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Embedding Consumption in Biodiversity Monitoring: Options for Strengthening GBF Target 16

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Summary

Unsustainable patterns of consumption are among the most significant indirect drivers of global biodiversity loss. Demand for food, housing, mobility and consumer goods generates pressures through all five direct drivers of biodiversity loss: land- and sea-use change, direct resource exploitation, pollution, climate change and invasive alien species. These pressures often operate through complex global supply chains that shift biodiversity impacts across national borders. Despite this well-established evidence, consumption remains only partially represented within the monitoring framework of the Kunming-Montreal Global Biodiversity Framework (GBF), limiting the ability of Parties to monitor and address fundamental drivers of biodiversity loss.

This report examines how consumption can be more effectively integrated into biodiversity monitoring, with particular attention to Target 16, the sole GBF target that explicitly addresses sustainable consumption. The report aims to support Parties to the Convention on Biological Diversity (CBD) in strengthening implementation and reporting under the GBF, while using the European Union as an illustrative example of how consumption-related monitoring can be operationalised. The report reviews the scientific evidence linking consumption to biodiversity loss, critically assesses the strengths and limitations of the current GBF monitoring framework, particularly for Target 16, examines the current reporting by Parties on Target 16, identifies indicators that could strengthen its monitoring, and explores emerging approaches for interpreting these indicators through benchmarks and reference values.

Across the literature, food consumption – particularly animal-based products – emerges as the largest consumption-related contributor to biodiversity impacts, while housing, mobility and consumer goods are also major sources of pressure. These impacts extend well beyond national borders: a substantial share of biodiversity loss associated with consumption in high-income economies occurs in biodiversity-rich producer countries through international trade. This highlights the importance of accounting for telecoupled impacts when assessing progress towards biodiversity objectives.

Although Target 16 calls for reducing the global footprint of consumption, halving food waste and significantly reducing overconsumption, its monitoring framework remains limited. Unlike most other GBF targets, Target 16 currently has no headline indicator and relies primarily on a mandatory binary indicator recording the number of countries developing, adopting or implementing policy instruments to encourage sustainable consumption choices. While useful for assessing policy adoption, this approach does not capture changes in consumption patterns, consumption footprints, or the biodiversity pressures associated with lifestyles and global supply chains. As a result, current reporting provides only a partial picture of progress towards the ambition of Target 16.

This report maps 31 consumption-related indicators that could contribute to strengthening monitoring under Target 16 and assesses their readiness against the CBD indicator criteria. Seventeen indicators are sufficiently operational for immediate application. Among these, the Material Foot-print – already a Target 16 component indicator – is one of the most operationally mature; sup-ported by an internationally harmonised methodology, regular updates, alignment with the Sustainable Development Goals and the System of Environmental-Economic Accounting, it has a broad institutional acceptance. However, this indicator measures resource demand rather than biodiversity outcomes directly and should therefore be interpreted as a proxy for biodiversity-related pressures. It also does not distinguish the differing biodiversity impacts of individual material types or fully capture telecoupled biodiversity impacts and equity dimensions. The report therefore concludes that, while the Material Footprint provides a pragmatic starting point for monitoring consumption, it is best interpreted alongside complementary indicators, including the Food Waste Index, recycling rates and, as methodologies mature, biodiversity footprint and other consumption-based indicators.

Evidence from the CBD 7th National Reports shows that implementation and reporting under Target 16 remain highly uneven across Parties. While several countries report comprehensive policy frameworks and sustainable consumption measures, many report only partial implementation or initiatives still under development. Reporting continues to focus primarily on policy frameworks and awareness-raising, whereas the use of harmonised consumption-based indicators remains limited. The Material Footprint is by far the most widely reported consumption-based indicator, while biodiversity, ecological and consumption footprint indicators are used much less consistently and often rely on different methodologies, limiting comparability across countries.

The analysis also identifies important gaps in the current indicator landscape. Food-related consumption is comparatively well represented, whereas indicators covering housing, mobility and consumer goods remain less developed. Existing indicators capture several major drivers of biodiversity loss, including land-use change, climate change and pollution, but provide weaker coverage of direct resource exploitation, invasive alien species and biodiversity impacts embedded in global trade. Monitoring equity dimensions and differences in consumption across income groups also remains limited despite their explicit relevance to Target 16.

Beyond indicators, the report reviews emerging approaches for defining benchmarks or reference values that could help interpret consumption-related indicators. Scientific evidence is most advanced for food systems, where planetary boundaries and healthy dietary reference values provide increasingly robust benchmarks. Comparable thresholds for housing, mobility and material consumption are emerging but remain less harmonised. While these approaches are not yet sufficiently mature for formal integration into the GBF monitoring framework, they offer a promising direction for translating broad policy ambitions into measurable progress.

Drawing on these findings, the report presents a range of practical options that Parties may wish to consider when further developing the GBF monitoring framework, while recognising the importance of limiting reporting burden and differences in national capacity and institutional readiness. These include:

- strengthening the visibility of consumption through a more prominent role for operational footprint indicators;
- expanding complementary indicators to improve coverage of major consumption domains, telecoupled impacts and equity dimensions;
- adopting a tiered approach that distinguishes core and enhanced monitoring packages;
- supporting further methodological development and pilot testing of emerging biodiversity footprint indicators; and
- improving the integration of consumption perspectives across biodiversity, circular economy and climate policy frameworks.

Strengthening the monitoring of consumption will not by itself reduce biodiversity loss. However, better indicators can improve accountability, support evidence-based policymaking, strengthen coherence across environmental policy agendas, and make consumption-related pressures more visible. At the same time, the effectiveness of monitoring depends on broader policy frameworks that address the underlying drivers of unsustainable consumption and production while ensuring that the transition is socially fair and equitable. By progressively embedding consumption within biodiversity monitoring, the GBF can more effectively support the transition towards sustainable, equitable and nature-positive societies.

1 Introduction

1.1 Background

The scale and pace of biodiversity loss are unprecedented in human history. The IPBES Global Assessment (IPBES, 2019) estimates that around one million animal and plant species – roughly one in eight known species – are threatened with extinction if current trends continue. This loss of biodiversity reflects widespread ecosystem degradation, habitat fragmentation, and the erosion of ecosystem services – such as pollination, soil health, water purification, and climate regulation. These changes weaken societies' capacity to absorb shocks (Diaz et al., 2019) and threaten economies and human wellbeing. Biodiversity decline could reduce global GDP by up to 2.7 trillion USD annually by 2030 (World Bank, 2021; Dasgupta, 2021), with severe impacts on sectors reliant on natural capital (TNFD, 2023).

At the root of this crisis are unsustainable patterns of production and consumption. While the direct drivers of biodiversity loss include land-use change, direct overexploitation, invasive species, pollution, and climate change, these are ultimately shaped by human demand for goods and services[1]. Unsustainable production and consumption are widely recognised as the underlying cause of the triple planetary crisis – biodiversity loss, climate change, and pollution – and a key challenge for achieving transformative change (IPBES, 2019; IPBES, 2024). This highlights the need for integrated, systemic solutions capable of reducing pressures across environmental domains simultaneously (IPBES, 2019).

In response to the biodiversity crisis, the Convention on Biological Diversity (CBD) adopted the Kunming-Montreal Global Biodiversity Framework (GBF) at COP15 in December 2022. The GBF sets out a global vision of "living in harmony with nature" by 2050, articulated through four long-term goals for 2050 and 23 action-oriented targets for 2030. To support implementation, Parties also adopted a comprehensive Monitoring Framework to the GBF comprising a set of indicators for tracking progress towards the Goals and Targets of the Framework.

The Monitoring Framework is composed of four types of indicators:

- **Headline indicators:** a minimum set of mandatory, high-level indicators intended to capture the overall scope of the goals and the most critical dimensions of progress towards each target;
- **Binary indicators:** mandatory global indicators based on yes/no questions assessing whether specified enabling measures (e.g. policy instruments) are in place. These are intended as an interim solution for targets where headline indicators have not yet been defined[2];
- **Component indicators:** optional indicators that support more detailed monitoring of specific components of each goal and target of the GBF;
- **Complementary indicators:** additional optional indicators for thematic or in-depth analysis of each goal and target.

[1] Demand for food, transport, housing, and consumer goods shapes resource extraction, agricultural expansion, and global trade flows, determining the cumulative impacts of human lifestyles on the biosphere (IPBES, 2022).

[2] Headline and binary indicators are mandatory for national reporting, while component and complementary indicators are optional.

Parties may also use further national or subnational indicators. Collectively, these indicators aim to support accountability, comparability, and transparency in National Reports. Parties to the CBD, including the European Union (EU), were requested to submit their 7th National Report on GBF implementation by 28 February 2026, followed by the 8th National Report by 30 June 2029. Within the EU, reporting is coordinated by the European Commission with analytical support from the Knowledge Centre for Biodiversity (KCBD) at the Joint Research Centre (JRC)[3].

1.2 Target 16 of the Kunming-Montreal Global Biodiversity Framework (GBF): consumption and biodiversity loss

Consumption represents a high-leverage but still an under-addressed dimension of biodiversity policy focus (Hot or Cool, 2026; Verissimo et al., 2025). A growing body of work underscores that tackling unsustainable consumption is essential to halt biodiversity loss, yet consumption remains insufficiently embedded in global and national strategies (Ellen MacArthur Foundation, 2021, 2025; Jennings et al., 2024; Köppen et al., 2024; Sitra, 2022). Among the GBF's 23 targets, Target 16 is the primary entry point for addressing demand-side pressures. It calls on Parties to enable sustainable consumption by 2030 by:

- "Halving global food waste;"
- "Substantially reducing overconsumption and waste generation; and"
- "Significantly reducing the global footprint of consumption,"

including through enabling policy frameworks and ensuring that reductions occur in an equitable manner (Text box 1.1).

[3] The European Environment Agency (EEA), together with Eurostat and other services, contributes as a data provider and supports indicator development and reporting processes. The EU also engages in the CBD Technical and Scientific Cooperation Centres (TSCCs), established to enhance regional and thematic cooperation and help Parties apply science, technology, and innovation in implementing the GBF. The European TSCC, led by the JRC through the KCBD, plays a key role in strengthening scientific and technical capacities, data flows, and indicator frameworks relevant to biodiversity monitoring. This structure elevates the importance of robust science–policy linkages and fit-for-purpose indicator systems for realising the GBF's vision.

Text box 1.1. Target 16 of the Kunming-Montreal Global Biodiversity Framework (GBF): Sustainable Consumption and Waste Reduction

Full description

Ensure that people are encouraged and enabled to make sustainable consumption choices including by establishing supportive policy, legislative or regulatory frameworks, improving education and access to relevant and accurate information and alternatives, and by 2030, reduce the global footprint of consumption in an equitable manner, including through halving global food waste, significantly reducing overconsumption and substantially reducing waste generation, in order for all people to live well in harmony with Mother Earth (CBD, 2022, Target 16).

Context

Target 16 addresses one of the GBF's most systemic challenges: unsustainable consumption is an underlying driver of biodiversity loss. Halting and ultimately reversing biodiversity loss will require a shift towards more sustainable consumption patterns. Target 16 therefore links behavioural change to enabling policy frameworks and emphasises equitable reduction of the global consumption footprint across nations and income groups.

Implementation gaps identified in recent analyses

(CBD, 2024; UN, 2024; Jennings et al., 2024)

- *Limited national translation*: Only a minority of Parties have defined measurable, country-specific targets related to consumption footprints or waste reduction.
- *Data and technical capacity constraints*: Many countries lack the tools, datasets, or institutional capacity to monitor material, carbon, or biodiversity-related footprints.
- *Equity and fairness tensions*: Balancing consumption reduction with food security and poverty alleviation goals remains a major concern, particularly in developing economies.
- *Policy fragmentation*: Measures on consumption, waste, and biodiversity are often addressed separately, reducing coherence and impact.
- *Monitoring and indicator gaps*: The global monitoring framework for Target 16 is still evolving, and reporting by Parties suggests uneven coverage and limited use of consumption-based indicators.
- *Cross-border impacts*: Current national accounting systems rarely capture the biodiversity pressures embedded in international trade and global supply chains.

Together, these gaps highlight that while Target 16 has strong transformative potential, its implementation depends on coordinated policy design, improved data and indicators systems, and greater attention to the global dimensions of consumption.

At the EU level, Target 16 is operationalised through three sub-targets, with progress monitored separately for each:

- "EU Target 16a: Sustainable consumption and reduction of the global footprint of consumption";
- "EU Target 16b: Reducing food waste by half";
- "EU Target 16c: Reducing waste generation"

These three dimensions are reflected across a range of EU policy initiatives. Elements of Target 16 are already being implemented through EU policy frameworks addressing sustainable food systems, resource efficiency and circularity, and biodiversity conservation (Text box 1.2). Together, these frameworks demonstrate how biodiversity objectives can be integrated into broader consumption and production policies.

Text box 1.2. Operationalising GBF Target 16 through EU policy frameworks

The EU has already begun operationalising GBF Target 16 on sustainable consumption through several policy initiatives under the European Green Deal (European Commission, 2020a). For example, the following major frameworks address key consumption-related drivers of biodiversity loss:

- The *Farm to Fork Strategy* promotes sustainable diets, food-waste reduction, and biodiversity-friendly food systems (European Commission, 2020b).
- The Circular Economy Action Plan (European Commission, 2020c), with further measures expected under the forthcoming Circular Economy Act (Siefridt, 2026), supports resource efficiency, product durability, and reduced material use.
- The *EU Bioeconomy Strategy* supports more sustainable production and consumption of bio-based resources, complementing broader efforts to reduce biodiversity pressures (European Commission, 2025b).
- The *EU Biodiversity Strategy for 2030* links reduced consumption pressures to ecosystem restoration and species recovery objectives (European Commission, 2020d).

Together, these initiatives demonstrate how biodiversity goals can be integrated into broader food, resource, and consumption policies, while also highlighting the need for stronger monitoring and policy coherence across sectors. Please refer to Marelli et al. (2025) for an in-depth analysis of progress towards the EU Green Deal targets.

The current GBF monitoring framework includes no headline indicator for Target 16 and relies primarily on one binary indicator alongside optional component and complementary indicators[4]. This limits the visibility of consumption-related pressures and the comparability of reporting across Parties.

Moreover, while Target 16 explicitly addresses consumption, demand-side pressures are systemic across the entire GBF, influencing progress on multiple targets beyond Target 16, including those related to land use, pollution, climate, and ecosystem restoration. Consumption shapes ecosystem pressures, influences production incentives, and determines the scale of impacts along global supply chains. As a result, multiple GBF targets – including those on sustainable agriculture, pollution reduction, ecosystem restoration, and equitable benefit-sharing – depend on consumption shifts to reduce pressures. Embedding consumption perspectives into monitoring systems is therefore important for supporting systemic, cross-sectoral transformation. The EU examples presented in Text box 1.2 further illustrate how these linkages extend across multiple policy domains.

The 8th national report to CBD in June 2029 provides a strategic opportunity to strengthen the representation of consumption in GBF monitoring.

1.3 Addressing Consumption Gaps in the GBF Monitoring Framework

Despite its ambition, the GBF monitoring framework is characterised by important gaps. Scientific assessments (e.g. Chaudhary & Hertel, 2024; Brooks et al., 2006) note that existing monitoring tools are unevenly developed and significantly underrepresent consumption-related drivers of biodiversity loss – even though these drivers are now recognised among the most powerful intervention areas for transformative change (IPBES, 2019). Evidence from UNEP's International Resource Panel (UNEP, 2024a), for example, indicates that more than 90% of global land-based biodiversity loss and water stress results from the extraction and processing of natural resources – activities ultimately driven by consumption patterns (see chapter 2 for further details).

[4] See also https://www.cbd.int/doc/decisions/cop-16/cop-16-dec-31-en.pdf.

Most headline indicators focus on production-side pressures (e.g., land-use change, sustainable fisheries) or outcome metrics (e.g., species extinction risk). Very few capture the pressures arising from consumption patterns, particularly in high-income regions where per-capita impacts are greatest (Anderson et al., 2023). This imbalance risks obscuring key underlying drivers of biodiversity loss and overlooking opportunities for demand-side policy interventions.

Although Target 16 calls for reducing the global consumption footprint, the indicators associated with this aspect of the target in the GBF Monitoring Framework are all optional component indicators, including the Material Footprint and the Ecological Footprint (see Table 3.2). As a result, monitoring coverage remains limited for key dimensions of consumption, including high-impact commodities (e.g., beef, soy, and palm oil), overall levels and patterns of consumption, and distributional or equity-related differences in consumption. Moreover, biodiversity impacts embedded in international trade – often referred to as telecoupled impacts – are not systematically captured by current GBF indicators (Cabernard et al., 2024), leading to substantial under-reporting of biodiversity losses occurring outside consumer nations through both North-South and South-South trade flows.

These gaps have significant implications:

- Because the component indicators related to reducing the global consumption footprint under Target 16 are optional, many Parties may not monitor consumption footprints at all;
- Important dimensions such as high-impact commodities, telecoupled impacts, consumption intensity, and equity differences remain only partially covered;
- As indicators currently included in the GBF Monitoring Framework do not systematically cover global supply-chain impacts, biodiversity loss in producing countries risks remaining under-reported.

Consequently, even full compliance with the existing GBF Monitoring Framework would not provide a complete or comparable picture of consumption-driven biodiversity pressures, limiting the ability of Parties to design effective demand-side strategies or track actual progress towards Target 16's ambition to reduce global consumption footprint.

Without more robust and harmonised indicators, Parties risk reporting progress on downstream conservation outcomes while failing to address the structural consumption drivers that perpetuate biodiversity loss (Chaudhary & Hertel, 2024; Kok et al., 2024). Strengthening the representation of consumption within the GBF Monitoring Framework is therefore a strategic opportunity to strengthen the transformative potential of the GBF monitoring.

