GeoERA Raw Materials to support Europe's resilience on raw materials

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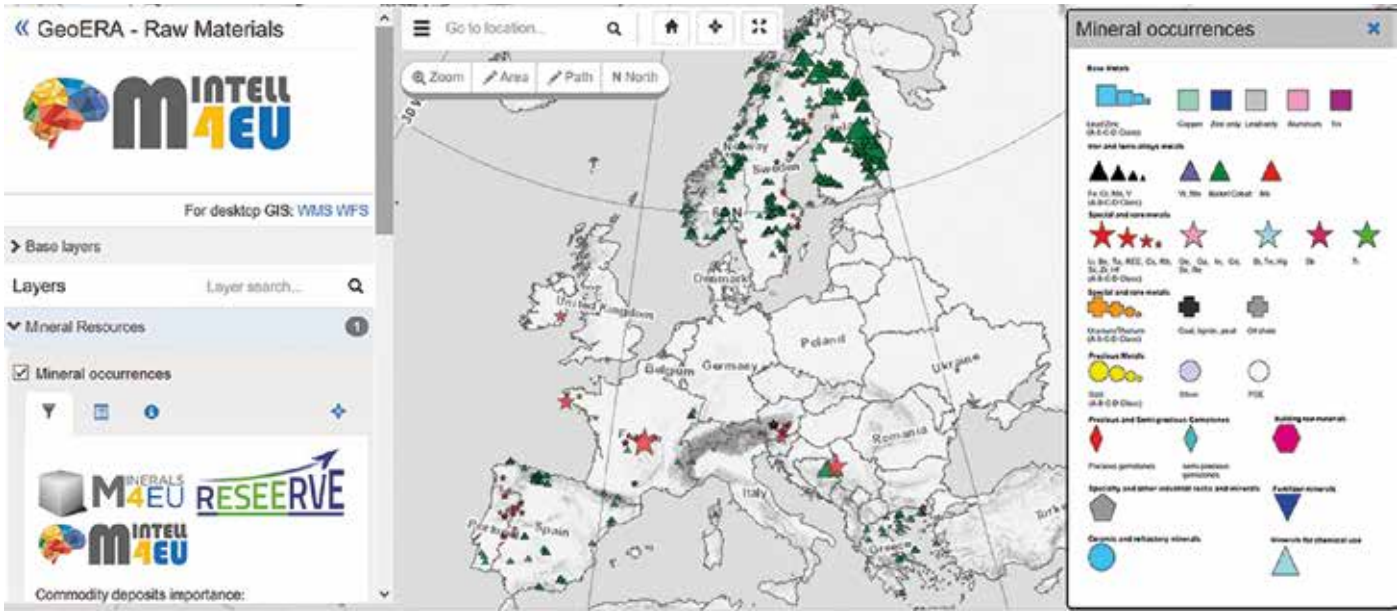

Fig. 1 Cobalt (green triangles) and lithium (red stars) occurrences in Europe (as of November 2020). Different sizes reflect the assessed amount of the commodity in question; most of the small symbols reflect non-quantified occurrences.

