MONTHLY RESEARCH DIGEST

An Executive Briefing on New & Notable Sustainability Research

In This Issue – December 2025

Editors: Alissa Stevens, Senior Editor, and Mike Rama, Deputy Director

Please direct comments and questions to Mike Rama, mike@corporateecoforum.com.

CORPORATE SUSTAINABILITY LANDSCAPE

2025 EY Global Climate Action Barometer

By EY

View the full report here

Notable Highlights

- **Nearly two-thirds of companies (64%) have net-zero targets.** Of those companies, 82% report that their targets are Paris-aligned, despite **only 8% being aligned with a below-2°C global warming scenario.**

- 34% of company targets were restated from 2023 to 2024. **56% of them reflect strengthened climate ambition** or an accelerated timeline, while **44% reflect weaker ambition or a delayed timeline**.

- 64% of companies have set overall **Scope 3 targets** or subcategory targets. **Nearly half of them are not on track** to achieve the target.

- **64% have a climate transition plan,** while **24% show no progress** on developing transition plans **or are moving backward on prior commitments**.

- Companies with plans to implement mitigation and adaptation measures **expect the cost of action to be 8% of FY 2024 revenue** on average, **compared with an average cost of inaction of 15%.**

- **68%** have conducted a quantitative **climate risk assessment,** yet only **44% have implemented adaptation measures**.

- The following Report Findings include **recommendations for companies to accelerate climate action,** as well as corporate case studies.

Objective

- To analyze corporate climate action progress, including target setting, transition planning, decarbonization strategies, and adaptation to climate risk.

Background

- The data in this annual report is based on the climate disclosures from 857 companies across 50 countries and 13 sectors, as well as interviews with EY subject-matter experts (methodology on pg. 3, 36-37).

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- Companies selected for inclusion were identified in the 2024 EY Global Climate Action Barometer as demonstrating leadership on climate ambition, disclosure quality, and climate risk management, and as having a transition plan or planning to disclose one.

Report Findings

Corporate decarbonization targets and strategies (pg. 6-13, 19-23):

- **44% of restated net-zero targets reflect weaker ambition or a delayed timeline,** likely to better reflect practical considerations, such as funding availability, regulatory developments, and achievable emission-reduction timelines.

- **54% incorporate internal carbon pricing** into their business strategies, including 73% of Energy companies and 68% of Materials and Buildings companies.

- **Nearly 80% of companies have adopted decarbonization levers across Scopes 1-3.**
    - 96% have implemented levers for Scopes 1 and 2, with 75% of them adopting energy efficiency as a measure.
    - 79% have implemented levers for Scope 3, with supplier engagement as the most used measure (60%).
    - Page 20 breaks down **common decarbonization levers across all sectors.**

- **60-90%** (depending on the sector) **disclose upstream Scope 3 emissions** across most subcategories, and 10-40% report downstream emissions.

- **3 out of 5 companies** with net-zero targets are **using carbon credits**.

Corporate climate transition plans (pg. 14-18):

- **65%** of companies with net-zero targets **lack an actionable transition plan,** not meeting at least one of the following criteria:

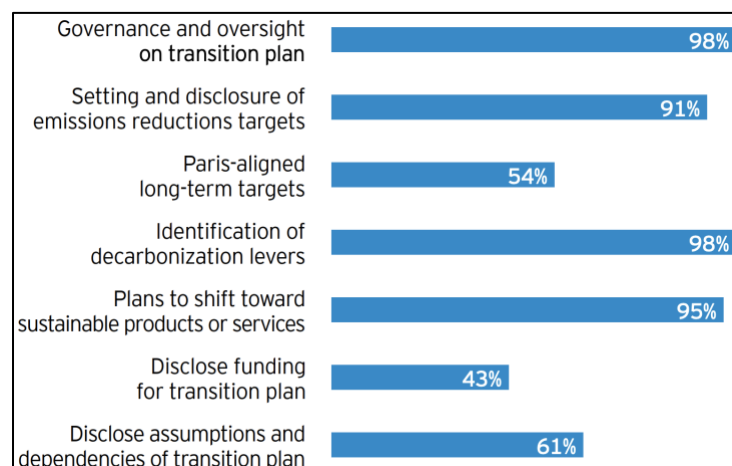| Criteria	Percentage
Governance and oversight on transition plan	98%
Setting and disclosure of emissions reductions targets	91%
Paris-aligned long-term targets	54%
Identification of decarbonization levers	98%
Plans to shift toward sustainable products or services	95%
Disclose funding for transition plan	43%
Disclose assumptions and dependencies of transition plan	61%

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Image taken from pg. 15

- These criteria outline the steps companies should take to develop transition plans and the order in which to take them.

- 40% of nonfinancial services companies have stalled in their transition plans at the stage of setting emission-reduction targets, and 23% have stalled between planning to shift to sustainable products and services and securing dedicated funding for the transition.

- For financial services companies, moving from setting emission-reduction targets to Paris-aligned long-term targets is the greatest barrier (35%).

Corporate climate risk readiness and adaptation (pg. 24-29):

- 68% have conducted a quantitative **climate risk assessment.** Yet, **only 17% of them disclose the financial impact of those risks,** likely due to the short time horizons of financial statements relative to longer-term climate risks, the difficulty of producing such calculations, and companies following suit when peers withhold such disclosures.

- **Only 44% of companies have adaptation measures in place;** the most commonly used are temperature controls to mitigate rising temperatures (37%) and flood walls (24%). Page 27 includes key adaptation measures by sector.

- **43%** of nonfinancial services firms **allocate funds** to their transition plans.

- 1 in 3 companies assess both the cost of action and the long-term cost of inaction associated with climate-related risks.

- Companies with plans to implement mitigation and adaptation measures **expect the cost of action to be 8% of FY 2024 revenue** on average, **compared with an average cost of inaction of 15%.**
   - Real Estate companies expect to allocate 96% of FY 2024 revenue to climate mitigation and adaptation.
   - Companies in the Financial Asset Owners and Managers sector disclose the highest cost of inaction, averaging 120% of FY 2024 revenues.
   - Page 29 breaks down the average cost of action versus inaction by sector.

Corporate climate governance (pg. 30-33):

- **82% include environmental metrics in executive incentives**. However, nearly half of those companies link only 10% or fewer of their incentives to environmental issues, and few link them to emission-reduction targets.

- Companies with **long-term incentive plans perform better on climate-related goals** and are more likely to set net-zero and Scope 3 targets, develop transition plans, and implement adaptation measures.

- Around 70% of companies have board oversight of climate risks and climate strategy.

Recommendations for companies to accelerate climate action (pg. 35):

- **Embed climate goals into the business strategy:** Set challenging yet achievable targets and allocate capital to investments critical to achieving them.

- Conduct a quantitative **climate risk assessment**.

- Utilize internal **carbon pricing.**

- **Develop and disclose an actionable transition plan:**
  - Include information on the setting and disclosure of emission-reduction targets and Paris-aligned long-term targets, decarbonization levers, plans to shift toward sustainable products and services, how the plan will be funded, governance, and any assumptions and dependencies.
  - Outline different scenarios, including the associated risks and opportunities, potential financial consequences, and intended measures to mitigate risks.

- **Reduce reliance on carbon credits** and use them alongside emissions-reduction strategies, not as an alternative.

- **Link executive incentives to long-term value creation**, not just short-term business and financial objectives.

- **Engage suppliers across the value chain** (e.g., by asking them to set net-zero targets and develop transition plans).

- Explore how **AI tools** can enable the company's transition (e.g., by modeling future climate scenarios and planning low-emission transport routes).

