



INTERNATIONAL UNION
OF RAILWAYS

3RD ZERO WASTE RAILWAYS WORKSHOP

**Circular economy in rail: A stock take
on research, reporting standards and
metrics**



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AGENDA



Agenda

| Time | Subject | Speaker |
|---------|---|---|
| 9.00 | Registration and welcome | |
| 9.30 | Welcome 5' | Alex Burrows / Jenny Illingsworth BCRRE |
| | Opening 15' | Andrew Quinn (BCRR) |
| | Keynote: <i>CSRD - Preparing the road to circular economy reporting</i> 45' | Arnoud Walrecht, KPMG |
| | Infra manager's view 15' | Katy Beardsworth, Network Rail |
| | Train operator's view 15' | Speaker (tbc) |
| 11.05 | Break 25' | |
| 11.30 | CSRD 15' | Michel Scholte, CSRD Academy (online) |
| | Asset Management as an enabler for the circular economy across the rail sector 15' | Carl Waring, Fraser Nash Consultancy |
| | Measuring GB rail's circular economy performance 15' | Thom Rawson (RSSB), Sam Jones (RSSB), Liv Judge (Ricardo) |
| | Recycl, a digital solution for waste and recycling 15' | Peter Hyldgaard, Reycl.com (online) |
| | Blockchain and data management 15' | Joe Preece, University of Birmingham |
| | Q&A 10' | |
| 1.00pm | Lunch break 45' | |
| 1.45 pm | Interactive session: world café on hot topics of the day 3 x 30 mins <ul style="list-style-type: none"> • Circularity specifications for rolling stock • SAP and circularity metrics • Circularity metrics for Rail Sustainability index | <ul style="list-style-type: none"> • Carl Waring, Fraser Nash Consultancy • Thomas Kortekaas et al., ProRail • Snejana Markovic, UIC |
| | Wrap up of world café 15-30' | |
| 3.45 pm | End of workshop | |



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WELCOME



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OPENING

Dr Andrew Quinn



Andrew Quinn

Professor of Climate
Adaptation

Deputy Director of Education
for the College of Engineering
& Physical Sciences



Circular economy in rail: Research, reporting standards and metrics

Andrew Quinn
Professor of Climate Adaptation



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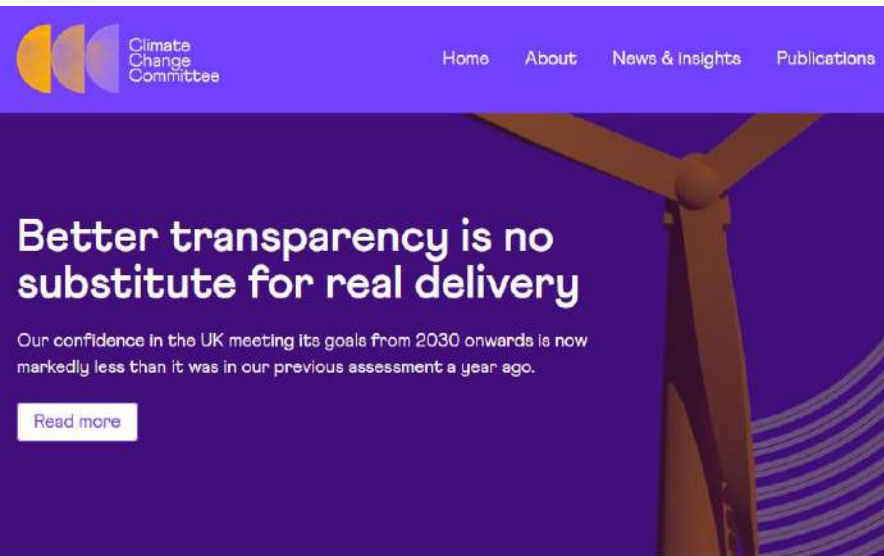




Lots of Urgency

Sustainability is here to stay, or we may not be.
Niall FitzGerald, Chairman, UCD Graduate Business School

Tackling climate change is not a choice, it's a necessity.
Anish Shah CEO & MD, Mahindra Group, India



Lots of Reports



Lots of questions!



Reducing Risks of
Future Disasters
Priorities for Decision Makers



Sustainable Development

Tools in the toolbox

- Asset Management

- Physical Assets
- Digital Assets
- Intangible Assets
- Developing, Operating, Maintaining, Upgrading, Disposal

- Risk Management

- Costs
- Opportunities
- Performance

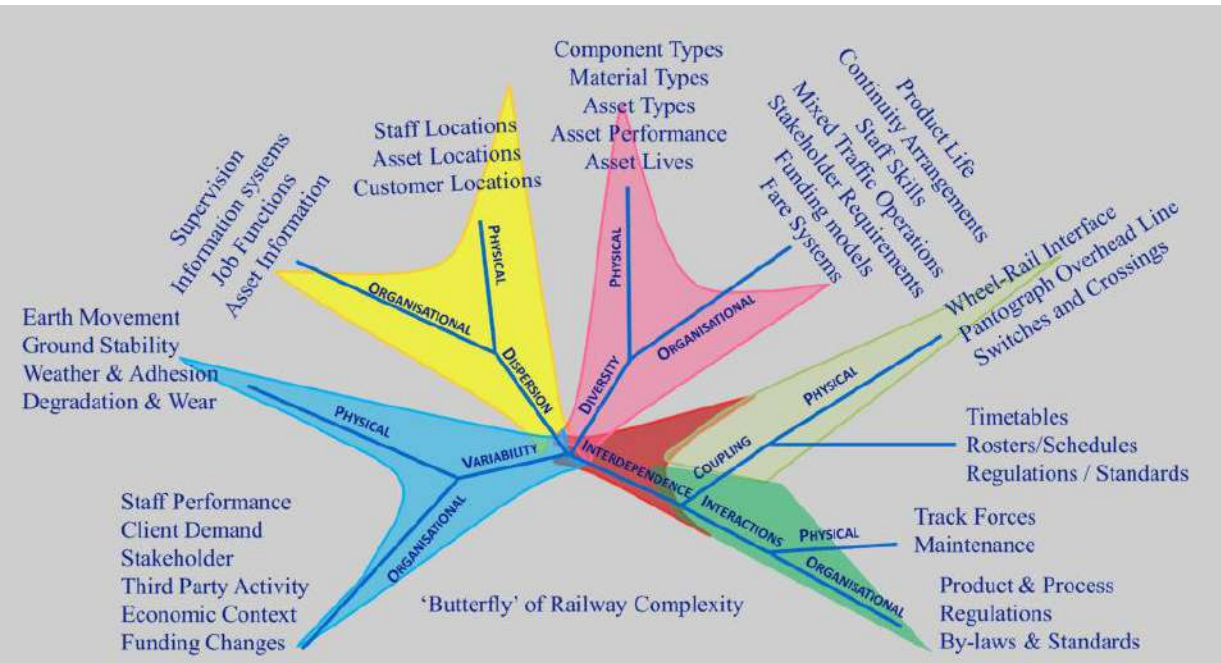
- Financial Management

- Partnerships!

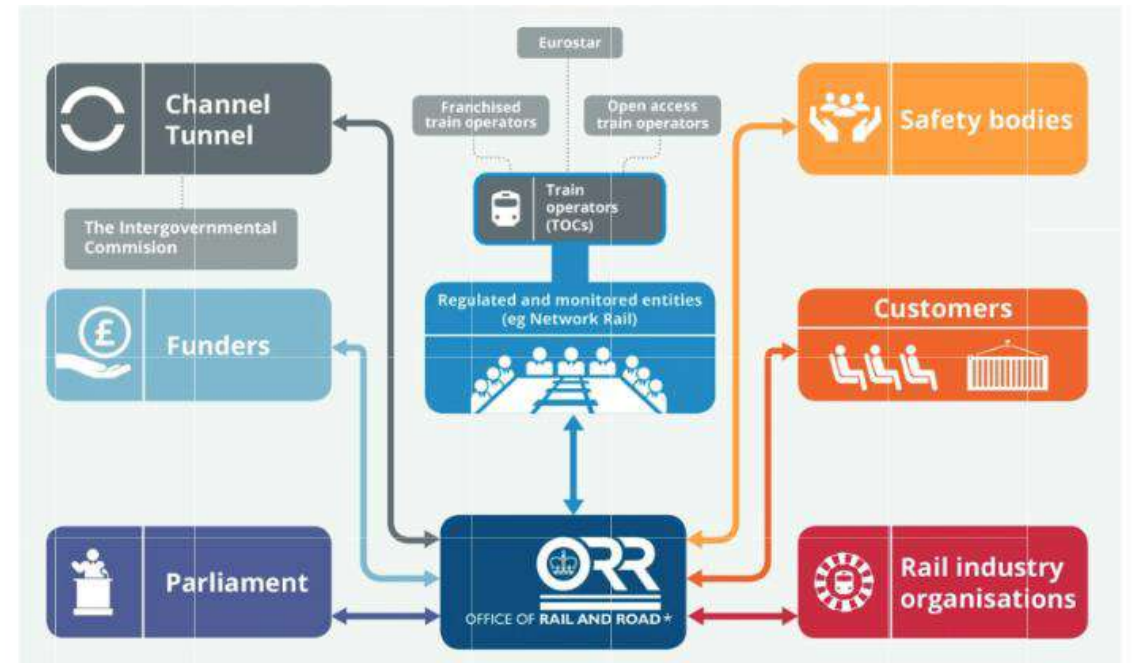


Challenges of achieving a sustainable railway

Complexity of rail systems



Complexity of rail industry



Structure of the British Rail Industry (ORR Annual Report 2015)

<https://www.railengineer.co.uk/the-long-history-and-exciting-future-of-railway-systems-thinking>
 Professor Felix Schmid and Alexandra McGrath



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Challenges of achieving a sustainable railway

Changing expectations

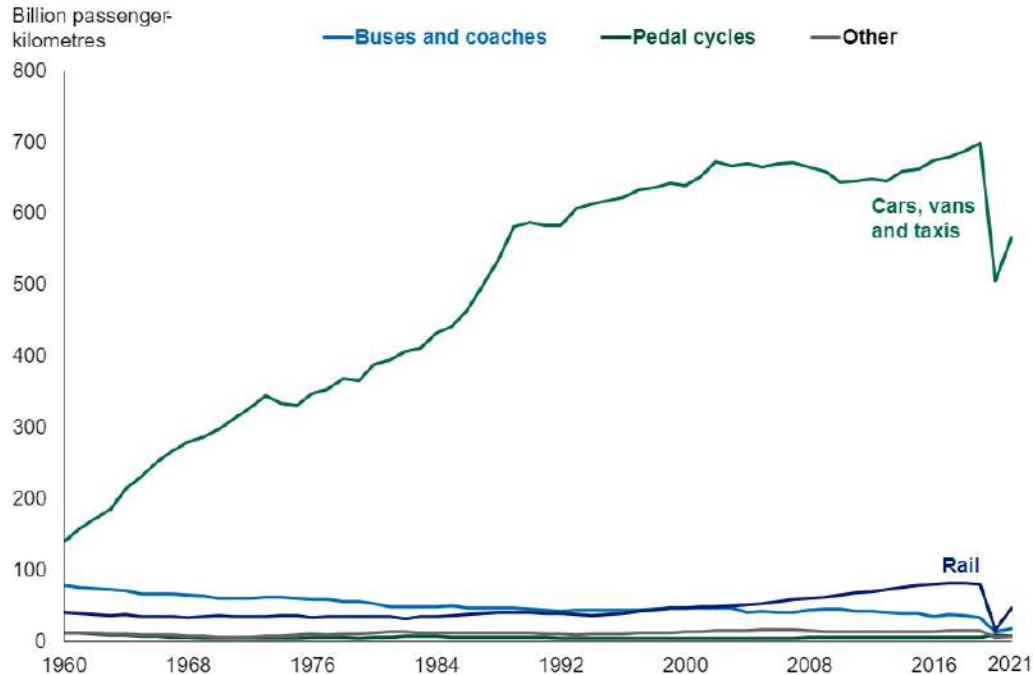


Chart 1: Passenger kilometers by mode, Great Britain, 1960 to 2021

<https://www.gov.uk/government/statistics/transport-statistics-great-britain-2022/transport-statistics-great-britain-2022-domestic-travel>



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Changing climate

Weather and Climate Extremes 33 (2021) 100340

Contents lists available at ScienceDirect

Weather and Climate Extremes

journal homepage: www.elsevier.com/locate/wace



Increase in the frequency of extreme daily precipitation in the United Kingdom in autumn

Daniel Cotterill^a, Peter Stott, Nikolaos Christidis, Elizabeth Kendon

^aMet Office Hadley Centre, Exeter, United Kingdom

ARTICLE INFO

Keywords:
Extreme precipitation
Model resolution
Clausius-clapeyron
Long-term trends
Climate models
Climate change attribution

ABSTRACT

The flooding in South Yorkshire in the United Kingdom (UK) in autumn 2019 saw one fatality, at least 500 properties flooded and 1 200 households evacuated. The worst of the flooding occurred after very high 24-h rainfall totals of up to 82 mm fell on already saturated ground. This followed very high 24-h rainfall totals in the region just two weeks earlier of up to just under 50 mm. In the light of anthropogenic climate change, it is expected that extreme rainfall events are set to become more intense as a result of increased global mean temperatures and the Clausius-Clapeyron relation. Here we investigate the change in risk of such extreme rainfall events in the UK in autumn using a new index R_{50mm_OND} , representing the mean number of daily precipitation totals in excess of 50 mm in October–December each year. Using high resolution regional model datasets and observations we show that extreme rainfall totals for the UK are increasing exponentially as a result of anthropogenic climate change. Observations show that the frequency of extreme daily precipitation in the form of R_{50mm_OND} has already increased by 60% (95% CI: 44–76) in the UK between the beginning of the 20th and

Daniel Cotterill, Peter Stott, Nikolaos Christidis, Elizabeth Kendon (2021) Increase in the frequency of extreme daily precipitation in the United Kingdom in autumn, Weather and Climate Extremes <https://doi.org/10.1016/j.wace.2021.100340>

Supporting moves to a circular economy

Actions

- Reuse products and components
- Minimize use of new resources
- Reduce greenhouse gas emissions (GHG)
- Reduce waste and pollution
- Environmental respect
- Biodiversity net gain

Broader scope

Challenges

- Quantification
- Setting scope
- Reporting, when where and how
- Appropriate disclosure

Support

- Research
- Standards
- Metrics



Zero Waste Railways, 3rd workshop

Enjoy the day!

Introducing
CSRD - Preparing the road to circular economy reporting
Arnoud Walrecht, KPMG



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KEYNOTE

**CSRD - Preparing the road to circular economy
reporting**

Arnoud Walrecht

Partner at KPMG, Arnoud is responsible for leading KPMG Sustainability in Circular Economy engagements in the Netherlands and worldwide



On track with circular economy (reporting)?



Your speaker



Arnoud Walrecht

Partner

Global Circular Economy
Lead

walrecht.arnoud@kpmg.nl

Environmental Economist



23

Years working in sustainability



2005

Big 4 since 2005



2013

Started Circular Economy consulting at KPMG

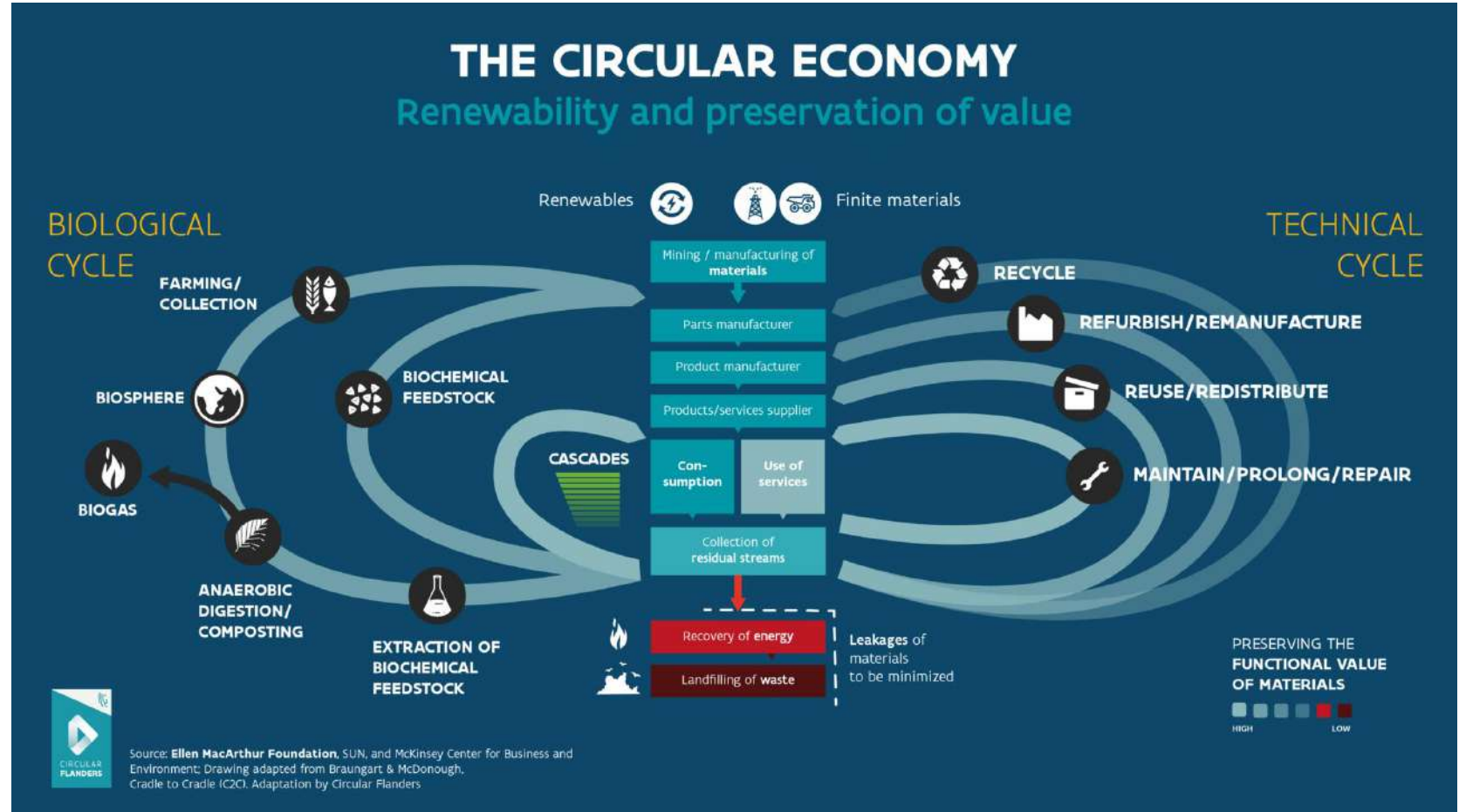


Introducing the concept of a circular economy

“A Circular Economy is an economic system of closed loops in which raw materials, components and products keep their value for as long as possible, where renewable energy sources are used and with systems thinking at the core.”

(Ellen McArthur Foundation)

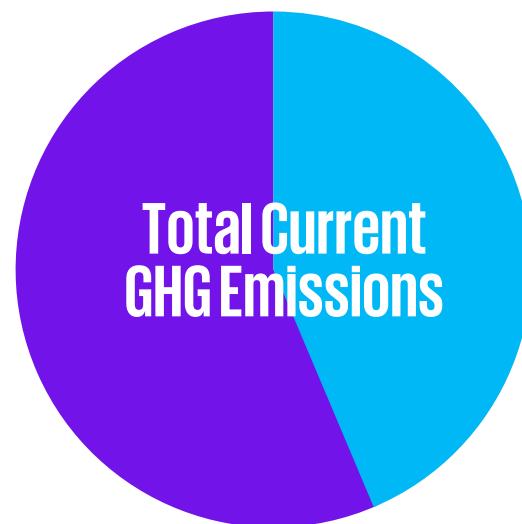
Currently, our world is only circular **7.2%**



**What are the
drivers?**

Circular economy is essential for companies to achieve net-zero emissions

COMPLETING THE PICTURE: TACKLING THE OVERLOOKED GHG EMISSIONS



55% from energy supply & consumption

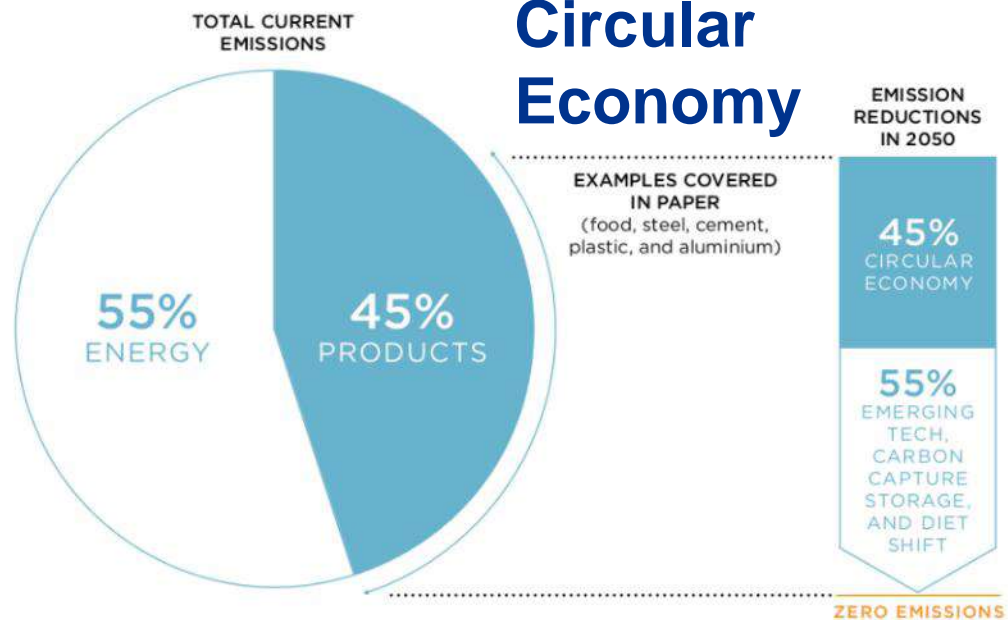
Improved by optimal uptake of renewable energy and energy efficiency

45% from products life cycle

Improved by revision of how we design, make, use products and materials, and the way we use land

Let's look a bit more into that

COMPLETING THE PICTURE: TACKLING THE OVERLOOKED EMISSIONS



“Responsible for 45% of emissions reduction”



“A critical role in hard to abate carbon”



“A tool to reduce embodied emissions”



“A solution to address energy scarcity”



“A way to retain carbon.”

