Metals-as-a-Service: From Challenge to Design

Closed-Door Strategy Workshop







Columbia Center on Sustainable Investment
A JOINT CENTER OF COLUMBIA LAW SCHOOL AND COLUMBIA CLIMATE SCHOOL

CARBON TRUST

July 15, 2025

Agenda

1. 9:30 | Opening Remarks and Introductions
2. 10:00 | Session 1: Exploring Stakeholders' Perspectives & Systemic Drivers of MaaS
3. 11:20 | Coffee Break
4. 11:40 | Session 2: The MaaS Model Framing: From Concept to Collaborative Action
5. 13:00 | Wrap-Up and Next Steps

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Opening Remarks and Introduction

Housekeeping

Anti competition behaviour protocol

We will operate under the **Chatham House Rule**: you are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed

- DO limit communications, discussions and information exchanged to that which is strictly necessary for the purposes of the Workshop (the "Scope").
- DO limit the information exchanged to Participants and ensure that this is on a "need to know basis" only.
- DO NOT discuss or communicate with another Participant any competitive or commercially sensitive information that falls outside the Scope (see below for general guidance on permitted discussion topics).
- DO NOT disseminate information received from other Participants more widely as is necessary within your own organisation.

Permitted discussion topics*

Publicly available information	General topics such as **legal regulatory development, industry trends, politics**	**Old 'war stories'** like experiences of bids made or past contracts worked on	**General market conditions** not relating to specific contracts customer rates/prices and o/or bidding strategies

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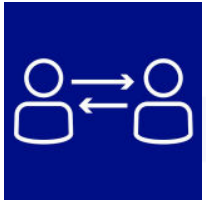
* Illustrative, non-exhaustive

Today's goals

For you

- **Explore** the commercial demand for systems-level changes needed in critical mineral value chains to ensure sufficient metal is available for the energy transition.
- **Contribute** to mapping out current efforts toward these changes and assess how **MaaS business models** could unify and accelerate progress.
- Engage with industry peers to share experiences, **identifying business drivers and barriers** to MaaS adoption.
- **Gain insights** into the latest trends and perceptions in MaaS.
- **Join a community of practice** dedicated to advancing MaaS.



For our research

- To **inform you of our research strategy.**
- To **obtain your feedback** on our research strategy.
- To ensure we capture **key challenges** for inclusion in our research, we would like to hear from you about:
  - Your organisation's experience with MaaS if any,
  - Your perceived benefits and challenges associated with MaaS,
  - Your organisation's motivation behind interest in MaaS.

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Introduction to the Columbia Center on Sustainable Investment (CCSI)

The Columbia Center on Sustainable Investment (CCSI)

Applied research center of Columbia Climate School (since 2006)

- **Mission**: to develop and advance policies and practices that shape investment to contribute to, rather than undermine, sustainable development.

- **Vision**: a world in which investment is aligned with sustainable development to improve **human wellbeing**, **reduced inequality**, and operate within **safe planetary boundaries.**

How We Work

Three Iterative Steps

1. We help build a clear, **evidence-based understanding** of how investment laws and policies affect people and the planet, including future trends and possible solutions.
2. We **share ideas for improving investment practices** through **events, publications**, and conversations with key partners.
3. We **create tools, offer training, and provide technical support** to help others make investment more sustainable and beneficial for development.

Our areas of focus

- Critical minerals: Governance, Decarbonization and Circular Economy
- Climate Change Law and Policies
- Decarbonization of hard-to-abate sectors
- Investment Law & Policy
- Just Energy Transitions & Fossil Fuel Phaseout
- Carbon accounting
- Climate Finance

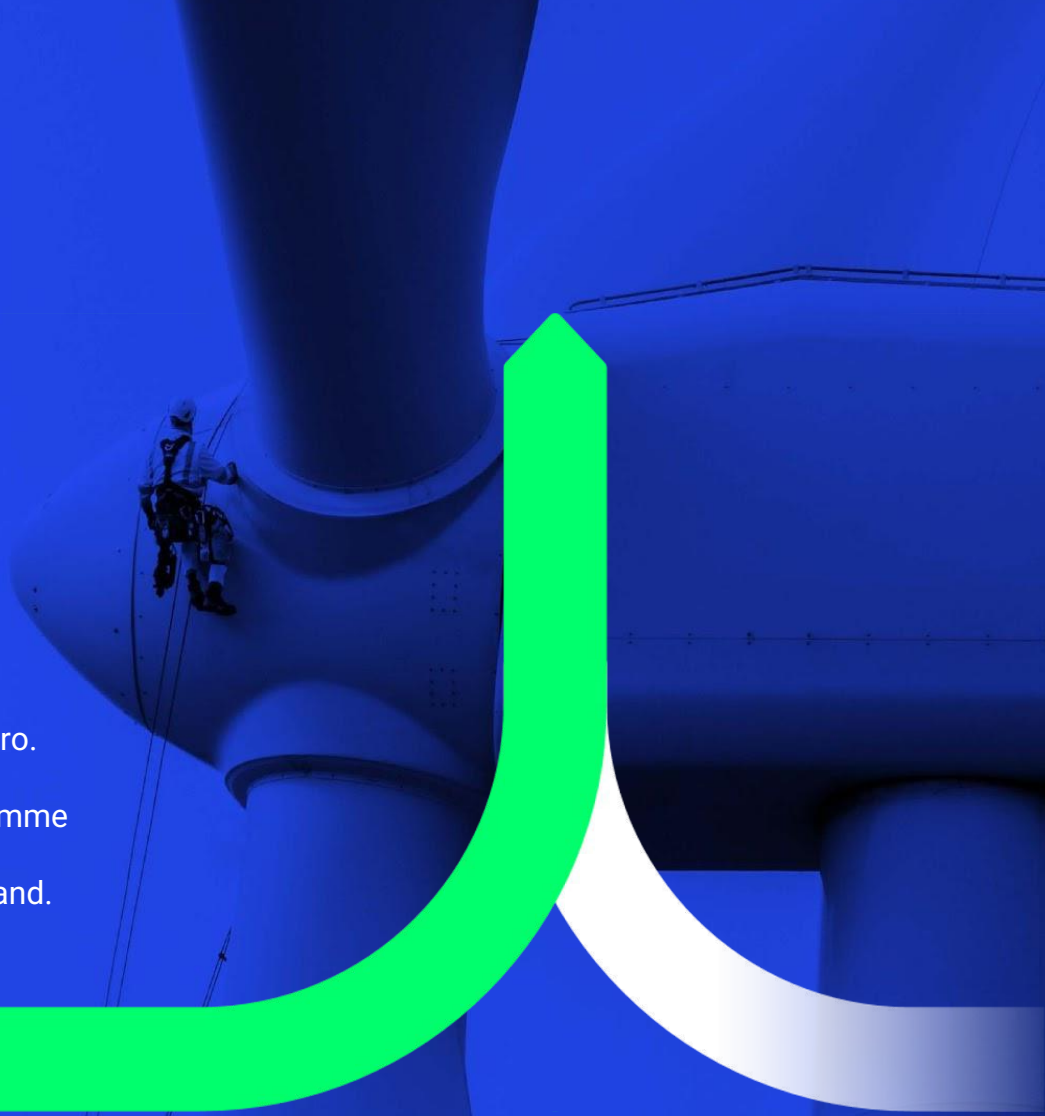
OUR STAKEHOLDERS

Business leaders | Communities | Development advocates | Governments | Investors | Policymakers

Introduction to the Carbon Trust

What we do

We provide solutions to the climate crisis. We support organisations globally as they accelerate towards Net Zero. From target setting, Net Zero pathways, assurance and footprinting, to policy advice, strategy setting and programme delivery, we seek smarter ways to turn intent into impact, where sustainability and economic realities go hand in hand.



