

Harmonizing Metrics to Measure Circularity: A Call to Action

BRIEFING PAPER
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Foreword



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We recognize a growing consensus in both policy and business domains that circularity/resource efficiency is an indispensable tool for addressing climate change, biodiversity loss and pollution globally. This will need more sustainable use of resources and minimization of waste along value chains. It will increase resilience and efficiency of business operations, reducing the dependence on specific raw materials and the associated risks for value chains and national economic security.

The Group of Seven (G7) leaders under Japan's Presidency, bearing this in mind, endorsed "Circular Economy and Resource Efficiency Principles," or CEREP, at the G7 Summit in 2023.

CEREP created a basic voluntary framework for companies to expand their circular and resource-efficient businesses and expedite the transition to a more circular economy. The principles include identifying risks and opportunities from a circular economy transition; enhancing corporations' disclosure of circularity-related information such as business models, governance, targets and the progress on these; as well as the monitoring of progress of circularity and resource efficiency at the value-chain level to enable aggregation. These are fundamental for scaling circular business across the globe in the mid to long term, involving the public sector and other stakeholders.

Implementing such principles requires common guidance and standards, in particular comparable metrics and disclosure schemes, which are

missing right now, to ensure quality performance assessment and a level playing field, among other conditions. The G7 environment ministers also supported these efforts under the Italian Presidency this year.

Since companies operate their businesses across borders and make efforts to transition to a circular economy in an open economy, harmonized rules and standards, as opposed to those fragmented across regions, are essential to reduce the cost and further increase circularity. Indicators and disclosure schemes are relevant examples in this context. Countries need to work together with the private sector to achieve this goal.

In this regard, it is encouraging that there are relevant initiatives to set a global standard, in particular the Global Circularity Protocol led by the United Nations Environment Programme, One Planet Network and the World Business Council for Sustainable Development, which could serve as global guidance and standards.

I believe that this briefing paper helps readers understand business perspectives and where we are now in terms of circularity/resource efficiency metrics, with possible actions to further encourage the business sector to set targets and improve measurement of circularity with concrete action.



Hugo Schally

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Transforming our economic system into a regenerative and sustainable one is a complex challenge. The transition to a circular economy is a strategy to support this transformation through productive and responsible management and use of resources. However, understanding and measuring the real impact of its implementation remains complex and often elusive. To truly put circular practices into action, businesses and governments need more than just a theoretical understanding — they must be able to accurately track and measure their progress and impact.

Without effective measurement, it is impossible to discern what strategies are effective, which ones are falling short, and where resources should be deployed to achieve the greatest impact. Accurate tracking is also essential for promoting and rewarding sustainable practices. Harmonized measurements and standards must be established across industries and geographies to ensure that progress can be evaluated consistently around the world.

In recognition of this need, a range of efforts at the national, regional and international level are already underway. The European Commission has developed a comprehensive approach to measuring the transition to a circular economy in Europe in the form of the Circular Economy Monitoring Framework. This is an essential element of the implementation of the European Green Deal and the Circular Economy Action Plan, which are key initiatives of the European Union for the years to come.

But doing this at the level of policy-makers and regulators will not be enough. It is now time for international organizations, intergovernmental bodies as well as standardization bodies to work in collaboration with governments to promote and facilitate harmonized, robust, interoperable and transparent circular economy metrics. Stakeholders such as businesses, academia and civil society should participate in and support these efforts towards a common understanding of how to measure and track a circular economy that delivers sustainable growth.

Executive summary

Harmonized metrics are crucial to realizing the potential of the circular economy. To reach harmonization, the public and private sectors around the world must collaborate.

Natural resources are the foundation of all economies and societies, making their sustainable management crucial for growth and prosperity. However, the way that these resources have thus far been extracted, transformed, consumed and disposed of has given rise to the triple planetary crisis – climate change, biodiversity loss and pollution.¹ To tackle the crisis, the idea of the circular economy is gaining traction among governments, businesses and societies.

The circular economy (CE) is a systems transformation approach that promotes the prolonged use of resources at their highest value as a means of reducing extraction and waste, so as to create space for the regeneration of natural systems. However, without universally accepted standards and metrics, there are significant inconsistencies in how CE practices are defined, implemented and evaluated. This holds true across regions, sectors and organizations. These inconsistencies make it difficult to assess the effectiveness of circular initiatives in addressing global challenges and creating economic value, leading to fragmented efforts and undermining the potential to scale successful practices globally.

This briefing paper builds on comprehensive reviews of existing metrics conducted by various organizations and integrates insights from an

industry survey (with more than 400 companies) and expert interviews. It focuses on high-level challenges pertinent to private and institutional decision-makers, highlighting the complexity of quantitatively measuring progress towards circularity at multiple stages of a product's life cycle – from design to production, use and reprocessing. The paper identifies the challenges in developing adaptable metrics that capture diverse circular flows, and the difficulties posed by unreliable and incomplete data on material flows, resource utilization and waste generation.

