TRACE IMPACT FRAMEWORK

Version One - 2025

TRA**CE**
Innomission 4

trace
a transition towards
circular economy

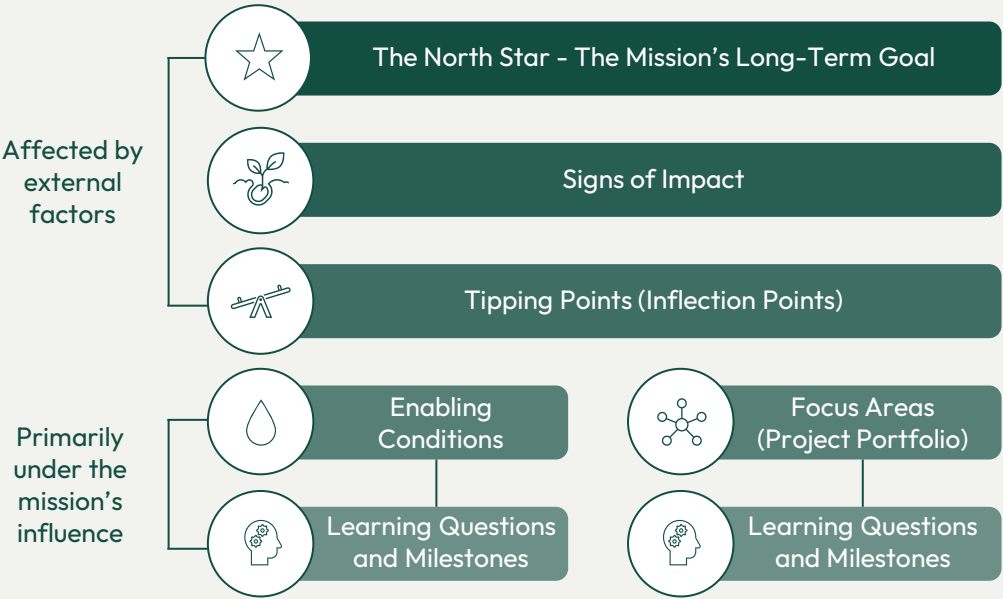# Table of contents

Background and purpose

TRACE Impact Framework Version One (May 2025) is the result of collective efforts across the TRACE Board of Directors and TRACE Impact Committee, supported by the TRACE Secretariat.

The framework has been developed through a collaborative process involving workshops, focused discussions, and several iterations. Input from these processes has been crucial in shaping and refining this first version, ensuring broad ownership and alignment with TRACE's strategic direction.

The framework:

- Ensures continuity and coherence with all TRACE roadmaps (2021, 2022, 2025).
- Aligns with the strategic priorities and requirements of our IFD applications, especially Pool 4 and Pool 5, as well as IFD's external evaluations.
- Is directly mapped to the IFD impact model and serves as a common framework, both internally and externally.
- Includes an updated description of the North Star and the tipping points. The tipping points are divided into a societal level and a clearly defined TRACE contribution. The first three tipping points (Compliance, Transparent, Integrated) now include progression examples at multiple levels.
- Integrates a dual approach to impact measurement: aligning with internationally recognized indicators and frameworks where relevant, while advancing a more systemic and mission-driven method to assess circular transition.

The purpose of the Impact Framework is to serve as a dynamic management tool that will be continuously refined in line with new insights and needs. The Board and Impact Committee will continue to play a central role in its further development and implementation toward TRACE Impact Framework version 2.

The North Star - The Mission's Long-Term Goal

Signs of Impact

Tipping Points (Inflection Points)

Affected by external factors

Primarily under the mission's influence

Enabling Conditions

Learning Questions and Milestones

Focus Areas (Project Portfolio)

Learning Questions and Milestones

The North Star - The Mission's Long-Term Goal: The North Star sets an ambitious goal for the mission in 2050. It gives a clear direction, brings everyone together, and shows what kind of change we want in society—even if we can't control everything along the way.

Signs of Impact: Signs of impact are the first signs that our work is making a difference. We can't know them in advance, because they depend on our North Star, tipping points, focus areas, and learning questions. We find signs of impact by following and checking progress in the areas we focus on.

