

THE GEO COMMUNITY ACTIVITY "EARTH OBSERVATIONS FOR MANAGING MINERAL AND NON-RENEWABLE ENERGY RESOURCES": HISTORY, PRESENT AND FUTURE ACTIVITIES

Stéphane Chevrel, MinPol, Austria,
PoC CA-06

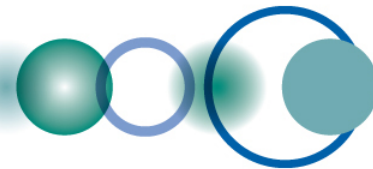
and

Michael Abrams, JPL, USA
Cindy Ong, CSIRO, Australia

Presented by Michael Abrams



Economic and societal importance of minerals



**Mining is not everything, but without
mining, everything is nothing!**

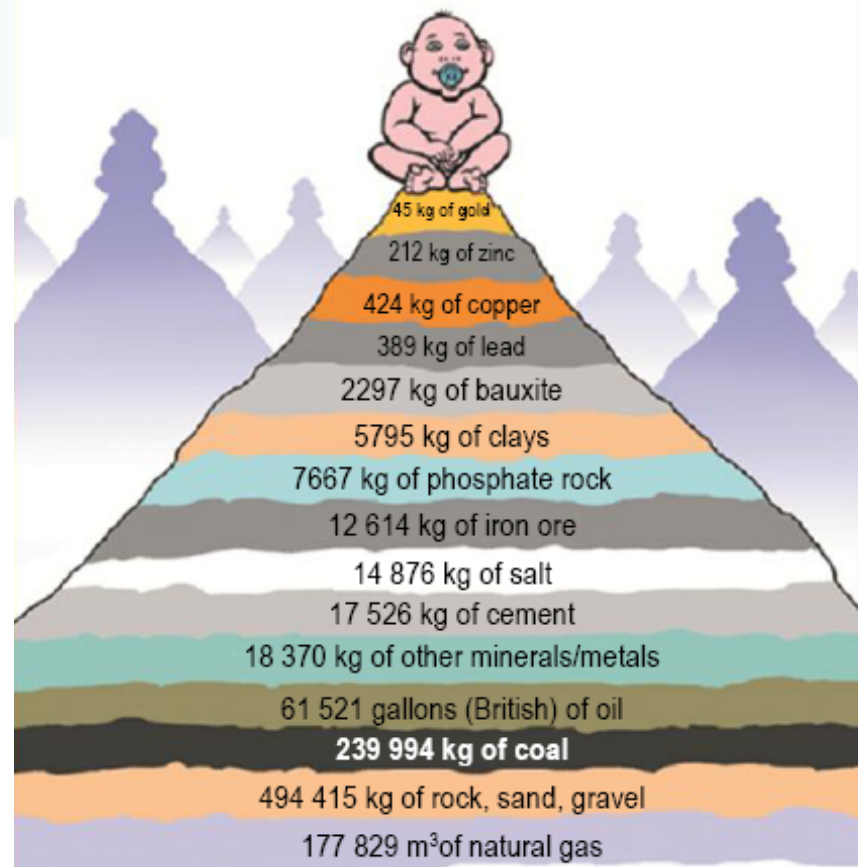
Max Planck

**The mining and extractive industry
plays a significant role in the
development of many countries all
over the world**

Most sectors, such as
construction, chemicals,
automotive, aerospace,
machinery and equipment
sectors

that provide e.g. in the EU a
total value added of €
1'324 billion, and
employment for some 30
million people,
depend on unimpaired access
to raw materials.

A child born today in the United States consumes on average:



...during the whole of his life. What gives the total of 1342 632 kg or 1 343 m³ of minerals, metals and fuels. It is more than 17 tons per 1 person/year



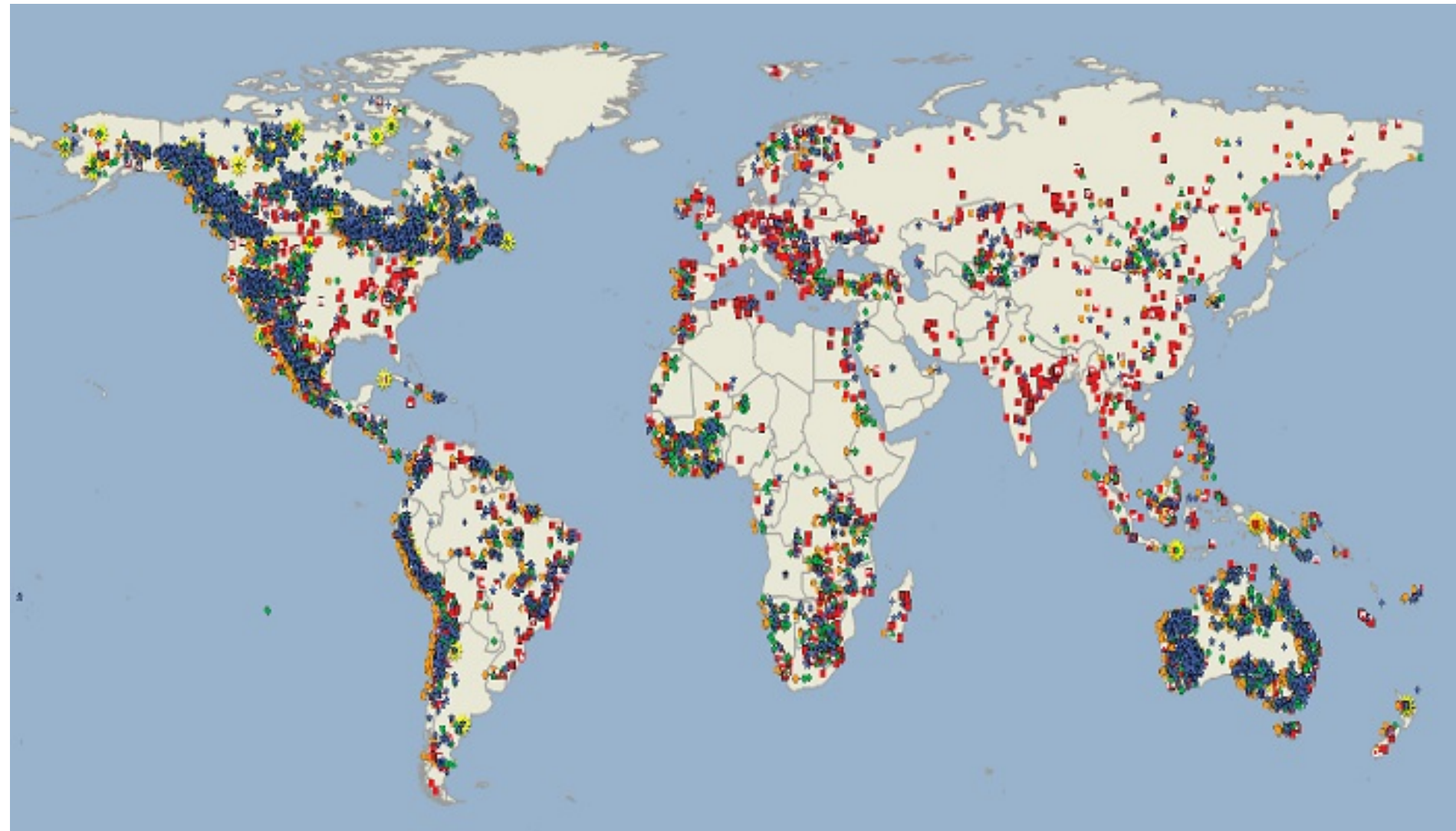
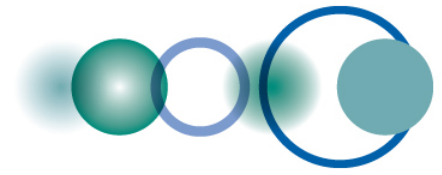


