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Mobility Roadmap Workshop 28th of October 2021

Cell production session

Dr. Johannes Betz, Oeko-Institut e.V., Germany

Noé Barriere, Vienna University of Economics and Business , Austria

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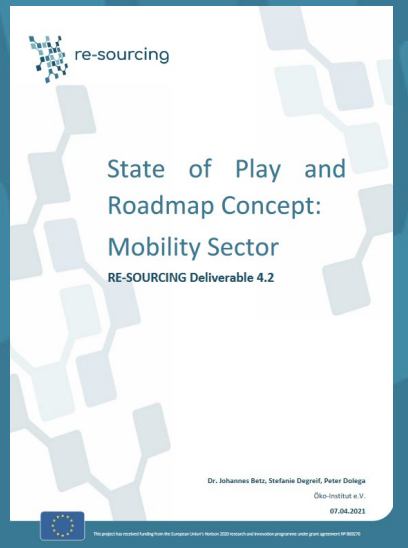
Agenda for the working group sessions

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



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

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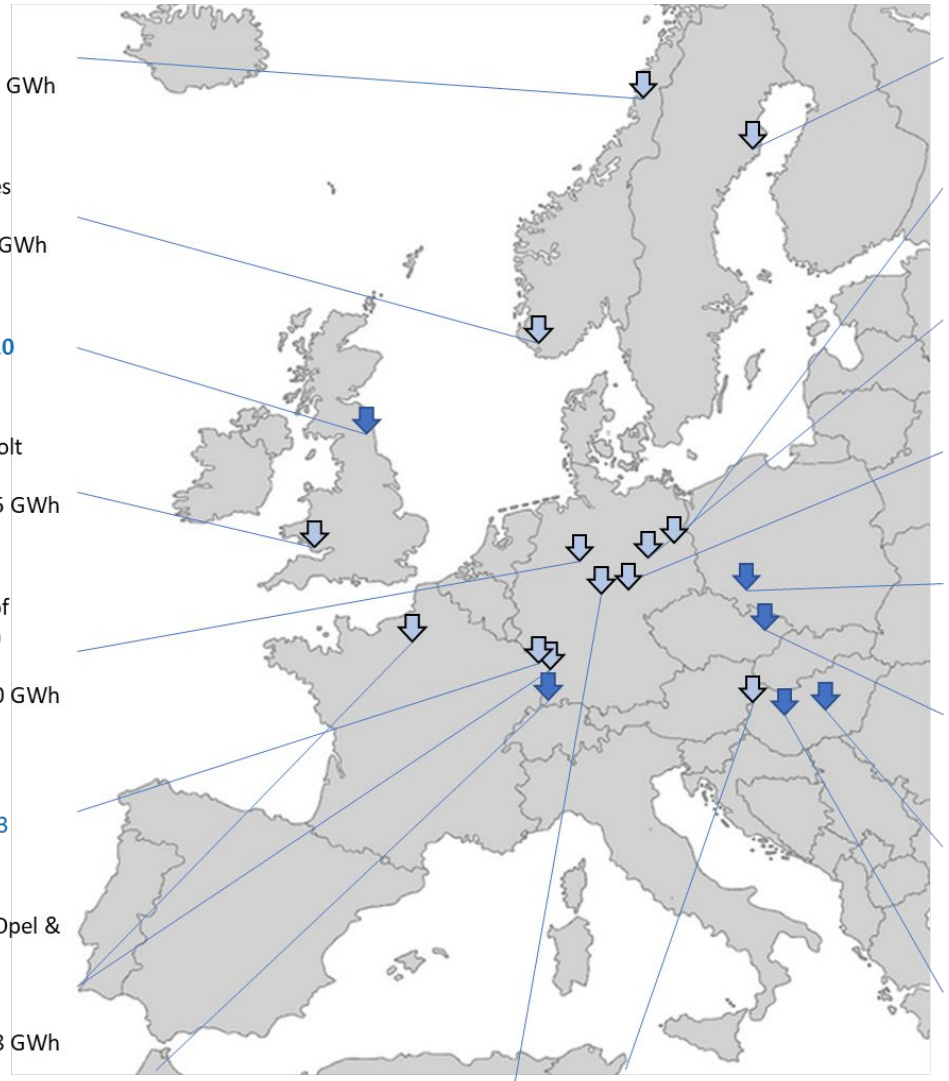
Battery cell production announcements in the EU beginning of 2021