Tipping Points (Inflection Points): Tipping points are big, concrete changes in systems, markets, or behaviors that help us get closer to the North Star. They are clear, measurable, have a set timeframe, and are within our influence. Tipping points connect our overall goal to our project work.

Enabling Conditions: Enabling conditions hold the project portfolio together. They include things like building new skills and knowledge, cross-sector collaboration, transparent decision-making, and good governance. Enabling conditions correspond to B-activities that TRACE applies for in its application to Innovation Fund Denmark.

Focus Areas (Project Portfolio): Each focus area connects to one tipping point and one learning question. The project portfolio is all the projects and activities we do to answer those learning questions. Focus areas correspond to the A-activities that TRACE applies for in its application to Innovation Fund Denmark.

Learning Questions and Milestones: Learning questions help us decide which focus areas and enabling conditions to choose. They show what we need to learn to reach a tipping point. Each question has clear milestones that help us measure and track progress over time.

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Our North Star – A Regenerative Circular Society by 2050

By 2050, we have transitioned to a regenerative circular society — a society where resources are continuously cycled, waste no longer exists, and natural systems are restored rather than depleted.

We have moved beyond a linear economy to an economic system where production and consumption are aligned with circular principles — prioritizing reuse, durability, shared ownership, and smart material use.

Achieving this is a true moonshot — an ambitious goal that requires deep collaboration and innovation across society.

This transformation supports Denmark's goal of reducing greenhouse gas emissions by 70% by 2030 and achieving net-zero emissions by 2050.

TRACE's mission is to accelerate this transition by building scalable circular systems, connecting actors across value chains, and generating actionable knowledge that enables systemic change — from pilots to policy, and from insight to infrastructure.

Our Theory of Change

To accelerate the transition to a regenerative circular society, TRACE follows a theory of change that builds on its core strengths. The dynamics of this transition do not unfold in a fixed sequence. Instead, they reappear across multiple levels — from individual behavior and organizational strategy to value chain structures and societal frameworks — and are closely linked to the tipping points TRACE aims to influence.

At the core of this theory are three recurring dynamics driving transformation:

A. Shared momentum for circular transition
emerges when key stakeholders come together — not just to coordinate efforts, but to co-create direction and build collective ownership of the transition.

B. Circular transition seen as realistic
reflects a growing recognition among policymakers, business leaders, civil society and the population at large, that circular solutions are desirable, feasible, and viable — supported by TRACE's real-world demonstrations, data, and research.

C. Institutionalization of circular principles
occurs when circular principles become embedded in the rules, incentives, and infrastructures that govern production, consumption, and investment.

To enable this transformation, TRACE takes on three strategic roles:

a. The Harmonizer – Quadruple Helix – *Co-creating across sectors for societal fit and fast adoption*
TRACE activates a broad ecosystem through collaboration, knowledge-sharing, and international engagement. By convening actors from research, policy, business, and civil society, TRACE enhances the quality, legitimacy, and real-world relevance of the solutions it develops. This inclusive model increases the likelihood of both market and societal fit, accelerates adoption, and harnesses the democratic foundation required for open, cross-sector collaboration.

b. The Builder – Proof of Concept CE Systems – *Building blueprints for resilient and scalable value chains*
TRACE builds Proof-of-Concept Circular Economy Systems by integrating circular solutions across all key phases of the value chain: materials, design & production, systems & services, and recovery. Rather than piloting isolated innovations, each PoC CE System connects multiple solution elements tailored to a specific value chain context. These systems demonstrate how systemic circularity can work in practice — and are designed to be resilient, economically viable, and scalable. They serve as validated blueprints for broader adoption and policy alignment.

c. The Pathfinder – Data, Impact and Learning – *Bridging knowledge gaps needed for transformation*
TRACE combines compliance with international standards and the development of system-level metrics to track and scale impact. TRACE Data Space supports consistent data collection, learning, and reporting. Together, these tools make systemic impact measurable, comparable, and transferable across projects and partners.

Signs of Impact and the Need for a New Metric

In line with Innovation Fund Denmark's 2025 guidance, signs of impact should only be defined after a mission has established its North Star, tipping points, focus areas, and learning questions. Once these are in place, missions can identify relevant early signs of impact and determine how to structure data collection, monitoring, and documentation.