It concludes by suggesting key principles for organizations working on harmonizing frameworks for CE metrics, emphasizing the need for global public-private collaboration to reach clear definitions, interoperable impact-driven metrics and robust data collection methods. Only with these principles in place will better benchmarking, transparency and global coordination towards a circular economy continue to advance.

This multi-staged approach can help overcome the existing implementation barriers towards a circular economy, fostering economic growth while mitigating environmental impacts.



Introduction:

The circular economy implementation gap

The circular economy (CE) presents a transformative opportunity by promoting extended resource use and sustainability, yet the lack of standardized and harmonized metrics remains a significant challenge.

CE strategies that aim to decouple economic growth from resource consumption are gaining traction. This can be observed at all levels, from businesses to governments and intergovernmental organizations across the globe. Countries including Brazil, Chile, China, Japan, Rwanda and South Korea have recently enacted CE action plans, as has the European Union (EU). Nearly 60% of businesses that have circular commitments have made them in the past two years. Nevertheless, a significant gap remains between intent and implementation. In fact, the global CE rate has declined from 9.1% to 7.2% over the past six years, according to the Circularity Gap Report 2024.²

While there are many barriers to the implementation of the CE, these are reinforced by the lack of universally accepted definitions, standardized metrics and harmonized regulatory frameworks. Without these, businesses and governments cannot track their progress, initiatives cannot be benchmarked and compared with each other, and investment cannot be deployed optimally to reward the most effective methods. Non-governmental organizations (NGOs), international organizations (IOs) and standard-setting organizations have made

efforts in recent years to bridge this gap and lead the international community towards harmonization – a complex but much-needed exercise.

This briefing paper examines the current landscape of CE metrics by reviewing existing literature and utilizing a novel industry survey of 400 companies, complemented by expert consultations with standard-setting organizations and key stakeholders. This paper does not aim to re-examine existing metrics and indicators;³ rather, it focuses on high-level challenges pertinent to decision-makers. It identifies key gaps and challenges in existing metrics and proposes recommendations for creating harmonized, impact-driven CE metrics.

Such metrics are crucial for overcoming implementation barriers and advancing CE across industries and regions, ultimately supporting a more sustainable and climate-resilient future. Additionally, the paper highlights the need for enhanced cohesiveness among stakeholders and advocates for a collaborative approach to metric development that will drive effective circularity practices and facilitate global progress towards sustainability objectives.

BOX 1

Circular Economy and Resource Efficiency Principles (CEREP)

CEREP is a set of principles adopted at the G7 Ministers' Meeting on Climate, Energy and Environment under the Japanese G7 Presidency, and later endorsed at the G7 Summit in Hiroshima, Japan. CEREP recognizes the role of businesses in expanding circular economy and resource efficiency across value chains and sectors globally and details the importance of enhancing monitoring and reporting.

“Principle 5. Enhancement of Monitoring and Reporting:

- Incorporate circular economy and resource efficiency in corporate-wide information disclosure including sustainability reports to facilitate engagement with the financial sector and the public in a transparent manner on areas such as value creation, business models, risks and opportunities, impacts, strategy, indicators and targets, and governance.
- Monitor and take stock of the progress on circularity and resource efficiency along entire value chains based on identified relevant indicators.”

Source: Circular Economy and Resource Efficiency Principles (CEREP), 2023

1

Existing circularity metrics, indicators and frameworks

Standardized metrics allow industries to manage resources better with clear, consistent benchmarks for evaluating CE practices.

1.1 An industry perspective on measuring circularity⁴

With the proliferation of different approaches to measure circularity, this section examines what type of metrics businesses are currently using to evaluate their circular operations and performance.

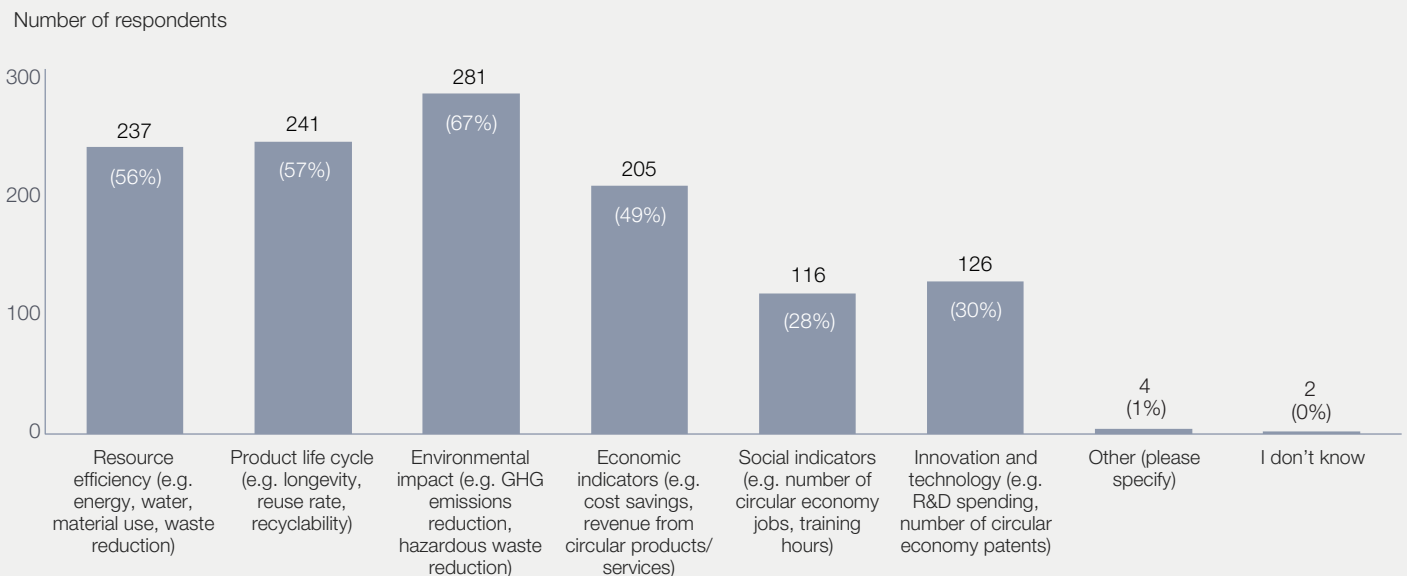
A survey of more than 400 business in 10 industries (Figure 1) shows that businesses are focusing on measuring the environmental impact of their circular solutions, with 67% of respondents saying they

