# Bioenergy sector – ESRS vs other frameworks
# Issues Paper

## Objective

1. The purpose of this paper is to bring forward an overall approach for addressing the treatment of activities related to bioenergy (including from synthetic fuels) in the Sector Classification (SEC 1).
2. The analysis carried out in this paper builds on the previous SR TEG discussion of the 25th April 2024 (see 04-02 Issues paper Bioenergy) and adds new information in terms of the comparison of Bioenergy-related disclosures that are part of ESRS (including the OG draft, version of the Agenda Paper 05.02, discussed at SR TEG on 4th September 2024), the GRI and SASB frameworks.
3. In addition to section 1 for SR TEG's information, section 2 includes a cross-analysis of the metrics under three frameworks (SASB, GRI, and the ESRS), compared by relevant aspect (which would roughly correspond to sustainability matters in ESRS jargon). Annexes 1 to 3 each cover one specific framework, starting with SASB (comparison between SASB Biofuels and other SASB standards), then proceeding with GRI (comparison with SASB), and finally ESRS and OG [draft]. Lastly, Annex 4 provides a description of the Bioenergy sector.

## 1. Information for EFRAG SR TEG

4. On the 25th April 2024, the EFRAG Secretariat presented a series of arguments in favour and against the creation of a separate ESRS Bioenergy sector for discussion at SR TEG. On that occasion, the EFRAG Secretariat proposed some changes to the aggregation of NACE codes, should a standalone Bioenergy sector be created. These changes are summarized here for convenience:

| *New NACE code* | *Current ESRS sector* | *Proposed new ESRS sector* | *Reason* |
|---|---|---|---|
| C.16.26 | Forestry and wood products | Biofuels | NACE 2.1 update |
| A.02.20 | Forestry and wood products | | |
| C.20.51 | Chemicals | | |
| D.35.21 | Power production and energy utilities | | |
| D.35.12 | Power production and energy utilities | | |
| C.19.20 | Oil and gas | | |
| G.46.81 | Oil and gas | | |

5. The SR TEG Chair suggested for the EFRAG Secretariat to strengthen the argumentations that were put forward through an additional analysis of the SASB and GRI frameworks as opposed

to the ESRS standards, in order to have an overview of all the existing Bioenergy-related information across frameworks and allow the SR TEG to evaluate the potential for interoperability between ESRS and the other frameworks, for the purpose of establishing a separate Bioenergy standard.

6. On the terminology used, it is to be noted that SASB has adopted the term Biofuels, while this document will refer to Bioenergy, as it is understood at EU-level as a renewable energy source derived from biologically sourced materials, encompassing both biomass (solid bioenergy) and biofuels (including biogases and bioliquids).[1,2,3,4,5] Bioenergy resulting from synthetic fuels is also to be considered here.

## 5. Comparative analysis: ESRS vs other standards

7. Taking SASB Biofuels as a reference point for Bioenergy standard-specific information, as opposed to information on Bioenergy that is located across other SASB standards (and which, by assumption, would not be relevant for a standalone ESRS Bioenergy sector standard), EFRAG Secretariat conducted a comparative analysis to map the currently required information by the ESRS (including the OG sector) to GRI and SASB. This analysis helped to identify the gaps and commonalities on which to build a proposal for a new ESRS sector standard on Bioenergy.

8. The table below illustrates this analysis, along with an 'aspect' label that was assigned to each of the analysed metrics.

9. In particular, it is worth noting that:

   (a) PAT disclosures are not featured by GRI nor SASB. However, SET1 already requires information on how policies, actions, and targets address renewable energy deployment. In this instance, Bioenergy is only mentioned as an example of renewable energy, and no specific disclosure is at the moment tailored to it. Therefore, in order to understand whether a sector specific standard should be created the EFRAG Secretariat suggests exploring PAT provisions that are related to bioenergy-specific sustainability matters only, going beyond generic provisions that could overlap with other renewables sectors (e.g., pulp and paper).

   (b) On production, the OG standard, in alignment with SASB's Oil & Gas standard, already covers the production of renewable fuels for fuel blending. However, the ESRS does not yet cover the information requested by SASB Biofuels on the overall biofuel production capacity, or on the breakdown of biofuels production by type. This latter aspect should be considered as part of a standalone Bioenergy sector. SASB Biofuels additionally includes a disclosure on the feedstock used in production, which might also be taken into consideration. The Secretariat also recommends designing a requirement on the sources of input, given the high relevance of the topic for the industry.

   (c) The disclosures on air pollutants, water consumption, biodiversity impacts, as well as on industrial hazards and the regulatory environment, are all only covered by SASB Biofuels (with the exception of specific requirements on the reporting of air pollutants and water consumption that stem from SET1). Therefore, they currently represent gaps in the ESRS domain, as they are not specifically highlighted as impacts

[1] https://energy.ec.europa.eu/topics/renewable-energy_en

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023L2413&qid=1699364355105#d1e1154-1-1

[3] https://energy.ec.europa.eu/topics/renewable-energy/bioenergy_en

[4] https://www.eea.europa.eu/help/glossary/chm-biodiversity/bioenergy

[5] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Biofuels

for the Bioenergy sector. In particular, the Secretariat notes that the SASB Biofuels standard does not cover the following disclosures, which should be considered in a potential ESRS Bioenergy standard: 1) indirect emissions of solid biomass air pollutants; 2) supply chain and Water-Energy-Food Nexus implications of the bioenergy-related activities; 3) supply chain implications of feedstock use as primary material for bioenergy production.

10. Concerning waste, ESRS E5, in alignment with GRI and SASB, already covers the diversion from disposal, which includes biomass as an example of materials that are present in the waste. Given the specificities of the Bioenergy sector, the Secretariat suggests considering that the critical issue would be to understand how companies source their materials from waste residuals, ensuring that it gets diverted to energy use.

11. On GHG emissions, ESRS is in overall alignment with GRI 305 Emissions, as well as SASB Biofuels, with a few exceptions: ESRS presents a broader scope of information, including also discussions on emissions removal (including carbon credits) and storage, and other types of GHG. There are, however, critical and important GHG accounting questions that would have to be addressed and discussed and are continuous sources of debate on biofuel. Three of the most critical and contentious aspects relate to:

    (a) the accounting of $CO_2$ biogenic emissions as a separate emission category and that does not count as a CO2 emission. This rule, which is rooted in the IPCC 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2, Energy, and reiterated in its 2019 revision, states that biomass is counted as an emission at the point of extraction – so, typically in the Agriculture or Forestry sectors - and not at the point of use – such as the energy sector, in order to avid double counting.

    (b) The consideration of biogenic CO2 as being "carbon neutral" due to biomass re-growth. This rule is contested more and more widely by many stakeholders. It also links to different growth cycles, with different rules being proposed depending on biomass origin in systems with annual, bi-annual or longer periods of growth (e.g. forest can take several decades). The carbon balance (positive/negative) of biomass is also contested if considering full life cycle analysis, depending on the type of biomass and the specific bioenergy system in which it is utilized.

    (c) LCA considerations, e.g. biomass originating from forestry systems and trees outside forests (e.g. gardens and urban trees) is often considered a "residue" that is diverted to energy use. There are specific LCA allocation rules that stipulate that system properties - like emissions – are not allocated to residues which lead, even if emissions were not allocated at point of extraction, to the burning of residual biomass to be considered as zero emissions.

12. As for the aspect of energy and fuel consumption, it is already fully covered by the ESRS, in full alignment with GRI and SASB. However, the Secretariat notes that it is worth exploring the possibility of including a bioenergy production and distribution-specific ratio, similar to the concept of Energy Return on Investment or 'EROI' of biofuels and biomass, which is highly variable depending on type of biomass and distribution/consumption system.

