

# Global ESG & SRI

## From Risk to Resilience: A Ten Point Plan

### CITI'S TAKE

In November 2023, the UN will host the annual Conference of the Parties (COP28) in Dubai in the United Arab Emirates (UAE). As an ESG Team we have outlined [our expectations for COP28](#) building on our discussions with investors with mandated sustainable investment strategies. We find that investors wish to stay invested in hard-to-abate sectors and use their role as active managers (in equity and fixed income assets, private and public markets) to accelerate the transition from brown to green. We also find that investors are looking deeper into supply chains to identify which companies are part of the solution to tackling biodiversity loss, deforestation, food security and water scarcity. We maintain our view that these issues are inextricably linked and deliver climate resilience and human security.

**Sophistication in sustainable investment** — We have also witnessed an acceleration in sophistication when directing capital flows towards green solutions and enablers to the transition. Efforts to identify enablers to the energy transition through supply chains linked to industrial sectors supported by active engagement, requests for stronger corporate disclosures and climate competent boards.

**Clearly articulated and unambiguous disclosures** — Investors seek unambiguous disclosures to identify which companies will deliver decarbonization strategies using climate metrics to understand climate ambition, investment in low-carbon infrastructure and climate leadership. Laser focus on 'the enablers', not just to the energy transition, but to deliver on biodiversity loss, deforestation, food insecurity and water scarcity whilst also delivering positive societal impacts has crystalized this year.

**Understanding climate-related risks and opportunities** — We find a clearer grasp of climate-related disclosures such as Scope1,2,3, the use of shadow carbon pricing and role of voluntary carbon credits as well as increasing education on the drivers of biodiversity loss, integration of social metrics, Earth observation and spatial analysis. The role of critical minerals in delivering energy security through batteries, storage, EV and renewable energy has risen in prominence.

**Scope 1&2 Emissions, Methane (CH4), Biodiversity and Forests** — COP28 will discuss halving Scope 1&2 emissions from the oil & gas sector, including reaching near-zero methane emissions by 2030. COP28 also seeks to facilitate financing packages to protect and manage forest basins together with Forest and Climate Leaders' Partnership. COP28 is the first climate COP since the Global Biodiversity Framework agreed in 2022 and will be crucial to monitor formal mechanisms that merge climate and nature concerns.

**From Risk to Resilience in Ten Steps** — We identify ten areas of focus that are inextricably linked to meeting the global climate goals, long term sustainable development and a Just Transition. This builds on our [Risk to Resilience Nexus](#) and will be our areas of focus as we head into the UNCOP28 Dubai. Please get in touch if you would like to discuss any part of this report.

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**Anita McBain** <sup>AC</sup>

+44-20-7508-4361

[anita.mc Bain@citi.com](mailto:anita.mc Bain@citi.com)

**Georgina Smartt**

+44-20-7500-0708

[gina.smartt@citi.com](mailto:gina.smartt@citi.com)

**Edward McKinnon**

+61-2-8225-4898

[edward.mckinnon@citi.com](mailto:edward.mckinnon@citi.com)

**Makanjuola Senbanjo**

+44-20-7508-4593

[makanjuola.senbanjo@citi.com](mailto:makanjuola.senbanjo@citi.com)

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### See Appendix A-1 for Analyst Certification, Important Disclosures and Research Analyst Affiliations.

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# Executive Summary

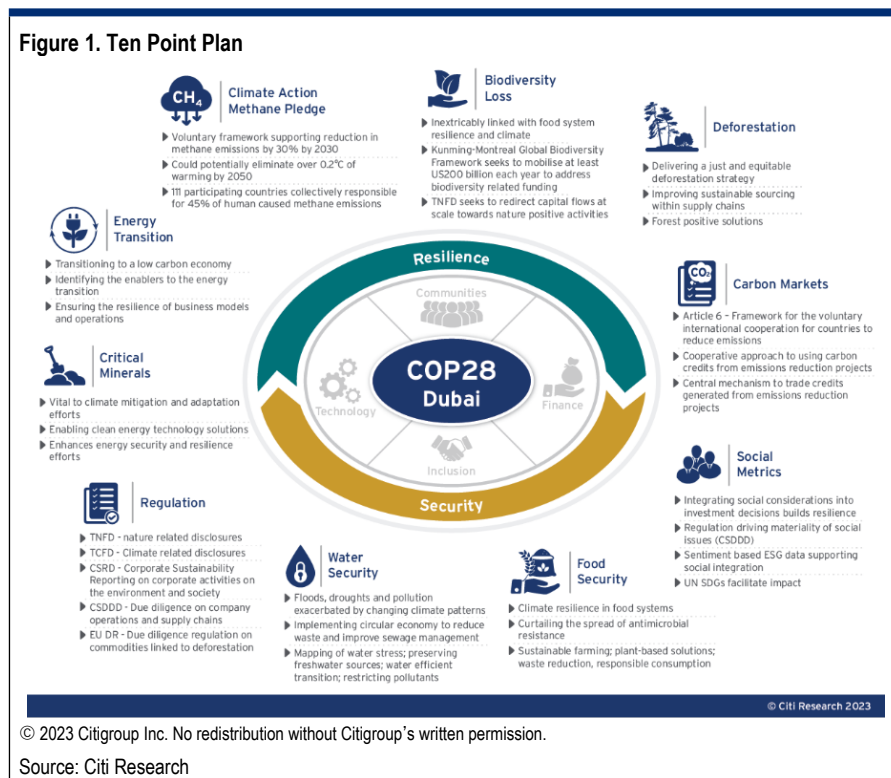
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In November 2023, the UN will host the annual Conference of the Parties (COP28) in Dubai. As an ESG Team we have outlined [our expectations for COP28](#), building on our discussions with investors with mandated sustainable investment strategies. We find that investors that wish to stay invested in hard-to-abate sectors use their role as active managers (in equity and fixed income assets, private and public markets) to accelerate the transition from brown to green.

We have also witnessed an acceleration in sophistication when directing capital flows towards green solutions and enablers to the transition. Efforts to identify enablers to the energy transition through supply chains linked to industrial sectors supported by active engagement, requests for stronger corporate disclosures and climate competent boards

Today, investors seek unambiguous disclosures to identify which companies will deliver on their decarbonization strategies using climate metrics to understand ambition, investment in low-carbon infrastructure and leadership. Laser focus on 'the enablers', not just to the energy transition, but to deliver on biodiversity loss, deforestation, food insecurity and water scarcity whilst also delivering positive societal impacts has crystalized this year.

Figure 1. Ten Point Plan



This has led to conversations around carbon pricing and the role of voluntary carbon markets and we see a stronger grasp of climate-related disclosures such as Scope 1,2,3, shadow carbon pricing and carbon offsets. This is linked to increasing education on the drivers of biodiversity loss, integration of social metrics, Earth observation and spatial analysis. The role of critical minerals in delivering energy security through batteries, storage, EV and renewable energy continues to rise in prominence.

In addition, COP28 will discuss the halving of Scope 1&2 emissions from the oil & gas sector and will include targets to reduce methane emissions by

**2030.** COP28 also seeks to facilitate financing packages to protect and manage forest basins together with Forest and Climate Leaders' Partnership and will be the first climate COP since the Global Biodiversity Framework agreed in 2022. This will see formal mechanisms that merge climate and nature concerns.

**We identify ten areas of focus that are inextricably linked to meeting the global climate goals, long term sustainable development and a Just Transition.** This builds on our Risk to Resilience Nexus and highlights areas of focus. Please get in touch if you would like to discuss any part of this report.

## Energy Transition

### The Global Stocktake

**Investors seek clearly articulated and unambiguous disclosures to identify which companies will deliver decarbonization strategies using climate metrics such as carbon pricing to unpack climate insights.**

**In November 2023, the UN will host the annual Conference of the Parties (COP28) in Dubai.** Citi's ESG Team outlined [expectations for COP28](#) building on discussions with sustainable investors through 2023. Citi's ESG Research Team find that investors that wish to stay invested in the hard-to-abate sectors are using their role as active managers (in equity and fixed income assets, private and public markets) to accelerate the transition from brown to green.

**Investors seek unambiguous disclosures to identify which companies will deliver credible decarbonization strategies using climate metrics such as carbon pricing to unpack climate insights.** Investors increasingly focus on 'the enablers', not just to the energy transition, but to deliver on biodiversity loss, deforestation, food insecurity and water scarcity whilst also delivering positive societal impacts which has crystalized this year.

**The Global Stocktake (GST)<sup>1</sup>, established under Article 14 of the Paris Agreement, assesses progress towards meeting the goals of the Paris Climate Change Agreement.** The GST is a two-year process and takes place every five years and is scheduled to conclude at the end of 2023 at COP28. Figure 2 below highlights latest facts on climate change.

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<sup>1</sup> <https://unfccc.int/topics/global-stocktake/about-the-global-stocktake/why-the-global-stocktake-is-a-critical-moment-for-climate-action>

## Identifying Enablers to the Transition

**Figure 2. Facts on Climate Change**

Facts on Climate Change		Source	
1	<b>US\$59tn</b>	AUM Net Zero Asset Managers Initiative representing 315+ signatories	<i>Net Zero Asset Managers Initiative</i>
2	<b>US\$35.3tn</b>	Global Sustainable Investment Strategies 2020	<i>Global Sustainable Investment Alliance</i>
3	<b>US\$863bn</b>	Total Green Bond Issuance in 2022 vs. US\$523bn 2021	<i>Climate Bonds Market Intelligence</i>
4	<b>US\$340bn</b>	Climate adaptation could potentially <b>cost developing countries up to US\$340bn</b> annually by 2030	<i>United Nations Environment Programme</i>
5	<b>US\$100bn</b>	<b>Pledged Public climate finance</b> provided by developed countries to developing countries annually to support critical infrastructure for adaptation and resilience	<i>Organisation for Economic Cooperation and Development</i>
6	<b>US\$243mn</b>	Amount of new pledges and contribution at COP27 to the <b>Adaptation Fund</b> to assist communities at risk with climate adaptation	<i>United Nations Environment Programme</i>
7	<b>20,000</b>	Companies disclosed to CDP in 2022 representing over 50% global market capitalization	<i>CDP</i>
8	<b>3,696</b>	Companies with approved Science-based Targets as of 3Q 2023	<i>Science Based Targets</i>
9	<b>278</b>	<b>Number of scientists</b> required to produce IPCC's Climate Risk to Climate Resilience report	<i>Intergovernmental Panel on Climate Change</i>
10	<b>45%</b>	Globally, <b>emissions must be cut by 45%</b> to achieve climate security, based on policies currently in place	<i>United Nations Environment Programme</i>