Further announcements by VW, Italvolt, Daimler, Porsche/Custom Cells, Verkor, LG and others



FREYR
Mo i Rana, 2023
ramp up to 32+2 GWh

Morrow Batteries
Arendal, 2024
8 GWh, later 32 GWh

Envision AESC
Sunderland, 2010
1,9 GWh

AMTE & Britishvolt
St. Athan, 2023
10 GWh, later 35 GWh

Northvolt II (JV of Northvolt & VW)
Salzgitter, 2024
16 GWh, later 30 GWh

SVOLT
Überherrn & Heusweiler, 2023
later 24 GWh

ACC (Stellantis (Opel & Total (Saft))
Kaiserlautern & Douvrin, 2022
16 GWh, later 48 GWh

Northvolt
Skelleftea, 2021
32 GWh, later 40 GWh

Tesla
Grünheide, 202x
Capacity unknow

Microvast
Brandenburg, 2021
Ramp up to 8-12 GWh

FARASIS
Bitterfeld, 2022
6 GWh, later 10 GWh

LG Chem
Wroclaw, 2018
15 GWh, later 65 GWh

Magna Energy Storage MES
Horní Suchá CZ
1,2 GWh

SAMSUNG SDI
Göd, 2018
3 GWh, later 15 GWh

SK Innovation
Komarom 1+2, 2020
7,5 GWh + 9,8 GWh,
later 16 GWh

Leclanché
Willstädt, 2020
1 GWh

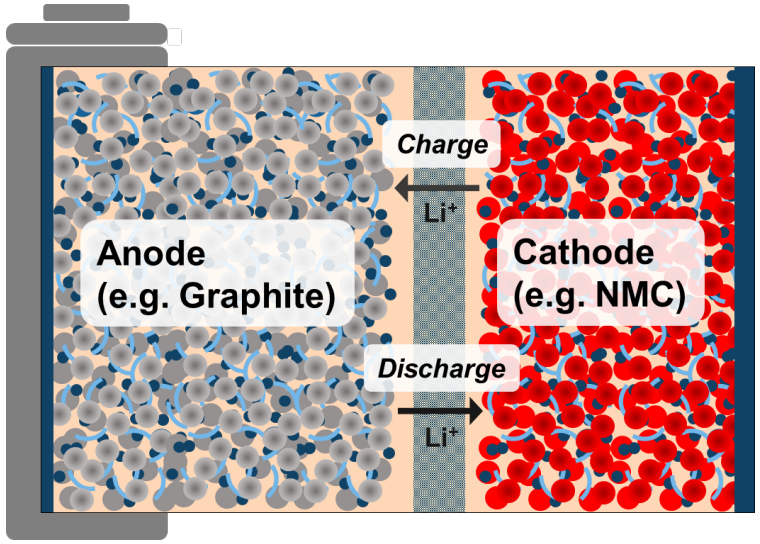
CATL
Erfurt, 2022
14 GWh, later 24 GWh

InoBat
Bratislava, 2024
Later 10 GWh

BYD
Europe, 202X
Capacity unknow

LIB cell

- Different cell formats
  - Pouch
  - Prismatic
  - Cylindric
- Cell stack
  - Combines both the electrodes on top of current collectors
  - Separator soaked in electrolyte



(1) Betz et al. (2019) Advanced Energy Materials, 9(6), 1803170.
(2) Winter et al. (2017): Elektromobilität – Was uns jetzt und künftig antreibt
http://www.bine.info/themen/publikation/elektromobilitaet-was-uns-jetzt-und-kuenftig-antreibt/