Our mission is to accelerate the move to a decarbonised future

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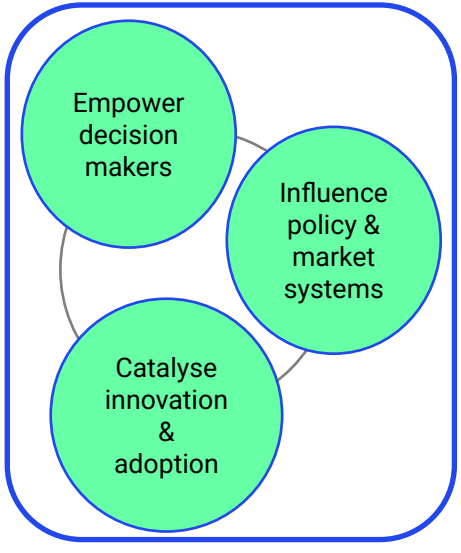
Sector expertise

Agriculture, food & drink
Manufacturing & industry
ICT
Finance & infrastructure
Offshore renewables
Energy transition
Cities & regions
Ventures & innovations

Activities



Outcomes

Decarbonisation strategies embedded in business models

Accelerated uptake of low carbon solutions

Stronger policy and market alignment

Impact

Deep decarbonisation across sectors and value chains

Resilient, future-ready businesses

Systemic market transformation

Stakeholders

Businesses & corporates
Governments & policymakers
Investors & financial institutions
Technology & innovation ecosystem
Academia & research Intuitions

Round of Introductions

Please take 1 minute to introduce yourself

- Name
- Role
- Organization
- What you would like to get out of today?

SESSION 1: Exploring Stakeholders' Perspectives & Systemic Drivers of MaaS

Setting the Scene: Rethinking Metals for the Energy Transition

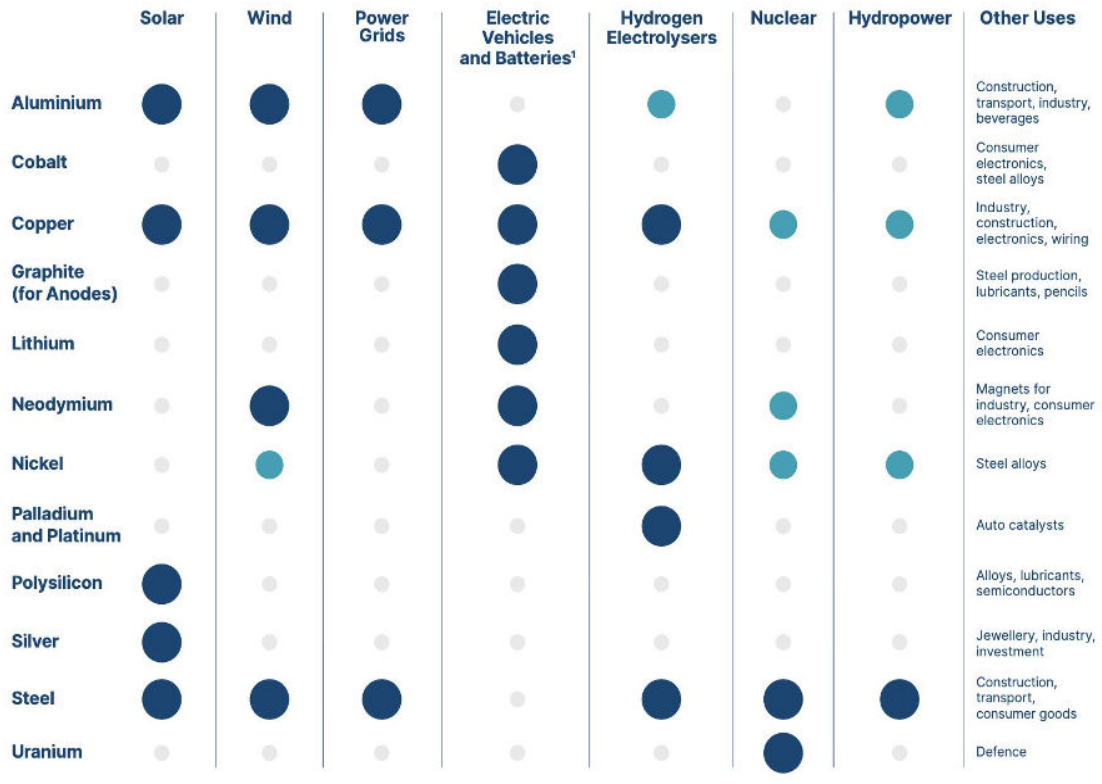
If change does not happen a critical minerals crunch will cut-short the clean energy transition

Clean energy technologies are a significant driver of increased demand for critical minerals

Ferrous and non-ferrous metal material flows are present in almost every aspect of clean energy technology, ranging from renewables, to battery storage and infrastructure development.

Rise of electrification rates in the Global South contributes to an increase in global demand for key metals.

EV and battery materials represent the highest risk to reliable supply due to market concentration in China.



Source: Material and Resource Requirements for the Energy Transition, ETC

Some transition metals have projected reserve crunches, others are (or will) experience primary supply constraints

An estimated 6.5 billion tonnes of end of use materials are needed for the energy transition

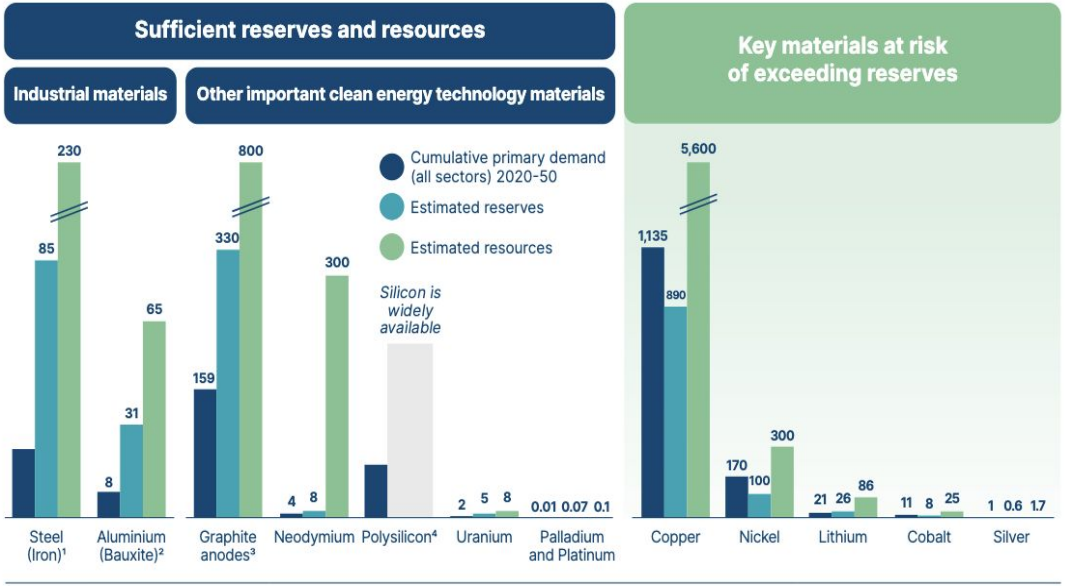
Forecast demand for materials like copper, nickel, lithium, cobalt and silver are forecast to exceed estimated reserves.

Where reserves are considered sufficient:

- Long project timescales limit the market's ability to respond to near term supply shortages and high prices.
- Large mining projects can take up to 20 years to production. Delayed by slow planning and permitting.
- Chokepoints arising from export controls and high supply concentration increase risk of shortages.

