Batteries and sustainability

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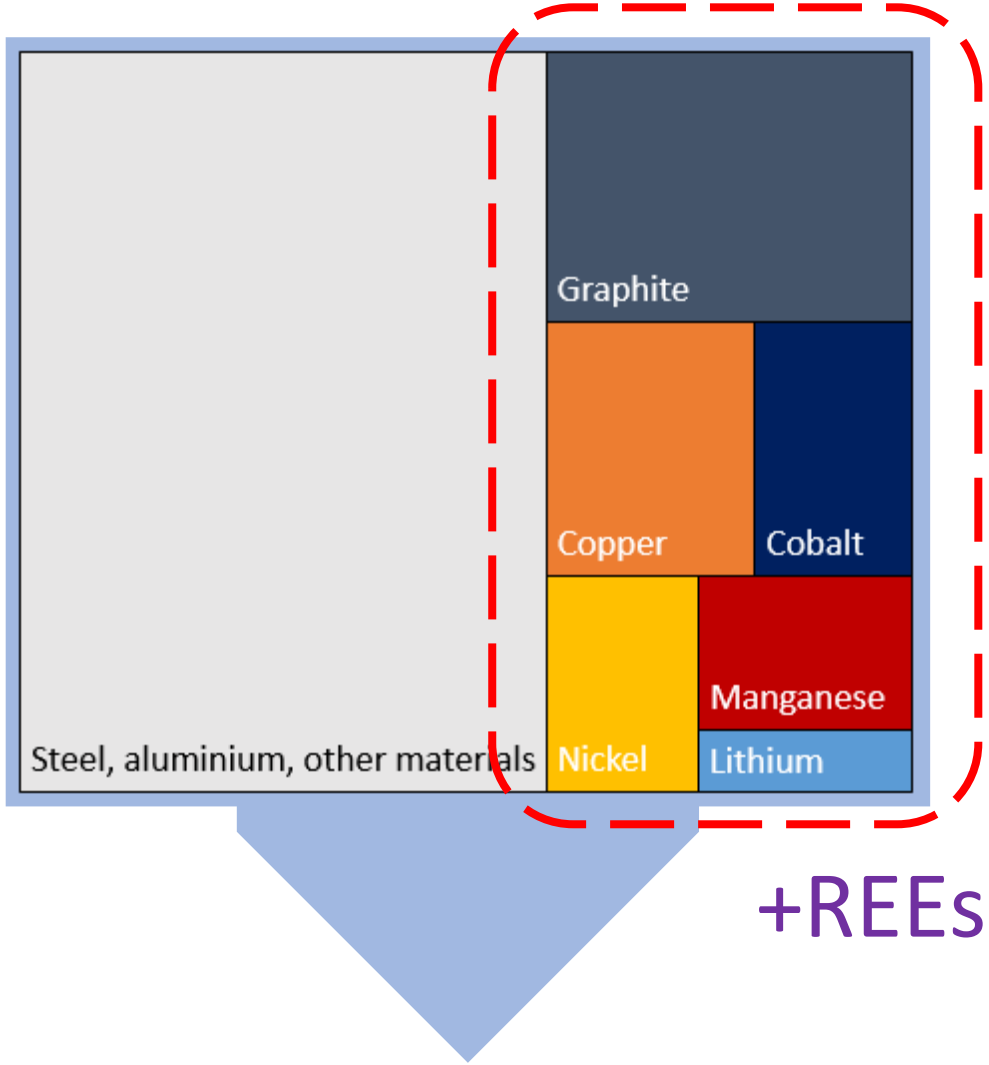
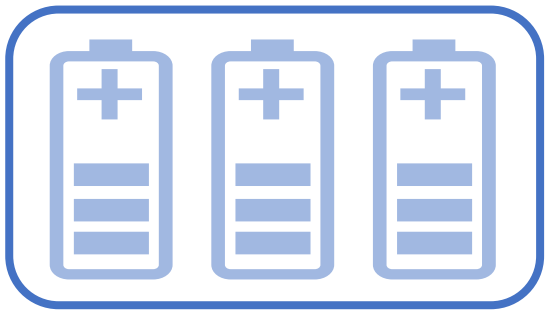
Photo: Sverre Hjørnevik