- **Establish robust climate governance,** including board oversight of target setting, tracking of target progress, and capital allocation to climate-related projects. Hire an additional board member with climate expertise if necessary.

GREEN ECONOMY COMPETITIVENESS

Making the Green Transition Work for People and the Economy

By World Economic Forum (WEF), in collaboration with McKinsey & Co.

View the full report here

Notable Highlights

- The **top three challenges businesses face in remaining competitive in the green transition** are higher energy and key commodity costs (37% global average), regulatory uncertainty/compliance burden (36%), and slow returns on investment and limited investment capacity/access to finance (both 32%).

- The **top three socioeconomic risks businesses foresee** in their countries due to the green transition are unequal access to capital (80%), unequal access to technology and know-how (71%), and less access to goods and services (66%).

- Companies must **embed socioeconomic considerations into climate transition planning** to ensure the long-term viability of climate action amid shifting geopolitical and economic priorities and socioeconomic challenges.

- The following Report Findings include a f**ramework for embedding socioeconomic factors within corporate climate transition plans** and corporate case studies.

Objective

- To present an overview of socioeconomic dimensions of the green transition and a framework for integrating socioeconomic factors into corporate climate transition plans.

Background

- The report data is based on WEF's 2024 and 2025 Executive Opinion Surveys (with each receiving over 10,000 responses across more than 110 countries) and a set of 29 indicators that measure countries' long-term, pre-existing socioeconomic foundations (methodology on pp. 11-12, 169-173).

- The Laudes Foundation, the Global Future Council on Equitable Transition, and senior delegates of the Equitable Transition Alliance provided additional support.

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Report Findings

Socioeconomic risks and competitiveness challenges linked to the green transition (pg. 9-36):

- **The green transition has an impact on employment and job transitions** (the ability to navigate job loss with social protection and support for reskilling); the **affordability and accessibility** of goods and services (including green alternatives); **access to** financing, investments, knowledge, and other resources; and **growth and competitiveness** (the ability to access to energy/goods, find green talent, and develop and adopt green tech).

- In almost **80%** of countries, **business leaders believe the green transition will have a positive overall impact** on their country's economy.

- Globally, **51% of businesses expect prices to rise** due to the green transition in at least one key industry in their country.

- The impact of climate mitigation and adaptation policies, as well as the rollout of green energy technology, is estimated to **disrupt 14.4 million jobs globally** by 2030. However, the transition could create 9.6 million jobs globally.

- The green transition could contribute to **new technology divides** between advanced and developing countries.

- Pages 17-36 break down how these risks and competitiveness challenges vary across six country archetypes (e.g., growth economies, emerging green adopters).

Framework for embedding socioeconomic factors within corporate climate transition plans (pg. 41-50):

NOTE: Each report section includes guiding questions and **corporate case studies**.

- **Establish baseline socioeconomic impacts of business activities (pg. 42):**
  - **Who is impacted by business activities** within and outside the organization (e.g., the workforce, the value chain, consumers, and broader communities)?
  - How do socioeconomic impacts differ between groups and/or regions?
  - How are peers addressing socioeconomic impacts, and what lessons can be learned?

- **Set ambition (pg. 42):**
  - How does addressing socioeconomic impacts **align with the organization's values and wider business strategy**?

- o Have you established clear **short-, medium-, and long-term milestones** for socioeconomic goals, alongside climate ambition, to enable progress tracking?

- o Do certain **groups need to be prioritized** for delivering socioeconomic outcomes (e.g., those that are disproportionately exposed to business activities)?

- o Embedding socioeconomic factors in transition planning provides an opportunity to **demonstrate leadership among peers** and other actors. What would this mean for the organization, and to what extent is this a priority?

- o Do the countries in which the business operates have stated climate goals to align transition efforts with? This may spur early public sector engagement, which could help shape an operating environment conducive to an efficient transition.

- **Establish governance (pg. 44):**

  - o Which existing governance frameworks and leadership roles are most relevant to the company's socioeconomic ambitions? New leadership roles may be required.

  - o Do **leaders have the competencies** to effectively deliver on socioeconomic targets? Upskilling may be required.

  - o What are the necessary RACI roles and responsibilities to ensure organizational accountability for socioeconomic outcomes?

  - o Are sufficient mechanisms in place to promote efficient cross-functional coordination toward socioeconomic and climate outcomes?

  - o What **KPIs and measures can be set** to measure socioeconomic ambitions and track and report progress?

- **Assess risks and opportunities (pg. 46):**

  - o What **short-, medium-, and long-term impacts** could your climate transition plans have on different stakeholder groups? For example, decommissioning high-emission assets may lead to direct job losses but also to affordability if costs are passed down to consumers.

  - o Are there natural **opportunities to support positive socioeconomic** outcomes through the company's climate plans? Identify them early to maximize them.

  - o How do socioeconomic impacts vary under a range of transition scenarios (e.g., different global or national macroeconomic outlooks)?

  - o How can you **incorporate knowledge and expertise** from affected stakeholder groups (including vulnerable and low-income groups) to develop more targeted and effective risk mitigation measures?

  - o Does your organization's **external positioning and communication** on sustainability and socioeconomic impact align with its core business activities? Misaligned messaging can create reputational risks.

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- **Develop mitigation measures (pg. 47):**

  - What **actions** could your organization take to prevent, mitigate, and remediate socioeconomic risks?

  - Are there sufficient **human and financial resources** allocated toward prioritized actions?

  - Where are **worker reskilling or upskilling** programs necessary to implement transition plans?

  - Are measures sufficiently targeted to support stakeholders in different locations?

  - What complementary strategies can be implemented to **maximize socioeconomic co-benefits** of climate plans?

  - Are you capitalizing on **innovation and novel business models** to lower costs, improve access, or open opportunities for disadvantaged groups?

- **Engage stakeholders (pg. 48):**

  - Which stakeholder groups within and outside the organization must be consulted to secure positive socioeconomic outcomes?

  - What **monitoring, reporting, and verification processes** can be implemented to promote continuous improvement?

  - Are there clear win-win opportunities for your organization and external stakeholders? How can they be communicated effectively?

- **Engage peers and the public sector (pg. 50):**

  - Can you proactively **engage public organizations** to help create an enabling environment for an efficient transition with positive socioeconomic outcomes (e.g., through cross-sector partnerships)?

  - Can you **collaborate with peers** to achieve technological development, reduce costs, or secure larger-scale access to goods, services, and capacity?

  - Does your organization actively support relevant proposals for driving positive socioeconomic outcomes within your sector? Responding to input from industry associations and trade groups is also important for positive external positioning.

Already a Multi-Trillion-Dollar Market: CEO Guide to Growth in the Green Economy

By World Economic Forum, in collaboration with Boston Consulting Group

View the full report here

Notable Highlights

- The **green economy surpassed $5 trillion in annual value in 2024** and is projected to exceed $7 trillion by 2030—the second-fastest-growing sector after technology.

- **Climate mitigation has accounted for 78% of the green economy value to date** (led by transportation and mobility), compared to 22% for adaptation and resilience (primarily driven by climate-adapted agricultural inputs, resilient construction materials, and cooling technologies).

- On average, **companies grew green revenues twice as fast** as conventional revenues from 2020 to 2024.

- Companies with green revenues also **accessed capital at up to 104 basis points less** than non-green competitors and **received valuations 4-11% higher.**

- **Significant expansion is expected** in fast-growing industries such as carbon and **methane** management (15% CAGR projected), **food, agriculture, and land use** (14%), and **circularity and waste management** (12%).

- **Adaptation and resilience investments are projected to grow** as climate-related disruptions increase, including a 3-5% CAGR for air conditioning systems, 7-10% for resilient building materials, and 25-30% for nascent markets such as climate analytics.