Cumulative primary demand 2022-50 from energy transition and other sectors, compared to estimated reserves and resources

Billion metric tonnes (Industrial materials); Million metric tonnes (All other materials)



[1] Reserves and resources of contained iron. [2] Reserves and resources of bauxite. Demand for aluminium converted to bauxite assuming 4 tonnes of bauxite are required to produce one tonne of aluminium. [3] Graphite reserves/resources refer to natural graphite and do not include synthetic graphite. [4] No estimated reserves for silicon, but quartz (the key input) is widely available in most geographies.

NOTE: "Resources" are an estimate of material stocks available in sufficient concentration to make exploitation an economic interest at some time. "Reserves" are the currently economically and technically extractable subset of resources. It is important to note that even these estimates tend to increase over time.

SOURCE: SYSTEMIQ analysis for the ETC; US Geological Survey.

Source: Material and Resource Requirements for the Energy Transition, ETC

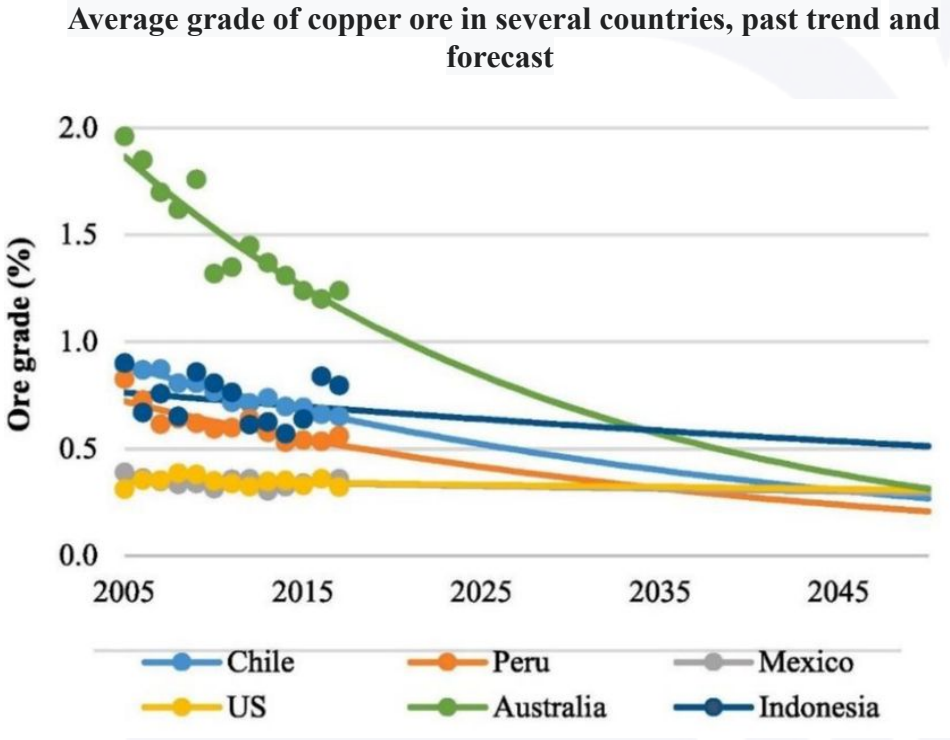
Falling ore grades add to the crunch, further tightening supply

Copper is a good example of this challenge

Miners like Codelco report ore grade declines of ~30% over past the decades, increasing production costs significantly.

Most large-scale copper comes from porphyry deposits, typically averaging 0.4–1% Cu; higher-grade (>1 %) deposits are rarer.

Scrap from e-waste recycling of electronics can have copper grades of ~3–4%, highlighting the value of secondary copper sources.



Sources: https://discoveryalert.com.au/news/global-copper-production-trends-2025-leaders-market
https://www.researchgate.net/figure/Copper-grade-on-evaluated-consumer-electronic-products_tbl1_292089685
https://www.researchgate.net/figure/Reported-symbols-and-forecasted-lines-ore-grade-by-country-Adapted-from-43-with_fig2_358670677

Dramatic in copper, declining ore grade impacts primary supply of many metals

Metal	Historical Grade	Modern Avg Grade	Trend
Copper	~2–4%	~0.4–0.6%	⬇ Strong
Iron Ore	>60% Fe	~30–62% Fe (blended)	⬇ Moderate
Bauxite	>50% Al_2O_3	~40–45% Al_2O_3	⬇ Gradual
Nickel	>2% (sulfides)	~1–1.5% (laterites)	⬇ Strong
Gold	>10 g/t	~0.8–1.5 g/t	⬇ Very strong
Zinc	~10–12%	~5–6%	⬇ Strong
Lithium	>1.5% Li_2O (hard-rock); >1500 mg/L (brines)	~1.0–1.2% Li_2O (hard-rock); ~500–800 mg/L (brines)	⬇ Clear

- 💰 Higher production costs
- ⚙️ More complex processing (especially for impurities)
- 🌱 Greater environmental footprint (energy, waste, water)
- 🚚 More material moved per unit metal

Greater push for **circular business models**

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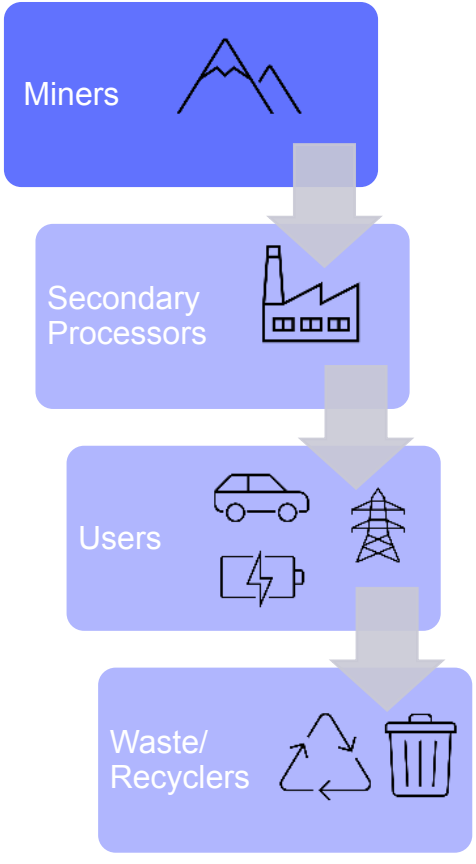
Sources: USGS (2023); IEA The Role of Critical Minerals in Clean Energy Transitions (2021); Mudd, G.M. (2009) The Sustainability of Mining in Australia; T. Tuck et al., Australian Bauxite Resources 2022; World Bank Minerals for Climate Action (2020); RMG Consulting (2020); S&P Global Market Intelligence (2021); Roskill (2022); Benchmark Mineral Intelligence; ResearchGate datasets (2020–2023); GRID-Arendal (2014); Mining Technology (various); Journal of Cleaner Production.