What TRACE must measure
TRACE contributes to the targets set in RM2021, including Denmark's legally binding 70% GHG reduction by 2030. Demonstrating this contribution requires:

1. Establishing a baseline for circularity
2. Tracking progress toward the 70% GHG reduction
3. Assessing how the Danish plastics and textiles sectors can become restorative by 2030
4. Assessing how they can become regenerative by 2050

However, circular transition has evolved beyond traditional KPIs. The scientific literature shows that circular economy initiatives often fail to drive systemic change. In TRACE's early phase, it became clear that transition depends on capacity building, knowledge sharing, and collaboration — aspects not easily captured with conventional metrics.

The case for a new metric: Circular Readiness Level (CRL)
TRACE is therefore developing the Circular Readiness Level (CRL) — a maturity metric that complements existing tools such as TRL and SRL. CRL will assess circular maturity across four levels: product, organization, value chain, and society, and across four value chain phases: materials, design & production, systems & services, and recovery.

CRL is structured around the EU waste hierarchy, with a weighted scoring model that rewards solutions with higher circular potential. It will provide TRACE with a systemically relevant and scientifically robust framework for evaluating circular transition — both within projects and across the full partnership portfolio.

CRL will be developed through an abductive, iterative process involving all partners, ensuring scientific credibility and practical applicability. The goal is to bridge the gap between measurement and actual systemic change — a gap that many circular initiatives have failed to overcome.

Illustrative concept description of the Circular Readiness Level Metric under development by TRACE,. Source: TRACE Roadmap 2025, p33

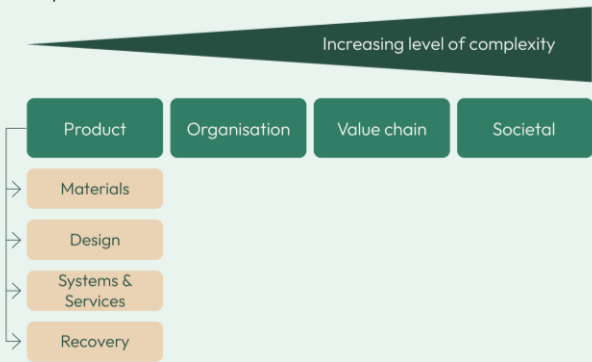**Circular Readiness Levels (CRL): Assessing Circular Maturity Across Levels**

The Circular Readiness Level (CRL) is a metric developed by TRACE to measure the circular maturity of projects, products, organizations, and systems—from individual items to broader societal contexts.

Scope of use
1. Product Level: Evaluates individual products for their circularity.
2. Organization Level: Assesses how businesses integrate circular practices
3. Value Chain Level: Measures circularity across entire supply chains
4. Societal Level: Examines broader societal impacts, including policy and behavior.

Measurement scale across
CRL measures circular maturity on a scale from 1 to 5, assessing Materials, Design, Systems & Services, and Recovery at four levels

Increasing level of complexity

| Product | Organisation | Value chain | Societal |

Materials

Design

Systems & Services

Recovery

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TRACE's Dual Approach to Impact Measurement

While TRACE is developing the Circular Readiness Level (CRL)metric — the partnership must in parallel ensure compliance with stakeholder expectations and global reporting requirements. To do so, TRACE intends to apply a dual approach to impact measurement: aligning with internationally recognised indicators and frameworks where relevant, while advancing a more systemic and mission-driven method to assess circular transition. This dual approach supports comparability across projects, enables engagement with funding and policy frameworks, and lays the foundation for a robust, scalable measurement system.

Existing Indicators TRACE May Integrate

TRACE can draw on well-established indicators to track early signs of impact and support cross-project comparability. These indicators are useful for measuring outputs and marginal system shifts — but are not suited for tracking tipping points or systemic change.

CMUR – Circular Material Use Rate: Measures the share of recycled materials in total material input. Used by Eurostat and the EU Circular Economy Scoreboard.

Ressource productivity: Measures GDP per unit of resource use. Reflects decoupling between economic activity and material throughput (e.g. as advocated in the Danish Green Reform).

Material Use (Input): Total material consumption, including both virgin and secondary resources. Indicates overall resource intensity.

Waste Generation (Output): Tracks the volume of waste generated. High levels indicate inefficient, linear systems.