A broader set of existing and emerging indicators – including footprint-based, product-level, and equity-sensitive metrics (Bogenreuther et al., 2024; Ivanova & Wood, 2020; Jaccard et al., 2021; Pothen & Tovar Reaños, 2018; Hoekstra & Mekonnen, 2012; Bromwich et al., 2025) – already provides a strong basis for expanding and strengthening monitoring of consumption impacts under Target 16. There is also a growing need to define reference values or thresholds for these indicators. Without such benchmarks, indicators alone provide limited guidance on the scale of demand reduction required to reduce biodiversity pressure. Embedding such indicators and thresholds within the GBF (structurally or as complementary tools for EU reporting) would improve visibility of biodiversity pressures, enhance accountability and cross-country comparability.

Strengthened indicators, however, are a necessary but not sufficient condition for achieving Target 16 and the GBF's wider transformative goals. Monitoring alone cannot reduce biodiversity loss; rather, it can inform and provide the evidence basis to support coherent and transformative policy measures such as sufficiency strategies (which reduce absolute material and energy requirements while retaining wellbeing and quality of life), reduced material throughput, and sustainable diets (Hot or Cool Institute, 2025).

This also requires a clear understanding of both ecological limits to consumption and minimum levels required to meet human needs, pointing towards a "safe and just" operating space within which consumption can be considered sustainable. In summary, the Monitoring Framework currently lags behind the GBF's ambition to address the global consumption footprint. Strengthening the measurement of domestic and telecoupled consumption impacts is essential for tracking progress under Target 16 and for supporting the wider systemic transition envisaged by the GBF.

1.4 Objectives of this ETC BE report

This ETC BE report aims to support Parties to the CBD in better understanding the role of consumption within the Global Biodiversity Framework (GBF) and to explore options for strengthening consumption-related monitoring under Target 16. It also highlights implications for EU and Member State reporting as an illustrative regional example. The report is structured around four guiding questions:

- To what extent – and through which pathways – does human consumption affect biodiversity loss? The report synthesises global and EU-level scientific evidence on consumption drivers, biodiversity impacts, and telecoupled pressures, while also examining the relevance of consumption across the broader GBF target framework (see chapter 2).
- Is consumption adequately addressed in the GBF and across its broader target framework? The report examines how consumption appears in Target 16, exploring the main indicator families and methods currently in use, and identifying gaps and opportunities (see chapter 3).
- Are consumption-related GBF targets monitored adequately, and which indicators and benchmarking could best inform reporting? The report maps existing indicators, evaluates their methodological robustness, and proposes options for monitoring Target 16 (see chapter 3), alongside emerging approaches to threshold-setting (chapter 4).
- To what extent are consumption perspectives currently embedded in policy frameworks and implementation practices? The report assesses how consumption is integrated into policy frameworks and implementation, and identifies implications for strengthening GBF monitoring and reporting (chapter 5).

Accordingly, this report has three interlinked objectives:

- Strengthen understanding of how consumption in key lifestyle domains – food, housing, mobility, and goods – affects biodiversity domestically and globally, including telecoupled impacts; and review available evidence on ecological limits and societal thresholds for consumption, exploring how these can inform quantifiable benchmarks or reference ranges for policy-relevant indicators.
- Map existing consumption-related indicators (and related targets) – currently out-side the GBF Monitoring Framework – to identify how they could complement GBF indicators and strengthen Parties' reporting, particularly for Target 16.
- Assess the implications of consumption drivers for wider GBF implementation, identifying synergies, trade-offs and opportunities to align EU policies and monitoring systems with global biodiversity goals.

Overall, this report provides an analytical foundation for strengthening the integration of consumption perspectives into biodiversity monitoring and reporting under the GBF – particularly by addressing gaps in monitoring and reporting for Target 16.

2 How Human Consumption Drives Biodiversity Loss

This chapter synthesises global (chapter 2.1) and European evidence (chapter 2.2) on how human consumption shapes biodiversity loss. It identifies the principal consumption hotspots, outlines the causal mechanisms linking lifestyle domains to biodiversity pressures and impacts, (chapter 0), and provides a preliminary mapping of consumption relevance across all targets of the Kunming-Montreal Global Biodiversity Framework (GBF) (chapter 2.4). This chapter provides the analytical foundation for subsequent chapters on policy relevance and indicator needs.

2.1 Global evidence: consumption as a key indirect driver of biodiversity loss

Global assessments and modelling studies consistently show that biodiversity loss is closely linked to the ways in which human societies produce and consume resources (Marelli et al., 2026; IIED, 2024; Wilting et al., 2017; EEA, 2023a). Consumption choices reflect human needs and wants, which in turn are shaped by broader indirect factors such as industrialisation, urbanisation, and technological innovation. Recent work conceptualises these dynamics as part of a wider "human behaviour crisis", in which once-adaptive behavioural traits – such as preference for immediacy, status, and calorie-dense foods – are re-directed by the growth paradigm, short-termism, and behavioural manipulation through modern marketing, reinforcing resource-intensive consumption patterns (Merz et al., 2023). Industrialised urban living may further contribute to this trend by weakening human-nature connections and normalising high-impact lifestyles (Amel et al., 2017; Galli et al., 2024).

The provisioning systems that support these consumption dynamics ultimately connect to pressures across all five primary direct drivers of biodiversity loss, which the IPBES Global Assessment (2019) identifies as land-use change (notably agriculture, forestry, and habitat conversion), direct exploitation of resources, pollution, invasive species, and climate change. These reflect the volumes and ways in which goods and services are produced, delivered, consumed, and managed throughout their life cycles.

Building on this, Jaureguiberry et al. (2022) define a ranking of these drivers: globally, land and sea use change remains the foremost direct driver of biodiversity loss, followed by direct resource exploitation, pollution, climate change, and invasive species. In Europe and Central Asia, climate change and pollution swap places (climate change 3rd; pollution 4th), with the rest unchanged. These patterns align with evidence from the Global Resources Outlook 2024 (UNEP, 2024a), which attributes to about 90% of global land-based biodiversity loss and water stress due to the extraction and initial processing of natural resources – particularly agricultural biomass for food, energy, and bio-based materials, as well as wood for energy and industrial uses. Crucially, the impacts occur predominantly at the beginning of global value chains, reinforcing the highly unequal distribution of socio-economic benefits and environmental burdens across regions.

2.1.1 Food

Food systems sit at the core of both the biodiversity and climate dimensions of the triple planetary crisis (Lin et al., 2025). They account for at least 35% of the environmental footprint globally (Marelli et al., 2025), and dominate consumption-related pressures. Agricultural systems occupy 38-55% of the world's habitable land, contribute 34-37% of anthropogenic green-house-gas (GHG) emissions and thus are a significant driver of climate change (Arneth et al., 2019; Crippa et al., 2021), and are major drivers of freshwater use (FAO, 2020), nutrient loading (Leip et al. 2020), and habitat conversion (Boakes et al., 2024; IPBES, 2019). According to the Global Resources Outlook 2024, almost 75% of land-related biodiversity impacts come from agriculture and food provisioning (UNEP, 2024b, pg. 18).

While land-use metrics capture only habitat conversion and direct land pressures, recent coupled land-use-climate modelling analyses estimate that the global climate change impacts from GHG emissions along the food supply chain – especially methane (e.g., from livestock, rice paddies, and waste management) – likely account for about 70% of biodiversity impacts, measured as resulting losses in local and rarity-weighted species richness. Moreover, in some major emitting countries (i.e., China, India and the USA), the GHG-driven biodiversity loss associated with a single year of food production may cause a biodiversity loss equivalent to 2% or more of those countries' total historic, land-use-driven biodiversity loss (Boakes et al., 2024), highlighting the full biodiversity cost of food consumption.

Nutritional life cycle assessments (nLCA) consistently identify animal-sourced foods (i.e., lamb, mutton, beef and cheese) as having the highest land- and carbon-footprint intensity, regardless of whether impacts are expressed per kilogram, kilocalorie, or unit of key micronutrient value (Katz-Rosene et al., 2023). Collectively, this evidence confirms that food consumption plays a central role in transgressing planetary boundaries (Hallström et al., 2022; Rockström et al., 2025) and remains one of the most powerful levers for transformative change (Willett et al., 2019).

2.1.2 Other sectors (housing, transport, and consumer goods)

Housing, transport, and consumer goods together exert biodiversity pressures comparable in magnitude to those of food systems.

Housing drives approximately one quarter of global raw material extraction (Krausmann et al., 2018), contributing to habitat loss and degradation; meanwhile, construction of built environments accounts for 17% of climate-change impacts, 9% of global biodiversity loss, and 6% of global water-related impacts (UNEP, 2024a). Moreover, expansion of built infrastructure leads directly to habitat loss and degradation: the built environment is estimated to affect 29% of threatened and near-threatened species on the IUCN Red List (WEF, 2020), and continued urban expansion could threaten up to 290,000 km² of natural habitats by 2030, an area larger than Ecuador (The Nature Conservancy, 2018). Energy use in buildings causes a further 26% of global energy-related GHG emissions (IEA, 2024), contributing to global climate change – one of the five direct drivers of biodiversity loss.

Mobility systems (land, sea, and air transport) account for 7% of global climate impacts, 6% of pollution, and 2-5% of impacts on biodiversity (UNEP, 2024a). Linear transport infrastructures are a major source of ecological fragmentation, directly reducing biodiversity by 13-75% and impairing key ecological functions (Haddad et al., 2015; Hilty et al., 2020). Roads alone threaten approximately 2,300 key biodiversity areas (Laurance et al., 2014), while planned road and railway projects in 137 countries pose risks to more than 2,500 species worldwide (UNEP, 2022a).

Consumer goods – including textiles, electronics, vehicles, and appliances – further amplify pressures on biodiversity through resource- and energy-intensive supply chains. Manufactured goods account for about one-third of global GHG emissions and roughly 5% of global freshwater and land use (Circle Economy & Deloitte, 2024). Their production depends on the mining and manufacturing of material resources, the use of which has tripled since 1970 (UNEP IRP, 2019), with cascading impacts on biodiversity. Recent International Resource Panel analyses (UNEP, 2024a) point at the textile sector (beside food provisioning) as a key source for the extraction and processing of biomass, with more than one-third of textile materials sourced from land-based ecosystems (Textile Exchange, 2023). The textile sector drives a significant and growing portion of global carbon emissions, approximately 10% (Coscieme et al., 2022). It is estimated that the apparel industry generated 8.3 million tons (Mt) of plastic pollution in 2019 (Kounina et al., 2024) and generates 9% of annual microplastic pollution in oceans (UNEP, 2021a) – with pollution representing another key direct driver of biodiversity loss.

Together, this evidence highlights that housing, mobility, and consumer-goods consumption are also important drivers of biodiversity loss, operating through habitat conversion, resource extraction, pollution, climate pressures, and biological invasions.

Cross-domain links are strong but often overlooked in policy and monitoring: food systems rely on transport and packaging, and housing expansion competes with agriculture for land. Evidence from life-cycle assessments shows that measures in one sector – such as food waste reduction – can lower energy, transport, and material demand simultaneously, reducing biodiversity, climate and pollution pressures across domains (Crenna et al., 2019). Despite this, an integrated focus across key consumption domains remains largely missing from current policy and monitoring frameworks.

2.1.3 The role of telecoupling: Biodiversity Impacts Embedded in Trade

Across sectors, a significant share of biodiversity impacts is displaced through international trade, reflecting well-documented telecoupling dynamics - in which final consumption in one region drives biodiversity pressures in distant production regions. Up to 50-60% of biodiversity loss associated with consumption in high-income regions occurs abroad, mainly in tropical producer countries (Moran & Kanemoto, 2017; Marques et al., 2019). International trade drives deforestation linked to beef, soy, palm oil, cocoa, and timber (Pendrill et al., 2019). Meanwhile, rising agri-food imports into high-income and emerging economies account for a large share of recent land-use change impacts, particularly in tropical regions (Cabernard et al., 2024).

Environmental pressures are often exported from affluent consumers to biodiversity-rich but economically vulnerable regions. This creates challenges for national-level reporting, as domestic biodiversity trends may improve while externalised impacts worsen.

These telecoupled impacts are particularly relevant for GBF reporting, as they imply that national trends in domestic biodiversity and resource use do not fully reflect the global pressures associated with consumption.

2.2 European trends: consumption drivers and biodiversity pressures

European consumption generates a significant impact on biodiversity loss both within the EU and globally (Wilting et al., 2017; Sanyé-Mengual et al., 2023).

A useful indicator of the magnitude of resource use associated with EU consumption is the Material Footprint (see Table 3.2 for further details), which quantifies the amount of raw materials extracted globally (both within and outside of the EU) to satisfy final demand for goods and services consumed within the EU. According to the EEA[5], the EU's per-capita Material Footprint was approximately 14.1 tonnes in 2024. Although the EU's Material Footprint declined by about 5.5% between 2010 and 2024, it remains above the global average (12.2 tonnes per capita) and far above levels considered compatible with sustainable resource use (see chapter 4). For the long term, the trend has remained relatively stable, indicating only a relative decoupling of resource use from economic growth (EEA, 2024a, UNEP, 2024a). However, the Material Footprint should be interpreted as an aggregate measure of resource demand rather than a direct measure of environmental impact.

Different material categories exert different pressures on ecosystems: while non-metallic minerals account for the largest share of the EU's material footprint by mass, the extraction and processing of fossil fuels, metals and biomass are associated with disproportionately high impacts on climate, pollution, biodiversity and water resources (EEA, 2024a). Nevertheless, a high material footprint generally signals greater pressure on natural systems because it reflects the overall scale of resource extraction required to satisfy consumption demand. The Material Footprint therefore provides a useful proxy for assessing consumption-related resource pressures (see Table 3.3 for further details).

Overall, the evidence indicates that EU consumption continues to exert substantial pressure on global ecosystems, particularly through resource-intensive supply chains.

The following subsections summarise the main evidence from peer-reviewed and grey literature studies across food, housing, mobility, consumer goods, and telecoupled trade impacts.

2.2.1 Food

Food consumption, particularly animal-based products, is consistently identified as the largest contributor to the EU's consumption-related biodiversity loss (Lin et al., 2025). Evidence from multiple studies applying multi-regional input-output (MRIO), footprint and Life Cycle Assessment (LCA) approaches show that food accounts for 40–57% of the EU's biodiversity footprint (Wilting et al., 2017; Sanyé-Mengual et al., 2023; Fülling et al., 2024). This dominant role is also reflected in broader environmental impacts: food consumption contributes to around 45% of the EU's overall environmental footprint, compared with a global average of 35% (Marelli et al., 2025). Land use linked to food and feed production, grazing and cropland expansion emerges consistently as the primary driver of biodiversity impact, while agricultural intensification, freshwater use and nutrient pollution further contribute to ecosystem degradation and species loss. Biodiversity impacts are further shaped by where production occurs, with agricultural expansion into biodiversity-rich eco-systems and the outsourcing of these pressures through international supply chains amplifying the global biodiversity footprint of consumption (Pasqualino et al., 2025; Sanyé-Mengual et al., 2023; Fülling et al., 2024).

[5] See https://www.eea.europa.eu/en/analysis/indicators/europes-material-footprint

Dietary shift scenarios show considerable mitigation potential, although results vary widely depending on the modelling assumptions. Shifts towards more plant-based diets within Europe (EU27+UK) combined with food-waste reduction and circular food systems, for instance, could reduce land use by up to 71% and per capita GHG emissions by 29%[6], according to van Zantem et al. (2023). Meanwhile, scenario analyses at city level (Matej et al., 2024) indicate potential food-related footprint reductions in Vienna between 21% and 43% under transitions towards diets with less animal products.

2.2.2 Other sectors (housing, transport, and consumer goods)

Housing and mobility each account for roughly 13-17% of EU consumption-related biodiversity impacts, mainly through land use, material extraction, energy demand, and associated greenhouse gas emissions. Housing impacts arise from land conversion for urbanisation, energy use in buildings, and extraction of construction materials. Most of these pressures originate from mineral extraction, land occupation, upstream manufacturing processes and, to a minor extent, bioenergy (Wilting et al., 2021; Sanyé-Mengual & Sala, 2023). In addition, demand for timber and other forest-based materials can generate biodiversity pressures when sourcing contributes to forest degradation, habitat simplification, or unsustainable harvesting practices, particularly where growing demand for wood products and bio-based construction materials increases pressure on forest ecosystems (European Commission, 2021; EASAC, 2017).

Mobility contributes through fuel combustion (GHG emissions and climate impacts), infrastructure expansion (habitat fragmentation), and the upstream impacts of vehicle manufacturing.

Consumer goods such as textiles and electronics generate additional pressures through resource- and energy-intensive supply chains and short product lifetimes; these sectors' impacts are often sensitive to global trade dynamics (Cabernard et al., 2024).

A recent EEA analyses suggests that circular economy measures – including product lifetime extension and higher circular material use rates – can help reduce biodiversity pressures associated with housing, mobility, and consumer goods by reducing the demand for primary raw materials and the associated impacts of resource extraction and processing. These measures are particularly important given that resource extraction and processing are estimated to account for 80% of biodiversity loss (United Nations Environment Programme, 2024b), especially when combined with sufficiency-oriented approaches that reduce overall resource demand (Zink & Geyer, 2017; Korhonen et al., 2018; Hot or Cool, 2025; EEA, 2023b; Vercalsteren et al., 2025; EEA, 2026).

2.2.3 European telecoupling

A substantial share of biodiversity loss associated with EU consumption occurs outside Europe, particularly in biodiversity-rich regions supplying globally traded commodities (Wilting et al., 2017; EEA, 2025). This "displacement" complicates policy coherence as domestic progress in reducing footprints may inadvertently shift impacts abroad (Fülling et al., 2025).

A clear example of telecoupled impact displacement concerns EU demand for feed crops linked to poultry production. Between 2007 and 2018, increased demand for soybean, wheat, and maize contributed to cropland expansion (+17%) both within the EU and in exporting regions, particularly in Latin America (Sporchia et al., 2023). This growth was driven by several interacting factors, including an increase in EU poultry production (the EU became the world's fourth-largest producer of chicken meat), rising foreign demand for EU poultry (particularly from West African countries such as Ghana and Côte d'Ivoire), a dietary shift from beef and pork to poultry within the EU, and an overall sectoral restructuring (Sporchia et al., 2023).