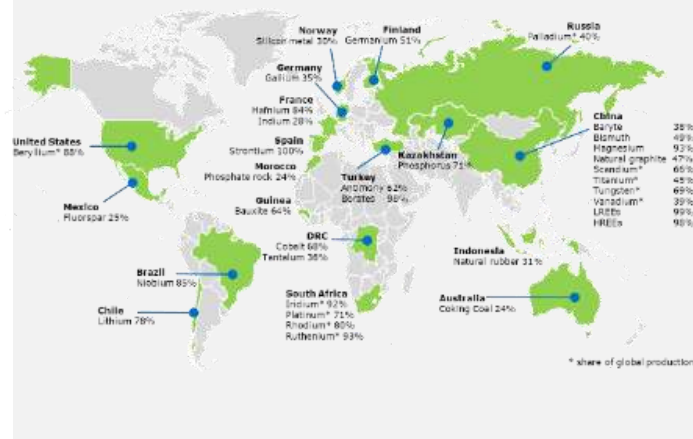
Shorter, circular and less risky supply chains

Factors for potential supply disruptions

Resource criticality



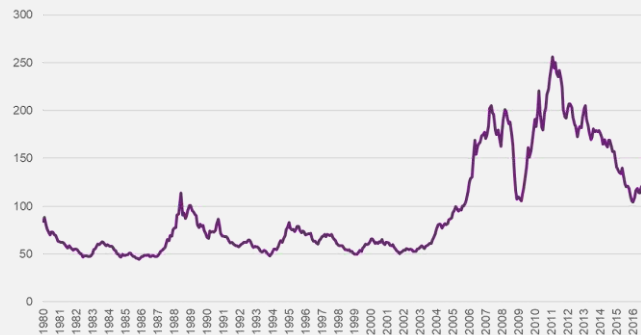
The supply of critical materials sourced with few suppliers and high economic value can be easily influenced by geopolitical factors.



Price volatility



Increase and volatility of price can have a significant impact on the stability of material and product supply.



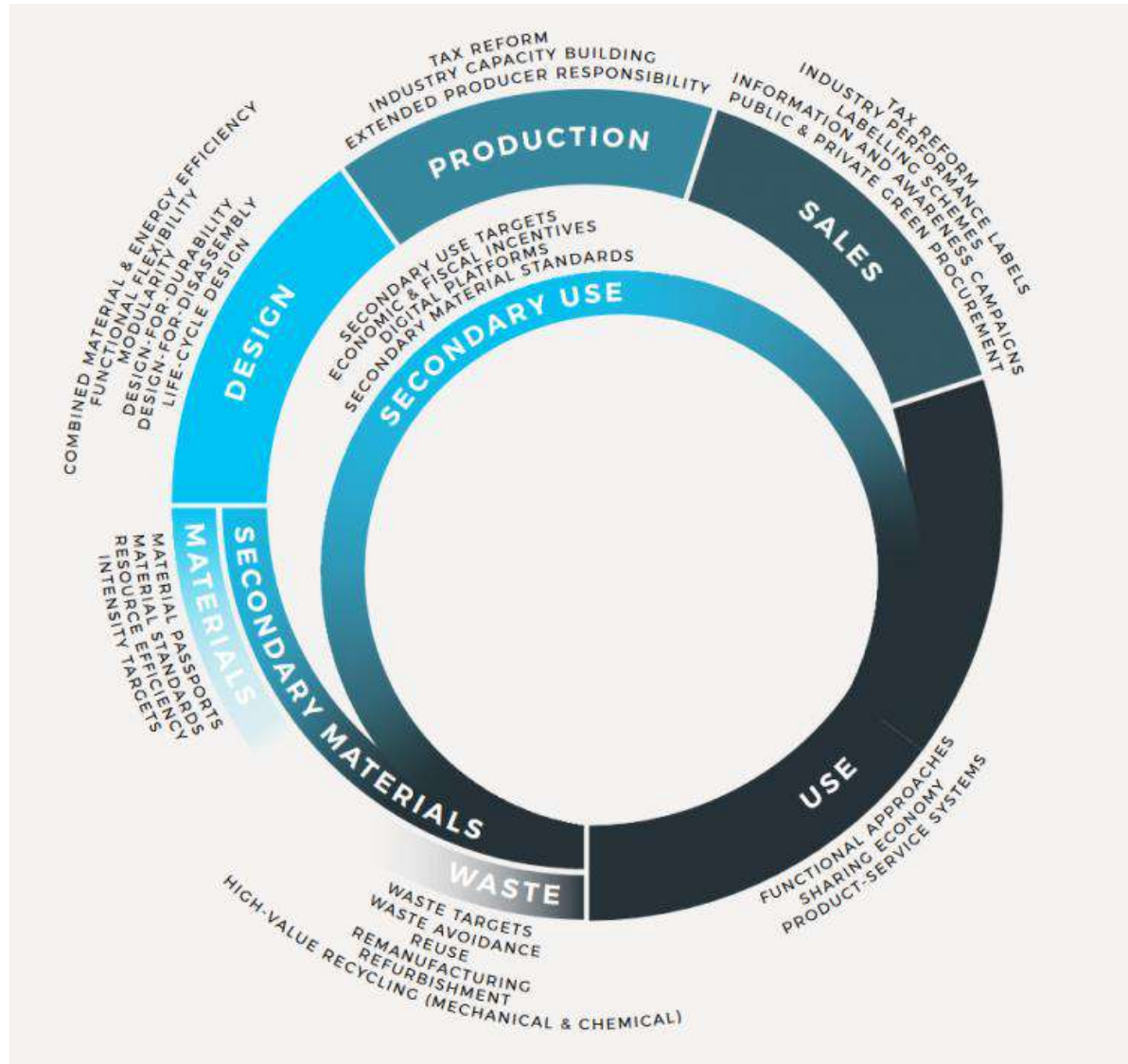
Natural disaster/disease



Natural disasters or disease can cause unpredictable major disruptions in global supply chain.



Different types of policies & regulations emerge in the value chain



Specific considerations

EU Taxonomy

DESIGN

- ESPR / Ecodesign

MATERIALS

- Critical raw materials
- Battery Directive
- CBAM

WASTE

- Waste Framework Directives
- Waste policies



KPMG

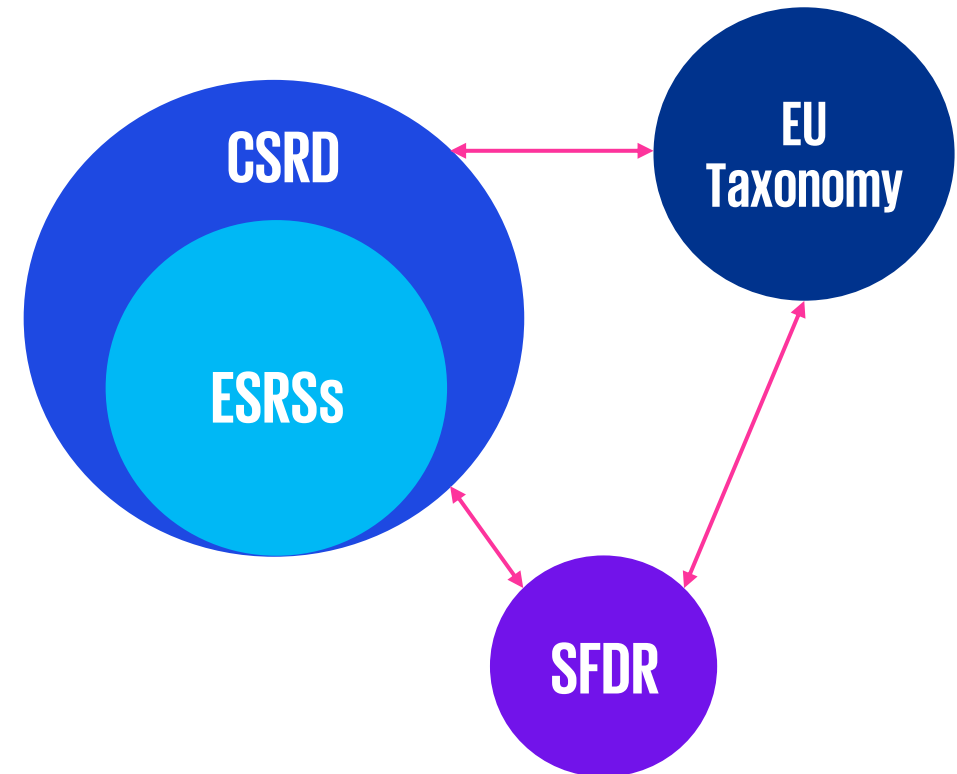
CSRD & Circular Economy

What is the EU Taxonomy Regulation?

The EU Taxonomy Regulation entered into force on 12 July 2020 and establishes an EU-wide classification system for environmentally sustainable economic activities. It serves as a common language and clear definition of what is “sustainable”, based on harmonized criteria at European Union level.

The EU Taxonomy is a cornerstone of the EU’s sustainable finance framework and an important market transparency tool. It helps direct investments to the economic activities most needed for the transition to sustainable investments, in line with the European Green Deal objectives¹.

The EU Taxonomy Regulation interacts with the Corporate Sustainability Reporting Directive (CSRD), and Article 8 of the EU Taxonomy requires companies reporting Sustainability Statements based on Articles 19a and 29a of the EU Accounting Directive to provide in the same statements information on how and to what extent their activities are associated with economic activities that qualify as environmentally sustainable based on the EU Taxonomy².



¹ Source: [EU Taxonomy for sustainable activities \(europa.eu\)](https://european-council.europa.eu/media/e300047c-3260-47e1-9957-3d1201c0d13c/asset-main)

² Based on the European Sustainability Reporting Standards (ESRS) pursuant to Article 29b of Directive 2013/34/EU



The text of EU Taxonomy Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 can be found [here](#).

When can activities be reported as sustainable?

Economic activities of a company resulting in Turnover, CapEx and/or OpEx, are potentially sustainable (“**eligible**”) if they are described in the Delegated Acts of the EU Taxonomy Regulation. An *economic activity* takes place when resources such as capital, goods, labor, manufacturing techniques or intermediary products are combined to produce specific goods or services. It is characterized by an input of resources, a production process and an output of products (goods or services).

The Delegated Acts specify the activities for each of the six environmental objectives identified by the European Commission, being:

1. Climate change mitigation
2. Climate change adaptation
3. Water and marine resources
4. Circular economy
5. Pollution prevention and control
6. Biodiversity and ecosystems

Whether the activity is sustainable (“**aligned**”) depends on whether the activity meets the Substantial Contribution and Do No Significant Harm criteria, as well as whether the company has minimum safeguards in place.

The **Substantial Contribution** and **Do No Significant Harm** criteria are referred to as the **Technical Screening Criteria**.

1. Assess company economic activities



2. Assess eligibility



Eligible activity A

Eligible activity B

Non-eligible activity C

Eligible activity D

3. Assess alignment



Aligned activity A

Non-aligned activity B

Aligned activity D



Eligible:
A+B+D
Aligned:
A+D



Economic activities and sectors currently covered



4. Report KPIs

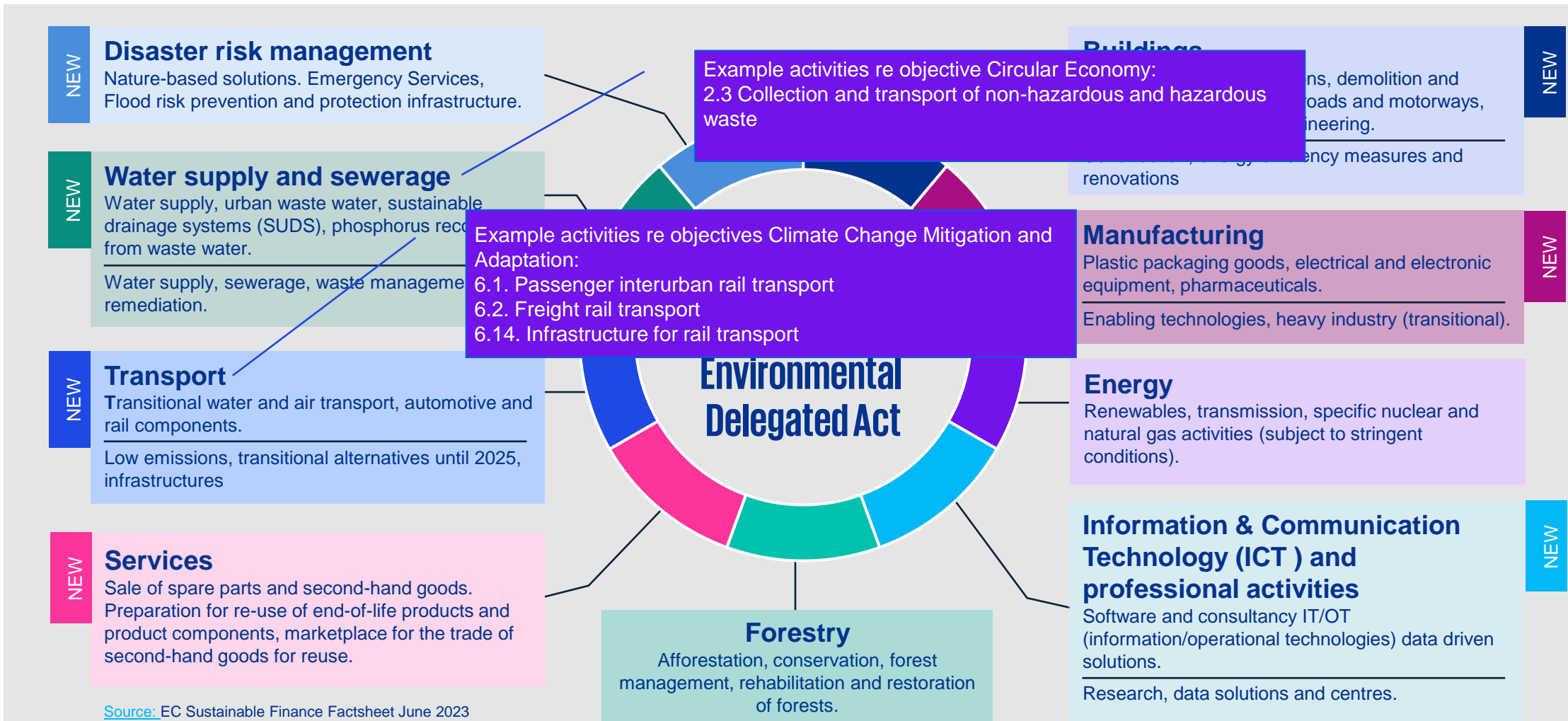
KPIs to be reported:

Turnover %

CapEx %

OpEx %

Economic activities and sectors currently covered



Source: EC Sustainable Finance Factsheet June 2023

NEW: Environmental Delegated Act and amendments to the Climate Delegated Act as published in 2023

Developments in non-financial reporting standards

Two ISSB proposals

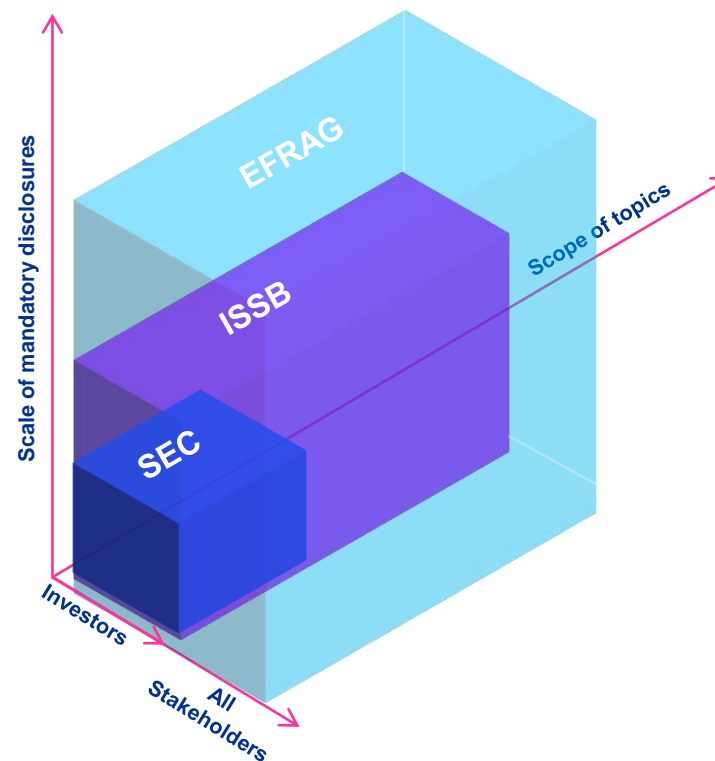
- Investor focus
- General principles, including proposed requirement to report across all significant sustainability-related risks and opportunities (not just climate)
- To date, detailed guidance on climate only¹

Twelve EFRAG proposals

- Multi-stakeholder focus, including investors
- Core principles for disclosure
- To date, granular requirements published for sustainability impacts, risks and opportunities

One SEC climate proposal

- Investor focus
- Detailed requirements to report on climate only

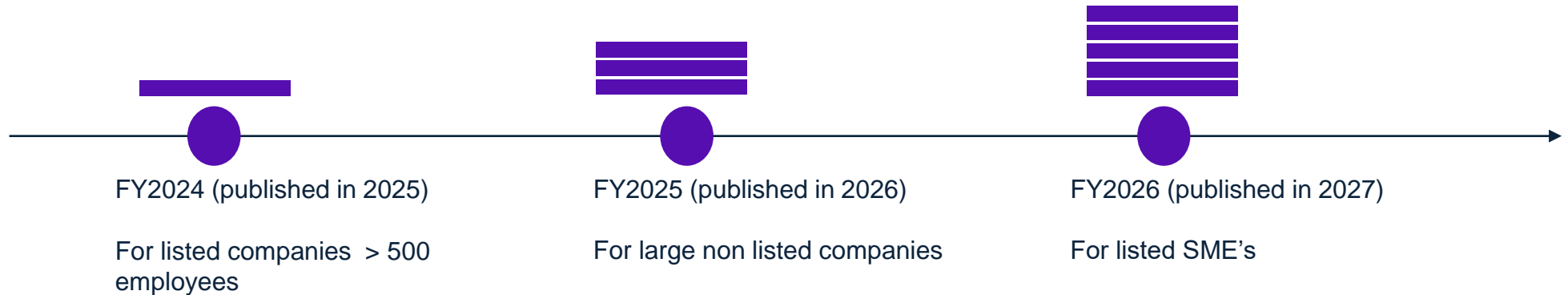


¹ Additional detailed guidance on other topics is planned for the future.

“78 % of companies are not ready to report quantitatively on circular economy”

CSRD readiness survey 2023 CircleEconomy

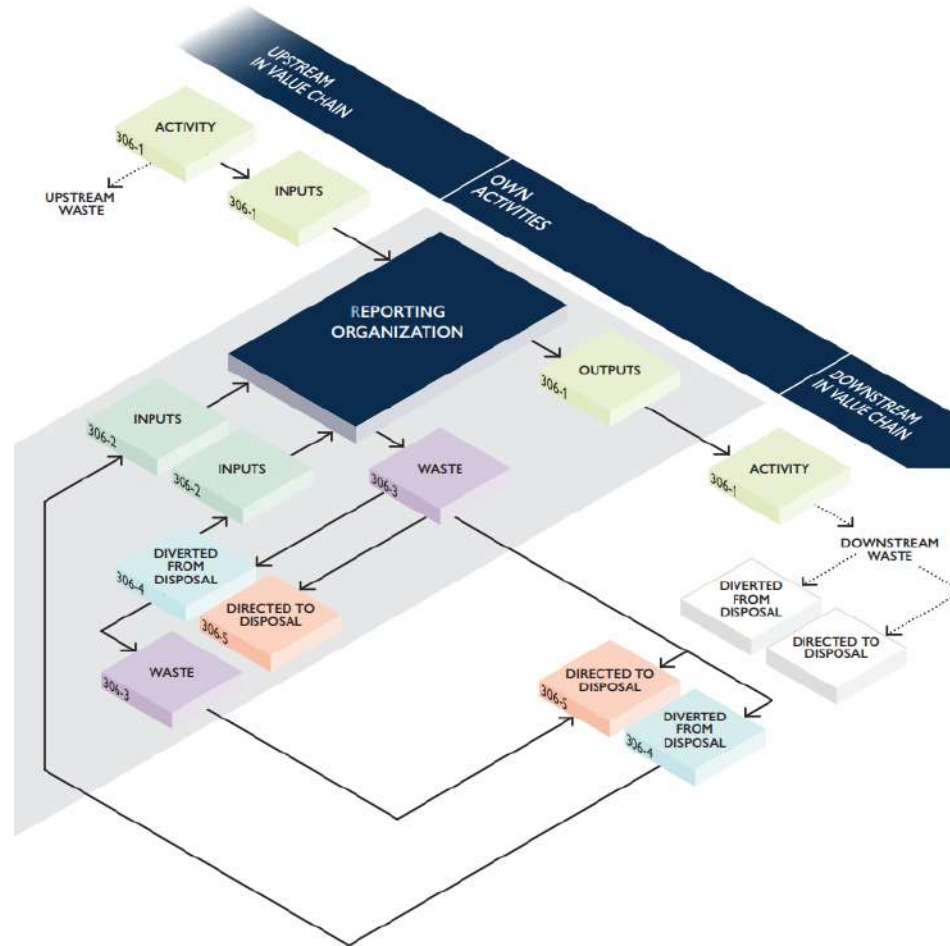
CSRD
implementation
timeline in E.U
50 000 companies



Step back - before CSRD came in

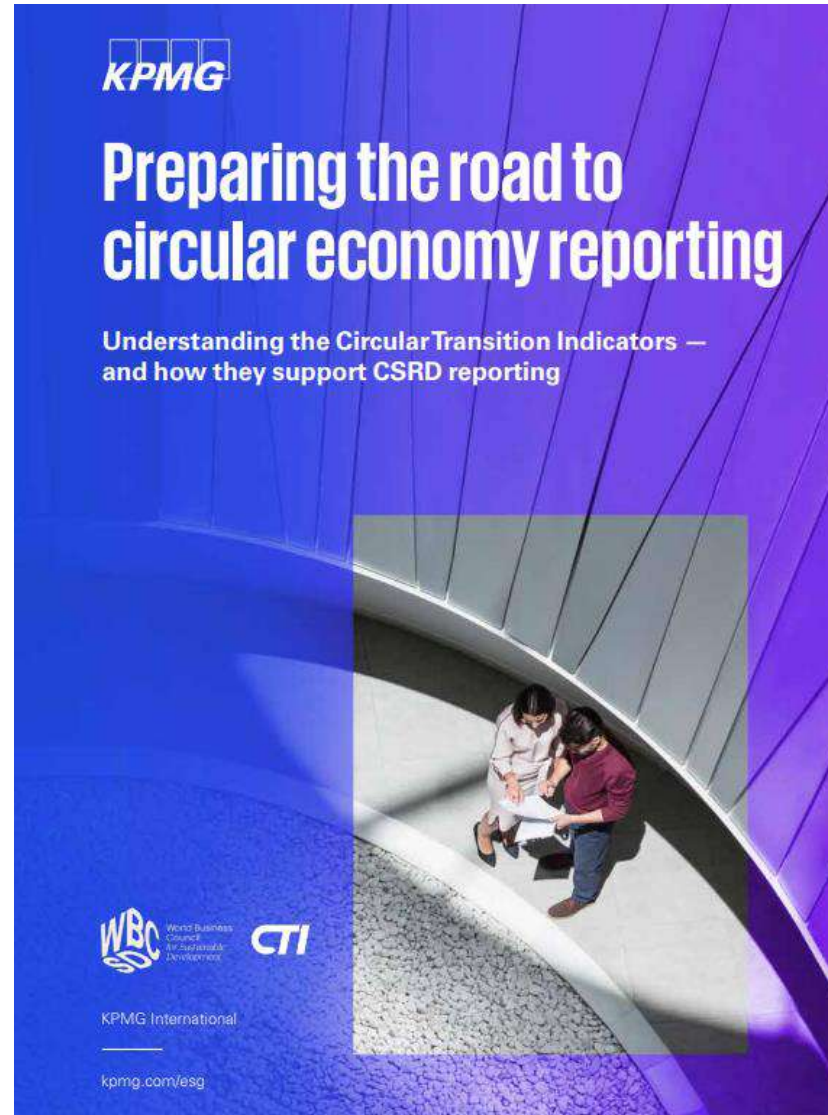


GRI 306: WASTE
2020



- Helps provide a comprehensive overview of waste-related impacts of activities, products and services.
- Introduces a stronger relationship between materials and waste, so as to help organizations understand how procurement, design, and use of materials lead to waste-related impacts.
- Enables organizations to identify and report on circularity and waste prevention opportunities and actions.
- Encourages organizations to assess waste generated throughout the value chain, prompting them to recognize responsibility for waste-related impacts upstream and downstream.
- Helps identify management decisions and actions that can lead to a systemic change.