13. All the remaining aspects in the table – which include fleet management, sourcing, and financial information (investments, potential revenue and market coverage) – all fall under other SASB standards (not Biofuel-related). Therefore, they represent disclosures outside of the Bioenergy sector scope.

| | *Standard & metric* | | | |
|---|---|---|---|---|
| *Aspect* | *ESRS* | *GRI* | *SASB* | *Analysis* |
| PAT | **ESRS E1-2**: if & how policies address […] renewable energy [e.g., **biomass**] deployment.<br><br>**ESRS E1-3**: may aggregate types of decarbonisation levers (e.g., renewable energy use).<br><br>**ESRS E1-4**: if & how GHG emissions reduction targets were set and/or any other targets to manage material climate-related IROs (e.g., renewable energy deployment). | | | SET1 mentions biomass as a part of general renewable energy policies, targets, actions. No specific GRI or SASB requirement on PAT.<br><br>Nonetheless, PAT disclosures on bioenergy are essential to the reporting by bioenergy companies, and they would go beyond general bioenergy provisions and towards specific PATs on sustainability matters that are impacted by bioenergy supply: e.g., LUC; water consumption; land management; energy (i.e., EROI); circular economy (where bioenergy represents the linear model, unless based on waste material); local communities; etc. |
| production | **OG SBM1**:<br><br>Volumes (produced, purchased) of renewable fuels [including biofuel, cellulosic biofuel, ethanol, advanced biofuels] for fuel blending. | | ***Biofuels***:<br><br>1. Biofuel production capacity.<br><br>2. Production of: (1) renewable fuel, (2) advanced biofuel, (3) biodiesel, and (4) cellulosic biofuel.<br><br>**Oil & Gas – Refining & Marketing**:<br><br>Volumes (produced, purchased) of renewable fuels [including biofuel, cellulosic biofuel, ethanol, advanced biofuels] for fuel blending. | Covered by SASB Biofuels, specifically as production capacity and production disaggregation by type.<br><br>To be considered for inclusion in standalone Bioenergy standard, excluding volumes for fuel blending (already covered by ESRS OG), an activity that occurs in principle within the O&G sector. |
| production (inputs processed) | | | **Biofuels**:<br><br>Amount of feedstock consumed in production. | Part of SASB Biofuels, not yet covered by ESRS nor GRI.<br><br>The source of the inputs is another critical disclosure for the Bioenergy sector. |
| consumption (energy /fuel) | **ESRS E1-5**:<br><br>Disaggregation of total energy consumed<br><br>from renewable sources (e.g., **biomass**, **biofuels**, **biogas**). | **GRI 302 Energy**:<br><br>Total fuel consumed from renewable sources [e.g., **biofuels** and **biomass**]. | **All, except Financials and Biofuels**:<br><br>% of energy /fuel consumed [from fuels & biofuels] that is renewable [e.g., **biomass**] | Not relevant for standalone Bioenergy standard, already covered by SET1 (in alignment with GRI and SASB).<br><br>Nevertheless, it might be worth exploring the possibility to differentiate between corporate disclosures on energy consumption (as already captured by ESRS, GRI and SASB) and a ratio that is specific to the manufacturing and distribution of bioenergy (i.e., Energy |

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| | | | | Return on Investment or 'EROI'[6,7,8] of biofuels and biomass). |
| energy intensity | | **GRI 302 Energy**:<br>Energy intensity ratio, with a possible breakdown by non-renewable and renewable (e.g., **biomass**) sources. | | Currently, breakdown by renewable source is not in ESRS nor in SASB Biofuels. To explore whether relevant to consider for a standalone Bioenergy standard. |
| fleet | | | **Waste Management**:<br>Percentage of alternative fuel vehicles [including powered by biodiesel, methanol, ethanol, etc.] in fleet | Not relevant for standalone Bioenergy standard (part of other SASB standard). |
| GHG emissions | **ESRS E1-6**:<br>**Biogenic** CO2 emissions from **biomass** combustion or biodegradation, separately from *Scope 1*, *Scope 2* and *Scope 3*.<br><br>**ESRS E1-7**:<br>**Biogenic** or non-biogenic nature of removal and storage, and of carbon credits from removal projects. | **GRI 305 Emissions**:<br>**Biogenic** CO2 emissions from **biomass** combustion or biodegradation, separately from *Scope 1*, *Scope 2* and *Scope 3*. | ***Biofuels***:<br>Lifecycle GHG emissions. | Covered by ESRS SET 1, in alignment with GRI. SASB Biofuels focusing on lifecycle approach.<br>Life cycle aspects are to be covered in the Bioenergy sector through lifecycle emissions, as well as specific carbon accounting controversies and the EROI indicator. |
| air pollutants | [ESRS E2-4 on air emissions, although no Bioenergy specific requirement] | | ***Biofuels***:<br>1. Emissions of air pollutants.<br>2. Non-compliance incidents (air quality permits, standards, regulations). | Part of SASB Biofuels, not yet covered by ESRS nor GRI.<br>General requirement under SET1 on air emissions (ESRS E2-4).<br>Nonetheless, SET1 covers direct emissions only. This needs to be distinguished from indirect emissions of solid biomass air pollutants, which represent a significant concern, and one that is specific to the Bioenergy sector,[9] especially at the local level.<br>It is recommended, hence, to integrate this additional aspect of indirect air emissions into the Bioenergy sector specific standard. |
| consumption (water) | [ESRS E3-4 on water consumption, although no Bioenergy specific requirement] | | ***Biofuels***:<br>1. Water withdrawn and consumed; percentages in water stress regions.<br>2. Water management risks; strategies, | Part of SASB Biofuels, not yet covered by ESRS nor GRI.<br>General requirement under SET1 on water consumption (ESRS E3-4).<br>One critical sector-specific issue to consider here is the inefficient use of water resources in the production of |

[6] https://www.mdpi.com/1996-1073/14/10/2803

[7] https://radar.brookes.ac.uk/radar/file/5ecefeb6-51e5-4aa3-a081-e2eda620fdfc/1/sustainability-14-07098.pdf

[8] https://www.eeca.govt.nz/insights/eeca-insights/liquid-biofuels-insights-summary/

[9] https://www.pfpi.net/air-pollution-2/

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| | | | practices to mitigate them.<br><br>3. Non-compliance incidents (water quality permits, standards, regulations). | bioenergy, which further enhances water stress in specific countries. A variety of challenges need to be considered, given the connected demands competition for water resources related to the Water-Energy-Food (WEF) Nexus (e.g., amount of resources needed to transform feedstock into bioenergy; withdrawals for production of crops and forestry).[10]<br><br>Considering the above, this aspect is to be treated as a sector specific disclosure requirement addressing water issues in the entire Bioenergy supply-chain. |
| biodiversity impacts | | | ***Biofuels***:<br><br>1. Strategy to manage environmental impacts risks of feedstock production.<br><br>2. Biofuel production third-party certified to standard. | Part of SASB Biofuels, not yet covered by ESRS nor GRI.<br><br>Bioenergy, as opposed to other forms of renewable energy, has the most severe biodiversity footprint.[11] This is due to its high reliance on raw material feedstock purchased from agricultural producers and distributors, use of land (i.e., production taking place on previous cropland), water and nutrients to ensure continuous production levels (given the raising demand for agri-forestry commodities that feed the bioenergy sector). This implies that the impacts on nature (including on protected species and habitats) stemming from bioenergy-related activities are a value chain concern, particularly sensitive at the supply level (i.e., potential land use and land management impacts associated with the sourcing of feedstocks throughout the plant's lifetime). Such impacts can happen both directly (habitats to crops conversion) and indirectly (extension of food/feed production to forests, peatlands and wetlands) through overexploitation and biodiversity loss, soil degradation, invasive species, land-use change and deforestation, pollution and climate change. The main types of land use management for bioenergy are: a) conventional crops (i.e. food and feed), including those specifically used for biogas, bioliquids and biofuels; b) purpose grown energy crops cultivated on agricultural land; c) forest biomass from existing forest land. To control for these impacts, it is fundamental to ensure supplier |

[10] https://www.sciencedirect.com/science/article/abs/pii/S0959378002000407

https://www.pnas.org/doi/full/10.1073/pnas.0812619106

[11] https://www.europarl.europa.eu/RegData/etudes/STUD/2015/513991/IPOL_STU%282015%29513991_EN.pdf (p. 109-112).

