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1. Mobility Roadmap Workshop 28 October 2021

Mining session

Lithium, Cobalt, Nickel, Graphite

Stefanie Degreif (Oeko-Institut)

Marie-Theres Kuegerl (Montanuniversität Leoben)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement № 869276

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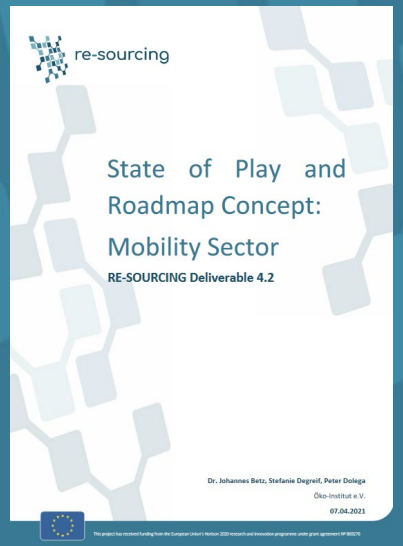
Agenda for the working group sessions

13:40-13:45	Short break & change to Working Groups		
Working Groups 1) Mining 2) Cell production/OEMs 3) Recycling		Moderators: **Stefanie Degreif** (Oeko-Institut) **Dr. Johannes Betz** (Oeko-Institut) **Tobias Wagner** (Oeko-Institut)	Facilitators: **Marie-Theres Kügerl** (Montanuniversität Leoben) **Noé Barriere** (Vienna University of Economics and Business) **Patrick Nadoll** (EIT RawMaterials GmbH)
13:45-14:00	**Introduction** *Current state of play and major challenges*	Working group moderators	
14:00-14:30	**Round of individual statements** *Your major inputs for the roadmap*	Participants	
14:30-15:45	**Roadmap development** *Brainstorming and prioritisation of topics, temporal arrangement*	Participants	
15:45-16:00	Coffee break & change to main conference room		

Current state of play and major challenges in the mining sector (Lithium, Cobalt, Nickel, Graphite)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State of Play and Roadmap Concept: Mobility Sector

RE-SOURCING Deliverable 4.2

Dr. Johannes Betz, Stefanie Degreif, Peter Dolega

Öko-Institut e.V.