KPMG & WBCSD – how to prepare for disclosure on circularity



CSRD – Reporting Requirements on Circular Economy

CSRD and its implications

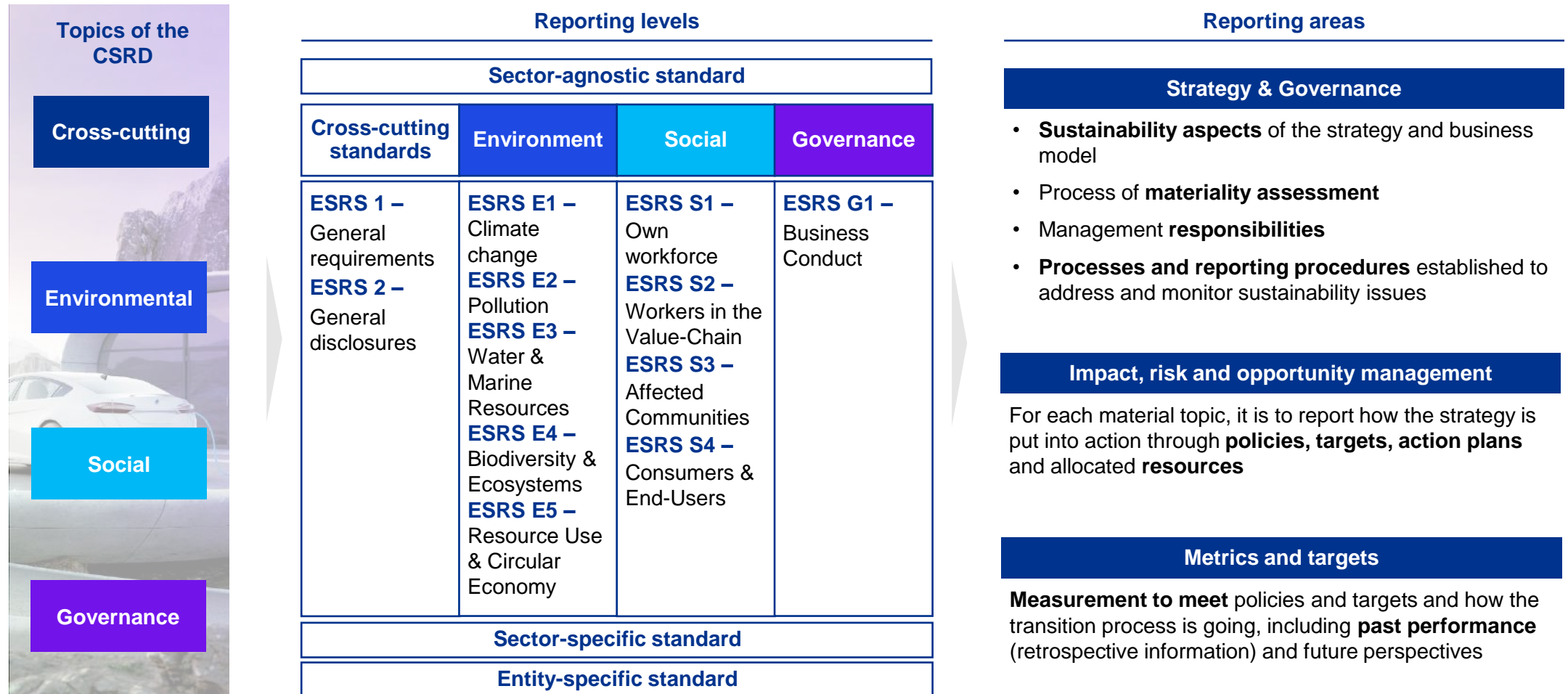
Sustainability statement – Who needs to report and how?

| Scope of application | Reporting | Assurance obligation |
|---|---|---|
| <p>All companies (incl. non-capital market oriented) with 250 employees, €40 Mio. in revenues, or €20 Mio. in total assets [2 out of 3]</p> <p>3-year phase-in for SMEs</p> <p>Reporting requirements for approx. 50.000 companies within the EU</p> | <p>Reporting in the Management Report</p> <p>Digital reporting of sustainability information in line with the European Single Electronic Format (ESEF)</p> <p>EU-Taxonomy</p> | <p>Limited Assurance according to ISAE 3000 or a comparable standard will be mandatory</p> <p>Reasonable Assurance possibly the next step in the process of aligning the depth of review with that of the annual report</p> |



Sustainability Reporting

Architecture: EU Sustainability Reporting Standards (ESRS)



Circular economy in the ESRS

Circular economy reporting areas

Only to be disclosed if topic is material (excl. two waste management KPIs in E5-5 – see next slide)

General disclosures

Disclosure Requirement IRO-1 – Description of the **processes to identify and assess material resource use and circular economy-related impacts, risks and opportunities**

Impact, risk and opportunity management

DR E5-1: Policies related to resource use and circular economy

DR E5-2: Action and **resources** in relation to resource use and circular economy

Metrics and targets

DR E5-3: Targets related to resource use and circular economy

DR E5-4: Resource inflows

DR E5-5: Resource outflows (Products and materials, Waste)

DR E5-6: Anticipated financial effects from resource use and circular economy-related impacts, risks and opportunities

Challenges

- **Risk/opportunity analysis:** Implement a circular economy impact, risk, and opportunity (IRO) analysis (implying a change to many existing ERM systems, which only focus on financial risks)
- **Policies:** Define policies to manage IROs and outline how they help to a) move away from virgin non-renewable resources and b) secure the regenerative production of renewable resources.
- **Actions:** Define action plans and specify how they relate to the waste hierarchy and circular economy strategies
- **Targets:** Define targets and outline how they relate to circular economy topics (circular design, circular material use rates, waste hierarchies)
- **Measure:** Measure and report on resource in- and outflow KPIs as well as financial effects from IROs

Deep-Dive – ESRS E5 Performance Measures

DR E5-4: Resource inflows

DR E5-4 32 (a): Total weight of used products and materials

DR E5-4 32 (b): Total weight of input materials from regenerative sources / total weight of input materials

DR E5-4 32 (c): Weight of reused or recycled input materials / total weight of input materials

DR E5-5: Resource outflows

DR E5-5 37 (a): Total weight of products designed along circular principles / total weight of products

DR E5-5 37 (b): Total weight of products not qualifying for circular principles, still designed for circular economy / total weight of products

DR E5-5 38 (a): Total weight of waste generated

DR E5-5 38 (b): Weight of recovered waste / by recovery operation type

DR E5-5 38 (c): Weight of disposed waste / by disposal treatment type

DR E5-5 38 (d): Total amount and percentage of non-recycled waste


DR E5-5 40: Total amount of hazardous and radioactive waste generated by the undertaking


Company

DR E5-6: Potential financial effects from resource use and circular economy-related impacts, risks, and opportunities

DR E5-6 42: Quantification of the potential financial effects (monetary terms)

 Mandatory

 Subject to materiality assessment

 Subject to materiality assessment with phase-in

Circular Economy Trends & developments in Industrial Manufacturing

industry is in frontline for circularity transition through massive investments and new revenue models

A circular Industrial value chain is necessary to **reduce carbon emissions**

by up to 75% as well as **resource consumption** by up to 80% until 2030.



Regulations are pushing for circular transformations by sectors. IM is one of the most impacted ones

Focused directives from EU Green Deal & Circular Economy Action Plan, Sustainable products and ESPR, Repairability initiatives around the globe



Companies are accelerating in decarbonization

45% GHG come from materials sourcing, manufacturing, use and disposal
Circularity reduces drastically GHG emissions vs. linear models



Companies are facing resource scarcity & high price volatility

Electronic components, rare earth and special metals are facing high supply chain disruptions



New markets & trends in IM and high capital equipment

Conscious purchase & emerging revenue models such as Product as a Service vs. ownership trigger product and business models innovation

Circular strategies in short-value chain is key

Rethink design

New materials, technologies, processes and manufacturing technologies to achieve closed material cycles



Reuse – Slow materials flow

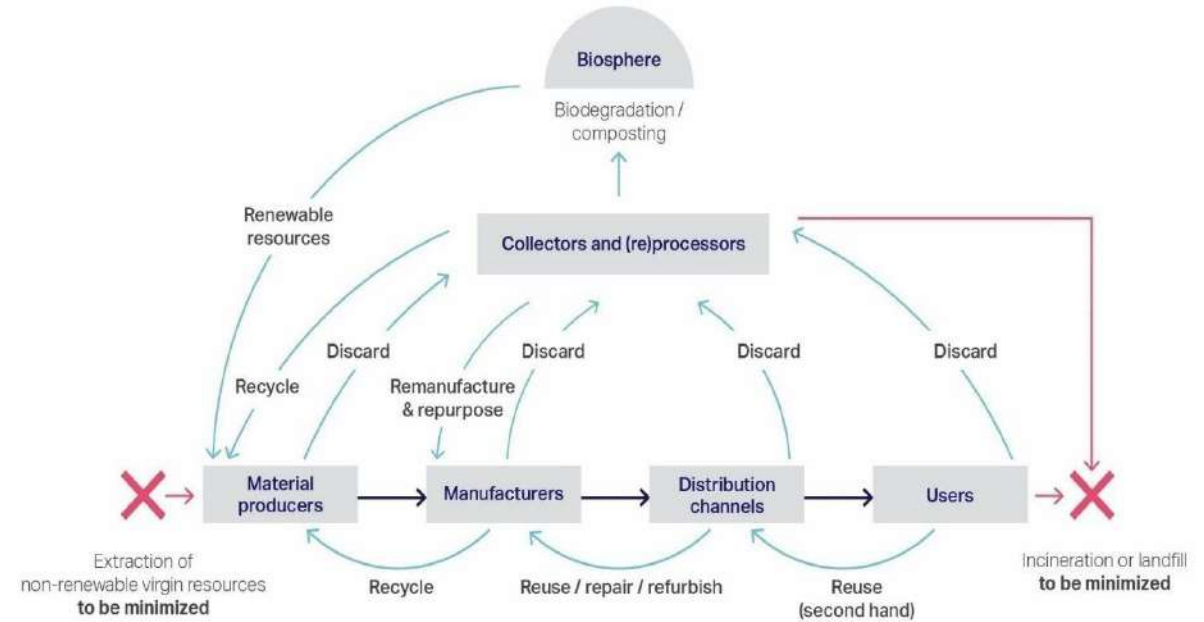
Extend IM assets useful life by being modular and upgradable and allow several lives through service-based business models

Recycle – Cycle materials flow

Prioritize secondary materials made to be disassembled quickly at end of asset' life to find a way back into new product cycle

Reduce – Narrow materials flow

Less component parts and lighter products



WBCSD CTI and KPMG

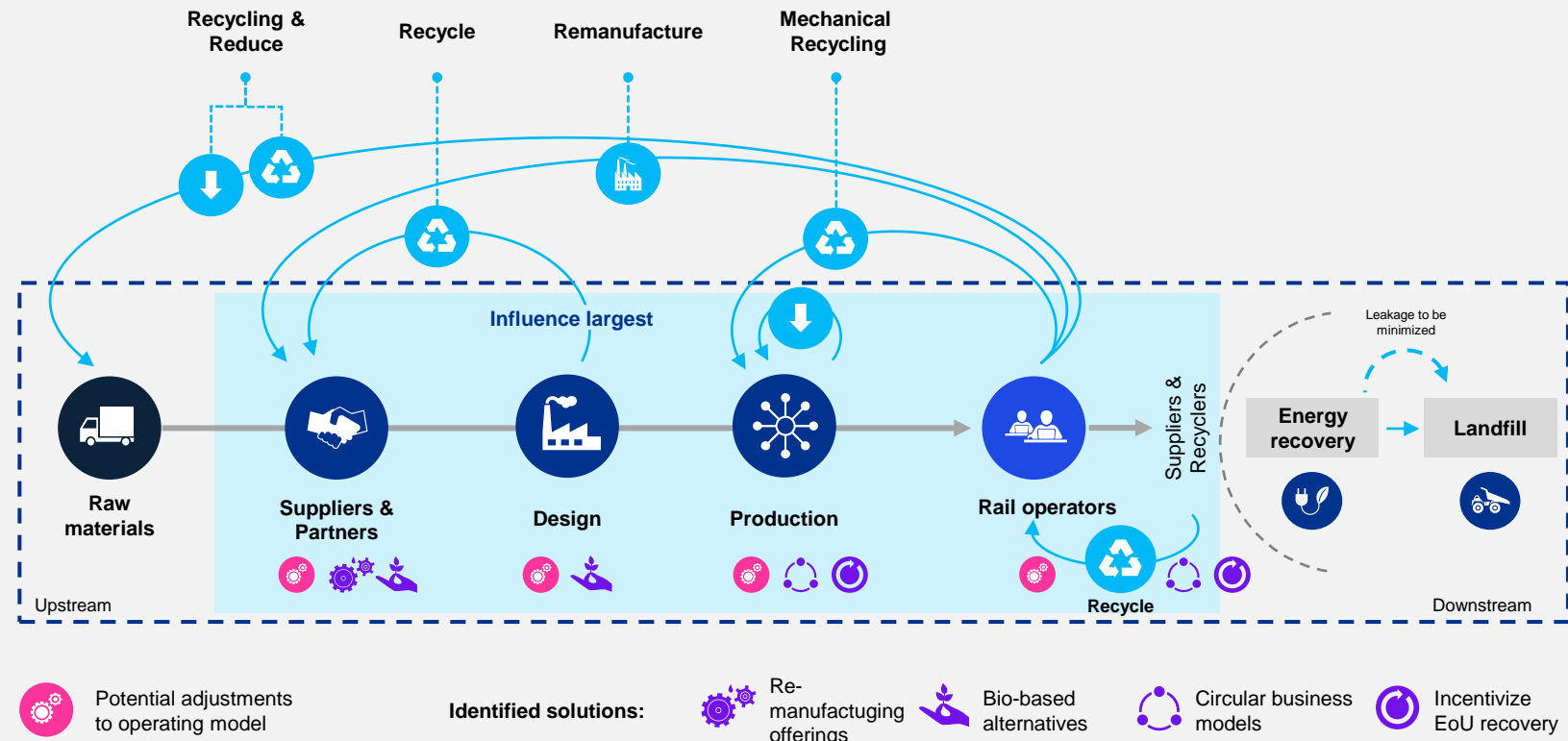
Adopting circular business models requires substantial changes to operations, supply chains, and production methods

Implementing Circular Economy solutions impacts various elements of the operating model

Changes to the operating model can include:

- Procurement of circular material inputs
- Adoption of material and energy-efficient production methods
- Expansion of recycling, re-use and remanufacturing capacities
- Establishment of reverse-logistic processes

Typical IM Value Chain



Circular Economy in Action: Advancing Sustainability



Recycling and waste reduction: Focus on recycling and reducing waste by re-purposing products into newer or other useful materials



Remanufacturing and refurbishment: Companies are investing in remanufacturing and refurbishment processes, taking used or damaged products and restoring them to like-new conditions



Sustainable materials: Usage of sustainable and renewable materials in manufacturing processes reduces the dependency on finite raw materials and lowers the environmental impact of products




Supply chain transparency and traceability: Tracking materials throughout the supply chain, from extraction to disposal




Schneider Electric *“Schneider Electric uses recycled content and recyclable materials in its products, prolongs product lifespan through leasing and pay-per-use, and has introduced take-back schemes into its supply chain”*




SIEMENS *“Siemens aims to accelerate recycling through its DEGREE (decarbonization, ethics, governance, resource, efficiency, equity, employability) framework”*




gm general motors *“General Motors has sold 750,000+ units of remanufactured parts in 2022”*




Ford *“Ford supplied 104,000 remanufactured engines and transmissions in US”*




CAT *“Caterpillar's Cat Reman returns products at the end of their lives (called 'core') to like new condition and helps reduce owning and operating costs”*




Volkswagen *“Volkswagen is using recyclable materials in their vehicle projects, including raw materials from production residues as well as renewable raw materials”*



BASF *“In 2021, BASF purchased around 1.3 million metric tons of renewable raw materials. These renewable raw materials are derived from various value chains”*



Apple *“Apple in 2022, has strengthened its existing traceability systems, and incorporated new technologies, such as blockchain, that improve material traceability”*



HP *“HP publicly reports, year-over-year, key information about its supply chain and its sustainability performance”*

Source(s): KPMG Analysis

Circular Economy in Action: Advancing Sustainability



Net-Zero: Circular economy practices play a significant role in achieving net zero emissions by enabling the recovery of resources from waste streams



“ArcelorMittal, aims to reach net-zero emissions by 2050. It promotes circular economy principles by developing steel products that are designed for reuse and recycling and by investing in recycling technologies”



“Honeywell greenhouse gas emission intensity is down 90% since we introduced our sustainability system in 2004, and now aiming carbon neutrality by 2035”



Policy and regulatory frameworks: Governments are increasingly recognizing the value of a circular economy and are putting policies and regulations in place



“Extended Producer Responsibility (EPR): EPR is a regulation that requires manufacturers to take responsibility for the environmental impacts of their products throughout their lifecycle”



“EU taxonomy framework will include disclosures on circular economy and resource efficiency parameters”



Collaboration: Advancements in collaborative research and development leads to more sustainable and resource-efficient operations



“Michelin and Bridgestone presented their shared vision in November 2021 to make tires 100% carbon neutral and sustainable by 2050. They are focused on promoting the use of recovered Carbon Black (rCB) in the tire industry”



Digitalization and Industry 4.0: The increased use of advanced technology, such as Internet of Things (IoT), artificial intelligence (AI), and robotics, allows for improved monitoring, maintenance, and control of resources



“Michelin provides sensor-based data analytics for predictive maintenance and tire-as-a-service i.e., pay per mile”



“Red's Best seafood products can be traced to the fishing vessel through QR codes on the company's packaging”

Source(s): KPMG Analysis



KPMG

**Closing the loop
with clients**

**Philips
circularity**

What does it take to drive a circular economy?



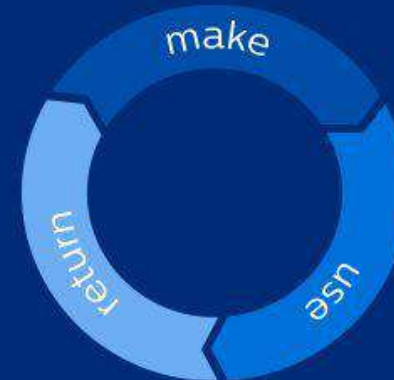
“Circularity helps us fight climate change through the responsible use of energy and materials.”

Robert Metzke,
Philips Global Head of Sustainability

The linear economy



The circular economy



Not just talking: Philips is very serious on Circular Economy



Philips' ambitious circular economy objectives for 2025



Generate **25%** of sales from circular products, services and solutions.



Close the loop by offering a trade-in on all professional medical equipment, and taking care of responsible repurposing.*



Embed circular practices at our sites** and send zero waste to landfill.