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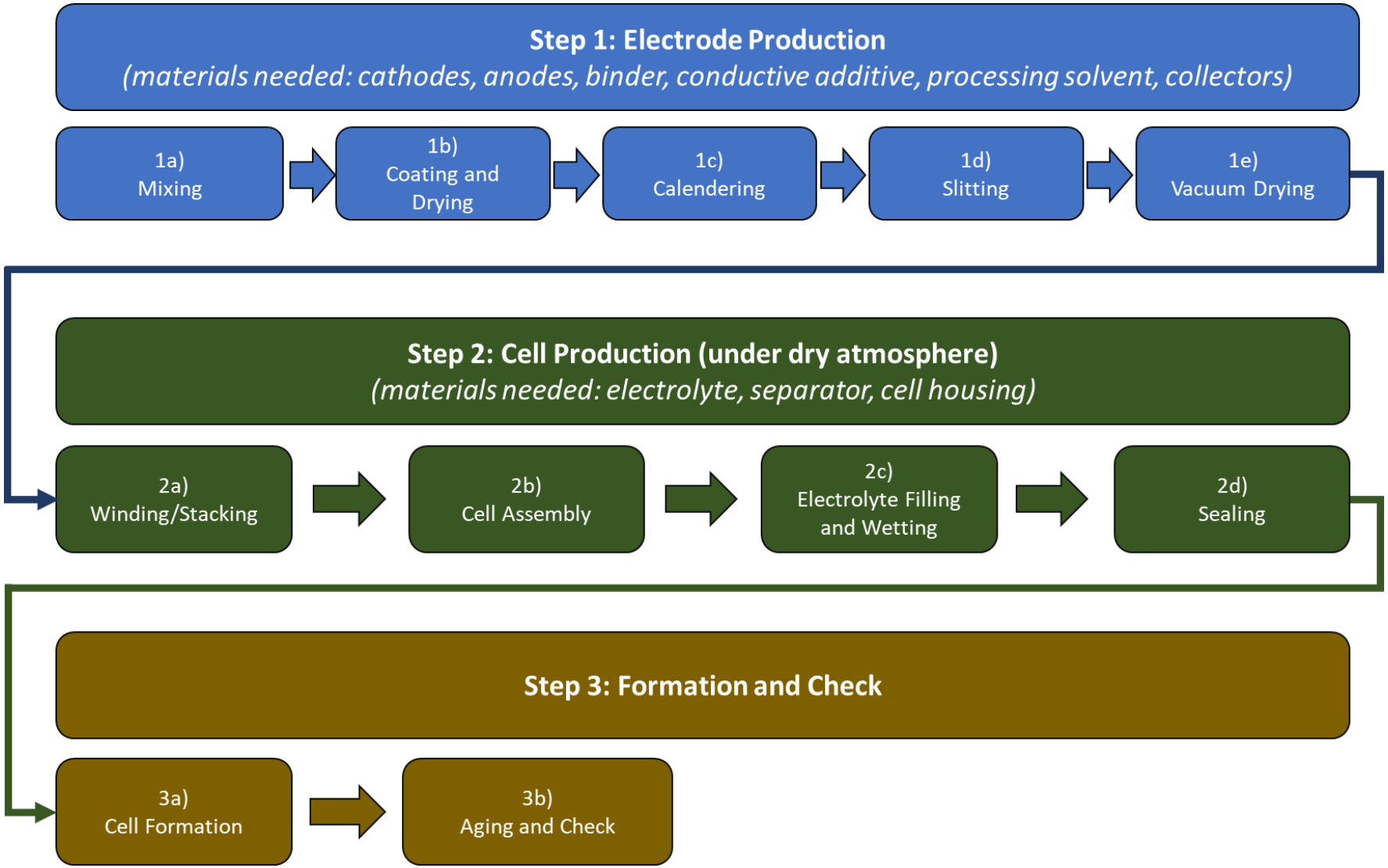
Overview over cell production



Challenges of cell production

Very energy intensive processes, related to GHG emissions

- Dry room atmosphere
- Drying of electrodes after coating by convection drying
- Formation and aging of cells, including:
  - Temperature control
  - Charging/discharging
  - Recuperation necessary for energy savings

Challenges of cell production

Toxic substances as part of the battery cell:

- Powders (anode, cathode, carbon black)
- Cathode itself (Co, Ni, partly toxic doping elements like Cr)
- Coatings on active materials
- Lithium salt in the electrolyte ($LiPF_6$)
  - Highly toxic decomposition products
- Often toxic processing solvents (NMP) for cathode
  - Should be recovered during drying phase
  - Release in the surrounding environment has serious consequences

Source: https://de.wikipedia.org/wiki/Global_harmonisiertes_System_zur_Einstufung_und_Kennzeichnung_von_Chemikalien

Challenges of cell production

- High susceptibility to errors leading to high scrap rates
  - Especially in the beginning of the production (5 – 40 %)
  - Material intensive production leading to a lot of waste
  - Recycling of wastes has to be established from the beginning
- Logistics is key
  - Dependency on material flows from around the world

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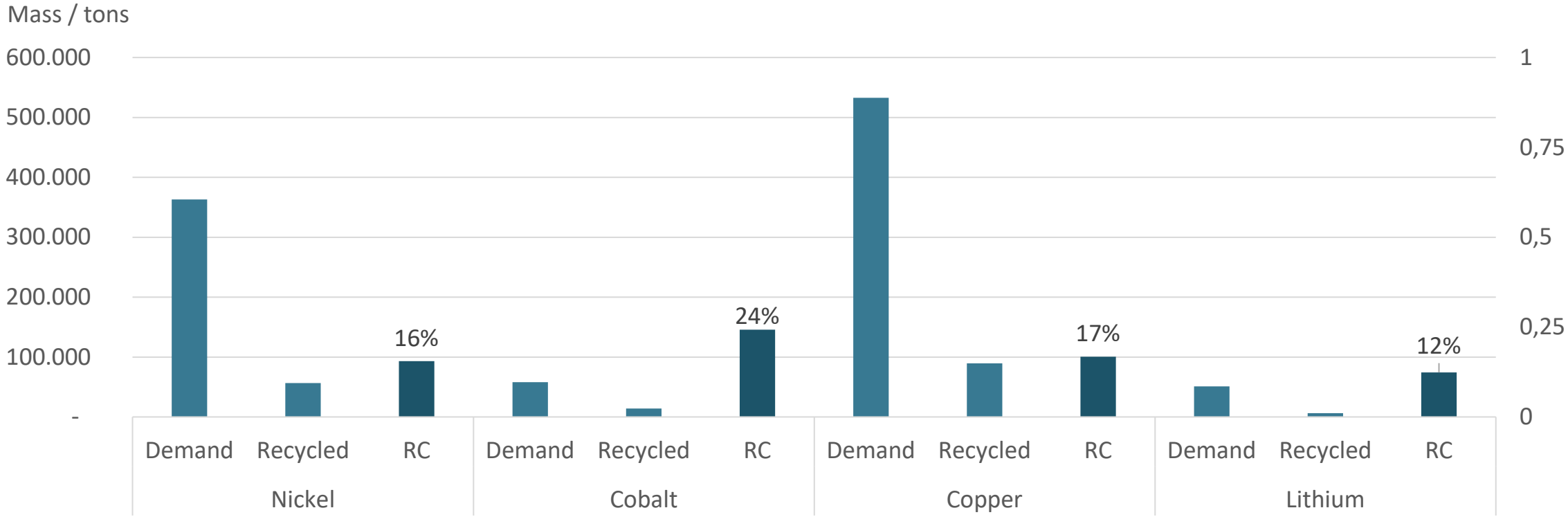
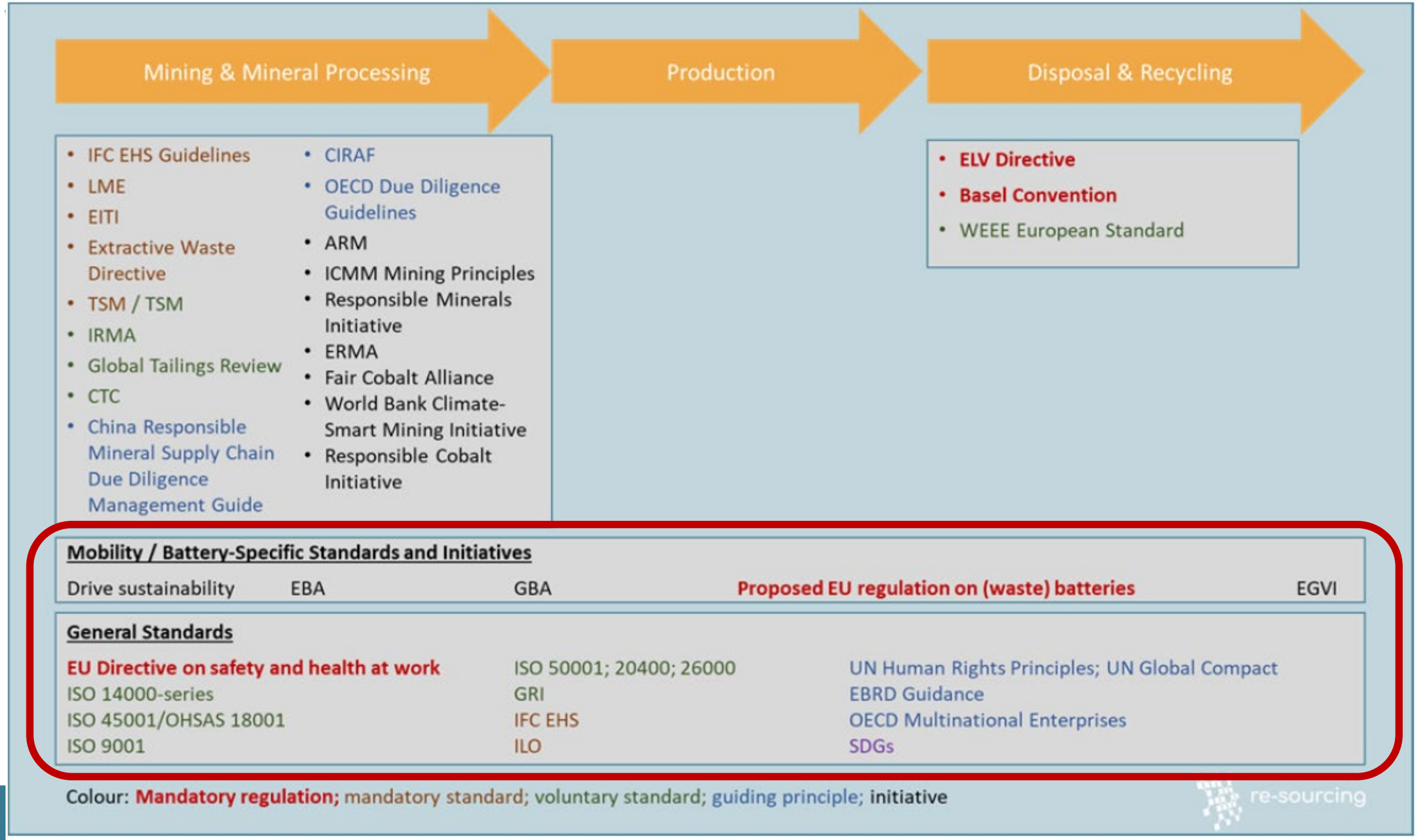
EU-27 demand for battery materials in 2035 and potentials for recycled content (RC)