- The Report Findings include **four critical priorities for CEOs to grow the green economy,** along with **corporate case studies** to illustrate them.

Objective

- To assess the growth of the global green economy and identify critical priorities for CEOs to help grow the green economy.

Background

- The report covers the green economy in seven major industry segments in mitigation (Energy Supply & Optimization; Industrials & Buildings; Transportation & Mobility; Food, Agriculture & Land Use; Carbon & Methane Management; Circularity & Waste

Management; and Financial & Enabling Solutions) and seven adaptation and resilience themes (e.g., energy, food, and water resilience) (listed on pg. 9-10).

- The report data is based on interviews with a dozen members of the Alliance of CEO Climate Leaders and contributions from executives at several companies (methodology on pg. 30, 51-52).

- The "green economy" refers to commercial solutions with a clear environmental purpose or that directly respond to environmental challenges.

Report Findings

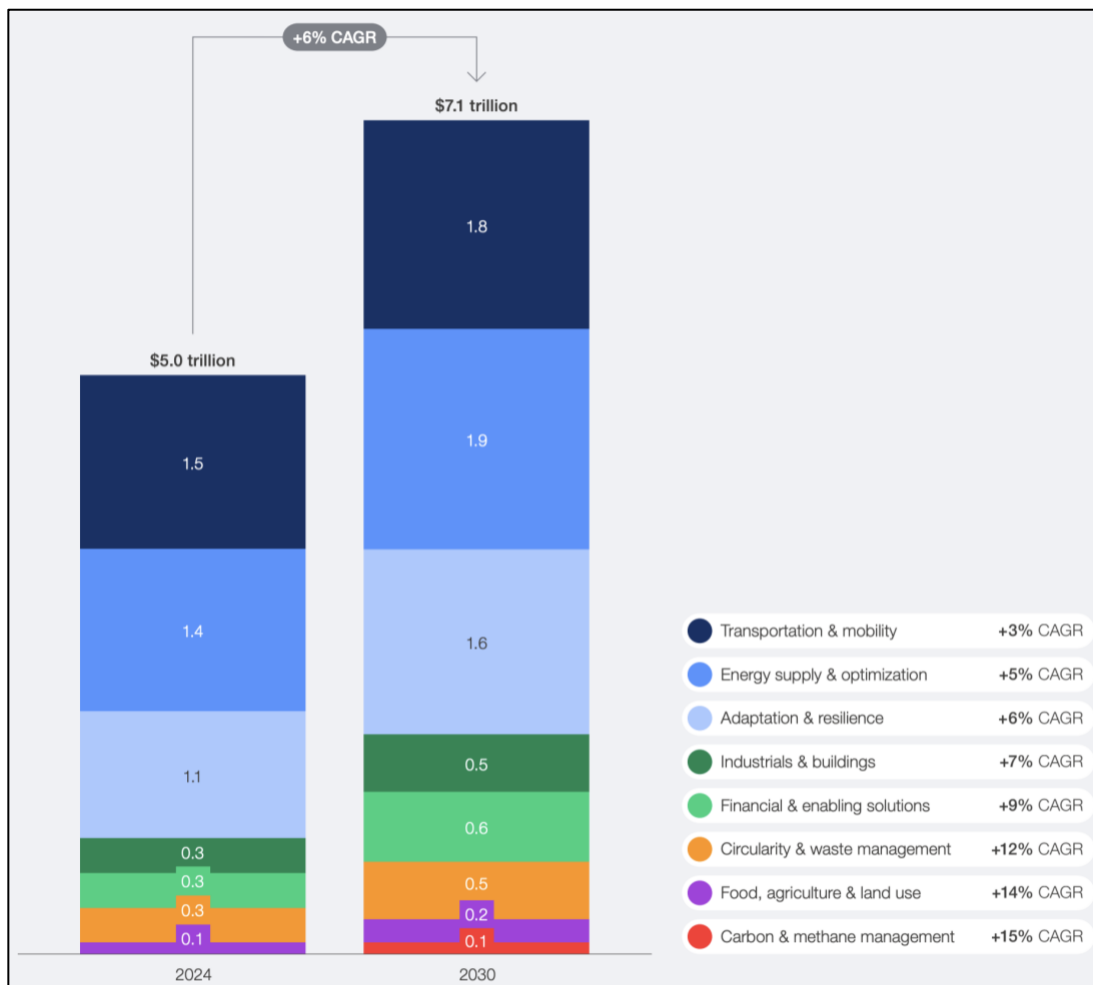## Projected global green market growth from 2024 to 2030 (pg. 5-8):

Image taken from pg. 6. CAGR stands for compound annual growth rate.

Green market growth opportunities (pg. 12-23):

- **55% of global emissions can be decarbonized by cost-competitive solutions**, 20% by solutions that pose a "minor cost disadvantage," and another 20% by solutions that pose a "major cost disadvantage." Page 13 breaks down the **cost-competitiveness of several solutions by sector and technology**.

- **Markets for decarbonization technologies needed to address hard-to-abate sectors are growing unevenly** across geographies and remain well short of what is required to achieve a net-zero pathway.
  - They will only be scaled in regions where governments and businesses heavily invest in them (e.g., through infrastructure and regulations that reduce costs).
  - Page 16 includes an estimated trajectory for global demand for low-carbon hydrogen, CCUs, and biofuels from 2025-2030.

- **China is increasingly leading global green growth.**
  - The country **invested $659 billion in clean energy in 2024** (a 12% CAGR since 2019), significantly more than Europe ($410 billion) and the U.S. ($300 billion).
  - Since 2020, it has nearly 4x'd its solar PV capacity and doubled its wind capacity.
  - It is the largest electric vehicle market, with over 12 million charging stations.

- **Energy independence is increasingly driving investments in renewables,** as recent geopolitical tensions have demonstrated the vulnerability of the global energy supply.

Four CEO priorities to grow the green economy (pg. 30-41):

NOTE: See the report chapter for corporate case studies.

Purpose and strategy:

- **Set a bold, quantified green ambition and a clear vision.** Strong C-suite ownership of the vision is vital to fostering engagement, empowering employees to take risks, and reassuring investors and employees that green growth remains a priority despite shifting narratives or public noise.

- **Identify where the company has a credible right to win** (e.g., in segments with established customer trust, proven technological or topic expertise, or privileged access to supply chains) so capital is allocated to areas with the highest likelihood of ROI. Invest in R&D and early pilots to validate your concept before scaling to industrial scale.

- **Embed performance metrics and green standards** within the strategy to demonstrate the credibility of green products and claims. Consider using life-cycle assessments, product carbon footprints, and chain-of-custody methodologies. Communicate green standards transparently in external communications.

Value proposition:

- **Develop a sharp, unique selling proposition.** "'Being green(er)' is not a value proposition in itself – it only becomes valuable when it serves a genuine demand and continues to meet that demand at a competitive quality and cost" (pg. 32).

- **Build a robust business case** demonstrating environmental and financial value, including opportunities for a price premium.

  - If there is no price premium, it is critical to compete with conventional solutions on value.

  - Proactively manage financial expectations by bringing investors and employees along the profitability journey. In immature markets, short-term profitability may not be the best measure.

- **Enter into on early offtake agreements** to signal market confidence, ensure revenue certainty, and de-risk the value proposition.

Operating model:

- **Build a robust, sustainable supply chain** by securing reliable access to critical materials/inputs, diversifying across regions, and embedding sustainability from the outset.

- **Develop a lean yet scalable team with a focused culture.** Most CEOs are using the following two models. Determine which fits your company's strategy and avoid getting stuck between the two.