[6] These results are based on the assumption of a self-sufficient European food system, while the EU is currently relying on both international and inter-EU trade flows (Galli et al., 2023).

Food consumption within EU countries also increasingly relies on biocapacity (e.g., primary natural resources) from other EU and non-EU countries, reducing national strategic autonomy (Galli et al., 2023). This pattern is reflected in recent EU land footprint estimates, which show that the EU remains heavily dependent on imported cropland to satisfy domestic consumption. In 2021, the EU's cropland footprint totalled approximately 116 million hectares, of which 22 million hectares were net imports, confirming the EU's significant reliance on cropland outside its borders to meet domestic consumption. Cropland imports were concentrated in a relatively small number of trading partners – particularly Argentina, Brazil and Ukraine – while vegetable oils, oilseeds and food industry residues (including oilcakes used for animal feed) accounted for a substantial share of imported land demand (De Laurentiis et al., 2024). These studies confirm that biodiversity pressures are transmitted through global supply chains from production regions – often biodiversity-rich tropical areas – to consumption centres in Europe, North America, and East Asia. The JRC analysis also found that the EU's per capita cropland footprint slightly exceeds the estimated planetary boundary for sustainable land use, underscoring the global sustainability implications of European consumption patterns (De Laurentiis et al., 2024).

Collectively, these findings point to a limited number of consumption hotspots that account for most of Europe's impacts on biodiversity. Table 2.1 summarises the evidence base and typical quantitative signals associated with these high-impact domains.

Table 2.1 Consumption hotspots of biodiversity impact with quantitative evidence

Hotspot	Evidence Base	Typical Quantitative Signal
Food and agriculture	Identified as the single largest driver in multiple global and regional footprint studies. Animal products and meat frequently singled out within food as the top contributor in Life Cycle Assessment and footprint studies.	Food accounts for about 40–57% of the EU's consumption-related biodiversity footprint. Animal products and meat have a high footprint intensity per unit and large potential reductions when diets change.
Housing/construction	Consistently identified as a major contributor in EU consumption footprint studies due to material demand, land occupation, and energy use in buildings.	Linked to mineral extraction, land occupation, upstream manufacturing processes, and demand for timber and other forest-based materials. Biodiversity impacts occur through urban expansion, construction material supply chains, and pressures on forest ecosystems.
Mobility/transport	Reported as a major contributor alongside food and household goods in EU consumption studies.	Housing and transport accounts for roughly 13-17% of EU consumption-related biodiversity impacts. Transport services (e.g. passenger mobility and infrastructure) consistently rank among the highest-impact consumption domains.
Household goods and commodities	Appears repeatedly in multi-sector footprint decompositions as a contributor.	Linked to upstream processes such as manufacture.

2.3 Biodiversity outcomes and causal pathways: linking consumption to impacts

Consumption patterns shape pressures across both local and distant ecosystems (Hickel et al., 2022), with impacts embodied in international trade often exceeding domestic pressures (Moran and Kanemoto, 2017). Production and consumption systems drive ecosystem degradation (Shi et al., 2025), intensify pressures on protected and unprotected areas, including areas of high biodiversity importance (Geldmann et al., 2014; Jones et al., 2018; Venter et al., 2016), contribute to pollution (UN, 2019a), disrupt ecosystem services, and fuel the exploitation of wild species, with around one-third of global species threats linked to international trade (Lenzen et al., 2012). Consumption-related pressures also affect climate regulation, urban green space planning, and equitable access to nature. Importantly, trade can shift biodiversity and other environmental pressures across regions, transferring impacts to locations outside the area of consumption. These displaced impacts need to be accounted for in integrated policy approaches (Lenzen et al., 2012).

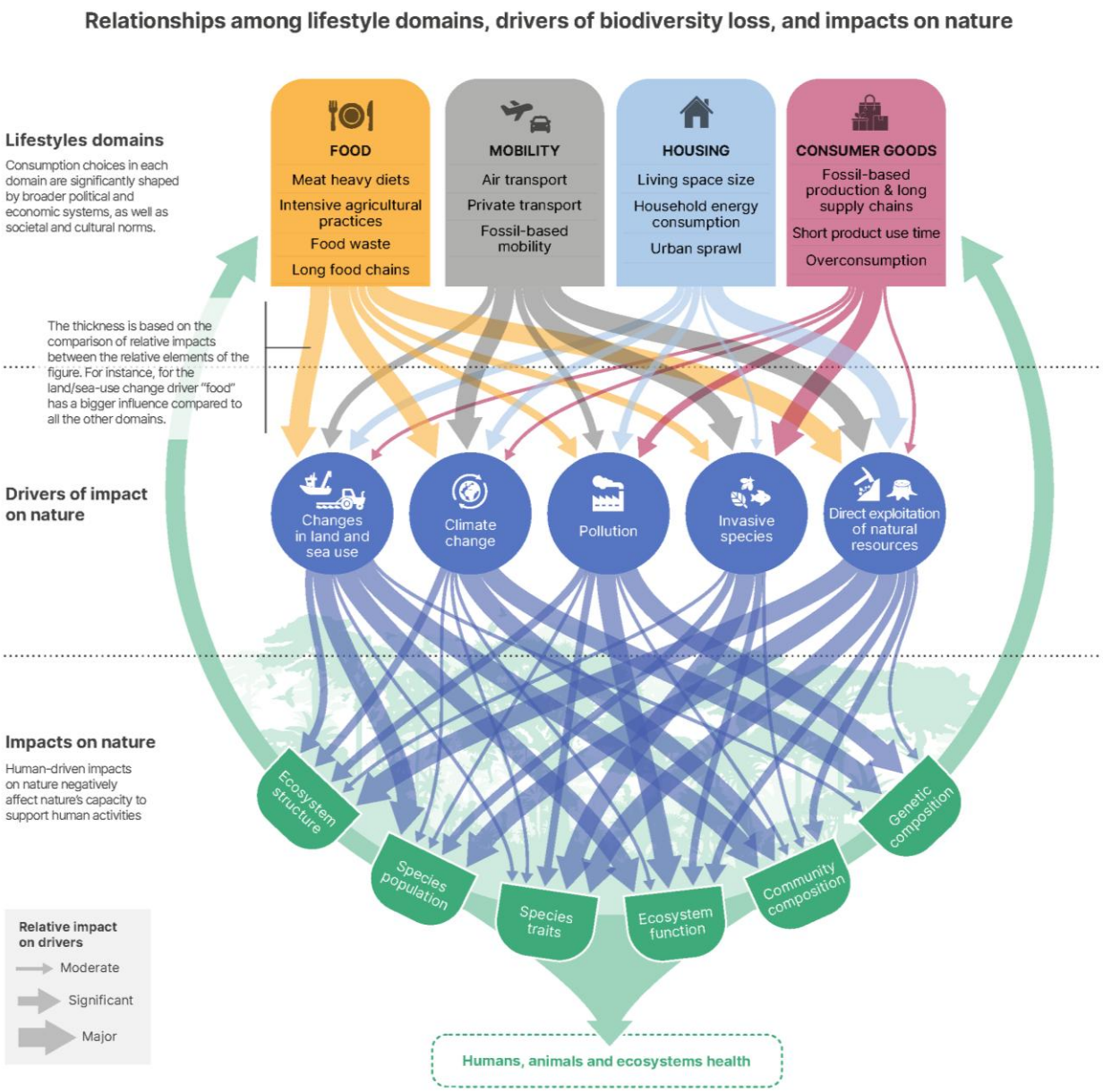
Despite advances in integrated assessment frameworks, such as the JRC Consumption Footprint model[7], a comprehensive and globally harmonised system capable of fully linking consumption patterns to biodiversity outcomes is still lacking. Unlike climate policy, where carbon footprints provide a widely used accounting framework, biodiversity-related consumption metrics remain methodologically fragmented. This gap is particularly relevant for biodiversity policy, as it limits the ability to set clear, consumption-based biodiversity targets and reference values comparable to those used in climate policy (e.g. carbon budgets), thereby constraining the operationalisation of Target 16.

Taken together, the findings above nevertheless support a qualitative mapping of how major lifestyle domains influence the five direct drivers of biodiversity[8] loss, as illustrated in Figure 2.1 (Hot or Cool, 2026).

[7] https://web.jrc.ec.europa.eu/policy-model-inventory/explore/models/model-consumption-footprint/

[8] In this report, the most direct measures of impacts on biodiversity – often referred to as *endpoint impacts on biodiversity* – are understood as human-induced changes in Essential Biodiversity Variables (EBVs). According to Jaureguiberry et al. (2022), six classes of EBVs can be distinguished, each representing a dimension through which human activities affect nature: 1) Genetic composition (measures of genetic diversity of populations, structure and inbreeding based on the number and frequency of alleles measured across time and species), 2) Species populations (measures of the distribution and abundance of species as well as the specific structure of their populations), 3) Species traits (measures of within-species changes in traits over time), 4) Community composition (measures of community diversity and ecosystem-level interactions), 5) Ecosystem structure (measures of the state and dynamics of ecologically relevant ecosystem traits) and 6) Ecosystem function (measures of the dynamics of small- to large-scale ecosystem processes and resulting ecosystem functions).

Figure 2.1. Relationships among lifestyle domains, drivers of biodiversity loss, and impacts on nature



Notes: The way we eat (food), travel (mobility), live (housing), and consume goods affect nature through five main drivers (IPBES, 2019): land- and sea-use changes, resource exploitation, pollution, climate change, and invasive species. These drivers impact nature in terms of six Essential Biodiversity Variables (EBV): ecosystem structure, species population, species traits, ecosystem function, community composition and genetic composition (Pereira et al., 2013). Arrow thickness between lifestyle domains and drivers reflects on data from literature and expert consultations. Arrows between drivers and impacts are based on findings from Jareguiberry et al. (2022). Leisure is considered as a cross-cutting element affecting all domains. Source: Hot or Cool, 2026.

2.4 Consumption relevance across the GBF targets

Because consumption pressures influence multiple drivers of biodiversity loss, limiting consumption primarily to Target 16 risks underestimating its broader relevance across the GBF. Advances in telecoupling frameworks, global biodiversity footprinting, and integrated systems modelling provide a solid foundation for broadening how consumption is understood and operationalised within the GBF.

Kozicka et al. (2023), for instance, show that if agricultural land spared within forest ecosystems – through efficiency gains in production or shifts towards more sustainable diets – were restored to forest, this could contribute 13%-25% of the global land-restoration needs under GBF Target 2 by 2030. More broadly, the dietary shifts modelled in the study would substantially reduce pressure for agricultural expansion, almost completely halt net forest and natural land loss, and support ecosystem recovery. This is just one of the multiple interactions that exist between consumption and biodiversity, and which are preliminarily illustrated in Table 2.2 below. The table shows how consumption influences nearly all GBF targets – either as a direct driver, a pressure modifier, or an enabler of implementation and equity – and includes a preliminary qualitative assessment of the relevance of consumption to each target. This assessment has been developed specifically for this report, drawing on the authors' knowledge and the reviewed evidence base, and is intended as a starting point for further refinement and validation through wider expert and stakeholder engagement.

Table 2.2 Consumption remains relevant beyond Target 16 of the GBF.

GBF Target	How Consumption is Relevant	Direct / Indirect	Qualitative Relevance	Key Reference(s)
1. Spatial Planning for Biodiversity	Drives land- and sea-use via demand for urbanization, agriculture, extraction (e.g. urban expansion driven by housing demand and infrastructure development increases land sealing and habitat fragmentation)	Direct	High	IPBES, 2019
2. Ecosystem Restoration	Resource-intensive demand increases degradation; sustainable consumption reduces pressure (e.g. reduced meat consumption lowers land demand, enabling land restoration)	Indirect	High	Kozicka et al., 2023
3. Protected & Conserved Areas	Consumption shapes pressures on unprotected ecosystems, conservation priorities, and funding	Indirect	Medium	Jones et al., 2018 Venter et al., 2016
4. Threatened Species, Diversity, Conflict	Overconsumption of wild species elevates extinction and conflict risks (e.g. demand for wildlife products - timber, seafood, exotic species - linked to global trade pressures)	Direct	High	Lenzen et al., 2012
5. Sustainable Harvest/Trade Wild Species	Drives (over)exploitation and illegal trade	Indirect	Medium	Seebens et al., 2015
6. Invasive Alien Species	International supply chains facilitate introductions linked to consumption	Indirect	Medium	Seebens et al., 2015

GBF Target	How Consumption is Relevant	Direct / Indirect	Qualitative Relevance	Key Reference(s)
7. Pollution	Demand for pesticides, plastics, chemicals, and the alike directly drives pollution (e.g. textile consumption contributes to microplastic pollution and chemical discharge)	Direct	High	UNEP, 2019
8. Climate Mitigation and Adaptation	Consumption of energy, food, and materials drives emissions and land-use change (e.g. high-carbon diets and energy-intensive housing increase emissions affecting ecosystems)	Direct	High	IPCC, 2022
9. Sustainable & Equitable Benefits	Production and consumption systems potentially shape benefit-sharing via sustainable sourcing and fair trade	Indirect	Medium	IPBES, 2022
10. Sustainable Agriculture/Aquaculture/Forestry	Consumption drives land- and water-use, input intensity, management practices (e.g. demand for animal products drives feed production and fertiliser use)	Direct	High	Springmann et al., 2018
11. Ecosystem Services	Overuse/overconsumption undermines provision of ecosystem services	Indirect	Medium	IPBES, 2019
12. Urban Planning & Green Spaces	Urban consumption influences demand for land and materials, affecting green areas (e.g. larger dwelling sizes and infrastructure expansion increase land-use pressure)	Direct	Medium	Seto et al., 2012
13. Access to Genetic Resources	Consumption of genetic resources affects fair sharing of benefits with source countries and communities	Indirect	Low	CBD, 2010
14. Integrate Biodiversity Across Sectors	Mainstreaming depends on consumption-driven fiscal, trade, and business practices	Indirect	Medium	OECD, 2019
15. Business Biodiversity Disclosure	Corporate value chains and reporting are shaped by consumption patterns, while improved biodiversity disclosure (e.g. under frameworks such as TNFD) can provide consumers with better information to support more sustainable purchasing decisions.	Indirect	High	TNFD, 2023
16. Sustainable Consumption	Central — target is footprint minimization, sustainable consumption, and waste reduction	Direct	High	This report
17. Biotechnology & Biosafety	Demand for biotech/GMOs shaped by consumption and risk preferences	Indirect	Low	CBD, 2000

GBF Target	How Consumption is Relevant	Direct / Indirect	Qualitative Relevance	Key Reference(s)
18. Harmful Subsidies & Incentives	Subsidies for high-impact sectors often reinforce unsustainable consumption (e.g. fossil fuel or agricultural subsidies incentivise high-impact consumption patterns)	Indirect	High	IPBES, 2019
19. Finance for Biodiversity	Choices (e.g. eco-labels) can channel investments toward biodiversity-positive outcomes (e.g. demand for sustainable products drives biodiversity-positive investment flows)	Indirect	Medium	OECD, 2021 UNEP, 2022b
20-23. Implementation, Knowledge, Gender, Participation	Societal values/participation patterns influence delivery and gendered consumption	Indirect	Medium	UNEP, 2016

Notes: The table illustrates how consumption relates to the GBF targets and the Monitoring Framework. "Direct" means that changes in consumption patterns would immediately or substantially influence progress towards the target and its associated indicators. "Indirect" reflects an enabling, amplifying, or contextual influence where consumption act as an underlying driver mediated by broader governance, economic, or social factors. "Qualitative relevance" provides a preliminary expert-based assessment of the overall significance of consumption for achieving each target, drawing on the literature reviewed in this report. "High" indicates that consumption is considered a major determinant or leverage point for achieving the target; "Medium" indicates a meaningful but less central influence; and "Low" indicates a more limited relationship.

Taken together, these examples illustrate that consumption influences progress across much of the GBF and could therefore be considered beyond Target 16 alone (see also Figure 2.2). The CBD draft Global Report[9] also highlights the relevance of consumption beyond Target 16, noting – for in-stance under Target 15 – that business disclosure and consumer information are part of enabling sustainable consumption patterns, although national target coverage remains limited.

9 See https://www.cbd.int/gbf/implementation/globalreview (accessed June 9 2026).

Figure 2.2 Alignment of GBF Targets with biodiversity policy domains and their relative relevance to consumption patterns.

Notes: The figure groups targets into three categories – ecosystem management, biodiversity governance, and biotech innovation and digital information – while indicating their increasing relevance to consumption from top (low) to bottom (high). Ecosystem management refers to the actions and practices aimed at conserving, restoring, and sustainably managing ecosystems; Biodiversity governance is the systems of rules, institutions, and decision-making that guide biodiversity conservation and use.

3 Measuring Biodiversity Impacts of Consumption within the GBF: Mapping of Indicators Relevant to Target 16

3.1 Methodological foundations: how consumption impacts are measured

This section outlines the main approaches currently used to measure the biodiversity impacts of consumption and their relevance for monitoring under the Global Biodiversity Framework (GBF). Particular attention is given to methods capable of attributing biodiversity pressures along global supply chains to final consumption (telecoupled impacts), which are especially relevant for Target 16.

Over the last decade, measurement has advanced across three main "families" of analytical approaches for assessing the environmental impacts of production and consumption (Crenna et al., 2020; Sanyé-Mengual et al., 2023; Marquardt et al., 2021):

- **Consumption-based Multi-Regional Input-Output (MRIO) models:** MRIO models track global supply-chain flows, linking final consumption to environmental pressures and biodiversity impacts through trade-adjusted calculations of direct drivers of impact such as land use, air emissions, and resource extraction (Kitzes, 2013). These models are particularly well suited to capturing telecoupled impacts (see chapter 2), as they allocate pressures occurring anywhere in the world to the country where final demand takes place.