Europe's vision to be a climate neutral economy by 2050 has ushered in the energy transition. Carbon-neutral energy supply is based on raw materials from which energy-critical elements for rechargeable batteries like cobalt, graphite, lithium and rare earth elements can be purified. In addition to direct energy generation, other future-oriented, environmentally friendly key technologies needed for digitisation and mobility can only be engineered by using raw materials (European Commission 2019). Semiconductors, super alloys and lightweight steel, fibre optics are amongst the fundamental technical components for which scarce chemical elements like tellurium, gallium, germanium, rhenium or scandium are crucial (Marscheider-Weidemann et al. 2016). Many important raw materials can only be found in low concentrations in accessory minerals in the usually accessible upper hundred meters of the Earth's crust. Because of their low concentrations, they are rarely a primary mining target. In what geological environment and by what means such elements are enriched is still a lively scientific debate. Moreover, the mineralogy that needs to be cracked to extract the desired chemical elements is often a technological challenge. Furthermore, social, environmental, economic, political constrains have their share to limit the raw materials accessible further, but are also part of the solution towards a responsible and sustainable sourcing. These aspects must be taken into account and lead to a number of studies and policies to define critical raw materials. Among these is the sequential reviewing exercise to determine Europe's Criti Europe's vision to be a climate neutral economy by 2050 has ushered in the energy transition. Carbon-neutral energy supply is based on raw materials from which energy-critical elements for rechargeable batteries like cobalt, graphite, lithium and rare earth elements can be purified. In addition to direct energy generation, other future-oriented, environmentally friendly key technologies needed for digitisation and mobility can only be engineered by using raw materials (European Commission 2019). Semiconductors, super alloys and lightweight steel, fibre optics are amongst the fundamental technical components for which scarce chemical elements like tellurium, gallium, germanium, rhenium or scandium are crucial (Marscheider-Weidemann et al. 2016). Many important raw materials can only be found in low concentrations in accessory minerals in the usually accessible upper hundred meters of the Earth's crust. Because of their low concentrations, they are rarely a primary mining target. In what geological environment and by what means such elements are enriched is still a lively scientific debate. Moreover, the mineralogy that needs to be cracked to extract the desired chemical elements is often a technological challenge. Furthermore, social, environmental, economic, political constrains have their share to limit the raw materials accessible further, but are also part of the solution towards a responsible and sustainable sourcing. These aspects must be taken into account and lead to a number of studies and policies to define critical raw materials. Among these is the sequential reviewing exercise to determine Europe's Critical Raw Materials List conducted for the European Union sets the political framework and defines what and why a raw materials are currently considered to be critical (European Commission 2020). The approach assesses various indicators from a European perspective, including economic importance, trade distortions, the import dependencies, recyclability and substitutability.

Fig. 2 The Rock Gallery example shows the granite monlith and adjoining sculptures in the Vigeland Sculpture Park, Oslo Numerous unique resources of ornamental stone have given a geological signature to architecture and art of Europe

Increase the raw materials supply from domestic sources that abid the high ethical, social and ecological standards is one of the recommendation of the European Commission that has been repeatedly expressed.

Europe has a long history in mining going back for centuries. Easy targets are to a large extend already mined out. Modelling of geological enrichment processes and the use of innovative exploration tools to discover unknown raw materials are techniques and methods that build on comparable, high quality and reliable data including geochemical and mineralogical analyses. It calls for a coordinated database, which uses harmonized vocabulary and cross-border validation schemes. A task most of the Geological Survey Organisations (GSO) of Europe already committed to in earlier European projects.

GeoERA Raw Materials: a joint Programme towards Europe's raw materials intelligence

Europe represents great cultural variety echoed by more than 100 different languages spoken in an area about half the size of Australia. As such, many of the GSO in Europe have developed their own reporting on their national resources. The standards and vocabulary used have grown over time and only some are understood in the same way across national borders. This calls for concerted actions to which more than 50 individual regional and national European Geological Survey Organisations of 30 countries respond with the GeoERA as a joint programme supported by the European Commission. The overarching objective of GeoERA is to contribute to the optimal use and management of the subsurface. Underpinned by fifteen research projects in the four themes GeoEnergy, Groundwater, Information Platform and Raw Materials it supports 1) a more integrated and efficient management and 2) more responsible and publicly accepted, exploitation and use of the subsurface. The GeoERA Raw Materials comprises four projects ranging from dimension stone (EuroLithos) to seabed (MINDeSEA) and land-based (FRAME) minerals supported by a data management project (Mintell4EU).