WHERE THE MINERALS ARE

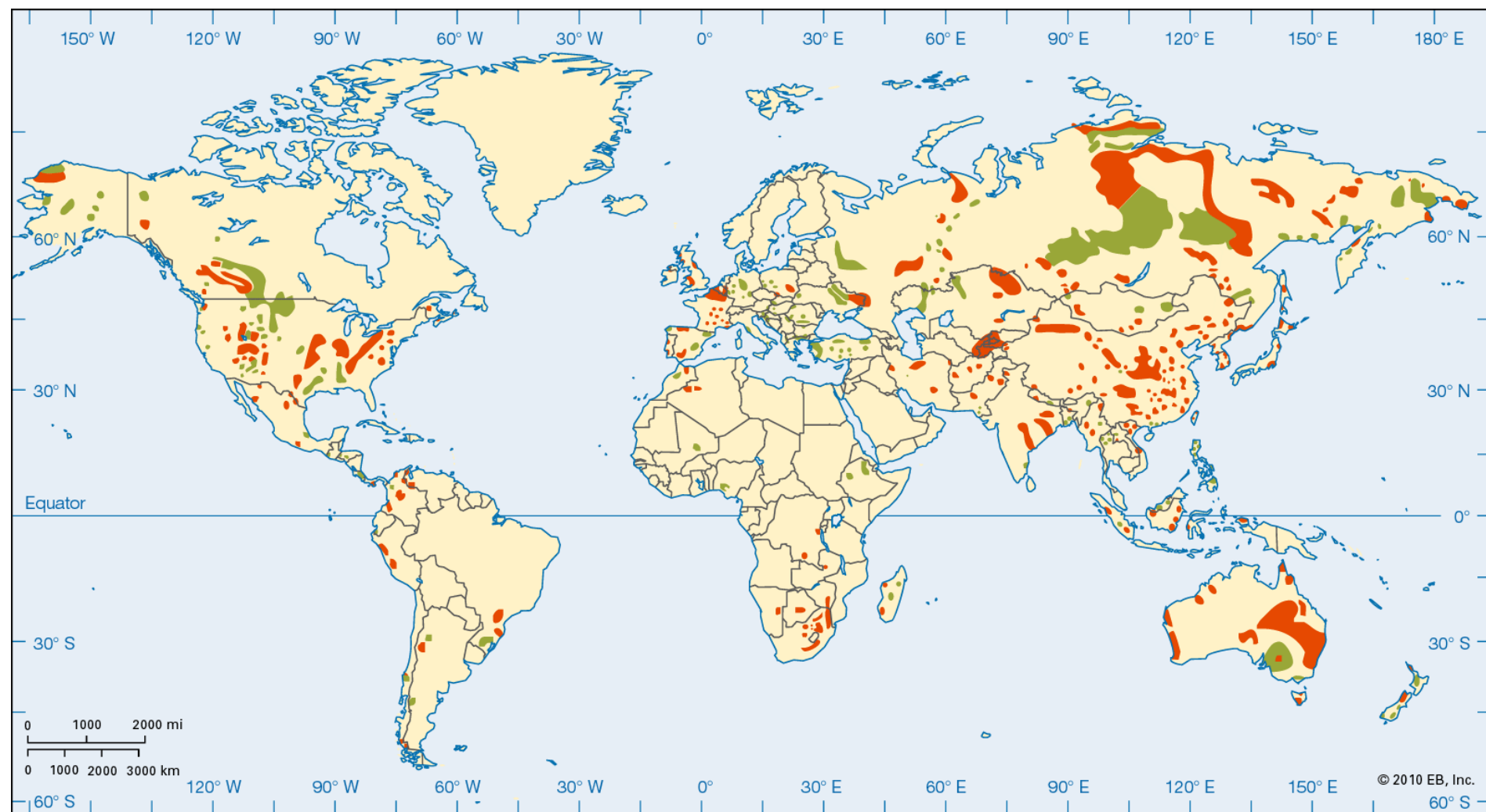
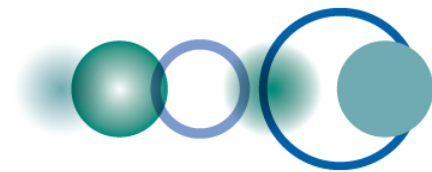


Figures refer to proportion of world reserves available for extraction given current technology, whether economic or not. Reserves below 5% not shown.