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| | | | | engagement or supply chain certifications.[12,13,14] |
| waste | **ESRS E5-5**:<br><br>When disclosing the composition of the waste, the undertaking shall specify:<br><br>[…] (b) the materials that are present in the waste (e.g. **biomass**, metals, non-metallic minerals, plastics, textiles, critical raw materials and rare earths). | **GRI 306 Waste**:<br><br>Total weight of (1) waste generated, (2) waste diverted from disposal, (3) waste directed to disposal in metric tons, and a breakdown of this total by composition of the waste [including materials, such as **biomass**]. | **Food Retailers & Distributors**:<br><br>(1) Amount of food waste generated, (2) percentage diverted [including through conversion for use in bio-based industrial products such as raw material to make **biodiesel**, or breakdown via bacteria in the absence of oxygen to generate **biogas**] from the waste stream. | Bio-based waste is addressed by all 3 frameworks., especially in terms on waste generation (ESRS, GRI, SASB). As for waste directed from disposal, this is covered by GRI and non-Bioenergy SASB. According to SASB, not part of standalone Bioenergy standard. Here, the wwaste diverted from disposal is currently covered as an overall amount, not broken down by biomass and other materials.<br><br>What the Secretariat believes is missing, and that is a fundamental aspect for bioenergy, is how bioenergy-related operations make use of biomass waste streams that are diverted from disposal and have a significant impact in bioenergy carbon footprint, rather than how much waste is diverted from disposal without a specification of its subsequent use. This is in line with the cascadic value chain approach for biomass use (efficient use of biomass residues for the extension of total biomass availability).[15]<br><br>As for the specific types of waste streams that can be generated during bioenergy production, one needs to consider the following: (a) wastewater (resulting from the washing of the finished biofuels product to remove contaminants); (b) ion exchange resins (styrene plastic beads used to remove contaminants from biofuels, generating low amounts of waste); (c) minerals such as magnesium silicate (used for cleaning biofuels, generating low amounts of waste); (d) used oil sediments (e.g., from restaurants –organic solids that are strained before the utilization of the oil in biofuel production); and € glycerin (a byproduct of biofuel production with high levels of impurities.<br><br>Wastewater may be treated through specific recycling equipment, or sent to municipal sewage plants for diversion from disposal against payment. The resins are costly and currently challenging to be recycled, often prompting entities to direct them to disposal. Minerals are also bound for disposal, however, without toxic effects on the environment given their nutritional |

[12] European Commission, Directorate-General for Environment, Bowyer, C., Tucker, G., Underwood, E. et al., Potential impacts of bioenergy developments on habitats and species protected under the birds and habitats directives – Final report, Publications Office of the European Union, 2020, https://data.europa.eu/doi/10.2779/614742.

[13] Knowledge Centre for Biodiversity – Bioenergy (EC, 2023).

[14] SASB Biofuels

[15] How bioenergy contributes to a sustainable future (IEA Bioenergy, 2022).

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| | | | | value for animals (and the possibility to add it to feed). As for the sediments from used oil, these can be sold as livestock feed. Glycerin poses a disposal issue as, especially smaller biofuels producers, do not have the refining capacity to attain a byproduct with the necessary purity level required for use as an industrial chemical. Given glycerin's methanol content, release into the environment as a disposal option is not considered a safe option, and the only alternatives left are anaerobic digestion or transfer to a larger biofuels plant or appropriate refining.[16] |
| industrial hazards | | | ***Biofuels***:<br>PSIC, PSTIR, and PSISR. | Part of SASB Biofuels, not yet covered by ESRS nor GRI. |
| regulatory environment | | | ***Biofuels***:<br>1. Subsidies received.<br>2. Corporate positions on government regulations /policy proposals on environmental /social factors affecting the industry. | Part of SASB Biofuels, not yet covered by ESRS nor GRI. |
| sourcing | | | **Agricultural Products**:<br>(1) Percentage of agricultural products [using raw materials such as biofuel ingredients] sourced [including from regions with High or Extremely High Baseline Water Stress] that are certified to a third-party environmental or social standard, and (2) percentages by standard | Not relevant for standalone Bioenergy standard (part of other SASB standard). |
| financial (investments) | | **GRI 201 Economic Performance**:<br>Capital expenditure (CapEx) % that is allocated to investments in: […] energy from renewable sources (by type of source) [including biomass] | **Oil & Gas – Exploration & Production**:<br>Amount invested in renewable energy [including biomass], revenue generated by renewable energy sales | Not relevant for standalone Bioenergy standard (part of other SASB standard). |
| financial (potential revenue & market share) | **OG SBM1**:<br>Total addressable market and share of market for advanced biofuels and associated infrastructure | | **Oil & Gas – Refining & Marketing**:<br>Total addressable market and share of market for advanced biofuels and associated infrastructure | Not relevant for standalone Bioenergy standard (part of other SASB standard, and already covered by OG). |

[16] Waste Management in Biodiesel Production (Farm Energy, 2019).

In addition to the impacts summarized in the above table, the following aspects should also be evaluated in the context of a potential sector-specific Bioenergy standard: food security in affected communities due to competing land use demands (supply chain issue),[17,18] land rights conflicts (areas excluded for land use allocation),[19] health and safety in communities surrounding bioenergy plants (exposure to air and water pollutants stemming from bioenergy-related operations, also due frequent to violations of water and air quality environmental standards).[20] Furthermore, with a growing global market demand for both solid, liquid and gaseous bioenergy types and an important role to be played in may 1.5 and 2C scenarios, as the sector expands, key sustainability issues will be driven by its size/scale of operation (e.g. global markets vs. local markets). In this case, it may be particularly relevant that the sector has its own set of standards, with its own specific issues, just like coal, oil and gas, or electricity production (each with their own specific sector standard).

### Conclusions

14. Considering the above analysis, and with reference to the SR TEG discussion of the 25th April 2024 (see 04-02 Issues paper Bioenergy), EFRAG Secretariat recommends the creation of a standalone Bioenergy sector (building on the previous discussion of the NACE codes), on the basis of the following arguments:

15. A standalone Biofuels standard exists under SASB, and the GSSB Work Program 2023-2025 prioritizes the creation of a GRI Renewable Energy sector project, including biofuels producers (although it is yet unclear whether Bioenergy will be given a separate prominence under GRI).

    (a) Although the other SASB standards include specific metrics on biofuels, these do not overlap with SASB Biofuels.