The joint programme GeoERA takes advantage of the optimised network of the Regional and National Geological Survey Organisations of the European States, Europe's long tradition in mining and quarrying and on new methods, models and data to unlock domestic resource potential. Based on the respective national databases on sites and commodities, specific issues along with a more general perspective across national borders aim at compiling and unifying the geoscientific knowledge on Europe's resource potential. The scientific projects establish the first stepping-stone to secure reliable and responsible sourcing from domestic sources by

- providing a common and harmonised minerals inventory of known mineral resources and their development status' (Figs. 1 and 2);
- establishing harmonized vocabularies and cross-border validation schemes;
- identifying new sources of supply through critical mineral potential mapping and quantitative mineral assessment on land and in the European seabed, with focus on the CRM needed in the course of the Energy transition (Fig. 3);
- identifying and mapping principal metallogenic areas defining models for different types of mineralisation (Fig. 4);
- developing new methods and technologies to unlock Europe's Raw Materials potential;
- providing test cases on the operability and applicability of the UNFC for Geological Surveys tasks.

Common digital database

Site-specific detailed data and information required in the context of mining activities are usually a task for the industry. The regional and national Geological Survey Organizations of Europe are the counterpart that provides decision-makers from government and the public with comprehensive and unbiased information. The United Nations Framework Classification of Resources (UNFC) integrated into the United Nations Resource Management System (UNRMS) could prove to be a suitable instrument to communicate complex issues in a simplified manner to the society. The strength of the classification system is to combine scientifically sound information on the level of confidence on geological knowledge in addition to the feasibility of a project as well as social-environmental considerations in a standardized way with ecological and social requirements.

MINTELL4EU is a lighthouse project that compiles knowledge and information on commodities from the data provider's national data sources. Currently 30 data providers from 29 European countries (more to come in 2021) add to the established harvesting routine that collects, validates and stores data in a central database in line with the INSPIRE regulations of the European Commission (European Commission n. d). The common data structure builds on former projects and data are exposed at the EGDI infrastructure. Through EGDI, Europe's Mining Inventory is visualised in different maps, e.g. a map showing historical mine sites with touristic interest will be made accessible via EGDI (Fig. 5). The map includes international important sites as UNESCO Global Geoparks, UNESCO World Heritage sites and much more.

Where is the benefit?

The cooperation in GeoERA improves mutual understanding in the multilingual community by enhancing a common language and knowledge. Mineral deposits are temporally or spatially connected and do not stop at national borders. Therefore, common charac-

