii** Identifying and publishing about RFG in high impact journals bridging economics, foreign affairs and science policy.

In addition, a two-day symposium on resourcing future generations is being planned for the 35th IGC at Cape Town, South Africa from 27 August to 4 September 2016 and the topic is the basis of the RFG2018 conference to be held in Vancouver, British Columbia in June of that year.

If you have comments or wish to become involved email Edmund Nickless, Chair, IUGS New Activities Strategic Implementation Committee edmund@geolsoc.org.uk

Footnotes

1. The International Union of Geological Sciences (IUGS) is one of five geosciences-related scientific unions within the International Council for Science (ICSU). With 121 national members, the IUGS aims to promote development of the Earth sciences through the support of broad-based scientific studies relevant to the entire Earth system; to apply the results of these and other studies to preserving Earth's natural environment, using all natural resources wisely and improving the prosperity of nations and the quality of human life; and to strengthen public awareness of geology and advance geological education in the widest sense. Further information on IUGS is at <http://www.iugs.org/>. The International Council for Science (ICSU) is a non-governmental organisation with a global membership of national scientific bodies (122 Members, representing 142 countries) and International Scientific Unions (31 Members). See <http://www.icsu.org/>
2. Resourcing Future Generations was launched in February 2013. Background is at <http://iugs.org/index.php?page=resourcing-the-future-initiative> and <http://www.geolsoc.org.uk/RFG>
3. Membership of IUGS comprises Adhering members and Affiliated organisations. Adhering members are listed at <http://iugs.org/index.php?page=adhering-members>; Affiliated organisations are listed at <http://iugs.org/index.php?page=directory#AO>
4. The 35th IGC will be held in Cape Town, South Africa from 27 August to 4 September 2016. Further details are at <http://www.35igc.org/>
5. Membership of the RFG Core Group (listed as 'Strategic Implementation Committee') is at <http://iugs.org/index.php?page=directory#spc>
6. Lambert, I., Durrheim, R., Godoy, M., Kota, M., Leahy, P., Ludden, J., Nickless, E., Oberhaensli, R., Anjian, W., Williams, N. Resourcing Future Generations: A proposed new IUGS initiative. Episodes. June 2013 <http://www.episodes.org/index.php/epi/article/view/57474/44844>
7. RFG brochure <http://www.geolsoc.org.uk/~media/shared/documents/RFG/ResourcingFutureGenerations%20%20%20FINAL.pdf?la=en>
8. Nickless, E., Bloodworth, A., Meinert, L., Giurco, D., Mohr, S., Littleboy, A. Resourcing Future Generations White Paper: Mineral Resources and Future Supply. International Union of Geological Sciences. 2014, 30pp. http://iugs.org/uploads/Consultation%20Paper%202014_Oct_12_AL_EN_DG%20FINAL.swf
9. Nickless, E., Ali, S., Arndt, N., Brown, G., Demetriades, A., Durrheim, R., Enriquez M.A., Giurco, D., Kinnaird, J., Littleboy, A., Masotti, F., Meinert, L., Nyanganyura, D., Oberhänsli, R., Salem, J., Schneider, G., Yakovleva, N. Resourcing Future Generations: A Global Effort to Meet The World's Future Needs Head-on. International Union of Geological Sciences. 2015, 78pp. <http://iugs.org/uploads/RFG%20Report-sm.pdf>
10. RFG policy statement <http://www.geolsoc.org.uk/~media/Files/RFG%20Policy%20Statement.pdf?la=en>