prioritize GHG.eq (greenhouse gas-equivalent) emissions reduction. Resource efficiency and product life-cycle management metrics are equally utilized, reflecting an interest in measuring and optimizing resource utilization, extending the product life cycle and improving material recovery rates. Circularity-focused economic indicators are also valued and utilized by approximately half of the surveyed businesses.

FIGURE 1 Indicators to measure circularity of operating and business models

Question 1

Which circular economy indicators are you using to measure the circularity of your operating and business models?



Note: Multiple selection question; qualified data

Source: Market survey jointly conducted by the World Economic Forum, Bain & Company and the University of Cambridge

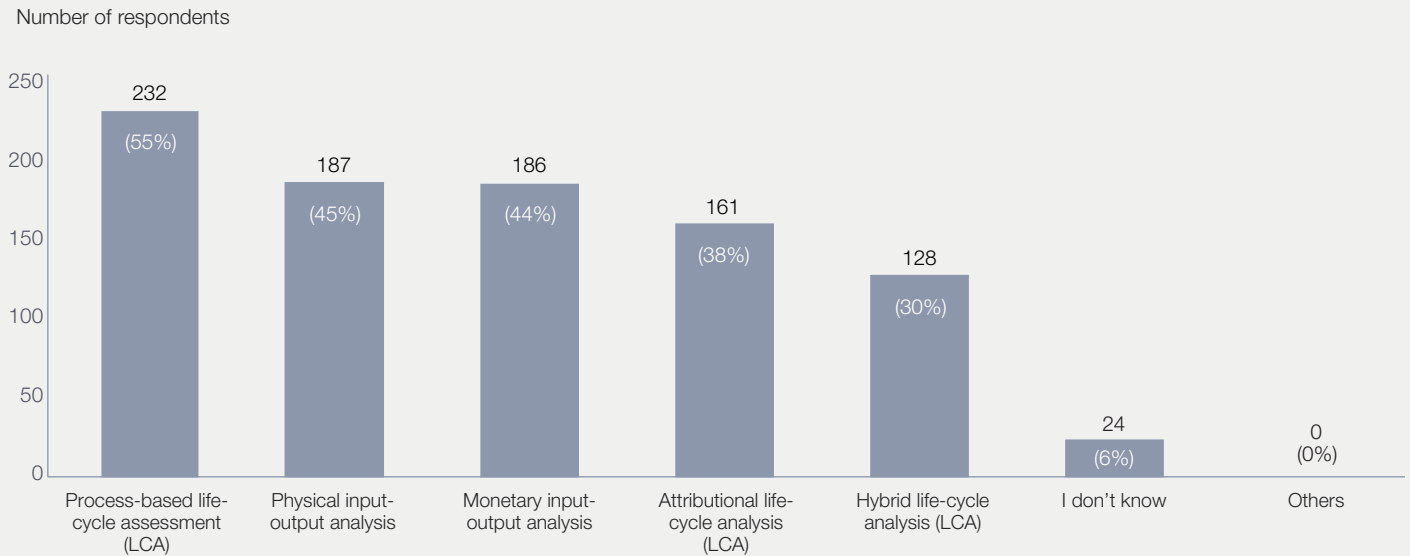
Innovation, technology and social indicators are less utilized, particularly social impact indicators that are reportedly used by 28% of respondents. Further research is needed to understand the reasons behind this lack of measurement, which could range from prioritization choices to lack of available metrics or capacity to measure.

Overall, the results highlight a shift towards environmental, product and resource-centric CE measures, with the emergence of economics-related indicators (e.g. cost savings and revenue from circular products or services), showing the increased perception of the economic value of circular practices.