Recycling Rate: The proportion of collected waste that is actually recycled. The EU tracks multiple waste categories (household, packaging, electronics, etc.).

The North Star: A Regenerative Circular Society by 2050

Innovation Fund Denmark Compliance, strategic objectives	Contribute to: 70% reduction in CO2 emissions in Denmark by 2030	Contribute to: Climate neutrality by 2050	Contribute to: Reduced pressure on nature and the environment	Contribute to: Increased competitiveness
Compliance indicators	CO2 CMUR	CO2 CMUR	CO2 CMUR	Ressource productivity
Systemic indicators	CRL (under development)	CRL (under development)	CRL (under development)	CRL (under development)

Signs of Impact

	Reduce	Reuse	Recycle	Rethink
Short term signs of impact: What we hope to observe (depends on activity)	Reduce	Reuse	Recycle	Rethink
Short term Indicators	Material Use (Input)	Waste (Output)	Recycling Rate	?
Systemic signs of impact: What we hope to observe (depends on activity)	Integration across sectors and value chains	Adoption of shared standards and data models	Visible changes in business practices, public procurement, or regulation	Behavioral shifts or new collaborative governance models
Systemics Indicators: (no standard indicators)	CRL (under development)	Adoption metrics (e.g. % of actors using CRL	E.g. PP investment rate in Circular Economy	(e.g. # of cross-sector alliances)

Tipping Points (Inflection Points)

Tipping Point 1: Compliance – A Shared Baseline for Circular Transition	**Tipping Point 2: Transparent** – Circular Business Models Become a Viable Choice	**Tipping Point 3: Integrated** – Circular Becomes the System Default

Overarching learning questions

How can we establish and adopt a shared and credible baseline for circular economy performance across sectors and value chains?

How can we create the conditions for circular business models to become the preferred option across sectors?

How can we enable circular systems to move from isolated solutions to fully integrated, scalable systems across sectors?

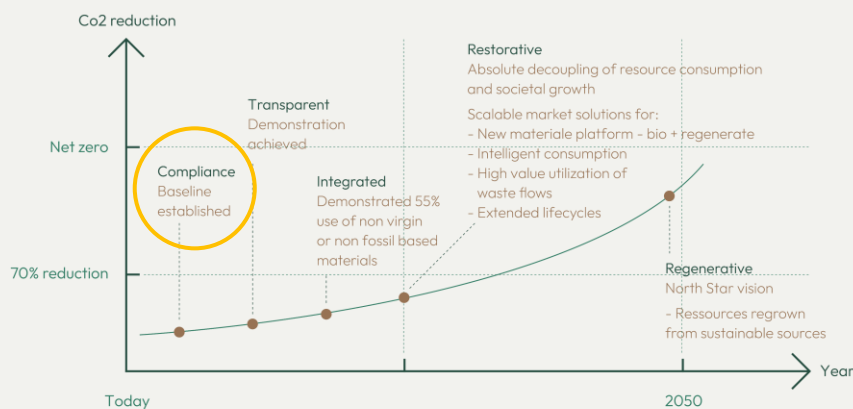| Enabling Conditions	Focus Areas (Project Portfolio)
Learning Questions and Milestones	Learning Questions and Milestones

Tipping point 1: Compliance – A Shared Baseline for Circular Transition

Definition (societal-level tipping point):
A tipping point is reached when a credible and widely adopted baseline for circular economy performance is in place across companies, ecosystems, and society. Shared metrics, data infrastructures, and reporting practices make it possible to evaluate progress and respond proactively to policy and market developments. Early compliance becomes the norm, and circularity is no longer a niche practice.

TRACE's contribution:
- A maturity framework is being developed to assess circular performance at product, organisational, value chain and societal level.
- A shared data infrastructure enables consistent reporting and alignment with European indicators such as material input and recycling rates.
- The framework is tested and refined through real-world projects and partner collaboration, including CircularTEX, SPATAIS and Back2Back.Scientific validation ensures credibility, while alignment with national and European systems supports long-term adoption.
- By establishing shared metrics and tools, TRACE helps create the foundational systems society needs to navigate and govern the transition to circularity.