Mining: a global issue...



Coal and Lignite a global issue too...



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<http://media.web.britannica.com/e-b-media/14/105414-050-2AB4F88F.gif>

Major Coal Deposits of the World

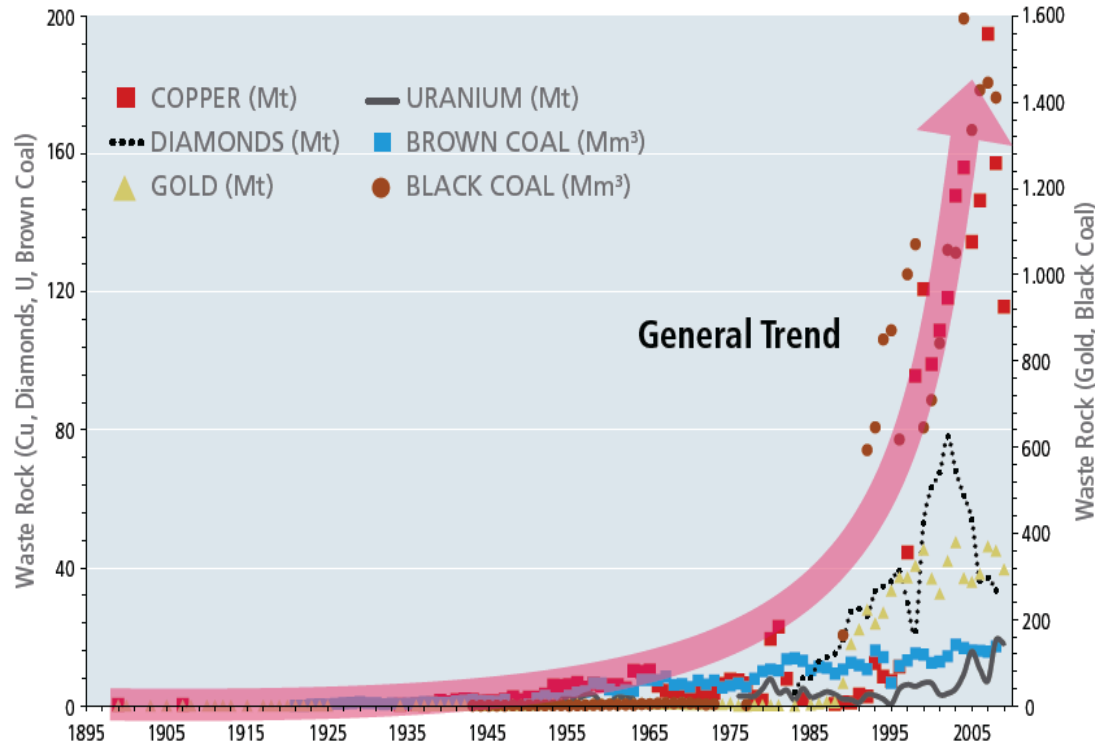


Anthracite and Bituminous Coal



Lignite

Growing environmental impacts by mineral extraction

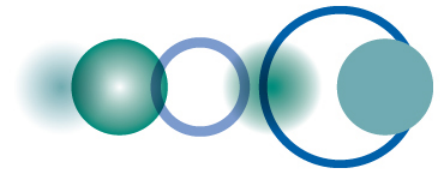


Source: Mudd 2009, Australia

"Unused extraction" grows

- more waste, water distraction, landscape change...
- Land use conflicts
- Resource extraction prefers sparsely populated areas as conflicts grow with population density



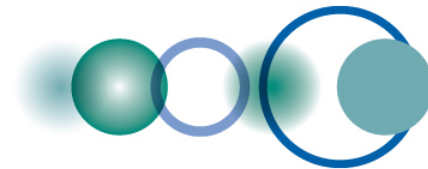


The intergovernmental **Group on Earth Observations**, has been established by the Resolution of the Third Earth Observation Summit in February of 2005, in response to calls for action from the 2002 World Summit on Sustainable Development, to develop & implement **GEOSS**

104 countries plus the EC are members and there are also **109 participating organisations** (e.g. IUGS, EuroGeoSurveys, EARSel, WB...)

A **10-year implementation plan** with bi-annual Work Plans, addressing **8 Societal Benefit Areas (SBAs)** + **cross-cutting issues**

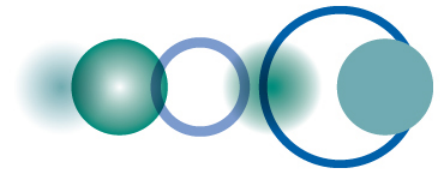
GEO, the group on Earth Observations, envisions "*a future wherein decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth Observations and information.*"



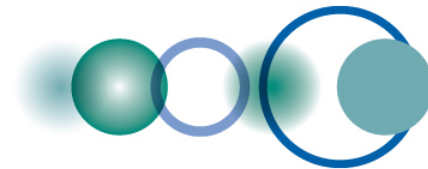
2005 – 2015 10-year WP : Nine Societal Benefit Areas (SBAs)