FIGURE 2 Accounting approaches and methodologies for circularity

Question 2

What accounting approaches and methodologies are you applying to benchmark, monitor and evaluate your circularity also but not exclusively in terms of GHG.eq emissions reductions?



Note: Multiple selection question; qualified data

Source: Market survey jointly conducted by the World Economic Forum, Bain & Company and the University of Cambridge

Figure 2 shows that organizations largely depend on established methodologies for measuring and improving CE practices and GHG emissions reduction. Nearly 55% of respondents reported that they use process-based life-cycle assessment (LCA) as it provides detailed environmental evaluations.

Physical and monetary input-output analyses are reported to be used by 44% of respondents each, emphasizing the need to consider both resource flows and economic factors. Some 38%

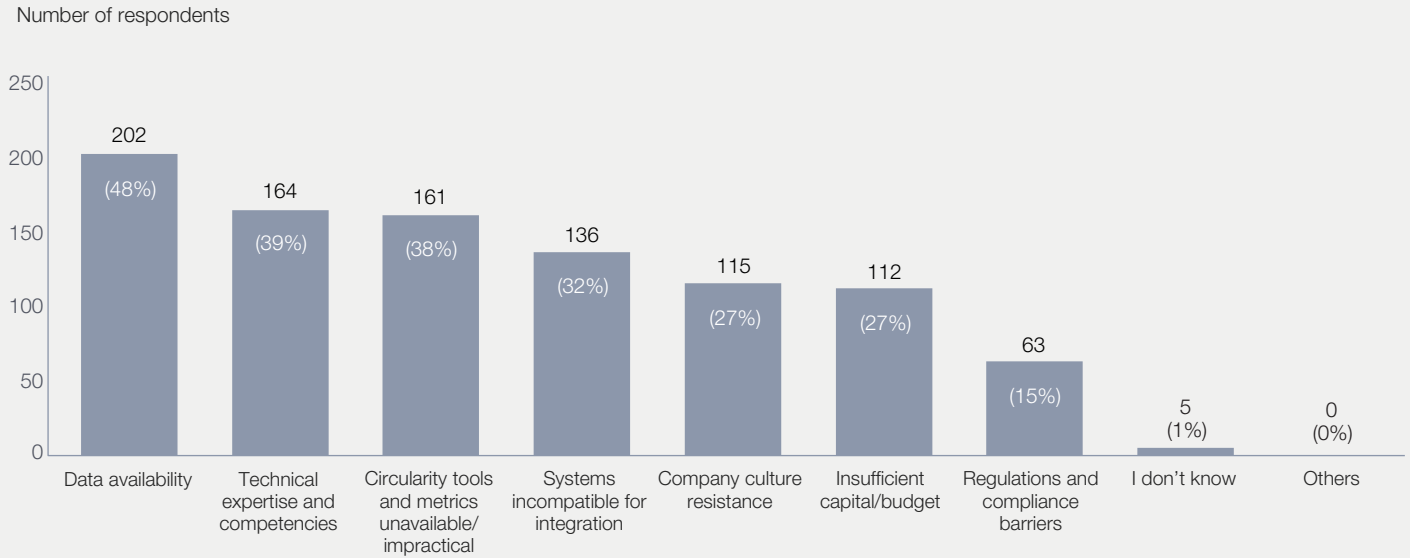
of respondents said they use attributional LCA, while 31% said they use hybrid LCA, indicating a mix of assessment techniques. The fact that only 6% of respondents said they are unsure of their methodologies and that no respondents reported using methodologies outside of those listed suggests a strong reliance on recognized, conventional assessment techniques. This reflects a preference for proven approaches in evaluating circularity and GHG.eq emission reductions.



FIGURE 3 | Obstacles in implementing circularity metrics

Question 3

What are the major obstacles you are facing in implementing metrics to measure the circularity of your business?



Note: Multiple selection question; qualified data

Source: Market survey jointly conducted by the World Economic Forum, Bain & Company and the University of Cambridge