  Recent methodological advances have extended MRIO frameworks to include biodiversity impact characterisation factors, enabling the estimation of endpoint impacts such as potentially disappeared fraction of species (PDF) or species-area relationship (SAR)-based metrics. As a result, MRIO-based approaches are increasingly used in international assessments and policy relevant analyses, including work by the International Resource Panel (UNEP, 2024b)[10].

  However, important limitations remain. MRIO-based biodiversity footprints still capture some biodiversity pressures more comprehensively than others, with land-use change generally better represented than drivers such as invasive species, overexploitation, freshwater impacts, or ecological fragmentation. Results also depend on the spatial and sectoral resolution of MRIO databases, which can mask local ecological conditions and biodiversity sensitivities (Vanham et al., 2023). Consequently, MRIO-based biodiversity footprints could be interpreted as indicative approximations of consumption-related biodiversity pressures rather than comprehensive measures of biodiversity loss (Bjelle et al., 2021; Davin et al., 2024; Cabernard et al., 2024):

- **Product-level Life Cycle Assessment (LCA):** LCA provides product-level pressure data, such as land occupation, climate emissions, and ecotoxicity. End-point LCA models can translate direct drivers of impact into species-loss equivalents, although often with limited spatial specificity (Lindner et al., 2019).

- **Hybrid approaches combining LCA and MRIO:** Hybrid approaches aim to combine the economy-wide completeness of MRIO models with the technological and product-level specificity of LCA. By integrating sector-level trade modelling with process-level environmental extensions, they can improve pressure attribution while retaining supply-chain coverage (Crenna et al., 2020; Crawford et al., 2018; El Geneidy et al., 2023). Such approaches are increasingly used to refine biodiversity footprint estimates.

[10] Recent developments include spatially explicit extensions that combine global trade modelling with land-use characterisation factors to estimate consumption-based biodiversity footprints (e.g. Cabernard et al., 2024). Within the European context, environmentally extended MRIO (EE-MRIO) models have been applied by the European Topic Center Circular Economy (ETC CE) and the European Environment Agency (EEA) to assess the global environmental and biodiversity impacts of EU consumption, including the effects of increased circularity (ETC CE, 2024; ETC CE, 2025). Empirical applications for the EU-27 show that the environmental footprint of total final demand declined between 2010 and 2013, increased again after 2016, and temporarily decreased in 2020 due to the COVID-19 pandemic (EEA, 2024b; EEA, 2025), illustrating the usefulness of MRIO-based approaches for tracking structural changes in consumption and externalised environmental pressures over time.

These methods differ in spatial resolution, coverage of biodiversity pressures, and their ability to track international trade and supply chains (see Table 3.1).

Table 3.1. Overview of main approaches for assessing consumption-driven biodiversity impacts.

Method	Spatial focus	Drivers measured	Main indicators	Key reference
MRIO consumption (incl. biodiversity footprint extensions)	National/global (trade-linked; increasingly spatially explicit)	Land use, emissions, trade flows	Consumption-attributed species loss (PDF, SAR, BII); biodiversity footprint	Wilting et al., 2017; Cabernard et al. 2024; IRP, 2024
LCA/LCIA product	Product/supply chain	Land use, climate, ecotoxicity	Species loss; midpoint/endpoint characterisation	Lindner et al., 2019; Sanyé-Mengual et al., 2023
Hybrid LCA–MRIO	Multi-scalar, sector-resolved	Combined pressures	Mixed indicators	Crenna et al., 2020

Notes: The table summarises the principal analytical frameworks currently applied to quantify the biodiversity impacts of consumption. MRIO models capture economy-wide supply-chain effects; LCAs provide detailed product-level information; and hybrid models seek to integrate both perspectives.

Most existing approaches measure biodiversity-related pressures indirectly through mid-point indicators assessing direct drivers of biodiversity loss such as land use, emissions, resource extraction, or climate change, while fewer methods comprehensively translate these pressures into endpoint biodiversity outcomes such as species loss or ecosystem condition (see Figure 2.1). No single number indicator currently provides a fully integrated representation of the complete causal chain linking consumption to biodiversity outcomes (El Geneidy et al., 2023; Sitra & University of Jyväskylä, 2025).

Taxonomic coverage also remains uneven, with vertebrates and vascular plants better represented than invertebrates. Differences in impact metrics, spatial resolution, and the pressure categories included further contribute to variations across modelling results (Sanyé-Mengual et al., 2023; Crenna et al., 2020). At the same time, ongoing efforts to harmonise characterisation factors, improve spatial datasets, and integrate biodiversity-specific extensions into global trade models are gradually improving comparability and robustness (Kim et al., 2018; Bowler et al., 2024). Methodological divergence could therefore be understood as a frontier of refinement rather than as a barrier to policy application.

Recent developments increasingly seek to translate these modelling advances into operational indicators. For example, the Global Environmental Impacts of Consumption (GEIC) indicator builds on MRIO-based footprint modelling to quantify trade-adjusted environmental impacts of national consumption across multiple pressure categories, including land-use and biodiversity-relevant pressures[11]. Similarly, indicators such as biomass resource productivity, which measures how efficiently biomass resources are used to generate economic value, and net land take, which tracks the conversion of natural and agricultural land to urban and other artificial uses, provide complementary system-level perspectives on the resource-use and land-use implications of consumption patterns. Together, these indicators offer pragmatic entry points for integrating consumption-based biodiversity considerations into GBF monitoring, even where full endpoint biodiversity modelling remains methodologically complex.

The following sections examine how these methodological developments are currently reflected in the GBF Monitoring Framework and in national reporting practices.

[11] See https://commodityfootprints.earth/

3.2 Overview of GBF Headline Indicators and the Blind Spot of Target 16

The Kunming-Montreal Global Biodiversity Framework (GBF) includes headline, component, complementary, and binary indicators to support monitoring across its goals and targets[12]. While the framework is broad in scope, its current indicator portfolio remains oriented mainly towards biodiversity state and restoration outcomes rather than systematically tracking upstream consumption pressures. A recent assessment of the GBF Monitoring Framework (Affinito et al., 2025) found that, even under best-case implementation, the framework fully covers only 29% of GBF goals and targets, and partially covers 47%, leaving major gaps particularly in areas related to sustainable use, benefit-sharing, and resource mobilisation. These limitations create a particular blind spot for Target 16.

Target 16 is the only GBF target that explicitly addresses sustainable consumption. It calls for halving global food waste, reducing overconsumption, and promoting sustainable and equitable lifestyles. Yet no headline indicator has been adopted to track these core ambitions. Instead, the principal mandatory metric associated with this target is a binary indicator: the "number of countries developing, adopting or implementing policy instruments aimed at encouraging and enabling people to make sustainable consumption choices" (CBD, 2025) (Table 3.2).

This binary indicator captures whether policy instruments exist, but not their ambition, implementation quality, effectiveness, or distributional implications (Jennings et al., 2024). It also risks focusing attention on individual consumer choices rather than broader systemic drivers of consumption, such as product regulation, fiscal incentives, or changes in provisioning systems (how food, housing, mobility and goods are designed, produced, traded, distributed, priced and made available). Moreover, by ignoring per-capita and distributional differences, it further fails to reflect GBF's commitment to ensuring that reductions in consumption occur in an equitable manner.

Table 3.2 Indicators for Target 16 in the GBF (latest update February 2026, CBD decision 16/31[13])

Headline	Binary	Component	Complementary
N/A	16.b Number of countries developing, adopting or implementing policy instruments aimed at encouraging and enabling people to make sustainable consumption choices	• 16.CT.1 Food Waste Index • 16.CT.2 Material Footprint, material footprint per capita, and material footprint per GDP • 16.CT.3 Ecological Footprint	• 16.CY.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education and (d) student assessment • 16.CY.2 National recycling rate, tons of material recycled • 16.CY.3 Human appropriation of net primary production • 16.CY.4 CO2 emission per unit of value added • 16.CY.5 Change in water-use efficiency over time • 16.CY.6 Indicators from the Life Cycle Impact Assessment Pro-gramme • 16.CY.7 Poverty level

[12] See https://www.cbd.int/doc/decisions/cop-16/cop-16-dec-31-en.pdf
[13] See https://www.cbd.int/doc/decisions/cop-16/cop-16-dec-31-en.pdf

More broadly, current Target 16 indicators do not quantify overconsumption, nor they systematically track the distribution of resource use across income groups or social categories. Food waste is only partially covered through SDG-aligned metrics, while broader consumption domains such as mobility, housing, and material use remain weakly operationalised.

Consumption-based footprint indicators – including material and ecological footprints (which are currently included as component indicators), along with carbon, water, and biodiversity footprints – may offer additional perspectives for capturing upstream and telecoupled biodiversity pressures associated with consumption. Their inclusion into the GBF would support a shift from merely tracking policy intent towards measuring real-world pressures and outcomes.

The GBF nevertheless allows Parties to complement mandatory reporting with additional nationally selected indicators. This creates opportunities for countries or regional organisations to incorporate more consumption-related metrics where relevant and feasible.

This report does not seek to map all biodiversity-relevant indicators; such comprehensive catalogues are developed elsewhere (e.g. by SBSTTA and the Biodiversity Indicators Partnership – BIP) and fall outside the scope of this report. Instead, the focus here is on consumption-related indicators with clear relevance for biodiversity governance and GBF monitoring, particularly under Target 16.

3.3 Mapping of indicators for measuring impacts of consumption

This section maps consumption-related indicators relevant to biodiversity monitoring under Target 16 and assesses their operational readiness, coverage, and policy relevance.

Several of these indicators are already included in the GBF Monitoring Framework – primarily as component or complementary indicators under Target 16 or other targets – while others are not yet formally integrated but are widely used in related policy and analytical contexts. One exception is the "value of environmentally harmful subsidies", which is a headline indicator for Target 18. Section 3.4 examines the extent to which Parties have reported on these indicators in their 7th National Reports to the CBD.

The indicator mapping followed a structured approach:

- **Disaggregation of Target 16 into six interlinked components**: A) sustainable consumption, B) waste, C) high-impact products, D) equitable consumption, E) policy and legislative frameworks, and F) education and access to information.
  This reflects the multi-dimensional nature of the target, covering behavioural outcomes (reducing overconsumption and waste), distributive principles (ensuring equity in footprint reductions), and enabling conditions (policy support and information access) (see Text box 1.1)[14].
- **Compilation of a revised set of indicators**, drawing on international frameworks (CBD, SDGs, UNEP IRP, the Biodiversity Indicators Partnership), European statistical systems, and national initiatives such as Finland's work on consumption-based biodiversity footprints[15]. Together with indicators already included in the GBF Monitoring Framework, this step aims to outline an extended set of indicators that could inform a future revision or expansion of the Monitoring Framework for Target 16.

[14] While components E and F are retained for completeness, they largely overlap with Targets 14, 21 and 22, and their associated indicators.

[15] This extended set reflects both indicators currently included in the GBF Monitoring Framework and additional candidate indicators identified in the literature and policy practice. Under CBD Decision 15/5 and Decision 16/31, the Monitoring Framework is subject to ongoing review, including the submission of additional headline, component and complementary indicators by Parties and relevant organisations. These submissions are to be considered by the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) ahead of COP17 (October 2026). The indicator mapping presented here is therefore intended to support this process by identifying options to address current gaps in monitoring consumption-related pressures under Target 16. Section 3.4 examines the use of these indicators in Parties' National Reports, providing insight into feasibility and uptake.

- **Evaluation against CBD indicator criteria** (CBD COP Decision 15/5, Annex 1, para. 2 – CBD 2022), including conceptual alignment with targets, scientific robustness, scalability, data availability, custodianship, and interpretability (Text box 3.1).
- **Assessment of relevance** to key consumption domains (food, housing, mobility, consumer goods, and leisure), as well as to the five direct anthropogenic drivers of biodiversity loss (land- and sea-use change, climate change, pollution, invasive species, and resource exploitation) (Table 3.5, Table 3.6).

Table 3.3 summarises the outcome, listing all 31 indicators with details on methodology, frequency, scale, and custodianship. Of these, 25 indicators have established methodologies, but only 17 are both methodologically sound and regularly updated. This shows that while many candidate indicators exist, only a limited subset is currently operational, harmonised, and regularly updated for systematic GBF reporting.

Text box 3.1. Indicator criteria for the Monitoring Framework of the Kunming-Montreal Global Biodiversity Framework

According to CBD COP Decision 15/5 (Annex 1 paragraph 2 – CBD 2022), the indicators in the monitoring framework for the Kunming-Montreal GBF meet the following criteria:

- The data and metadata related to the indicator are publicly available;
- The methodology underpinning the indicator is either published in a peer-reviewed academic journal or has gone through a scientific peer-review process and has been validated for national use;
- The data sources and indicators are compiled and regularly updated with a time lag of less than five years between updates, if possible;
- There is an existing mechanism for maintaining the indicator methodology and/or data generation, including, for example, by a member of the Biodiversity Indicators Partnership, an intergovernmental organization or a well-established scientific or research institution, providing nationally applicable guidance on the use of the indicator;
- Indicators are able to detect trends relevant to the components of the goals and targets of the Kunming-Montreal Global Biodiversity Framework;
- When possible, indicators are aligned with existing intergovernmental processes under the Statistical Commission, such as the Sustainable Development Goals, the Framework for the Development of Environment Statistics or the System of Environmental-Economic Accounting or utilize the existing work on essential biodiversity variables under the Group on Earth Observations Biodiversity Observation Network.

Table 3.3 Overview of consumption-related indicators identified as potentially relevant to GBF Target 16

Indicator	Globally agreed – peer-reviewed methodology	Metadata available	National scale	Update frequency	Latest update	Custodian/ Publishing Organisation	Already included in the GBF monitoring framework	Use in other international frameworks
A. SUSTAINABLE CONSUMPTION								
Material footprint				Annual	2024	UNEP, IRP	Yes (16.CT.2)	SDG 8.4.1 SDG 12.2.1
Carbon footprint (consumption-based)				Annual	2024	Eurostat		SEEA
Ecological footprint				Annual	2025	Global Footprint Network	Yes (16.CT.3)	
Global Environmental Impacts of Consumption (GEIC) indicator				Annual	2023	Joint Nature Conservation Committee (JNCC)		
Water footprint					2020	Water Footprint Network		
Nitrogen footprint					2022	Nitrogen Footprint Network		
Phosphorus footprint					2011			
Chemical footprint				Annual	2024	Clean Production Action		

Indicator	Globally agreed – peer-reviewed methodology	Metadata available	National scale	Update frequency	Latest update	Custodian/ Publishing Organisation	Already included in the GBF monitoring framework	Use in other international frameworks
Land footprint				Annual	2022	Eurostat		
Biosphere integrity genetic and functional				Annual	2025	PIK		
Biodiversity footprint					2025	University of Jyväskylä		
Total energy consumption				Twice a year	2025	IEA		SDG 7.3.1 SEEA
Consumption footprint				Annual	2026	JRC		8th EAP
B. WASTE								
Food Waste Index				Every four years	2024	UNSD - UNEP	Yes (16.CT.1)	SDG 12.3.1
Municipal solid waste collected and managed				Annual	2025	UNSD - UN-Habitat	Yes (7.CY.3)	SDG 11.6.1
Waste recycling rate				Annual	2022	EEA	Yes (16.CY.2)	
C. HIGH-IMPACT PRODUCTS								
Per capita meat consumption				Annual	2024	FAO		
Passenger-km by car				Annual	2025	IEA		8th EAP

Indicator	Globally agreed – peer-reviewed methodology	Metadata available	National scale	Update frequency	Latest update	Custodian/ Publishing Organisation	Already included in the GBF monitoring framework	Use in other international frameworks
Ratio of land consumption rate to population growth rate				Annual	2025	UN-Habitat		SDG 11.3.1
D. EQUITABLE CONSUMPTION								
Proportion of population living in households with access to basic services				Every two to five years	2023	UN-Habitat – WHO/UNICEF		SDG 1.4.1
Gini coefficient of consumption				Annual	Varies by country	OECD		EU SDG 10
Share of consumption by income					2023	OECD		SDG 10.1.1
Material footprint by income					2020	OECD - UNSTATS		
Carbon footprint by income					2025	Hot or Cool Institute		
Average size of dwelling by income				Annual	2025	Eurostat		

Indicator	Globally agreed – peer-reviewed methodology	Metadata available	National scale	Update frequency	Latest update	Custodian/ Publishing Organisation	Already included in the GBF monitoring framework	Use in other international frameworks
E. POLICY AND LEGISLATIVE FRAMEWORKS								
Environmental Democracy Index					2015	World Resources Institute		
Environmental Performance Index				Annual	2025	Yale University		
Value of environmentally harmful subsidies				Annual	2024	OECD - UNEP	Yes (18.2)	
F. EDUCATION AND ACCESS TO INFORMATION								
Biodiversity Engagement Indicator					2018	Conservation International		
Number of EU Ecolabel products				Monthly	2025	DG ENV		SEEA, 8th EAP

Indicator	Globally agreed – peer-reviewed methodology	Metadata available	National scale	Update frequency	Latest update	Custodian/ Publishing Organisation	Already included in the GBF monitoring framework	Use in other international frameworks
Extent to which (i) global citizenship education and (ii) education for sustainable development are main-streamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment				Annual	2025	UNESCO	Yes (16.CY.1)	SDG 12.8.1

Notes: The table summarises the 31 identified indicators, specifying for each whether a globally agreed and peer-reviewed methodology exists, the scale and frequency of updates, and the responsible custodian organisation. Indicators are grouped into the six interlinked components of Target 16 identified in this report: A) sustainable consumption, B) waste, C) high-impact products, D) equitable consumption, E) policy and legislative frameworks, and F) education and access to information. “Latest update” refers to the most recent year in which an analysis for a given indicator was published, not the data year itself, which often lags by 2-3 years**.**

Sustainable Consumption

The mapping highlights both readiness and important gaps in the availability of relevant indicators for Target 16. Indicators such as the Material Footprint and the Ecological Footprint are grounded in internationally agreed methodologies, regularly updated, and supported by established custodians such as UNEP and recognised research institutions. Conversely, the Carbon Footprint – despite widespread use and strong institutional support – still lacks a globally agreed methodology, as different approaches (e.g. monetary vs. physical accounts) yield varying results.