07.04.2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 869276

See „State of Play and Roadmap Concept“ on the RE-SOURCING website here

Lithium

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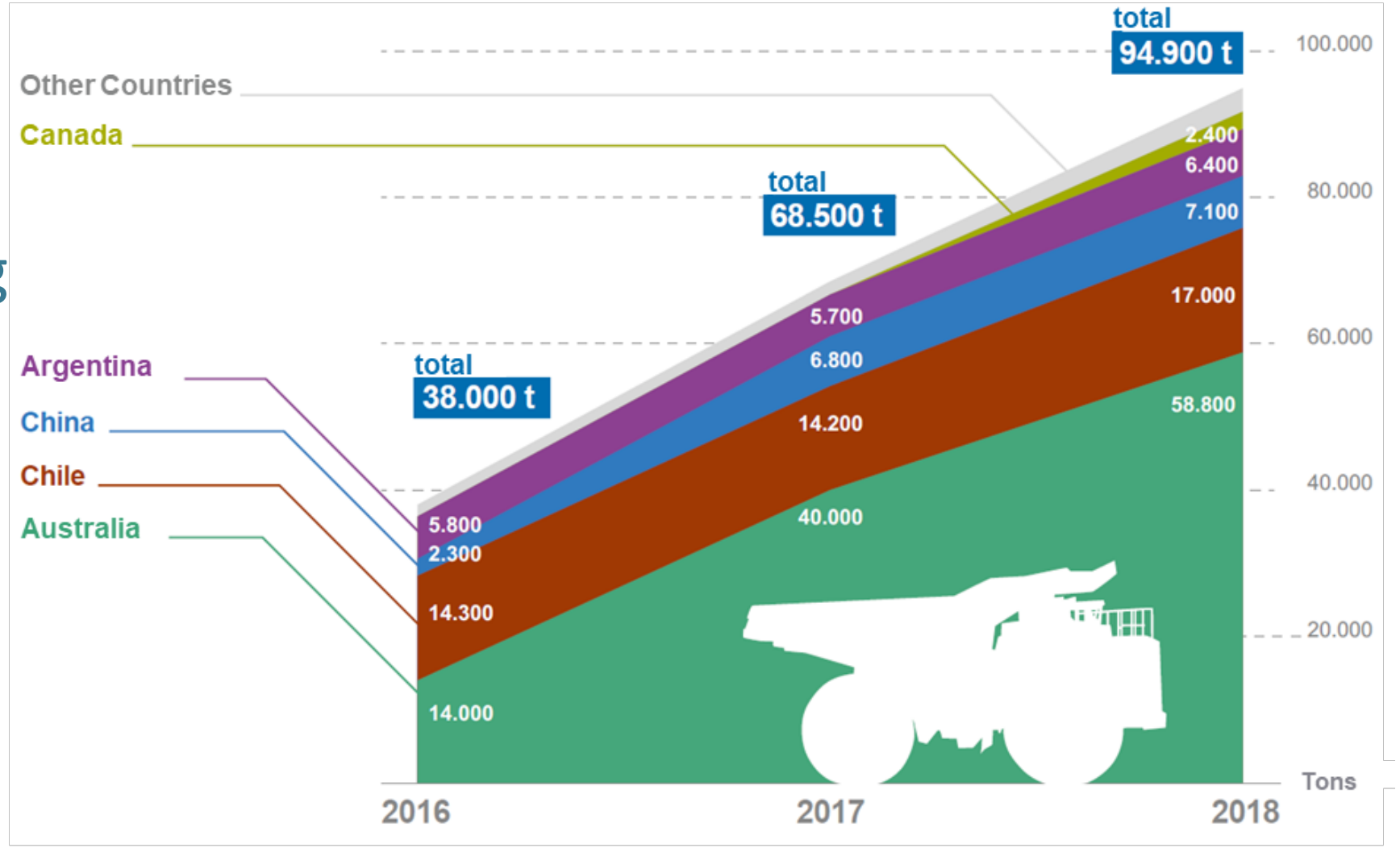
Country overview for lithium mining



Data source: USGS Mineral Commodity Summaries, 2018 (https://bit.ly/3mmezgB), 2019 (https://bit.ly/32xEnyB), 2020 (https://on.doi.gov/33paCil)

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Challenges of lithium mining

- Hard rock mining (mainly Australia):
  - Mining of spodumene in open pits
  - Extraction followed by roasting and acid treatment
  - Related problems are
    - Heavy metal pollution
    - Acid mine drainage
    - Energy intensive processing
- Lithium rich brines in the Andes region
  - Evaporating water out of a hyper-saline solution in arid region leading to
    - Water scarcity, leading to social tensions
    - Dust evolution
- Refining mostly takes place in China

Picture “20170809 Bolivia 1505 crop Uyuni sRGB” by Dan Lundberg, licensed under CC BY-SA 2.0