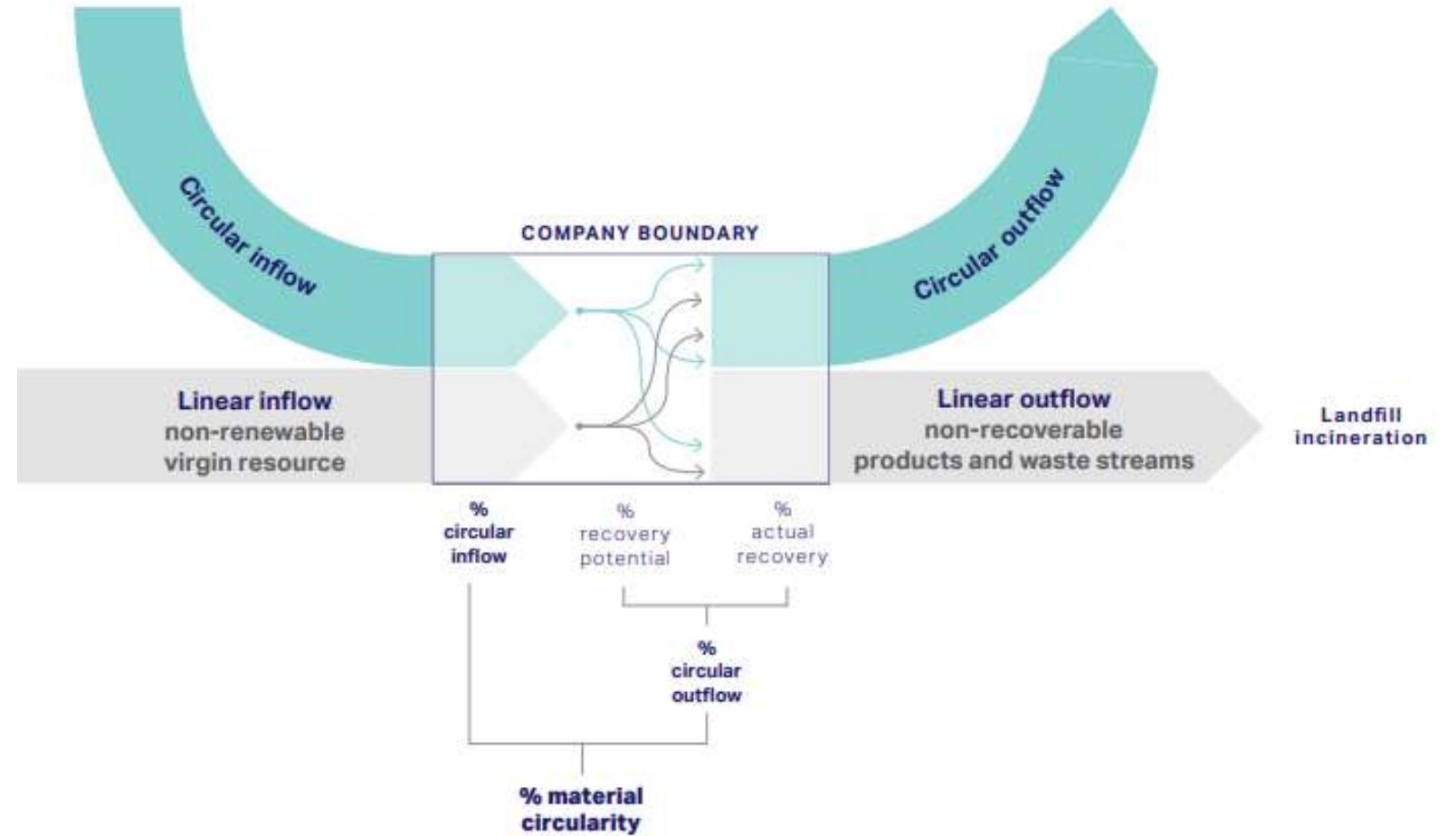
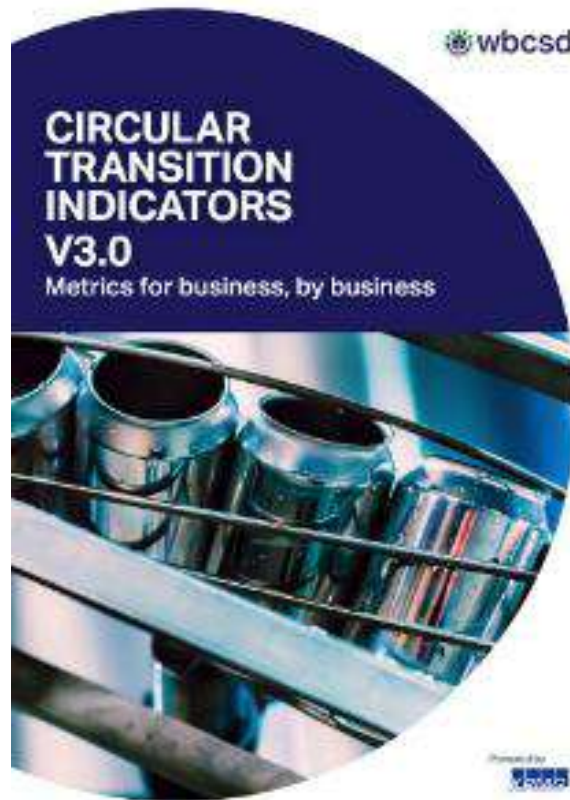
**either refurbished at Philips, or locally recycled in line with Philips policies*

*** including non-manufacturing sites, such as large offices, warehouses and R&D facilities*

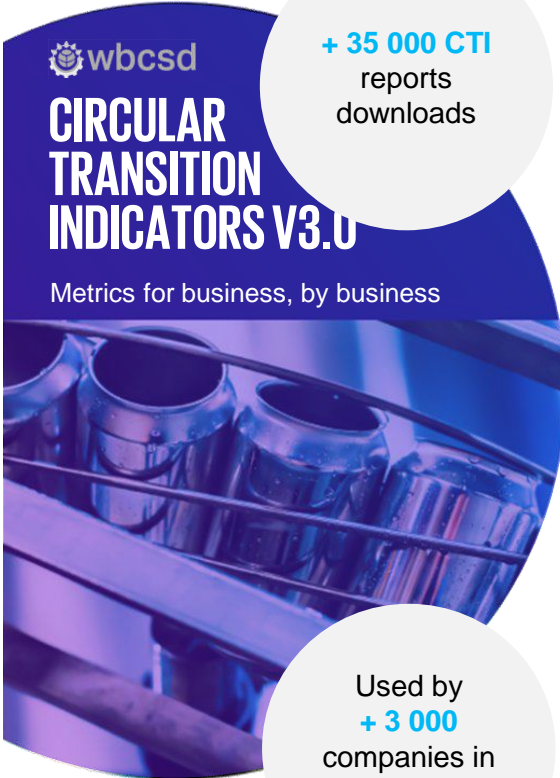
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CTI framework deepdive

The CTI methodology supports in measuring material flow circularity



Measuring circularity as the first step for disclosure and steering towards improvement



wbcscd
CIRCULAR TRANSITION INDICATORS V3.0
Metrics for business, by business

+ 35 000 CTI reports downloads

Used by + 3 000 companies in 94 countries

The CTI framework has been co developed by KPMG & WBCSD

It tackles the business need for a universal and consistent way to measure circularity.

The CTI process helps companies' scope and prepare the assessment and interpret its results, understand its risks and opportunities, prioritize actions and establish SMART targets to monitor progress.



Close the Loop

- % material circularity
- % water circularity
- % renewable energy

Optimize the Loop

- % critical material
- % recovery type
- actual lifetime
- onsite water circulation

Value the Loop

- circular material productivity
- CTI revenue

Impact of the Loop

- GHG impact

How CTI could support you with the quantitative disclosures of CSRD

| | Close the Loop | | | | | Optimize the Loop | | | Value the Loop | |
|---|-------------------|--------------------|----------------------|-------------------|--------------------|---------------------|-----------------|-----------------|--------------------------------|-------------|
| | % circular inflow | % circular outflow | % recovery potential | % actual recovery | % renewable energy | % critical material | % recovery type | actual lifetime | circular material productivity | CTI revenue |
| DR E5-4 32 (a): Total weight of used products and material | ✓ | | | | | | | | | |
| DR E5-4 32 (b): Total weight of input materials from regenerative sources / total weight of input materials | ✓ | | | | | | | | | |
| DR E5-4 32 (c): Weight of reused or recycled input materials / total weight of input materials | ✓ | | | | | | | | | |
| DR E5-5 37 (a): Total weight of products designed along circular principles / total weight of products | | | ✓ | | | | | ✓ | | |
| DR E5-5 37 (b): Total weight of products not qualifying for circular principles, still designed for circular economy / total weight of products | | | ✓ | | | | | | | |
| DR E5-5 38 (a): Total weight of waste generated | | ✓ | | | | | | | | |
| DR E5-5 38 (b): Weight of recovered waste / by recovery operation type | | ✓ | | ✓ | | | ✓ | | | |
| DR E5-5 38 (c): Weight of disposed waste / by disposal treatment type | | ✓ | | ✓ | | | ✓ | | | |
| DR E5-5 38 (d): Total amount and percentage of non-recycled waste | | ✓ | | ✓ | | | ✓ | | | |
| DR E5-5 40: Total amount of hazardous and radioactive waste generated by the undertaking | | | | | | | | | | |
| DR E5-6 42: Quantification of the potential financial effects (monetary terms) | | | | | | | | | ✓ | ✓ |

Circularity data unlocked

KPMG as a global Microsoft business partner – ESG integrated



“KPMG’s deep industry, ESG and process expertise, combined with the power of our trusted cloud — spanning Azure, Dynamics 365 and Microsoft 365 — will bring the best of both organizations together to help customers around the world become more agile in an increasingly complex business environment.”

Satya Nadella
CEO Microsoft



+\$1Bn+
Global Microsoft practice



KPMG received the full suite of **Microsoft Solutions Partner** designations, including **Business Applications**.

+8.000
Microsoft professionals

+2.500
Certified Dynamics experts

60
Countries with Microsoft capabilities
Offshore capabilities in Malta, Sofia and India

kpmg.com/microsoft

Top 5 GSI for Microsoft in Dynamics

KPMG Digital Investment Hub invested **+\$6m** in solutions, like Powered Finance and Supply Chain AND CfS.

Microsoft Cloud innovator

- Preview and launch partner across Microsoft Clouds
- RPA early adopter program
- Global Analytics & AI Accelerate Program
- Global MISA partner
- Global AMMP partner

Monitoring and steering circularity is extremely challenging



Many different sources of data are currently used which causes difficulties in retrieving right data

Circularity data is in many cases divided over multiple different data sources e.g. Excel sheets, invoices, ERP system procurement data which cause difficulties in retrieving useful data for circularity calculations.



Manual interventions needed in data processing

Circularity data processing is in many cases based on manual interventions and a time consuming task due to the combination of different sources



Limited solutions to support in tracking circular performance over time

Currently limited numbers of automatized solutions to track circular performance improvement over time exist causing the need for manual calculations based on snapshots of performance.

The 'Circularity Tracker' helps our clients to measure and improve circular performance on a digital platform

The KPMG Circularity Tracker powered by Microsoft Cloud for Sustainability

Embedding the 'Circularity Tracker' in collaboration with KPMG's circularity and Microsoft experts, creates the opportunity to monitor circular progress and steer on improvement over time.



Organizing diversified Circularity data sources

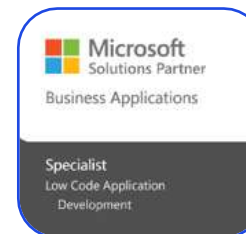


Reducing the number of manual interventions in circular data processing



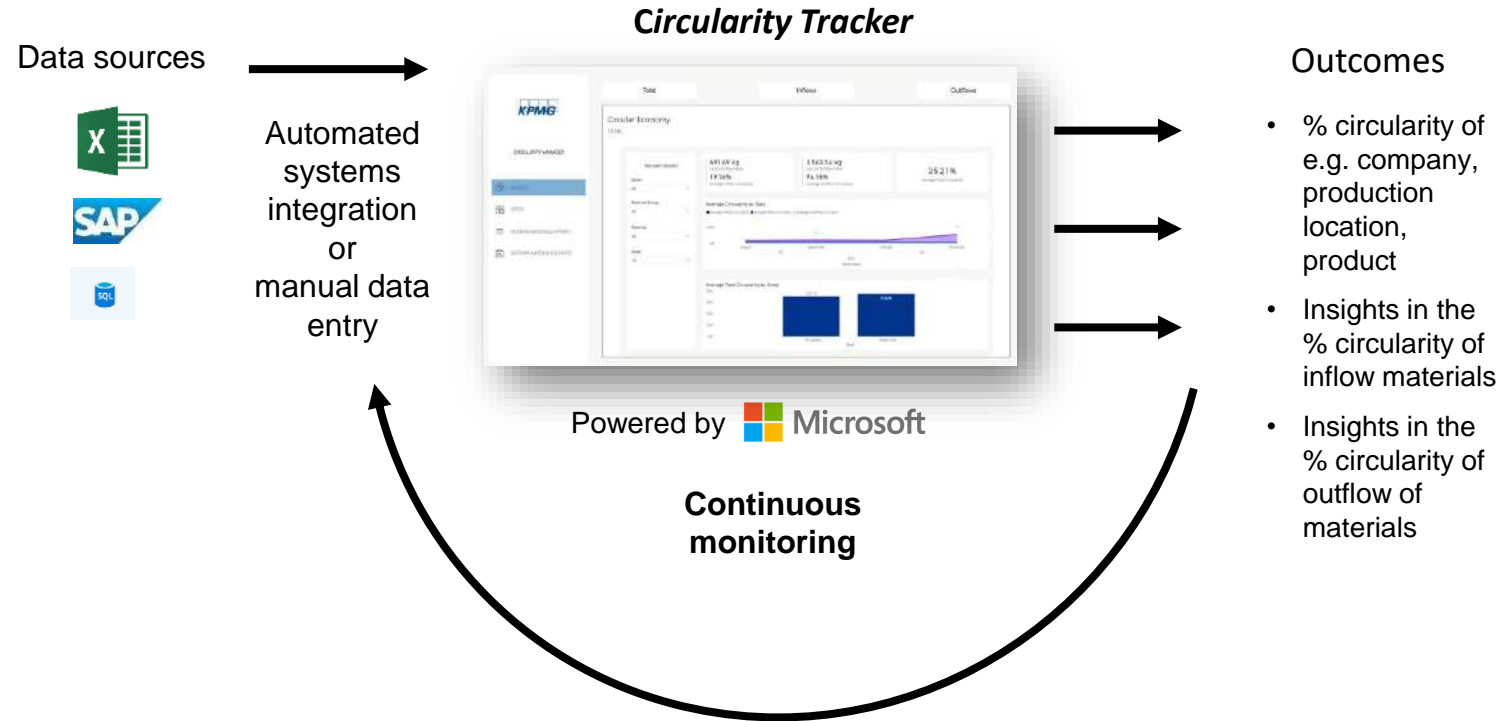
Providing insights into current circular performance and performance over time

KPMG received the full suite of **Microsoft Solutions Partner designations**, including Business Applications



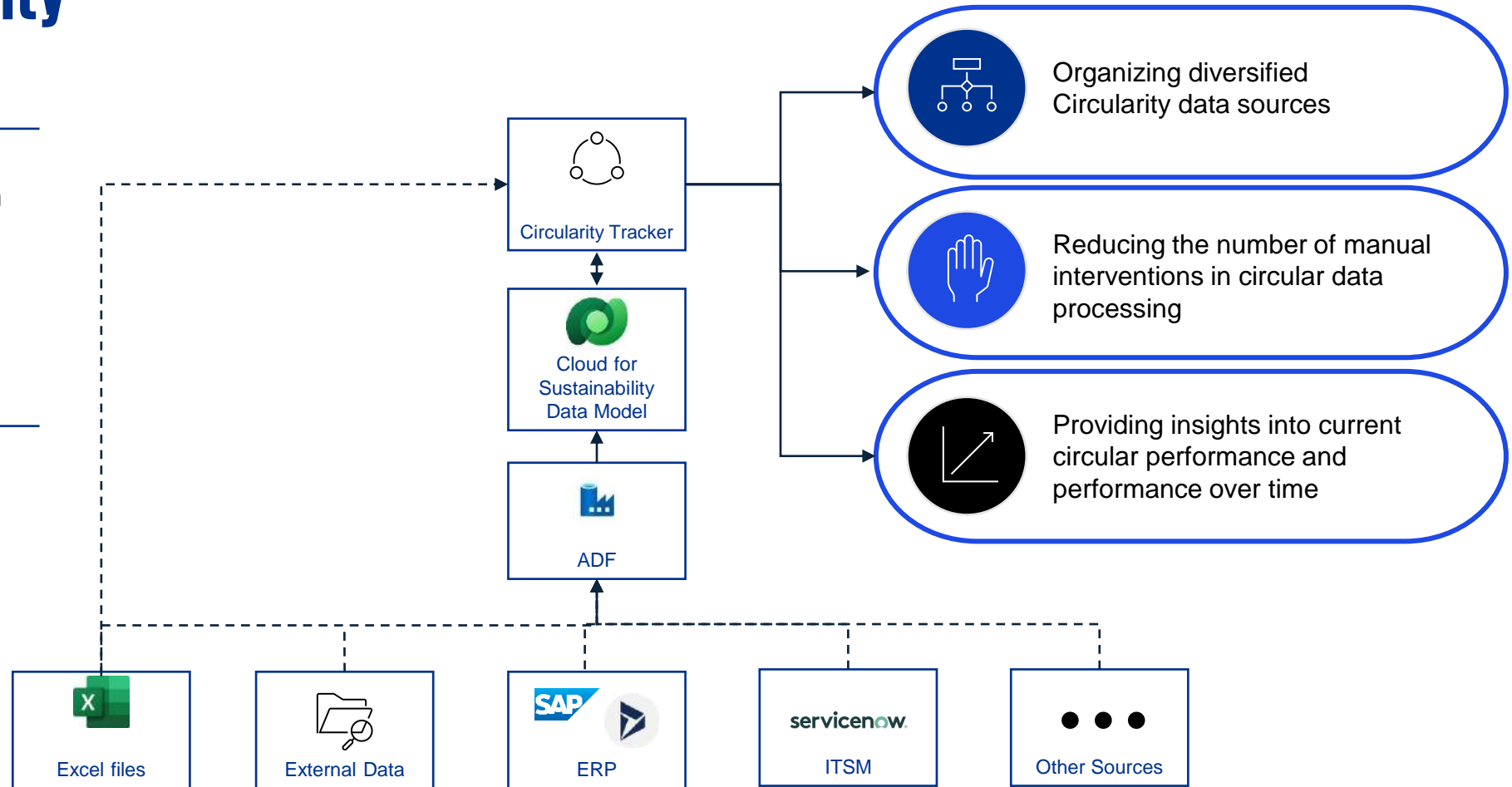
The KPMG Circularity Tracker provides clients with circular performance insights

The 'Circularity Tracker' has been developed to help businesses measure and continuously improve their circular performance. The tool automates the data collection from different sources and performs the calculations needed to support businesses in their transition towards a circular economy.



The KPMG Circularity Tracker powered by Microsoft Cloud for Sustainability

Embedding the 'Circularity Tracker' in collaboration with KPMG's circularity and Microsoft experts, creates the opportunity to monitor circular progress and steer on improvement over time.



E2E Supply Chain traceability will become the backbone for any circular value chain

Supply Chain Traceability Solutions

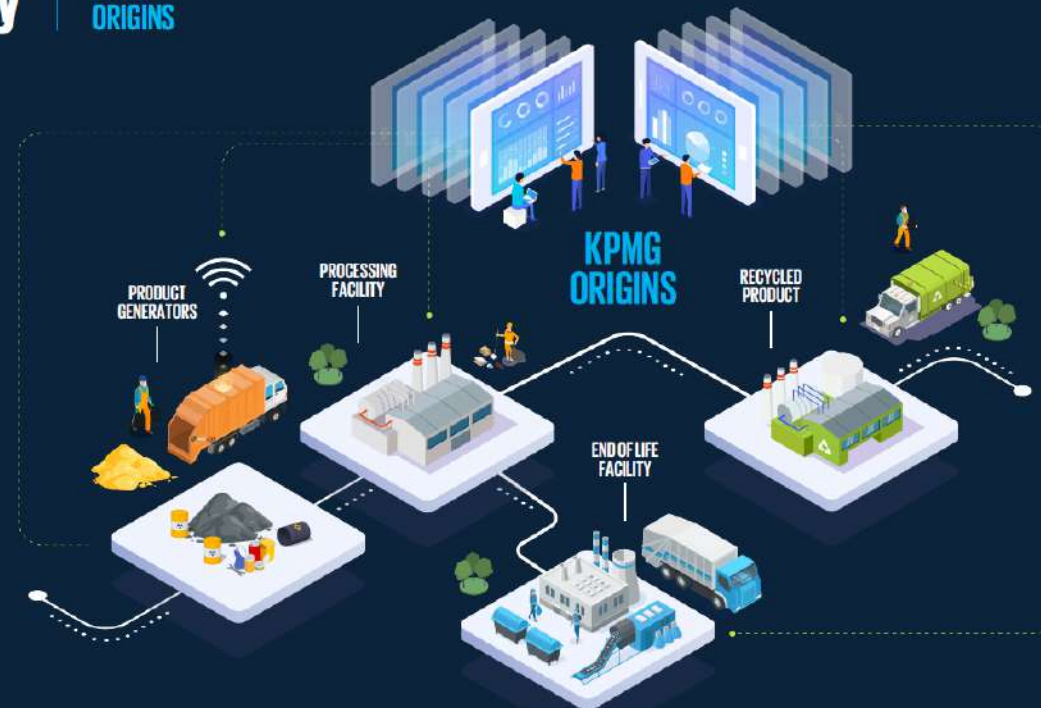
Asset Traceability

KPMG ORIGINS

Traceability of supply chain assets

KPMG Origins Asset Traceability is a blockchain-based track-and-trace solution helping trading partners codify trust, enabling more streamlined interactions across organisations and borders.

Our easy-to-use solution reshapes industries by enabling exceptional visibility and control of the supply chain, from tracking raw materials to the final point of sale.



Industry needs to prepare for digital traceability of their value chain enabling a circular economy transition



“From 2026/27 Digital Product Passports (DPP) will be mandatory for 8^(a) priority industries”

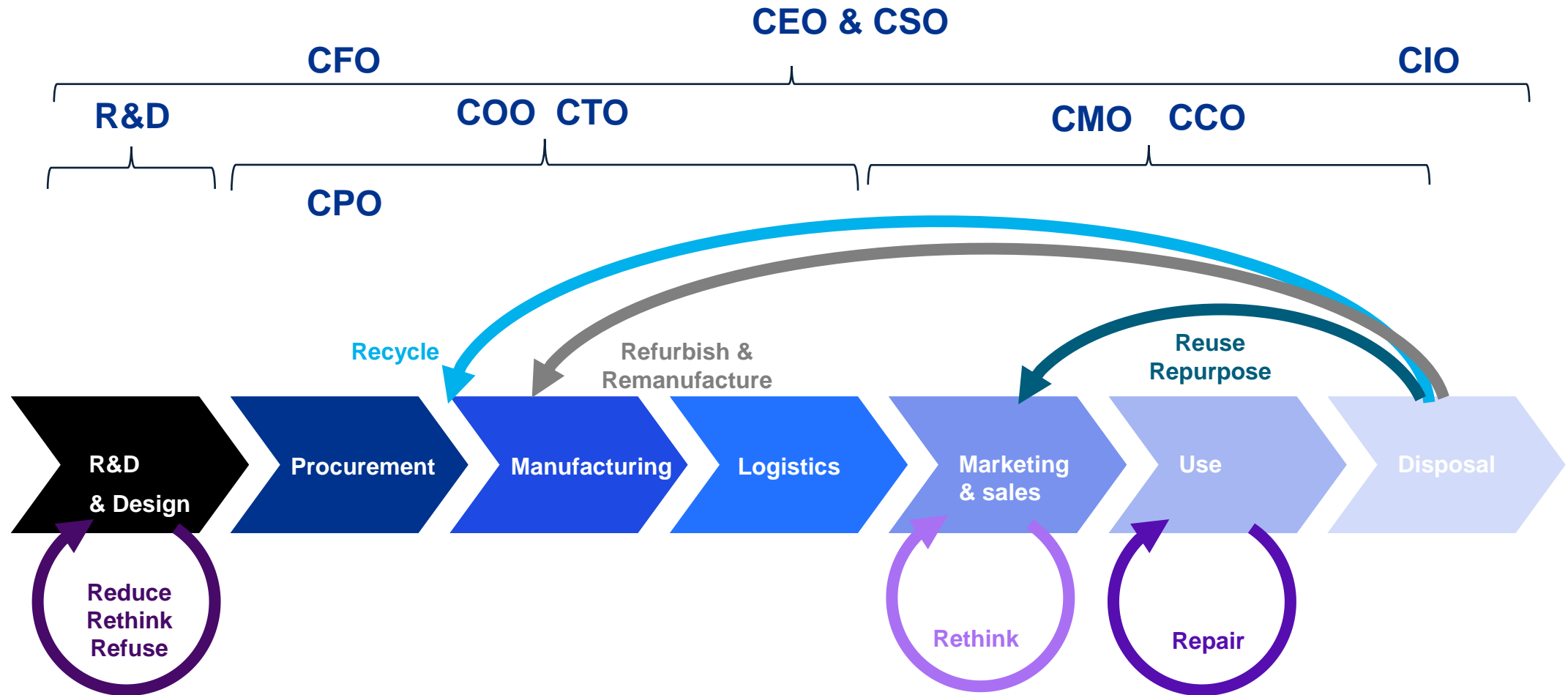
EV batteries’ first DPP solutions are arriving in the market

Note: (a) Electronics, vehicles, textiles, plastics, construction and buildings, furniture, and chemicals, 13 in total by 2030. Only food, feed, and medicinal products being exempt.



Circular Economy governance

For you, deploying circular business models means new strategies and principles involving all functions





Q&A



KPMG

KPMG: What defines us

Expertise & Experience



We are **pioneers in circular economy advisory** with over 10 years experience and relevant experience in cross-cutting sustainability areas.

Global Network



Our **global network** of ESG strategy, climate, circular economy, biodiversity and social experts and alliances is well positioned to support you.

Analytics & Tools



Our approach to circular economy is analytic in nature with **useful tools and templates** you can put to immediate use.