Source: Citi Research

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Source: Citi Research

**Energy Transition remains at the forefront of sustainable investment priorities and continues to dominate the narrative**

**The analysis finds that Europe is moving faster than the U.S. which is a product of European regulation and mandated climate-related disclosures.**

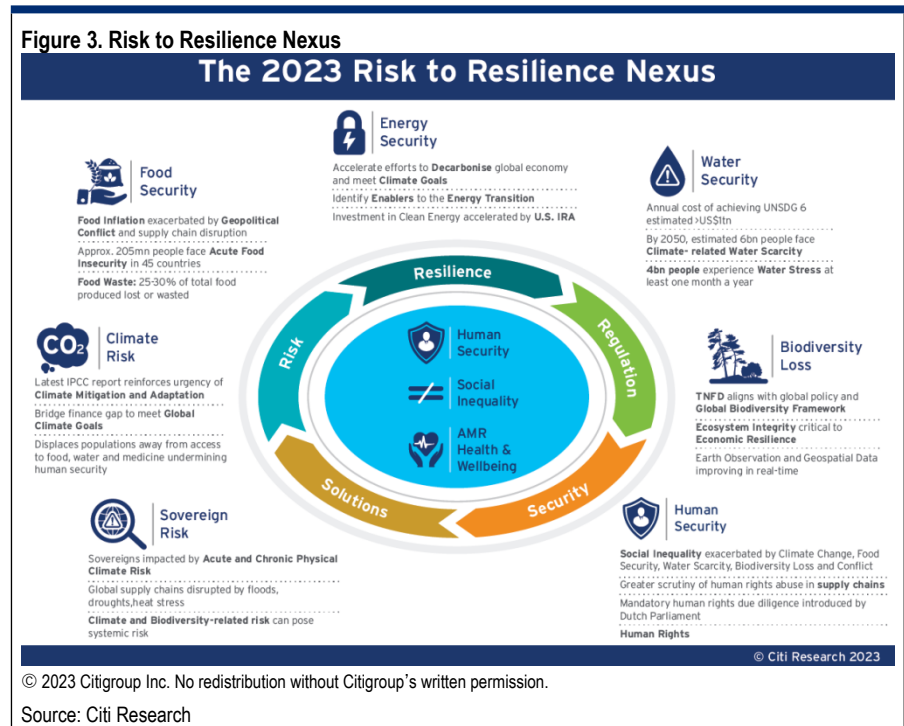
**Energy Transition remains at the forefront of sustainable investment priorities and continues to dominate the narrative.** Investors responding to [Citi's ESG Survey](#) expect capital flows towards Energy Transition to "increase significantly". In our [report](#) published in July 2023, the Citi ESG Research team analysed the role of carbon pricing to better understand climate ambition, climate competency and climate leaders.

**The analysis finds that Europe is moving faster than the U.S. which is a product of European regulation** and mandated climate-related disclosures. Shadow carbon pricing is one element to assess climate preparedness and can give unique insight into management credibility. It also helps assess ability to deliver on decarbonization strategies and how influential a shadow carbon price is on decision-making and capital deployment towards a low-carbon economy.

Read more:

- [Let's Talk Energy Transition, Carbon Pricing and Climate Benchmarks](#)
- [WATCH: Let's Talk Energy Transition, Carbon Pricing and Climate Benchmarks](#)

**Hard-to-abate companies have a significant role to play in global decarbonization efforts.** It is critical investors identify which companies in these sectors demonstrate resilience and are on track to deliver climate targets and which are the laggards.



**The broad definition of sustainability is to ensure resilience in our food, energy and water systems (F-E-W Nexus).** The Citi ESG Research team expanded this F-E-W Nexus to encompass ecosystem resilience, climate system resilience embracing systems thinking that positions human security at the core, see Figure 3 above.

**Scientists have been forewarning of the changing climate and the need to transition to a low-carbon economy.** As governments and policymakers increasingly work towards mitigating and adapting to climate change, companies are under increasing pressure to decarbonize to align their business models with a low-carbon economy.

Read more:

- [ESG Risk to Resilience: Scrutiny, Solutions and Security](#)

**The energy transition is particularly material for the companies within the hard to abate sectors** inclusive of transportation, electricity and heat, buildings, manufacturing and construction, fugitive emissions and other fuel combustion. According to the World Resource Institute this sector accounts for 75.6% of worldwide GHG emissions<sup>2</sup>.

**GHG emissions contribute significantly to the warming planet. The impact of a rising climate includes:** increased frequency of physical climate events such as droughts, floods and heatwaves; sea-levels and ocean heat continuing a trend of record-levels; increasing glacier melt and Antarctic sea ice falls. These environmental impacts are systemic and require rapid decarbonization efforts across sectors, regions and policymakers.

<sup>2</sup> <https://www.wri.org/insights/4-charts-explain-greenhouse-gas-emissions-countries-and-sectors>, February 6, 2020

**Climate-driven food and water security is projected to increase with growing warming<sup>3</sup>.** In addition, according to the latest IPCC report, in every region people are severely negatively impacted by extreme heat<sup>4</sup>.

**The negative impacts of GHG emissions are often termed as “negative externalities”.** The worsening impact of emissions on the environment and society often drive policymakers to seek to internalize the externalities. Examples of this are cap-and-trade systems such as the EU Emission Trading Scheme (ETS), Carbon taxes, UK plastic tax, UK sugar tax and others. Companies who are actively reducing their negative externalities are likely to be positioned in front of regulatory developments.

## Integrating Energy Transition into Investment Decisions

### Risk Mitigation

**Overlay ESG ratings with specific forward-looking metrics** to analyse the credibility of decarbonization efforts. Metrics such as: internal/shadow carbon price, KPI's linked to remuneration, scenario analysis based on IPCC, IEA, BNEF and others, CAPEX exposure to the EU Taxonomy first two objectives, use of carbon credits, scope 3 emissions reporting and others.

**Integrate controversy reports.** Our quantitative research team have published a report which analyses the relationship between controversies and share price.

Engage with investee companies on decarbonization.

Read more:

- [Citi ESG Research: Effective Engagement – A Focus on Outcomes](#)
- [Effective Engagement, Demonstrating Outcomes, Influencing Impact](#)
- [2023 Engagement Refresher: Focus on Materiality and Outcomes](#)

### Identifying Leaders

Screening companies based on climate credentials relative to peers. Separate hurdles by sectors, for example utilizing the CA100+ benchmark which applies separate sector specific criterion such as: for electric utilities, has the company announced a full phase out of coal units by 2040 that is consistent with the Carbon Tracker Initiative (CTI) interpretation of the International Energy Agency's (IEA) beyond 2 degrees scenario.

Read more:

- [Energy Transition Framework](#)

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<sup>3</sup>

[https://www.ipcc.ch/report/ar6/wg2/downloads/outreach/IPCC\\_AR6\\_WGII\\_FactSheet\\_FoodAndWater.pdf](https://www.ipcc.ch/report/ar6/wg2/downloads/outreach/IPCC_AR6_WGII_FactSheet_FoodAndWater.pdf), 2022

<sup>4</sup> [https://report.ipcc.ch/ar6syr/pdf/IPCC\\_AR6\\_SYR\\_SPM.pdf](https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_SPM.pdf), 2023

## Opportunities mapping

Supporting the enablers of the transition. Turnover, CAPEX, OPEX exposure to EU Taxonomy – enabling activities.

Read more:

- [Global Theme Machine - Decoding Thematic Investing: Entering a New Decade of the Theme Machine](#), Figure 40
- Companies mapped to UN SDGs related to the transition.

Read more:

- [Let's Talk Energy Transition, Carbon Pricing and Climate Benchmarks](#)
- [Engaging on Transition Resilience and Identifying Adaptation Solutions](#)
- [WATCH: Let's Talk Energy Transition, Carbon Pricing and Climate Benchmarks](#)
- [WATCH: The Bottom Line of Carbon Pricing – ESG Equity Research and Commodities Research](#)
- [Which Stocks Screen Well on Climate?](#)



## Carbon Markets and Net Zero

### Article 6 of the Paris Agreement

Article 6 of the Paris Agreement defines the legal framework for the creation of a global carbon emissions market through marketing of carbon credits.

Article 6 of the Paris Agreement establishes a framework for the voluntary international cooperation for countries to reduce emissions and meet nationally determined contributions (NDCs) or pledges.

The multilateral environmental agreement paved the way for scaling up the carbon credits market, but detailed technical provisions were open to interpretation.

Article 6 outlines a cooperative approach to using carbon credits from emissions reduction projects, known in the Agreement as “Internationally-Transferred Mitigation Outcomes” (ITMO).

It also establishes a central UN mechanism to trade credits generated from emissions reduction projects.

### Legal Framework

**Article 6 of the Paris Agreement defines the legal framework for the creation of a global carbon emissions market through marketing of carbon credits.**

Carbon crediting is the process of issuing tradeable securities to projects ensuring sequestered or avoided greenhouse gas emissions, each one representing one ton of CO<sub>2</sub> emissions.

**Unlike carbon allowances, which are traded under compliance carbon markets** and have a consolidated history, carbon credits are mainly traded under voluntary carbon markets and are generated by projects with clearly defined objectives.

**The Paris Agreement paves the way for scaling up the carbon credits market through a rulebook in its Article 6,** but detailed technical provisions were needed for the new mechanism to start operating efficiently.

**Article 6 covers the ways countries can work together to generate deeper emission reductions** and produce more ambitious national climate action plans, called “Nationally Determined Contributions” (NDCs) to the Paris Agreement.

### Internationally Transferred Mitigation Outcomes

**Article 6 includes cross-border compliance carbon markets, described as “ITMOs”** (Internationally-Transferred Mitigation Outcomes). At COP26, world leaders formally approved rules for implementing Article 6 of the Paris Climate Agreement. The final agreement seeks to resolve technicalities of paragraphs 2 and 4 of Article 6.

At COP26 in Glasgow an agreement was reached in relation to Article 6 on carbon markets

**At COP26 in Glasgow an agreement was reached in relation to Article 6 on carbon markets,** making the Paris Agreement fully operational. This will give certainty and predictability to both market and non-market approaches in support of mitigation as well as adaptation.

**The guidance has strong provisions against double counting of emission reductions, to safeguard integrity** and requires corresponding adjustments for all “Internationally-Transferred Mitigation Outcomes” (ITMO). The COP26 decision creates unified and internationally-controlled standards and includes provisions to avoid double counting and “carbon leakage”.