Linear business models underservice supply of needed metals



Linear business model / heavy asset & mass production

- Dependent on primary extraction
  - New mines require high capex due to decline ore grade, and face strict regulatory barriers
- Minimal reverse supply chain
  - Recycling as an afterthought generates a lot of waste of durable materials

Inefficient business models in metal value chains

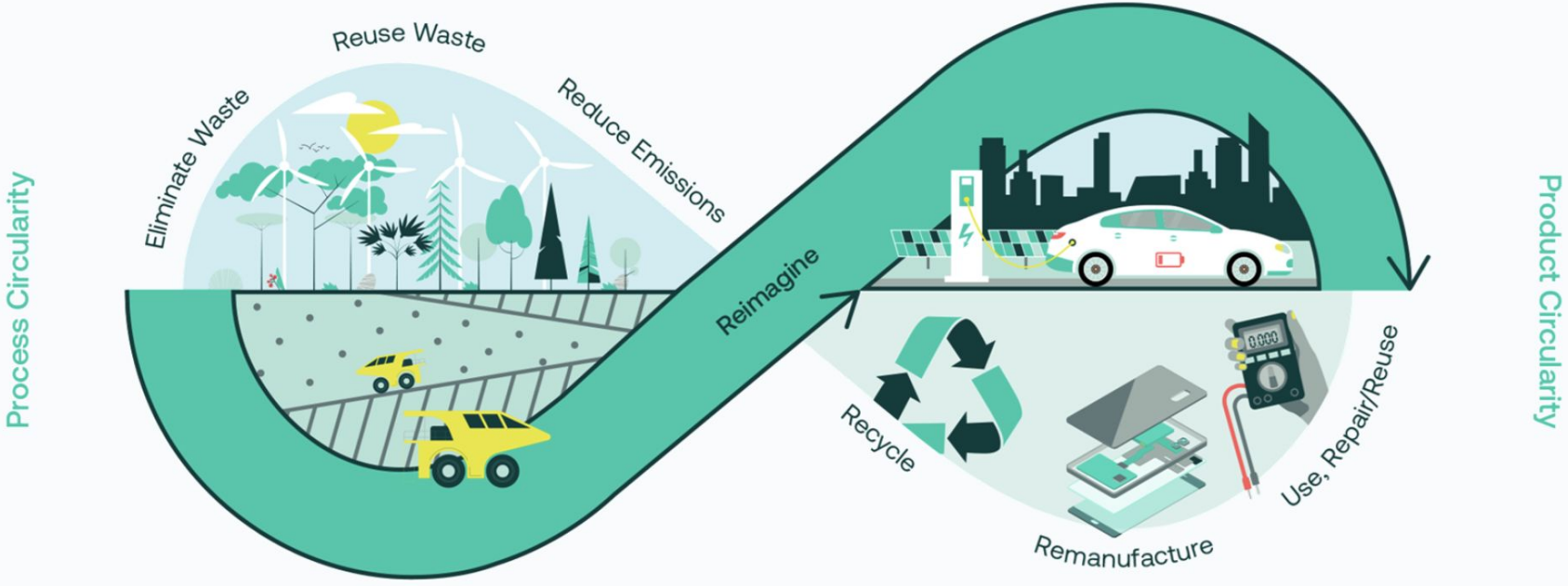
- Traditionally conservative
- Decisions driven by lowest-risk cases
- KPIs emphasize production efficiency, mine life, and reserve grades. Little focus on circularity
- Weak commercial ties with downstream manufacturers
  - Minimal focus on product design, durability or reusability

Status quo in metal value chains won't deliver the timely societal, environmental, and economic changes needed for the clean energy transition

And, circularity focused on recycling is insufficient to foster systems change

Traditionally hailed as the answer to mining's linear model, much circularity thinking has focused on recycling. A broader circularity strategy which includes product design, reuse and repair paves the way for service models like MaaS to drive deeper market transformation to create sufficient critical mineral flows that thaw frozen supply.

A circular economy results from mining processes that minimise, reuse and ultimately eliminate waste, and from product design and collection processes that harvest and reuse metals indefinitely.



Source: ICMM

How do we energise circularity to deliver sufficient critical minerals?

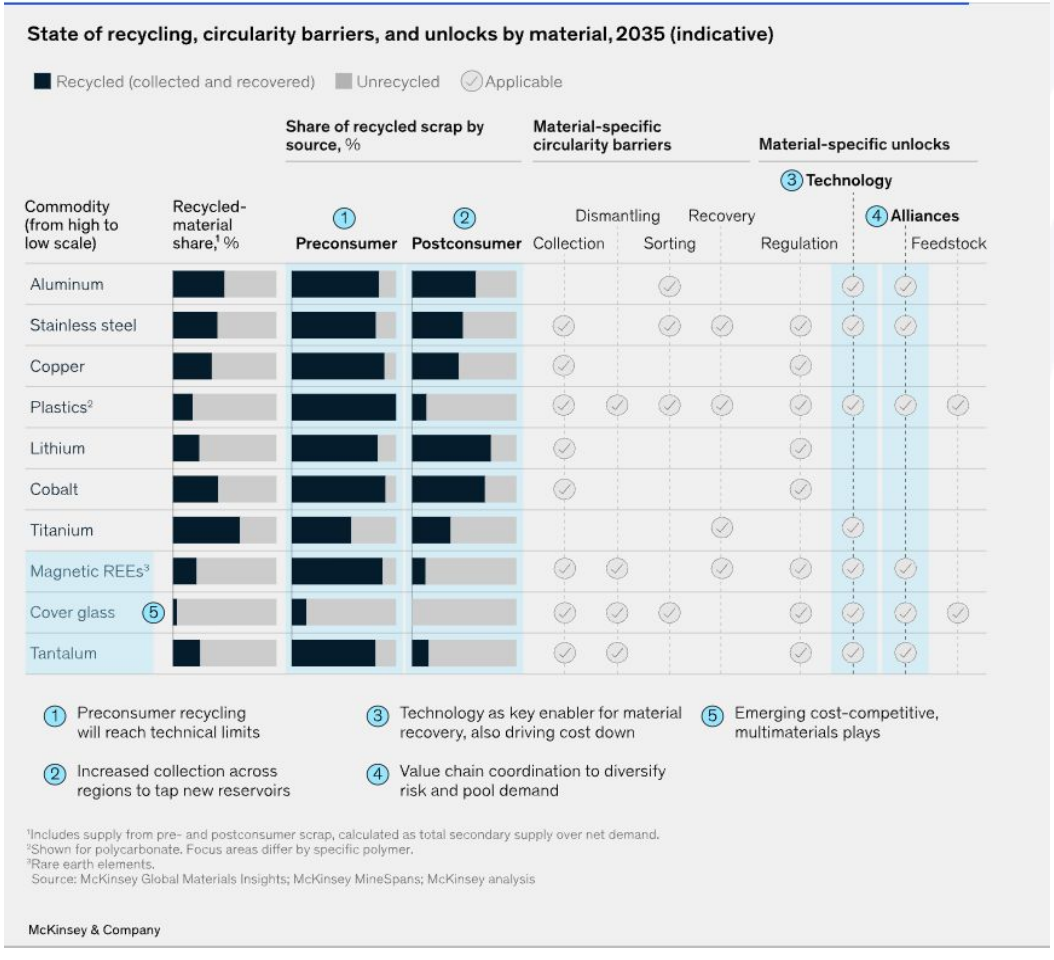
Pre-/Post-Consumer Scrap
- Pre-consumer tech ceiling (~80% by 2035)
- Post-consumer key for future growth

Collection
- Unlock new streams
- Partner for infrastructure (e.g., regional hubs)

Technology
- High-quality options exist
- Need scale, lower carbon

Alliances
- Cross-chain collaboration improves scale & economics
- Closed loops cut cost & share risk

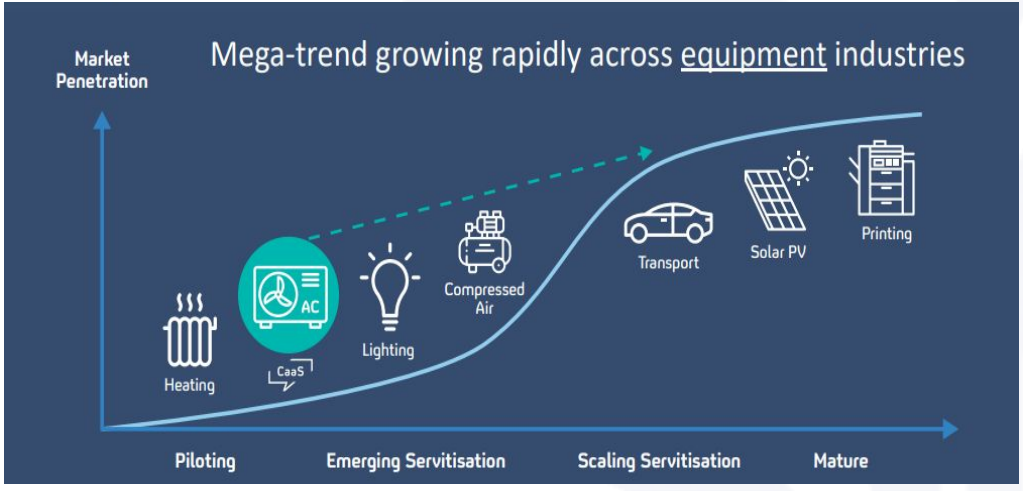
Multi-material recovery
- Still nascent for some critical materials
- Can integrate into existing value chains?