Values resulting from the battery impact assessment model accompanying the proposal for a battery regulation from the EC. It is based on the following recycling rates: Ni, Co, Cu: 95% Li: 70%. The graph also includes portable and industrial batteries, which have shorter use phases. Furthermore, no second life is considered here, which would reduce the RC even further. Taken from (Stahl et al. 2021).

Initiatives and standards


Mining & Mineral Processing
Production
Disposal & Recycling
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
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 14000-series
ISO 45001/OHSAS 18001
ISO 9001
ISO 50001; 20400; 26000
GRI
IFC EHS
ILO
UN Human Rights Principles; UN Global Compact
EBRD Guidance
OECD Multinational Enterprises
SDGs
Colour: Mandatory regulation; mandatory standard; voluntary standard; guiding principle; initiative
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Vision

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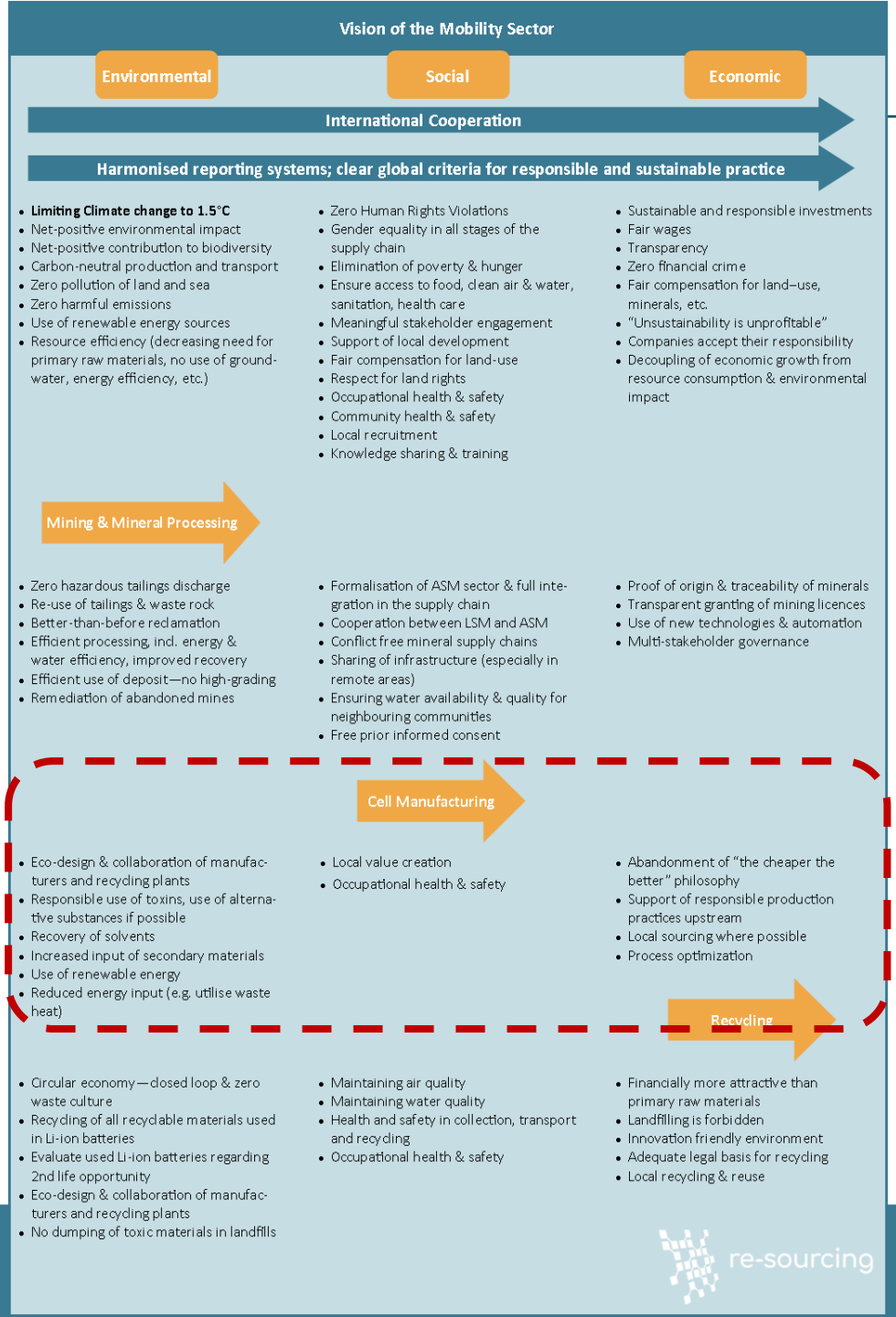
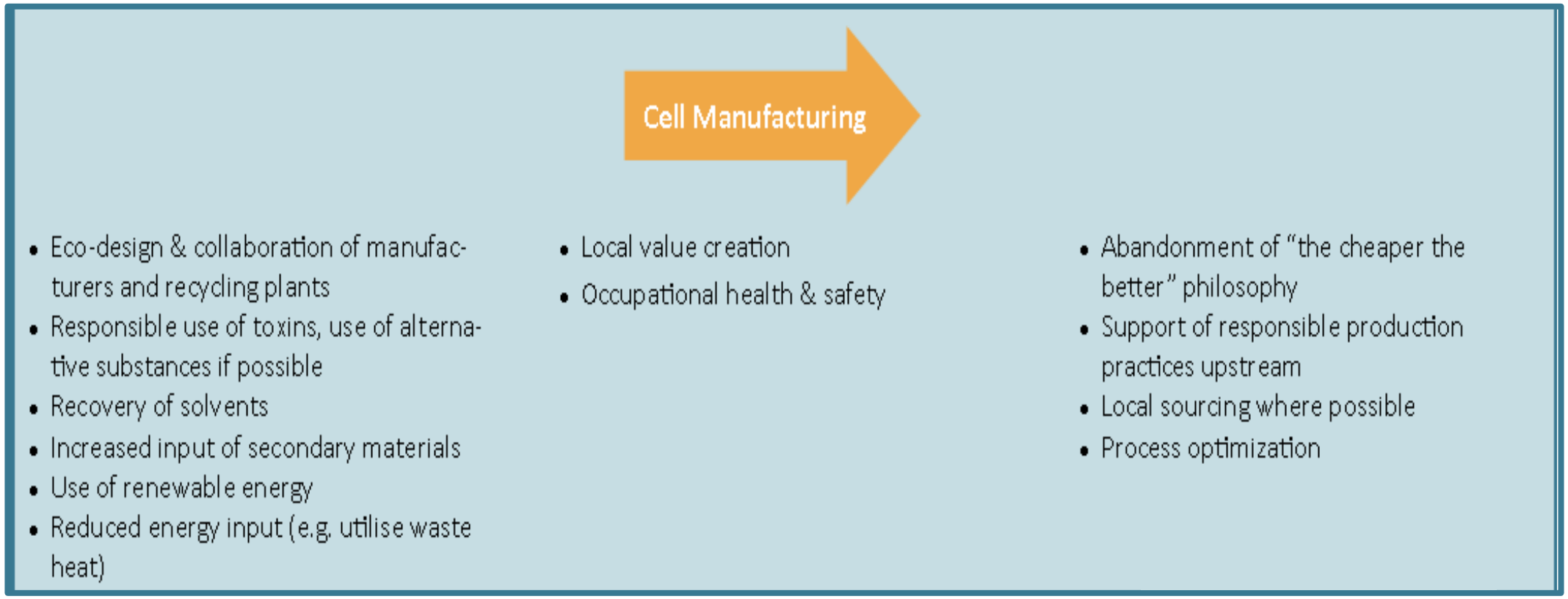
Vision