| Level	Early-stage example	Emerging signs of transformation
Company	A manufacturer self-assesses its product design using the Circular Readiness Level	Circular maturity becomes a criterion in procurement and tenders
Ecosystem	Multiple project partners begin sharing data based on aligned categories	A sector adopts shared benchmarks for evaluating circular performance
Society	Danish actors begin aligning with European Union indicators	Authorities recommend use of the Circular Readiness Level as part of public reporting or strategy

Board-informed learning questions

Overarching learning question: *How can we establish and adopt a shared and credible baseline for circular economy performance across sectors and value chains?*

Supportive questions:
- What frameworks are most suited to serve as common baselines?
- What drives or blocks the adoption of shared circular metrics across different stakeholder groups?
- What institutional, policy, or financial mechanisms can accelerate uptake and alignment?
- How do we make impact measurement understandable and meaningful for both public and private actors?
- What builds trust and legitimacy in shared reporting and evaluation systems?

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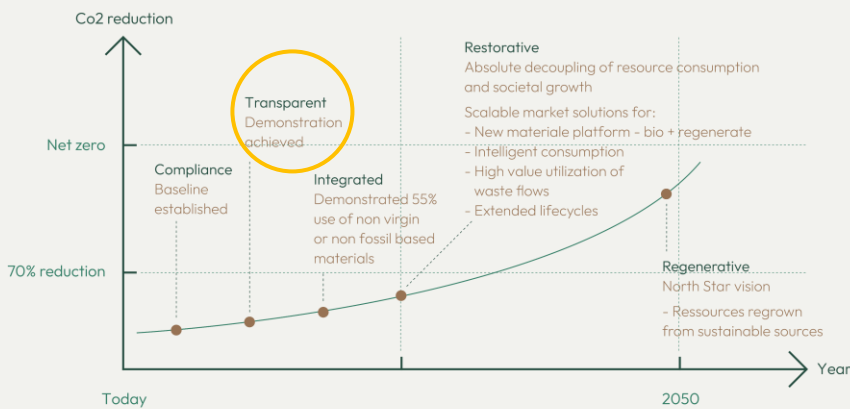
Tipping Point 2: Transparent – Circular Business Models Become a Viable Choice

Definition (societal-level tipping point):
A tipping point is reached when circular economy business models are no longer seen as experimental but as viable, desirable and feasible across sectors. Transparent documentation, proven demonstrations, and policy support enable actors to assess, trust, and adopt circular solutions. Market structures begin to favour circular practices over linear ones, and performance data becomes a driver for decision-making.

TRACE's contribution:
- TRACE contributes by building Proof of Concept Circular Economy Systems (PoC CE Systems) that demonstrate the viability of circular business models across entire value chains.
- A shared data infrastructure enables transparent documentation of environmental, social, and economic effects.
- Sector-specific reporting frameworks are developed and aligned with regulatory tools such as digital product passports.
- Capacity building and shared learning strengthen the ability of actors to work with data and translate it into decisions.
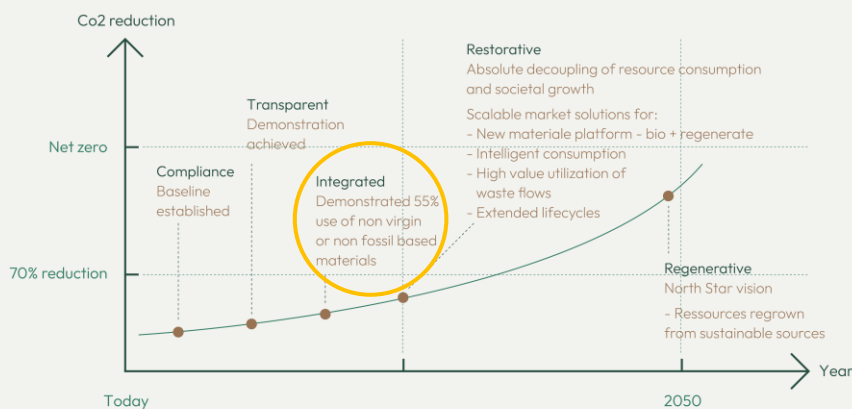
Level	Early-stage example	Emerging signs of transformation
Company	A service provider begins documenting reuse and recycling rates	Circular offerings become preferred in competitive tenders
Ecosystem	Value chain partners co-develop a reporting format for circular impact	Shared metrics and documentation standards adopted sector-wide
Society	Public buyers include traceability requirements in selected procurements	Transparency metrics integrated into regulation or subsidy schemes

Board-informed learning questions

Overarching learning question: *How can we create the conditions for circular business models to become the preferred option across sectors?*

Supportive questions:
•What types of data and performance indicators build trust in circular business models?
•What barriers prevent adoption of Circular Economy business models — and how can transparency reduce these?
•How do we align policy, market incentives, and consumer understanding to support new models?
•What makes a Proof of Concept Ciruclar Economy System transferable and convincing to others?