**The amended Article 6 allows a hosting country of an offsetting project to decide whether sequestration should be counted** towards its own climate target or marketed elsewhere. The amended Article 6.4 states that voluntary emissions reductions may only be used towards a country's Nationally Determined Contribution if they are authorised by the UN and the host country must apply a corresponding adjustment for any units sold abroad to avoid double counting. The new rules will also require developers to deposit 5% of the credits generated by a project into a fund to steer capital toward developing countries.

## Carbon Pricing

**A carbon price is an economic instrument applied to GHG emissions to incentivize polluters to reduce emissions**

**A carbon price is an economic instrument applied to GHG emissions to incentivize polluters to reduce emissions**<sup>5</sup>. The 2023 World Bank State and Trends of Carbon Pricing Report describes the evolution, diversity and sophistication of the carbon markets that seeks to promote standardization transparency.

**A carbon price is an economic signal used by governments and corporates as part of a climate mitigation effort and to inform scenario analysis.** In the High-Level Commission on Carbon Price Report, Stiglitz & Stern (2017) conclude that a carbon price of US\$40 - US\$80/tCO<sub>2</sub>e by 2020, rising to US\$50 - US\$100/tCO<sub>2</sub>e by 2030, when combined with supportive policies, would allow for achievement of the Paris goal.

**Analysing a shadow carbon price on its own, as a single metric, will not deliver a complete view** on how successful the company is transitioning and mitigating risks towards a future carbon tax.

**Analysis** conducted by the Citi ESG Research team finds that it is still too early to assess the full impact on bottom line from the adoption of a shadow carbon price. However, it is useful to understand climate-preparedness if it is aligned to European regulation and demonstrates how far out into the future companies are looking with regard to future carbon taxes.

**The Citi ESG Research also found that companies that weighted low on carbon price compared to peers were predominantly U.S. based.** The sectors were Chemicals, Consumer Goods, Electric Utilities and Industrials and the analysis questions whether this is simply a reflection of the more ambitious EU-ETS and mandated climate-related disclosures in alignment to TCFD, SFDR and EU Taxonomy.

Read more:

- [WATCH: Unpicking Corporate Carbon Price Disclosures with Nicolette Bartlett CDP: Video Webcast](#)
- [Key Topics from Voluntary Carbon Markets Webinar](#)
- [WATCH: The Role of Voluntary Carbon Markets \(VCM\) in Meeting Net Zero Targets: Video Webcast](#)
- [European ESG & SRI - ESG 2022 Roadshow Wrap Up](#)

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<sup>5</sup> <https://www.lse.ac.uk/granthaminstitute/explainers/what-is-a-carbon-price-and-why-do-we-need-one/> (1 November 2019)

## The Global Methane Pledge

Around 150 countries have now joined the Global Methane Pledge, which aims to reduce methane emissions from human activity by 30% from 2020 levels by 2030.

### Why Consider Methane Emissions

Concentration of methane in the atmosphere is currently around two-and-a-half times greater than pre-industrial levels and steadily increasing.

Concentration of methane in Earth’s atmosphere is currently around two-and-a-half times greater than pre-industrial levels and steadily increasing. This has important implications for climate change as methane (CH<sub>4</sub>) is 80 times more potent than carbon dioxide (CO<sub>2</sub>) in terms of climate warming.

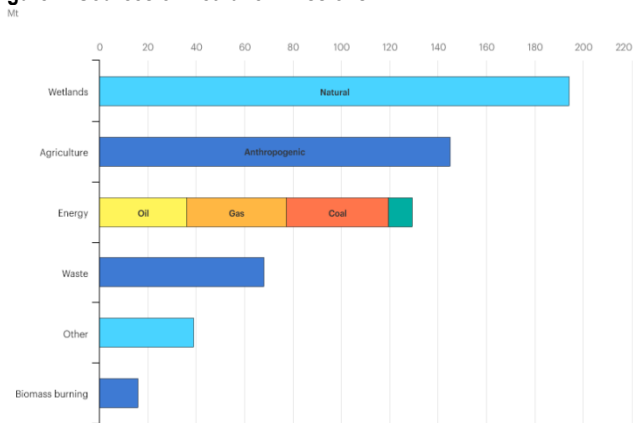
Earth’s atmosphere has also been recognized by The Taskforce on Nature-related Financial Disclosures (TNFD) in the final recommendations: “climate change is a global process within one shared atmosphere”<sup>6</sup>. The TNFD identifies four realms for nature: ocean, freshwater, land and atmosphere.

About 60% (360mt) of methane released globally is from human activities described as anthropogenic activity<sup>7</sup>, while natural sources contribute about 40% (230mt). The IEA describe two key characteristics that determine the impact of greenhouse gases on the Earth’s climate: the length of time they remain in the atmosphere and their ability to absorb energy. Methane has the ability to absorb much more energy whilst it is in the atmosphere and its concentrations are rising at an alarming rate.

### Methane Emissions

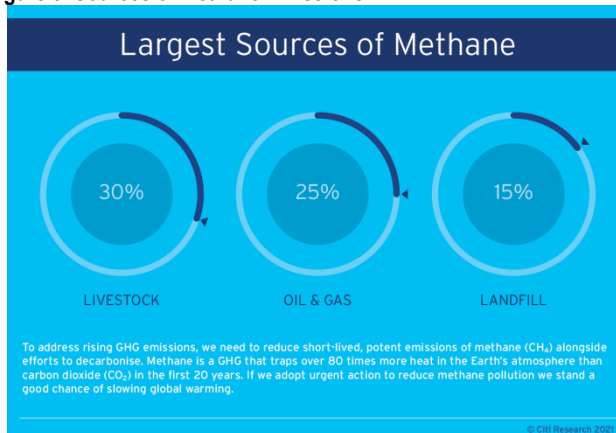
According to the IEA, the largest contributing anthropogenic factor to methane emissions comes from agriculture followed by energy and waste, see Figure 4. Agriculture is responsible for approximately 25% of emissions, whilst the oil and gas sector in the energy industry emits 80 million tonnes of methane annually<sup>8</sup>.

Figure 4. Sources of Methane Emissions



Source: IEA

Figure 5. Sources of Methane Emissions



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Source: Citi Research

<sup>6</sup> [https://tnfd.global/wp-content/uploads/2023/08/Recommendations\\_of\\_the\\_Taskforce\\_on\\_Nature-related\\_Financial\\_Disclosures\\_September\\_2023.pdf?v=1695118661](https://tnfd.global/wp-content/uploads/2023/08/Recommendations_of_the_Taskforce_on_Nature-related_Financial_Disclosures_September_2023.pdf?v=1695118661)

<sup>7</sup> <https://www.iea.org/reports/global-methane-tracker-2022/methane-and-climate-change>

<sup>8</sup> <https://www.methanesat.org/purpose/>

According to the Intergovernmental Panel on Climate Change (IPCC), one tonne of methane can be considered to be the equivalent of 28 – 36 tonnes of CO<sub>2</sub>, when considering its impact over a 100-year time span<sup>9</sup>.

## Emissions Tracking

**Satellite technology is increasingly being used to track and measure methane emissions**, giving precise data on locations. With this approach, it is possible to track emissions, rate of time and verify performance of companies made against any stipulated targets.

**Leveraging this technology to understand methane emissions ensures data granularity**, enabling the quantification in various ways. For example, the footprint of emissions from the oil and gas sector can be analysed and quantified on a regional scale. Methane emissions can be quantified from both large sources and small sources, with the emissions from smaller sources aggregated.

**Whilst the development of satellite technology to track methane emissions is welcome progress in the field, some limitations persist.** Satellites are unable to provide measurements over equatorial regions or offshore operations. Moreover, weather conditions could create interferences, making it difficult to obtain methane readings and data on a daily basis.

**Methane is responsible for around 30% of the rise in global temperatures.** It dissipates faster than CO<sub>2</sub> and is a much more powerful greenhouse gas. The 2023 update of the IEA Global Methane Tracker<sup>10</sup> estimate that the global energy sector was responsible for nearly 135 million tonnes of methane emissions in 2022 and increase from 2021. Coal, oil and natural gas operations are each responsible for around 40 Mt of emissions and nearly 5 Mt of leaks from end-use equipment.

**Satellites have greatly increased the world's knowledge of methane emission sources.** However, the coverage provided by satellites is still far from complete: existing satellites do not provide measurements over equatorial regions or offshore operations.

**Major methane reductions can be achieved with known technologies and with tried and tested policies** that have been proven to work effectively. Global methane emissions from oil and gas operations would fall by more than 90% if all producing countries matched Norway's emissions intensity, the lowest worldwide.

Read more:

- [ESG Snippets: COP26 so far... Deforestation and Methane Pledges lead the way](#)

## Biodiversity Loss

### Global Biodiversity Framework (GBF)

Four overarching goals agreed at the UN CBD address ecosystem integrity, sustainable use, fair and equitable sharing of genetic resources and closing the estimated US\$700bn biodiversity funding gap.

In 2022, the 15th COP to the UN Convention on Biological Diversity (CBD) adopted the “Kunming-Montreal Global Biodiversity Framework” (GBF) that includes four Goals and 23 Targets for 2030.

<sup>9</sup> <https://www.iea.org/reports/methane-tracker-2021/methane-and-climate-change>

<sup>10</sup> <https://www.iea.org/reports/global-methane-tracker-2023/overview>

**This landmark COP agreed on Goals and Targets critical to tackling biodiversity loss**, ecosystem restoration, addressing environmentally harmful subsidies and reducing global food waste. See some key facts in Figure 6.

**Four overarching goals address ecosystem integrity, sustainable use, fair and equitable sharing of genetic resources and closing the estimated US\$700bn biodiversity funding gap.** These goals should be aligned to the Global Biodiversity Framework and 2050 Vision for Biodiversity.