Strong references



We have a **wide range of references** in the conception and implementation of circular economy and major sustainability focus topics.

Attractive Terms



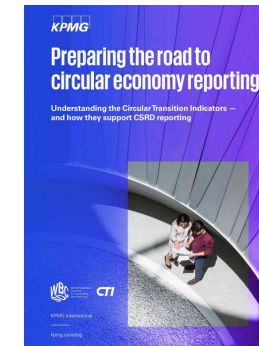
Our offer is **reliable, competitive, and focused on long-term cooperation** to drive your circular transformation.

Trusted partner



We are **solution driven, pragmatic and agile**, with a track record of multiple successful cross-cutting circular economy projects.

KPMG thought leadership





INTERNATIONAL UNION
OF RAILWAYS

INFRASTRUCTURE MANAGERS' VIEW

Katy Beardsworth

Circular Economy Strategy Manager,
Network Rail

Chair of the UIC Circular Economy
Sector

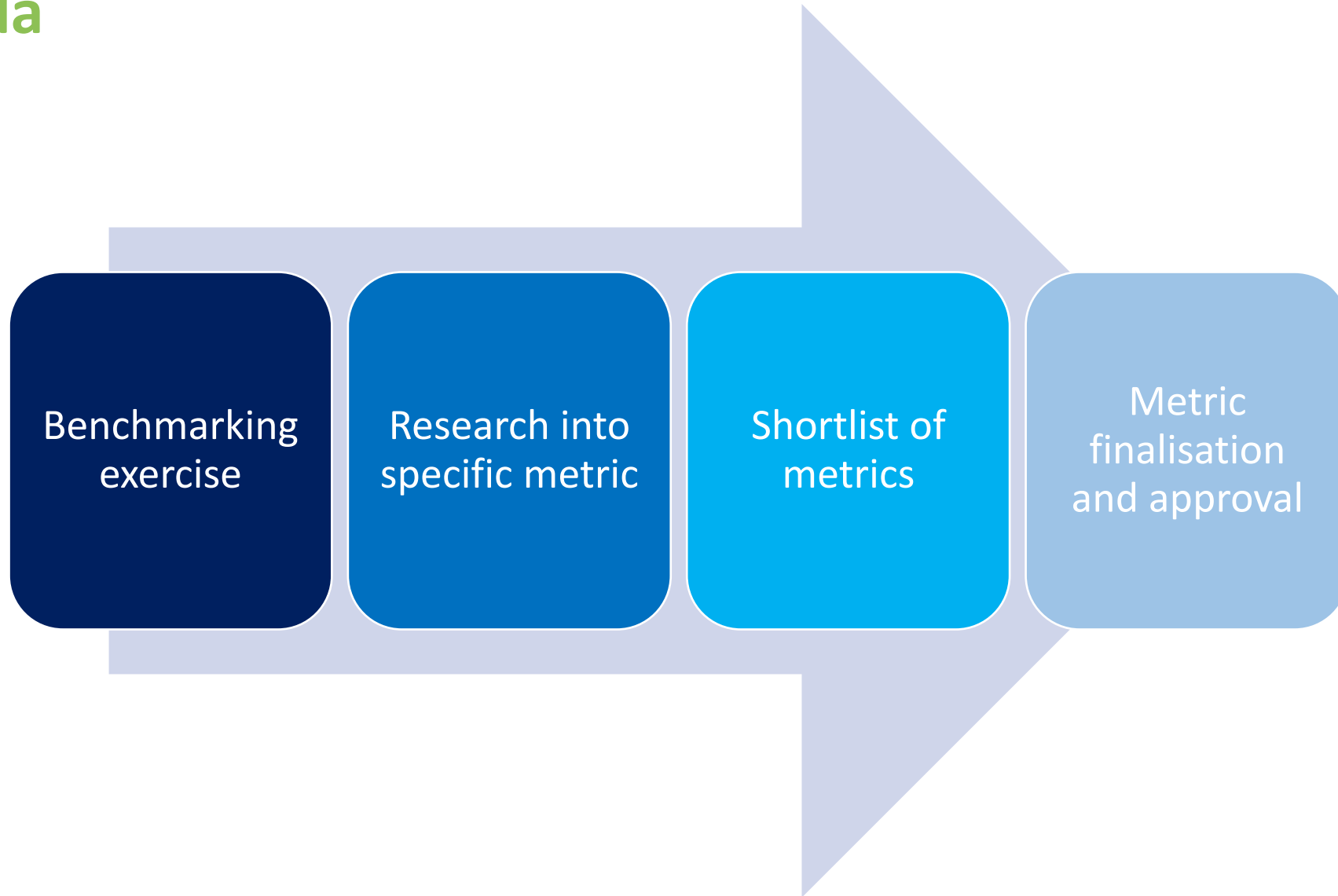


Metrics and measuring – a view from infrastructure

Katy Beardsworth, Circular Economy Strategy Manager

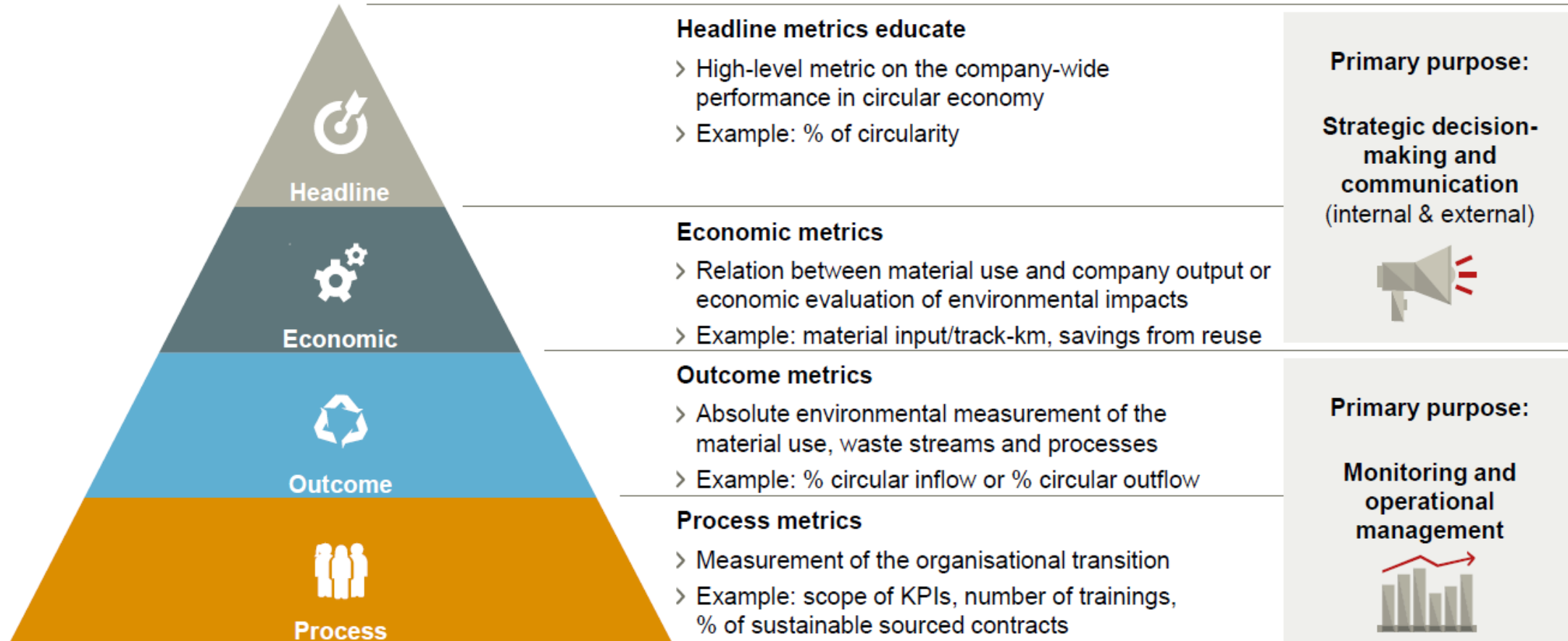


Agenda



Our metric journey – benchmarking exercise

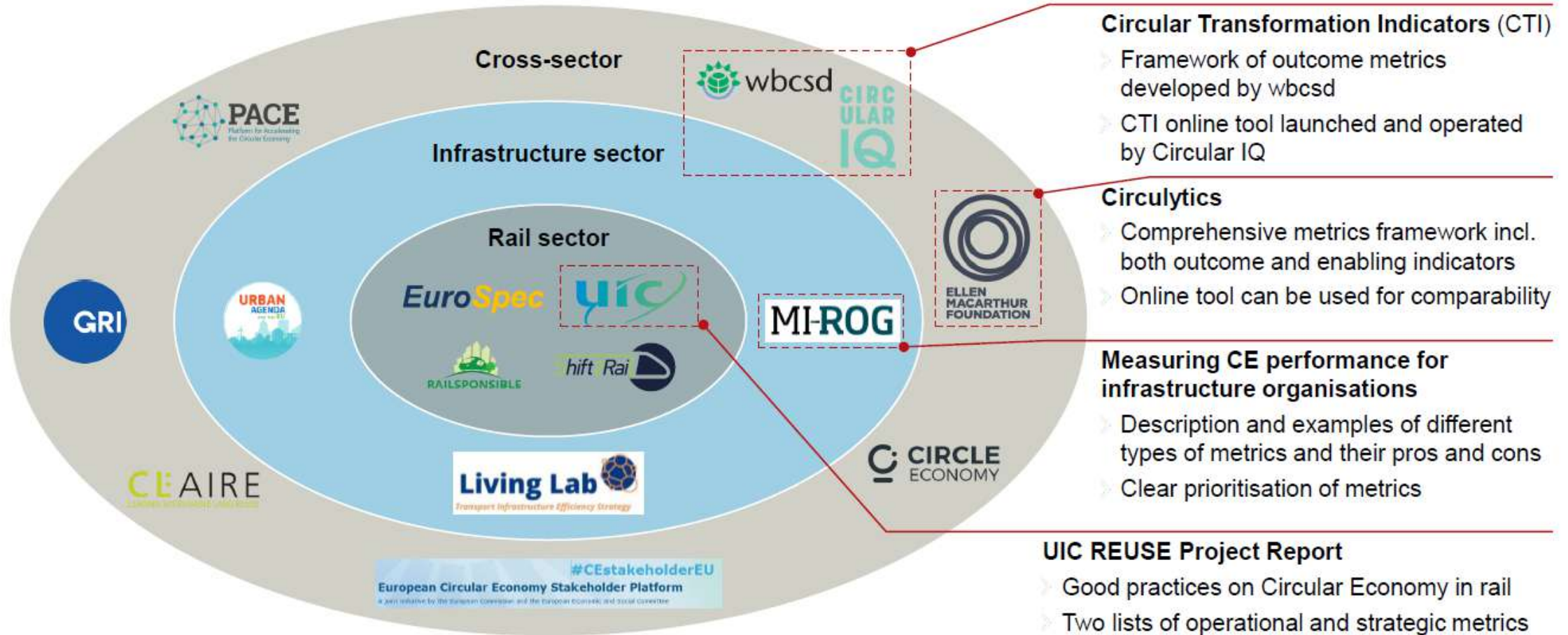
- What were others in our industry doing?
- How did different metrics compare?



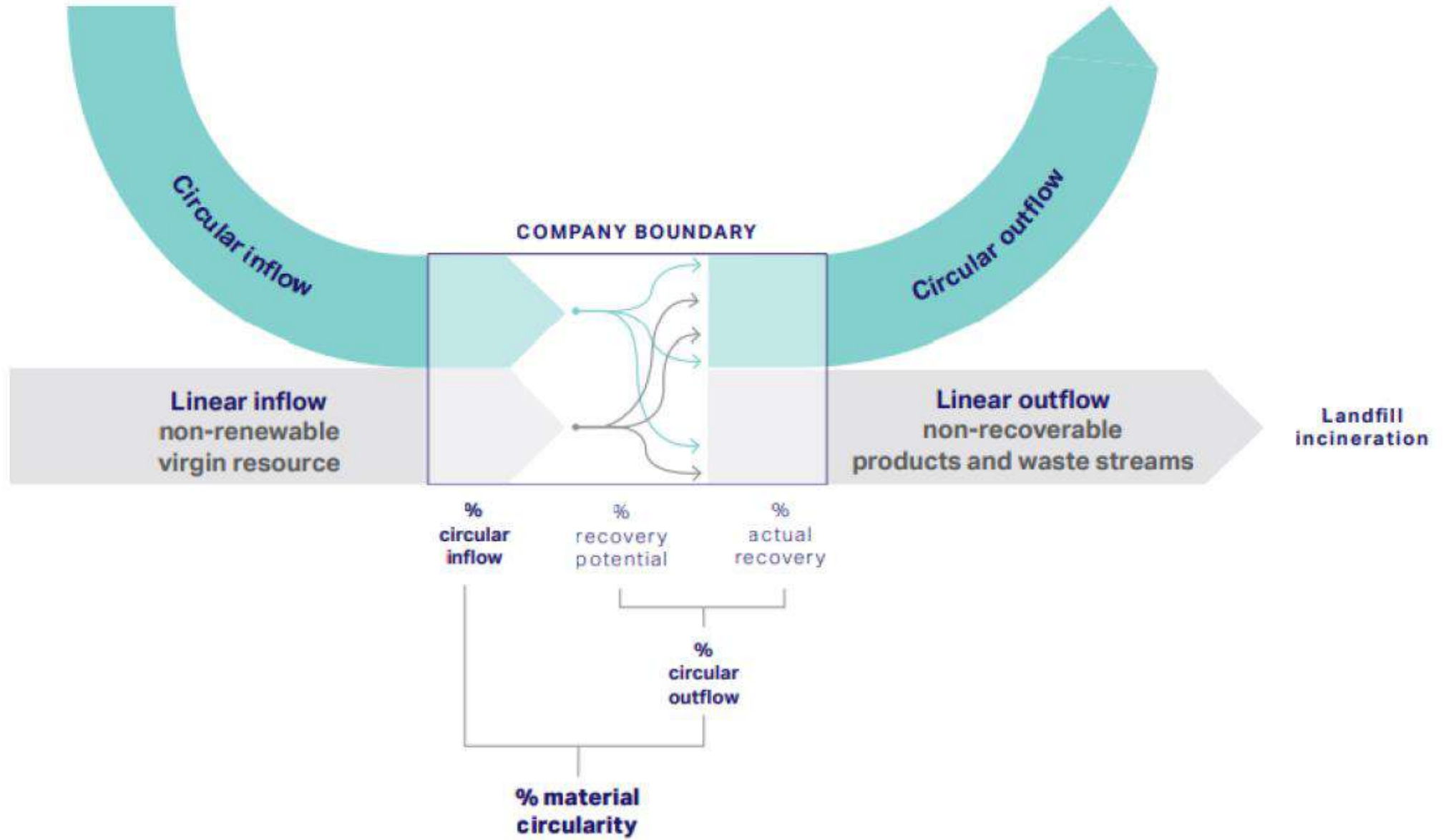
Source: categorisation inspired by MI-ROG (2018), wbcSD (2021) and Ellen MacArthur Foundation (2021)



Our metric journey – benchmarking exercise



Our metric journey – research into WBCSD CTI



Our metric journey – research into WBCSD CTI

- Requirements to embed WBCSD into Network Rail
 - Change in procurement processes – extra ‘tag’ added to categorise materials and products
 - Extra questions in procurement to determine if critical materials included
 - Examination of Environmental Product Declarations to determine if product contains virgin / non virgin material
 - Conversion of quantities to mass (not always known)
 - Conversion of waste data to understand outflow
 - Change in definitions for how Network Rail categorises waste (include repair/refurbish and repurpose/remanufacture)
 - Monitoring of circular water use

Outcome: ‘It is believed there is mostly insufficient data, or data requiring improvement within the current Network Rail procurement and waste data collection to support the requisite calculations. Some of the non-product/ material specific indicators and metrics have sufficient levels of data for use in the CTI framework’



Our metric journey - shortlist of metrics

| Target | Proposed Metrics |
|--|---|
| Reuse, recycle, or redeploy all our non-hazardous infrastructure materials by 2029 Engage with contractors, retailers, Train and Freight Operating Companies to minimise waste and embed circular economy (CP6) | % of non-hazardous waste re-used , recycled, recovered, landfilled |
| Adapt standards to include circular economy aspects by 2023 | % renewable energy No of standards adapted |
| Embed material re-use and redeployment systems and tools into procurement process by 2024 | £savings from material reuse via Surplus App |
| Embed material re-use and redeployment systems and tools into procurement process by 2024 Improve product approval process to ensure quality for reused materials (CP7) | % of virgin and non-virgin materials used in key priority products |
| We have circular processes in place for all of our non-hazardous materials by 2034 | Use of critical raw materials (for key priority materials) |



Our metric journey – metric finalisation and approval

- Metrics shown on previous slide have now been approved and will go live in April 2024
- More work needed to understand how to gather and report
- Further metrics to be introduced in future years
- Project level metrics to be developed



Any questions?





INTERNATIONAL UNION
OF RAILWAYS

CSRD

Michel Scholte

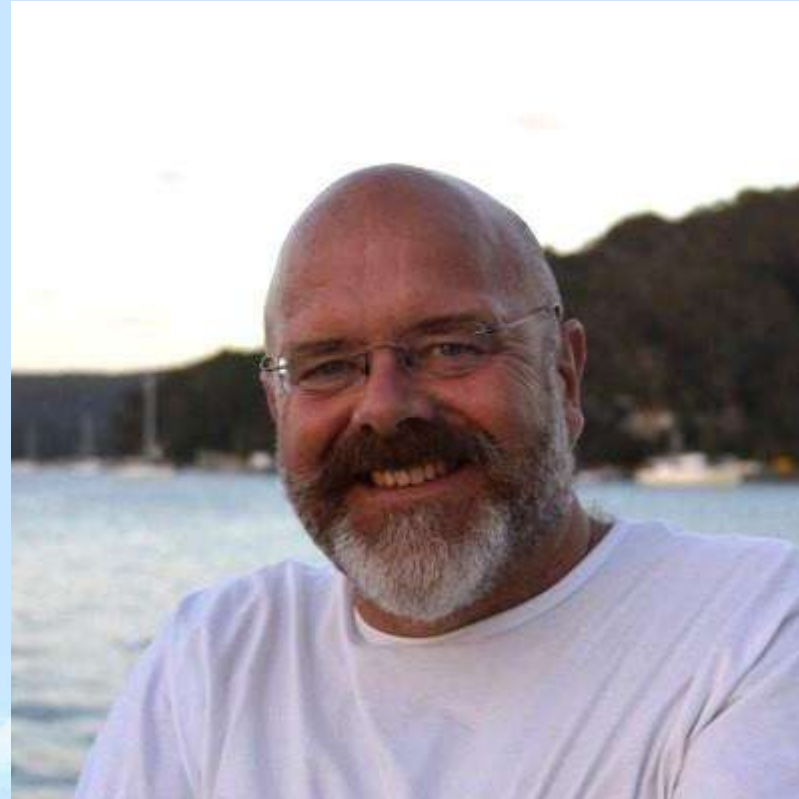
Co-founder and Executive Board
Member of Impact Institute, True
Price and CSR Academy



**Asset Management – An enabler for
the circular economy across the rail
sector**

Carl Waring

Principal Consultant at
Frazer-Nash Consultancy



Better outcomes from railway investment in a circular economy

Carl Waring MSc CEng CITP MBCS MIAM

Principal: Service Development Lead – Circular Economy

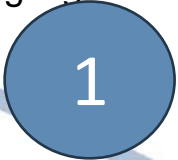
Circular Economy (Asset Management Context)



This white paper aims to outline how asset management can embrace circular economy principles and highlight the opportunities for enhancing value that this can offer.

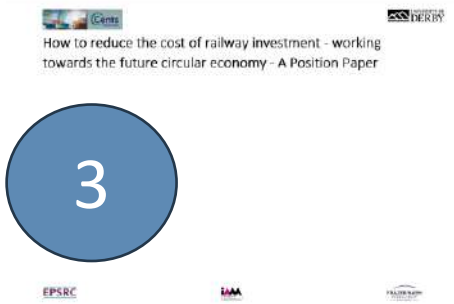
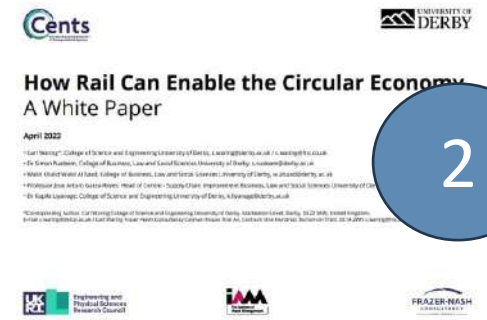
This is important for organizations working on their circular economy transformation and identity.

Drawing upon good asset management practice, the organization's leaders and asset managers will need to understand the relative strengths of their existing asset management capability and how these systems can evolve and adapt, supporting a future circular economy.



This white paper is the result of EPSRC/Circular Economy Network for Transportation System (CENTS+) research with the University of Derby and supported by Frazer-Nash.

The white paper is set within the UK rail context and takes a systems thinking view on how the UK railway can align to facilitate growth in the circular economy and how asset management can enable that to happen. As part of the research, a number of workshops were held with rail sector stakeholders. The paper shows the application and extension to the UK rail sector of the IAM circular economy white paper published in November 2022.

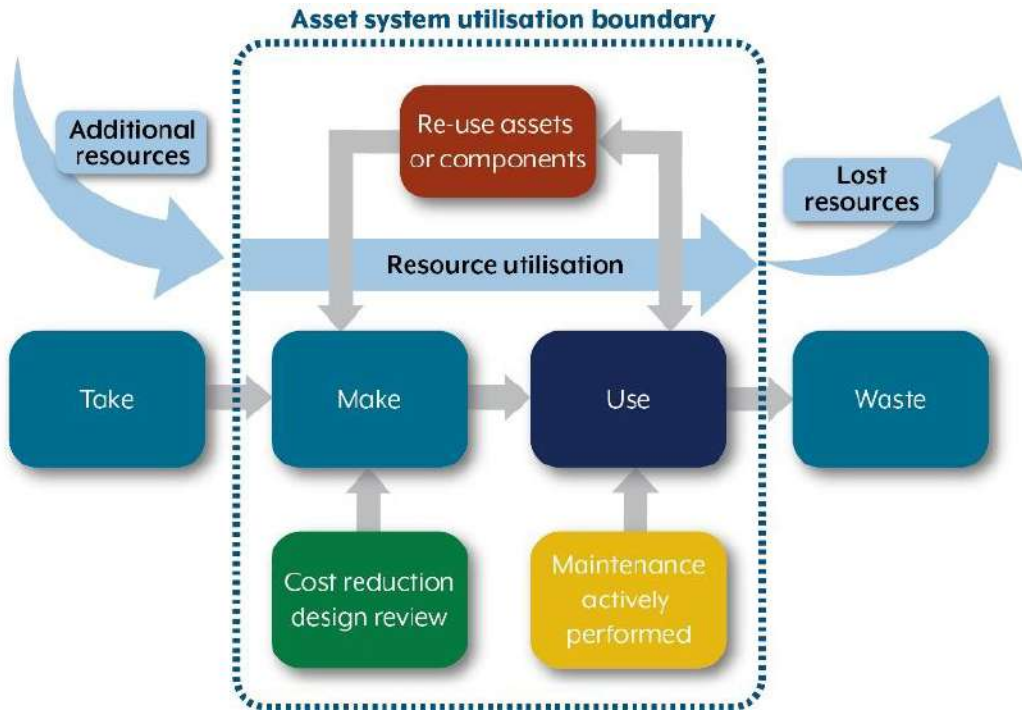


Better outcomes from railway investment in a circular economy.