Source: How circularity can make the built environment more sustainable, McKinsey 2025

Servitization has emerged as a solution in equipment industries

- Transformation of a traditional product-based business model into one that delivers service outcomes.
- Functionality or utility as a service, rather than through product ownership.
- Provider retains ownership of the physical asset or material, and the customers pay to access its use, performance or results over time.
- Use of leasing, subscription or pay-per-use arrangements.



Servitization phases: piloting, emerging, scaling, and maturing. Mature industries like transport, solar PV and printing have achieved full market adoption. Other equipment industries (e.g., cooling) are advancing fast

Other examples include ICT software, mobile phones, data centres.

Source: Market Transformation:Servitization of Cooling Industry

Metals-as-a-Service servitization across the entire value chain

Service based model and contractual agreements to redefine the linear life cycle of metals extraction.

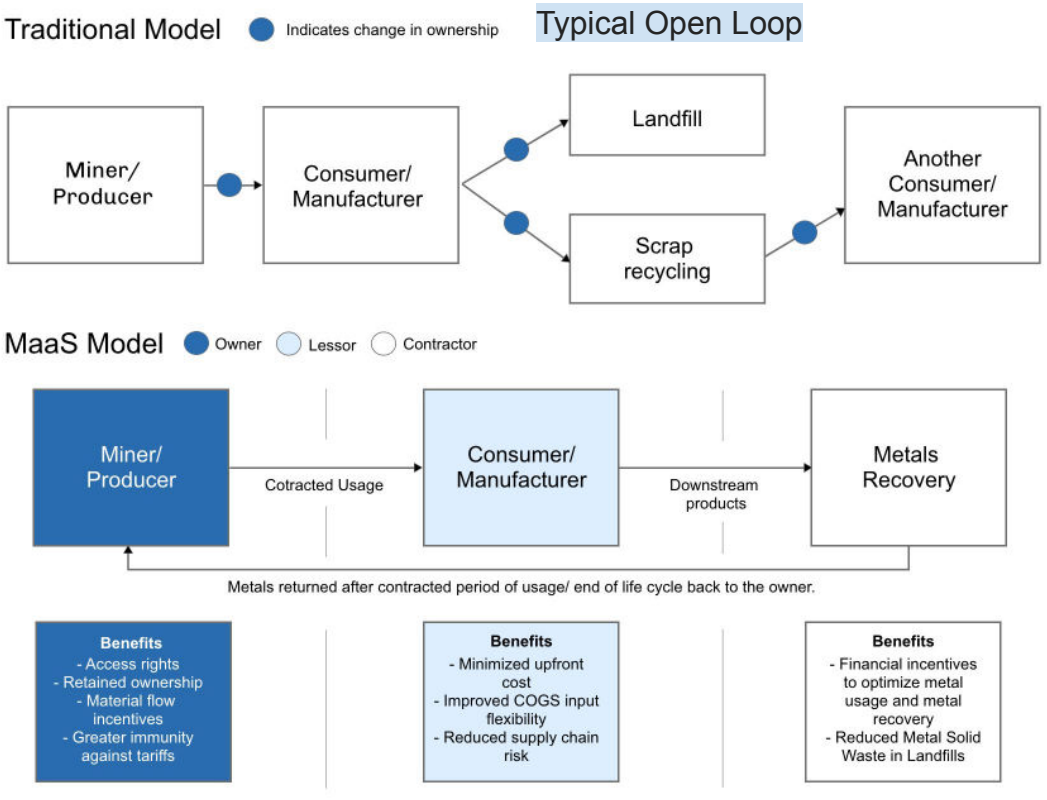
Characteristics of MaaS: (i) retained ownership of metal by the producer and (ii) shift from CAPEX to OPEX payment for customer.

The right to use metal is transferred along with a contractual duty to ensure recoverability.

Actors across the value chain design and produce in a circular way. Effectively turning each product or building into an “above-ground mine” for future reuse.

De-risking for the producer ranges from derecognizing the CAPEX to leveraging derivatives in the commodities markets.

De-risking for customer ranges from insurance to digital traceability to performance-based fees.



The structure should optimize metal consumption while minimizing waste, material efficiency and incentivize recovery

Case Study: Masco

MASCO: Materials-as-a-Service-Company

Value chain for product low in circular value, sold in a linear business model.

Sales price to building owner	€ 90
Sales price to contractor	+ € 25
Margin contractor	+ € 7,5 (€ 25 x 30%)
Labour	+ € 57,5
Sales price to building owner	= € 90

TCO for the building owner	€ 110
Sales price	+ € 90
Disposal of waste	+ € 20
Total	= € 110

Value chain for circular valuable product, sold with a circular discount funded by MASCO.

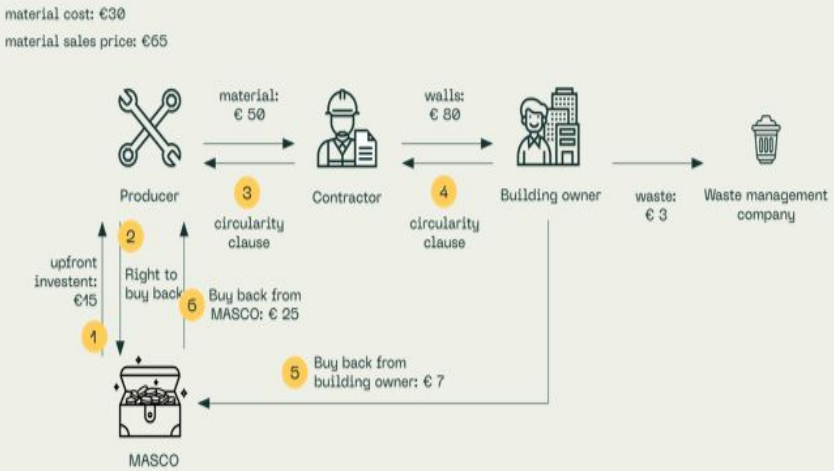
Sales price to building owner	€ 80
Material sales price	+ € 65
Circular discount	- € 15
Sales price to contractor	= € 50
Margin contractor	+ € 15 (€ 50 x 30%)
Labour	+ € 15
Sales price to building owner	= € 80

TCO for the building owner	€ 81
Sales price	+ € 80
Buyback from MASCO	- € 7
Cost of deconstruction	+ € 5
Disposal of waste	+ € 3
Total	= € 81

P&L MASCO	€3,5
Initial investment (circular discount)	- € 15
Buyback from building owner	- € 7
Selling to the producer	+ € 25
Total	= € 3,5

Material sourcing supplier	-14%
Material cost	€ 30
Material cost after 9 years (indexation à 2% yearly)	€ 36
Sourcing price from MASCO	+ € 25
Cost for reuse	+ € 6
Total	= € 31 => 14% cheaper than new material

MASCO: Materials-as-a-Service-Company



Value chain for circular valuable product, sold with a circular discount funded by MASCO.