**Figure 6. Facts on Biodiversity Loss**

Biodiversity-Related Data		Source	
1	<b>US\$58tn</b>	Over half the world's total GDP is moderately or highly dependent on nature and its services and, as a result, exposed to risks from nature loss	World Economic Forum & PWC
2	<b>US\$2.7tn</b>	Decline in global GDP by 2030 from the collapse of ecosystem services such as pollination, provision of food from marine ecosystems and timber from native forests	The World Bank
3	<b>US\$428bn</b>	Estimated cost to the global economy of <b>human-caused declines in ocean health and biodiversity loss</b>	Intergovernmental Panel on Climate Change
4	<b>&gt; US\$300bn</b>	The cost to the global economy from natural disasters linked to <b>ecosystem degradation</b> and climate change	Intergovernmental Panel on Climate Change
5	<b>US\$824bn</b>	Up to \$824bn needed each year, in the next ten years, to close the <b>Biodiversity Funding Gap</b>	Cornell University
6	<b>US\$154bn</b>	Current annual financial flow into nature-based solutions, with public funds accounting for 83% of total investment	United Nations Environment Programme
7	<b>10m</b>	There are an estimated over <b>10 million multicellular species</b> but only about 1.7 million are known	UN Convention on Biological Diversity
8	<b>&gt;1,240</b>	Companies already taking action for nature	World Wide Fund for Nature
9	<b>140</b>	Signatories to Finance for Biodiversity Pledge (FfB) with EUR19.7tn AUM as of September 2023	Finance for Biodiversity
10	<b>80%</b>	UN Sustainable Development Goals (SDGs) dependent on halting biodiversity loss	Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services

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Source: Citi Research

## Taskforce on Nature-Related Disclosures (TNFD)

**In September 2023, the Taskforce on Nature-Related Disclosures (TNFD) released their recommendations** and guidance for organisations reporting and acting in scope of nature-related concerns.

**The recommendations have been designed to remain consistent with the approach and structure of the Task Force on Climate-related Financial Disclosures (TCFD)**

The recommendations have been designed to remain consistent with the approach and structure of the Task Force on Climate-related Financial Disclosures (TCFD) and the International Sustainability Standards Board (ISSB). The four disclosure pillars and all 11 TCFD recommended disclosures have been incorporated into the ISSB Standards and its global sustainability reporting baseline. It is expected that TNFD will have similar influence.

TNFD recommended disclosures fall into four pillars:

1. **Governance** – of nature-related dependencies, impacts, risks, and opportunities
2. **Strategy** – the effect of natural-related dependencies, impacts, risks, and opportunities on organisation's strategy, business model, and financial planning
3. **Risks** – processes used by the organisation to identify, assess, prioritise, and monitor nature-related dependencies, impacts, risks, and opportunities.
4. **Metrics and targets** – used to assess and manage nature-related dependencies, impacts, risks, and opportunities.

**TNFD inclusion of human rights policies is notable, and a new addition since TCFD.**

**TNFD inclusion of human rights policies is notable, and a new addition since TCFD.** Citi's ESG Research Team have recently published on social metrics and human rights: regulation, changing consumer sentiments, and increasing access to data, are all driving increasing risk associated with human rights.

**The Corporate Sustainability Due Diligence Directive (CSDDD) potentially reaches further than EU states** as it captures non-EU companies based on revenue exposure to the EU. The CSDDD requires companies to monitor and prevent human rights violations in their core operations, as well as supply chains.

**Complex, opaque supply chains can obscure the level of human rights standards in operations.**

**Complex, opaque supply chains can obscure the level of human rights standards in operations.** As regulation seeks to enforce greater transparency, traceability, and accountability, companies will be required to disclose greater data related to practices in their direct operations, as well as their supply chains.

## **Six General Requirements for TNFD**

**The recommendations include six general requirements**, which should be applied to help create consistency in the information disclosed:

1. **Application** of materiality
2. **Scope** of disclosures
3. **Location** of nature-related issues
4. **Integration** with other sustainability-related disclosures
5. Time horizons considered
6. **Engagement of Indigenous Peoples**, Local Communities, and affected stakeholders in identification and assessment of organisation's nature-related issues

**The interaction of these disclosures and requirements have been designed on the basis of TNFD Principles**, including market usability, the integration of scientific evidence, a minimum level of granularity required to achieve nature-positive action, and the climate-nature nexus. They have also been designed to be globally inclusive and relevant across emerging and developed markets.

## Role of Geospatial Technology

**Earth's atmosphere is a major component of the natural world.** The TNFD recognizes the close association between climate and nature-related risks and opportunities. Sectors such as food and agriculture are heavily reliant on land use and leverage geospatial technology for insights on landscapes in supply chains.

**Geospatial analysis reveals changes in carbon emissions from an identified area of land,** which is informative for scope 3 emissions and financed emissions footprint. Investors can obtain specific, granular carbon information on specified areas of land and map out the changes over time to spot trends around deforestation and land use change.

**Geospatial analysis can more accurately measure efforts to tackle deforestation and deliver regeneration.**

**Geospatial analysis can more accurately measure efforts to tackle deforestation and deliver regeneration.** It is possible to understand historical deforestation, which has occurred in context of how much primary forest has been removed, how monoculture plantations have replaced biodiversity-rich primary forests, and where tree cover changes have occurred.

**This distinction is important for investors reporting into TNFD as it enables proper classification** through indicating a change in harvest or actual deforestation, improving quality of information and decision-making. Regenerative practices and progress in restoration from trees can be tracked and geospatial technology can act as a means of verification and measurement.

Read more:

- [TNFD Updates: Part I](#)
- [TNFD Updates Part II: Biodiversity is Not Just Butterflies and Bees](#)
- [TNFD Updates Part III: Role of Geospatial Technology](#)
- [WATCH: The Role of Geospatial Technology as part of the TNFD disclosure framework: Video Webcast](#)

Figure 7. Global Biodiversity Framework

## Global Biodiversity Framework: 4 Goals 23 Targets

The Global Biodiversity Agreement has **FOUR** overarching goals for **2050** and **23 GLOBAL TARGETS** for **2030** to address **UNPRECEDENTED** loss of biodiversity with plans to **RESTORE** and **PROTECT** natural ecosystems.



By 2030: **PROTECT** 30% of Earth's lands, oceans, coastal areas, inland waters; **REDUCE** by US\$500 billion Environmentally Harmful Subsidies (EHS) and **TARGET** a 50% reduction in Food Waste

- Target 1: Inclusive spatial planning for ecosystems high ecological integrity
- Target 2: Restoration at least 30% degraded land & water by 2030
- Target 3: Areas high ecological integrity conserved and managed
- Target 4: Halt human induced extinction of species at risk
- Target 5: Sustainable harvest and trade wild species to minimise spillover
- Target 6: Minimise invasive alien species on high priority ecosystems
- Target 7: Reduce harmful pollution: pesticides and hazardous chemicals
- Target 8: Minimize impact climate change and ocean acidification
- Target 9: sustainable management wild species using indigenous knowledge
- Target 10: sustainable management agriculture, aquaculture, fisheries, forests
- Target 11: enhance ecosystem services: pollination, clean air, soil health, water
- Target 12: access green and blue space
- Target 13: fair and equitable benefits of genetic resources
- Target 14: full integration into policies, regulations and financial flows
- Target 15: Financial institutions monitor, assess and disclose risks, dependencies and impacts
- Target 16: sustainable consumption
- Target 17: biosafety measures
- Target 18: reduce EHS by at least US\$500bn per year by 2030
- Target 19: mobilise US\$200bn per year PES, offsets, BioCredits, Green bonds
- Target 20: Capacity building technology
- Target 21: Best available data and FPIC
- Target 22: Ensure an equitable, inclusive and gender responsive approach
- Target 23: Ensure gender equality in the implementation

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Source: Citi Research



## Definitions

**Biological Diversity or Biodiversity** - refers to the wide variety of plants, animals and other living things, and to the ecosystems that they form. Biodiversity is the biological variety and variability of life on Earth.

**Biodiversity** is a measure of variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

**Biodiversity** is unevenly distributed on Earth and is richer in the tropics. These tropical forest ecosystems cover 7% of Earth's surface and contain about 90% of the world's species.

**Ecosystem** - An ecosystem is made up of all living things in an area, and the interactions between them. An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system.

Components are linked together through nutrient cycles and energy flows. Energy enters the system through photosynthesis and is incorporated into plant tissue. Ecosystems are dynamic entities and impacted by external factors such as a changing climate.

## Deforestation

### Tackling Deforestation Critical to Climate Action

The acceleration in net-zero commitments recognises role that forests play in meeting emission reduction targets.

The acceleration in net-zero commitments recognises the role that forests will have to play in meeting emission reduction targets. Deforestation, the permanent clearing of forests and conversion to non-forest use, represents one of the largest issues in global land use change estimated at 20% of GHG emissions.

Tackling deforestation linked to commodity supply chains and forest risk commodities is of increasing focus by investors when looking at supply chain emissions identifies links to deforestation and forest risk commodities, see some key facts in Figure 8 below.

**Figure 8. Key facts on Deforestation**

Facts on Deforestation			Source
1	US\$203bn	Annual amount required for forest based solutions globally	World Economic Forum
2	US\$79bn	Risks resulting from deforestation are valued at US\$79bn	CDP
3	US\$12bn	COP 26 Global Forest Finance pledge to collectively provide forest related climate finance until 2025, by 12 donor governments	United Nations Food and Agriculture Organisation
4	>3GTCO <sub>2</sub> e	Global GHG mitigation potential of deforestation	Intergovernmental Panel on Climate Change
5	>80m ha	Reduction in area of primary forest globally since 1990 as a result of deforestation	United Nations Food and Agriculture Organisation
6	10m ha	Estimated rate of deforestation per year since 2015 globally	United Nations Food and Agriculture Organisation
7	1,043	Companies that disclose to CDP on how they are managing deforestation	CDP
8	145	Countries that signed Glasgow Leaders' Declaration on Forests and Land Use representing 90% of forest covered at COP26	UK COP26 Glasgow Leaders
9	100 tonnes	Amount of carbon per hectare released immediately as a result of deforestation	Intergovernmental Panel on Climate Change Response Strategies Working Group Reports
10	90%	Agricultural expansion drives almost 90% of global deforestation for key forest risk commodities such as palm oil, soy, beef and rubber	United Nations Food and Agriculture Organisation

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Source: Citi Research

**Deforestation is the permanent clearing of forests and conversion to non-forest use and represents one of the largest issues in global land use change estimated at 20% of global GHG emissions.**

**Tropical forests are biodiversity rich hotspots and harbour some of the richest and most critically endangered species on Earth**

**Tackling deforestation is critical to reducing terrestrial emissions.** There is no solution to climate change without tackling deforestation and negative emissions, a term used by climate scientists for the removal of atmospheric CO<sub>2</sub>. Reducing emissions from deforestation, first discussed at UN Climate Change negotiations 15 years ago, has evolved to become a vital pillar for achieving the Paris Agreement.

**Deforestation and land use change is also a major driver of biodiversity loss.** Deforestation is driven mainly by agricultural expansion for globally traded commodities including beef, soybean, palm oil, timber, coffee, rubber and cocoa.

**Habitat destruction and human encroachment into remote, undisturbed and intact forest biomes** is a driver of biodiversity loss. These biodiversity rich hotspots harbour some of the richest and most critically endangered species on Earth.