Photo: McKinsey


Graphite
Copper
Cobalt
Manganese
Steel, aluminium, other materials
Nickel
Lithium
+REEs



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World Mining Production 2016

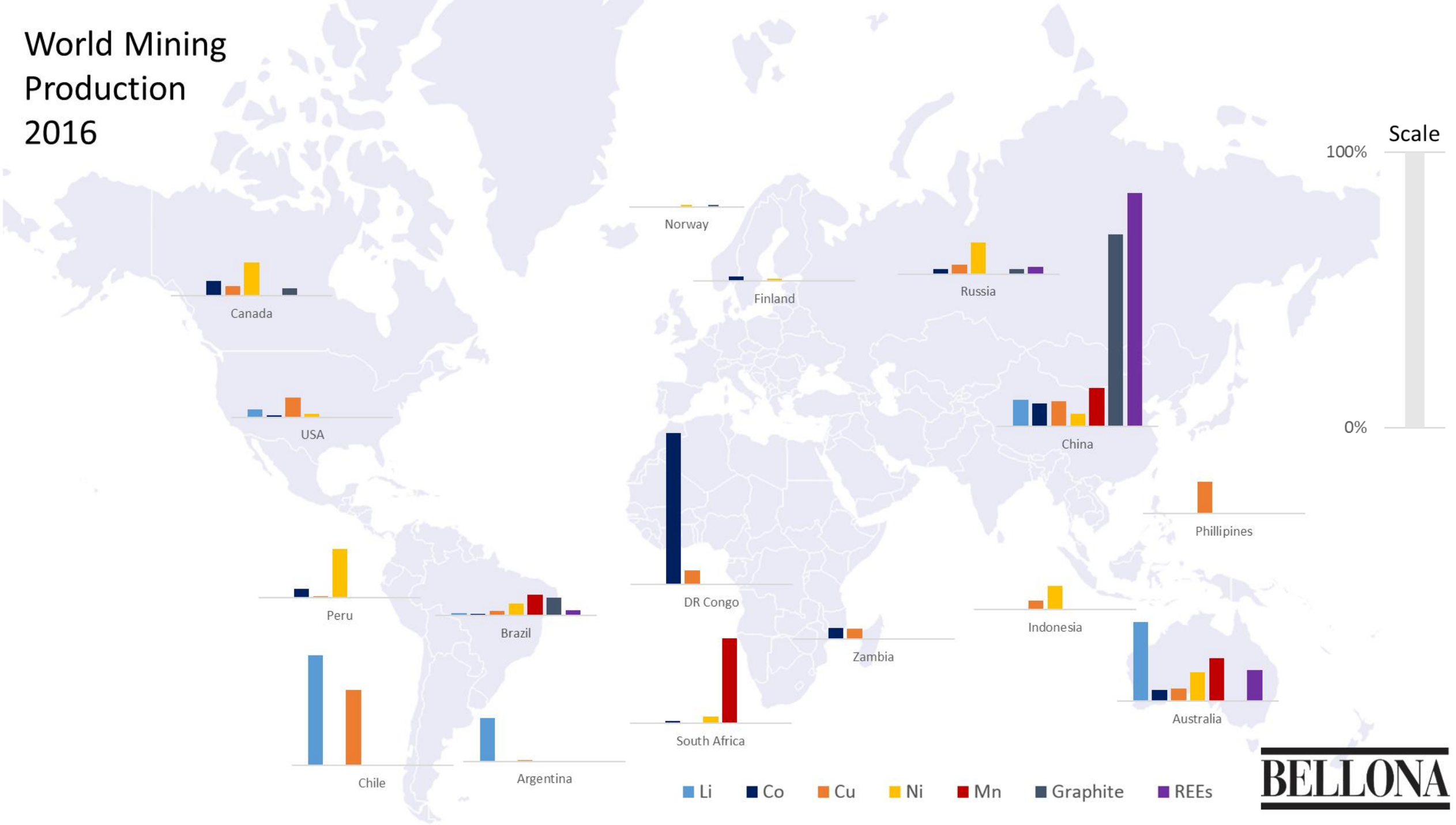