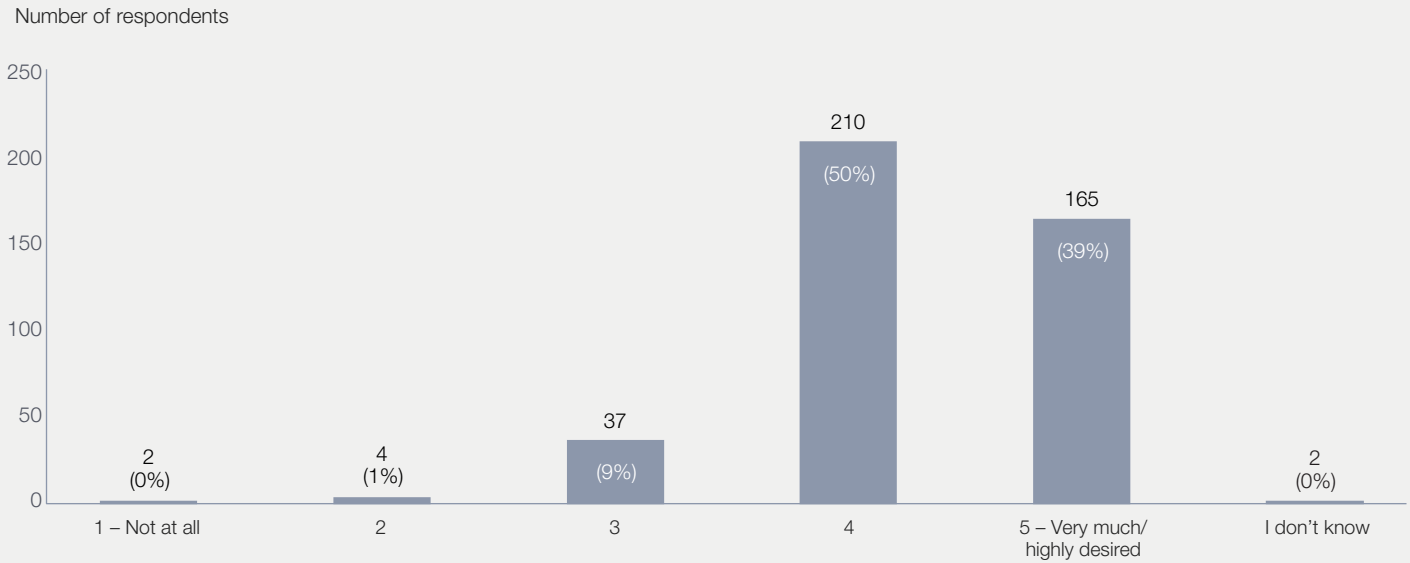
Figure 3 reveals several key challenges in implementing circularity metrics. Data availability is reported to be a major obstacle, with many organizations saying they struggle to access and utilize reliable information. Technical expertise is lacking, and suitable tools or metrics are often inadequate, some respondents said, while system incompatibility further complicates integration into existing processes.

Cultural resistance and budget constraints present internal and financial barriers to adoption, respondents said. While regulatory and compliance issues are concerns, practical challenges in implementing metrics and tools often take precedence. Overall, these findings underscore the multifaceted nature of the difficulties organizations face in measuring and improving circularity.



Question 4

To what extent, in your opinion, can the harmonization of circularity standards enable the circular transformation of industries?



Note: Multiple selection question; qualified data

Source: Market survey jointly conducted by the World Economic Forum, Bain & Company and the University of Cambridge

As Figure 4 illustrates, 89% of respondents said they believe that harmonizing standards is crucial for advancing a CE transition, as unified standards enhance clarity, comparability and coordination across sectors and regions. In the absence of such harmonization, companies are developing their own outflow metrics to track and increase product recovery (such as take-back and recycling).

For example, the multinational information technology company HP has developed internal metrics focusing on product design, recovery

potential and amount of take-back to monitor open-loop and closed-loop operations, addressing the limitations of other outflow indicators often restricted by extended producer responsibility (EPR) regulations beyond corporate control. While these tailored metrics enable companies to drive their circularity efforts, they also contribute to fragmentation in measurement practices. This divergence underscores the ongoing challenge of reconciling the need for customized approaches with the pursuit of harmonized, cross-industry standards.

1.2 Perspectives from circular economy standard bodies and relevant organizations

So, if industries are welcoming circular metrics and are looking for harmonization, how can the international community help? Table 1 summarizes a selection of recognized frameworks and metrics for tracking CE progress. It does not include internal

frameworks from companies, national targets or frameworks provided by consultancies, but focuses on frameworks that are being developed in multistakeholder processes, aiming towards harmonization.

TABLE 1 | **Circular economy measurement initiatives: Metrics and indicators**

Circular economy measurement initiatives	Organization	Objectives	Target stakeholders
Circular Transition Indicators	World Business Council for Sustainable Development (WBCSD)	Provides a framework for businesses to measure circularity	Businesses of all sizes, industries, value chain positions and geographical locations Voluntary
ISO 59004 - Circular economy (ISO/TC 323)	International Organization for Standardization (ISO)	Defines CE concepts, principles and guidelines	Any type of organization Voluntary
European Environment Agency indicators	European Commission	Monitors resource usage in EU countries through input-output flows and virgin material reduction in line with the Circular Economy Action Plan	EU parliament and environmental ministries; leverages available statistical data at national and EU levels Mandated
Circular economy measurement and reporting initiative	Ellen MacArthur Foundation	To inform the development and revisions of voluntary or mandated CE-related reporting frameworks	Businesses, financial organizations and policy-makers Voluntary
Inventory of Circular Economy Indicators	Organisation for Economic Co-operation and Development (OECD)	To track global resource use, waste generation and recycling rates, and monitor progress of existing CE strategies across OECD member cities and countries	Governments, to improve circular-economy policies as it leverages country, national and local survey data Voluntary

BOX 2 | **Global Circularity Protocols (GCP) for Business**

GCP for Business is an upcoming global initiative spearheaded by the World Business Council for Sustainable Development (WBCSD) and the One Planet Network of the United Nations Environment Programme (UNEP).