## **Tropical Forests are Biodiversity Hotspots**

**Tropical forests are biodiversity rich hotspots and harbour some of the richest and most critically endangered species on Earth.** Tropical forest ecosystems cover less than 10% of Earth's surface yet contain about 90% of the world's species.

**Habitat destruction and human encroachment into remote, undisturbed and intact forest biomes is a driver of biodiversity loss.** Earth system scientists warn that the Amazon rainforest, along with other biomes, are approaching irreversible tipping points with far-reaching effects on the economy and society.

**Scientists at the Convention on Biological Diversity state that climate change, deforestation and biodiversity loss are deeply connected.** Biodiversity is directly impacted by a changing climate and habitat loss with negative consequences for human well-being, but biodiversity, through the ecosystem services it supports, also makes an important contribution to both climate-change mitigation and adaptation.

## **Forests Face Multiple Threats**

**In the last decade, we have lost over 20 million hectares of forest for conversion to plantations and agricultural land for cattle grazing.** Between 2015 and 2020, the rate of deforestation was estimated at 10 million hectares per year<sup>11</sup>.

**Deforestation is estimated to have contributed between 10-20% of global GHG emissions<sup>12</sup>.** Tackling emissions from deforestation can, and will, have a role to play in reversing rising GHG emissions and negative emissions (a term used by climate scientists for the removal of atmospheric CO<sub>2</sub>). Carbon sequestration from natural solutions (photosynthesis) will need to be part of the solution to meet Net Zero by 2050.

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<sup>11</sup> UN Food and Agricultural Organisation

<sup>12</sup> IPCC Climate Change and Land An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. See A3.6 Page 13.

## EU Deforestation Regulation (EU-DR)

**In June 2023, pioneering EU regulation on deforestation-free supply chains,** considered a critical component in climate adaptation and efforts to reduce emissions and reverse biodiversity loss, came into force.

**Companies that source or place key commodities such as palm oil, beef, soy, cocoa, rubber and timber on the EU market will be under increased scrutiny** to evidence that these products are not linked to illegal deforestation and do not contribute to forest degradation. Operators will have 18 months to accelerate supply chain monitoring to meet these new requirements.

**The introduction of this landmark law on deforestation reflects agreements** reached at the COP26 Glasgow Declaration on Forests to halt and reverse forest loss and land degradation by 2030.

**Future regulation requests that financial market participants disclose their share of investments in companies without a policy to address deforestation** and that companies start to disclose that supply chains are deforestation free. As investors develop long-term, sustainable solutions to tackle rising emissions there is an increasing awareness that halting and reversing deforestation and engaging with investee companies on the issue will have a critical role to play.

## Definitions

**Deforestation** refers to the clearing of a forest and the main driver of deforestation is unsustainable and illegal forest conversion for agriculture activity.

When a forest is **Degraded** it still exists, but it can no longer function. It becomes a shell of its former self; its health declines until it can no longer support people and wildlife by, for example, filtering the air and water or providing animals with food and habitat.

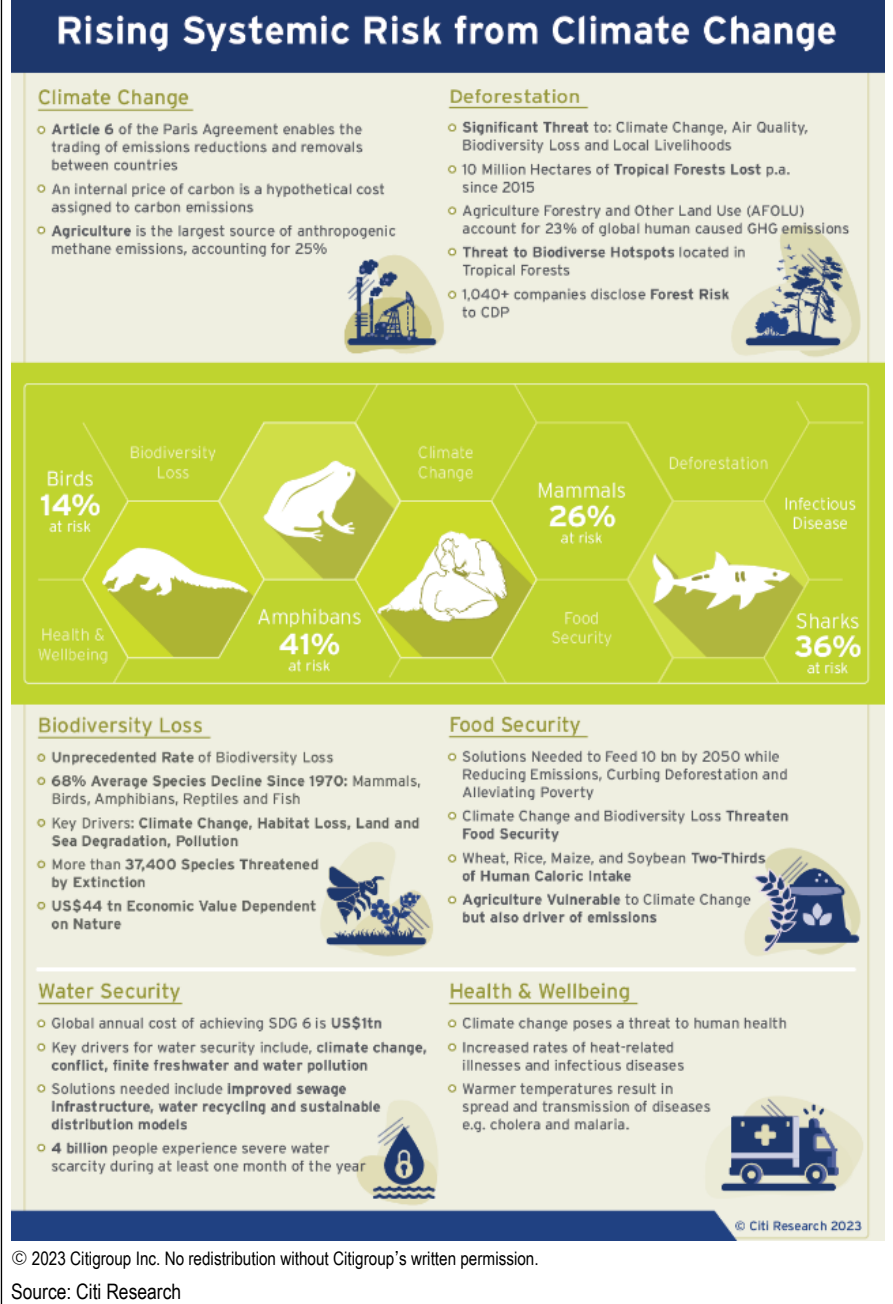
**The High Carbon Stock Approach (HCS)** - distinguishes forest areas for protection from degraded lands with low carbon and biodiversity values.

**High Conservation Values (HCV)** - significant biological, ecological, social and cultural features of an environment, such as endangered species, riverbanks or archaeological sites. Three-step process in which HCVs are identified, managed and monitored to ensure maintenance over time.

Read More:

- [The Earth Observation Ecosystem: A Critical Climate Enabler](#)
- [EU Regulation on Deforestation-Free Supply Chains](#)
- [Key Takeaways from EU-DR and Satellite Monitoring Webinar](#)
- [Earth's Sleeping Giant: The Amazon Rainforest, Deforestation, Climate Change and the Biodiversity Nexus](#)
- [Decoding Deforestation Disclosures: What Does Good Look Like?](#)
- [VIDEO: Investor Sentiment Survey on the Integration of Biodiversity Loss and Climate Change](#)
- [VIDEO: Halting and Reversing Deforestation this Decade in Conversation with Prof. Sir Charles Godfray](#)
- [VIDEO: Decoding Deforestation Disclosures: What Does Good Look Like? – Part One](#)

Figure 9. Rising Systemic Risk from Climate Change



## Social Metrics

### Human Security

**Regulation is increasingly calling for greater disclosure related to social and human capital related risks.**

**Regulation is increasingly calling for greater disclosure related to social and human capital related risks.** Recent proposed regulation (CSDDD) goes beyond reporting requirements and seeks to mandate companies on due diligence standards in direct operations as well as supply chains. Failure to do so can lead to civil liability or fines.

**Much of the sustainability regulation includes social considerations and a prerequisite to abide by international minimum social principles.** This helps drive companies to consider the social impact of their operations, product, and services in order to attract and maintain investment.

**Companies are also cognizant of the growing awareness of sustainability being much broader than climate, inclusive of social issues.** The immediate ramifications felt should a social risk materialize, creates pressure for corporates to protect their social license to operate.

**Integrating social into investment decisions requires reliable consistent data.** The EU Sustainable Financial Disclosure Regulation (SFDR) includes a set of 14 Principle Adverse Indicator (PAI) metrics which investors must disclose. Five of the metrics are centered around social issues such as violations of UN Global Compact principles and OECD Guidelines for Multinational Enterprises and board gender diversity.

**Given that investors require this information, it is likely that corporates start disclosing this data voluntarily.** This set of metrics then acts as a starting point for consistent comparable social data disclosed by companies.

### Growing Social Awareness

**The growing awareness of social issues, the Just Transition and the interconnectivity of sustainability issues is likely to drive better, evidence-based integration of social considerations by both corporates and investors.** Aside from regulation, geopolitical tensions are further exacerbating risks related to energy, food, water, human security.

**Several academics have looked at the relationship between energy security, renewable energy and geopolitics.** One example of this: [Does energy security improve renewable energy? A geopolitical perspective \(ScienceDirect, 2023\)](#).

**Building resilience seeks to address the root causes of crises whilst also strengthening capability and resources to cope with the risks, stresses and shocks these crises present.** Systems thinking is a holistic approach to analysis that focuses on the way a system's constituent parts interrelate and how systems work overtime.

**Companies that have identified social risks are better positioned to build strategies to mitigate these risks.** In doing so, these companies are building the resilience required to be considered sustainable. More generally, resilience can be defined as the process of adapting well in the face of adversity, trauma, tragedy, threats, or significant sources of stress.

**Food security, water stress and supply chain resilience have been highlighted by a series of events in recent years.** We are witnessing several supply chain

shocks in quick succession: (i) pandemic-related supply chain displacement; (ii) a six-day obstruction by the Ever Given in the Suez Canal and (iii) the current conflict in Ukraine has resulted in major disruption to key crops.

## Supply Chain Disruption

**Russia and Ukraine supply 28% of globally traded wheat, 29% of the barley, 15% of the maize and 75% of sunflower oil<sup>13</sup>.** This is already having an impact on global supply chains and could be further exacerbated by labor shortages, closure of airspace and disturbance to shipping lanes and truck routes. This is a window into supply chain dislocations from future climate-related events such as floods, droughts, water stress and heat waves.