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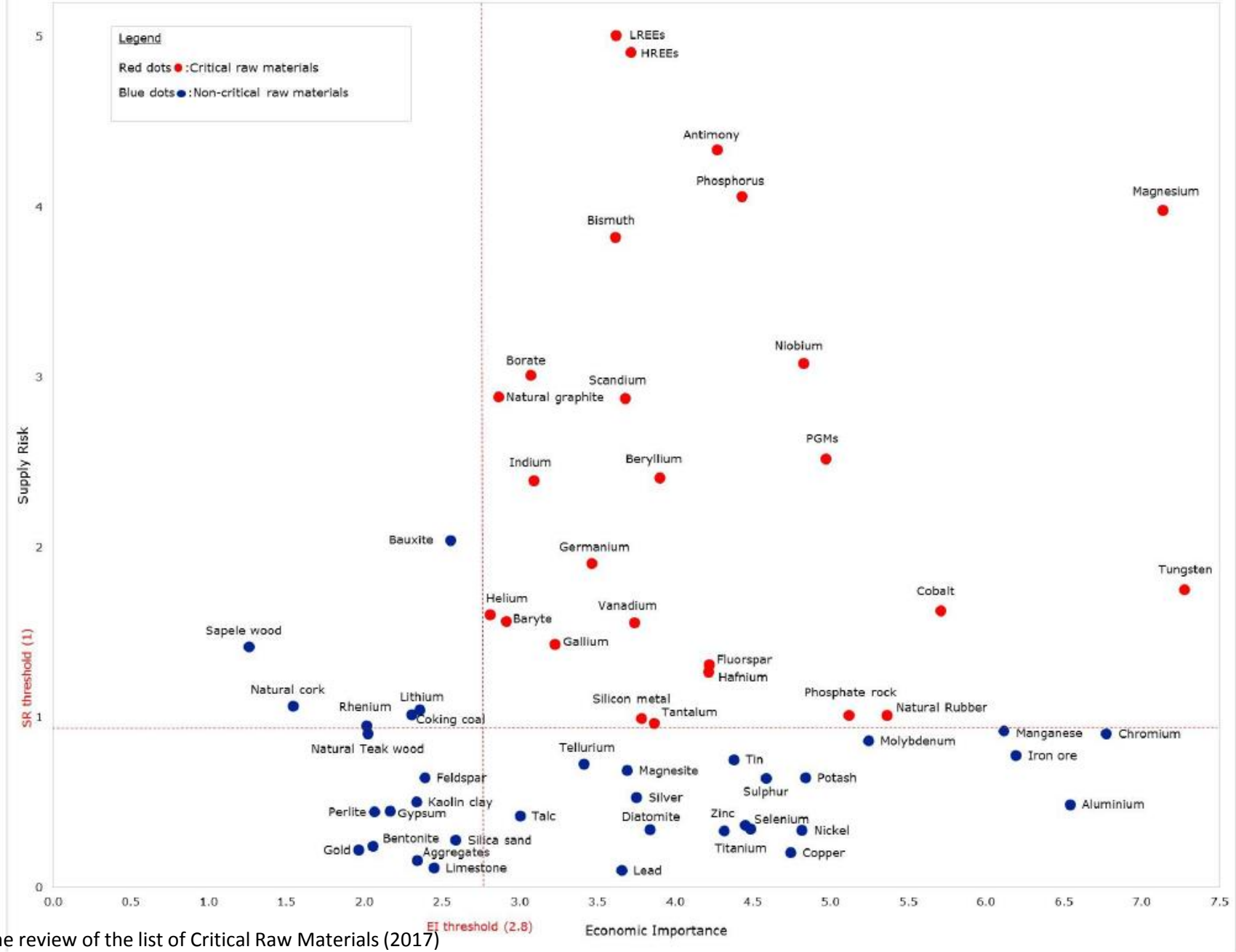
Figure A: Economic importance and supply risk results of 2017 criticality assessment



European Commission: Study on the review of the list of Critical Raw Materials (2017)