The protocols aim to provide a comprehensive framework for implementing circular principles, including design for longevity, resource efficiency and waste minimization. They offer detailed guidance for transparent reporting on circular activities, with sector-specific guidelines that address unique challenges in different industries.

The GCP also include best practices and case studies to demonstrate successful implementation efforts, outline necessary data and information for accurate assessments, and ensure alignment with

global sustainability standards. Emphasizing the need for ongoing updates, the protocols support continuous improvement to reflect technological advancements and evolving practices.

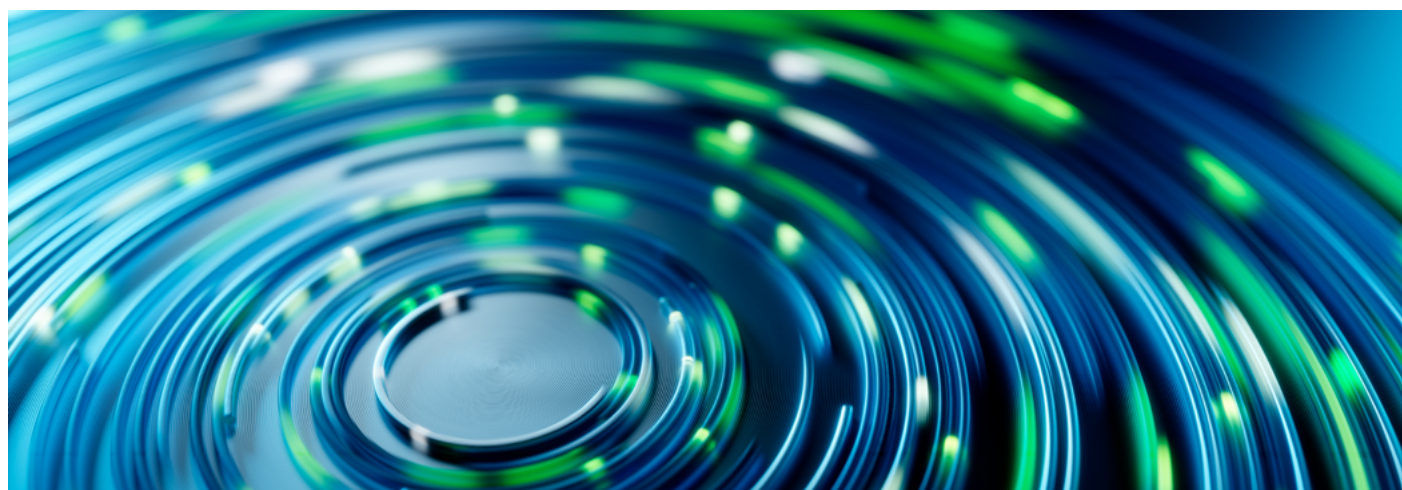
The initiatives seek to ensure the active engagement of partners from academia, cross-sectoral businesses, NGOs and policy-makers to address the accountability and policy gaps currently impeding the scaling up of circularity initiatives. By 2026, the framework aims to guide companies in setting targets, and measuring, reporting and disclosing progress on resource efficiency and circularity, while also providing comprehensive and targeted policy guidance to accelerate the shift towards circular business models and a regenerative economy.

Source: The Global Circularity Protocol (GCP) 2024

Table 2 lists more of the key challenges in advancing CE metrics and implementation, informed by a series of expert interviews.⁵

TABLE 2 | Key challenges in advancing circular economy metrics and implementation