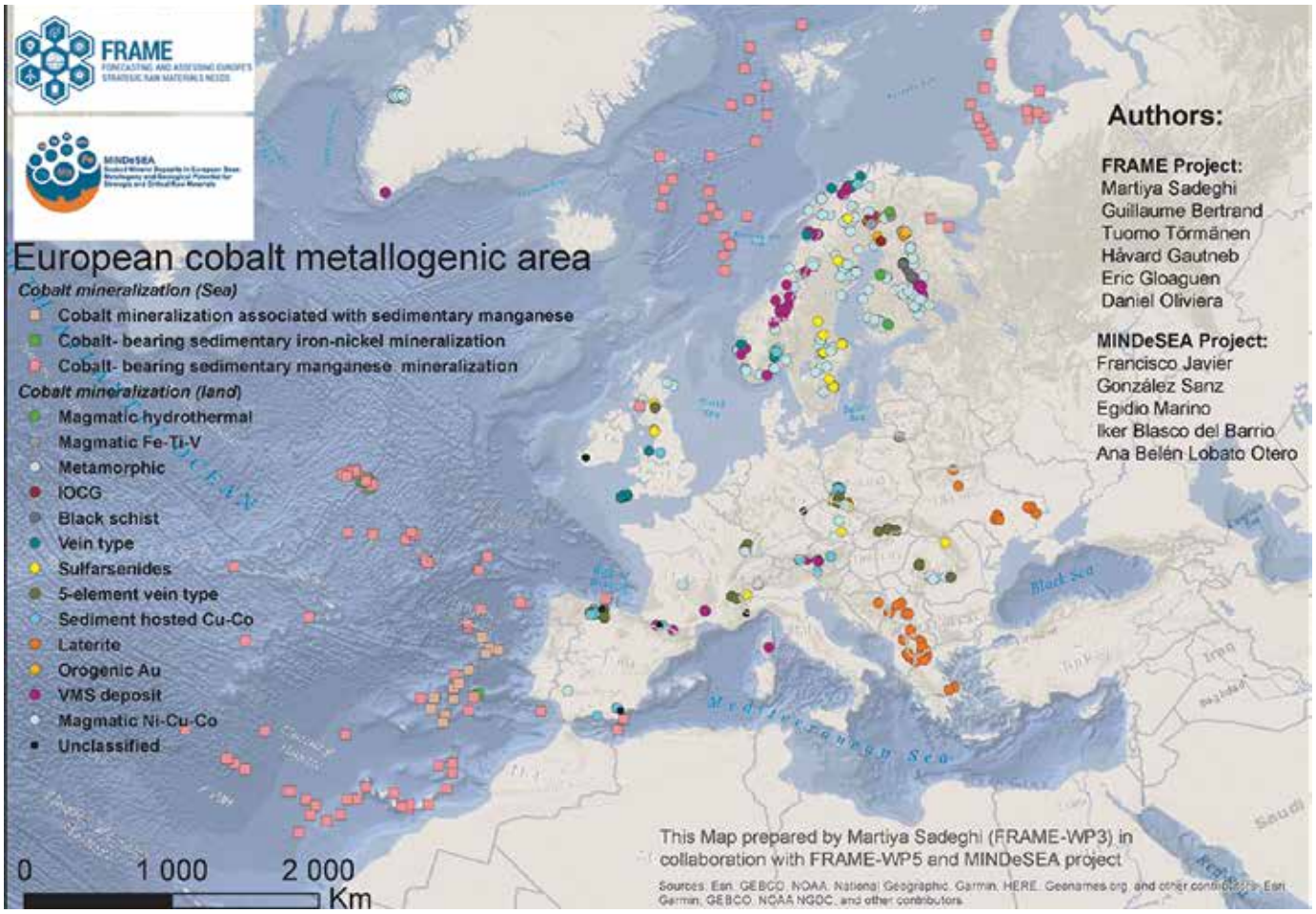

Fig. 3 European cobalt metallogenic areas classified by style of mineralization, status October 2020