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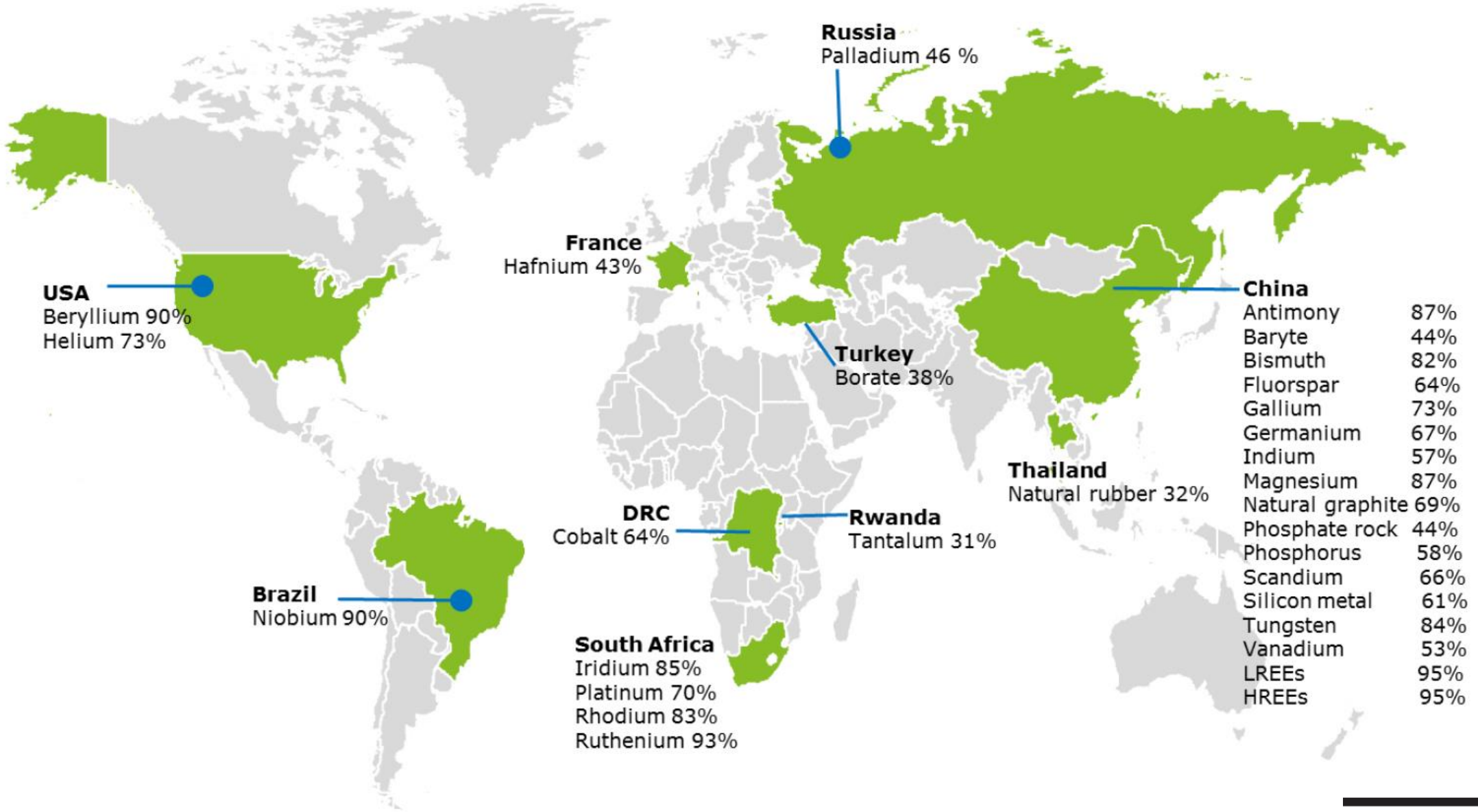
Figure B: Countries accounting for largest share of global supply of CRMs