Definition (societal-level tipping point):
A tipping point is reached when circular solutions are no longer isolated pilots, but integrated across entire value chains, with coordination between materials, products, logistics, policies, and business models. At this stage, circular practices are embedded into procurement, production, distribution, and recovery systems — replacing traditional linear approaches. A critical threshold is achieved: at least 55% of materials used are non-virgin or non-fossil, and market structures begin to favour circularity by default. This tipping point signals a shift from demonstration to structural transformation. Circular infrastructure is in place and connected, enabling reuse, regeneration, and recirculation at scale. The economy begins to function through circular logics, supported by policy, finance, and public-private alignment.

TRACE's contribution:
- Proof-of-concept circular systems are advanced from demonstration into integrated sectoral frameworks.
- Actors across plastics, textiles, and healthcare collaborate to align materials, logistics, and policy.
- Public procurement criteria are adapted to make circularity the default requirement.Governance and financing models are developed to enable long-term system change.
- Progress is measured using circular maturity assessments and indicators such as share of non-virgin materials.

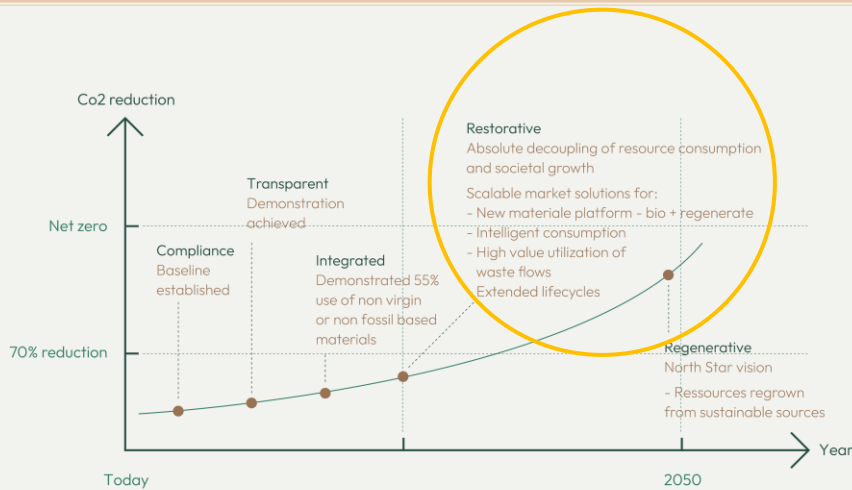| Level	Early-stage example	Emerging signs of transformation
Company	A producer adjusts internal processes to prioritise non-virgin inputs	Circular design and sourcing become standard in procurement and production
Ecosystem	Partners coordinate take-back systems and logistics across a full value chain	End-to-end circular flows replace linear models in key sectors
Society	Circularity is included in public procurement frameworks or funding conditions	National targets (e.g. 55% non-virgin materials) are adopted and enforced

Board-informed learning questions

Overarching learning question: *How can we enable circular systems to move from isolated solutions to fully integrated, scalable systems across sectors?*

Supportive questions:
- What types of data and performance indicators build trust in circular business models?
- What barriers prevent adoption of Circular Economy business models — and how can transparency reduce these?
- How do we align policy, market incentives, and consumer understanding to support new models?
- What makes a Proof of Concept Ciruclar Economy System transferable and convincing to others?

Tipping Point 4: Restorative – Absolute Decoupling is Achieved

Definition (societal-level tipping point):
A tipping point is reached when economic and social progress no longer depend on increased resource extraction. The system achieves absolute decoupling: growth in well-being and productivity is no longer tied to growth in material use. Instead, value is created through circularity, regeneration, and innovation — not depletion.