Cobalt

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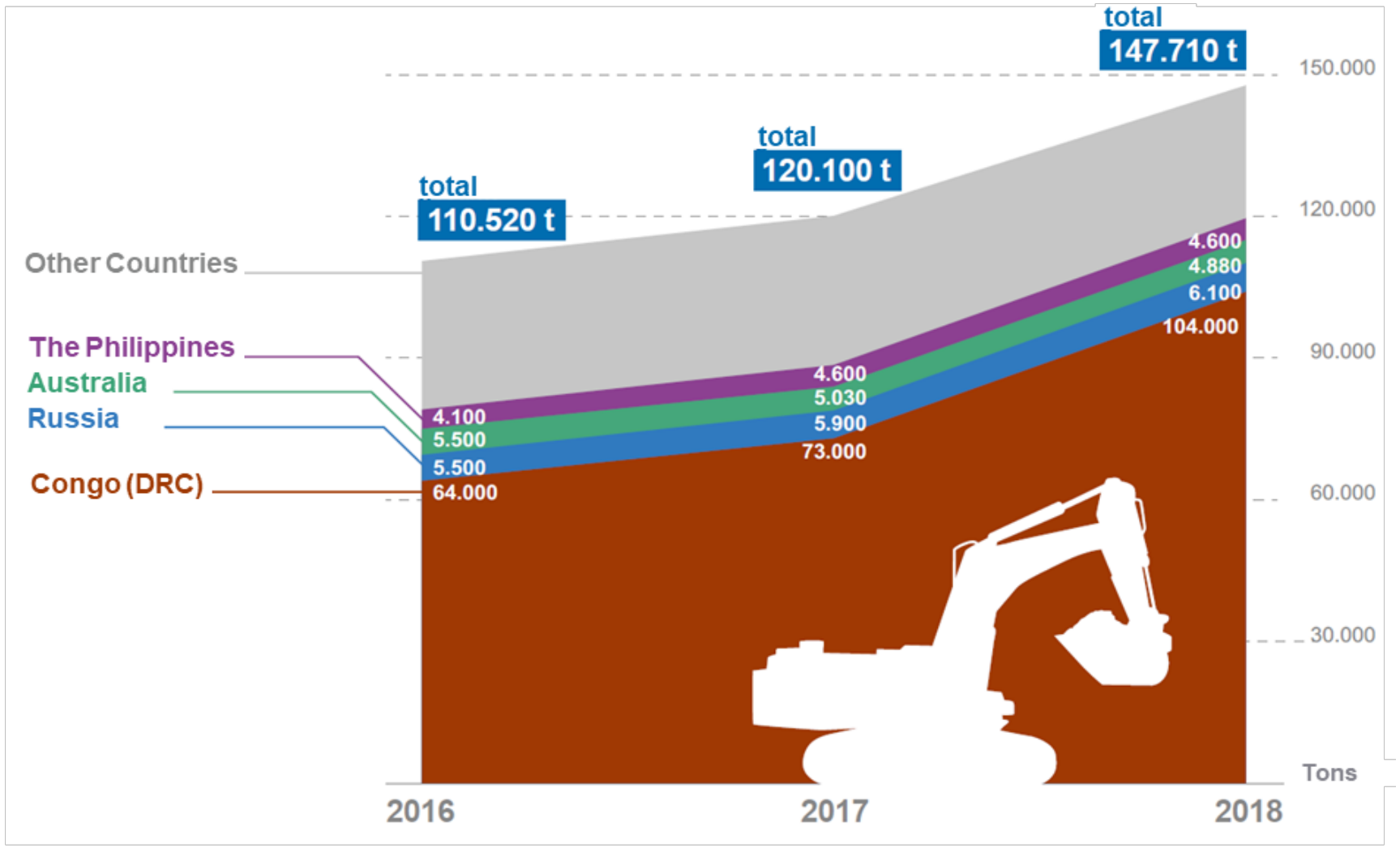
Country overview for cobalt mining



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Challenges of cobalt mining

- Production >70% from DRC in 2018; mainly a by-product of copper and nickel mining
- Major issue: social dimension with high share of artisanal and small-scale mining (ASM)
  - Related challenges like child labour, working conditions
  - In 2020, ASM only about 5% of global production due to low cobalt prices
- Further typical problems related to metal mining:
  - →Disturbance of land areas
  - →Dust pollution
  - →Habitat fragmentation
  - →Heavy metal pollution

https://commons.wikimedia.org/wiki/File:Child_labor,_Artisan_Mining_in_Kailo_Congo.jpg
https://commons.wikimedia.org/wiki/File:Ohio_Valley_Mushroom_Farm,_Acid-Mine_Drainage_(AMD)_(13670979525).jpg