**THE GLOBAL EARTH OBSERVATION
SYSTEM OF SYSTEMS**

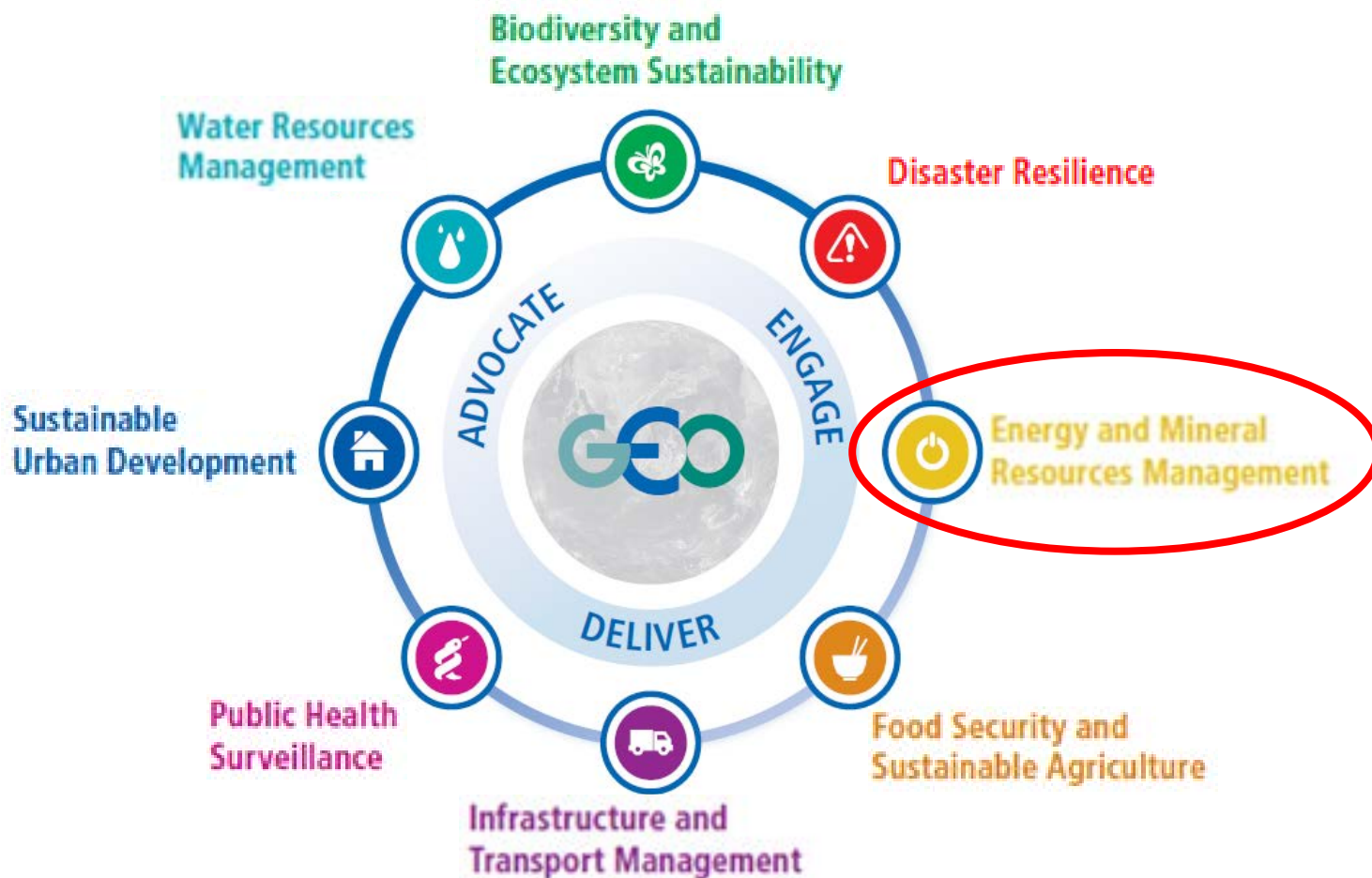




- 2012-2015 WP task SB-05-C2 (GEO VIII, Istanbul, 2011):
Impact monitoring System for Geo-Resource
exploration and Exploitation
 - Integration of spaceborne, airborne and ground-based EO datasets into mature stakeholder-oriented EO products to monitor the societal and environmental impacts of the extractive industry over all phases of a project, from exploration to closure



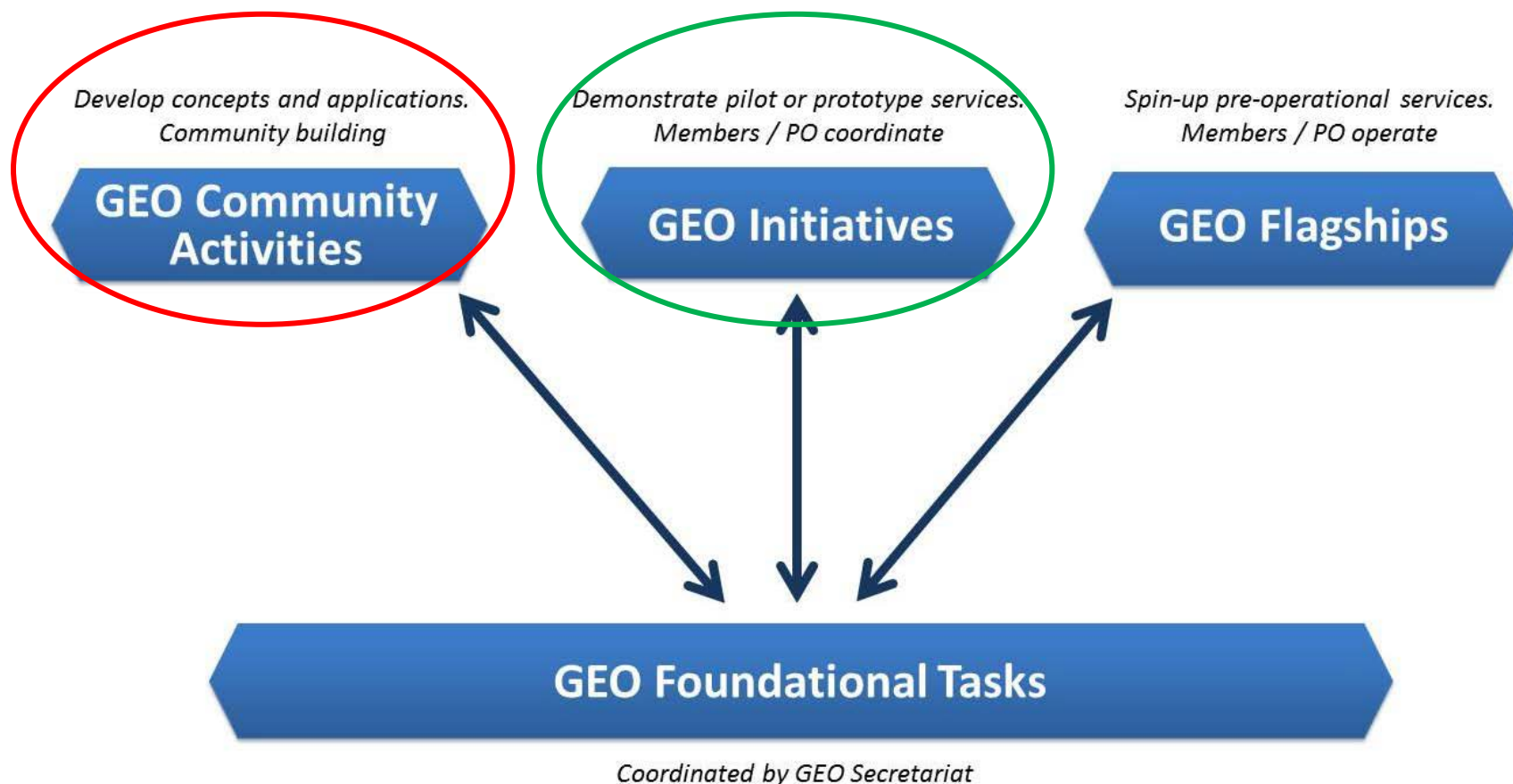
Adopted at GEO XII Plenary, Mexico city, November 2015