  - Model #1: Establish lean, integrated teams that combine technical, commercial, and sustainability expertise. Upskill existing talent, and coordinate tightly across functions to scale quickly without added bureaucracy.

  - Model #2: Establish distinct growth units with dedicated capabilities, governance, and financing to give new green businesses the focus and flexibility they need.

- **Leverage technology (including AI) and existing assets as multipliers for scale.**

  - Automate core processes to cut costs and errors; use analytics to anticipate demand and manage resources; and deploy digital tools to track performance and emissions.

  - For capital-intensive sectors, leveraging and upgrading existing assets can help companies expand capacity at lower cost and complexity.

Growth accelerators:

- **Rigorously push for technology maturity and cost reductions.** Many companies overestimate how long customers will pay a green premium and wait for favorable regulations while neglecting the need to rigorously slash unit economics.

- **Shape and navigate supportive regulations,** including via partnerships with governments and other stakeholders.

  - **Don't over-rely on perpetual policy support or public funding** during market scale-up; this can leave businesses exposed if/when policies shift or funding is reduced, as can happen when administrations change.

  - In sectors where a lack of harmonized standards hinders the adoption of greener products, company initiatives can serve as a blueprint (e.g., Dow's Carbon Footprint Ledger applies existing carbon accounting frameworks to certify low-carbon products).

- **Unlock diversified financing to bring down the cost of capital** (e.g., by tracking results that demonstrate value to investors and using traditional financial metrics, such as ROI and industry-specific KPIs).

ENERGY TRANSITION INVESTMENT TRENDS

Global Landscape of Energy Transition Finance

By the *International Renewable Energy Agency (IRENA), the* *Climate Policy Initiative (CPI)*

View the full report here

Notable Highlights

- **Global investment in energy transition technologies reached a record $2.4 trillion in 2024** (up 20% from the average annual levels of 2022/23).

- **Global renewable energy investments reached $807 billion in 2024, up 22%** from 2022/23. **Year-on-year growth slowed** from 32% in 2023 to 7.3% in 2024.

- **Global solar PV investment grew by 49%** from 2022/23 to 2024 **to a record $554 billion**, power grid investment grew by 14% to $359 billion, **battery storage by 73%** to $54 billion, **EVs by 33%** to $763 billion, and energy efficiency by 3% to $346 billion.

- **Global investment in wind energy fell 10.5%** from 2022/23 to 2024 to $196 billion, solar thermal investment **fell by 32%** to $12 billion, other renewables **fell by 61%** to $19 billion, and green hydrogen fell by 20% from 2023 to 2024 to $8 billion.

- **Solar PV is the only renewable technology with investment levels almost in line with IRENA's 1.5°C pathway,** requiring a 1.2x increase in investment by 2030. Onshore wind investment must increase 3x, **offshore wind 4x**, hydropower 4x, bioenergy 6x, solar thermal 32x, and geothermal 29x**.**

- To align with IRENA's 1.5°C pathway, **annual investments in renewable power generation must double** from 2024 levels by 2030, energy efficiency investments must grow 7.5x, green hydrogen 8x, heat pumps 4.1x, **battery storage 3.2x,** power grids 1.9x, and **EV charging infrastructure 2.8x**.

Objective

- To analyze global investments in energy transition technologies, including renewables, energy efficiency, battery electric vehicles, green hydrogen, and power grids.

Background

- The data in this fourth annual report is based on (methodology on pg. 2, 13, 132):

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     ○ Renewable energy data for 2013-2023, from the CPI Global Landscape of Climate Finance datasets.

     ○ Energy transition-related data from BNEF, CPI, the IEA, IJGlobal, and IRENA.

- Whenever possible, the analysis uses preliminary 2024 data, derived by applying BNEF's 2024 sector-level growth rates to data from CPI's 2023 Global Landscape of Climate Finance. Comparisons with previous years are based on average annual investments over 2022 and 2023.

- Executives at consulting firms, foundations, think tanks, financial alliances, UN agencies, and international organizations provided technical expertise.

- The analysis includes only renewable energy investment in new assets and/or projects that have reached the final investment decision.

Report Findings

Energy transition investment landscape (pg. 15-30):

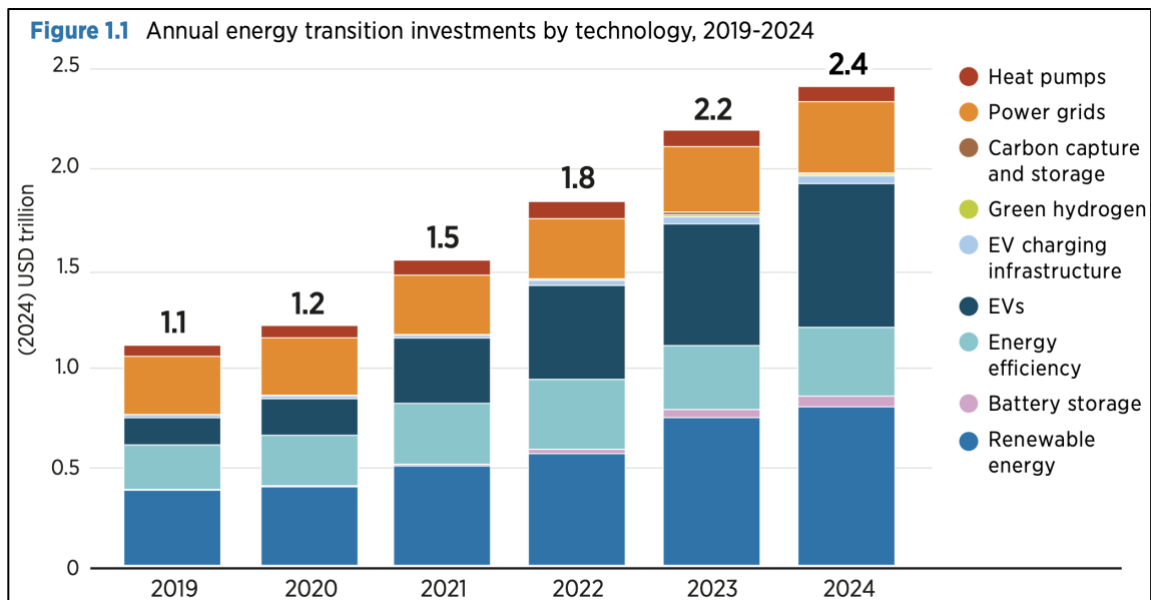- **Annual energy transition investments by technology, 2019-2024:**

Image taken from pg. 16

- **Power grid investment grew by 14% from the average annual levels of 2022/23 to $359 billion.**

     ○ 16% of investment was directed toward new connections, 44% toward replacing ageing assets, and 40% toward reinforcements (e.g., to improve flexibility).

- Over 1,650 gigawatts (GW) of wind, solar PV, and hydropower projects globally were awaiting grid connection, up from around 1,500 GW in 2023, due to constraints in grid capacity, planning, and permitting. This could deter future renewables investment.

- **Battery storage investment increased by 73% from 2022/23 to $54 billion**.

  - This was driven by a 94% cost decline from 2010 to 2024, attributable to scale-up in manufacturing, improved material efficiency, and advances in manufacturing processes.

  - IRA incentives positioned the U.S. as the second-largest destination of battery storage investment, accounting for nearly 25% of newly added capacity in 2024.

- **Investment in electric vehicles (EVs) grew by 33% from 2022/23 to $763 billion.**

  - China accounted for 49% of global BEV investment in 2024, Europe accounted for 23%, and the U.S. for 19% (a 35% increase from 2022/23).

  - The share of EVs in global car sales grew from 4.4% in 2020 to 22% in 2024.