The Material Footprint, developed under UNEP and the International Resource Panel (IRP), is relevant for including consumption aspects in biodiversity policy. The indicator measures the total quantity of raw materials extracted worldwide to satisfy final consumption demand, including materials embodied in imported goods and services. It is calculated using environmentally extended multi-regional input-output models that trace material flows through global supply chains and allocate extraction to final consumers rather than producers. As such, the Material Footprint does not directly measure land use or biodiversity impacts. Instead, it serves as a consumption-based proxy for the resource demands that drive biodiversity pressures through extraction, land conversion, pollution, infrastructure development, and associated environmental change. By capturing the pressures linked to land use and ecosystem extraction, it helps assessing the biodiversity impacts of consumption, and especially direct drivers of impact (UNEP/IRP, 2024). Although the Material Footprint is often primarily associated with biomass extraction and land-use pressures, biodiversity impacts linked to material consumption extend across all major material categories. Importantly, the relationship between material consumption and biodiversity is not uniform across material categories. A tonne of biomass, fossil fuels, metal ores, or construction minerals can generate very different types and magnitudes of ecological pressure depending on extraction methods, geographical context, and associated supply chains. The Material Footprint captures these material flows in aggregate terms but does not differentiate their biodiversity impacts. Therefore, interpretation of the indicator benefits from considering the composition of the footprint across material categories. Table 3.4 summarises the main biodiversity-relevant pressures associated with different Material Footprint components.

Table 3.4 Biodiversity relevance of different Material Footprint components

Material category	Main biodiversity pressures	Typical biodiversity impacts	Illustrative evidence/examples	Indicative quantitative evidence
Biomass	Agricultural expansion, forestry, fisheries, water extraction	Habitat loss, deforestation, soil degradation, freshwater depletion, species decline	Soy and cattle expansion in Latin America; logging in tropical forests	Agriculture responsible for ~75% of land-related biodiversity impacts globally (UNEP, 2024a)
Fossil fuels	Extraction, infrastructure expansion, pollution, climate change	Habitat fragmentation, marine degradation, climate-driven biodiversity loss	Oil extraction in Niger Delta; offshore drilling; coal mining	Fossil fuel extraction and use are major contributors to climate change, one of the five direct drivers of biodiversity loss (IPBES, 2019)

Material category	Main biodiversity pressures	Typical biodiversity impacts	Illustrative evidence/examples	Indicative quantitative evidence
Metal ores	Mining expansion, tailings, toxic contamination, water pollution	Ecosystem degradation, freshwater contamination, species loss near mining sites	Lithium, cobalt, copper and nickel mining linked to ecosystem degradation in Latin America and Africa	Mining occupies relatively small land areas globally but often overlaps with biodiversity-rich regions and generates disproportionately high ecological impacts (Maus et al., 2022)
Non-metallic minerals	Sand, gravel and limestone extraction; urban expansion	River and coastal ecosystem degradation, habitat fragmentation, land sealing	Sand mining affecting riverine and coastal biodiversity in Asia and Africa	Construction minerals represent the largest material flow globally by mass and are strongly associated with land-system change (Park et al., 2026)

This overview illustrates that the biodiversity relevance of the Material Footprint extends beyond agricultural biomass. Although biomass extraction is a major contributor to land-related biodiversity pressure, the Material Footprint also encompasses fossil fuels, metal ores, and construction minerals, all of which can generate substantial biodiversity impacts through habitat conversion, pollution, freshwater degradation, climate change, and infrastructure expansion. In this sense, the indicator captures not only direct land occupation by agriculture but also the wider ecological consequences of extractive and industrial supply chains (e.g. Rowlands et al., 2025; Lamb et al., 2024).

The Material Footprint can therefore be understood as a broad proxy for biodiversity-relevant resource pressures across multiple material categories. Its main strength lies in capturing the global resource demands embodied in consumption, including imported products; however, it does not directly measure biodiversity outcomes and cannot by itself distinguish between the differing ecological impacts associated with specific materials, locations, or extraction practices.

The Ecological Footprint – developed by Global Footprint Network and currently maintained by York University – measures the biologically productive land and sea area required to provide the renewable resources consumed by a population and to absorb the associated carbon emissions, using prevailing technologies. As a consumption-based accounting framework, it allocates ecological demand to final consumers, including international trade, and compares this demand with the available biocapacity. It therefore provides an integrated measure of human pressure on the biosphere rather than a direct measure of biodiversity state or species loss and has been proposed as a means of tracking the underlying drivers of biodiversity loss associated with human consumption (Galli et al., 2014).

The Ecological Footprint has been used by the Convention on Biological Diversity and the Biodiversity Indicators Partnership as an indicator of anthropogenic pressure relevant to monitoring progress towards biodiversity targets. It was included among the global pressure indicators used to assess progress towards the 2010 Biodiversity Target (Butchart et al., 2010) and the Aichi Biodiversity Targets (Tittensor et al., 2014) and was used by IPBES among the indicators of direct anthropogenic drivers of biodiversity change,

ecosystem functioning, and nature's contributions to people (Mancini et al., 2018). Unlike the Material Footprint, which quantifies material extraction embodied in consumption, the Ecological Footprint measures demand for biologically productive ecosystems and their regenerative capacity, thereby capturing pressures associated with renewable resource use, land occupation, and demand for carbon sequestration. Nevertheless, as with other aggregate environmental indicators, the Ecological Footprint has been subject to methodological criticism regarding its scope and underlying assumptions (Galli et al., 2016); moreover, it does not directly quantify biodiversity outcomes or distinguish impacts on particular ecosystems or species.

Waste

Waste indicators, although technically sound and well institutionalised, offer only indirect links to biodiversity pressures, especially for complex waste streams or recycling systems; these indicators would need to be improved to reflect consumption-biodiversity links more sharply.

High-Impact Products

Within the high-impact products domain, the mapping identifies indicators with straightforward definitions and annual updates, offering highly operational entry points for GBF monitoring. Per capita meat consumption, car-related passenger kilometres, and the ratio of land consumption rate to population growth rate are metrics that generally respond well to established policy demands.

Equitable consumption

Monitoring should address equity both within and between countries, recognising that responsibility for environmental pressures is unevenly distributed: high-consuming countries (and higher-income groups within countries), account for disproportionately large consumption footprints, while many lower-income countries and populations consume resources at substantially lower levels. Indicators such as the Gini coefficient and average size of dwelling by income likewise speak to distributional impacts, providing data on how consumption benefits and pressures are apportioned across income groups and social strata (though these too sometimes rely on country-specific data infrastructure, affecting comparability and frequency). Other equity-sensitive indicators (e.g. material, ecological or carbon footprints by income group and country) remain underdeveloped and lack harmonisation, yet they are essential for operationalising the fairness dimension of Target 16. Their inclusion would mark an important step forward in the evolution of the GBF.

Policy and Legislative Framework, and Education and Access to Information

Finally, indicators related to Policy and Legislative Framework and those related to Education and Access to Information capture enabling conditions rather than direct consumption pressures. While critical for enabling and scaling long-term transformation, they are less frequently updated and more difficult to link to measurable biodiversity outcomes. While the current indicator set includes education for sustainable development, it does not directly assess whether consumers receive, understand, trust or use biodiversity-related information when making consumption decisions. Consequently, important enabling conditions for behavioural change (such as biodiversity literacy, awareness of biodiversity impacts, and the use of environmental information or ecolabels in purchasing decisions) remain only partially captured. These dimensions could represent priorities for future indicator development as methodologies mature.

Overall, the mapping indicates that operational monitoring of Target 16 is currently feasible for some consumption dimensions, while important gaps remain regarding equity, telecoupling, and biodiversity outcomes.

The analysis further assessed how the operational indicators capture major consumption domains. As shown in Table 3.5, coverage is uneven. Food is by far the best represented, with dedicated measures such as the Food Waste Index, and per capita meat consumption. These complement broader footprint indicators that capture multiple domains at once. By contrast, housing, mobility, and consumer goods remain comparatively under-represented in current monitoring systems. Only seven indicators in the entire set span all consumption domains, and even these tend to do so indirectly through composite metrics rather than domain-specific measures.

Table 3.5 Consumption-related indicators meeting CBD criteria and their domain coverage.

Indicator	Food	Mobility	Housing	Consumer goods
Material footprint				
Ecological footprint				
Chemical footprint				
Total energy consumption				
Food Waste Index				
Municipal waste generated				
Waste recycling rate				
Per capita meat consumption				
Passenger-kilometres by car				
Ratio of land consumption rate to population growth rate				
Proportion of population living in households with access to basic services				
Gini coefficient of consumption				
Average size of dwelling by income				
Environmental Performance Index				
Environmentally harmful subsidies				
Number of EU ecolabel products				
Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment				

Notes: Seventeen of the 31 indicators mapped in Table 3.3 meet the CBD criteria for the GBF monitoring framework. The table shows the extent to which each indicator fully (green), partially (yellow), or not at all (red) captures biodiversity-relevant consumption domains. This assessment has been developed specifically for this report, drawing on the authors' knowledge and the reviewed evidence base and is intended as a starting point to understand how different consumption domains are considered within the GBF Monitoring Framework.

A further assessment examined how the 17 operational indicators correspond to the five direct drivers of biodiversity loss (Table 3.6).

Land- and sea-use change, climate change, and pollution are relatively well captured, reflecting the strong overlap between existing footprint and food-related indicators and these pressures. Conversely, invasive species and direct resource exploitation remain largely absent from current consumption-based metrics, despite their recognised importance in the IPBES Global Assessment and in recent European footprint studies (see chapter 2.2). This reveals a structural blind spot: while the GBF formally recognises all five drivers, current consumption-based monitoring remains concentrated on land-use, climate, and pollution, with limited coverage of other critical pressures.

Table 3.6 Consumption-related indicators meeting CBD criteria and their coverage of biodiversity loss drivers.

Indicator	Changes in land and sea use	Climate change	Pollution	Invasive species	Resources exploitation
Material footprint					
Ecological footprint					
Chemical footprint					
Total energy consumption					
Food Waste Index					
Municipal waste generated					
Waste recycling rate					
Per capita meat consumption					
Passenger-kilometres by car					
Ratio of land consumption rate to population growth rate					
Proportion of population living in households with access to basic services					
Gini coefficient of consumption					
Average size of dwelling by income					
Environmental Performance Index					
Environmentally harmful subsidies					
Number of EU ecolabel products					
Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment					

Notes: Seventeen of the 31 indicators mapped in Table 3.3 meet the CBD criteria for the GBF monitoring framework. The table shows the extent to which each indicator fully (green), partially (yellow), or not at all (red) captures biodiversity-relevant consumption domains. This assessment has been developed specifically for this report, drawing on the authors' knowledge and the reviewed evidence base and is intended as a starting point to understand how different consumption domains are considered within the GBF Monitoring Framework.

3.4 Evidence from the CBD 7th National Reports: Current Practices in Reporting on Target 16

This section examines how Parties currently report on sustainable consumption under Target 16 of the Kunming-Montreal Global Biodiversity Framework (GBF), using evidence from the 7th National Reports submitted to the Convention on Biological Diversity (CBD) in February 2026. It thus intends to assess the actual uptake of indicators, identify data gaps, and highlight opportunities to strengthen harmonised monitoring and reporting.

The analysis focuses on the 44 countries served by the European Subregional Technical and Scientific Cooperation Support Centre (EU TSCC)[16] and examines reporting on policy frameworks, awareness-raising and education measures, and policy instruments supporting sustainable consumption. It also assesses the use of consumption-based metrics (e.g. material, carbon, ecological, consumption, and biodiversity footprints), which are essential for capturing environmental impacts embedded in consumption, including those embodied in international trade (telecoupled impacts) (see Table 3.7).

Within the 7th National Reports, reporting against Target 16's binary indicator is structured around three diverse components:

- 16.1: Has your country established mechanisms, policy or legislative or regulatory frameworks aimed at supporting sustainable consumption?
- 16.2: Has your country adopted mechanisms to improve awareness or education with regard to the impacts of consumption on biodiversity and access to relevant and accurate information or alternatives supporting sustainable consumption?
- 16.3: Has your country adopted or implemented policy instruments aimed at encouraging and enabling people to make sustainable consumption choices, including by reducing food waste, overconsumption and waste generation?

[16] See https://knowledge4policy.ec.europa.eu/biodiversity/geographical-coverage-european-subregional-tscc_en for full country coverage.

Table 3.7 Reporting on Target 16 Indicators in the CBD 7th National Reports across European Countries.

Country	16.1 Policy Frameworks	16.2 Awareness & Education	16.3 Policy Instruments	Material Footprint	Consumption Footprint	Biodiversity Footprint	Ecological Footprint	Carbon Footprint
Austria	Fully	Fully	Fully	Yes	Yes	Yes	Yes	Yes
Belgium	Partially	Partially	Partially	Yes	No	No	No	No
Cyprus	Partially	Partially	Partially	Yes	No	No	No	No
Czechia	Under development	Partially	Partially	Yes	No	No	No	No
Finland	Partially	Partially	Partially	Yes	Yes	No	Yes	Yes
France	Partially	Fully	Partially	Yes	No	No	No	No
Germany	Fully	Partially	Partially	Yes	No	No	No	No
Greece	Partially	Under development	Under development	No	No	Yes	No	No
Hungary	Partially	Partially	Under development	Yes	No	Yes	No	No
Iceland	Partially	No record	Fully	Yes	No	No	No	No
Ireland	Fully	Partially	Fully	Yes	Yes	No	Yes	No
Italy	Under development	Under development	Under development	Yes	Yes	No	Yes	Yes
Luxembourg	Fully	Fully	Fully	Yes	No	No	No	No
Malta	Fully	Fully	Fully	Yes	Yes	Yes	Yes	Yes
Netherlands	Partially	Partially	Partially	Yes	Yes	Yes	Yes	No
Norway	Partially	Partially	Partially	Yes	Yes	Yes	Yes	Yes
Poland	Partially	Partially	Partially	Yes	No	Yes	No	No

Country	16.1 Policy Frameworks	16.2 Awareness & Education	16.3 Policy Instruments	Material Footprint	Consumption Footprint	Biodiversity Footprint	Ecological Footprint	Carbon Footprint
Slovakia	Partially	Partially	Partially	Yes	No	No	No	No
Spain	Fully	Fully	Fully	Yes	No	No	No	No
Sweden	Partially	Under development	Under development	Yes	No	Yes	No	No
Switzerland	Partially	Partially	Partially	Yes	Yes	Yes	No	Yes
Türkiye	Fully	Partially	Partially	No	No	Yes	No	No
United Kingdom	Partially	Partially	Partially	Yes	Yes	Yes	Yes	Yes

Notes: "Fully", "Partially", and "Under development" refer to the extent of implementation or reporting. "No record" indicates that no relevant information was available in the national report at the time of analysis. The green font indicates that the indicator is reported in the national report; the red font indicates that the indicator is not reported. European countries not listed in the table had not submitted their report at the time of review (March 20, 2026).

Source: Authors, based on the Parties' 7th National Reports to the Convention on Biological Diversity (CBD), 2026.

The review reveals a heterogeneous landscape of reporting across Europe, reflecting differences in national capacities, policy priorities, and methodological approaches. Several countries (e.g. Austria, Malta, Luxembourg and Spain) report a relatively advanced implementation of Target 16, supported by comprehensive policy frameworks and initiatives promoting sustainable consumption. These typically include circular economy strategies, waste reduction measures, eco-labelling schemes, sustainable public procurement, and public awareness campaigns. Such efforts indicate increasing alignment between national biodiversity strategies and broader sustainability agendas. In contrast, many countries report only partial implementation (e.g. Belgium, Cyprus, Poland) or indicate that relevant mechanisms remain under development (e.g. Italy, Greece, Sweden). This is particularly evident for awareness-raising initiatives and policy instruments targeting overconsumption and waste reduction. These findings suggest that, while political commitment to sustainable consumption is increasing, implementation remains uneven across the region. Moreover, as discussed in section 3.2, the binary nature of current reporting makes it difficult for Parties to assess the ambition or effectiveness of reported measures (Jennings et al., 2024).

This assessment complements the CBD Secretariat's review of the use of indicators in the 7th National Reports, which found that the uptake of indicators varies considerably across Parties (CBD, 2026), as well as other assessments which indicate that the EU's collective progress towards Target 16 is insufficient (Montereale Gavazzi et al., 2026). While binary indicators are generally well reported, the use of headline, component and complementary indicators remains uneven, reflecting differences in statistical capacity, data availability and methodological maturity. The European assessment presented below explores these patterns in greater detail for Target 16 and consumption-related indicators.

The Material Footprint is the most consistently reported consumption-based indicator, reflecting both its methodological maturity and its integration within existing policy and statistical frameworks, including the SDGs, SEEA, and regional initiatives such as the EU 8th Environment Action Programme (8th EAP). Carbon footprint indicators are also relatively widespread, although methodological differences persist.

By contrast, ecological, consumption, and biodiversity footprints are reported far less consistently. Moreover, where "biodiversity footprint" approaches are reported, they often rely on different underlying methodologies, data sources, and impact metrics, limiting comparability across countries. This uneven uptake and methodological fragmentation underscore both capacity constraints and the current lack of harmonised approaches for capturing biodiversity impacts of consumption.

Some countries have also begun incorporating indicators intended to capture the telecoupled impacts of consumption. Biodiversity footprint approaches, for example, aim to assess potential species loss linked to domestic consumption, including impacts embedded in international trade. However, these approaches are implemented using different modelling frameworks (see chapter 3.1), which can lead to variations in scope, resolution, and reported results. While these efforts represent an important step toward addressing telecoupled biodiversity pressures and improving accountability for global environmental impacts, they also highlight the need for greater methodological convergence and guidance to support consistent application in GBF reporting.