This position paper is a follow-on from the EPSRC/Circular Economy Network for Transportation System (CENTS+) research with the University of Derby and supported by Frazer-Nash.

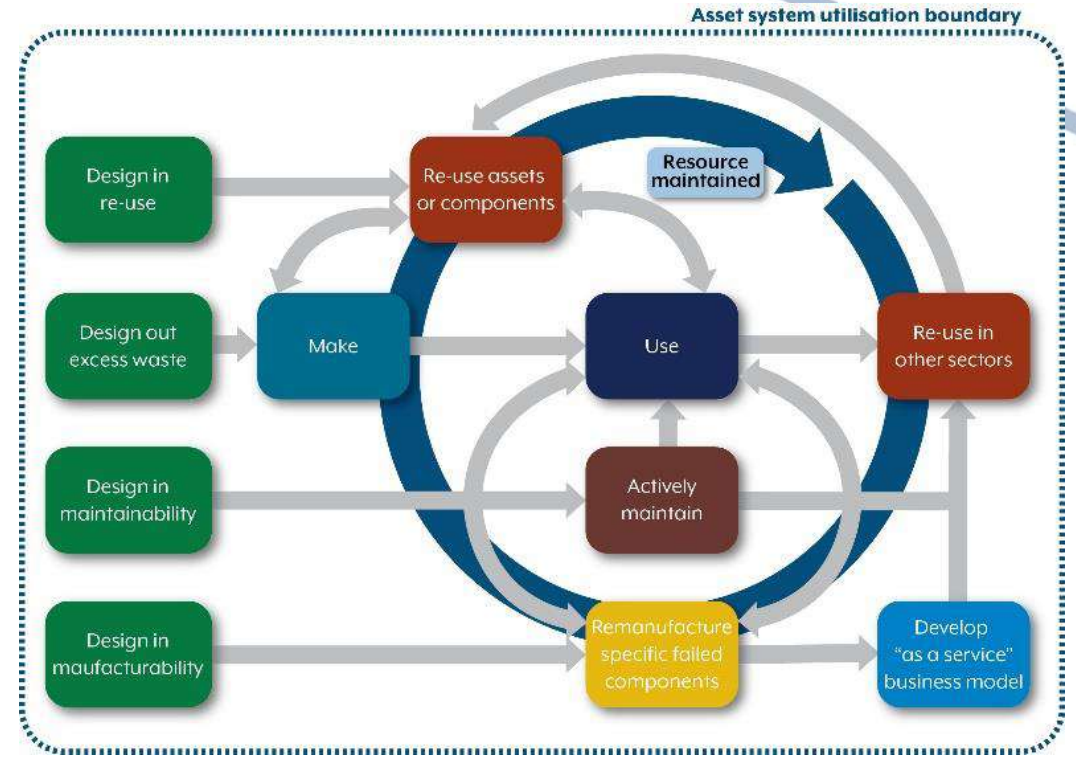
The position paper calls upon asset management strategy as part of corporate business development strategy and applies systems thinking in context and calls for business models that are more suited to the future circular economy and discusses market conditions.

Circular Economy (Asset Management Context)



Not like this

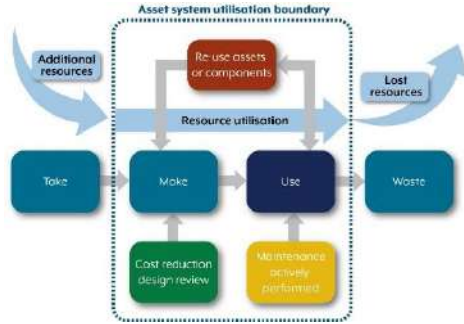
HOW?
➔



More like this

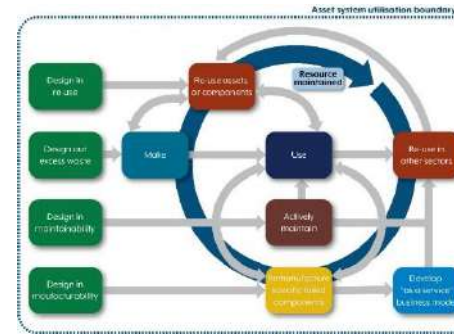
Circular Economy on a page (Asset Management Context)

Linear economy – influenced significantly by short term profit gain and minimal compliance to the detriment of externalities.



- No evidence of corporate purpose (how value is created, and impact enabled) beyond compliance.
- Whole life cost drives increases in consumption.
- Driven through efficiencies e.g. in order to maximise short term profit gain.

Circular economy – influenced significantly by creating value that is greater than the sum of its parts with profit.

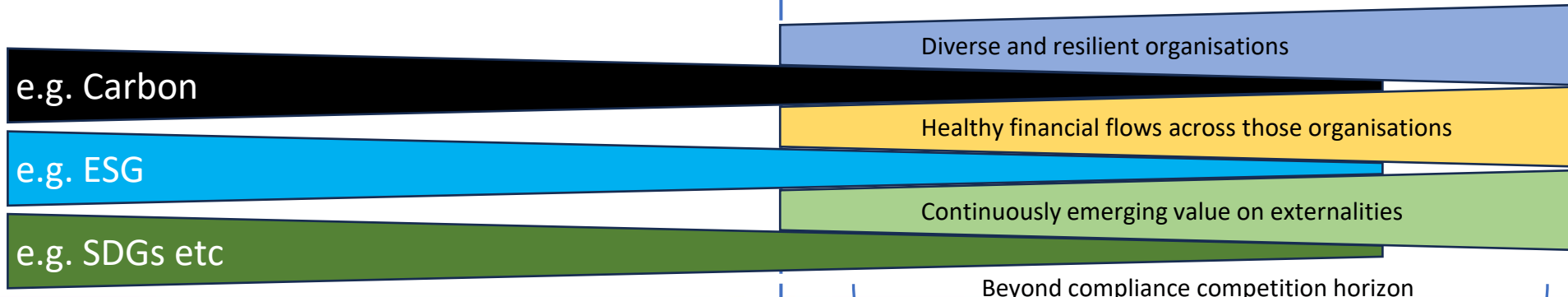


Value spectrum in context

- Evidence of corporate purpose (how value is created beyond the sum of its parts) beyond compliance.
- Whole life value frameworks e.g. service orientated.
- Driven through performance and effectiveness over the long term.

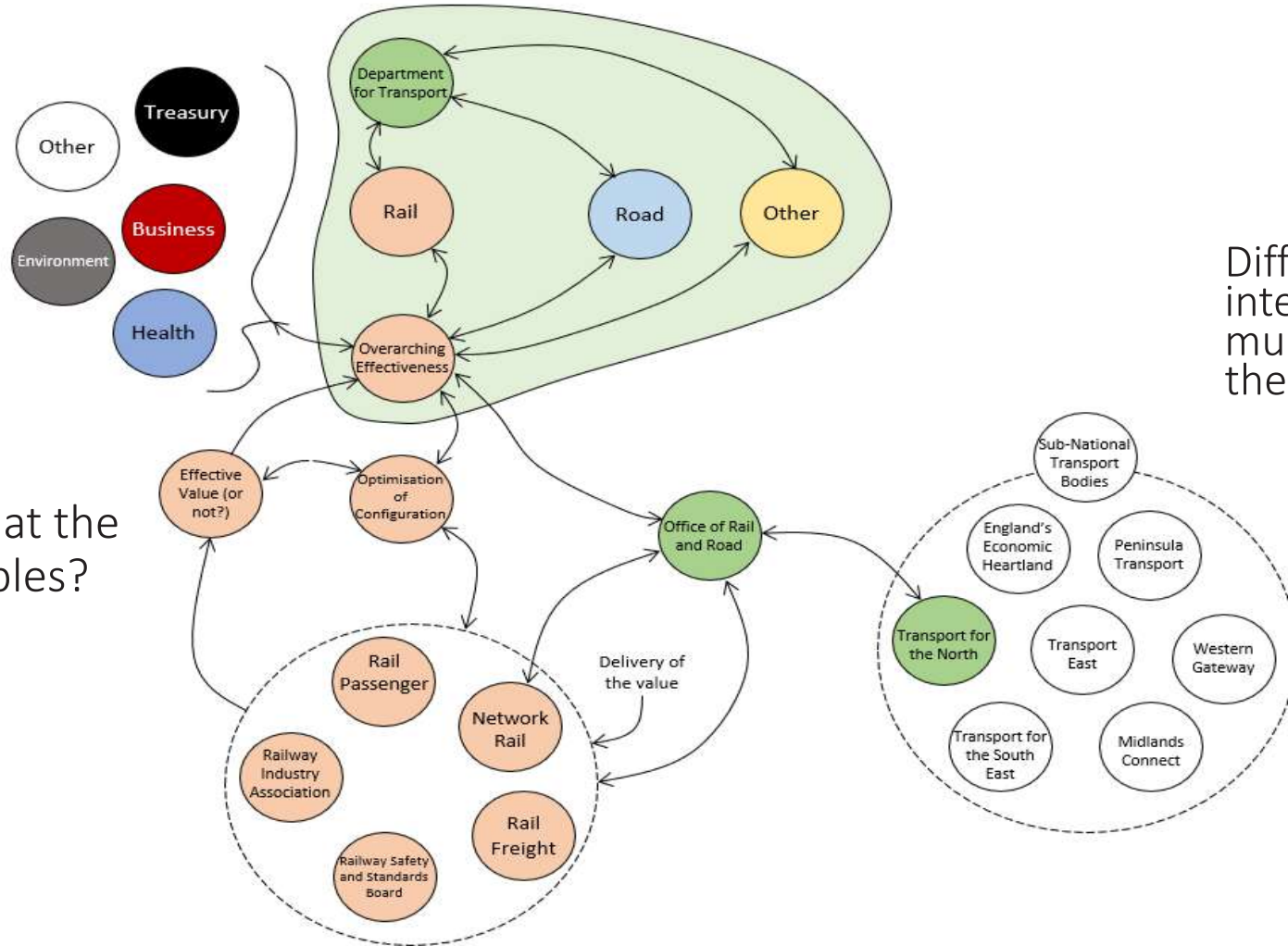
Beyond Compliance

External Pathways



Nurturing circular economy value streams

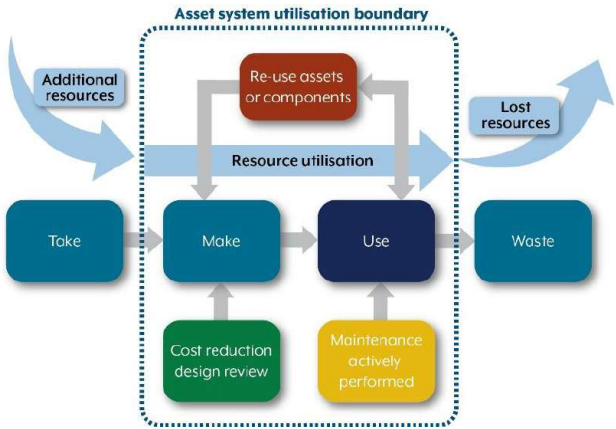
What is it that the railway enables?



Different types of interventions at multiple levels creates the greatest impact

Figure 1 Whole systems approach diagram

Circular Economy (Asset Management Context)



Not like this

Generic Conditions

- C1
- C2
- C3
- C4
- C5

- P1
- P2
- P3
- P4
- P5

Theory

Sector Conditions

- C1
- C2
- C3
- C4
- C5

- P1
- P2
- P3
- P4
- P5

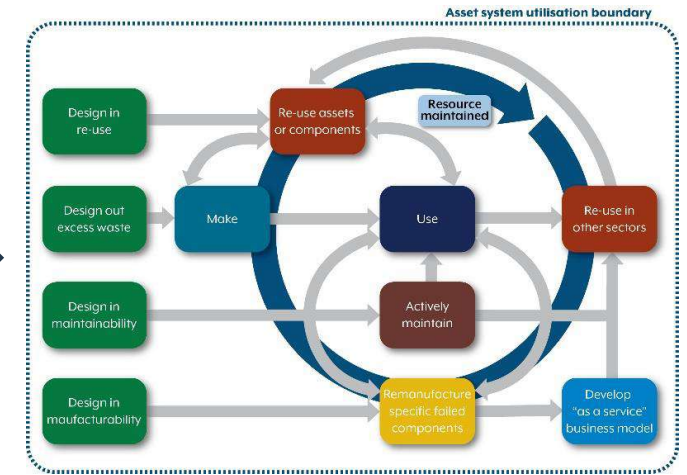
Applies Theory & Provides Meaning

Strategic Conditions

- C1
- C2
- C3
- C4
- C5

- P1
- P2
- P3
- P4
- P5

Signposts Value



More like this

Conditions and Products around Complexity – Sector Conditions

| | | |
|---------------------------------|---------------------------------|---|
| Conditions | Numerosity | Many companies, that work in multiple sectors, that work with different operating models, that interact with each other, that operate at different times. |
| | Disorder and Diversity | Not solely dependent on the rail sector, have multiple strategies that cover different markets, For structure to arise it is necessary to have disorder. Disorder leads to order. |
| | Feedback | Weathers the storm from responding to market behaviours deals with previous states as well as exploits emerging markets |
| | Non-equilibrium | Able to work within (and across sectors) but is able to provide/enable frequent innovation, upgraded/enhanced products and services that continually add value. A strong research pipeline for problems for research and fix. |
| | Emergence | The whole that is displayed in terms of behaviour that the individual parts cannot display on their own. ‘Were the interesting things happen’. |
| Products (of the conditions) | Spontaneous order | A continuous and healthy pipeline of opportunities from SMEs born from the conditions. |
| | Non-linearity | Change impacts can spread quickly and adaptations can be made easily |
| | Robustness | Not centrally controlled, but works within adaptive frameworks this also supports robustness. |
| | Nested structure and modularity | Random system boundaries and evidence of interconnectedness but not dependent. Asset systems and sub-systems boundaries defined. Functional and interoperability interfaces defined for assets and asset sub-systems. |
| | History and memory | Retained history for future learning purposes e.g. apprenticeships, culture, adopted beliefs. |
| | Adaptive behaviour | Receptive to change from monitoring the horizon and predicting opportunities, this is also a form of robustness. |

Circular Economy on a page (Asset Management Context)

1. Develop long term strategic and integrated planning at local, regional and national levels. Investment in railway infrastructure should be integrated and planned over long and rolling 25-year periods. This extends beyond the short political 5-year investment cycles. However, respective Governments should still be held to account on the value they create during their office that enable the short and longer-term outcomes. Cost savings and benefits should still be made in the short term, but future costs savings and benefits will be far greater with visibility of how those decisions enable longer term outcomes. Asset investment strategies and plans should reflect this way of thinking and regulation should be so aligned. A key driver to this will be Government committing to adapt standards, incentives and regulation so they are aligned in a circular economy.

Circular Economy on a page (Asset Management Context)

2. Compete on asset and systems performance.

- The only certainty we see in the rail sector now is that prices will increase.
- This needs to change to move towards increased and sustained value.
- The supply chain must do more than simply try to control the price of technology and value extraction. It needs to be more multi-faceted. For example, this can be enabled by an asset systems interoperability framework.
- The concept of high degrees of interoperability/compatibility and interchangeability of assets is not an unreasonable requirement. It should be possible to buy part of a signalling system off the shelf from a competing supplier when it performs better or costs less.
- This stimulates the demand for new technologies in the market and encourages innovation and new types of business. In turn, this drives down costs through a market that works across a range of diverse operating models.
- A key driver to this is the ambitious commitment to adapt existing standards that enable circular economic behaviour in the supply chain.

Circular Economy on a page (Asset Management Context)

3. Create the market conditions that enable limitless emergent opportunities. This work specifically looked at complexity in the UK rail market and the outcomes that enable circular economy behaviour in the supply chain if these conditions were created. These conditions included such things as the following:
 - a. Having many companies that work in multiple sectors with different operating models, and that interact with each other and at different cycles.
 - b. Organisations that are not solely dependent on the rail sector but have multiple strategies that cover and share synergies and concepts from adjacent markets.
 - c. Organisations that can weather the storm from responding to multiple market behaviours. Such organisations have often been capable of dealing with previous market stresses and are quick to learn and adapt as well as exploit new emerging market opportunities.
 - d. Organisations that can work within and across sectors and provoke frequent innovation, leading to upgraded and enhanced products and services that continually add value. These organisations hold a strong research pipeline for problems for research and industry to fix.

Thank you

Carl Waring MSc CEng CIP MBCS MIAM
c.waring@fnc.co.uk

Measuring GB rail's circular economy performance



Thom Rawson
*Sustainable Rail Principal at
RSSB*



Sam Jones
*Sustainable Rail Programme
Assistant at RSSB*



Liv Judge
*Senior Consultant within the
Circular Economy team at
Ricardo*

Measuring GB rail's circular economy performance

Thom Rawson

Sustainable Rail Principal, RSSB

Samuel Jones

Sustainable Rail Programme Assistance, RSSB

Liv Judge

Senior Consultant, Circular Economy & Sustainability, Ricardo plc



Sust

Bl

The in blueprint for realising sustain



Common Solutions in the Sustainable Rail Blueprint



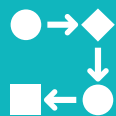
Data Framework

A data framework is needed to measure, collate, and report progress against sustainable rail goals.

What is the Sustainable Rail Data Framework (SRDF)?

The SRDF will enable the rail industry to monitor progress and report performance against the Blueprint goals, ambitions and milestones.

THE SRDF PROGRAMME INCLUDES:



*REVIEW AND AGGREGATE INDUSTRY
DATA*



*DEFINE METRICS ALIGNED TO THE
BLUEPRINT*



*ESTABLISH A PERFORMANCE
DASHBOARDS*



*INTEGRATE METRICS WITHIN
INDUSTRY MECHANISMS*

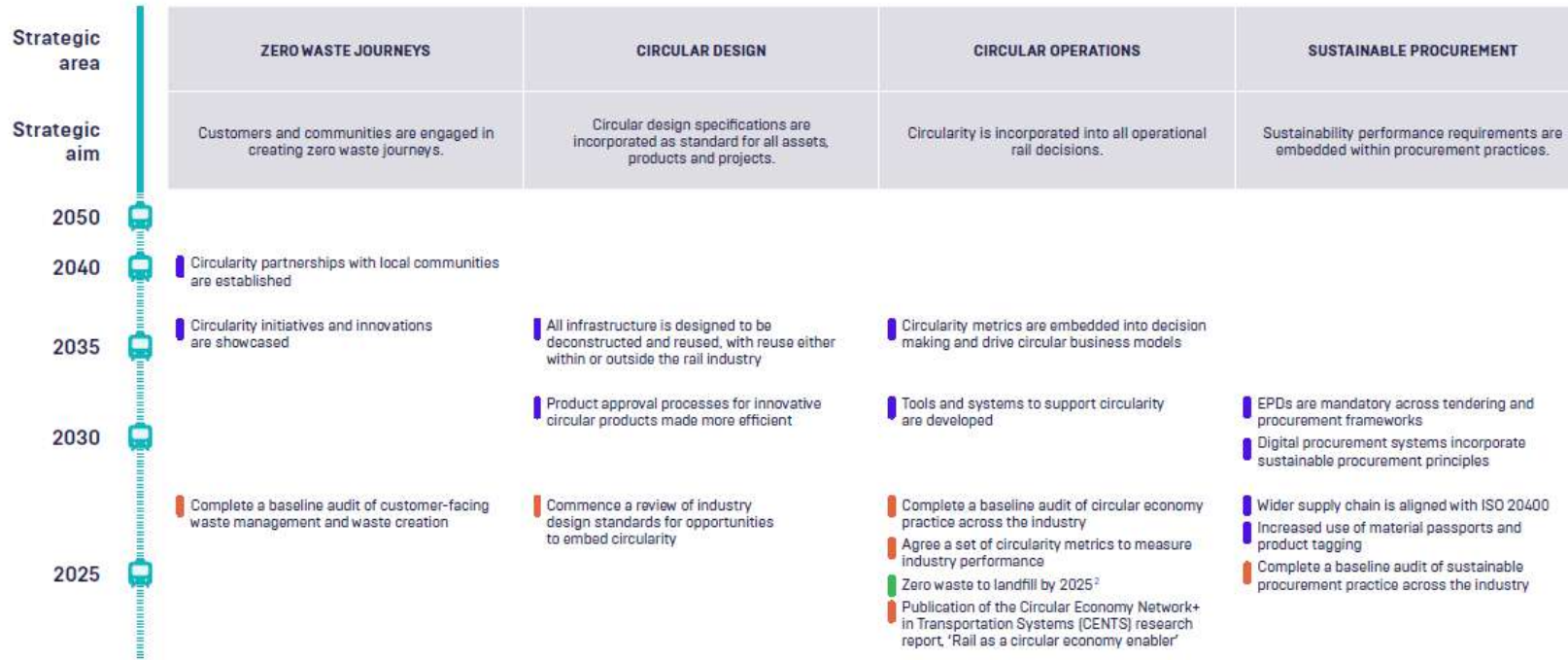


Zero Waste

A railway that uses resources efficiently and supports a collaborative circular economy



Zero Waste Rail Routemap



Key: ■ Policy Milestones ■ Ambition ■ Proposed Initiatives

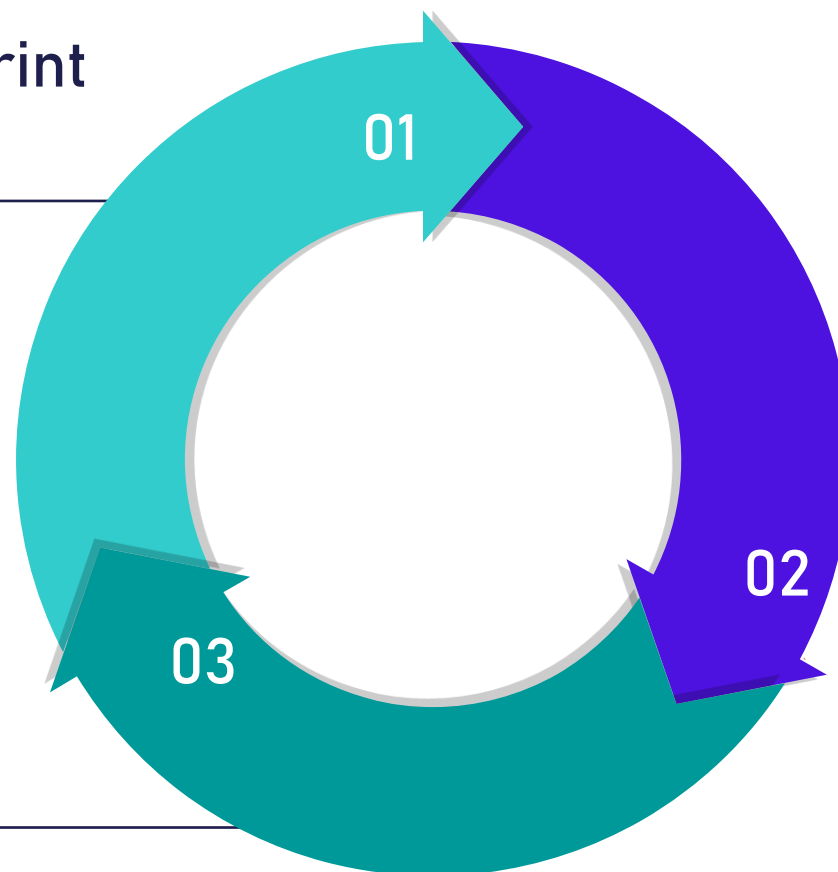
Note: Industry ambitions are subject to change based on government policy, funding and delivery across rail organisations

Sustainable Rail Blueprint

Provides a common strategic framework for making rail even more sustainable

Zero Waste Metrics Project

Defines how the GB rail industry should measure circular economy performance



Sustainable Rail Data Framework

Enables industry data collection and performance reporting for sustainable rail

[Download a copy of the blueprint >](#)


Blueprint Dashboard

A summary view of the GB rail industry's sustainability performance.