  - **Investment in EV charging infrastructure increased 27% to $39 billion.** Governments provided 75% of the investment.

- **Energy efficiency investment across industry, transport, and buildings increased by just 3% from 2022/23 to $346 billion.** While notable efficiency gains have been made globally since 2010, **achieving further gains is challenging** because industrial processes require high-temperature heat and feedstocks, and because infrastructure comprises **long-life assets that are difficult and costly to upgrade** or replace.

- After significant growth in the previous four years, **annual green hydrogen investment declined by 20% from 2023 to 2024 to $8 billion.**

  - The sector faces significant barriers, including production costs, uncertain demand, and limited transport and storage infrastructure. Many high-profile projects are at risk of cancellation as a result.

  - Pages 25-28 include a deep dive on de-risking green hydrogen projects.

- **Investment in renewable power, grids, and battery storage ($1.19 trillion total) exceeded fossil fuel investment ($1.13 trillion) in 2024. However,** fossil fuel spending is on the rise, partly due to European efforts to secure alternative oil and gas supplies following the Russia-Ukraine conflict.

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Renewable energy investment landscape (pg. 33-49):

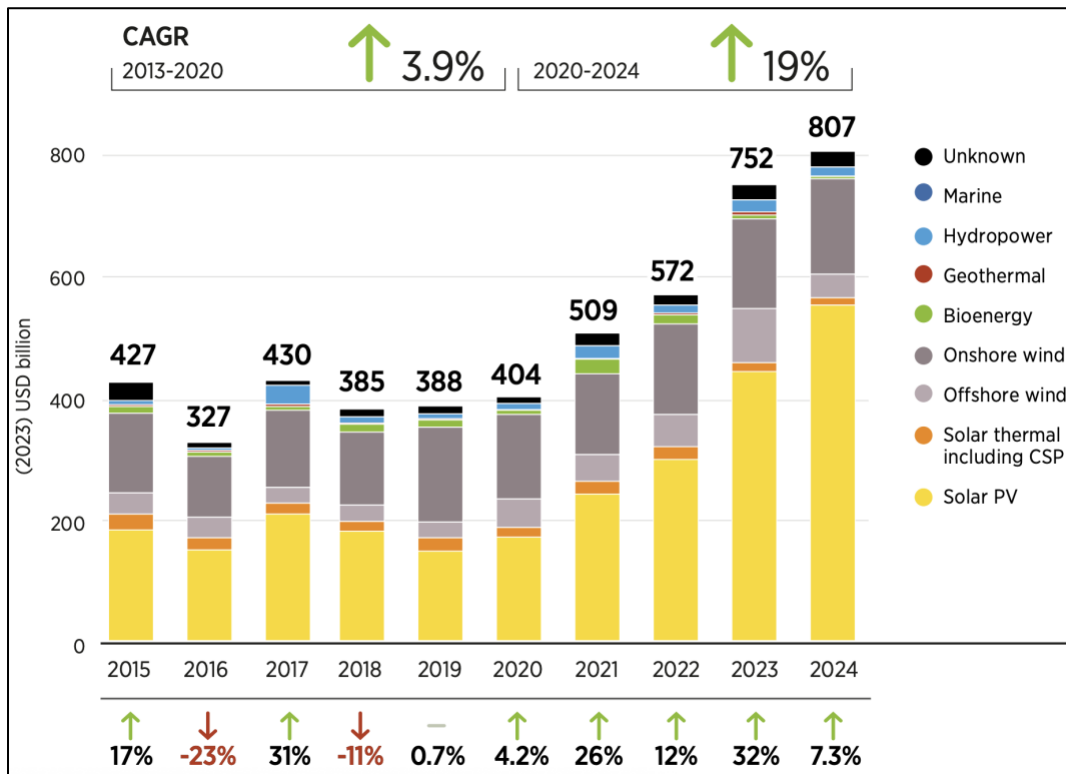- **Share of global renewable energy investment by technology from 2018-2024:**

Image taken from pg. 36

- **Global renewable energy investments reached $807 billion in 2024, up 22%** from the annual average of 2022/2023. However, **year-on-year growth slowed from 32% in 2023 to 7.3% in 2024**.

  o This is partly due to permitting issues and grid connection queues, and possibly to the end of the initial surge of investment resulting from incentives under the IRA, REPowerEU, and China's 14th Five-Year Plan.

  o **The global renewables outlook remains positive:** Europe is implementing the Renewable Energy Directive III, and China enacted its first Energy Law, putting renewable energy at the core of national energy policy.

- **Global investment in solar PV hit a record $554 billion,** up 49% from 2022/23 and more than 3x the amount invested in 2018/19.

  o Investment in solar thermal fell to $12.1 billion in 2024, the lowest level since 2013. Outside China, the sector has struggled to grow due to high capital expenditure requirements, long lead times (4x those of solar PV), the availability of cheaper solar PV-storage hybrids, and insufficient policy support.

- o The **off-grid solar** industry has been a major driver of energy access expansion, with over $3.8 billion invested between 2012 and 2024 and more than **500 million people worldwide provided with new or improved access**.

- **Global investment in wind energy fell 10.5% from 2022/23 to $196 billion in 2024.** Onshore wind investment reached a record $157 billion in 2024 (a 6% increase from 2022/23), but that was offset by offshore investments declining by 45% to $39 billion.

  - o China remained the largest combined wind market, accounting for 50% in 2024.

  - o Both sectors faced significant deployment challenges due to inflation, permitting delays, grid bottlenecks, and supply chain pressures.

  - o All major geographies experienced a decline in offshore wind investments due to longer permitting timelines and higher costs—by approximately 80% in Europe, 65% in China, and 40% in the U.S.

- **Hydropower investment declined by 11% from 2022/23 to $14.8 billion in 2024**. China remained the largest market, accounting for 73% of global flows.

- **Bioenergy investments declined from an annual average of $10.7 billion in 2022/23 to $4 billion in 2024.** Ongoing policy volatility, rising levelized electricity costs, and increasing feedstock costs must be addressed to attract investment.

- **Geothermal investments declined** from $4.2 billion in 2022/23 **to $576 million in 2024.** Marine energy received $93 million in 2024, in line with 2023 investment levels. The less established supply chains and limited policy support for these technologies have led to slower deployment and cautious investor appetite.

Energy transition supply chain investments (pg. 92-101):

- **Investments in factories for manufacturing solar, wind, battery, and hydrogen technologies fell 21% in 2024 to $102 billion,** after peaking at $128 billion in 2023. The decline was driven by:

  - o A **72% decline in solar PV factory investment** from 2023 to $24.5 billion, driven primarily by an oversupply of manufacturing capacity worldwide and the proliferation of tariffs and non-tariff trade barriers on solar panel imports.

  - o A **112% increase in battery factory investment** from 2023 to $74 billion, driven by the growing demand for energy storage solutions for renewable integration, grid flexibility, EVs, and data centers.

- **Solar PV** manufacturing investments are expected to **decline even further next year**, to one-third of 2023-24 levels.

- **US investment in solar factories increased by 78%** from 2023 to 2024 to $4.5 billion, and **investment in battery factories increased sixfold to $5 billion.**

- o This was mainly due to incentives under the Inflation Reduction Act and tariffs, which made domestic PV production more profitable.

- o Recent cuts to federal incentives and the enactment of the OBBBA may undercut earlier efforts to boost local manufacturing of energy transition technologies.

- o More than $24 billion in new factories and energy transition-related projects were cancelled between January and September 2025.

- **Investment in wind energy factories fell by almost 80% in 2024** due to inflation, permitting delays, and supply chain pressures.