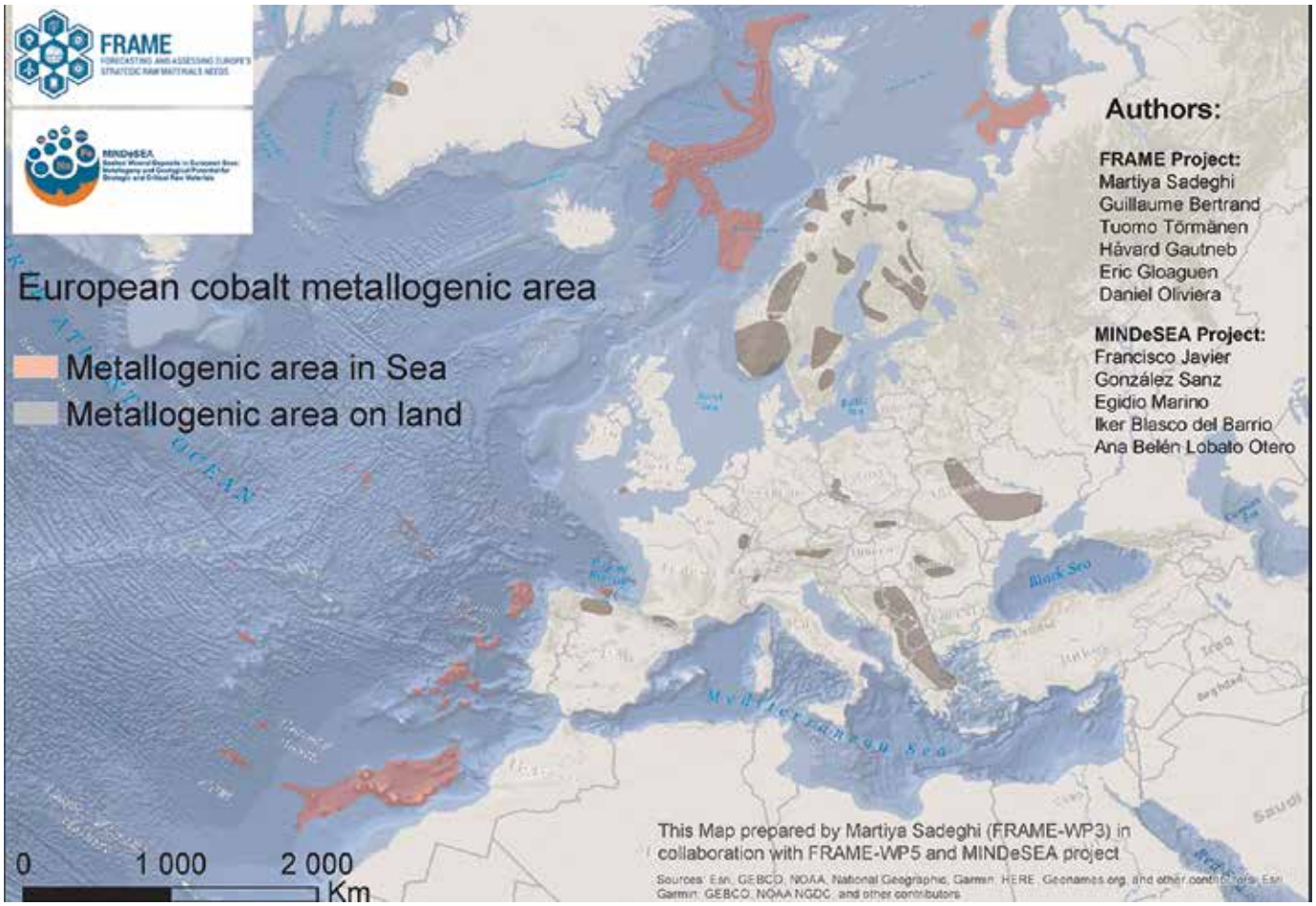

Fig. 4 European cobalt metallogenic principal areas, status October 2020

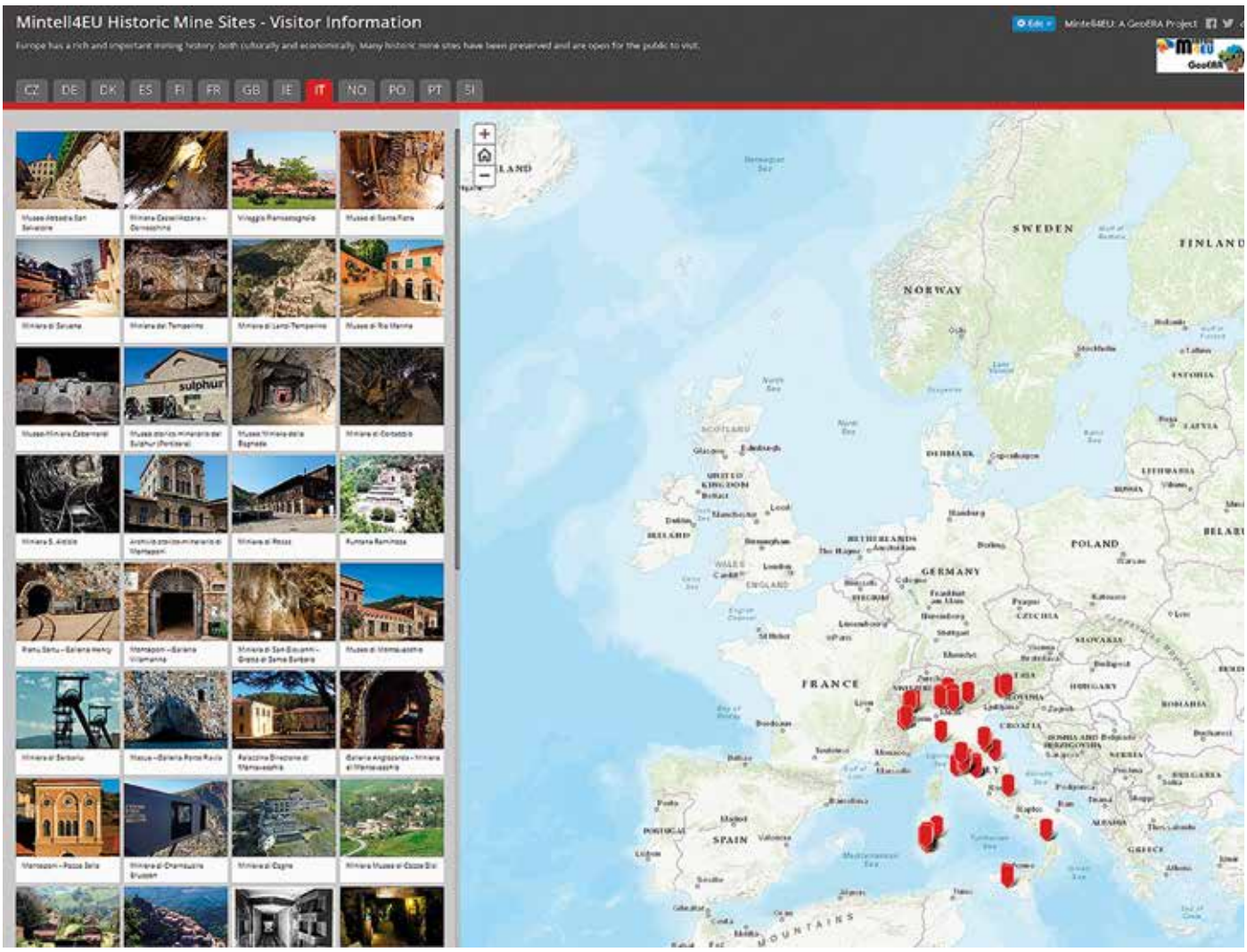

Fig. 5 Historical mining sites minerals inventory includes tourist information for visitors lised by country. The example shows Italy with status October 2020

teristics, signatures and structures across political borders must be considered. This is only possible with a mutual understanding of the output and a common set of reliable and validated data. GeoERA Raw Materials builds on existing data sets, adds to these and mutually improves quality and reliability. With the GeoERA Raw Materials scientific projects, the community promotes a collective understanding of science about critical minerals in relation to their environment, their European distribution and the likelihood of discovering unknown potentials through the exchange of data, knowledge, information and creating solid networks of expertise. By recognizing knowledge gaps and using individual strengths to improve working relationships and exchange specialist knowledge, further improvements are approached and considered to be continued in later collaboration. With GeoERA, the community of Geological Survey Organisations of Europe provides neutral and unbiased information to the public.

GeoERA – a joint programme of the Geological Surveys in Europe

Europe is a continent of 51 sovereign states of which 27 are part of the European Union. GeoERA is a joint programme of more than 50 individual Survey Organisations of 30 countries. The GeoERA covers the applied geosciences, addressing the following themes: Raw Materials, GeoEnergy, Groundwater and Information Platform.

The importance of raw materials to our society today and to become carbon-neutral by 2050 are underlined by terms like Critical Raw Materials, Energy Critical Elements, Battery Minerals, Strategic Raw Materials.

GeoERA Raw Materials provides unbiased and science-based knowledge and information to the public. GeoERA Raw Materials focuses on strategic and critical raw materials in Europe on land (FRAME) and in the seabed of Europe's territories (MINDeSEA). With information on the raw material occurrence (known and potential) GeoERA Raw Materials provides a common raw materials inventory (MINTELL4EU), improved vocabulary and codes also on dimension stones (EuroLITHOS). GeoERA Raw Materials is a step forward to publicly available reliable pan-European database based on scientific knowledge and information through The European Geological Data Infrastructure of the EuroGeoSurveys (EGDI) as the hosting data infrastructure.