## Social Risks

Aside from social risks related to energy, water, food, and human security there are also areas within a company's operations that investors can integrate social factors.

Social risks include:

**Reputational damage** – Greater awareness of social violations, fuelled in-part by social media and access to data, makes corporates and investors increasingly vulnerable to risks related to reputation. The greatest impact likely felt by sectors directly exposed to consumer sentiment. A World Economic Journal report found that *“Reputation is not just a repository of shareholder value, it is also a means to grow it. This analysis suggests that a notional 5% improvement of the strength of an extant reputation would yield a market capitalization growth of 2.5% for the average S&P500 company and 2.2% in the FTSE100<sup>14</sup>.”*

**Corporate controversies** – Wider than reputational damage, controversies can have immediate financial implications. Controversial projects can lead to significant delays such as the East African Crude Oil Pipeline (EACOP), which is significantly exposed to social issues such as those relating to the local communities<sup>15</sup>.

Controversies themselves once occurred can have financial implications, see more on this later in the report.

**Regulatory requirements** – Disclosure requirements within the EU Taxonomy, SFDR and CSRD all include social metrics. Regulation globally is moving away from voluntary guidelines and toward legislative minimum social requirements related to human rights and labour practices.

Regulatory breaches lead to fines incurred, beyond that, the cost of reputational damage due to regulatory wrong-doing has been cited as £1.15 billion worth of value loss for the average FTSE 100 firm<sup>16</sup>.

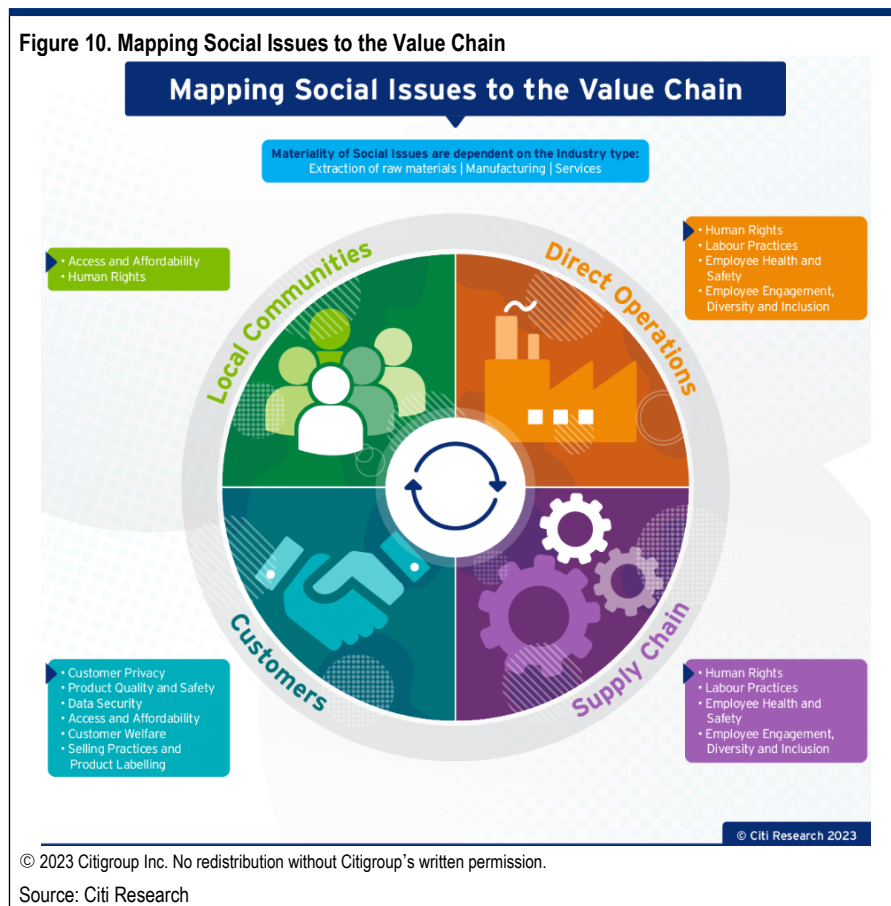
<sup>13</sup> <https://impact.economist.com/projects/trade-in-transition/food-inflation/#:~:text=Regarded%20as%20the%20breadbaskets%20of,and%2075%25%20of%20sunflower%20oil.&text=However%2C%20exports%20of%20these%20goods,a%20result%20of%20global%20sanctions.>

<sup>14</sup> [https://www.world-economics-journal.com/Papers/The%20Impact%20of%20Reputation%20on%20Stock%20Market%20Value\\_3d2c6d00-f485-4dfe-b9bb-76b22c0c64ef.paper](https://www.world-economics-journal.com/Papers/The%20Impact%20of%20Reputation%20on%20Stock%20Market%20Value_3d2c6d00-f485-4dfe-b9bb-76b22c0c64ef.paper), February 2013

<sup>15</sup> <https://www.independent.co.uk/eacop-construction-starts-after-june-delayed-by-pap-grievances/> (12 January 2023)

<sup>16</sup> <https://www.grantthornton.co.uk/insights/esg-how-a-bad-rep-can-seriously-hurt-a-firms-value/>, April 2022

**Social issues can manifest in different areas of the value chain.** Investors focusing on financial materiality can focus on the specific areas in the value chain with the greatest material risk and the underpinning social themes.



**Fixed income also offers solutions to mitigating and solving social issues.** Social bonds and Sustainability-linked bonds (SLBs) offer investment strategies which can focus specifically on social issues.

**SLBs have faced recent criticism due to the lack of ambition in KPIs as well as the minimal coupon step-up for missed targets<sup>17</sup>.** Investors are under increasing scrutiny in regards to their sustainability classified strategies therefore we will be observing closely on the level of issuance/demand of SLBs as well as any changes in the level of ambition within the instruments going forward.

## Critical Minerals

### Critical Minerals and Emission Reduction

**Critical minerals are key components in various clean energy technology developments and therefore play a vital role in delivering reduced reliance on fossil fuels.**

**Increasing attention and emphasis placed on critical minerals is directly linked to the rapid and urgent need to reduce GHG emissions.** The Paris Agreement, signed in 2015, set the target to limit temperature increase to 1.5°C above preindustrial levels.

<sup>17</sup> <https://www.bloomberg.com/news/articles/2022-09-20/the-booming-esg-bond-that-s-facing-growing-skepticism-quicktake?leadSource=verify%20wall> 2022

**The need for urgent and rapid decarbonization is directly linked to the pivot away from fossil fuel to clean energy technology.** Critical minerals are key components in various clean energy technology developments and therefore play a vital role in delivering reduced reliance on fossil fuels.

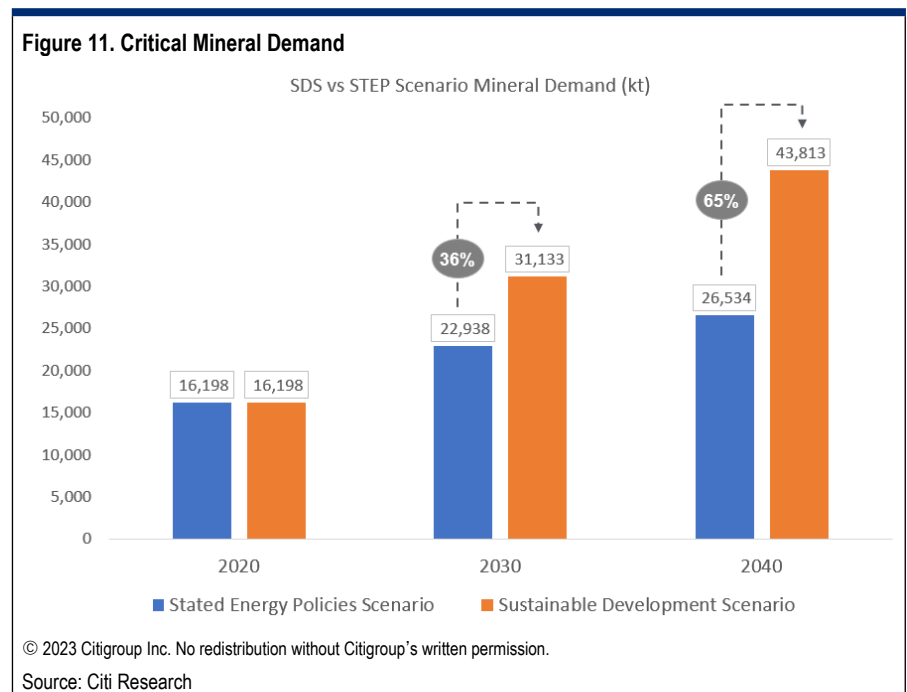
**The energy transition, climate security and the supply of critical minerals are inextricably linked.** To successfully fulfil net zero ambitions and attain climate security, production of critical minerals need to be accelerated to fulfil the resulting increasing demand.

### Relevance of Critical Minerals

**In light of global needs for both an energy and climate secure future, it is important for investors to understand the relevance of critical minerals,** the investment opportunities within the space and the risks which could result if critical minerals becoming the next energy security crisis. Exploring these investment opportunities will deliver resilience linked to energy and human security.

**IEA Stated Energy Policies Scenario (STEP)** – Assesses guidance under current governmental policies and those currently under development, and the energy related goals that have been set. It does not consider potential additional intervention from policy makers. An example of this is Nationally Determined Contributions<sup>18</sup>

**IEA Sustainable Development Scenario (SDS)** – Highlights the advancement of the energy sector required to reach key energy linked targets of the UN, such as Climate Action (SDG 13) and Affordable and Clean Energy (SDG 7)<sup>19</sup>.