- **Mining and refining of cobalt, lithium, and nickel reached a record $28.6 billion in combined revenue,** driven by growing demand for battery technologies and EVs. The long-term investment outlook remains positive, but short-term volatility in commodity markets poses significant challenges for investors.

- **Foreign direct investment** (primarily from Chinese companies) is helping to build battery, solar, wind, and EV manufacturing capacity across the developing world, thereby enhancing geographic **diversification of supply chains and global energy security.**

Renewable energy investments by region (pg. 50-60):

- **44% of energy transition investments in 2024 were made in China** (down from 50% in 2022/23), 17% were made in Europe (up by 22%), 15% in North America and Oceania (up by 34%), and 11.6% in Asia (up by 8%).

- Advanced economies accounted for 78% of global renewable energy investment in 2024, emerging economies 21%, and the least developed economies 2%.

Renewable energy investment sources (pg. 62-90):

- **Private institutions accounted for 60% ($397 billion) of renewable energy investment in the average 2022/23 year,** including 40% from corporations, 38% from commercial financial institutions, and 19% from households. Public institutions accounted for 40% ($265 billion).

CIRCULARITY

2030 Plastics Agenda for Business

By Ellen MacArthur Foundation (EMF)

View the full report here

Notable Highlights

- ♦ **Businesses have collectively avoided using 14 million tons of virgin plastic**, tripled their use of recycled content, and avoided 7.8 million tons of CO2 per year since 2018 (as signatories of the EMF Global Commitment).

- ♦ Global levels of mismanaged plastic waste, plastic pollution, and GHG emissions related to plastic production and disposal are increasing, largely due to **three systemic barriers that businesses can't overcome alone:** difficulty scaling reusable packaging, tackling flexible plastic packaging waste, and developing collection and recycling infrastructure.

- ♦ **Global plastic waste is projected to double by 2050** (from 62 million tons in 2020 to 121 million tons), and global GHG **emissions are projected to increase by 37%.**

- ♦ The number of plastics and packaging regulations globally has grown by more than 50% since 2018. Businesses that act early can **shape the plastics policy landscape and stay ahead of regulation**, rather than being disrupted by it.

- ♦ **Targeted policies and fiscal and financial incentives are required** for lasting change. However, businesses can help overcome these barriers by engaging in (A) **collective advocacy** to accelerate policy implementation and catalyze market transformation, (B) **collaborative action,** which significantly **lowers costs** compared to individual actions, and (C) **individual action** to scale proven solutions.

- ♦ The following Report Findings include **priority actions for companies to address the systemic barriers.**

Objective

- To identify a set of priority actions for businesses to eliminate plastic waste and pollution.

Background

- The report data is based on input and support from Systemiq, the UN Environment Programme, WRAP, WWF International, The Plastics Pact Network, and others.

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Organizations and individuals within the EMF business network provided additional contributions (methodology on pg. 28).

Report Findings

Businesses are facing three systemic barriers to reducing plastic waste and pollution (pg. 11-14):

- Global levels of mismanaged plastic waste, plastic pollution, and GHG emissions related to plastic production and disposal are increasing, largely due to **three systemic barriers that businesses can't overcome alone:**

    o **Scaling reuse:** Uncertainty about how reusable packaging can be scaled, when it will become cost-competitive with single-use packaging, and which policy mechanisms would enable this is preventing reusable packaging from reaching economies of scale.

    o **Tackling flexible plastic packaging waste:** Flexible packaging is the fastest-growing segment of plastic packaging and the most challenging for circularity due to low recycling rates and high leakage rates. This, along with a lack of alignment on solutions, is delaying the significant R&D investment and production scale-up required.

    o **Developing collection and recycling infrastructure:** A multistakeholder strategy is needed to attract investment and drive policy interventions that enable dedicated, ongoing funding and demand for recycled materials, while ensuring a just transition for workers in the plastics industry.

Three levels of business collaboration can help overcome the systemic barriers (the EMF 2030 Plastics Agenda for Business) (pg. 18-19):

- **Collective advocacy accelerates effective policy.** For example, business advocacy has accelerated the adoption of Extended Producer Responsibility (EPR) policies. The number of jurisdictions with EPR grew from 25 in 2000 to 61 in 2021. A group of approximately 100 businesses explicitly called for EPR implementation in 2021, and the number of jurisdictions grew from 61 that year to 113 in 2025.

- **Collaborative action enhances the business case:** Larger-scale collaborations that involve a critical mass of businesses, operate at the city/country scale, and have a clear path to further scaling can help pool investments and demand, unlock economies of scale, and build confidence to close policy gaps.

- **Individual action can drive impact and strengthen credibility for policy advocacy:** Businesses must continue to scale proven solutions that have shown meaningful progress on their own and share their learnings.

Priority actions for businesses to help eliminate plastic waste and pollution (pg. 37-62):

SYSTEMIC BARRIERS		Individual action	Collaborative action	Collective advocacy
Create conditions for reuse[4] to scale		**Scale 'individual' reuse models** where relevant, noting many reuse types require collaboration and/or policy, but others (e.g. refill at home) can be scaled by individual companies for relevant product types	**Join at-scale demonstrators** that are multi-brand and multi-retailer, have shared reuse infrastructure/packaging, and are at a city/country scale — to learn, inform policy, and unlock financing for further scale up	**Align and advocate** for effective policies that can improve the viability, feasibility, or desirability of at-scale reuse systems
Drive material innovation for flexible packaging[5]		**Set company strategy** to address flexible packaging waste, considering and prioritising all levers in line with circular economy principles, and secure funding for delivery	**Share R&D efforts** to reduce the cost, risk, and timeframe for bringing material innovations to market at scale, where relevant, and in line with a common vision	**Align on a common vision** and clear boundary conditions for where and how alternative materials for flexible packaging are beneficial. Champion this vision and supportive policies
Demonstrate and scale collection and recycling infrastructure		**Contribute to infrastructure and EPR development** **Use design for recycling and recycled content** to create easily recyclable inputs for, and demand for the outputs of, the recycling system	**Jointly fund global south city-scale transformations[6]** of collection and recycling infrastructure for plastic packaging, ensuring a just transition for waste pickers, unlocking co-investment from public and private finance, and demonstrating a pathway to national-scale system transformation	**Advocate for effective EPR and other policies** that secures ongoing funding for collection and recycling infrastructure (including EPR), and that stimulates design for recycling and recycled content use, across the world

CROSS-CUTTING

Deliver virgin plastic reduction[7]
through circular economy approaches

Ensure health, safety, and rights are respected
by ensuring all plastic packaging is free of hazardous chemicals, and the health, safety, and rights of all people involved, including waste pickers, are respected

Image taken from pg. 22

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Global Circularity Protocol for Business: Version 1.0

By *WBCSD* and *One Planet network (OPN)*

View the full report here

Notable Highlights

- **Widespread adoption of the Global Circularity Protocol (GCP) could reduce global material consumption by 110-132 billion tons** (equal to a year of current global material consumption), **avoid 74-84 billion tons of CO2e** (1.3-1.5x current annual global emissions), and reduce $PM_{2.5}$ pollution by 11-12% annually by 2050.

- **The GCP can help businesses:**
    - Measure and manage material flows across value chains to **reduce exposure** to resource shocks.
    - Generate decision-useful, comparable data to align with investor expectations, **reduce regulatory risks, and attract new capital sources.**
    - Identify **opportunities for circular products**, services, and business models.
    - Link circular strategies to measurable climate and nature outcomes, allowing for verifiable claims that **build trust with consumers** and value chain partners.

- The **five-stage methodology entails** (1) Framing company objectives, (2) Preparing a circular performance and impact assessment, (3) Measuring circularity performance, (4) Managing circular performance and impact, and (5) Communicating with external stakeholders.