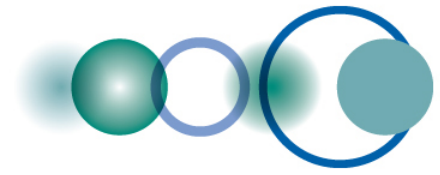


**CA-06 : EO data for managing mineral
and non-renewable energy resources.
PoC: S. Chevrel (MinPol)**

**GI-10 : EO data and renewable
energies. PoC: T. Ranchin
(MinesParisTech)**



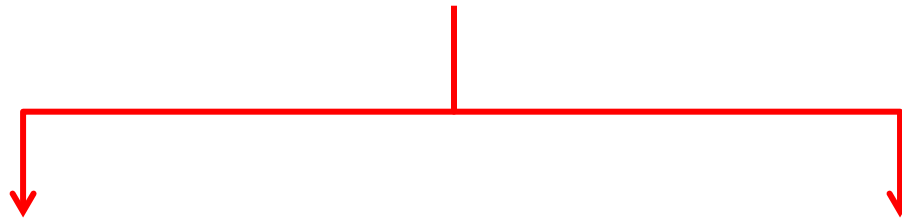
CA-06 overarching proposed activities



- Develop tool sets and information products for the Resource Assessment, Monitoring and Forecasting of Geological Resources (including mineral and fossil resources, raw material and groundwater)
- Develop tool sets for environmental impacts monitoring of mining and processing operations
- Identify and foster implementation of strategic measures for the competitive, reliable and sustainable management of geo-resources exploitation and treatment of re-usable materials



GEO Community Activity “Earth Observations for Managing Mineral and Non-renewable Energy Resources” (CA-06)



Global mineral map of the Earth's surface

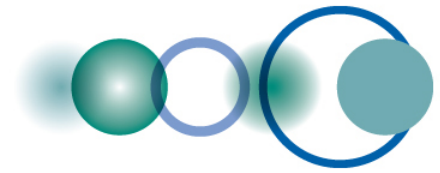
- Australia Geoscience mineral map
- Global spectral libraries of soils in view of future IS spaceborne missions

Global GEO community portals

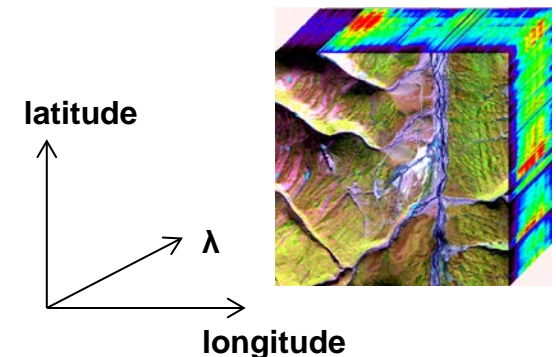
EO-based integrated products for monitoring environmental and societal impacts:

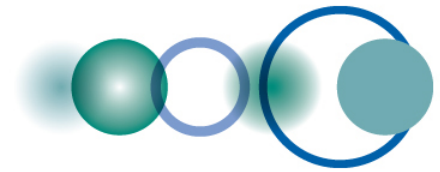
- National to regional (e.g. illegal mining, GFOI, GMOS)
- Local : mine site, SLO...