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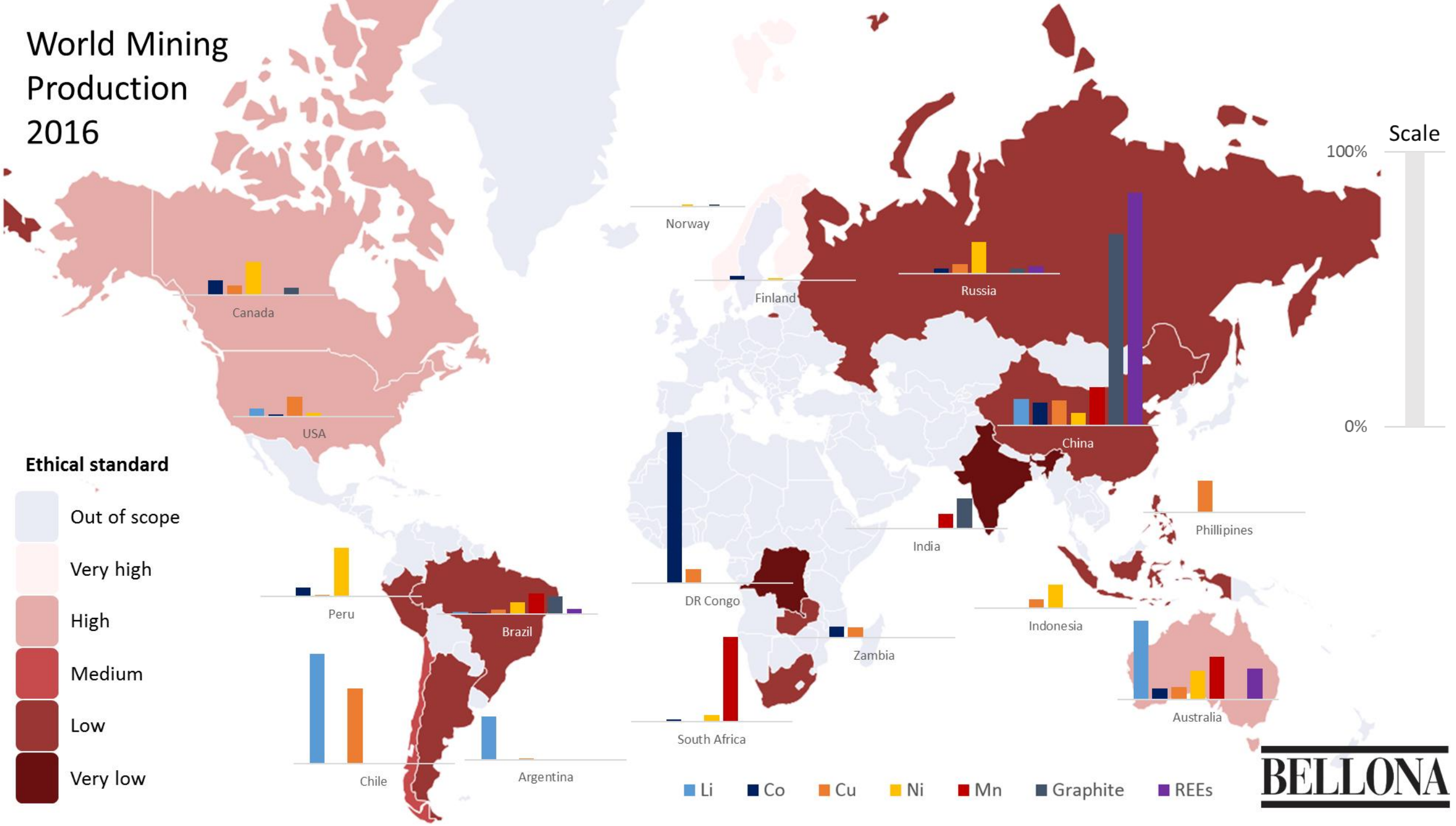