Nickel

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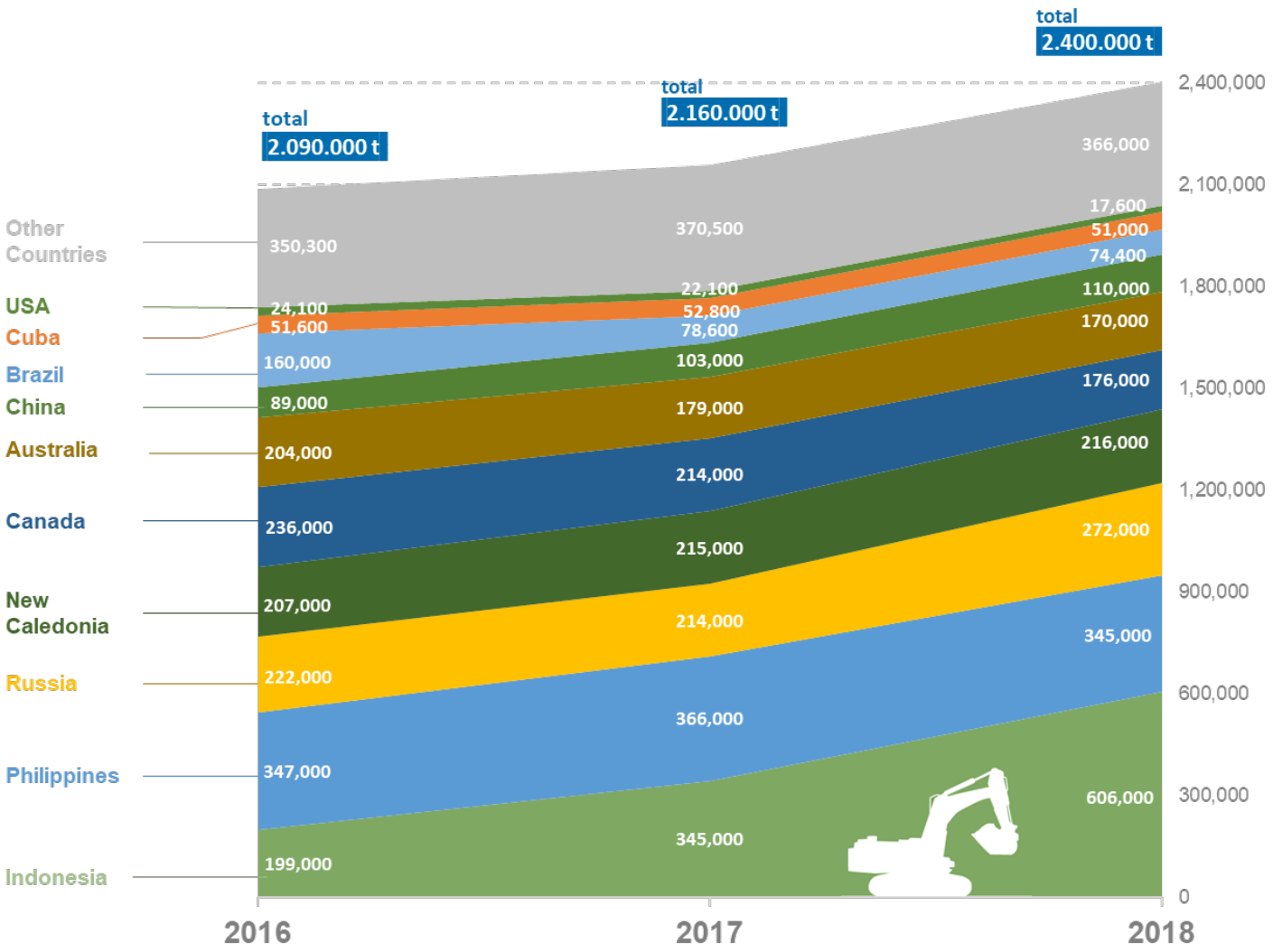
Country overview for nickel mining



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Challenges of nickel mining

- Sulphide deposits
  - Approximately equal shares
  - Mined both in open cut and underground mines
  - Mining is followed by concertation via flotation, smelting of concentrates and refining
  - Potential for acid mine drainage high
- Lateritic deposits
  - Found in tropical areas with high temperatures and rainfall → high biodiversity and vegetation
  - Mined in open cut
  - High pressure acid leaching follows mining, then hydrometallurgical solvent extraction
  - High energy consumption