For more information visit https://geoera.eu and specific homepages of the scientific projects FRAME (www.frame.lneg.pt), MINDeSEA (https://geoeramindesea.wixsite.com/mindesea) and EuroLithos (https://www.eurolithos.org).

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Disclaimer

News of the Society

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Due to the COVID-19 pandemic, the e-Council Meeting was organized on October 22, 2020 from 12,00 to 14,30 CET via Zoom. After welcome by D. Huston (SGA President), the Agenda was handled by J. Pašava (SGA Executive Secretary). Council members received all reports in advance and only items that needed council vote were discussed. At the end of the e-meeting all submitted reports were approved with great thanks.

Roll Call and Apologies

Present: G. Beaudoin (for part of the meeting), G. Bozkaya, T. Christie (Chair LOC SGA 2021), H. Frimmel, D. Huston (SGA President), C. McCuaig, P. Garofalo, G. Graham, D. Holwell, P. Mercier-Langevin, E. Naumov, J. Kolb, S. Mikulski, J. Pašava, S. Petersen, R. Skirrow, J. Slack, G. Tourigny (for part of the meeting) and A. Vymazalová.

Apology: D. Banks, S. Bouhlel, C. Conde, S. Decree, E. Ferrari, A. Idrus, B. Lehmann, B. Orberger, I. Pitcairn, N. Saintilan, Y. Song, X. Sun.

1. Summary of previous e-Council Meeting (March 30, 2020) – J. Pašava
   Council decision not needed
2. Reports of officers on Council:
   2.1 Report from President (D. Huston)
   Council decision not needed
   2.2 Report from Executive Secretary (J. Pašava)
   Council decision not needed
   2.3 Report from Treasurer (H. Frimmel)
   Council decision not needed
   2.4 Report from Promotion Manager (S. Decrée)
   Council decision needed on selection newly proposed promotional items and quantity
   Neon Safety Jacket : >1.74€
   Camera cover for laptop : >0.10€
   Magnet: >0.09€
   Neon armband: >0.23€
   Armband (for the Biennial meeting?): >0.11€
   Tag for luggage: >0.43€
   Action: After discussion, the council approved the presented reports with great thanks and the following motions:
   D. Huston to send a letter to Newmont Company, asking for continued support for the production of new SGA-Newmont Gold medals.
   H. Frimmel to contact the Zürich Insurance Company regarding SGA 2020 insurance payment.
   S. Decrée to negotiate best deals for the purchase of newly proposed promotional items except of masks with producing companies (quantities in range from 500 to 1000 pcs, depending on best offer).
   J. Pašava to contact IUGS Secretary General to find out how to manage IUGS financial contribution towards African Metallogeny Course.
   2.5. Report from Chief Editor, SGA News (J. Kolb)
   Council decision needed on widening the editorial team (one or two associate editors for the student chapter submissions and a paid student for importing into the Adobe InDesign program). Present Chief Editor would do the final editing in the program.
   Action: After discussion, the council approved widening the editorial team and asked J. Kolb to look for suitable persons to help with technical editing with a remuneration of up to 500 Euro per year (to be arranged through H. Frimmel as SGA Treasurer).
   2.6 Report from Chief Editors, MD (B. Lehmann)
   Council decision not needed
   2.7 Report from Chief Editor SGA Special Publications (J. Slack)
   Council decision not needed
   2.8 Report from the Chief Editor SGA website (I. Pitcairn)
   Council decision needed on prioritization of the following website development projects:
   - Setting up a storage place for SGA documents at SGA website for Council members (access via password).
   - Update the SGA membership application on-line forms to enable members to donate to SGA EF.
   - Adapt SGA website for e-submission of contributions to SGA News.

   Action: After discussion, the council recommended to ask Iain Pitcairn to update the SGA membership application on-line forms in collaboration with Blueways to enable members to donate to SGA EF.
   2.9 SGA Educational Fund (D. Banks)
   2.10 to 2.16 Reports from Regional Vice Presidents (Asia, Australia/Oceania, Europe, North Africa and Middle East, Sub-Saharan Africa, North America, South America)