<p>1. Multiplicity of CE definitions</p>	<p>Varied concepts and definitions: CE encompasses multiple interpretations, with both established principles and emerging concepts. This variance complicates the development of globally accepted definitions and boundaries, making consistent measurement of CE activity and impacts difficult.</p> <p>Difficulty in achieving consensus and harmonization: Stakeholders face challenges in aligning on CE metrics and standards due to differing priorities, definitions and approaches.</p>
<p>2. Complexities in translating CE metrics into impact proxies</p>	<p>Disconnect between circularity and impact: CE metrics are often treated in isolation, or as process-driven metrics, and not clearly linked to measurable environmental, social or economic impacts.</p> <p>Difficulty in measuring regenerative effects: CE metrics may fail to capture the regenerative effects for nature and ecosystems into long-term positive environmental outcomes and their compounding impacts.</p> <p>Incomplete life-cycle data: Metrics often prioritize waste management and recycling over strategies like reuse, repair and remanufacturing, leaving gaps in understanding the full impact throughout life-cycle phases.⁶ For example, trade-offs made during the design phase, which affect the entire life cycle, such as balancing weight reduction with durability or lifespan extension with ease of disassembly, may not be captured.</p>
<p>3. Lack of harmonization on metrics and standards</p>	<p>Differing regulatory requirements: Regulatory frameworks vary across regions and institutions, leading to inconsistent accounting methodologies that complicate compliance for businesses operating in multiple jurisdictions.</p> <p>Evolving standards and metrics: Rapid technological, market and regulatory changes make it challenging to maintain relevant and consistent metrics.</p> <p>Inconsistencies in measurement and reporting: Diverse methodologies and reporting formats hinder benchmarking and data aggregation. For example, while carbon accounting is becoming increasingly relevant for ensuring consistency in reporting across borders, the GHG Protocol is currently undergoing revisions to better measure circularity and account for CE considerations through trade-related climate policies such as the EU's Carbon Border Adjustment Mechanism (CBAM).</p> <p>Supply chain complexity: Variations in how materials and products are traced across supply chains create challenges in accurately measuring circularity impacts, such as emissions reductions and resource savings across multiple product, component and material life cycles.</p>
<p>4. Data acquisition and credibility</p>	<p>Multidimensional nature of circularity: Capturing comprehensive data across material flows, energy use, waste management and life-cycle stages is a complex process, which requires robust methodologies.</p> <p>Integration challenges: Implementing CE practices requires significant changes in data management, workflows and systems, which can be resource-intensive and face internal resistance.</p> <p>Data accessibility: Measuring circularity across complex supply chains is hindered by a lack of data collection and sharing protocols, insufficient data infrastructure and inconsistent data quality.</p> <p>Policy and data disconnect: Policies designed to extend product life cycles and promote reuse often lack the granular data needed to assess their effectiveness.</p>
<p>5. Misalignment between regulatory and market drivers</p>	<p>Geographical and legislative variability: CE regulations vary by region, creating a fragmented landscape. Multinational companies need to adjust their supply chains to satisfy local laws, such as trade regulations and waste classifications.</p> <p>Compliance costs: Adhering to diverse regulatory requirements incurs significant additional costs, including administrative expenses and investments in supporting technology infrastructure.</p> <p>Impact on market competitiveness: Regulatory disparities can lead to unequal competition, as businesses operating under stricter regulations bear higher operational costs compared to those in regions with less stringent requirements.</p> <p>Need for economic incentives: Integrating economic factors like cost savings, revenue generation and financial benefits into CE metrics can drive wider adoption of circular practices.</p>