→Disturbance of land areas

→Dust pollution

→Habitat fragmentation

→Heavy metal pollution

Graphite

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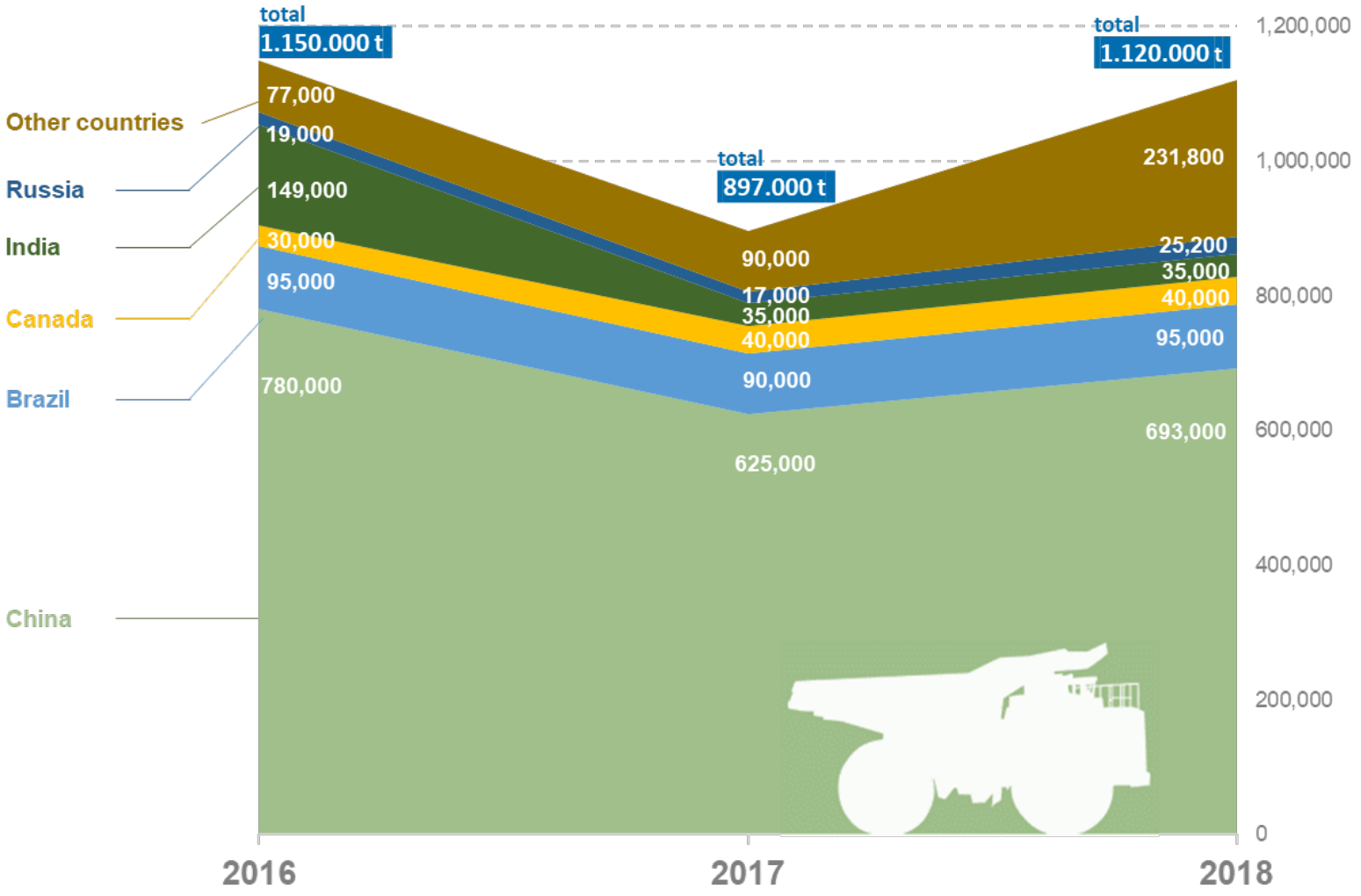
Country overview for natural graphite



Data source: USGS Mineral Commodity Summaries, 2018 (https://bit.ly/3mmezgB), 2019 (https://bit.ly/32xEnyB), 2020 (https://on.doi.gov/33paCil)

Production of graphite

Synthetic graphite:

- High energy consumption and higher cost
- Precursors resulting as side products from crude oil or coal production

Natural graphite:

- Mined both in open cut and underground mines
  - Similar problems as mentioned before
- Purification often conducted by acid treatment (hydrofluoric acid and others) → Water pollution, if not sufficiently monitored

Initiatives and standards

Mining & Mineral Processing

- IFC EHS Guidelines
- LME
- EITI
- Extractive Waste Directive
- TSM / TSM
- IRMA
- Global Tailings Review
- CTC
- China Responsible Mineral Supply Chain Due Diligence Management Guide
- CIRAF
- OECD Due Diligence Guidelines
- ARM
- ICMM Mining Principles
- Responsible Minerals Initiative
- ERMA
- Fair Cobalt Alliance
- World Bank Climate-Smart Mining Initiative
- Responsible Cobalt Initiative