Overall, the findings confirm a gap between growing policy attention to sustainable consumption and the systematic use of harmonised consumption-based indicators in biodiversity reporting. While a broad range of indicators conceptually exists, only a more limited subset is currently operational, comparable, and feasible for widespread implementation across Parties. In particular, the limited uptake of biodiversity-relevant and trade-adjusted indicators suggests that current reporting still only partially captures the global and systemic nature of consumption-driven biodiversity loss.

Recent findings from the CBD draft Global Report[17] provide additional insight into the practical challenges faced by Parties in implementing Target 16 (see also Montereale Gavazzi et al., 2026). While some progress has been reported in establishing policy frameworks and mechanisms intended to support sustainable consumption, Parties indicate that implementation remains constrained by several recurring barriers.

[17] Report accessed on June 9, 2026 at https://www.cbd.int/gbf/implementation/globalreview

Reported challenges include inadequate waste management infrastructure, insufficient financial resources, weak enforcement capacities, limited implementation of extended producer responsibility schemes, and the persistence of high material footprints in some countries. Furthermore, despite the generally lower ambition of many national targets compared with the global Target 16, a majority of Target 16-related national targets are reported as showing either no significant change or insufficient progress. These findings suggest that strengthening monitoring frameworks alone will be insufficient unless accompanied by investments in implementation capacity, financing mechanisms, regulatory enforcement, and policy instruments capable of addressing the underlying drivers of unsustainable consumption.

The evidence from the indicator mapping and reporting review conducted in this report also highlights substantial variation in technical capacity, institutional readiness, and indicator uptake across Parties. These findings – together with those from the draft Global Report – underline the importance of balancing comprehensiveness, feasibility, reporting burden, and continuity within any future strengthening of Target 16 monitoring. Chapter 5 discusses possible options for addressing these trade-offs.

4 Benchmarks and reference ranges for interpreting consumption-related Biodiversity indicators

While chapter 3 identifies a feasible set of indicators for monitoring consumption-related biodiversity impacts, an additional challenge lies in interpreting observed indicator or reference values in relation to broader biodiversity and sustainability objectives.

Although the GBF sets important global ambitions (see Text box 1.1), in many cases, these targets remain abstract. For example, Target 16 calls for reducing the global footprint of consumption or significantly reducing overconsumption – without specifying the scale of change required or defining reference values against which progress can be assessed. Thus, there is limited guidance on how consumption-related indicators that meaningfully capture the biodiversity impacts should be interpreted in practice.

This chapter provides the context on reference ranges/benchmarks that may help Parties interpret selected indicators for Target 16. It does not propose formal targets or universally applicable limits. Rather, it reviews existing approaches and emerging evidence that may help contextualise indicator results, while recognising the scientific, methodological, and normative uncertainties involved.

4.1 The role of benchmarks and thresholds in policy and science

Benchmarks and thresholds are increasingly discussed across sustainability governance frameworks as possible tools for translating broad ambitions into more operational reference points that are compatible with ecological limits or societal objectives. In policy context, setting measurable thresholds and benchmarks, may help inform policy interventions to become actionable, accountable, and time-bound (Evans et al., 2017).

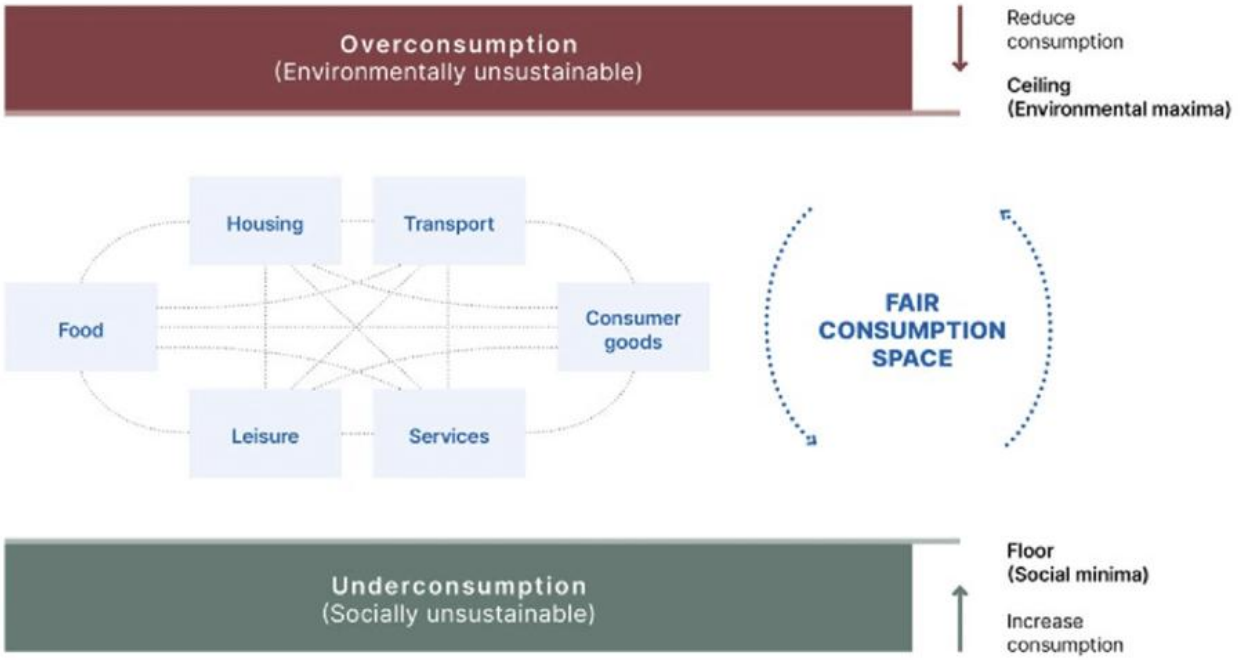
However, defining quantitative thresholds is inherently complex and subject to debate. They depend on methodological choices, underlying assumptions, and normative considerations about fairness, responsibility, and acceptable levels of consumption. As a result, they are not purely scientific constructs, and it is unlikely that a single universally agreed threshold will emerge. Recent work also highlights that environmental ceilings are not directly observable, but depend on the choice of indicator, system boundaries, allocation rules and downscaling principles used to translate global ecological limits into consumption-based benchmarks (Heide et al., 2023). Consequently, benchmark values should be interpreted as policy-relevant reference ranges rather than precise ecological thresholds and are most informative when considered alongside complementary indicators capturing different dimensions of environmental pressure.

In environmental sciences, consumption thresholds are often informed by the concept of ecological tipping points – critical levels beyond which ecosystem resilience is undermined and may collapse (Rockström et al., 2009; Steffen et al., 2015). However, most consumption-related indicators measure pressures on ecosystems rather than ecological condition directly. As such, associated threshold values can generally be interpreted as proxy benchmarks linked to ecological risks, rather than direct ecological tipping point. Ecological research shows that many systems exhibit non-linear responses, where small increases in resource use or habitat loss can trigger abrupt declines in species richness or ecosystem function. While some studies have questioned the universality and empirical robustness of these thresholds (e.g. Hillebrand et al., 2020), they remain a useful heuristic for understanding ecological limits and sustainable resource use.

In parallel, sustainability assessments increasingly incorporate societal dimensions, including minimum standards for nutrition, housing, and mobility. As a result, some frameworks seek to combine ecological considerations with social foundations in defining “safe and just” operating space for consumption: below these levels, basic human needs are not adequately met (Raworth, 2017).

The concept of Fair Consumption Space (FCS) brings these elements together, defining an equal opportunity space between environmental ceilings and societal thresholds within which human needs can be met without exceeding ecological limits (Figure 4.1). Rather than prescribing a single threshold value, it provides policymakers with flexibility to balance environmental and social goals and adapt to local and national contexts. The FCS is predicated on three principles: consumption within ecological limits; equity and ecological justice; optimised for the wellbeing of individuals and society.

Figure 4.1 A fair consumption space for sustainable lifestyles, defining limits for over- and underconsumption (Adapted from Akenji et al., 2021).



The practical application of consumption-related benchmarks in biodiversity policy remains, however, methodologically challenging. Consumption-driven pressures on biodiversity remain under-addressed in international policy frameworks, partly due to the absence of clear targets, indicators, and baseline data linking consumption to biodiversity pressures.

4.2 Benchmarks and thresholds in practice: evidence from the literature

Working to bridge such a knowledge gap, this section synthesises existing evidence from a systematic review on potential consumption thresholds both in aggregate and across key consumption domains – food, housing, mobility, and consumer goods. The review highlights methodological heterogeneity, limited comparability and persistent data gaps (see Table 2.2 and Annex 1 Potential thresholds in key consumption domains).

4.2.1 Defining the environmental ceiling: Reference values for Material Footprint

Material Footprint has emerged as one of the most widely used proxy indicators for assessing the environmental impacts of consumption, and as highlighted in chapter 3 is widely reported on by countries under Target 16 of the GBF. Because material extraction is closely linked to consumption-related drivers of biodiversity loss, Material Footprint can serve as a proxy indicator for approximating the environmental ceiling for consumption. While it captures mid-point pressures rather than biodiversity outcomes directly, it remains a pragmatic basis for defining indicative ceilings, given current data availability and methodological maturity.

Global material use has more than tripled since the 1970s. The current global average Material Footprint is 12.2 tonnes per capita, although consumption levels vary significantly across countries. High-income countries use around six times more materials per capita than low-income countries (UNEP, 2024a). The EU Material Footprint, estimated at about 14.1 tonnes per capita (Eurostat, 2025), remains above the global average, but below the average of 26 tonnes per capita observed across high-income countries[18] (UN, 2019b). This difference highlights the substantial variation in resource use within high-income economies and reflects the particularly high material footprints associated with consumption patterns that rely heavily on global supply chains and imported materials.

Establishing a sustainable target value for aggregated Material Footprint remains challenging and there is limited scientific consensus on sustainable levels of material use. This reflects the complexity of material flows, differing socio-economic contexts, and the interplay between primary and secondary resource markets, among other factors (Nuss et al, 2026).

Across scientific literature, three dominant approaches for setting target values can be identified:

- **Retrospective boundaries approaches** define target values relative to historical levels of material extraction or consumption, using a selected reference year as the baseline against which future reductions are assessed. Widely cited reference years range from 1950 to 2000s. The 1970 benchmark, for example, has been used by the European Commission in assessments of the EU consumption footprint (Sala et al., 2020). However, these historical baselines are not always derived from ecological thresholds and therefore do not necessarily represent environmentally sustainable levels of resource use.
- **Materials accessibility approaches** estimate sustainable resource use based on the availability of materials under environmental and technological constraints. These approaches focus primarily on physical availability, extraction feasibility, and dissipation losses rather than direct environmental impacts.
- **Impact-based approaches** derive boundaries from planetary boundaries or material requirements of sustainability scenarios. Although Material Footprint is not itself a planetary boundary indicator, the impacts from material use on existing planetary boundaries (e.g. climate change, freshwater use, biosphere integrity, biogeochemical flows) can be modelled and downscaled.

Among the most widely cited examples is the IRP's indicative range of approximately 6-8 tonnes per capita, derived from scenario modelling and decoupling analysis. While not a formally agreed target, this range is frequently used as a reference point for assessing whether current levels of resource use are compatible with long-term sustainability objectives. Compared with current global levels and substantially higher material footprints in many high-income economies (UN, 2019b), it implies a significant reduction in resource use and highlights the scale of transformation required.

A key methodological challenge is that Material Footprint is a mid-point indicator, capturing levels of resource extraction rather than the resulting environmental impacts. Aggregate Material Footprint targets do not account for the variation in impacts between different materials. A tonne of gravel does not have the same impact on biodiversity as a tonne of uranium or pork (EEA, 2024b). Therefore, Material Footprint as a sole, headline indicator can obscure important differences in environmental impact and lead to counterintuitive policy conclusions. Complementary indicators, including biodiversity and carbon footprints, are therefore needed to provide a more impact-oriented perspective and support the identification of environmental hotspots and guide policy priorities (Text box 3.1). Recent assessments further argue that no single consumption indicator adequately captures all environmental dimensions relevant to sustainability, reinforcing the need for indicator suites that combine resource use with impact-based metrics when defining environmental ceilings (Heide et al., 2023).

[18] High-income countries are defined according to the United Nations income-group classification based on GNI per capita (World Economic Situation and Prospects).

4.2.2 *Defining Societal Thresholds: Minimum requirements across key consumption domains*

While establishing the environmental ceiling is essential for addressing the biodiversity pressures linked to resource use, it is equally important to ensure that resources are distributed in a way that enables all people to meet basic needs and achieve a decent quality of life. Societal thresholds define this lower boundary, below which essential needs are not equally fulfilled.

The Decent Living Standards (DLS) framework provides a structured approach to defining minimum requirements across key domains such as food, housing, mobility, and access to goods and services (Rao and Baer, 2012; Rao and Min, 2018; Rao et al., 2019). Traditionally focused on defining minimum service levels, DLS has more recently been extended to quantify the associated resource requirements, linking minimum living standards to material, energy, and environmental requirements (Vélez-Henao & Pauliuk, 2023; Vélez-Henao et al., 2026).

Emerging evidence suggests that delivering DLS globally could require a Material Footprint of approximately 6 tonnes per capita per year (Vélez-Henao & Pauliuk, 2023), with a broader range of 3–16 tonnes depending on technological choices and lifestyle configurations (Vélez-Henao & Pauliuk, 2023; Vélez-Henao et al., 2026). These findings indicate that basic human needs can, in principle, be met at substantially lower levels of material use than those currently observed in many high-income countries, while remaining broadly compatible with proposed sustainability ranges.

At the same time, meeting DLS does not automatically ensure that environmental limits are respected. Even under decent living scenarios, biodiversity loss, climate change, and biogeochemical flows may still exceed planetary boundaries (Vélez-Henao & Pauliuk, 2023; Schlesier et al., 2024; Vélez-Henao et al., 2026). This highlights that sufficiency-oriented consumption benchmarks alone are not enough to achieve sustainability goals. Achieving a “safe and just” operating space requires not only reducing excessive consumption, but also transforming provisioning systems – how food, housing, mobility and goods are designed, produced, traded, distributed, priced and made available – to reduce the environmental impacts associated with meeting basic needs.

Taken together, these findings suggest that DLS can provide a useful empirical benchmark for defining societal thresholds. Across key consumption domains, indicative benchmark ranges have been proposed to contextualise and add granularity to the concept of sustainable consumption, although levels of scientific consensus and policy maturity vary considerably across sectors. As shown in Table 4.1, the evidence base is strongest for food-related consumption, where internationally recognised dietary frameworks provide relatively robust reference ranges. Housing and mobility benchmarks are less harmonized and often depend on the local context, while benchmarks for goods and services remain comparatively underdeveloped due to methodological and data limitations. Table 4.1 summarises the availability and robustness associated with consumption-related thresholds across domains, while Annex 1 Potential thresholds in key consumption domainsprovides a brief overview of the scientific consensus underpinning these thresholds and presents indicative threshold values and benchmark ranges for key consumption domains, including food, housing, mobility and consumer goods and services (Annex 1 Potential thresholds in key consumption domains).

Overall, approaches reviewed in this chapter illustrate both the potential and the limitations of using benchmarks and reference ranges to support the interpretation of consumption-related indicators. Thresholds are best understood as optional interpretive support rather than formal targets, reflecting both scientific uncertainty and normative choices inherent in translating global environmental limits into operational policy benchmarks (Heide et al., 2023). Further challenges are presented by the fragmentation of standards and inconsistent reference bases. Even where threshold values exist, they are often defined for different population groups or timeframes, limiting comparability and cross-domain aggregation. Despite these limitations, benchmark approaches can still support the interpretation of consumption-

related indicators and help identify patterns of under- and over-consumption, and to move from aspirational goals to transparent, benchmark-based governance [19] . Importantly, they can help contextualise the scale of changes to consumption and lifestyles implied by broader sustainability objectives and thus stimulate the necessary policy ambition.

These considerations are taken forward in chapter 5, which outlines possible options Parties may consider for strengthening Target 16 monitoring while balancing scientific robustness, feasibility, reporting burden, and institutional stability.

[19] Tools such as “traffic light” or color-coded systems – used in national frameworks such as the UK Biodiversity Indicators (JNCC, 2025), as well as in monitoring platforms like the EU Biodiversity Strategy for 2030 dashboard (European Commission 2024) – derive much of their policy value from having clearly defined reference points that signal progress or transgression.

Table 4.1 Availability and accuracy of consumption-related thresholds by source.