Vision – Cell manufacturing specific aims



Introduction Round

- Short introduction (1 sentence)
- Why do I participate? What do I want the roadmap to contain?

Roadmap Development

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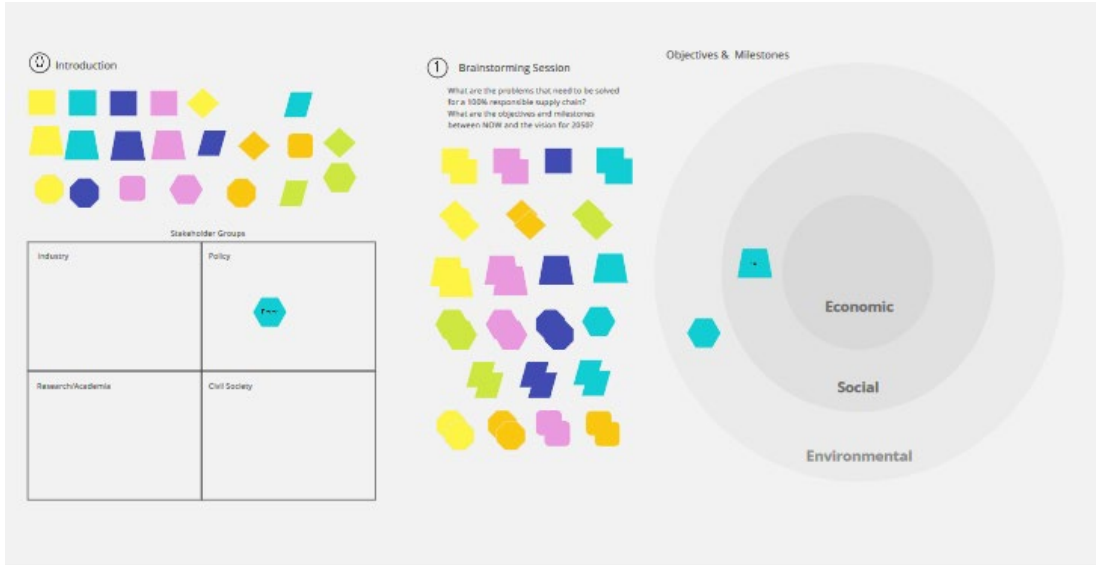
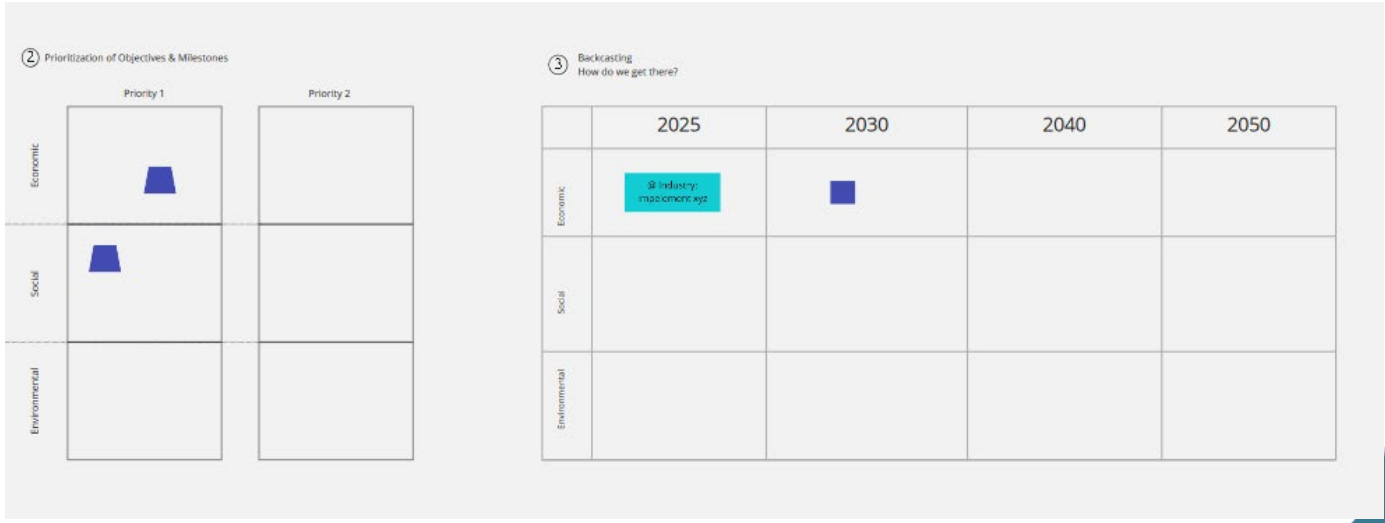
Roadmap Development

- MIRO-Board; Please see link in the chat
- Everyone is invited to participate
- Use the sticky notes
- You can zoom and navigate with mouse
- 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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Stefanie Degreif
Project Manager
s.degreif@oeko.de

Dr. Johannes Betz
j.betz@oeko.de

Tobias Wagner
t.wagner@oeko.de

Resources & Transport
Office Darmstadt
+49 6151 8191-0

Coordinated by:
Vienna University of Economics and Business,
Institute for Managing Sustainability
Welthandelsplatz 1A
1020 Vienna
Phone: +43-1-31336-5452
Email: info@re-sourcing.eu

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

www.re-sourcing.eu

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