- The following Report Findings **break down the methodology in detail.**

Objective

- To provide a global framework for measuring, managing, and communicating a company's circular performance and impacts (the "Global Circularity Protocol" (GCP)).

Background

- The GCP v1.0 was developed in consultation with over 80 organizations and 150 experts, with strategic guidance and review provided by three advisory committees (methodology on pg. 13-14, 16, 167).

- It focuses on the cycling of physical materials and the processes that support them. It defines the material categories that organizations should focus on to identify the

resources and components present in each material flow when preparing their circular performance and impact assessment (biomass, metals, non-metallic minerals, fossil resources, plastics, critical raw minerals, and hazardous materials). Future versions will have a broader scope.

- The Protocol provides standardized scopes, indicators, and methodologies that align with the GRI, ESRS, ISO 59020, IFRS S1/S2, and the GHG Protocol.

- The 2024 GCP Impact Analysis quantifies the transformative potential of the widespread adoption of the GCP.

Report Findings

The GCP progressive user journey (pg. 20-21, 28, 176-177):

- The Protocol includes a progressive three-level user journey so **organizations can start, prioritize foundational elements** (e.g., a single product or material), **and advance as they build capacity, expertise, and data availability:**

  o Initiation (Level 1): for organizations starting to measure circular performance

  o Expansion (Level 2): for organizations with a foundation of circular performance that want to grow impact by applying a more complete set of metrics

  o Consolidation (Level 3): for organizations with sufficient value chain data

- Different levels can be used for different products or materials.

- Pages 176-177 break down detailed criteria for transitioning from one level to another.

The Global Circularity Protocol (GCP) (pg. 25-166):

NOTE: The following chapters include detailed guidance, examples, and case studies.

Stage 1: Frame your objectives (pg. 25-28):

- **Define your use case (pg. 25):** Identify the most relevant use case for the GCP to help define your organization's vision for circularity. Proposed strategic use cases include resource risk mitigation, driving internal decision-making and operational efficiency, and external stakeholder communication and reporting. (Page 26 includes examples.)

- **Define your stakeholder audience (pg. 26):** Identify the key stakeholders affected by your organization's activities and their specific interests in circularity data. Involve teams such as sustainability, operations, finance, procurement, business units, and products from the outset to facilitate access to the correct data, build internal buy-in, and streamline the assessment process.

- **Determine the level at which you will conduct the circular performance assessment** (material/resource, product, or business unit/organization) and the subject of the assessment so the assessment yields consistent, meaningful, and comparable results **(pg. 27).**

- **Select a level within the GCP progressive user journey for the assessment (pg. 28),** based on the company's data availability, capacity, and expertise**.**

Stage 2: Prepare your circularity assessment (pg. 29-55):

- **Define organizational boundaries (pg. 30):** Specify which subsidiaries, business units, or geographical locations will be included in the circularity assessment.

- **Define your value chain and identify circularity hotspots (pg. 32):** Map the activities and processes associated with material flows and products, from extraction to end-of-life management. Screen for hotspots related to material circularity (e.g., high resource consumption) and value and impact (e.g., pollutants, social and human rights risks).

- **Define the company's material impacts, risks, and opportunities (IRO) related to resource use and circularity (pg. 37):** Conduct a double materiality assessment on both impact and financial materiality across the value chain. (Pages 38-41 include a process for assessing circularity-related IROs, key IRO categories, and considerations for a robust IRO assessment.)

- **Set operational boundaries for material flows (pg. 42):** Identify which material IROs are within the organization's direct control or indirect control. (Pages 43-46 include a framework to do so.)

- **Identify the materials and products that have a material impact within the organizational boundaries (pg. 47).** Prioritize material flows that account for over 20% of the total material flow inventory, those relevant to business continuity and identified risks and opportunities, and those with a high environmental impact. (Pages 47-55 include a process to do so.)

Stage 3: Measure your circularity performance (pg. 56-123):

- **Select indicators to monitor organizational progress toward circular material use (pg. 58):** The GCP's circular performance and impact assessment methodology includes a set of indicators structured across four themed "modules" that companies can adapt based on strategic priorities, operational context, and readiness level. (Pages 58-111 explore each module in depth, with guidance on how to calculate, interpret, and use the results from indicators to inform strategy and action.)

- **Gather data for each indicator and calculate the circular performance (pg. 112):** Document the methodologies and data sources used in calculations, as well as any gaps

and assumptions. (The subchapter includes guidance on relevant data points and sources (pg. 112), potential internal data sources (pg. 123), the data compilation process (pg. 118), and data quality and availability (pg. 121, with additional guidance on pg. 183).

Stage 4: Manage your circularity performance (pg. 124-138):

- **Analyze the performance assessment results to identify patterns, inefficiencies, and opportunities for action (pg. 125):** Compare results across business units, product lines, and value chain segments to identify where interventions can have the greatest impact. Track current performance and performance over time to enable strategy adjustments and alignment with internal targets and industry benchmarks.

- **Prioritize interventions (pg. 126):** For each intervention, conduct a risk assessment, define and assess potential action roadmaps, link circular solutions to action roadmaps (pages 127-128 include examples), and evaluate the business case (page 124 includes key considerations).

- **Develop an action roadmap (pg. 131):** Identify high-impact areas based on the organization's exposure to circular risks and opportunities. Set SMART targets and tangible actions (pages 131-132 include a checklist to do so, along with examples).

- **Establish governance (pg. 133):** Define strategic priorities, roles and responsibilities, targets, and accountability mechanisms to embed circularity as a shared organizational priority. Embed circularity data into incentive structures and KPIs. Monitor progress through regular reporting and performance reviews, and take corrective action as needed. (Pages 136-1 include relevant indicators and detailed recommendations.)

Stage 5: Communicate with external stakeholders (pg. 139-166):

- **Prepare your disclosure (pg. 139):** Consider the target audience and the decision usefulness of the information. Apply foundational reporting principles (consistency, transparency, verifiability, comparability) to create the most effective narrative.

- **Select and disclose only the relevant elements for the target audience and decision-useful information (pg. 142).** Structure disclosures in line with the four key pillars: strategy, governance, IRO management, and metrics and targets. (Pages 148-166 include detailed guidance to enhance the decision-usefulness of reporting under each pillar for investors, regulators, suppliers, and customers/consumers.)

NATURE

Recommendations for Upgrading the Nature Data Value Chain for Market Participants

By Taskforce on Nature-related Financial Disclosures (TNFD)

View the full report here

Notable Highlights

♦ The global nature data value chain is fragmented: Public institutions **struggle to secure funding** to maintain nature datasets and invest in new data-collection efforts. Companies are facing increasing demand for nature data due to shifting regulations and policy priorities, but they often lack sufficient, high-quality, or accessible data.

♦ The following Report Findings include **eight recommendations to improve the quality, discoverability, and accessibility of nature-related data** as a strategic public good, thereby **enabling companies and other stakeholders to drive positive nature outcomes** (e.g., adopting global nature principles to enhance data quality, standardizing metadata requirements, and incentivizing corporate nature data exchange).

Objective.

- To provide recommendations to upgrade the nature data value chain, improving the quality, discoverability, and accessibility of nature-related data as a global public good.

Background

- The recommendations that follow build on the TNFD's 2024 Roadmap for upgrading market access to decision-useful nature-related data.

- They were developed in collaboration with organizations across the global nature data value chain, in a three-stage process beginning in 2023: (1) a scoping study, (2) roadmap development, and (3) a pilot program of the proposed Nature Data Public Facility (NDPF) involving over 120 datasets from over 40 data providers, tested by 25 companies, financial institutions, and market intermediaries such as Ecovadis (methodology on pg. 4, 8-13, 74).