    (b) Some Bioenergy-related aspects are currently covered by ESRS and aligned with GRI and/or SASB standards, with the exception of the production and emissions metrics, which partially overlap with SASB Biofuels on certain disclosure details. Overall, this gives room for the development of a standalone set of Bioenergy-related requirements, that would complement the information already required by SET1, and be mindful of the principle of interoperability with the SASB framework.

**Question[s] for EFRAG SRB**

16. Does EFRAG SRB agree with the creation of a new ESRS sector on Bioenergy? Please explain.

[17] A Global Assessment of the Environmental and Social Impacts Caused by the Production and Use of Biofuels (IUCN; 2014).

[18] Impacts of Biofuel Production Case Studies: Mozambique, Argentina and Ukraine (GEF, FAO, UNIDO, UNEP; 2013).

[19] Impacts of Biofuel Production Case Studies: Mozambique, Argentina and Ukraine (GEF, FAO, UNIDO, UNEP; 2013).

[20] The Biofuels Revolution: Understanding the Social, Cultural and Economic Impacts of Biofuels Development on Rural Communities (OSTI, 2011).

## Annex 1: Analysis of frameworks: SASB

### SASB Biofuels Standard (Ver. 2023-12)

17. The SASB Biofuels Standard (Ver. 2023-12) is a standalone industry standard by SASB, grouped under the Renewable Resources & Alternative Energy Industry, together with the standards on:

    (a) Forestry Management

    (b) Fuel Cells & Industrial Batteries

    (c) Pulp & Paper Products

    (d) Solar Technology & Project Developers

    (e) Wind Technology & Project Developers

18. Biofuels are defined is this standard as ethanol and biodiesel (the most widely produced biofuels), biogas, biohydrogen and synthetic biofuels, produced from a variety of organic feedstocks. More precisely, SASB refers to the production of (1) renewable fuel, (2) advanced biofuel, (3) biodiesel, and (4) cellulosic biofuel.

19. The scope of this standard covers entities primarily involved in the refining of biofuels and production of biofuels (that are used primarily in transportation) through the processing of biomass (i.e. organic feedstock, such as food, oil crops and animal products) sourced from agricultural product distributors, which are part of the biofuel production upstream value chain. The downstream value chain of biofuel production (i.e., customers) is mainly composed of fuel-blending and fuel-supply entities, including major integrated oil entities.

20. The need for this specific standard in the industry was significantly driven by government regulations related to the use of renewable fuel.

21. According to SASB, the most significant impacts of the Biofuels sector that drive the related Sustainability Disclosure Topics and Metrics on which the related entities are to report on are:

    (a) Lifecycle GHG emissions. The Biofuels sector is responsible for the generation of direct and indirect GHG emissions, stemming from a variety of activities throughout the biofuels lifecycle (i.e., feedstock crop production and land use, fuel refining, fuel and feedstock transport, vehicle exhaust emissions). The calculation of biofuel lifecycle emission calculation is functional to achieving a lifecycle emissions balance by encouraging biofuel entities to implement processes for the reduction of net emissions (fuel use management during refining, use of low-emission profile feedstocks for innovating processes, etc.). Fuel products that achieve a (cost-effective) reduction in net emissions may qualify as advanced biofuels, which could increase future demand and create a competitive product advantage for the Biofuel entities achieving them.

    (b) Air quality. The activities carried out by biorefineries (e.g., distillation and fermentation, wastewater treatment, cooling, drying, use of grain-handling equipment and boilers) generate air emissions of, for example, air pollutants and volatile organic compounds. Such emissions are typically subject to emissions limits, permits and abatement (as well as penalties, permit restrictions or delays from jurisdictional legal or regulatory authorities for non-compliance when thresholds are not respected), giving rise to gradually increasing compliance and operating costs or capital expenditures.

    (c) Water management. The activities carried out by biorefineries (feedstock processing, fermentation, distillation and cooling) are water-intensive and locally concentrated, which may affect local water resources, including through

contamination of water supplies, as well as tensions with local communities as a result of water extraction from specific areas. This may, in turn, lead to a lower water availability for refining, and subsequently, higher operational costs and operational disruption risks. Operational water efficiency is, therefore, fundamental. Additionally, biorefining facilities can produce wastewater with concentrations of phosphorus, dissolved solids, organic compounds, salts, and other substances, requiring an appropriate treatment of effluents.

(d) Biodiversity (and overall environmental) impacts from feedstock sourcing. The production on biofuels requires the use of a variety of plant-based feedstocks, which is typically purchased by biofuels entities from agricultural producers and distributors. As a result, a large portion of global arable land is currently occupied by biofuel crops. The impacts on land are exacerbated by unsustainable cultivation practices, which leads to other negative environmental externalities, such as biodiversity loss, deforestation, soil degradation, and water pollution. To avoid these effects and ensure that adverse crop yields do not result in extreme price fluctuations and biomass unavailability for biofuels producers, it is important to guarantee the vetting of Biofuels supply chains through, for instance, supplier engagement or certifications.

(e) Hazards in the Biofuels industry. The presence of pressurized equipment, high temperatures and flammable and explosive substances within biorefining processes and facilities causes operational and process safety accidents and incidents that, despite representing rare occurrences, may bring about severe outcomes (workers injuries resulting in regulatory penalties and litigation, harm to local communities and the local environment, damaged facilities that become inoperable for extended periods, etc.) with subsequent significant effects on financial performance (large capital expenditures for repairs and higher cost of capital for entities at a greater risk, as well as lost revenue). Therefore, it is essential for entities to have a strong safety culture and operational safety oversight in place, including through emergency preparedness and response, which may help in the timely detection of and effective response to such incidents, mitigating potential financial risks and improving operational efficiency.

(f) Management of the legal & regulatory environment. The work of Biofuels entities is strictly intertwined with and dependent on government policies and regulations related to renewable fuel policies, which, in the short-term, create market demand and incentivize supply through tax credits and support for feedstock production. Despite the regulatory support, the potential long-term adverse environmental impacts from feedstock and biofuels production may result in a reversal of beneficial policies, leading to a more uncertain regulatory environment. For this reason, Biofuels entities should leverage engagement with regulators by developing clear strategies that are aligned with long-term sustainable business outcomes and that account for environmental externalities.

22. In addition to sustainability metrics, SASB features a set of complementary Activity Metrics, to be used in conjunction (to normalize data and facilitate comparison), quantifying the scale of the specific activities or operations by a Biofuels entity. The Biofuels Activity Metrics required by SASB are:

    (a) Biofuel production capacity.

    (b) Production of: (1) renewable fuel, (2) advanced biofuel, (3) biodiesel, and (4) cellulosic biofuel.

    (c) Amount of feedstock consumed in production.