Sector	Source	Geographical coverage	Food											Mobility							Housing				Goods			Services		
			Animal products				Other food							Private		Public			Active												
			Meat	Dairy	Eggs	Fish	Vegetables	Cereals	Fruits	Plant-based	Other food	Beverages	Organic waste	Airplane	Car	Bus	Train	Motorcycle	Bicycle	Walking	Living space	Electricity	Other energy	Water	Clothing and	Furnishing etc.	Waste	Health	Education	Other
PB, Health, Nutritional	Willet et al. (2019)	Global																												
PB, Health, Nutritional	Schlesier et al. (2024)	Global																												
PB, Health, Nutritional	Nordic Council of Ministers (2023)	Nordic / EU																												
PB, Health, Nutritional	Tuicci et al. (2020)	Med / EU																												
PB, Health, Nutritional	FAOStat (2024)	Global																												
DLS, PB	Vélez-Henao & Pauliuk (2026)	Global																												
DLS, PB	Millward-Hopkins et al. 2020	Global																												
DLS, PB	Kikstra et al. (2021)	Global																												
DLS, PB, Health	Hot or Cool Institute (2025)	Global																												
DLS, PB.	Coscieme et al. (2022)	Global																												
Health	WHO (2018)	Global																												
Health	WHO (2022)	Global																												
PB, Health, Nutritional	UNEP (2024)	Global																												

Sector	Source	Geographical coverage	Food											Mobility								Housing				Goods			Services		
			Animal products				Other food							Private		Public			Active													
			Meat	Dairy	Eggs	Fish	Vegetables	Cereals	Fruits	Plant-based	Other food	Beverages	Organic waste	Airplane	Car	Bus	Train	Motorcycle	Bicycle	Walking	Living space	Electricity	Other energy	Water	Clothing and	Furnishing etc.	Waste	Health	Education	Other
PB, Health, Nutritional	Eurostat (2024), combined with European Union (2025)	EU																													
DLS, Health, Economic	Lehtinen (2021)	FI																													
DLS, PB	Grubler et al. (2018)	Global																													
DLS, Health	Finlex (2024)	FI																													
DLS, Health	Légifrance (2021)	FR																													
DLS, Health	Department for Communities and Local Government (2015)	GB																													
DLS, Health	International Code Council, Inc. (2021)	US																													
DLS, Health	Department of Environment, Heritage and Local Government (2017)	IE																													
DLS, Health	NSW Government (2017)	AU																													

Sector	Source	Geographical coverage	Food											Mobility							Housing				Goods			Services		
			Animal products				Other food							Private		Public			Active												
			Meat	Dairy	Eggs	Fish	Vegetables	Cereals	Fruits	Plant-based	Other food	Beverages	Organic waste	Airplane	Car	Bus	Train	Motorcycle	Bicycle	Walking	Living space	Electricity	Other energy	Water	Clothing and	Furnishing etc.	Waste	Health	Education	Other
DLS, Health	Japan's Ministry of Land, Infrastructure, Transport and Tourism (2017)	JP																												
DLS, Health	WoAufG Bln (n.d.)	DE																												
DLS, Health	Ministry of Municipal Affairs and Housing (2022)	CA																												
DLS, Health	City of Toronto (2021)	CA																												
DLS, Health	Appolluni & D'Alessandro (2021)	DE																												
		FR																												
		IT																												
		ES																												
		NL																												
		PT																												
		SE																												
DLS, PB, Health	Rao et al. (2019)	IN																												
		BR																												
		ZA																												

Notes: Colours indicate data quality: Green (good coverage/exact threshold), Yellow (partial coverage/ranges), Red (limited accuracy/assumptions required or qualitative only; X – when present - indicates no data). Sector-specific codes refer to benchmark domains used in this report: PB = Planetary Boundaries (environmental ceilings); DLS = Decent Living Standards (minimum service levels enabling social participation and quality of life); Health = health guidelines; Nutritional = dietary guidelines ensuring adequacy; Economy = indicators of economic capability or viability. In the geographical coverage column, 2-digit ISO codes refer to country-specific studies, while EU and MED refer to Europe and the Mediterranean region, respectively.

5 Conclusions and options for improving GBF Target 16 monitoring

Building on the evidence presented in Chapters 1-4, this chapter outlines possible options Parties may consider for strengthening monitoring related to Target 16 of the GBF. The chapter focuses, in particular, on the transition from broad policy commitments on sustainable consumption towards more operational and comparable reporting practices.

The chapter recognises that the GBF Monitoring Framework must balance scientific comprehensiveness with practical feasibility, reporting burden, methodological maturity, and institutional stability across Parties with different capacities and reporting systems. Rather than presenting prescriptive recommendations, the chapter therefore outlines a range of possible options that could support the progressive strengthening of consumption-related biodiversity monitoring over time. EU experiences and frameworks are discussed as illustrative examples within the broader global context.

5.1 Synthesis of findings from Chapters 1–4

Human consumption constitutes one of the most significant indirect drivers of biodiversity loss globally. As shown in chapter 2, consumption patterns associated with food, housing, mobility and consumer goods generate pressures across all five direct drivers of biodiversity loss, often through globally interconnected supply chains that shift biodiversity impacts beyond the territories where goods are ultimately consumed.

Although Target 16 represents the primary entry point for addressing demand-side pressures within the GBF, chapters 2 and 3 show that consumption remains only partially reflected in the current Monitoring Framework. In particular, the absence of a headline indicator limits the visibility and comparability of consumption-related pressures, while existing indicators only partially capture telecoupled impacts, biodiversity-relevant material consumption, and differences in consumption intensity across population groups.

Chapter 3 identifies a broad range of candidate indicators. Some – particularly the Material Footprint, Food Waste Index, and selected consumption- and resource-use metrics – are already operational, internationally harmonised, and embedded within frameworks such as the SDGs and the SEEA, whereas many other potentially relevant indicators are only partially operationalised, have limited country coverage, or involve substantial methodological complexity and reporting burden. Moreover, evidence from the 7th National Reports to the CBD and the CBD draft Global Report[20] indicates that implementation remains uneven across Parties owing to differences in statistical capacity, institutional arrangements and data availability. Parties also report persistent barriers – including insufficient financing, weak enforcement, limited implementation of extended producer responsibility schemes and inadequate waste-management infrastructure – and around 70% of national targets aligned with Target 16 are assessed as showing either no significant change or insufficient progress. Together, these findings reinforce the conclusion that achieving Target 16 will require both stronger monitoring systems and more effective policy implementation[21].

Chapter 4 further shows that indicators alone provide limited guidance unless interpreted against reference values or thresholds. While thresholds are comparatively well developed for food- and climate-related consumption pressures, they remain less mature for mobility, housing, material consumption, and biodiversity-specific consumption impacts. Thresholds should therefore be viewed as evolving tools to support interpretation and policy ambition rather than universally prescriptive targets.

[20] Report accessed on June 9 2026 at https://www.cbd.int/gbf/implementation/globalreview

[21] Enhanced indicators can help make consumption pressures more visible and comparable, but meaningful progress will also depend on addressing structural governance, financing, infrastructure, and behavioural factors that continue to constrain the implementation and effectiveness of sustainable consumption policies.

Taken together, the findings suggest that strengthening Target 16 monitoring will require gradual and adaptive approaches that improve the visibility of consumption pressures while remaining feasible for Parties with differing capacities, monitoring systems, and implementation contexts.

5.2 Design principles for strengthening Target 16 monitoring

Any future strengthening of Target 16 monitoring will likely need to consider several broader design principles emerging from the evidence reviewed in this report.

First, the Monitoring Framework necessarily reflects trade-offs between comprehensiveness and feasibility. While broader coverage of consumption-related pressures would improve representation of biodiversity drivers, increasing the number or complexity of indicators may also increase the reporting burden and reduce comparability across Parties. Feasibility considerations are therefore particularly important for indicators requiring complex footprint accounting, multi-regional input-output modelling, or extensive lifecycle assessment methodologies. These feasibility concerns are consistent with findings from the CBD draft Global Report, which indicate that many Parties continue to face substantial capacity constraints and fragmented data systems, including differences in data standards, metadata, and interoperability. Such constraints may limit the ability of some Parties to implement more data-intensive monitoring approaches in the short term.

Second, stability and continuity of headline indicators are important considerations for Parties. Establishing national reporting systems, statistical workflows, and institutional coordination mechanisms often requires substantial investments of time and resources. Changes in headline indicators may therefore create additional burdens and reduce comparability over time. This suggests that any future modifications to Target 16 monitoring may benefit from prioritising indicators with established methodologies, institutional uptake, and alignment with existing reporting systems.

Third, transparency regarding methodological limitations remains important. Existing indicators differ substantially in what they measure and what dimensions of biodiversity pressure they capture. For example, many indicators primarily measure mid-point pressures such as material extraction, land use, emissions, or pollution rather than direct endpoint impacts on biodiversity itself. Similarly, telecoupled impacts embedded in trade and global supply chains remain only partially represented in many national accounting systems. Explicit recognition of these limitations may therefore improve interpretation and avoid overestimating what current indicators can capture.

Fourth, monitoring systems are most effective when understood as enabling tools for policy learning rather than as standalone solutions. Strengthening indicators alone will not reduce biodiversity loss unless accompanied by broader policy frameworks capable of addressing underlying drivers of unsustainable consumption and production. A key gap lies in connecting policy measures to measurable environmental outcomes. While many EU initiatives promote sustainable consumption, their impact on biodiversity pressures is not systematically tracked. At the same time, metrics for assessing sufficiency-oriented policies, sustainable consumption incentives, and behavioural interventions are limited (Fuchs et al., 2021; Hot or Cool, 2025). Developing integrated monitoring systems that link policy interventions to consumption trends (e.g., changes in consumer behaviour, sustainable product uptake, and per-capita material throughput) and, in turn, biodiversity outcomes would improve accountability and policy effectiveness under the GBF and EU Biodiversity Strategy for 2030 (EEA, 2023c).

Effective implementation of Target 16 depends not only on monitoring environmental outcomes but also on governance arrangements that enable sustainable consumption. These include access to reliable information, coherent policy frameworks, consumer empowerment, and the participation of consumer organisations and civil society in the design, implementation and evaluation of sustainable consumption policies. These governance dimensions should therefore be considered when further developing monitoring approaches under Target 16.

The next section presents a range of options which Parties can pursue in order to strengthen Target 16 depending on national circumstances, statistical capacity, policy priorities, and existing reporting systems. Strengthening Target 16 monitoring may therefore be understood as a gradual and adaptive process rather than a single uniform model applicable across all Parties.

5.3 Options for strengthening Target 16 monitoring

5.3.1 Options for addressing the headline-indicator gap

One possible option to strengthen the monitoring of Target 16 would be to maintain the current structure without introducing a headline indicator, while strengthening guidance and encouraging more systematic reporting on existing component indicators. Under this approach, Parties could continue relying primarily on indicators such as the Material Footprint, Food Waste Index, and Ecological Footprint without modifying the formal headline-indicator structure of the Monitoring Framework.

This option presents several advantages. It would minimise institutional disruption and avoid additional reporting burdens associated with introducing new mandatory headline indicators. It would also preserve continuity and stability within existing reporting systems, which may be particularly important given the investments already required for Parties to establish national monitoring and reporting arrangements. In addition, stronger methodological guidance, harmonised metadata standards, shared modelling resources, and targeted capacity-building could potentially improve reporting consistency without requiring formal revisions to the Monitoring Framework itself. Particular attention could be given to facilitating reporting on the Material Footprint, given its relatively mature methodology, integration within SDG and SEEA processes, and comparatively broad uptake in the 7th National Reports from European countries reviewed in chapter 3.

At the same time, this option also involves limitations and risks. Without a headline indicator, consumption-related pressures may continue to receive lower visibility and less systematic reporting within the GBF compared with other biodiversity drivers. Evidence reviewed in chapter 3 suggests that reporting on existing consumption-related indicators already remains uneven across Parties, reflecting differences in statistical capacity, institutional uptake, and methodological familiarity. Strengthened guidance alone may therefore not be sufficient to ensure consistent integration of consumption perspectives into biodiversity reporting.

A second option would involve assessing whether an existing operational indicator could progressively assume a stronger role within the Monitoring Framework, potentially including headline-indicator status. The Material Footprint presents several advantages in this regard, including an internationally harmonised methodology, annual updates, integration within the SDG framework, and relatively broad institutional acceptance. It also already appears comparatively frequently in national reporting practice in European countries reviewed in chapter 3, suggesting a degree of operational readiness. Elevating the Material Footprint could therefore improve the visibility, comparability, and systematic uptake of consumption-related reporting across Parties.

However, important limitations would remain. The Material Footprint primarily measures material extraction pressures rather than biodiversity outcomes directly and therefore acts mainly as a mid-point proxy for biodiversity-related pressures. It only partially captures certain dimensions of biodiversity loss, including differences in impacts across material types, the biodiversity consequences associated with telecoupled trade pressures, and equity dimensions of consumption. In addition, there remains limited scientific consensus regarding appropriate threshold or reference values for sustainable material consumption (see chapter 4). Introducing or elevating a headline indicator could also create transition costs for Parties that would need to adapt existing reporting systems, statistical workflows, and institutional coordination mechanisms. Concerns regarding indicator stability and reporting burden may therefore remain important considerations in any future revision of Target 16 monitoring.

A broader strategic question underlies both options discussed above. From a conceptual perspective, biodiversity-specific indicators – particularly Biodiversity Footprint approaches – may ultimately provide a more direct representation of consumption-related biodiversity impacts than proxy indicators such as the Material Footprint. However, as discussed in chapter 3, biodiversity footprint methodologies currently remain heterogeneous, only partially harmonised, unevenly operationalised across countries, and associated with comparatively high methodological complexity.

If biodiversity footprint methodologies become sufficiently operationalisable, harmonised, and feasible for regular national reporting in the near to medium term, Parties may prefer strengthening systematic reporting within the existing framework rather than introducing a potentially temporary Material Footprint headline indicator. Conversely, if biodiversity-specific methodologies continue to face important feasibility, harmonisation, and reporting-capacity constraints, strengthening the role of an already operational indicator such as the Material Footprint may represent a more pragmatic pathway for improving visibility and comparability of consumption-related pressures within the Monitoring Framework.

The present report does not seek to resolve this question. Rather, it highlights the trade-offs involved and outlines possible options that Parties to the CBD may wish to consider in ongoing discussions on implementation and future development of the GBF Monitoring Framework, including discussions leading towards COP17 and subsequent review processes.

5.3.2 Options for strengthening component and complementary indicators

Several options also exist for strengthening the broader portfolio of component and complementary indicators associated with Target 16. These options offer pathways for building on, rather than duplicating, indicators already included in the GBF Monitoring Framework or used in EU reporting. The EU 7th National Report, for example, already reports on Material Footprint, food waste, Consumption Footprint, carbon dioxide emission footprints, recycling rates, waste generation and treatment, and EU Ecolabel products. The remaining challenge is to improve how such indicators are connected to biodiversity-relevant consumption pressures, and to extend coverage to areas that remain weakly represented.

One option would involve improving coverage across lifestyle domains currently underrepresented in the Monitoring Framework, particularly mobility, housing, and consumer goods. Existing monitoring remains comparatively stronger for food systems, waste and aggregate material use, while indicators related to transport demand, housing-related material use, or consumption of high-impact manufactured goods remain more limited. This gap is also somehow reflected in the CBD draft Global Report, which reports that sustainable consumption norms are not yet sufficiently embedded in consumer information frameworks (and in curricula), and that biodiversity-related product labelling remains limited. More systematic tracking of high-impact commodities and supply chains could support targeted interventions. Commodity-specific biodiversity risk indicators – informed by spatially explicit trade and footprint analyses – could help capture pressures along global supply chains and guide prioritisation of high-impact sectors (Marques et al., 2019). Commodities such as beef, soy, palm oil, minerals, textiles, and bioenergy crops are particularly relevant in this regard (Chaudhary & Brooks, 2018; UNEP, 2022b). Coverage could also progressively expand to underrepresented pressures, including links between consumption patterns and invasive alien species (see Table 3.6 Consumption-related indicators meeting CBD criteria and their coverage of biodiversity loss drivers.).

Another option would involve strengthening indicators capable of capturing telecoupled impacts embedded in trade and international supply chains. This builds on existing consumption-based metrics, such as Material Footprint, Ecological Footprint, and Consumption Footprint, rather than treating telecoupled monitoring as entirely new. However, additional development is needed to better translate trade-adjusted resource and environmental pressures into biodiversity-specific outcomes. Although methodologies remain complex and unevenly operationalised, biodiversity footprinting approaches and trade-linked consumption metrics are evolving rapidly and may become increasingly relevant over time.

Additional options may also include greater integration of equity-sensitive indicators (see chapter 3.3) capable of capturing disparities in consumption intensity and access to sustainable consumption alternatives, both between and within countries. Indicators reflecting per-capita and income-based disparities, aligned with the *Leave No One Behind* principle of the SDGs and EU Green Deal objectives, are essential for ensuring social equity in resource use (Ivanova & Wood, 2020). Such indicators may help operationalise the Target 16 objective of reducing the global footprint of consumption "in an equitable manner". Given current methodological limitations and uneven data availability, this should be treated as a medium- to long-term option rather than an immediate reporting requirement.

Parties may also consider whether complementary indicators related to circular economy performance, sustainable diets, material efficiency, consumption-based emissions, or product-level environmental performance could provide useful contextual information alongside biodiversity-specific metrics. In the EU context, several of these elements are already present in related monitoring frameworks, such as the 8th Environment Action Programme and circular economy monitoring. This is consistent with the draft Global Report's finding that circular economy and recycling measures are already being reported under Target 7 as structural responses to plastic and waste pollution, although implementation and monitoring constraints remain. The question is therefore how far these indicators can be more systematically linked to biodiversity reporting under Target 16.

5.3.3 Options for a tiered monitoring architecture ("core" and "enhanced" packages)

The findings of this report suggest that a portfolio-based monitoring architecture drawing on currently available and sufficiently mature indicators may offer a pragmatic approach for balancing global comparability with flexibility. Under such an approach, a limited "core package" of operational and harmonised indicators could support broad comparability and manageable reporting burden across Parties. This package could primarily draw on indicators already included in the GBF Monitoring Framework or widely used in related reporting systems, such as:

- Material Footprint,
- Food Waste Index,
- selected waste-generation and recycling metrics,
- and existing policy-framework indicators.

Alongside this, an "enhanced package" of optional currently available indicators could allow Parties with greater technical capacity to report additional dimensions of consumption-related biodiversity pressure. Such indicators could include:

- biodiversity footprint indicators,
- consumption-based emissions,
- trade-linked biodiversity-pressure indicators,
- product- or commodity-specific biodiversity-risk indicators,
- or equity-sensitive consumption metrics.

A tiered structure could allow gradual strengthening of monitoring without requiring all Parties to immediately adopt complex methodologies.

5.3.4 Options for future methodological development and pilot testing

Several potentially relevant indicator approaches remain insufficiently mature for broad implementation but may warrant further methodological development and pilot testing.

These include:

- biodiversity footprint methodologies,
- indicators integrating multiple biodiversity drivers,
- telecoupled trade indicators,
- ecosystem service metrics,
- and integrated "safe and just" consumption threshold approaches.

Pilot initiatives and voluntary testing by interested Parties or regional organisations could support further methodological harmonisation and help clarify feasibility, comparability, and policy relevance before broader integration into formal monitoring systems. Future work could also explore indicators capturing consumer awareness and the effective use of biodiversity-related information, thereby improving the monitoring of the enabling conditions envisaged under Target 16.