...Face a technical (and societal) gap



- Minerals lack dedicated EO systems and rely on systems from other SBAs
- The “mineral community” strongly advocates for operational hyperspectral spaceborne missions ensuring a global systematic coverage at no (or marginal) costs and at “decent” spatial resolution
 - Operational, freely available, global coverage
 - *Multispectral* : Sentinel 2 and Landsat TM
 - *Superspectral* : ASTER (failure of SWIR sensors in 2009)
 - Operational, commercial, local coverage on request, high acquisition costs
 - *Superspectral* : WV-3
 - *hyperspectral* : airborne VNIR-SWIR, few operational TIR sensors
- EO in mineral industry lacks institutionnal support
 - Mostly deals with private companies
 - => EO-based monitoring of illegal mining

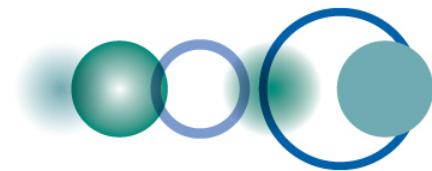




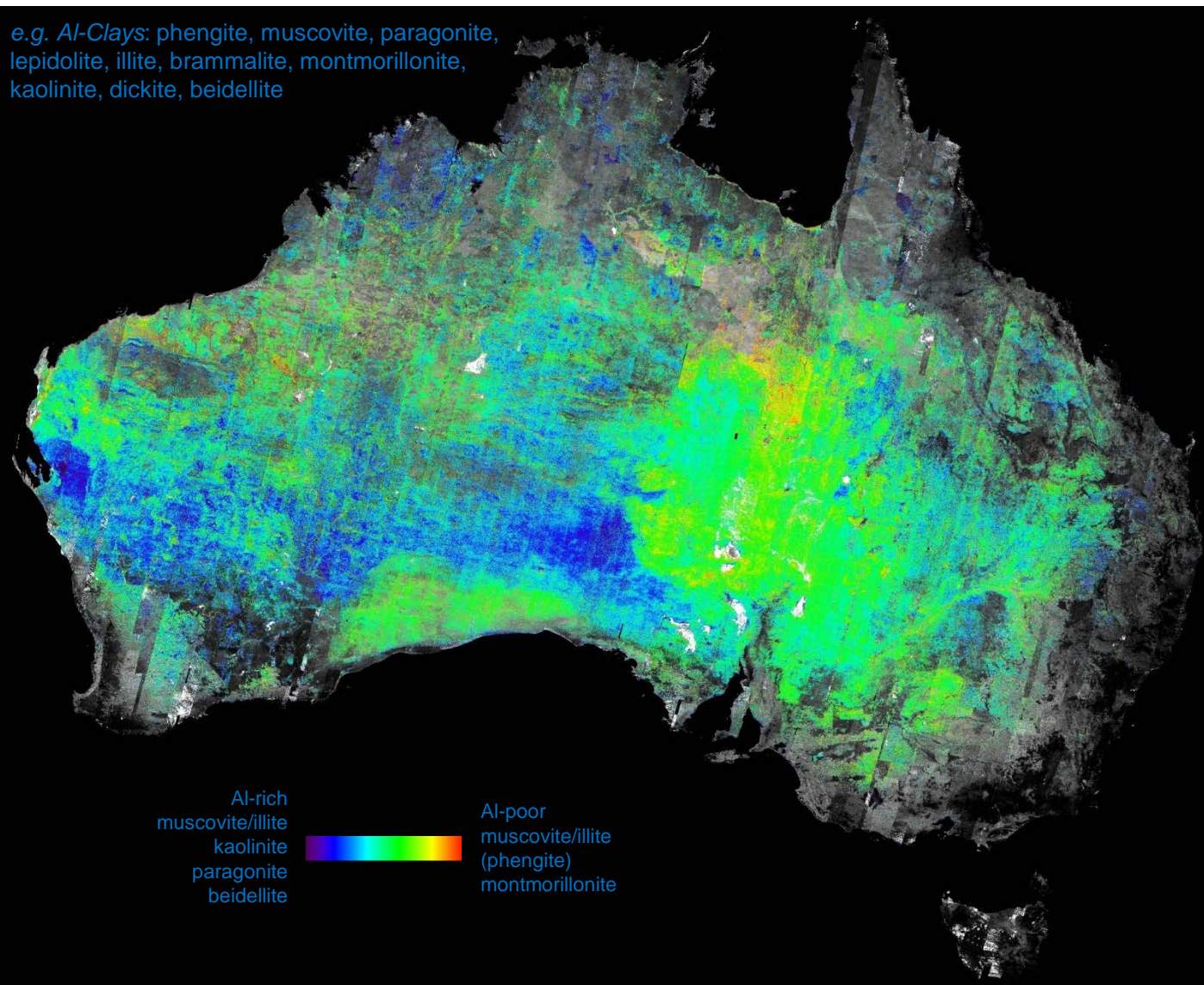
Activities for 2017-2019 WP

- Overall plans
 - Generation of a publicly available Global ASTER Geoscience map to be delivered to GEO (2018)
 - Definition of possible product standards for global, public hyperspectral satellite land surface composition
 - Global land surface composition spectral libraries
 - Identification of user community and their requirement, including mineral regulation enforcement
- Activities
 - Global ASTER Geoscience map : challenges, collaborations, network, path for moving forward
 - Global Soil Spectral Library (GSSL)
 - Definition of relevant essential variables...
 - Cross-cutting GEO activities
 - *Links with GEO initiatives GI-10 (renewable energies) and GI-18 (SDGs)*
 - *Illegal mining : links with GFOI, GMOS (GEOBON?)*
 - Support global user community portals
 - *EO Broker Energy*
 - *MAP-X*

ASTER Geoscience Map of Australia



e.g. *Al-Clays*: phengite, muscovite, paragonite,
lepidolite, illite, brammalite, montmorillonite,
kaolinite, dickite, beidellite



17

Geoscience
maps were
created

**AlOH group
composition**

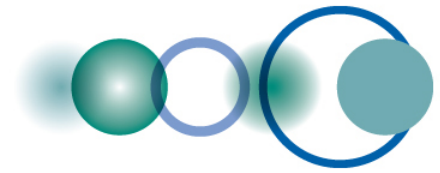
White mica chemical
gradients
(exploration)

Transported versus *in
situ* regolith
materials.

Productive
agricultural soils.

Surface permeability
(water catchments).
pH indicator.