23. The table below presents all the metrics connected to the afore-mentioned impacts that are to be disclosed according to the SASB Biofuels standard.

| *Topic (SASB code)* | *Category & unit of measure* | *Metric* | *Aspect* |
|---|---|---|---|
| Lifecycle Emissions Balance (**RR-BI-410a.1**) | **Quantitative**: grammes of $CO_2$-e per megajoule (MJ) | Lifecycle greenhouse gas (GHG) emissions, by biofuel type | emissions |
| Air Quality (**RR-BI-120a.1**) | **Quantitative**: metric tonnes (t) | Air emissions of the following pollutants: (1) NOx (excluding N2O), (2) SOx, (3) volatile organic compounds (VOCs), (4) particulate matter (PM10), and (5) hazardous air pollutants (HAPs) | air pollutants |
| Air Quality (**RR-BI-120a.2**) | **Quantitative**: number | Number of incidents of non-compliance associated with air quality permits, standards, and regulations | air pollutants |
| Water Management in Manufacturing (**RR-BI-140a.1**) | **Quantitative**: thousand cubic metres ($m^3$), percentage (%) | (1) Total water withdrawn, (2) total water consumed; percentage of each in regions with High or Extremely High Baseline Water Stress | water consumption |
| Water Management in Manufacturing (**RR-BI-140a.2**) | **Discussion & analysis**: n/a | Description of water management risks and discussion of strategies and practices to mitigate those risks | water consumption |
| Water Management in Manufacturing (**RR-BI-140a.3**) | **Quantitative**: number | Number of incidents of non-compliance associated with water quality permits, standards and regulations | water consumption |
| Sourcing & Environmental Impacts of Feedstock Production (**RR-BI-430a.1**) | **Discussion & analysis**: n/a | Discussion of strategy to manage risks associated with environmental impacts of feedstock production | biodiversity impacts |
| Sourcing & Environmental Impacts of Feedstock Production (**RR-BI-430a.2**) | **Quantitative**: percentage (%) of litres | Percentage of biofuel production third-party certified to an environmental sustainability standard | biodiversity impacts |
| Management of the Legal & Regulatory Environment (**RR-BI-530a.1**) | **Quantitative**: presentation currency | Amount of subsidies received through government programmes | regulatory environment |
| Management of the Legal & Regulatory Environment (**RR-BI-530a.2**) | **Discussion & analysis**: n/a | Discussion of corporate positions related to government regulations or policy proposals that address environmental and social factors affecting the industry | regulatory environment |
| Operational Safety, Emergency Preparedness & Response (**RR-BI-540a.1**) | **Quantitative**: number, rate | Process Safety Incidents Count (PSIC), Process Safety Total Incident Rate (PSTIR), and Process Safety Incident Severity Rate (PSISR) | industrial hazards |
| Activity Metric (**RR-BI-000.A**) | **Quantitative**: millions of litres (ML) | Biofuel production capacity | production |
| Activity Metric (**RR-BI-000.B**) | **Quantitative**: millions of litres (ML) | Production of: (1) renewable fuel, (2) advanced biofuel, (3) biodiesel, and (4) cellulosic biofuel | production |

| | | | |
|---|---|---|---|
| Activity Metric (**RR-BI-000.C**) | **Quantitative**: metric tonnes (t) | Amount of feedstock consumed in production | inputs processed |

### Distribution of Biofuels-related activities across other SASB standards

24. Despite there being a standalone standard on Biofuels, the set of SASB standards also features additional Biofuels-related disclosures, which do not, however, intersect with the Biofuels standard reporting. These mainly cover such additional aspects as energy/fuel consumption (all industries, except Financials) and (fleet/) fuel management, biofuel ingredients sourcing for use by the entity's operations (Agricultural Products), and investments in renewable energy (Oil & Gas). Besides, the Oil & Gas (refining & marketing) sector takes into account the potential revenue and market share related to advanced biofuels and the associated infrastructure, as well as the volumes of renewable fuels produced and purchased for fuel blending, which may include an analysis of the entity's biofuel production capacity and total renewable fuel production of advanced biofuel, biomass-based diesel and cellulosic biofuel. And finally, Food Retailers & Distributors consider the percentage of food waste that is diverted from the waste stream, including through conversion for use in bio-based industrial products such as raw material to make biodiesel or breakdown via bacteria in the absence of oxygen to generate biogas.

25. The following table features details on the Biofuels-related metrics required by the other SASB standards.

| *SASB industry /standard (by codes)* | *Topic (SASB code)* | *Category & unit of measure* | *Metric* | *Aspect* |
|---|---|---|---|---|
| CG (except AA, AM, HP, TS).<br>EM (except CO, EP, MD, RM, SV).<br>FB (except TB).<br>HC (only DR, DY).<br>IF (only RE, WU).<br>RR (except BI, FM).<br>RT (all).<br>SV (only CA, HL, LF).<br>TC (except ES, HW).<br>TR (only AP, CL, MT).<br>*FN all excluded.* | [Energy management] (**xx-xx-130a.1**); **RR-PP-130a.1**). Greenhouse Gas Emissions (**TR-CL-110a.3**; **TR-MT-110a.3**). | **Quantitative**: gigajoules (GJ), percentage (%) | (1) Total/operational energy consumed,* [...] (3) percentage renewable**/ (3) percentage from **biomass**,*** [...] ***[RR-PP]***.<br><br>* Energy consumption from fuels and **biofuels.**<br><br>** Renewable energy […] such as geothermal, wind, solar, hydro and **biomass**.<br>*** limited to materials certified to a third-party standard (e.g., Forest Stewardship Council), materials considered eligible sources of supply according to the Green-e Energy National Standard Version 2.5 (2014), or the Green-e Framework for Renewable Energy Certification, Version 1.0 (2017) or Green-e regional standards, or materials eligible for an applicable jurisdictional renewable portfolio standard (describing risks and uncertainties associated with the use of biomass as an energy source - such as air emissions risks, regulatory risks, sourcing risks - including risk management). *The entity shall apply conversion factors consistently […] such as the use of HHVs for fuel usage (including **biofuels**) and conversion of kilowatt hours (kWh) to GJ (for energy data including electricity from solar or wind energy).* | consumption (energy) |
| EM (only SV).<br>FB (only FR, NB).<br>IF (only WM).<br>TR (only AF, AL, RA, RO). | Emissions Reduction Services & Fuels Management (**EM-SV-110a.1**). Fleet Fuel Management (**FB-FR-110a.1**; **FB-NB-110a.1**; | **Quantitative**: gigajoules (GJ), percentage (%) | Total /Fleet fuel consumed**, [...] percentage renewable* [...].<br>Fuel consumed by (1) road transport, percentage (a) natural gas and (b) renewable, and (2) air transport, percentage (a) alternative and (b) sustainable.<br><br>* Produced from renewable **biomass**, used to replace or reduce the quantity of fossil fuel present in a fuel, and | consumption (fuel) |