Circular solutions become embedded not just within sectors, but across the entire economy, supported by coherent regulation, restructured value creation models, and infrastructure for reuse, sharing, and regeneration. Material flows are looped, waste becomes feedstock, and resources retain value across cycles.
This tipping point reflects a fundamental transformation in how the economy works. Circularity is no longer about doing "less harm," but enabling net-positive outcomes — where the economy restores ecosystems, strengthens communities, and builds long-term resilience.

TRACE's contribution:
TRACE supports this transformation by:
- Developing and scaling systems that demonstrate restorative effects (e.g. reducing total material throughput, extending product life cycles)
- Facilitating system-wide learning on the structural conditions that enable absolute decoupling
- Contributing to metrics and frameworks (e.g. CRL, material flow analysis, Life Cycle Assessment) that can track decoupling at scale
- Building narratives and coalitions that shift business and policy focus from efficiency to regeneration
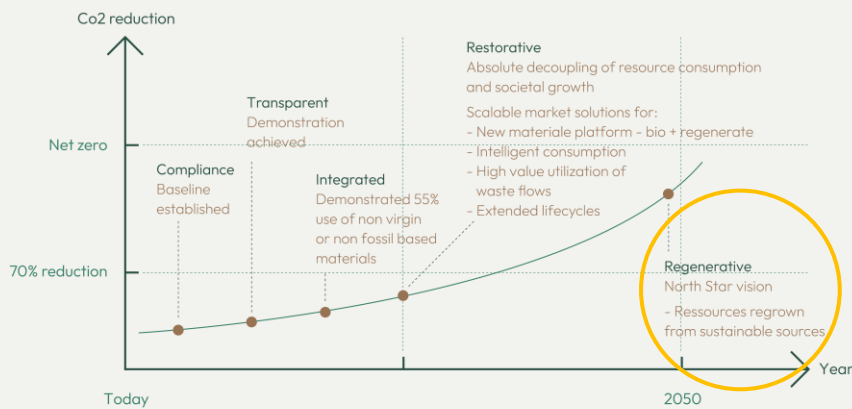- Supporting cross-sector governance and value chain integration needed for structural change

Board-informed learning questions

Overarching learning question: *What does it take to achieve absolute decoupling of material use and societal progress — and how do we track and support it?*

Supportive questions:
- What business models, technologies, and behaviours support regenerative outcomes?
- How can we quantify and verify net-positive or restorative impacts?
- What system levers (e.g. tax reform, procurement, education) accelerate this shift?
- How do we move from pilot success to structural redesign of key sectors?

Tipping Point 5: Regenerative – The Economy Restores More Than It Extracts

Definition (societal-level tipping point):
A tipping point is reached when the economy actively contributes to the regeneration of natural and social systems, rather than merely minimizing harm. All materials and products are sourced, designed, used, and cycled in ways that restore ecosystems, strengthen communities, and support long-term resilience.

In a regenerative circular society, resource use stays within planetary boundaries. Production systems are powered by renewable energy, designed for reuse and repair, and governed by principles of sufficiency and stewardship. The economy becomes a positive force — replenishing biodiversity, preserving carbon sinks, and increasing social equity and well-being.

This represents the long-term North Star for TRACE and Innomission 4 — a fully circular, net-positive economy by 2050, where sustainability is no longer the goal, but the baseline.

TRACE's contribution:
TRACE supports this vision by:
- Demonstrating systemic solutions that regenerate value — environmentally, socially, and economically
- Supporting governance models that enable long-term investment in circular infrastructures and behaviours
- Advancing frameworks that measure regenerative capacity (e.g. ecosystem restoration, resource looping, social indicators)
- Fostering collaboration between science, policy, industry, and communities to co-design solutions that benefit all
- Building learning environments (e.g. TRACE Academy) that promote regenerative mindsets and capabilities

Through its work across sectors and systems, TRACE lays the groundwork for an economy that gives more than it takes.

Board-informed learning questions:

Overarching learning question: *What conditions must be in place for the circular economy to become regenerative — restoring ecosystems and strengthening communities while meeting human needs?*

Supportive questions:
- How do we define and measure regeneration in circular systems?
- What policy, financial, and cultural shifts are needed to prioritize net-positive outcomes?
- How do we ensure regenerative approaches are inclusive and just?
- What feedback loops and infrastructures are needed to maintain regenerative capacity over time?