ASTER Global Geoscience Map

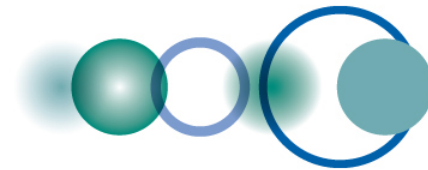


From ASTER Geoscience Maps of Australia to ASTER Global Geoscience Maps

Please attend following talk for
details

Estimated completion date: 2019

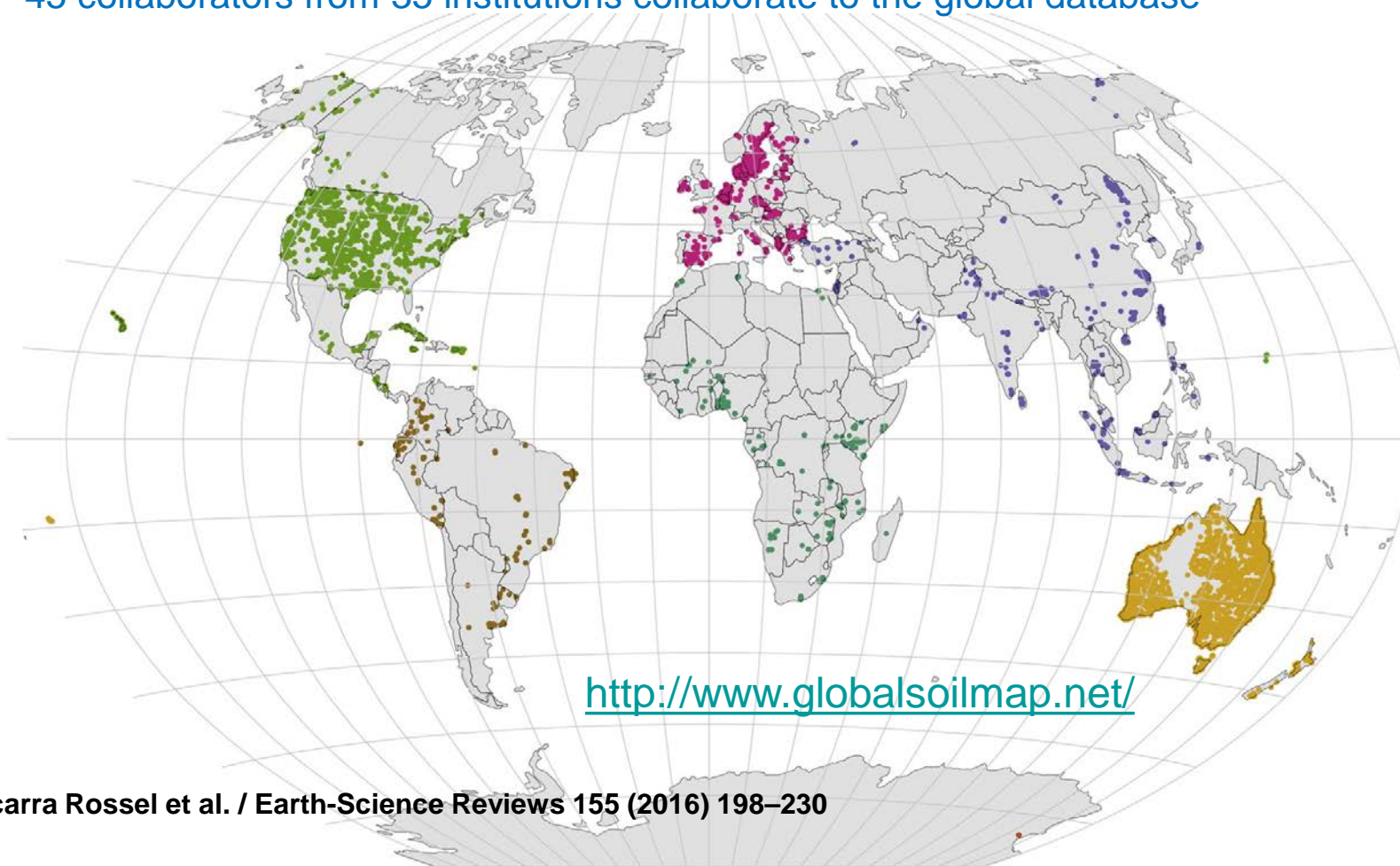
GSSL Global Soil Spectral Library

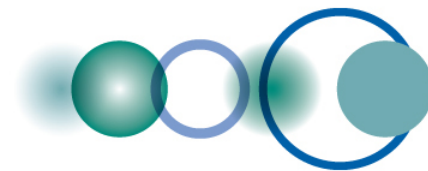


Global Soil VNIR-SWIR Spectra

Some 20,000 VNIR-SWIR reflectance spectra from 12,509 sites in 92 countries over the 7 continents