Producers

- More opportunities to accelerate business growth due to the lower material cost

Contractors

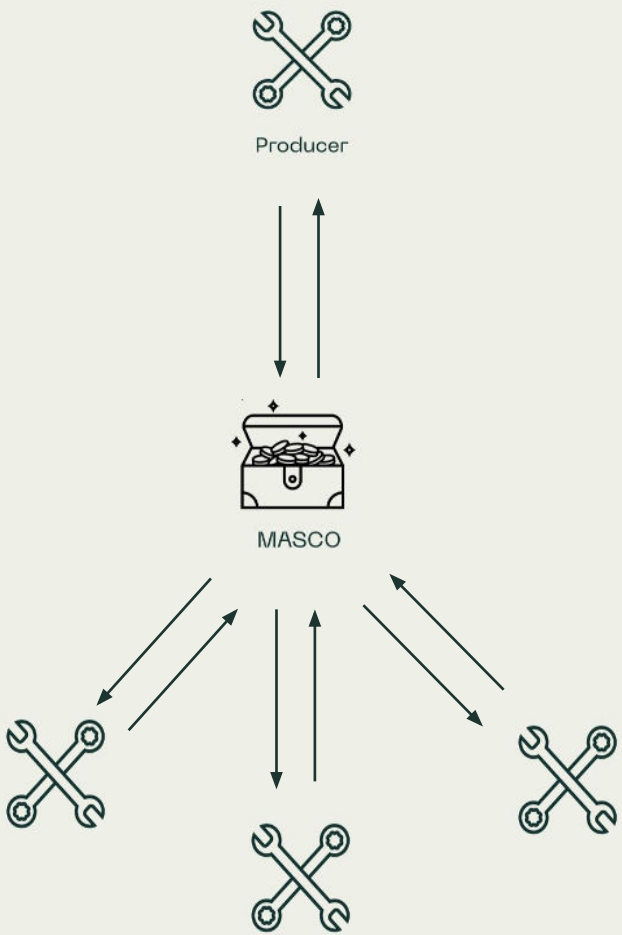
- Enable quick installation of more valuable materials

Building Owners

- Lower upfront cost (& lower Total cost of Ownership)
- Incentivize the return of product
- The buyback price should cover the demounting and transportation costs that owners are responsible for

Financial Sector

- Open feasible investment opportunities
- The Circular Value Index can be an objective way of measuring the viability of the model



MASCO: Materials-as-a-Service-Company

A fund that offers financing solutions to producers of circular valuable products, while assuring the material is kept in the loop.

It operates as a central knowledge hub, offering services to multiple producers:

1. business model setup
2. legal advice
3. access to (green) financing

By operating with several SPV's (for example, per product, per producer, per location) the risk is diversified and ringfenced.

Focus on Circular Valuable Products, analysed by the Circular Value Index.

Circular Value Index

Circular Value Index = An abstract indicator to express the profitability of a circular business model.

Circular Value Index

Established maximum achievable price for an item in the current market conditions.

maximum of
- emotional price
- 2nd-hand price
- buyback price
- resource price

- losses

$$\text{Circular Value Index} = \frac{\text{residual value}}{\text{cost of reuse}} \times \text{risk}$$

Expenses linked to the execution of a circular business model.

sum of costs of
- demounting
- repair
- quality
- sales (2nd vs 1st life)
- transport (2nd vs 1st life)
- storage ((2nd vs 1st life)
- disposal

When assessing a business model's potential for profitability, it is crucial to vigilantly monitor risks (especially when interacting with the financial sector).

risk linked to
- regulatory issues
- toxicity
- trends
- producer
- custom
- technology

Circular Value Index

$$\text{Circular Value Index} = \frac{\text{residual value}}{\text{cost of reuse}} \times \text{risk}$$

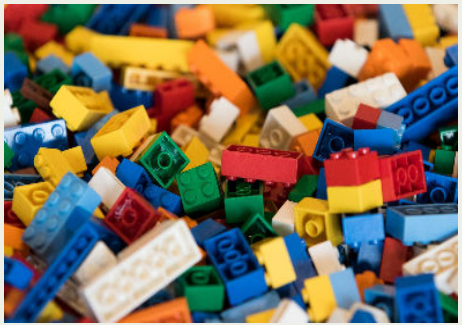
$$= \frac{\text{maximum of } \begin{bmatrix}\text{emotional price}\\ 2^{\text{nd}}\text{-hand price}\\ \text{buyback price}\\ \text{resource price}\end{bmatrix} - \text{losses}}{\text{sum of costs of } \begin{bmatrix}\text{demounting}\\ \text{repair}\\ \text{quality}\\ \text{sales } (2^{\text{nd}} \text{ vs } 1^{\text{st}} \text{ life})\\ \text{transport } (2^{\text{nd}} \text{ vs } 1^{\text{st}} \text{ life})\\ \text{storage } ((2^{\text{nd}} \text{ vs } 1^{\text{st}} \text{ life})\\ \text{disposal}\end{bmatrix}} \times \text{risk linked to } \begin{bmatrix}\text{regulatory issues}\\ \text{toxicity}\\ \text{trends}\\ \text{producer}\\ \text{custom}\\ \text{technology}\end{bmatrix}$$

Circular Value Index & product design

$$\text{Circular Value Index} = \frac{\text{residual value}}{\text{cost of reuse}} \times \text{risk}$$

$$\frac{€\ 0{,}08}{€\ 26{,}1} < 1 = \text{no reuse}$$

$$\frac{€\ 2{,}2}{€\ 0{,}09} > 1 = \text{reuse}$$



THE CIRCULAR VALUE INSTITUTE

Circular Value Index & product design
Focus on efficiëncy

beMatrix

global no. 1 wall system for tradeshows & events

custom

profiles

frames

labor

system

labor

system

labor

system

We want to hear and learn from you: What is MaaS in your context?

Roundtable Participation

Understanding different MaaS business model archetypes

Question: What is your current understanding of what MaaS is or could be for your organisation?

For those companies who have explored or tested MaaS:

- How have you implemented a MaaS business model in your organization?
- What were the key enablers (legal, financial, institutional, and policy support) that stimulated MaaS exploration?
- What benefits have been seen from adopting MaaS?
- Is the business model productive and sustainable (e.g., profitable, has a competitive advantage)?
- What archetype would you give to this MaaS model?

- For those who have not:
  - What has prevented you from trying MaaS?
  - What are the key challenges or risks that you identified in a MaaS business model?
    - Timeline, material quality, recyclability, perceived asset value, financing or contractual complexity
  - What incentives could be put in place for your organization to implement MaaS?
  - Where do you see the biggest opportunity for MaaS in your context? What benefits could MaaS deliver for your organization and your peers?

How does MaaS align or conflict with your organization's current direction?

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Coffee Break: 20 mins

SESSION 2: The MaaS Model Framing: From Concept to Collaborative Action

Our Research and Work Plan

- Research work streams producing applied knowledge:
  - **MaaS value chain economic analysis**: Analysis of the economic benefits found across the MaaS value chain; as well the potential impact on mineral supply.
  - **Business model innovation**: Deep exploration of MaaS business models to identify least-risk, first move opportunities to pursue; and how these could evolve from existing business models.
  - **Learning from elsewhere**: Summary review of relevant policy and financial enablers found in other market sectors using 'as-a-service' models.