5.4 Illustrative implications for regional and national reporting practice: the EU example

The findings above have direct implications for GBF monitoring and EU reporting.

First, they reinforce the need to move beyond qualitative tracking of whether policies are in place (as captured by the current binary indicator for Target 16) toward measuring actual changes in consumption patterns and their environmental impacts. As shown in chapter 3, existing reporting remains heavily focused on policy frameworks and awareness measures, while the use of robust consumption-based indicators is uneven.

Second, the EU experience demonstrates that indicator availability does not automatically translate into effective monitoring or policy impact. The EU can already build on existing indicators such as the Material Footprint, Consumption Footprint, food waste metrics, and sectoral consumption statistics (e.g. meat consumption and mobility-related energy use), which provide a practical starting point for more systematic biodiversity-relevant reporting.

Third, the persistence of high consumption impacts despite policy progress underscores the importance of combining mid-point indicators (e.g. material and energy use), outcome-oriented indicators (e.g. biodiversity footprints, where feasible), and contextual benchmarks or thresholds (see chapter 4), to assess whether observed trends are compatible with biodiversity objectives.

Strengthening monitoring therefore requires:

- greater consistency in the use of consumption-based indicators across Parties;
- improved integration of these indicators into biodiversity reporting frameworks;
- and clearer links between indicators, policy objectives, and expected outcomes.

Over time, more integrative indicators such as Consumption Footprint and Biodiversity Footprint approaches could strengthen the link between consumption pressures and biodiversity outcomes, although further harmonisation is needed before they can be applied consistently across Parties.

Fourth, different Parties and regional organisations currently possess varying levels of statistical capacity, institutional coordination, and experience with consumption-related monitoring. Existing approaches developed within the EU nevertheless provide an illustrative example of how several dimensions of Target 16 may progressively be operationalised within broader biodiversity, circular economy, and sustainability reporting systems. The EU already maintains relatively advanced frameworks relevant to material flow accounting, food waste reporting, circular economy monitoring, and consumption-related climate indicators. These experiences may offer useful lessons regarding indicator harmonisation, statistical

integration, and the practical challenges associated with monitoring consumption-related pressures across complex supply chains. The EU can contribute to ongoing efforts under the Convention on Biological Diversity, as well as through collaboration with organisations and initiatives such as UNEP and IPBES, to advance shared methodologies, metadata standards, and data infrastructures for consumption-based biodiversity indicators. Such coordination will be essential to enhance cross-country comparability, improve the robustness of global reporting under the GBF, and reduce fragmentation across statistical and policy frameworks.

The options outlined in this chapter may therefore also support broader efforts to improve coherence between biodiversity, climate, and circular economy reporting systems, while helping address telecoupled impacts associated with EU consumption.

The analysis presented in this report highlights several priority pathways for strengthening the integration of consumption perspectives into the implementation of the Global Biodiversity Framework (GBF) and EU biodiversity reporting. Strengthening consumption-related monitoring may ultimately support implementation of Target 16 itself, while also informing action under several other GBF targets influenced by demand-side pressures (see Table 2.2), including targets related to restoration, pollution, sustainable agriculture, climate mitigation, and harmful incentives.

By presenting a range of methodological options and evidence from existing practice, this report seeks to inform the further development of consumption-based indicators and reporting practices under the CBD. Strengthening the evidence base and improving methodological clarity can enhance the consistency, transparency and policy relevance of biodiversity monitoring.

Ultimately, embedding consumption perspectives more systematically within biodiversity monitoring and reporting can improve the visibility of consumption-related drivers and strengthen the evidence-base needed to inform policy responses. While reducing unsustainable consumption patterns will require action across a range of policy domains beyond biodiversity policy itself — including food systems, trade, resource management, climate, and circular economy policies — improved biodiversity monitoring can help demonstrate the relevance of these transformations for achieving the goals of the GBF. In this way, consumption-based indicators can support more coherent and integrated policy approaches that address the underlying drivers of biodiversity loss.

List of Abbreviations

Abbreviation	Name	Reference
BII	Biodiversity Intactness Index	https://www.nhm.ac.uk/our-science/services/data/biodiversity-intactness-index.html
BIP	Biodiversity Indicator Partnership	https://www.bipindicators.net/
CBD	Convention on Biological Diversity	https://www.cbd.int/
COP	Conference of the Parties	https://www.cbd.int/cop
EAP	Environment Action Programme	https://environment.ec.europa.eu/strategy/environment-action-programme-eap-2030_en
EBV	Essential Biodiversity Variable	https://geobon.org/ebvs/what-are-ebvs/
EC	European Commission	https://commission.europa.eu/index_en
EEA	European Environment Agency	www.eea.europa.eu
ETC-BE	European Topic Centre for Biodiversity and Ecosystems	https://www.eionet.europa.eu/etcs/etc-be
EU	European Union	https://european-union.europa.eu/index_en
FAO	Food and Agriculture Organization (of the United Nations)	https://www.fao.org/home/en
GBF	Kunming-Montreal Global Biodiversity Framework	https://www.cbd.int/gbf
GEIC	Global Environmental Impacts of Consumption	https://commodityfootprints.earth/
GHG	Greenhouse Gas	https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Greenhouse_gas_(GHG)
IEA	International Energy Agency	https://www.iea.org/
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services	https://www.ipbes.net/
IRP	International Resource Panel	https://www.resourcepanel.org/
IUCN	International Union for Conservation of Nature	https://iucn.org/
JRC	Joint Research Centre	https://joint-research-centre.ec.europa.eu/index_en
KCBD	Knowledge Centre for Biodiversity	https://knowledge4policy.ec.europa.eu/biodiversity-knowledge-centre_en
LCA	Life Cycle Assessment	https://knowledge4policy.ec.europa.eu/european-platform-life-cycle-assessment-eplca_en
LCF	Lifestyle Carbon Footprint	https://hotorcool.org/publications/a-climate-for-sufficiency-1-5-degree-lifestyles-report/
LCIA	Life Cycle Impact Assessment	https://www.iso.org/standard/37456.html

MRIO	Multi-Regional Input-Output (model)	https://www.mdpi.com/2079-9276/2/4/489
Mt	Million tonnes	N/A
nLCA	Nutrition Life Cycle Assessment	https://openknowledge.fao.org/items/f1fe306c-33f2-43f2-803e-f765ecf6fcd4
PDF	Potentially Disappeared Fraction (of species)	https://www.nature.com/articles/srep40743
SAR	Species-Area Relationship	https://www.sciencedirect.com/topics/earth-and-planetary-sciences/species-area-relationship
SDG	Sustainable Development Goal	https://sdgs.un.org/goals
SEEA	System of Environmental-Economic Accounting	https://seea.un.org/en
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice	https://www.cbd.int/SBSTTA
TNFD	Taskforce on Nature-related Financial Disclosures	https://tnfd.global/
UN	United Nations	https://www.un.org/en/
UNEP	United Nations Environment Programme	https://www.unep.org/

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Annex 1 Potential thresholds in key consumption domains

Table A1.1 Societal thresholds defining minimum housing standards for wellbeing.

Housing Component	Sub-component	Unit	Average	Minimum	Maximum
Living space		m^2/cap/yr	16.2	10.0	35.0
Living space		m^2/room	9.2	6.5	13.5
Living space		m^2/dwelling	30.0	20.0	35.0
Electricity	Cooking	kWh/cap/yr	390.9	30.0	621.7
Electricity	Heating	kWh/cap/yr	101.0	101.0	101.0
Electricity	Cooling	kWh/cap/yr	24.2	20.8	28.1
Electricity	Household appliances	kWh/cap/yr	112.2	30.6	173.0
Electricity	Lighting	kWh/cap/yr	36.8	10.0	91.0
Other energy	Cooking	kWh/cap/yr	295.1	83.3	506.9
Other energy	Water heating	kWh/cap/yr	402.8	361.1	444.4
Other energy	Heating	kWh/cap/yr	1302.1	166.7	3085.6
Other energy	Cooling	kWh/cap/yr	342.6	245.3	440.0
Water		l/cap/day	58.6	50.0	65.0
Water	Cooking	l/cap/day	10.0	10.0	10.0
Water	Drinking	l/cap/day	5.0	5.0	5.0
Water	Sanitation	l/cap/day	20.0	20.0	20.0
Water	Bath	l/cap/day	15.0	15.0	15.0

The table presents indicative values for societal thresholds for housing that delineate the lower boundaries of a “safe and just” operating space below which basic human needs are not adequately met. Average estimate, lowest estimate (minimum), and highest estimate (maximum) values are calculated considering all values from the following sources: Kikstra et al. (2021), Millward-Hopkins et al. (2020), Vélez-Henao et al. (2026): Decent Living Standards (DLS) – Hot or Cool Institute (2025): Sufficiency Living – WHO (2022): Domestic Water Quantity – Finland Ministry of the Environment (2024) – France decent housing standards (2021) – UK Technical housing standards (2015) – International Residential Code (2021): Minimum Area – Government of Ireland (2007): Quality Housing for Sustainable Communities – NSW Government (2007): Minimum Internal Area - Japan's Ministry of Land, Infrastructure, Transport and Tourism (2017): Residencial Living Area Standard Guidelines, space for healthy and cultural life – Berlin´s State Government (2020): minimum space requirements – Government of Ontario (2022): Building Code Requirements – Government of Toronto (2024): minimum size requirements for habitable rooms – Appolluni & D'Alessandro (2021): dimensional parameters of housing and living space in housing standards – Rao et al. (2019): Energy requirements for decent living in India, Brazil and South Africa.

The indicative benchmark range includes minimum living space requirements and efficient household energy use, although direct comparison across countries remains limited by climatic, technological, and regulatory differences.

Table A1.2 Societal thresholds defining minimum food consumption standards for wellbeing

Food Component	Sub-component	Unit	Average	Minimum	Maximum
Complete diet		kcal/cap/day	2289.6	1823.0	2500.0
Complete diet		g/cap/day	1566.8	1312.0	2700.0
Vegetables		g/cap/day	478.4	284.0	897.0
Cereals		g/cap/day	213.7	127.0	246.0
Cereals	Other cereals	g/cap/day	120.0	120.0	120.0
Cereals	Rice	g/cap/day	44.0	44.0	44.0
Cereals	Wheat	g/cap/day	68.0	68.0	68.0
Plant-based proteins		g/cap/day	108.0	16.0	175.0
Plant-based proteins	Legumes	g/cap/day	84.3	75.0	105.0
Plant-based proteins	Nuts and seeds	g/cap/day	48.5	11.0	70.0
Dairy		g/cap/day	270.6	250.0	350.0
Dairy	Butter	g/cap/day	6.0	6.0	6.0
Dairy	Cheese	g/cap/day	38.5	13.0	64.0
Dairy	Milk	g/cap/day	303.0	231.0	375.0
Dairy	Other	g/cap/day	375.0	375.0	375.0
Eggs	Eggs	g/cap/day	16.4	7.0	30.0
Fish	Fish	g/cap/day	68.1	22.0	246.0
Fruits	Fruits	g/cap/day	256.0	149.0	540.0
Meat		g/cap/day	33.3	14.0	43.0
Meat	Beef	g/cap/day	21.4	7.0	50.0
Meat	Lamb	g/cap/day	2.0	0.0	6.0
Meat	Other	g/cap/day	0.0	0.0	0.0
Meat	Pork	g/cap/day	13.3	7.0	26.0
Meat	Poultry	g/cap/day	37.8	29.0	50.0
Other food		g/cap/day	82.8	82.8	82.8
Other food	Other	g/cap/day	5.0	5.0	5.0
Other food	Sugar	g/cap/day	35.5	26.0	58.0
Other food	Vegetable oils	g/cap/day	43.2	25.0	60.0
Beverages	Non-alcohol	g/cap/day	52.0	52.0	52.0
Organic waste	Organic waste	kg/cap/yr	15.5	14.0	16.9

The table presents indicative values for societal thresholds for food consumption that delineate the lower boundaries of a “safe and just” operating space below which basic human needs are not adequately met. Average estimate, lowest estimate (minimum), and highest estimate (maximum) values are calculated considering all values from the following sources: Willet et al. (2019): EAT-Lancet Planetary Diet, Plant-based/vegan diet and Lacto-ovo-vegetarian diet - Schlesier et al. (2024): EAT-Lancet Planetary Diet – Nordic Council of Ministers (2023): Nordic Nutrition Recommendations – Tuicci et al. (2020): EAT-IT, Italian-Mediterranean Dietary Pattern - Kikstra et al. (2021), Millward-Hopkins et al. (2020), Vélez-Henao et al. (2026): Decent Living Standards (DLS) - Hot or Cool Institute (2025): Sufficiency Living – FAOSTAT (2024): Average and Minimum Dietary Energy Requirements.

In terms of food provisioning, international consensus is relatively strong, although implementation varies across national dietary guidelines (Bach-Faig et al., 2022; Marquardt et al., 2019; Springmann et al., 2020). While Decent Living Standards and Sufficiency Living literature proposes benchmark levels for sustainable household food waste, policy initiatives, such as SDG 12.3 and recent EU legislation focus on reduction targets rather than defining a sustainable threshold. Household food waste remains high globally, at around 79 kg per capita annually; achieving SDG 12.3. would simply reduce this to roughly 40 kg per capita per year by 2030 (≈50% reduction). In the EU, household food waste is currently about 68 kg per capita annually (Eurostat, 2024), with a binding target to reduce household and retail food waste by 30% (European Union, 2025).

Table A1.3 Societal thresholds defining minimum mobility standards for wellbeing

Mobility Component	Sub-component	Unit	Average	Minimum	Maximum
All		pkm/cap/yr	7479.7	4900.0	10000.0
Private transport		pkm/cap/yr	4722.2	4722.2	4722.2
Private transport	Airplane	pkm/cap/yr	1000.0	1000.0	1000.0
Private transport	Car	pkm/cap/yr	2236.9	1540.0	2933.8
Private transport	Petrol/Diesel	pkm/cap/yr	2932.3	2932.3	2932.3
Private transport	Electric	pkm/cap/yr	1.5	1.5	1.5
Public transport		min/cap/day	37.5	30	45
Public transport		pkm/cap/yr	2848.6	0.4	4993.2
Public transport	Bus	pkm/cap/yr	1825.3	645.0	3746.3
Public transport	Train	pkm/cap/yr	583.6	171.0	1130.0
Public transport	Motorcycle	pkm/cap/yr	459.9	300.0	619.9
Active transport		min/cap/day	30.0	30.0	30.0
Active transport		pkm/cap/yr	1193.5	394.0	1460.0
Active transport	Bicycle	pkm/cap/yr	596.8	197.0	730.0
Active transport	Conventional	pkm/cap/yr	365.0	365.0	365.0
Active transport	Electric	pkm/cap/yr	365.0	365.0	365.0
Active transport	Walking	pkm/cap/yr	596.8	197.0	730.0

The table presents indicative values for societal thresholds for mobility that delineate the lower boundaries of a “safe and just” operating space below which basic human needs are not adequately met. Average estimate, lowest estimate (minimum), and highest estimate (maximum) values are calculated considering all values from the following sources: Kikstra et al. (2021), Millward-Hopkins et al. (2020), Vélez-Henao et al. (2026): Decent Living Standards (DLS) – Hot or Cool Institute (2025): Sufficiency Living – UN Stats (2025): Access to Public Transport (EU) – Transportation Research Board of the National Academies (2013): Access to Public Transport – European Commission (2020): Accessibility for low-carbon modes - Rao et al. (2019): Energy requirements for decent living in India, Brazil and South Africa.

In the mobility domain, emerging estimates suggest a range of 5,000–10,000 passenger-kilometres per capita annually. However, accessibility- and sufficiency-based approaches increasingly emphasise access to essential services and opportunities, rather than travel demand itself, and corresponding threshold definitions remain under development and lack international harmonisation (Hilton & Cook, 2022).

Table A1.4 Societal thresholds defining minimum consumer goods and services standards for wellbeing

Consumer goods and services Component	Sub-component	Unit	Average	Minimum	Maximum
Clothing and footwear		kg/cap/yr	3.3	2.3	4.0
Clothing and footwear		piece/cap/yr	74.0	74.0	74.0
Clothing and footwear		€/cap/yr	667.0	576.0	758.0
Furnishings, household equipment and routine household maintenance		€/cap/yr	321.5	187.0	456.0
Furnishings, household equipment and routine household maintenance	Washing machine	piece/cap/yr	0.0	0.0	0.0
Furnishings, household equipment and routine household maintenance	Drye machine	piece/cap/yr	0.0	0.0	0.1
Furnishings, household equipment and routine household maintenance	Cold storage	piece/cap/yr	0.3	0.0	0.0
Furnishings, household equipment and routine household maintenance	Stove for cooking	piece/cap/yr	0.3	0.0	1.0
Furnishings, household equipment and routine household maintenance	Phone	piece/cap/yr	1.0	0.0	0.9
Furnishings, household equipment and routine household maintenance	Computer	piece/cap/yr	0.3	1.0	1.0
Furnishings, household equipment and routine household maintenance	Electronics	€/cap/yr	0.9	0.3	0.3
Waste		kg/cap/yr	297.0	0.7	1.0
Waste	Open dump	kg/cap/yr	111.5	243.0	350.9
Waste	Landfill	kg/cap/yr	133.5	89.0	134.0
Waste	Recycling	kg/cap/yr	43.9	128.9	138.0
Waste	Anaerobic digestion	kg/cap/yr	0.2	43.9	43.9
Waste	Incineration	kg/cap/yr	28.5	0.2	0.2
Health in m^2		m^2/cap/yr	1.6	1.6	1.6
Health in expenditure		€/cap/yr	588.7	259.9	911.4
Education in m^2		m^2/cap/yr	2.5	2.5	2.5
Education in expenditure		€/cap/yr	183.3	121.0	230.5
Other Service		m^2/cap/yr	4.7	4.7	4.7

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