INDUSTRY

MY ORGANISATION


Emissions


| | | |
|---|---|---|
|  NET ZERO CARBON RAIL > | | |
| 1.4% | Rail's direct emission as a % of UK GHG emissions | ● ↑ |
|  CLEAN AIR > | | |
| AQI 47 | Very brief explanation of KPI goes here | ● ↓ |
|  A QUIETER RAILWAY > | | |
| 73dB | Very brief explanation of KPI goes here | ● ↑ |

Natural Environment

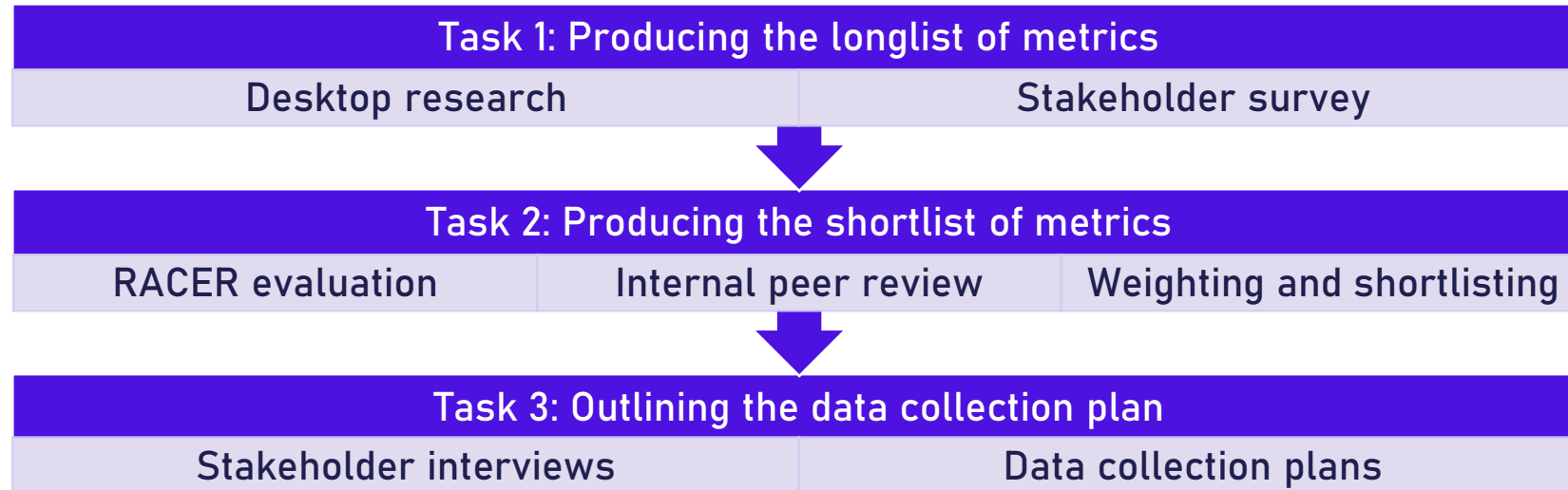
| | | |
|--|---|---|
|  PREPARED FOR A CHANGING CLIMATE > | | |
| 12 events | Very brief explanation of KPI goes here | ● ↓ |
|  A RAILWAY FOR NATURE > | | |
| 6320 BUs | Very brief explanation of KPI goes here | ● ↑ |
|  ZERO WASTE > | | |
| 2bn t | Very brief explanation of KPI goes here | ● ↓ |
|  PROTECT & CONSERVE WATER > | | |
| 9tn L | Very brief explanation of KPI goes here | ● ↑ |

Social Sustainability

Filters 

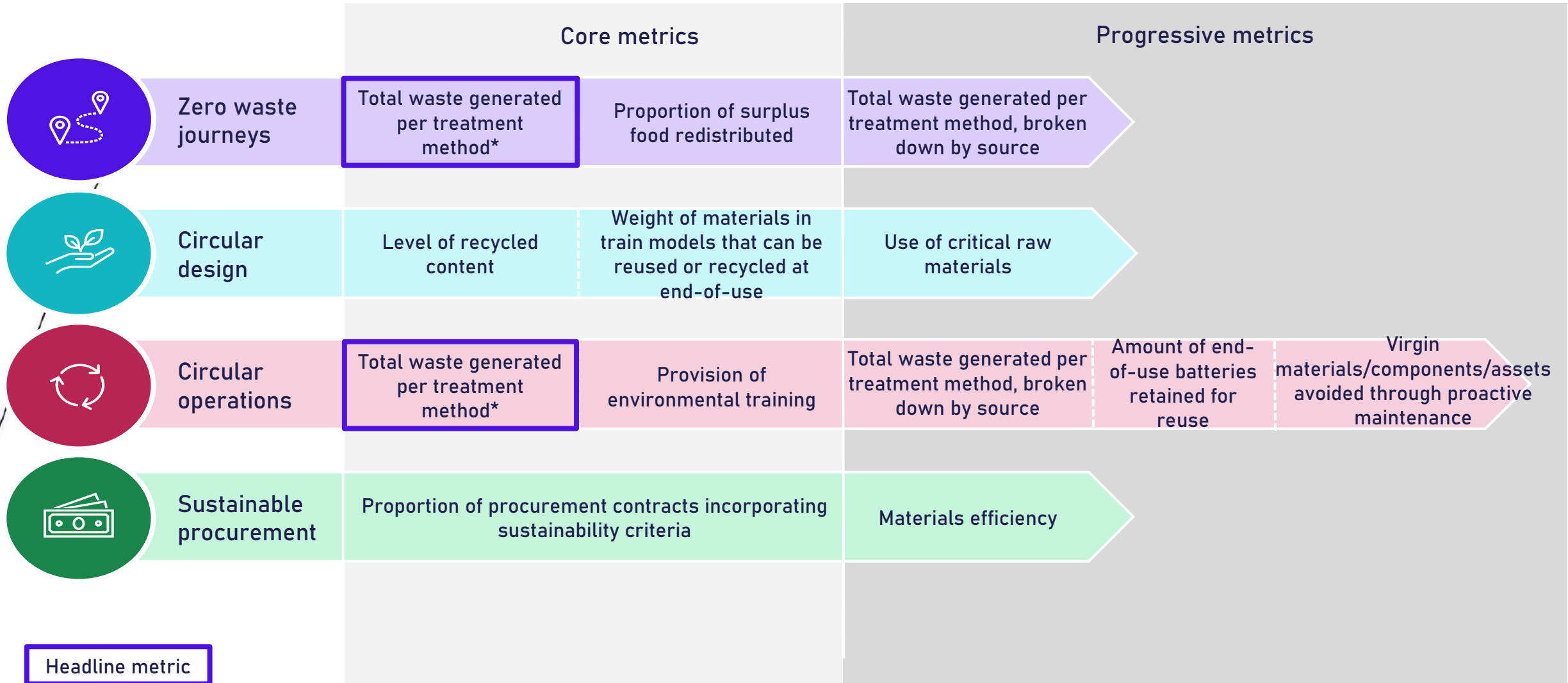
| | | |
|--|---|---|
|  MAXIMISING SOCIAL VALUE > | | |
| £233m | Very brief explanation of KPI goes here | ● ↑ |
|  RAIL AT THE HEART OF COMMUNITIES > | | |
| 1,650 | Very brief explanation of KPI goes here | ● ↑ |
|  CAREERS, ECONOMY & SUSTAINABLE GROWTH > | | |
| 800k jobs | Very brief explanation of KPI goes here | ● ↑ |
|  PEOPLE-CENTRED RAIL > | | |
| 4.3 | Very brief explanation of KPI goes here | ● ↓ |

This project aimed to develop a series of metrics to assess the performance of GB rail against their zero waste Flagship Goal.



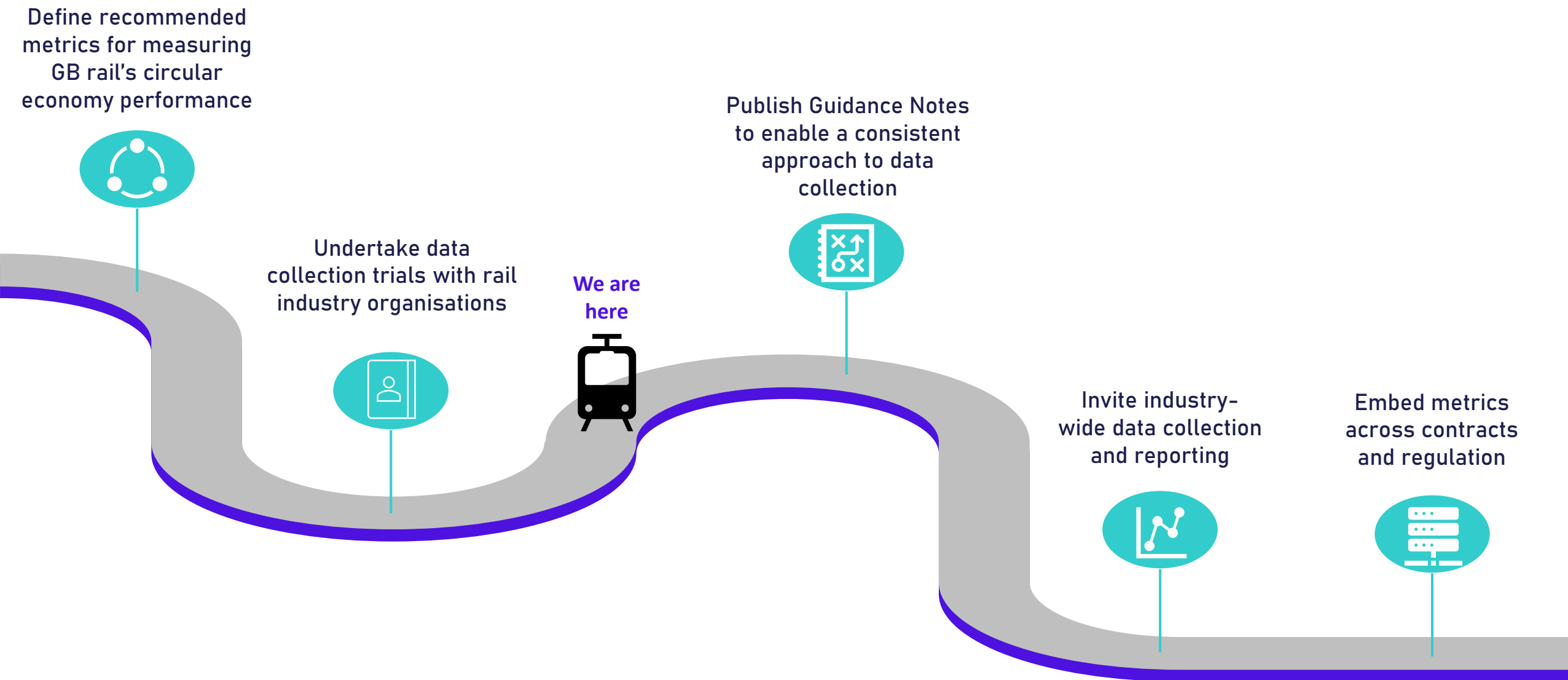
- We are now working with rail organisations to pilot the implementation of these metrics.
- The results will allow us to refine the guidance to enable RSSB's members to consistently and effectively collect, measure, and report on the industry's circular economy performance.

Seven core metrics have been selected to monitor the performance of the industry against the four strategic areas.



* Please note, this core metric supports two strategic areas which underpin the Flagship Goal, namely 'Zero waste journeys' and 'Circular operations'.

Timeline and next steps





Questions

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Samuel.jones@rssb.co.uk

Liv.judge@ricardo.com

Rezycl, a digital solution for waste and recycling

Peter Hyldgaard

CEO and Founder of
Rezycl.com





Digital waste and recycling solutions



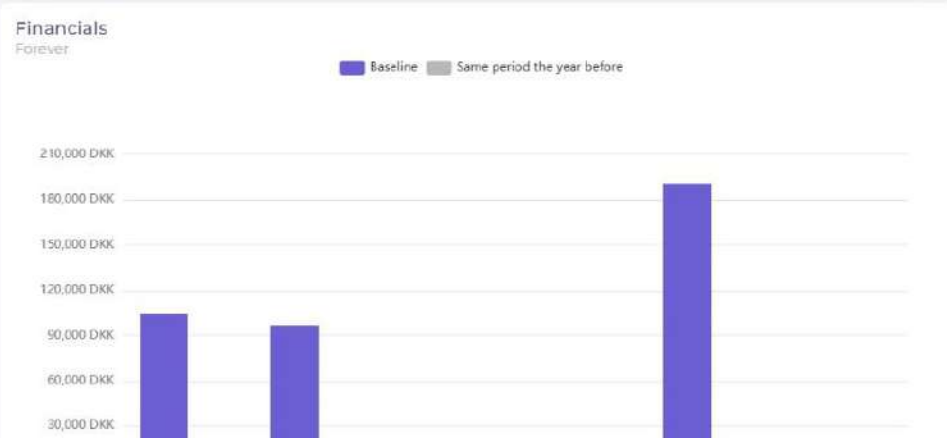
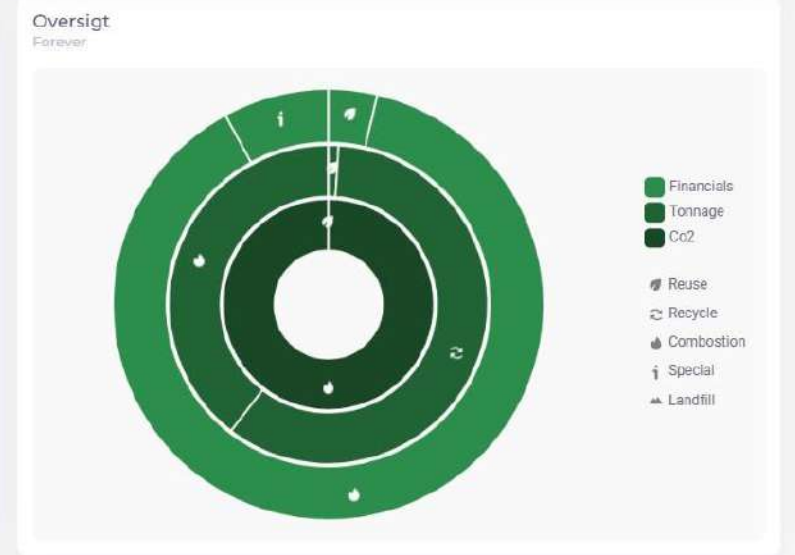


We create software to help you better understand, optimize, and reduce your waste



ERP system for sustainability in waste management

- Home
- Infocards
- ORDERING
 - Orders
- FINANCIALS
 - Invoices
 - Invoice inspection
 - Simulations
 - Price list
- REPORTING
 - Amounts
 - Postings
 - Drivings
 - Data insights
- SYSTEM ADMIN
 - Users
 - Background data
 - Theme
 - Integrations
 - Creation Wizard
 - Archived Infocards



Orders

Forever

| REQUISITION ID | ORDERER | CONTAINER | SUPPLIER | KG COLLECTED | STATUS |
|----------------|--|--|-------------------|--------------|---------------------------------|
| 776-990 | Peter Hyldgaard 15/11/2023 10:15 | Jernskrot 8147-86 3540 Lyng, Engmosen 1 - Gøsh Lyng | Rezycyl Collector | — | Emptied 20/11/2023 19:27 |
| 993-465 | Peter Hyldgaard 08/11/2023 12:56 | Plast 9033-90 1235 København, Ressourcegade 22 - Gentrugsplads 1 | Rezycyl Collector | — | Accepted 08/11/2023 12:58 |
| 605-616 | Peter Hyldgaard 08/11/2023 12:51 | Pap 5051-3A 9000 Aalborg, Gentrugvej 45 - Gentrugsplads 2 | Steen Tofteng A/S | — | Accepted 08/11/2023 13:35 |
| 147-000 | Peter Hyldgaard | Plast 9033-90 1235 København, Ressourcegade 22 - | Rezycyl Collector | — | Accepted 20/11/2023 |

+Co2 & KPI reporting +Daily operations +AI controlling



The smartest way to manage
waste and recycling



CEO & Founder
**20+ years in waste
management**

ph@rezycl.com
+45 30744762

Blockchain and data management

Joe Preece

Computer Scientist at
the University of
Birmingham

Postdoctoral researcher
in blockchain
technology



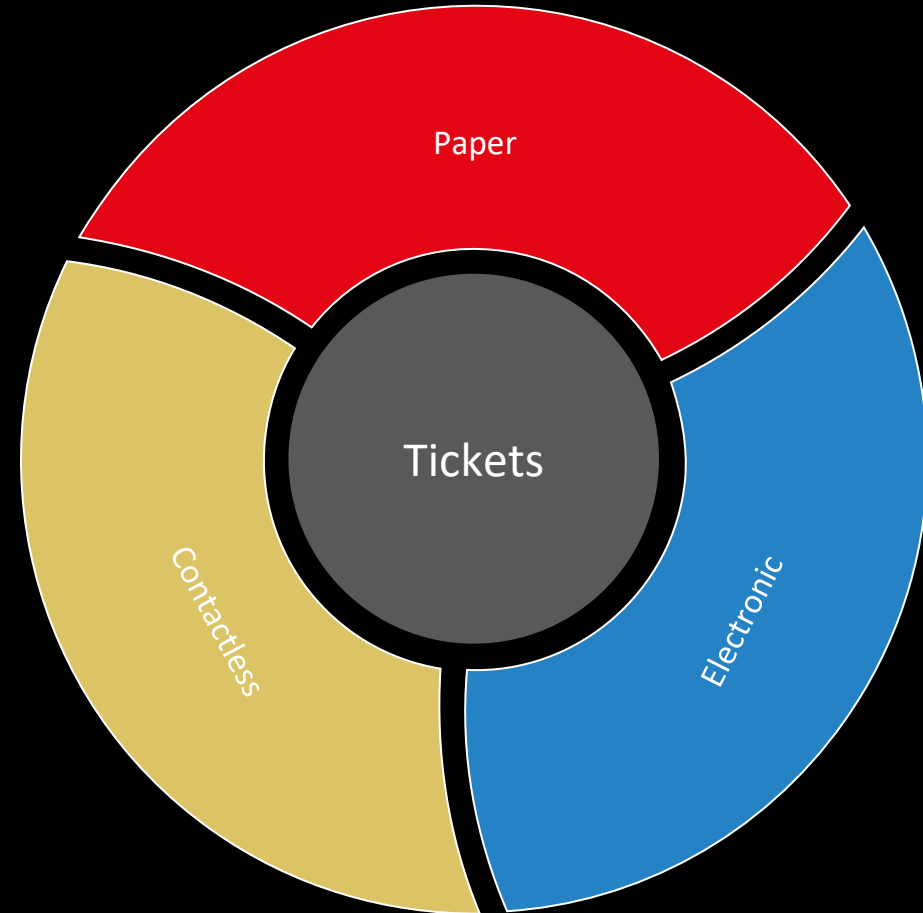
Digital Ticketing: A Fresh Approach?

Dr Joe Preece

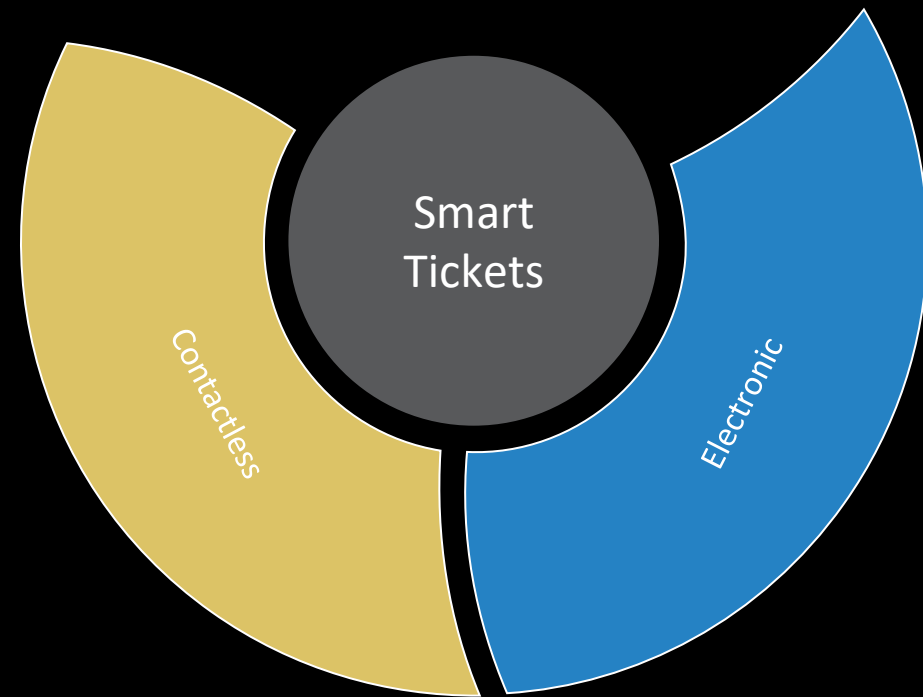


UNIVERSITY OF
BIRMINGHAM

What is a ticket?



What is a smart ticket?