| | | | | |
|---|---|---|---|---|
| | **IF-WM-110b.1**). Greenhouse Gas Emissions (**TR-AF-110a.3**; **TR-AL-110a.3**; **TR-RA-110a.3**; **TR-RO-110a.3**). | | achieved net greenhouse gas (GHG) emissions reduction on a lifecycle basis.<br><br>** In calculating energy consumption from fuels and **biofuels**, the entity shall use higher heating values (HHV), also known as gross calorific values (GCV), which are directly measured or taken from the Intergovernmental Panel on Climate Change (IPCC). *The entity shall apply conversion factors consistently […] such as the use of HHVs for fuel usage (including **biofuels**).* | |
| Waste Management | Fleet Fuel Management (**IF-WM-110b.2**). | **Quantitative**: percentage (%) | Percentage of alternative fuel vehicles* in fleet.<br><br>* Powered by **biodiesel**, denatured alcohol, electricity, hydrogen, **methanol**, mixtures containing up to 85% methanol or denatured **ethanol**, natural gas, or propane (liquefied petroleum gas). | fleet |
| Agricultural Products | Environmental & Social Impacts of Ingredient Supply Chain (**FB-AG-430a.1**).<br><br>Ingredient Sourcing (**FB-AG-440a.2**). | **Quantitative**: percentage (%) by cost | (1) Percentage of agricultural products* sourced that are certified to a third-party environmental or social standard, and (2) percentages by standard. [**430a.1**]<br><br>Percentage of agricultural products sourced from regions with High or Extremely High Baseline Water Stress. [**440a.2**]<br><br>* Raw materials such as food, feed and **biofuel ingredient**s sourced for use in the entity's operations. | sourcing |
| Oil & Gas – Exploration & Production | Reserves Valuation & Capital Expenditures (**EM-EP-420a.3**). | **Quantitative**: presentation currency | Amount invested in renewable energy*, revenue generated by renewable energy sales.<br><br>*Renewable energy […] such as geothermal, wind, solar, hydro and **biomass**. For the purposes of this disclosure, the scope of renewable energy from **biomass** sources is limited to materials certified to a third-party standard, materials considered 'eligible renewables' according to the Green-e Energy National Standard. | investments |
| Oil & Gas – Refining & Marketing | Product Specifications & Clean Fuel Blends (**EM-RM-410a.2**). | **Quantitative**: presentation currency, percentage (%) | Total addressable market* and share of market** for **advanced biofuels***** and **associated infrastructure******.<br><br>* Potential revenue (estimation) should the entity capture 100% of the market share of the product category.<br>** Revenue from these products divided by the size of the total addressable market.<br>*** Biofuels other than ethanol derived from corn starch (kernels) and having 50% lower lifecycle greenhouse gas emissions relative to gasoline.<br>**** Revenue from advanced biofuel infrastructure includes that from the entity's retail operations (fuel stations), joint ventures with primary producers, or technologies that enable the production of advanced biofuels. | potential revenue & market share |
| Oil & Gas – Refining & Marketing | Product Specifications & Clean Fuel Blends (**EM-RM-410a.3**). | **Quantitative**: barrels of oil equivalent (BOE) | Volumes of renewable fuels* for fuel blending: (1) net amount produced, (2) net amount purchased.<br><br>* Including **biofuel**, **cellulosic biofuel**, **ethanol**, **advanced biofuels**, and other renewable fuels for use in fuel blending.<br>*The entity shall disclose the conversion factors and assumptions used to convert renewable fuel volumes to barrels of oil equivalent (BOE).*<br>*The entity may include an analysis of its **biofuel** production capacity and total renewable fuel production of: (1) renewable fuel, (2) **advanced biofuel**, (3) **biomass-*** | production (for fuel blending) |

| | | | | |
|---|---|---|---|---|
| | | | ***based diesel*** *and (4)* ***cellulosic biofuel*** *in barrels of oil equivalent (BOE).* | |
| Food Retailers & Distributors | Food Waste Management (**FB-FR-150a.1**). | **Quantitative**: metric tonnes (t), percentage (%) | (1) Amount of food waste generated, (2) percentage diverted* from the waste stream.<br><br>* Inclusion through conversion for use in bio-based industrial products such as raw material to make **biodiesel**, soaps or cosmetics, breakdown via bacteria in the absence of oxygen to generate **biogas** and nutrient-rich matter (codigested or fermented). | waste (overall %) |

## Annex 2: GRI coverage of Bioenergy

26. Bioenergy-related activities are currently covered by four GRI sector-agnostic standards (GRI 302 Energy; GRI 305 Emissions; GRI 306 Waste; GRI 201 Economic Performance) and, by reference, also by the four currently available sector-specific standards (GRI 11 Oil and Gas Sector; GRI 12 Coal Sector; GRI 13: Agriculture, Aquaculture and Fishing Sectors; GRI 14 Mining Sector). It is to be noted that no specific sectoral requirement on Bioenergy is featured by any of the sector-specific standards.

27. The aspects covered by the GRI sector-agnostic standards are fuel consumption and energy intensity (GRI 302 – including in GRI 11, GRI 12, GRI 14), CapEx investments in renewable energy (GRI 201 – including in GRI 11 and GRI 12), and waste (GRI 306 – including all sectoral standards). This latter aspect is tackled not only in terms of waste diversion from disposal, like in SASB's case, but also as waste generation and waste disposal. Finally, GRI also addresses (biogenic CO2) Scope 1 and Scope 3 emissions under GRI 305, which under SASB constitute part of the impacts of the standalone Biofuels standard (and using the specific methodology of lifecycle assessment).

28. Unlike SASB, GRI has not yet published a standard on Bioenergy. However, as part of its priority sectors planning, GRI is also currently working on a sector standard project for Renewable Energy, which will address: (a) solar and wind project developers; (b) biofuels producers; (c) producers of fuel cells and industrial batteries. It is yet unclear whether biofuels will have a dedicated set of impacts, similarly to the SASB Biofuels standard. This project was scheduled to start in 2024, according to the GSSB Work Program 2023-2025.

29. The table below summarizes all Bioenergy-related requirement occurrences from GRI.

| *GRI agnostic standard* | *Topic [sector code]* | *Category & unit of measure* | *Metric* | *Aspect* |
|---|---|---|---|---|
| GRI 302: Energy 2016 | Disclosure 302-1(b) Energy consumption within the organization [**11.1.2**; **12.1.2**; **14.1.2**] | **Quantitative**: joules (J) or multiples | Total fuel consumption within the organization from renewable [fuel] sources*, in joules or multiples, and including fuel types used.<br><br>* Can include **biofuels**, when purchased for direct use, and **biomass** in sources owned or controlled by the organization. | consumption (fuel) |
| GRI 302: Energy 2016 | Disclosure 302-3(a) Energy intensity [**11.1.4**; **12.1.4**; **14.1.4**] | **Quantitative**: absolute energy consumption ÷ organization-specific metric) | Energy intensity ratio for the organization.<br><br>* The reporting organization should, where it aids transparency or comparability over time, provide a breakdown of the energy intensity ratio by: [...] type of source (see definitions for the listing of non-renewable sources and renewable sources) [recommendations]<br><br>*Glossary - renewable energy source: source that is capable of being replenished in a short time through ecological cycles or agricultural processes. Examples: **biomass**, geothermal, hydro, solar, wind.* | energy intensity |
| GRI 201: Economic Performance 2016 | Disclosure 201-2 Financial implications and other risks and opportunities due to climate | **Quantitative**:<br><br>percentage (%) | Report the percentage of capital expenditure (CapEx) that is allocated to investments in:<br><br>- prospection, exploration, and development of new reserves; [11.2.2]<br><br>- expansion of current coal mines; [12.2.2]<br><br>- energy from renewable sources (by type of source);* | investments (CapEx) |