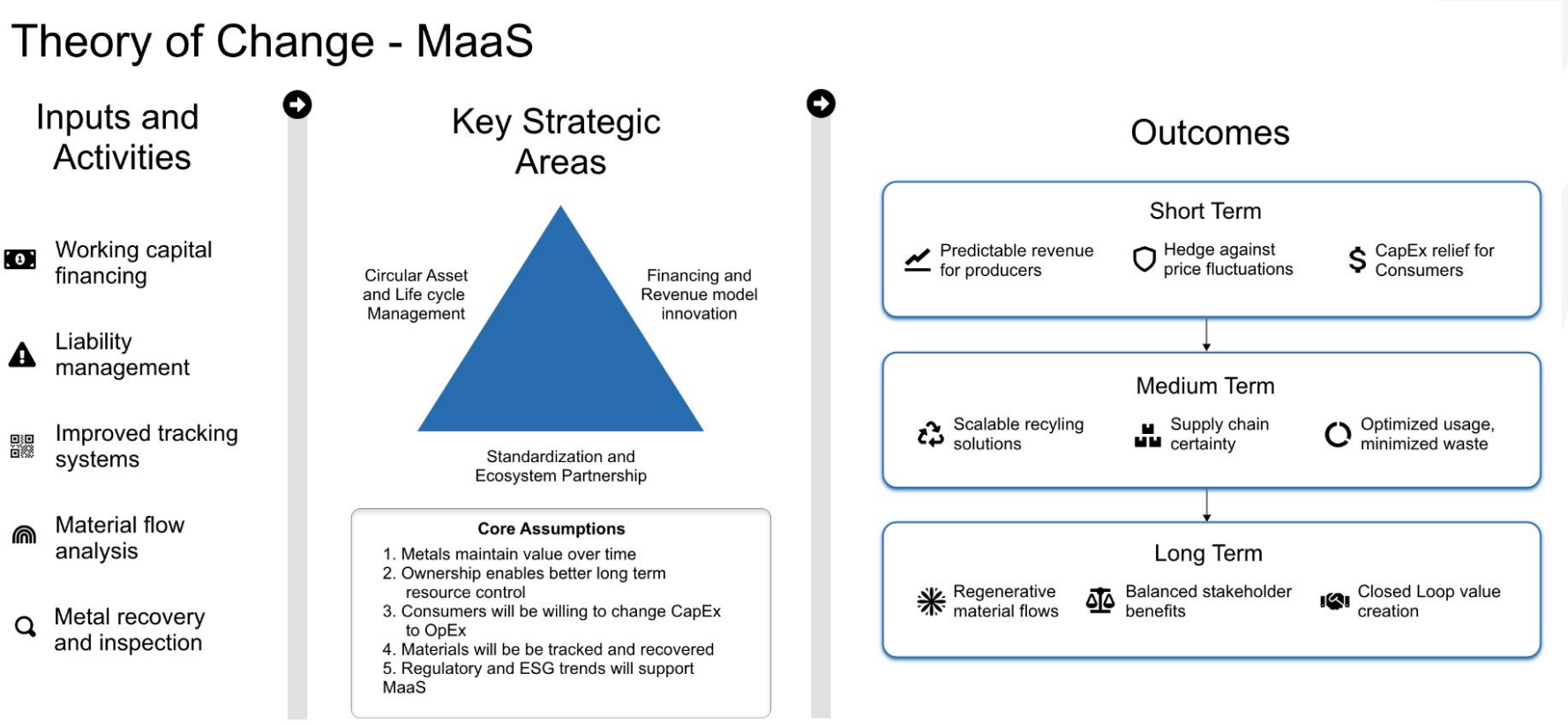
- Learnings will be shared in Autumn 2025, and Spring and Autumn 2026

- Possible closed loop metal focus areas (steel, aluminium, battery metals incl. copper)

- Vision for a community of practice

Exploring Economic Analysis and Benefits

MaaS as a strategic hypothesis for systems change



Stakeholder-specific business drivers: benefits and risks

Are these the right ones? What other benefits and risks are there?

Stakeholders	Benefits	Risks
Miners	- Recurring cash flow from leasing - Retained ownership of strategic materials - Improved ESG positioning	- Commodity price risk - Longer cash conversion cycle - Increased default risk
Metal Processors	- Reduced metal procure -ment and storage costs - Reduced market risk exposure - Supply chain certainty	- Loss of capital gains from refined metal products - Limited inventory manage -ment - Contract dependency
OEMs	- Reduced exposure to commodity price volatility - Lower upfront CapEx - Reliable, guaranteed supply of materials	- Increased liability and metals insurance expense - Must guarantee return of materials at EoL - Provision of collateral

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Stakeholder-specific business drivers: benefits and risks (continued)

Are these the right ones? What other benefits and risks are there?

Stakeholders	Benefits	Risks
Recyclers	- Predictable revenue opportunities - Increased investments in process innovation - Higher profitability	- Increased materials handling liability - Contamination challenges - Transparency and traceability requirements
Traders	- Creation of new financial instruments - Arbitrage opportunities - Improved capitalization and liquidity	- No clarity on exposure to emerging risks - Lack of initial liquidity - Complexity of valuing leased assets over time
Financiers	- Access to new asset class - Multiple ways to hedge commodity portfolios - Long term strategic asset development	- Complexities assessing value chain risks - Liquidity challenges - Taxation and policy risk

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Exploring Business Model Archetypes

Some MaaS archetypes

Are these good examples of MaaS archetypes? Are there others? Are these the right criteria to define MaaS archetypes?

Criteria	Metal + Service Bundles	Performance-based contracting + function deployment	Metal leasing + take-back scheme	Closed-loop MaaS: Ownership + performance-based
	Provide metal with fabrication, delivery, maintenance, or processing.	Fee on metal performance (durability, corrosion etc.), not the quantity. Deploy structural function to meet specific needs. Combined with IoT or digital twins to monitor metal in use.	Pay to use model Metal recovered at EOL Downcyling risk not monitored	Lease metals, *coupled with service of performance- based contract*. Retrieve and reuse metal for new customers without downcyling (closed loops)
Ownership	Transferred	Transferred	Most often Retained	Retained
Service Focus	High	High	Low	High
Circularity Focus	Low	High (if combined with function deployment)	High	High
Financial Viability	High	Intermediate	Low	High
Product Fungibility*	Low	Low	High	High
Traceability Need	Low	High	Low/ Intermediate	High
Contract Complexity	Low	High	Intermediate	High

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* Of a product or commodity that has been contracted for: that can be replaced by another identical item without breaking the terms of the contract. More generally: interchangeable, replaceable(*Oxford English Dictionary*).

Will performance be key to the MaaS model?

Does it need to move beyond retained ownership to include function and performance business models?

Function + **Performance**

How to tackle waste during on-site fabrication and logistics?

- Deploying *function* (e.g. beams of a specific size, structural nodes) rather than tons of metal
- Aligning supply with actual structural demand

What other benefits does deploying only needed materials have?

- Lowering up to 50% of CO2 and recycling burdens

Adding a *performance* fee links fees to structural effectiveness (e.g., strength, uptime, utilization rate) rather than metal tonnage

What is the performance-fee value-add?

- Discourages over-purchase and off-cut waste.
- Shifts risk to the provider, who:
  - Maximizes material efficiency and functional design optimization.
  - Remains involved, tracking use, performance, and refurbishing or recycling parts to extend asset life.

Can this model optimize the benefits of metal ownership?

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Source: https://www.weforum.org/stories/2024/04/why-recycling-metal-is-an-opportunity-too-good-to-waste
https://learningloop.io/plays/business-model/performance-based-contracting

Could MaaS transform a resource company to technology company, adding market value?