<sup>18</sup> <https://www.iea.org/reports/global-energy-and-climate-model/stated-policies-scenario-steps>

<sup>19</sup> <https://www.iea.org/reports/clean-energy-innovation/innovation-needs-in-the-sustainable-development-scenario>

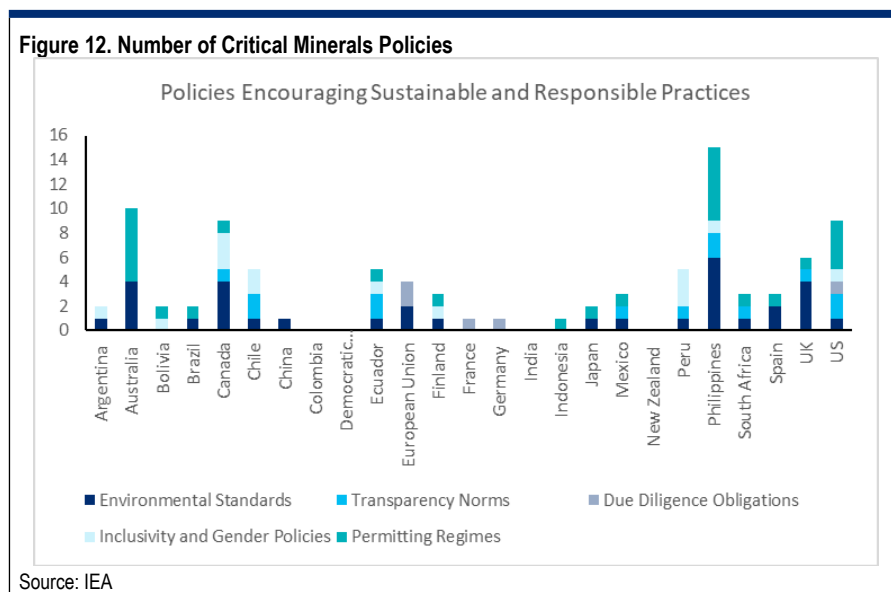


Figure 11 above highlights mineral demand under both the Stated Energy Policies Scenario (STEP) and Sustainable Development Scenario (SDS) scenarios. In both 2030 and 2040, there is a significant disparity between both scenarios, with the STEP scenario indicating lower demand than the SDS scenario by 36% and 65% respectively.

## Regulation and Policy as Key Drivers

**In our view, regulation and policy will be a main driver behind forthcoming changes in the current market** as we expect additional countries to enter the market due to ongoing discovery of resources. According to President Biden, *“the climate crisis is about human security, economic security, environmental security, national security, and the very life of the planet”*<sup>20</sup>.

**This interlink between various aspects of security is particularly relevant in relation to critical minerals**, further supporting our thesis that this topic will be addressed on a national scale, through policy and regulation, as countries look to secure their future prosperity.



As indicated by Figure 12 above, a number of countries are implementing policies focused on promoting sustainable and responsible practices on a national and global scale. Across the board, most policies are directed towards upholding and improving environmental standards, closely followed by permitting.

Both the United States and European Union have introduced legislation to encourage production of critical minerals.

## U.S. Inflation Reduction Act (IRA)

**The U.S. Inflation Reduction Act indicates how federal law can be leveraged to promote and enable diversification in global production sources.**

**The U.S. Inflation Reduction Act (IRA) indicates how climate legislation can be leveraged to promote and enable diversification in global production sources through incentives and tax credits.** It is perceived as one of the most significant, if not the most significant piece of climate legislation to date. With US\$369 billion

<sup>20</sup> <https://www.whitehouse.gov/briefing-room/speeches-remarks/2022/11/11/remarks-by-president-biden-at-the-27th-conference-of-the-parties-to-the-framework-convention-on-climate-change-cop27-sharm-el-sheikh-egypt/>

earmarked for investment in energy security and climate change projects, The Act contains critical mineral investment incentives.

To comply with the consumer tax credit for electrical vehicles, critical minerals must be extracted or processed in the U.S. or in any country with which the U.S. has a Free Trade Agreement (FTA) in effect or recycled in North America<sup>21</sup>. Current critical minerals producers with FTAs include<sup>22</sup>:

- Australia
- Chile
- Mexico
- Canada

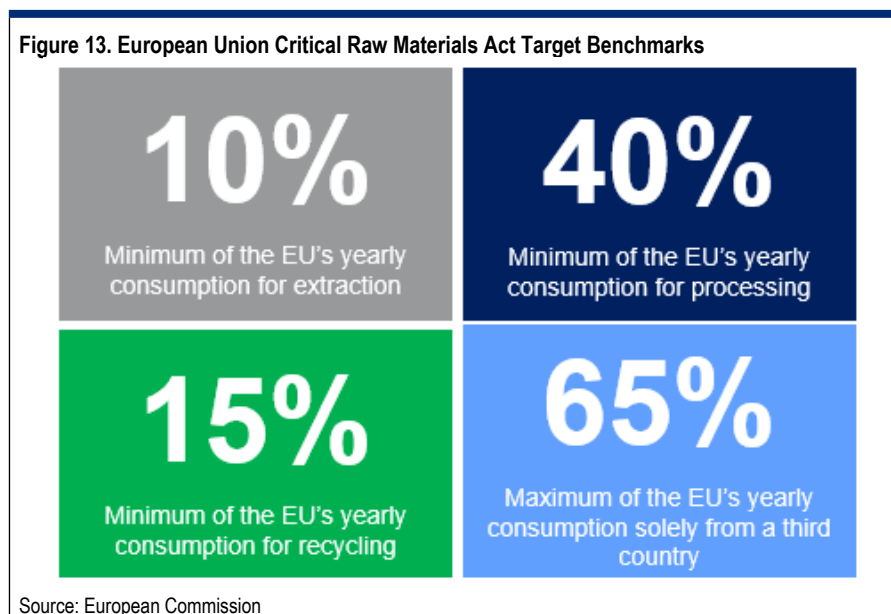
At least 40% of the critical minerals used need to be developed or built in North America from 2024 and this threshold increases to 80% in 2026<sup>23</sup>.

- Mining companies involved in the extraction or processing of critical minerals in the U.S. or in any country with which the U.S. has a FTA will be eligible to receive production credits equivalent to 10% of production costs, as long as the critical minerals meet the required purity standards.

### European Critical Raw Materials Act

**Similar to the U.S., the European Union is dependent on international trade for its critical minerals supply requirements.** With such high concentration risk, the Critical Raw Materials Act seeks to reduce the supply concentration risk and maintain global competitiveness, especially considering the stimulus outlined in the U.S. Inflation Reduction Act.

In line with the objective to build more sustainable and self-aligned supply chains, The European Critical Raw Materials Act has set target benchmarks for domestic capacities. Figure 13 below illustrates the target benchmarks.<sup>24</sup>



<sup>21</sup> <https://www.congress.gov/117/bills/hr5376/BILLS-117hr5376enr.pdf>

<sup>22</sup> <https://www.state.gov/trade-agreements/>

<sup>23</sup> <https://www.congress.gov/117/plaws/publ169/PLAW-117publ169.pdf>

<sup>24</sup> [https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials\\_en](https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en)

In addition, **The EU Critical Raw Materials Act is a key element of the EU Green Deal**, as the EU bloc looks to increase manufacturing and production of vital net zero technology components to enable the transition to a clean economy. The Green Deal covers four main pillars:

- Predictable and simplified regulatory environment
- Faster access to funding
- Enhancing skills
- Open trade for resilient supply chains<sup>25</sup>

**The EU Critical Raw Materials Act represents one of three main initiatives to support the predictable and simplified regulatory environment**, alongside the Net Zero Industry Act and Reform of Electricity Market Design. Together, these play a vital role in the overarching strategy to transition towards a more sustainable economy.

## Food Systems and Climate Resilience

Food security, as defined by the UN Committee on World Food Security, means that all people have physical, social, and economic access to sufficient, safe, and nutritious food that meets dietary needs for an active and healthy life.

**Food security, as defined by the UN Committee on World Food Security**, means that all people have physical, social, and economic access to sufficient, safe, and nutritious food that meets dietary needs for an active and healthy life. At the core of food security is access to healthy food and optimal nutrition for all, see Figure 14 below for key facts.

Figure 14. Facts on Food Security

Facts on Food Security		Source	
1	10bn	UN projects global population could grow to ~8.5 billion in 2030, 9.7 billion in 2050 and 10.4 billion in 2100	United Nations Department of Economic and Social Affairs
2	820m	People classed as <b>hungry</b> and will be exacerbated by war, conflict and extreme weather events	World Health Organisation
3	690m	People classed as <b>undernourished</b> and 2bn suffer from <b>micronutrient deficiencies</b> affected by extreme weather	World Economic Forum
4	613m	Women and girls aged 15 to 49 suffering from <b>iron deficiency</b>	Intergovernmental Panel on Climate Change Special Report: Food Security
5	151m	Children under five suffering from <b>stunted growth</b>	www.WorldHunger.org
6	29%	Global population (2.3bn people) moderately or severely <b>food insecure</b> in 2021, with 12% (924m people) facing severe food insecurity	World Health Organisation
7	2bn	Globally >2 billion children and adults suffer health problems related to being <b>overweight or obese</b> . 30% of global population affected by weight problems	Science Daily
8	1.3bn	Billion tons of <b>food wasted</b> each year causing economic losses of US\$750 billion and significant damage to environment	Food and Agriculture Organisation
9	19	Countries issuing <b>food export bans</b> due to internal food scarcity, and 7 implementing export-limiting measures	World Food Programme
10	4 Pillars	Four pillars of Food Security: <b>Availability, Access, Utilisation, and Stability</b>	Intergovernmental Panel on Climate Change Special Report: Food Security

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Source: Citi Research

## Optimal Nutrition for All

The Committee on World Food Security endorsed Voluntary Guidelines on Food Systems and Nutrition

**The Committee on World Food Security endorsed Voluntary Guidelines on Food Systems and Nutrition** which aims to support countries in their efforts to eradicate hunger and malnutrition in all its forms by utilizing a food systems lens.

<sup>25</sup> [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan_en)

The recommendations focus on food, agriculture and nutrition and also address social, economic, and environmental sustainability.

## Population Growth as a Major Pressure

**The food system is under pressure from non-climate stressors such as population and income growth**, demand for animal-sourced products, and climate change. These climate and non-climate stresses impact the four pillars of food security: (i) availability, (ii) access, (iii) utilisation and (iv) stability.