- Companies, financial institutions, government agencies, and research and scientific organizations provided additional feedback.

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- "State-of-nature" data refers to data about the condition of natural ecosystems (often raw data collected by public scientific institutions). "Nature-related data" includes broader nature-related information (e.g., privately collected and modeled data).

Report Findings

The global nature data value chain is fragmented (pg. 14-16):

- The collection and aggregation of **nature-related data ("upstream") relies primarily on government and scientific institutions,** most of **which struggle to secure funding** to maintain nature datasets and invest in new data-collection efforts.

- On the **"downstream" commercial side**, shifts in policy focus and corporate disclosure standards and obligations are **driving demand for nature-data innovation.**
    - In the race for market share, nature-data **startups often collect their own data** or fill data gaps with modeled data.
    - **Companies are concerned about the "black box" quality of data** in product offerings and are unsure about which solutions support assurable disclosures.

- The **TNFD proposes developing a global commons data trust to redirect the commercial value** generated by companies using nature data to public institutions, providing stable, long-term funding **to produce high-quality, reliable nature data.**

Recommendations to improve the quality, discoverability, and accessibility of nature-related data as a strategic global public good (pg. 17-60):

NOTE: Each subchapter includes detailed recommendations.

#1: Adopt a set of global nature data principles (pg. 17-23):

- **Promote global adoption of seven key principles for nature-related data across the value chain, including for new data layers and the upgrading of legacy state-of-nature data layers:**

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Transparent and reproducible	Provide a clear and accurate summary of the available data, including methodologies, assumptions and processes used in data collection and processing, and any resulting limitations in data quality, coverage and applicability to support understanding and reusability in line with the FAIR Guiding Principles.
Credible	Provide documentation that demonstrates the data has been prepared by a competent, capable and trustworthy source recognised as having authority, and is managed under clear governance policies to support reliability of the data.
Accurate and complete	Provide transparency about the data quality and the level of accuracy and completeness to help guide users in its interpretation and use. Put processes in place to identify and address any errors within the dataset, including redress mechanisms to support trust and accountability in the event of misrepresentation.
Relevant and decision-useful	Provide information for the user to understand how the data meets the specifications for the use case for which it is recommended and can support purposeful decision-making and analysis by the user.
Accessible and usable	Ensure data is findable, retrievable, understandable and usable for the broad community of users by minimising unnecessary access restrictions – in line with FAIR Guiding Principles for Findability and Accessibility – and incorporating user feedback and support mechanisms to guide data use and continual improvement.
Ethics and privacy protection	Uphold ethical standards in data collection and sharing by respecting individual rights, collective benefits, legal frameworks, licenses and Indigenous data sovereignty. This includes implementing controls to protect data integrity and avoid harm to biodiversity or communities involved in data collection and governance, in line with CARE Principles for Indigenous Data Governance.
Networked and compatible	Design data to be interoperable and compatible with other datasets and platforms, ensuring it can be easily discovered, and linked and integrated across systems in line with the FAIR Guiding Principles for Interoperability.

Image taken from pg. 19

- o **Pages 63-66 outline the principles in detail, including key criteria**.
- o These principles are informed by the IFRS, the ISSA 5000, and other standards.
- Create support functions within nature data platforms to facilitate large-scale adoption.
- Support capacity-building for private and public nature-data providers to promote broader adoption.
- Establish a **trust framework for responsible data sharing**, including data providers and independent data-assessment mechanisms, to foster transparency, confidence, and consistent application.

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- Establish a cross-sector data governance mechanism to oversee continuous refinement and ensure the principles are scientifically robust, ethical, and contextually relevant across jurisdictions.

#2: Standardize metadata requirements (pg. 24-27):

- **Require all data collectors and aggregators to utilize standardized metadata.**

- The metadata framework should include an AI-enabled data catalogue, core metadata principles, and a centralized Nature Data Identifier for seamless data discovery and citation, and incorporate ISO 19115 as a core geospatial structure for interoperability.

- 61% of data providers reported not using formal metadata standards, with many lacking clear governance, accountability, or defined quality processes.

#3: Harmonize data licensing and user agreements (pg. 28-32):

- **Develop and adopt harmonized nature-data provision and usage agreements to reduce time, costs, legal uncertainty, and operational friction for data providers and users.**

- Where possible, utilize Creative Commons licensing terms for state-of-nature datasets (details on pg. 29-30). This supports open access while clearly identifying where restrictions are required by law or due to data sensitivity.

- Develop clear, standardized language for commercial licensing terms for proprietary datasets and value-added datasets (raw data enhanced with insights).

- Pages 31-32 include detailed recommendations.

#4: Launch a Nature Data Public Facility (NDPF) (pg. 33-48):

- **Launch a Nature Data Public Facility (NDPF) to support all companies and financial institutions in conducting a baseline assessment and reporting on nature-related issues.**

- The NDPF would provide open access to essential, decision-useful data on the state of nature worldwide, generate and redistribute financing for data collection and quality enhancement, and encourage corporate nature data exchange through the facility.

- Page 36 includes a detailed blueprint of the NDPF.

#5: Incentivize corporate nature data exchange (pg. 49-52):

- **Provide mechanisms and incentives for companies and financial institutions to contribute the state-of-nature data they have collected to the global commons through the NDPF.**

- 62% of companies have invested in generating new state-of-nature data. They often use that data once or privately collect similar data from companies operating in the same area, resulting in unnecessary costs and inefficiencies, and a loss of shared public value.

- Companies interviewed indicated a **growing willingness to share data**, though **comparability issues, a lack of commercial incentive**, legal complexities, and concerns about misuse in competitive contexts **preclude participation**.

- **To incentivize corporate nature data exchange:**
    - Provide a trusted architecture to enable data sharing and build awareness of what leading companies are doing.
    - Develop a commercial value proposition.
    - Scale efforts by international actors to engage companies across sectors. The Global Biodiversity Information Facility (GBIF) has enabled 120 businesses to openly share biodiversity data through its international network.

#6: Develop an international Nature Data Trust (pg. 53-56):

- **Establish an independent, international, not-for-profit "data trust" to operate the Nature Data Public Facility (NDPF).**

#7: Develop a nature measurement protocol (pg. 57-58):

- **Develop globally applicable, science-based standards for measuring and accounting for nature-related dependencies and impacts.**

- The TNFD, SBTN, CSRD, and other frameworks, standards, and regulations guide companies on what to measure for nature-related impacts and dependencies, but not on how to measure them, limiting effective target tracking, performance management, disclosures, and investment.

- Establish an international, cross-sector initiative to develop a nature measurement protocol, including businesses, financial institutions, standard-setters, Indigenous Peoples, and scientific, conservation, and civil society organizations.

- Determine priority use cases and develop criteria to assess the relevance of nature data.

#8: Develop a universal digital protocol for sharing nature data across value chains (pg. 59-60):

- **Develop a standardized global digital protocol for sharing data on climate- and nature-related impacts and dependencies across supply chains.**

- Companies have expressed **significant frustration with fragmented, inconsistent data requests;** confidentiality concerns that hinder information sharing; and a lack of technology and data-sharing protocols to reduce the time and cost of responding to bespoke data questionnaires.

- **To develop a digital protocol for sharing supply chain data:**
  - Start with a collaborative, cross-sector prototype.
  - Identify and test lightweight, permission-based, universal formats (e.g., API-linked passports) that allow suppliers to securely share validated information with customers and capital providers while retaining control of sensitive data.
  - Align on required metadata schemas, open APIs, and governance principles to enable data portability and aggregation across existing supply chain traceability technology platforms, rather than creating new platforms.