| | | | | |
|---|---|---|---|---|
| | change [**11.2.2**; **12.2.2**] | | - technologies to remove CO from the atmosphere and nature-based solutions to mitigate climate change;<br>-other research and development initiatives that can address the organization's risks related to climate change.<br>**Glossary - renewable energy source: source that is capable of being replenished in a short time through ecological cycles or agricultural processes. Examples: **biomass**, geothermal, hydro, solar, wind.* | |
| GRI 306: Waste 2020 | Disclosure 306-3 Waste generated (a) [**11.5.4**; **12.6.4**; **13.8.4**; **14.5.4**] | **Quantitative**:<br>metric tonnes (t) | Total weight of waste generated in metric tons, and a breakdown of this total by composition of the waste.<br>* When reporting composition of the waste, the organization can describe: [...] the materials that are present in the waste (e.g., **biomass**, metals, non-metallic minerals, plastics, textiles). | waste (generated – no action) |
| GRI 306: Waste 2020 | Disclosure 306-4 Waste diverted from disposal (a) [**11.5.5**; **12.6.5**; **13.8.5**; **14.5.5**] | **Quantitative**:<br>metric tonnes (t) | Total weight of waste diverted from disposal in metric tons, and a breakdown of this total by composition of the waste.<br>* When reporting composition of the waste, the organization can describe: [...] the materials that are present in the waste (e.g., **biomass**, metals, non-metallic minerals, plastics, textiles). | waste (overall amount diverted - see SASB) |
| GRI 306: Waste 2020 | Disclosure 306-5 Waste directed to disposal (a) [**11.5.6**; **12.6.6**; **13.8.6**; **14.5.6**] | **Quantitative**:<br>metric tonnes (t) | "Total weight of waste directed to disposal in metric tons, and a breakdown of this total by composition of the waste.<br>* When reporting composition of the waste, the organization can describe: [...] the materials that are present in the waste (e.g., **biomass**, metals, non-metallic minerals, plastics, textiles). | waste (disposal – not relevant) |
| GRI 305: Emissions 2016 | Disclosure 305-1(c) Direct (Scope 1) GHG emissions [**11.1.5**; **12.1.5**; **13.1.2**; **14.1.5**] | **Quantitative**:<br>metric tonnes of $CO_2$-e (MTCO2e) | **Biogenic** CO2 emissions* in metric tons of CO equivalent.<br>* from the combustion or biodegradation of **biomass** separately from the gross direct (Scope 1) GHG emissions. Exclude biogenic emissions of other types of GHG (such as CH and N O), and biogenic emissions of CO2 that occur in the life cycle of biomass other than from combustion or biodegradation (such as GHG emissions from processing or transporting biomass). | ***emissions (S1)*** |
| GRI 305: Emissions 2016 | Disclosure 305-3(c) Other indirect (Scope 3) GHG emissions [**11.1.7**; **12.1.7**; **13.1.4**; **14.1.7**] | **Quantitative**:<br>metric tonnes of $CO_2$-e (MTCO2e) | **Biogenic** CO2 emissions in metric tons of CO equivalent.<br>* from the combustion or biodegradation of **biomass** that occur in its *value chain* separately from the gross other indirect (Scope 3) GHG emissions. Exclude biogenic emissions of other types of GHG (such as CH and N O), and biogenic emissions of CO2 that occur in the life cycle of biomass other than from combustion or biodegradation (such as GHG emissions from processing or transporting biomass). | ***emissions (S3)*** |

## Annex 3: Bioenergy in the ESRS

30. The ESRS sector-agnostic coverage of Bioenergy approximately follows GRI's requirements, in particular in terms of energy/fuel consumption (also in SASB), waste generation (also in SASB), and emissions (also in the SASB Biofuels standard, as life cycle emissions). The key difference is the extensive focus on emission-related information, which, under ESRS, not only includes Scope 1 and Scope 3 biogenic emissions (sole focus of GRI), but also Scope 2 biogenic emissions, as well as narrative explanations of whether emissions removal, storage, and carbon credits from removal projects are biogenic in nature. Another key difference with respect to SASB's Scope 1 and Scope 3 biogenic emissions is the fact that, unlike SASB, the ESRS require the additional consideration of biogenic emissions from other types of GHG (which are excluded in SASB). As for ESRS specific information, Bioenergy is to be discussed as part of the broader renewable energy management strategy of the undertaking under policies, actions, and targets (PAT).

31. From a sectoral perspective, the Oil and Gas (OG) draft (version of the Agenda Paper 05.02 from the SR TEG discussion of 04 September 2024) contains three additional datapoints to SET 1 on Bioenergy – one of which, being a clarification to the concept of permanent carbon storage, was not considered for the purpose of this analysis. The other additional requirements are aligned with SASB and are related to production for fuel blending, as well as revenue and market information.

32. The following table includes a detailed account of the ESRS and OG requirements that are related to Bioenergy.

| *Standard & DR* | *§* | *Category & unit of measure* | *Metric* | *Aspect* |
|---|---|---|---|---|
| ESRS E1-2 – Policies related to climate change mitigation and adaptation | 25(d) | **Discussion & analysis**:<br>narrative | The undertaking shall indicate whether and how its policies address the following areas:<br>[…] (d) renewable energy* deployment.<br>* From renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, **biomass**, landfill gas, sewage treatment plant gas, and **biogas**. | polices |
| ESRS E1-3 – Actions and resources in relation to climate change policies | AR 19(b) | **Discussion & analysis**:<br>narrative | When disclosing the information on actions as required under paragraphs 29 (a) and 29 (b), the undertaking may:<br>[…] (b) aggregate types of mitigation actions (decarbonisation levers) such as energy efficiency, electrification, fuel switching, use of renewable energy, products change, and supply-chain decarbonisation that fit the undertakings' specific actions.<br>* From renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, **biomass**, landfill gas, sewage treatment plant gas, and **biogas**. | actions |
| ESRS E1-4 – Targets related to climate change mitigation and adaptation | 33 | **Discussion & analysis**:<br>narrative | For the disclosure required by paragraph 30, the undertaking shall disclose whether and how it has set GHG emissions reduction targets and/or any other targets to manage material climate-related impacts, risks and opportunities, for example, renewable energy deployment, energy efficiency, climate change adaptation , and physical or transition risk mitigation.<br>* From renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient | targets |

| | | | | |
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| | | | energy, tide, wave and other ocean energy, hydropower, **biomass**, landfill gas, sewage treatment plant gas, and **biogas**. | |
| ESRS E1-5 – Energy consumption and mix | 37(c)i & AR 34 | **Quantitative**: MWh | Include the total energy consumption in MWh related to own operations disaggregated by:<br>[…] (c) total energy consumption from renewable sources disaggregated by:<br>i. fuel consumption for renewable sources including **biomass** (also comprising industrial and municipal waste of biologic origin), **biofuels**, **biogas**, hydrogen from renewable sources, etc. […].<br>* AR 34: information presentation in tabular format. | consumption (energy & fuel) |
| ESRS E5-5 – Resource outflows | 38(b) | **Discussion & analysis**:<br>narrative | When disclosing the composition of the waste, the undertaking shall specify:<br>[…] (b) the materials that are present in the waste (e.g. **biomass**, metals, non-metallic minerals, plastics, textiles, critical raw materials and rare earths). | waste (generated – no action) |
| ESRS E1-6 – Gross Scopes 1, 2, 3 and Total GHG emissions | AR 43(c) | **Quantitative**:<br>metric tonnes of $CO_2$-e (MTCO2e) | When preparing the information on gross Scope 1 GHG emissions required under paragraph 48 (a), the undertaking shall:<br>[…] (c) disclose **biogenic emissions** of CO2 from the combustion or bio-degradation of **biomass** separately from the Scope 1 GHG emissions, but include emissions of other types of GHG (in particular CH4 and N2O). | ***emissions (S1)*** |
| ESRS E1-6 – Gross Scopes 1, 2, 3 and Total GHG emissions | AR 45(e) | **Quantitative**:<br>metric tonnes of $CO_2$-e (MTCO2e) | When preparing the information on gross Scope 2 GHG emissions required under paragraph 49, the undertaking shall:<br>[…] (e) disclose **biogenic emissions** of CO2 carbon from the combustion or biodegradation of **biomass** separately from the Scope 2 GHG emissions but include emissions of other types of GHG (in particular CH4 and N2O).<br>*In case the emission factors applied do not separate the percentage of biomass or biogenic CO2, the undertaking shall disclose this. In case GHG emissions other than CO2 (particularly CH4 and N2O) are not available for, or excluded from, location-based grid average emissions factors or with the market-based method information, the undertaking shall disclose this.* | ***emissions (S2)*** |
| ESRS E1-6 – Gross Scopes 1, 2, 3 and Total GHG emissions | AR 46(j) | **Quantitative**:<br>metric tonnes of $CO_2$-e (MTCO2e) | When preparing the information on gross Scope 3 GHG emissions required under paragraph 51, the undertaking shall:<br>[…] (j) disclose **biogenic emissions** of CO2 from the combustion or biodegradation of **biomass** that occur in its *upstream and downstream value chain* separately from the gross Scope 3 GHG emissions, and include emissions of other types of GHG (such as CH4 and N2O), and emissions of CO2 that occur in the life cycle of biomass other than from combustion or biodegradation (such as GHG emissions from processing or transporting biomass) in the calculation of Scope 3 GHG emissions. | ***emissions (S3)*** |
| ESRS E1-7 – GHG removals and GHG mitigation projects financed through carbon credits | AR 57(b) | **Discussion & analysis**:<br>narrative | When disclosing the information on GHG removals and storage from the undertaking's own operations and its upstream and donwstream value chain required under paragraphs 56 (a) and 58, for each removal and storage activity, the undertaking shall describe:<br>[…] (b) whether removal and storage are **biogenic** or from land-use change (e.g., afforestation, reforestation, forest restoration, urban tree planting, agroforestry, building soil carbon, etc.), technological (e.g., direct air capture), or hybrid (e.g., bioenergy with CO2 capture and storage), and technological details about the removal, the type of storage and, if applicable, the transport of removed GHGs. | ***emissions (removals & storage)*** |