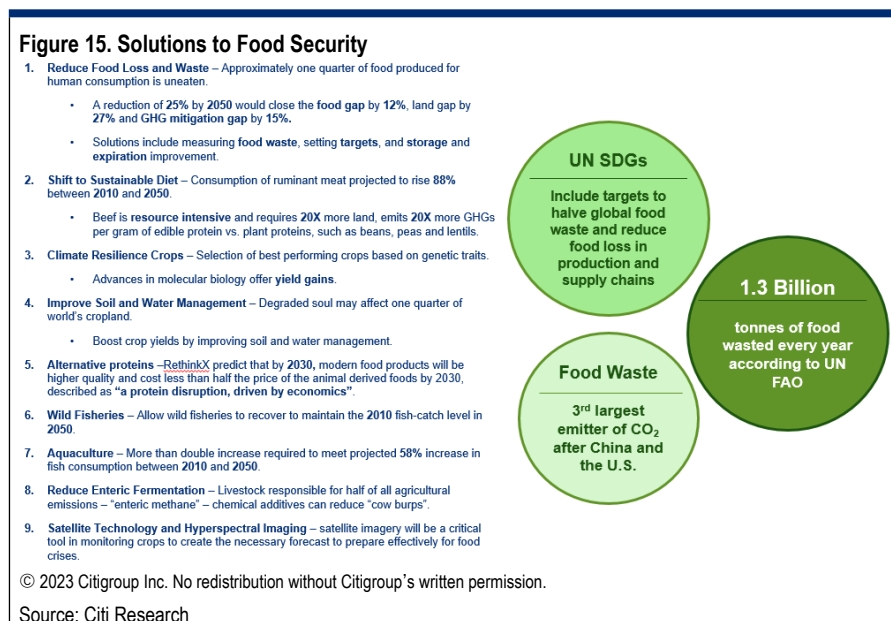
**Observed climate change affects food security through increasing temperatures, changing precipitation patterns, and greater frequency of extreme weather events.** There is a greater need to understand how climate resilient key crops such as wheat, rice, maize and soy are to changing temperatures and future research and development is needed into resilient and sustainable alternatives to key commodities such as coffee and cocoa.

**We need to understand how to sustainably produce food that is also nutrient rich as opposed to nutrient poor.** As global incomes rise, there will be increasing demand for more resource-intensive, animal-based foods such as meat and dairy. At the same time, we need to urgently reduce GHG emissions from agricultural production and halt and reverse the deforestation of biodiversity rich tropical forests.

**Growing competition for land, water, and energy, in addition to the overexploitation of fisheries, will affect the ability to produce food.** Further compounded by the requirement to reduce global GHG emissions linked to the food system. In the face of increased stressors from climate change, the food and water system need to become more resilient and resource efficient.

## Solutions to Food Security

The long-standing drivers of food insecurities, such as conflicts, supply chain dislocation, extreme weather events, invasive alien species and diseases, have been exacerbated in recent years delivering acute food insecurity.



Solutions to food insecurity are multi-faceted and in Figure 15 above we highlight a number of areas for investor focus: tackling food waste through education, supermarket and restaurant behaviors. Shifts to alternative proteins reducing reliance on resource intensive animal derived protein. Investment into climate resilient crops that can withstand extreme heat, drought and changes in weather patterns.

We also highlight the need to reduce enteric fermentation, methane from livestock farming and note the additives to animal feed to improve gut health in livestock. This links to the early section on methane emissions which are notable from the agricultural sectors. Finally, we also highlight the role of hyperspectral imaging that allows countries and ministries of agriculture to monitor areas of water stress or heat stress.

## Water Scarcity

**A continuously growing population and level of consumption gives rise to significant water use, pollution, wastewater, and sewage.** Aquatic waste and ineffective water treatment have a long-lasting effect on marine ecosystems, agriculture, and human health, see key facts in Figure 16 below.

**Figure 16. Facts on Water Scarcity**

Facts on Water Security		Source	
1	>\$1tn	Global <b>annual cost</b> of achieving Sustainable Development Goal 6 (water and sanitation)	OECD
2	\$2.3tn	Value in commercial opportunities which could be unlocked if private sector acts on water security	CDP
3	\$260bn	Amount <b>lost</b> globally every year, due to the lack of basic water and sanitation	World Economic Forum
4	4bn	People experiencing severe <b>water scarcity</b> during at least one month of the year	UNICEF
5	6bn	By 2050, an estimated 6 billion people will face water scarcity due to climate change, pollution, and increasingly sustainable consumption and production.	UN
6	2bn	People who rely on faecal laced contaminated water sources globally	WHO
7	>275m ha	Irrigated <b>cropland which would benefit</b> from enhanced water use efficiency	OECD
8	42%	Household wastewater <b>not treated properly</b> , damaging health and ecosystems	UN
9	25%	By 2040, approximately <b>1 in 4 children</b> will be living in areas of extremely high water stress	UNICEF
10	5x	Disclosures through the CDP indicate that the potential impacts of water risks may be over <b>5 times greater than</b> the costs of addressing them	CDP

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Source: Citi Research

## Water Pollution

**Globally, over 80% of wastewater is discharged without treatment,**<sup>26</sup> resulting in food chain disruption, and mass illness. 1.7 million deaths annually are accounted to untreated wastewater, over 90% of which are those in developing nations<sup>27</sup>. Furthermore, climate change is exacerbating water scarcity and water-related hazards, including floods and droughts, further degrading global water sources.

**In 2020, UNICEF reported that 1 in 4 people lacked access to safe drinking water**<sup>28</sup> within their homes, and nearly 50% of the world's population lacked safe and adequate sanitation. The United Nations addressed the global challenge of unsafe water and wastewater in SDG6, calling for universal and equitable access to safe and affordable drinking water, free from fecal and chemical contamination.

## Why Investors Should Care

**As regulatory disclosure requirements increase, the transparency and accountability of water management will lead to greater scrutiny** of the role investors are playing to exacerbate or remediate water stress. This is particularly true for portfolio companies that are operating in water intensive industries and water stress areas.

<sup>26</sup> <https://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/>

<sup>27</sup> <https://www.in.gov/health/eph/onsite-sewage-systems-program/diseases-involving-sewage/>

<sup>28</sup> <https://www.unicef.org/press-releases/billions-people-will-lack-access-safe-water-sanitation-and-hygiene-2030-unless>

**Companies found to have poor governance and stewardship of manufacturing processes could face tighter regulation and financial loss.**

Companies further found responsible for contamination, pollution, ecosystem degradation, and biodiversity loss. Furthermore, there are significant health and social costs related to contaminated water and lack of safe water access.

**Investors must ensure companies are in line with current regulation seeking to improve transparency** of supply chains and the negative waste externalities created. Financial penalties can in turn become controversies with reputational and litigation risk.

## Concerns With Aquatic Waste

### Antimicrobials and Antibiotics

**The presence of antimicrobials and antimicrobial resistant bacteria (ARB) in aquatic ecosystems is increasing in concern** as antibiotic-resistant pathogens continue to pose problems to human health and the environment.

**Wastewater treatment plants (WWTPs) host large quantities of bacteria, as well as the residual presence of antibiotics** and there is a risk that, if these bacteria are not sufficiently eradicated by the treatment processes, they can then evolve to develop resistance. These microbes could be a source of risk to human and animal health.

**WWTPs can play a critical role in managing future disease outbreak.** For example, the US Centre for Disease Control and Prevention cites wastewater testing as a “globally useful tool to identify disease outbreaks and manage infectious disease burden”<sup>29</sup>, whilst the UK government has stated that “wastewater-based epidemiology is likely to be of significant importance in the future, both domestically and internationally, and we are exploring further opportunities for this technology”<sup>30</sup>.

Read more:

- [Multi-Asset Strategy: Curtailing the Spread of Antimicrobial Resistance \(AMR\): Global Equity and Fixed Income Solutions](#)
- [The Role of Responsible Investors in Tackling AMR](#)

## Microplastics

**98% of the 1.5 million tonnes of microplastics in the ocean are derived from land-based activities**, with synthetic textiles, tyres, and city dust accounting for over 80% of microplastic pollution<sup>31</sup>.

**There is much evidence attributing microplastics to the disruption of aquatic life**, introducing carcinogenic compounds to consumption, and impacting feeding signals, fertility, and reproduction. It is important for investors to be aware of the reputational concerns attributed to increased public awareness and fear around microplastics found in food, drinking water, and most recently, breast milk<sup>32</sup>.

<sup>29</sup> <https://www.cdc.gov/nwss/wastewater-surveillance.html>

<sup>30</sup> <https://www.gov.uk/government/publications/monitoring-of-sars-cov-2-rna-in-england-wastewater-monthly-statistics-1-june-2021-to-7-march-2022/emhp-wastewater-monitoring-of-sars-cov-2-in-england-1-june-2021-to-7-march-2022>

<sup>31</sup> [https://www.eib.org/attachments/lucalli/20230042\\_microplastics\\_and\\_micropollutants\\_in\\_water\\_en.pdf](https://www.eib.org/attachments/lucalli/20230042_microplastics_and_micropollutants_in_water_en.pdf)

<sup>32</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9269371/>

**The economic cost of marine plastic is estimated up to \$33,000 per tonne of marine plastic per year**, and in 2019 a total loss to marine ecosystem value of up to US\$2.5tn a year was estimated<sup>33</sup>. This will be further exacerbated by extreme weather in relation to climate change.

**It is essential for companies to indicate they are ahead of the regulatory environment and sufficiently investing in alternative formulas.** Because of the nature of the changing regulatory environment, it is also financially material to sell and patent formulations.

## Fertilisers

**A growing human population, food consumption, wastewater discharge, and climate change are all contributing to the use and run-off of fertilisers, herbicides, and pesticides into water sources.** Excessive concentrations of nutrients, such as nitrogen and phosphorous, into aquatic ecosystems results in algal bloom, tainted drinking water supplies, and hypoxia and anoxia which threaten commercial and recreational water sources and fisheries.

## U.S. Water Crisis: Unbundling ESG

**The US, and particularly Western states, have been facing exacerbated weather patterns threatening water security, and commercial and municipal resilience.** The scientific and regulatory agency National Oceanic and Atmospheric Administration (NOAA) report that, in 2021, the US experienced “20 separate billion-dollar weather and climate disasters” including droughts floods and hurricanes<sup>34</sup>. Ineffective waste management, agricultural pollution, and pharmaceutical effluence further threaten the unstable freshwater supply.

**NY Climate Week reiterated concerns around ageing infrastructure and evolving wastewater and sewage penalties,** as well as the influence of water scarcity on inequality and fragmentation in the US. There has further been provision for upgrading the US water infrastructure in the Inflation Reduction Act (IRA).

## Water Utilities & Storm Overflow

**Floods and hurricanes disrupt critical water infrastructure and flood waters can contaminate clean water systems with wastewaters.** This has been identified as a contributing factor to emerging pathogen transfer posing a risk to human health. Secondly, if water infrastructure fails to deliver, the deleterious impact to societal health and equilibrium will be acutely felt by the health care system.

**There has been high-profile pressure from campaign groups, threatening reputations of polluters and wastewater treatment** and water utilities are facing continued controversy. In this case, the water sector may be liable to potential fines and grievance policies, from investigations into non-compliance.

Read more:

- [Why 2023 can be a pivotal year for US water infrastructure](#)

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<sup>33</sup> <https://doi.org/10.1016/j.marpolbul.2019.03.022>

<sup>34</sup> [2021 U.S. billion-dollar weather and climate disasters in historical context | NOAA Climate.gov](#)



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