Smart
Tickets

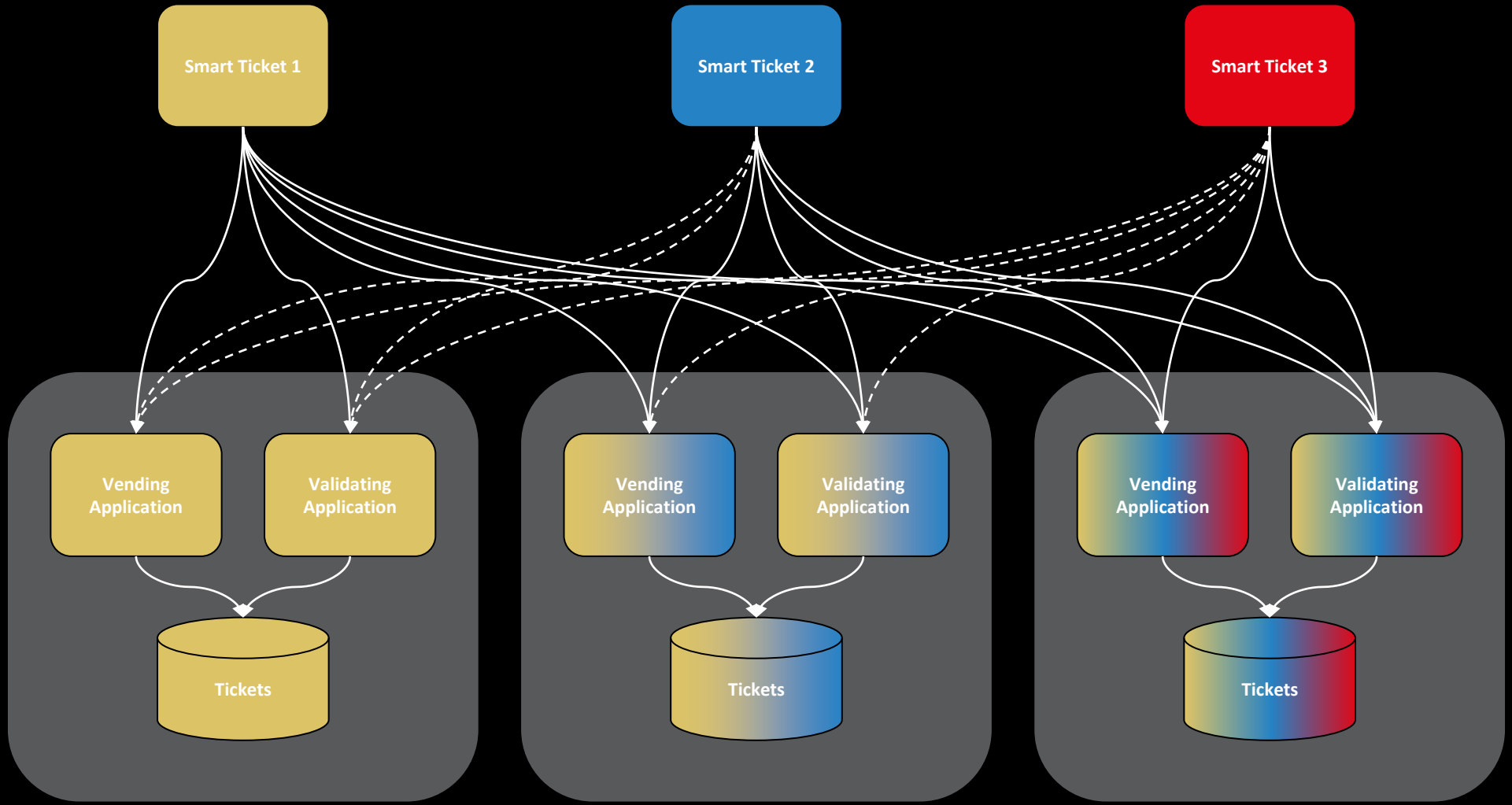
Storing things **digitally** does
not make it **smart!**

How many ways are there
to hold a rail ticket in Great
Britain?

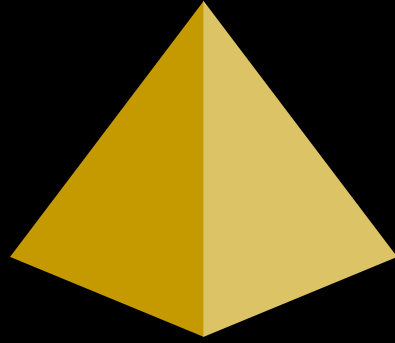
70

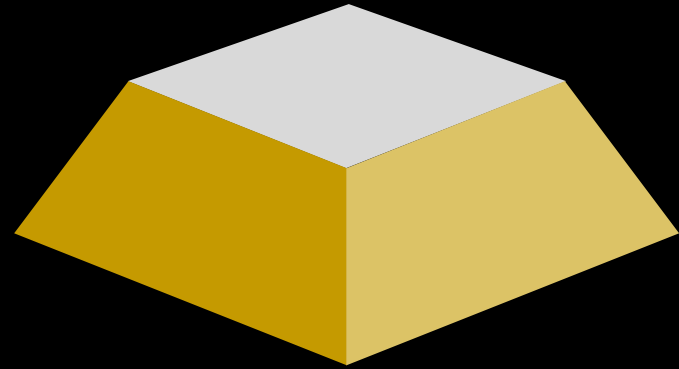


Source: GreenBiz



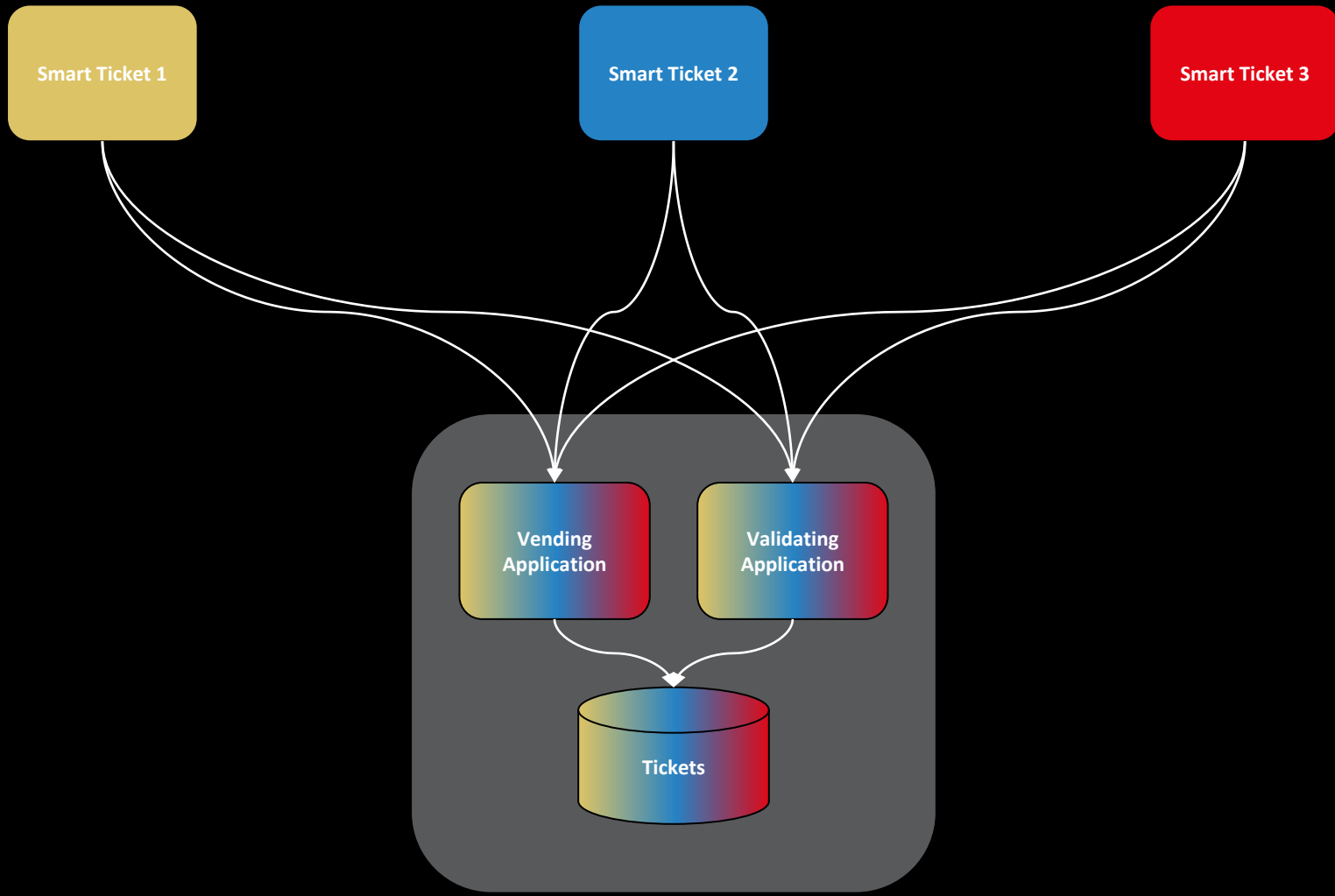






System for Ticketing Ubiquity with Blockchains

STUB



Conceptually, this is easy...

...but how can we build
this?



Source: All About Lean

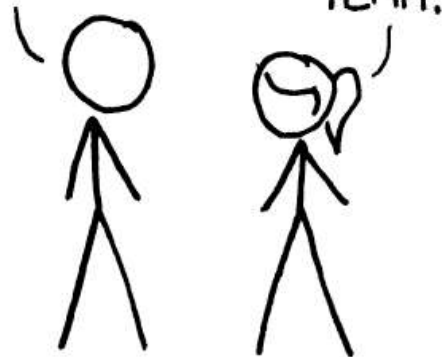


Source: All About Lean

HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)

SITUATION:
THERE ARE
14 COMPETING
STANDARDS.

14?! RIDICULOUS!
WE NEED TO DEVELOP
ONE UNIVERSAL STANDARD
THAT COVERS EVERYONE'S
USE CASES.



SOON:

SITUATION:
THERE ARE
15 COMPETING
STANDARDS.

Centralized Database



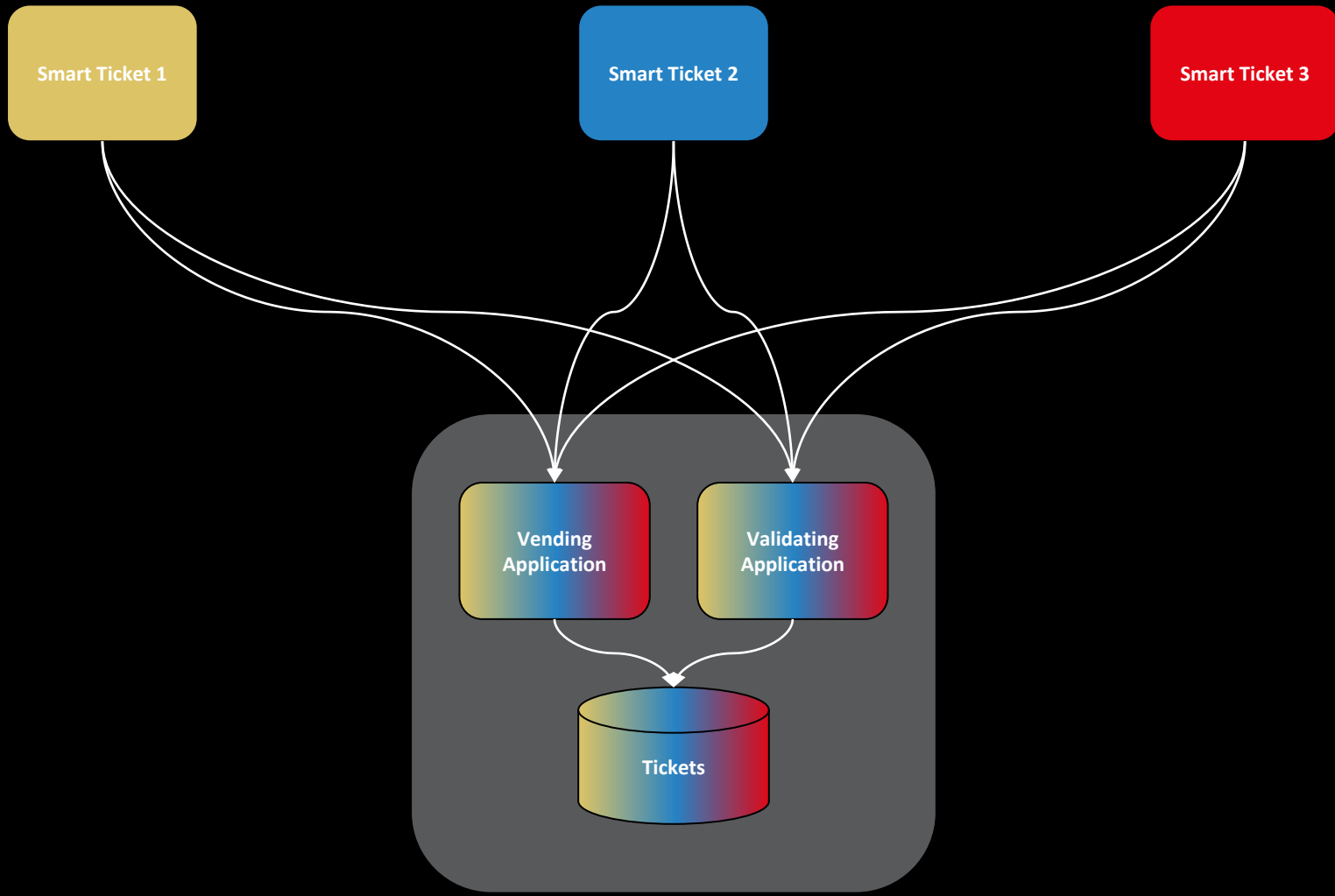


Centralized Database

Let's go for something **new**.

Blockchain

Ticketing data is share on a
Distributed Ledger



Our blockchain can **share**
ticketing data.

How do we **validate** these
tickets?

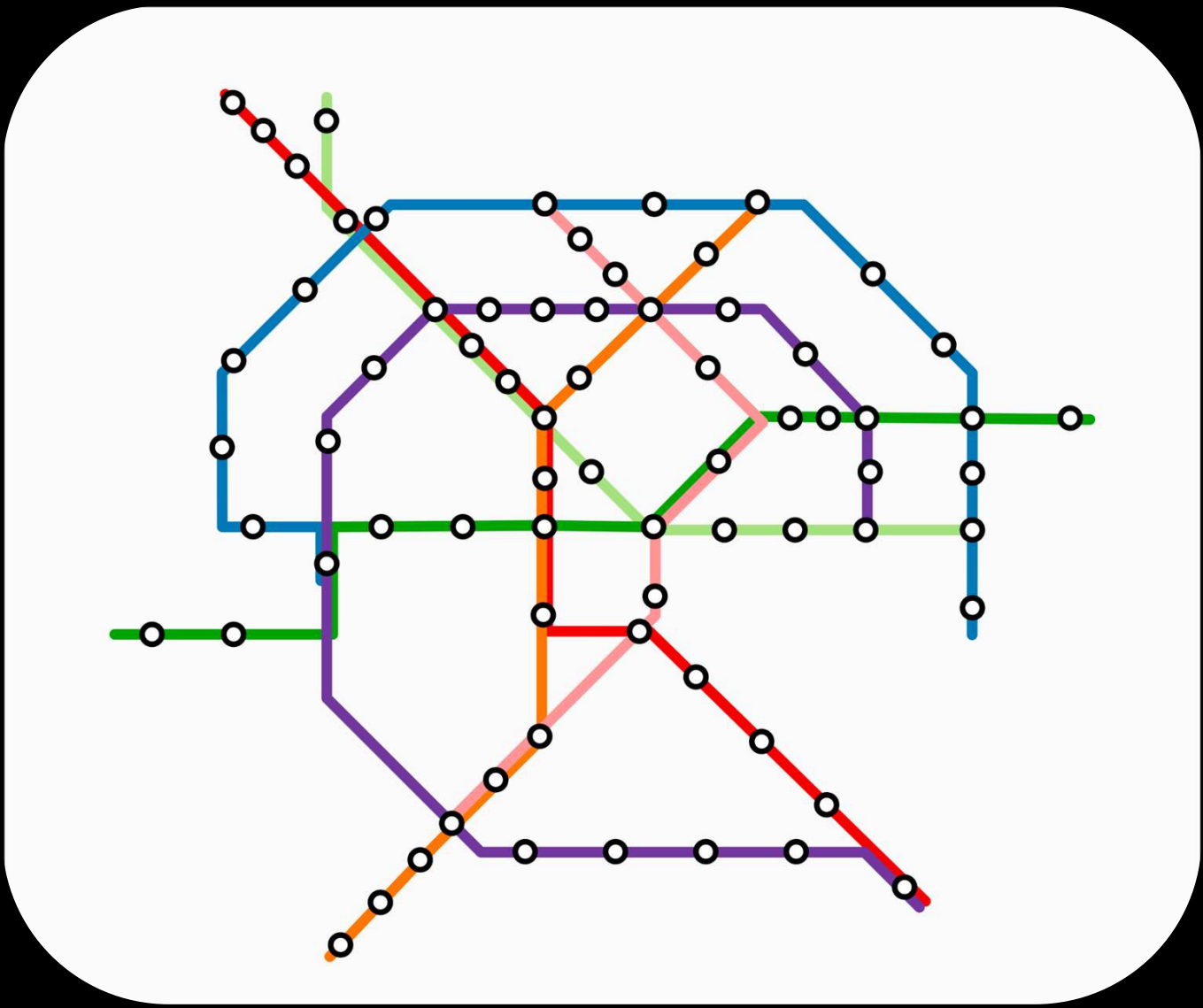
Blockchain

Ticketing data is share on a
Distributed Ledger



Ontology

Structured data of the
transport network.



Source: *Alternative Transport*

We need to build **shared**
knowledge of the network.

Blockchain

Ticketing data is share on a
Distributed Ledger



Ontology

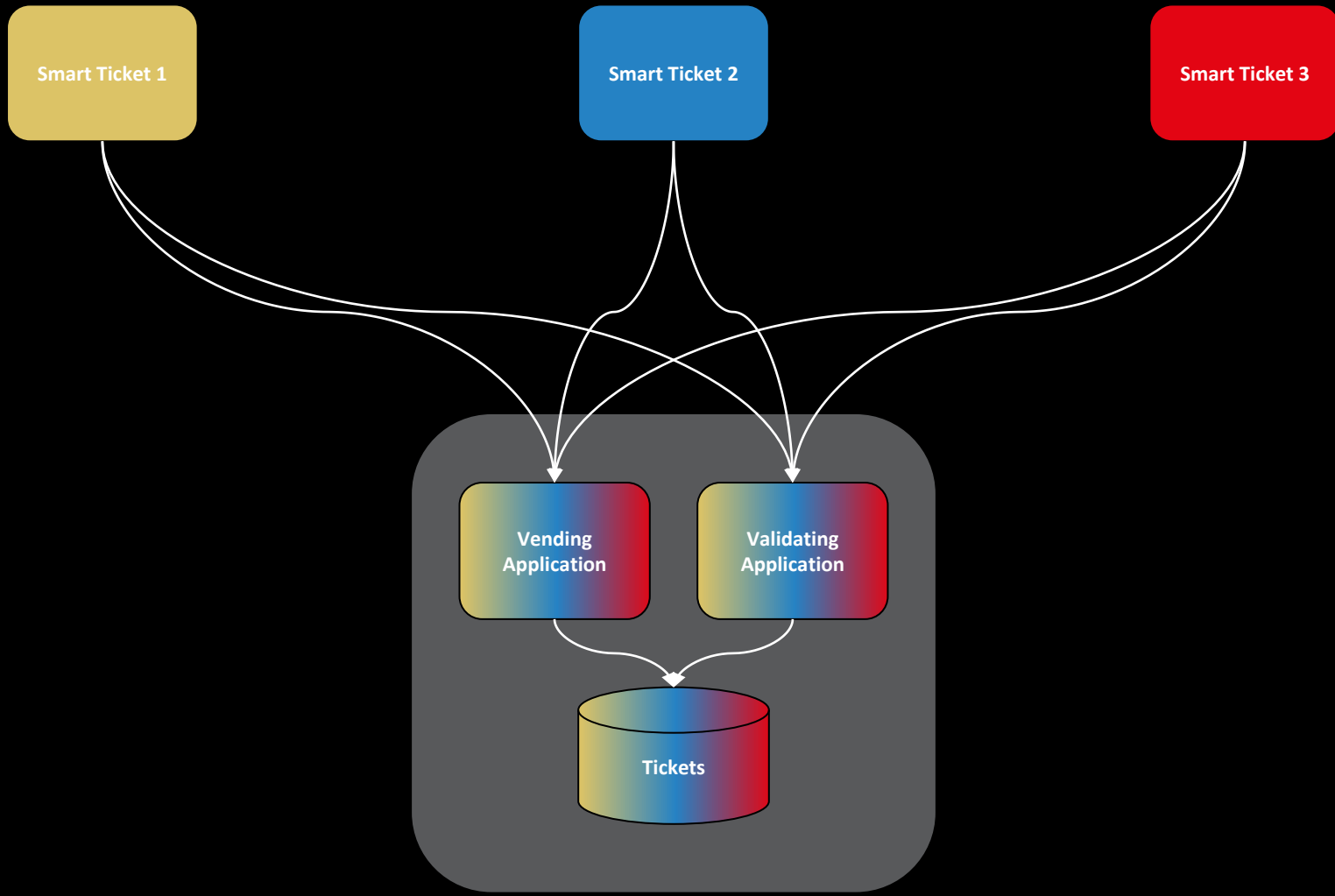
Structured data of the
transport network.



Ontochain

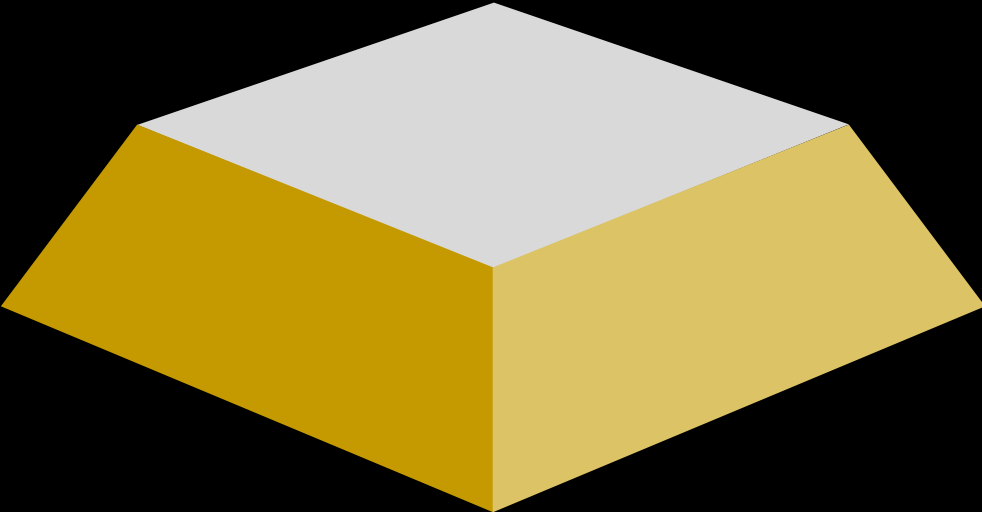
Decentralised knowledge graph (DKG) of the entire
system.

The state of the **graph** is
stored within the
distributed ledger itself.



Why does this **matter**?





21st century tech for a 20th
century problem.

Thank You!



INTERNATIONAL UNION
OF RAILWAYS

WORLD CAFÉ SESSION

Hot topics of the day

Interactive session: world café

Group distributed among three tables

Discussion on hot topics of the day 3 x 30 mins

- Circularity specifications for rolling stock, Carl Waring, Fraser Nash Consultancy
- SAP and circularity metrics, Thomas Kortekaas et al., ProRail
- Circularity metrics for Rail Sustainability index, Snejana Markovic, UIC

Wrap up of world café 15-30'

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#UICrail

Thank you for your attention.