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| ESRS E1-7 – GHG removals and GHG mitigation projects financed through carbon credits | AR 62(b) | **Discussion & analysis**:<br>narrative | When disclosing the information on carbon credits required under paragraphs 56 (b) and 59, the undertaking shall disclose the following disaggregation as applicable:<br>[…] (b) for carbon credits from removal projects, an explanation whether they are from **biogenic** or technological sinks. | ***emissions (carbon credits)*** |
| ~~OG 5. CO2 abatement~~ | ~~AR 58~~ | ~~**Quantitative**: total amounts~~ | ~~For the purpose of disclosing metrics related to CO2 abated in paragraphs 58 and 59 [total amounts of CO2 abated from emissions sources through carbon capture technologies], permanent carbon storage shall be understood as the set of activities, that under normal circumstances and using appropriate management practices stores atmospheric carbon or **biogenic carbon** for several centuries.~~ | ~~***emissions (abatement)***~~ |
| ESRS 2.SBM1.OG – Activity indicators | 22 | **Quantitative**: net volume of barrels of oil equivalent (bbl) | The undertaking shall disclose its volumes of renewable fuels for fuel blending, by including the following indicators expressed in net volume of barrels of oil equivalent (bbl):<br>(a) renewable fuels produced*;<br>(b) renewable fuels purchased.<br>* Shall include **biofuel**, **cellulosic biofuel**, **ethanol**, **advanced biofuels**, and other renewable fuels for use in fuel blending.<br>*The undertaking may additionally provide further breakdowns of its production capacity into specific categories, such as advanced biofuel, cellulosic biofuel and others.* | production (for fuel blending) |
| ESRS 2.SBM1.OG – Activity indicators | 23 | **Quantitative**: presentation currency, percentage (%) | The undertaking shall provide an estimation of the total addressable market** and the share of market*** for **advanced biofuels*** and **associated infrastructure**.<br>* **Biofuels** other than ethanol derived from corn starch (kernels) and having 50% lower lifecycle greenhouse gas emissions relative to gasoline.<br>** Potential revenue, should the entity capture 100% of the market share of the product category.<br>*** Revenue from the advanced biofuels and associated infrastructure, divided by the total addressable market.<br>*When disclosing its estimations on the total addressable [Draft] ESRS Oil and Gas market, the undertaking may additionally provide a projection of growth for this market, as well as the targeted market share that the undertaking plans to address.* | potential revenue & market share |

## Annex 4: Bioenergy sector description.

33. The ESRS bio-energy sector consists of the following economic activities.

34. The sub-sector biomass includes the processing of biological raw materials (e.g., briquettes, fire logs and pellets from agglomerated sawdust, wood waste and scrap, straw, charcoal or other vegetable biomass, agricultural residues) resulting from the agriculture and forestry sectors for the purpose of energy supply (A.02.20, C.16.26).

35. The sub-sector liquid biofuels includes the transformation of biomass into biodiesel, ethanol, the manufacture of mixtures of bio-ethanol and ethers partially derived from biomass, and manufacture of liquid biofuels even if processes use waste as an input (C.19.20, C.20.51).

36. The sub-sector biogas includes the transformation of sewage sludge, manure, and waste into biogas for the purpose of gas supply from, and the production of gaseous biofuels for energy supply through a gas distribution network. It also includes the cleansing of biogas for energy supply through a permanent network, as well as the operation of generation facilities that produce electricity from gaseous biofuels (D.35.12, D.35.21).

37. This sub-sector also includes supplementary activities, such as the blending of biofuels, i.e. blending of alcohols with petroleum (e.g. gasohol), as well as the wholesale of low or free carbon fuels, greases, lubricants, oils, such as pellets of wood or biomass, biofuels, liquefied bio forms of petroleum gases, natural gas, butane and propane gas in blending or pure.

38. Finally, the wholesale of solid, liquid and gaseous biofuels are included in the sector (G.46.81).

| *ESRS Standard* | *NACE Section* | *NACE Code* | *NACE class description* | *Bioenergy form* |
|---|---|---|---|---|
| Chemicals | Manufacturing | C.20.51 | Manufacture of liquid biofuels<br>• includes: - manufacture of biodiesel - manufacture of ethanol from biomass - manufacture of mixtures of bio-ethanol and ethers partially derived from biomass - manufacture of liquid biofuels even if processes use waste as an input<br>• excludes: - manufacture of solid fuels from vegetable biomass, see 16.26 - manufacture of ethyl alcohol other than for bio-ethanol biofuels, see 20.14 - manufacture of explosives, see 20.59 | Liquid |
| Power production and energy utilities | Electricity, gas, steam and air conditioning supply | D.35.21 | Manufacture of gas<br>• includes: - production of biogas for the purpose of gas supply from e.g. sewage sludge, manure, waste - production of gaseous biofuels for energy supply through a gas distribution network<br>• also includes: - cleansing of biogas for energy supply through a permanent network<br>• excludes: - manufacture of basic organic gases, not for energy supply through a network, see 20.14 | Gaseous |

| | | | | |
|---|---|---|---|---|
| Power production and energy utilities | Electricity, gas, steam and air conditioning supply | D.35.12 | Production of electricity from renewable sources<br>• includes: - operation of generation facilities that produce electricity from renewable sources, e.g. gaseous biofuels<br>• excludes: - production of electricity as part of a storage of electricity activities, see 35.16 - pre-treatment of waste for energy recovery, see 38.22 | Gaseous |
| Oil and gas | Manufacturing | C.19.20 | Manufacture of refined petroleum products and fossil fuel products<br>• includes: - blending of biofuels, i.e. blending of alcohols with petroleum (e.g. gasohol)<br>• excludes: - manufacture of solid fuels from biomass, see 16.26 - manufacture of liquid biofuels, see 20.51 | Gaseous |
| Oil and gas | Wholesale and retail trade | G.46.81 | Wholesale of solid, liquid and gaseous fuels and related products<br>• includes: - wholesale of low or free carbon fuels, greases, lubricants, oils, e.g.: • pellets of wood or biomass • biofuels • liquefied petroleum gases, liquefied natural gas, butane and propane gas and their related bio and renewable forms, in blending or pure<br>• excludes: - wholesale of hydrogen, see 46.85 | Solid, Liquid, Gaseous |