2

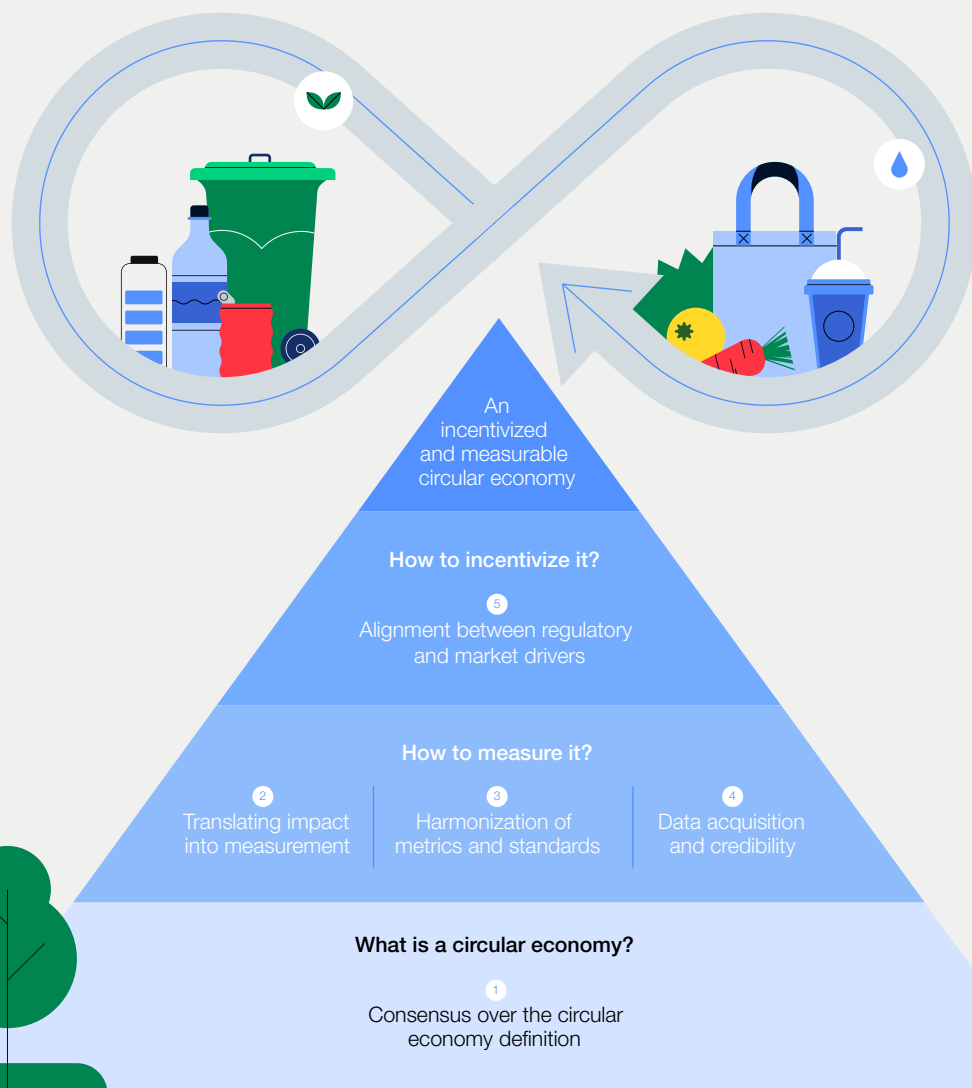
A standardized blueprint

A harmonized framework grounded in interoperability, robustness and reliability is essential. It should be transparent and supported by policy, financial investments, technology and cross-sector collaboration.

2.1 A multi-stage approach for advancing circular economy

Based on the significant impediments of CE metrics and frameworks described in the preceding section, Figure 5 illustrates the different stages to facilitate the broader implementation of the circular economy.

FIGURE 5 Multi-stage process to address challenges for circular economy implementation and measurement



2.2 Outlook for harmonized circular economy metrics

As businesses, governments and civil society collaborate to develop CE measurements, the below principles must underpin their development: interoperability, robustness and reliability and transparency. Critical enablers in developing and

implementing these measurements include global public-private collaboration, the integration of digital technologies and infrastructure, financial incentives, policy and regulatory support, and capacity building in organizations.

TABLE 3 Outlook of optimized circular economy metrics based on design principles

Design principles	Guiding recommendation	Supporting levers
Interoperable	<p>Set standardized data formats and protocols: Establish uniform data formats and communication protocols to facilitate the seamless exchange of circularity data across industries and regions. Ensure compatibility for global monitoring and comparative assessments.</p> <p>Align regulatory and market drivers: Bridge gaps between global and local regulations by aligning national frameworks.</p>	<p>Global public-private collaboration: Encourage partnerships to build robust data-sharing mechanisms and promote interoperability by establishing common standards that consider different regions and sectors.</p>
Robust and reliable	<p>Implement standardized data collection and sharing protocols: Define consistent methods for collecting, measuring and reporting circularity data to enhance accuracy and reduce variability. Ensure robust verification processes and implement decentralized data storage to protect data integrity and reliability over time.</p> <p>Ensure link of CE metric to impact: Ensure focus on long-term social, environmental and economic outcomes. Move beyond short-term indicators, incorporating measures such as pollution reduction, natural ecosystem regeneration and product life-cycle impacts.</p> <p>Consider financial investment: Secure funding for the infrastructure needed to collect and maintain data. Explore research and development, government grants and incentives to support innovation and long-term success of CE initiatives.</p>	<p>Digital technologies and infrastructure: Support interoperability with existing data-exchange mechanisms, enabling integration of circularity metrics across supply chains and industries.</p> <p>Financial incentives: Encourage the financial sector to demand harmonized metrics, allocate resources to organizations leading in CE practices, and fund the development of reliable data infrastructure.</p> <p>Policy and regulatory support: Implement regulations that support and incentivize transparent reporting on circularity, ensuring integration with broader financial and sustainability disclosures.</p>
Transparent	<p>Harmonize and integrate with existing disclosure frameworks: Ensure that circularity disclosures are comparable, verifiable, timely and understandable. Incorporate both quantitative and qualitative insights to highlight areas for improvement and track progress. Align CE metrics with established sustainability frameworks (e.g. GRI, SASB and TCFD) to integrate circularity into broader environmental, social and governance (ESG) reporting.</p> <p>Align with financial metrics: Develop clear mechanisms to link CE progress with financial performance indicators, ensuring that circularity is reflected in an organization's overall financial health and decision-making.</p>	<p>Internal capacity building: Equip organizations with the necessary skills to effectively measure and implement CE practices, also integrating them in their overall financial and operational reporting structures.</p>

The impact of how humankind has used and mismanaged resources is increasingly evident from climate change, biodiversity loss and pollution. However, the momentum for the circular economy to address those impacts is stronger than ever.

The public and private sectors must grab the opportunity across sectors and geographies to establish a common language to assess progress towards this shared goal.

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3. World Business Council for Sustainable Development. (2024). *Global Circularity Protocol for Business Landscape Analysis*.
4. The industry perspective is drawn from a market survey of 420 participating executives, 70% of whom have more than five years of experience in their role, are working in medium-sized or large companies in the four regions of Europe, North America, Asia and South America, and in 10 manufacturing industries (apparel and textiles, automotives, chemicals, consumer goods (white), consumer tech/hardware, fast-moving consumer goods (FMCG), heavy industry/aerospace and defence, machinery, medical technology and packaging).
5. The list outlines the most commonly used frameworks, but the challenges and gaps discussed are based on a comprehensive evaluation of a broader range of metrics, indicators and frameworks beyond those listed.
6. The EU is exploring consumption footprints to evaluate circular economy strategies' environmental impacts. However, linking specific circular practices to tangible environmental benefits remains difficult.



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