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Mobility Roadmap Workshop 28th of October 2021

Recycling session

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

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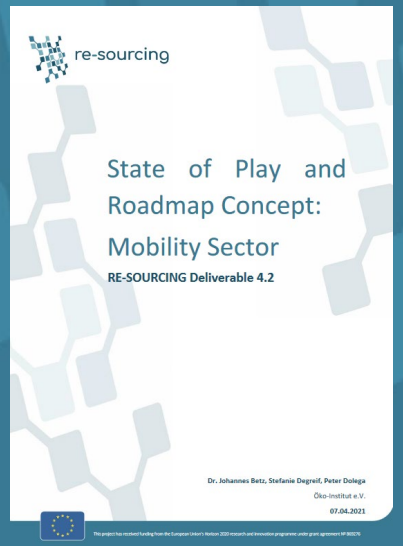
Agenda

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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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

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

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Why do we recycle lithium-ion batteries?

- Avoidance of uncontrolled and potentially hazardous battery waste streams
- Recovery of materials → protection of primary resources → reduced environmental and social impacts
- Independence of material imports

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Lithium-ion battery recyclers

- Recycling plants usually located in proximity to cell manufacturing plants to facilitate management of production wastes → to date, mainly located in China, South Korea, Japan

Over 1000 tons per annum (t/a):

- SungEel (South Korea)
- Dowa (Japan)
- GEM (China)
- Ganzhou Highpower (China)
- Kyoei Seiko (Japan)
- Brunp (China)
- Huayou Cobalt (China)
- Li-Cycle Corp (US)

Source: https://pixabay.com/de/illustrations/recycling-pfeile-netzwerk-gr%C3%BCn-4091876/

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Recycling of lithium-ion batteries in the EU

- Lithium-ion battery recycling is established in the EU
- Recycling industry in the EU is expecting huge rise of input stream
- The reasons are:
  - Start of production of battery cell plants
  - Retraction of several thousand tons of faulty car batteries
  - Battery market rose strongly in the last years
- Disposal of batteries could get very difficult, as recycling capacities are too small

Source: https://pixy.org/1378555/

Lithium-ion battery recyclers in the EU

Over 1000 tons per annum (t/a):

- Umicore (Belgium, 7000 t/a)
- Nickelhütte Aue (Germany, 3000 t/a)
- Accurec (Germany)
- Redux (Germany, 2000 t/a)
- VW (Germany, 1200 t/a)

Companies planning lithium-containing battery recycling plants in Europe:
Primobius, BASF, Northvolt (I+II), Fortum (Finland)

Under 1000 t/a:

- SNAM (France)
- EDI (France)
- TES-AMM (formerly “Recupyl”) (France)
- AkkuSer (Finland)
- Duesenfeld (Germany)
- Promesa (Germany)

Technical overview

Preparation (discharging and dismantling) → Pre-treatment → Pyrometallurgical and/or hydro-metallurgical processing

- Iron
- Copper (cables)
- Aluminium (casings)
- Electronics

To date mainly
- Copper
- Cobalt
- Nickel

In the future possibly
- Lithium
- Graphite

Challenges

Health & Safety:

- Thermal runaway → potential fire hazards
- Hazardous substances, e.g. the electrolyte or toxic metals

Design:

- Disassembly difficult/impossible
- Partly aggravated by current trends, e.g. leave out the module by directly linking the cells into a pack with glue

Environment:

- Energy intensity
- Inadequate execution may cause emission of pollutants to air and water

Economy:

- Expensive logistics due to safety requirements
- Limited upscaling so far due to comparably small waste streams
- Changing battery chemistries imply fewer valuable materials for sale, e.g. the trend to use less cobalt

Sustainability Schemes

- There are no international standards for recycling of LIBs
- Relevant policies
  - WEEE Directive
  - ELV Directive
  - Basel Convention
- Amendment proposal for the EU Battery Directive
  - Introduction of material-specific recycling efficiencies: for copper, nickel and cobalt, 90% in 2026 and 95% in 2030 are defined; for lithium, 35% in 2026 and 70% in 2030.
  - Target for the overall battery increases to 65 % in 2025 and 70 % in 2030.
  - Policies for a CO_2 threshold for LIBs and a battery passport are added.

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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

Targets across all value chain steps

Mining & Mineral Processing

- **Limiting Climate change to 1.5°C**
- Carbon-neutral production and transport
- Net-positive environmental impact
- Net-positive contribution to biodiversity
- 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
- Secure 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
- Absolute decoupling of economic growth from resource consumption & environmental impact
- Level playing field

Cell Manufacturing

- 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
- 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
- Local content in value chain

Recycling

- 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

- 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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Roadmap Development

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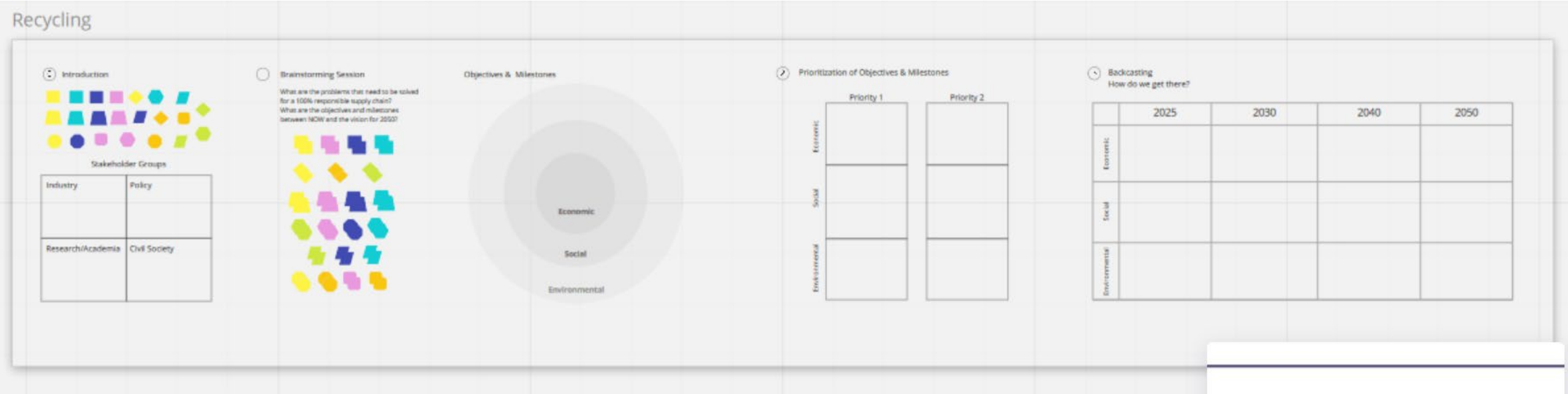
Joint roadmap development, with Miro board

- Goal: Discuss and compile major objectives and milestones, time frame up to 2050
- Miro white board tool: everyone please participate!
- Miro access: see link in the chat