Production

Disposal & Recycling

- **ELV Directive**
- **Basel Convention**
- WEEE European Standard

Mobility / Battery-Specific Standards and Initiatives

Drive sustainability | EBA | GBA | **Proposed EU regulation on (waste) batteries** | EGVI

General Standards

EU Directive on safety and health at work	ISO 50001; 20400; 26000	UN Human Rights Principles; UN Global Compact
ISO 14000-series	GRI	EBRD Guidance
ISO 45001/OHSAS 18001	IFC EHS	OECD Multinational Enterprises
ISO 9001	ILO	SDGs

Colour: **Mandatory regulation;** mandatory standard; voluntary standard; guiding principle; initiative

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Vision

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Vision

Vision of the Mobility Sector

Environmental | **Social** | **Economic**

International Cooperation

Harmonised reporting systems; clear global criteria for responsible and sustainable practice

- **Limiting Climate change to 1.5°C**
- Net-positive environmental impact
- Net-positive contribution to biodiversity
- Carbon-neutral production and transport
- Zero pollution of land and sea
- Zero harmful emissions
- Use of renewable energy sources
- Resource efficiency (decreasing need for primary raw materials, no use of ground-water, energy efficiency, etc.)

- Zero Human Rights Violations
- Gender equality in all stages of the supply chain
- Elimination of poverty & hunger
- Ensure access to food, clean air & water, sanitation, health care
- Meaningful stakeholder engagement
- Support of local development
- Fair compensation for land-use
- Respect for land rights
- Occupational health & safety
- Community health & safety
- Local recruitment
- Knowledge sharing & training

- Sustainable and responsible investments
- Fair wages
- Transparency
- Zero financial crime
- Fair compensation for land–use, minerals, etc.
- "Unsustainability is unprofitable"
- Companies accept their responsibility
- Decoupling of economic growth from resource consumption & environmental impact

Mining & Mineral Processing

- Zero hazardous tailings discharge
- Re-use of tailings & waste rock
- Better-than-before reclamation
- Efficient processing, incl. energy & water efficiency, improved recovery
- Efficient use of deposit—no high-grading
- Remediation of abandoned mines

- Formalisation of ASM sector & full integration in the supply chain
- Cooperation between LSM and ASM
- Conflict free mineral supply chains
- Sharing of infrastructure (especially in remote areas)
- Ensuring water availability & quality for neighbouring communities
- Free prior informed consent

- Proof of origin & traceability of minerals
- Transparent granting of mining licences
- Use of new technologies & automation
- Multi-stakeholder governance

Cell Manufacturing

- Eco-design & collaboration of manufacturers and recycling plants
- Responsible use of toxins, use of alternative substances if possible
- Recovery of solvents
- Increased input of secondary materials
- Use of renewable energy
- Reduced energy input (e.g. utilise waste heat)

- Local value creation
- Occupational health & safety

- Abandonment of "the cheaper the better" philosophy
- Support of responsible production practices upstream
- Local sourcing where possible
- Process optimization

Recycling

- Circular economy—closed loop & zero waste culture
- Recycling of all recyclable materials used in Li-ion batteries
- Evaluate used Li-ion batteries regarding 2nd life opportunity
- Eco-design & collaboration of manufacturers and recycling plants
- No dumping of toxic materials in landfills

- Maintaining air quality
- Maintaining water quality
- Health and safety in collection, transport and recycling
- Occupational health & safety

- Financially more attractive than primary raw materials
- Landfilling is forbidden
- Innovation friendly environment
- Adequate legal basis for recycling
- Local recycling & reuse