45 collaborators from 35 institutions collaborate to the global database





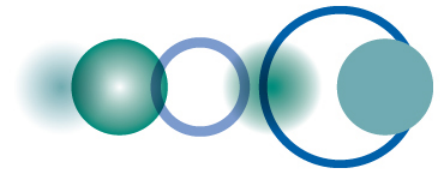
An initiative supported by ESA

<https://www.youtube.com/watch?v=1OSNaDrPixE>

Earth Observation Broker Demo

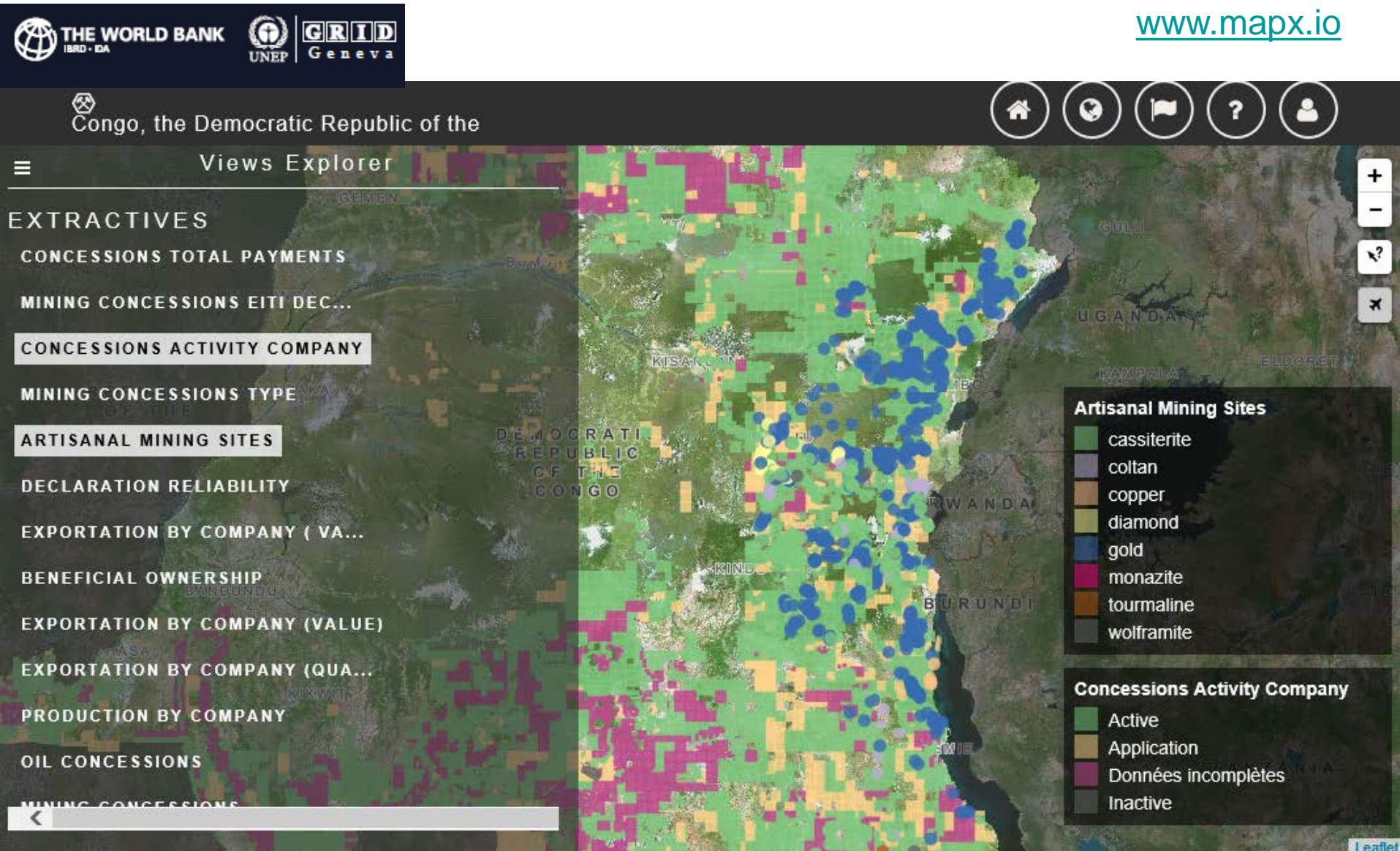
The interface features a top navigation bar with the 'EARTH OBSERVATION BROKER ENERGY' logo, a search bar, and icons for shopping, notifications, and a user profile. A left sidebar contains a menu with 'Products', 'On-demand services', 'Off-the-shelf data', 'Software solutions', and 'Projects'. Below the menu are filters for 'Sector' (set to 'All') and 'Thematic' (set to 'All'), along with a 'Filter by area of interest' checkbox and a map of Europe with a highlighted region. The main content area displays a grid of product cards, each with a representative image, a title, a description, and an 'INFO' link.

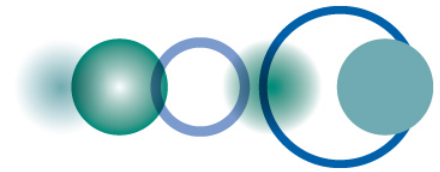
Product Card	Image Description	Title	Description	Link
1	Golden agricultural field under a blue sky	Agricultural land	Assess environmental impact of human activities	INFO
2	Industrial port with ships and cranes	Asset Monitoring	Asset infrastructure monitoring	INFO
3	Colorful bathymetric map of the ocean floor	Bathymetry	Map water depth or charting	INFO
4	Aerial view of a city with building footprints	Building inventory	Monitor construction and buildings	INFO
5	Global map showing chlorophyll-a concentrations	Chlorophyll-a concent...	Monitor ocean quality and productivity	INFO
6	Close-up of a boat's wake in the ocean	Chlorophyll-a concent...	Monitor ocean quality and productivity	INFO
7	CO2 molecule graphic with a smokestack	CO2	Monitor atmosphere composition	INFO
8	Aerial view of a coastline with land cover	Coastal land cover	Monitor the coast line	INFO



Mapping and Assessing the Performance of Extractive Industries

www.mapx.io





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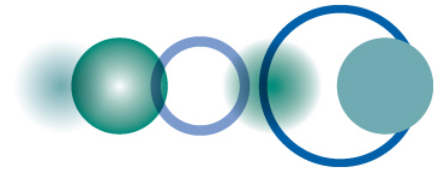
giz German Development
Cooperation
International Services

White Paper

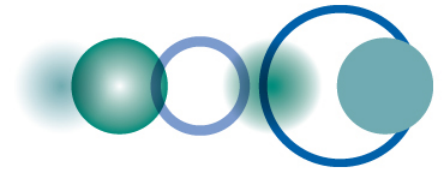
Mapping Mining to the Sustainable Development Goals: An Atlas

[illegible]

The CA-06 contributors



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- UK : BGS, Univ. of Nottingham
- Germany : DLR, GFZ
- Japan: AIST, Japan Space Systems
- China: China University of Mining and Technology, RADI
- Israel: Tel Aviv University
- NL: ITC
- More to join?
 - ✓ Oil and gas community



Thank you for your attention

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