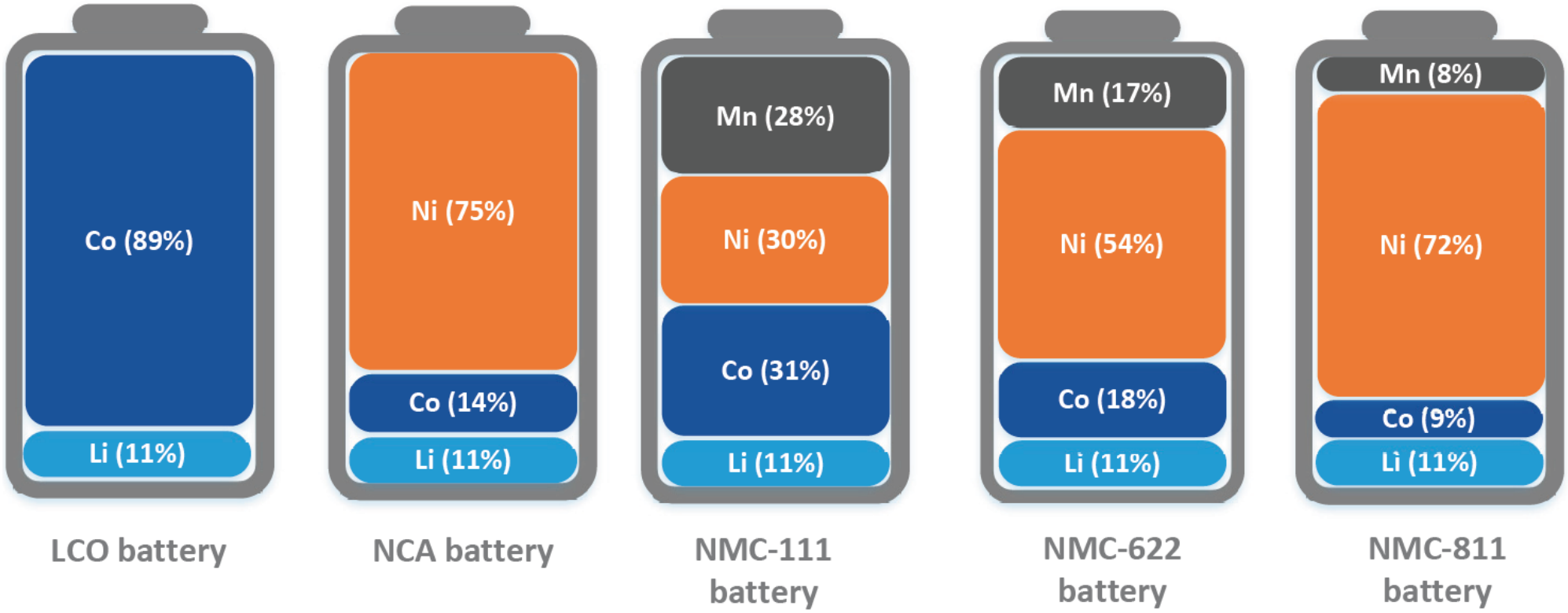

Li-ion battery types and their key constituents (based on figures by Olivetti et al. 2017).

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BEBA

1 *Building a world class battery company in Norway*

2 *Vast underlying and growing market driven by growth in renewables, energy storage and electrification of transport*

3 *Promising technology development of Li-S cells and Li-ion components – enabling cheaper, lighter and more energy dense batteries*

4 *Additionally positioned within charging stations, battery packs and ecotourism*

5 *Strong network within the industry through Bellona's 30+ years of advocating electric vehicles and battery technology internationally*

6 *Experienced in applying for and obtaining soft funding from public institutions – highly favourable political climate for "green tech"*

BEBA

A Li-Sulphur battery will vastly outperform Li-Ion technology on performance and price while being more sustainable to handle and produce

Input – cheaper and more efficient production

- ✓ **Cheaper** raw materials
- ✓ **More abundant** raw materials
- ✓ More **energy effective** production
- ✓ **Less harmful** production process
- ✓ **Less complex** production process

Lithium Sulphur Battery

S

500 Wh/kg
(double state of art Li-Ion)

< 100 USD/kWh

Output – forward leap in battery technology

- ✓ **Lightweight** batteries with high energy density
- ✓ **Safe to use –** Non-explosive, low flammability
- ✓ **Low temperature** operation range
- ✓ Competitive volumetric capacity
- ✓ Competitive cycle life

The one who succeeds will be a major player in the battery industry where "the sky is the limit"

BEBA's five pillars to build an international battery industry in Norway

Next generation battery technology	Battery components existing technology	Battery Management System	Prototyping, testing and certification	Production equipment
▪ Developing cell technology achieve performance levels Li-Ion batteries cannot achieve	▪ Improve key parts of today's technology ▪ Create income and interest in Norway as a prime location	▪ Improve performance and security through improved software for steering and integration	▪ Common infrastructure for R&D and commerc-ialisation of components or technologies	▪ New components and technologies require new production methods and equipment

Cooperation and constant feedback from (potential) clients and end-users:

System integrators and battery manufacturers in electric mobility, maritime applications, emissions free construction, green tourism and many more

Re-use, recycling and substitution of critical raw materials focus in all of BEBA's activities