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Vision

Overarching aims

Vision of the Mobility Sector

Environmental

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Social

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Economic

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Mining specific aims

Vision

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Roadmap Development

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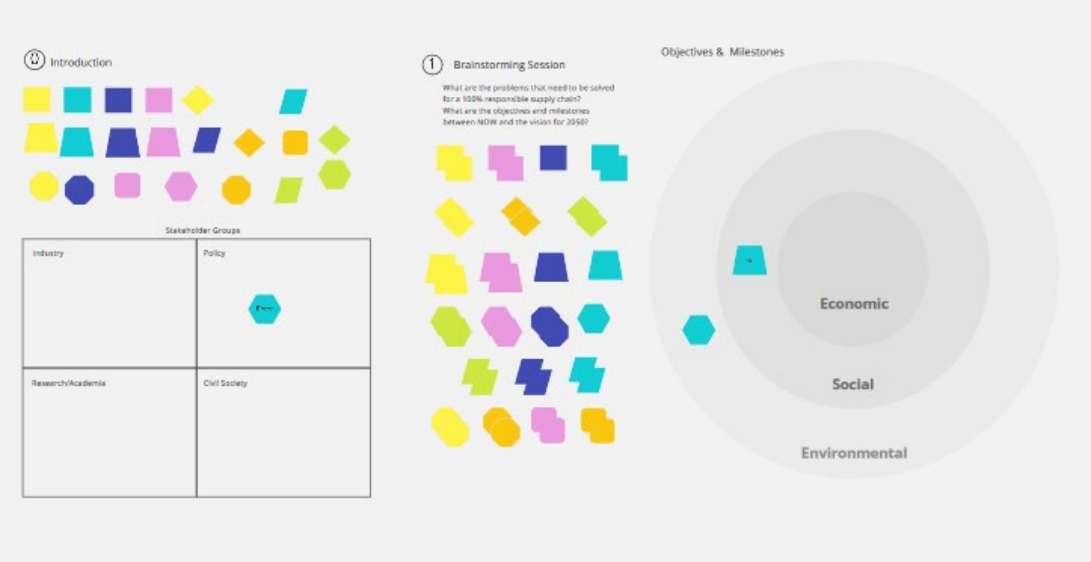
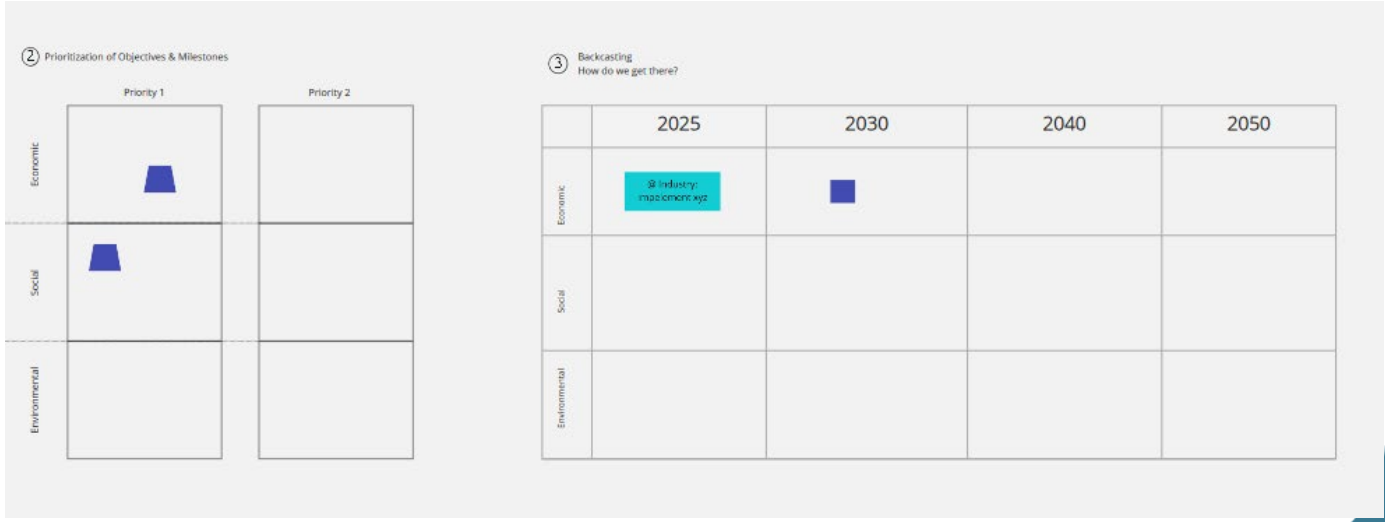
Roadmap Development

- MIRO-Board; Please see link in the chat
- Everyone is invited to participate
- Use the sticky notes
- You can zoom and navigate with mouse of control button
- Step 1: Objectives 2050
  - What do we want to achieve by 2050
  - What Milestones need to be implemented?
- Step 2: Setting Priorities via voting
- Step 3: Timeline
  - What are the concrete steps achieve the objectives?





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THANK YOU

for your attention!

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