Performance-based management:

- companies accumulate valuable data and can improve design using digital models
- creating tech-driven products rather than commodities.

Structuring as a tech/service company can unlock market value?

- Market values in service-recurring models significantly higher than commodity-based businesses.

Feature	Traditional Steel Seller	Performance-Driven Service Model
Pricing	$/ton, incentivizes volume	$/structure or $/performance unit; links fee to outcome
Waste	Off-cut scrap, site inefficiencies	Minimized through off-site precision manufacturing off-site, take-back, and high-level design data
Revenue Type	Transactional, one-off	Recurring and long-term, performance-based
Data/IP	Minimal	Builds proprietary analytics, digital twin capabilities
Valuation Multiple (roughly)	~0.2–0.5× revenue	~6–8× revenue (as circular tech analogs)

Source:
https://www.bain.com/insights/machinery-and-equipment-the-circular-path-to-value-global-machinery-and-equipment-report-2024
https://reports.weforum.org/docs/WEF_Circular_Transformation_of_Industries_2025.pdf
https://www.weforum.org/stories/2022/01/5-circular-economy-business-models-competitive-advantage

Exploring Policy, Legal and Financial Enablers

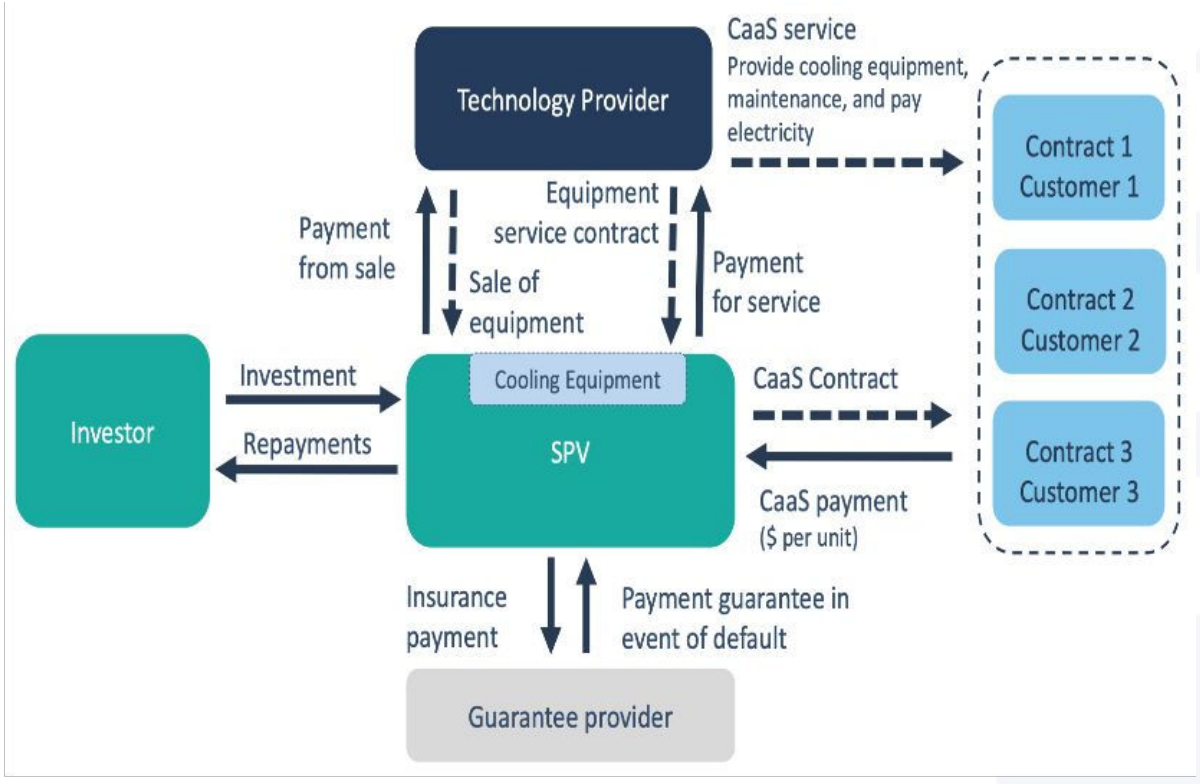
Which policy and legal enablers could stimulate the use of MaaS?

What are the other policy and legal enablers do you think are important to consider?

Legal ownership and use rights frameworks	• How do we secure ownership and multi-use rights across lifecycles? • What type of rules or adaptations to current property law or leasing statutes will be needed?
Evolution of Extended Producer Responsibility (EPR) frameworks	• Can EPR evolve beyond end-of-life to drive retained ownership?
Standards & certifications for quality and traceability	• What type of standards and cross-border harmonization are needed to guarantee quality, track use history, and unlock secondary markets?
Contractual innovation	• How do we design multi-party agreements for complex value chains?
Fiscal regimes	• Which tax or royalty shifts would accelerate servitization?
Industrial policy and public procurement	• How can governments spark early MaaS markets through policy and procurement power?

Is having an SPV the right financial enabler to stimulate the use of MaaS?

What are the other financial enablers do you think are important to consider?



- Project Finance scheme enabling to attract third-party investors through an SPV.
- The SPV purchases the equipment from the technology provider and the SPV signs CaaS contracts with clients.
- Under an agreement between the SPV and the technology provider, the technology provider is responsible for the maintenance and operation of the equipment and payment of utilities.
- The technology provider does not own the equipment. **This enables the technology provider to derecognize the assets.**

Source: https://www.caas-initiative.org/wp-content/uploads/2024/08/CaaS_SETAlliance_PPT.pdf

How should traceability concerns be addressed?

QR code Tagging:

- Enables visibility into carbon footprint, material composition and recyclability
- Supports premium pricing & circular decisions
- **Blockchain technology** adds authenticity & immutability (e.g. Hydro & DNV GL aluminum traceability)

Digital Twins: a virtual replica of products/processes synced with real-time data

- Enables quality monitoring & coordination of reuse/take-back (e.g. Circularise, Porsche, other players tracking plastic within auto supply chain from raw material to final product)

What other tools could help track and ensure metal quality? Do they differ between fungible leased products and non non-fungible leased products?

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Sources:

- Hydro Digital Passport https://www.hydro.com/en/global/about-hydro/stories-by-hydro/the-certificates-of-hydros-greener-brands-feed-into-digital-product-passports/
- Blockchain technology https://www.dnv.com/news/hydro-and-dnv-launch-blockchain-for-greener-metals-197574/
- Digital Twins for plastic supply chain traceability https://www.circularise.com/resource/domo-how-plastic-is-getting-serious-about-the-circular-economy / https://www.circularise.com/resource/achieving-visibility-into-the-porsche-supply-chain

What markets/segments would you prioritize (steel, aluminium, battery metals)?

Do you see any blind spots?

Wrap-up and Next Steps

Our Research Timeline and Knowledge Drops

Finalise research strategy in Q3

Informed by your insights

Workshop outcome

Document shared with you in Sept 2025

Knowledge drops:

1. October 2025
2. February 2026
3. October 2026

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Let’s continue the conversation

Join our ‘Community of Practice’

Contact us to share insights, inform our research, exchange ideas, and connect with the cohort.

Access valuable knowledge

You will get exclusive access to workshop outcomes, research findings, and periodic knowledge-sharing drops at no cost to you.

Invitation to be involved

We’ll keep you informed with key updates, events we will present at, and opportunities to engage further.

Help shape the future of MaaS

We welcome your thoughts. Help us tailor future efforts to industry needs and shared priorities and contribute with case studies and shaping potential pilot projects.

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THANK YOU

Contact us for more!

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