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Upstream sustainability in purchased goods and services

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Abstract

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Sustainability is one of the major driving factors for changes in the economy and the transition requires a lot of work from all the participants. To secure that resources are used effectively for sustainable development, the research part of this thesis used qualitative methods. A survey was conducted to material and service suppliers of a global manufacturing company to gather information on the current state and future goals in sustainability actions. Internal stakeholders were interviewed to form the survey questions and to ensure to get the most out of the survey. Current regulations and regulations in preparation were studied to understand the demands that are placed on the suppliers and to ensure they don’t conflict with the planned improvements.

Sustainability related regulations that are introduced in Europe in connection with the European Green Deal, are demanding increasing awareness and efforts from all the companies. Since unlimited resources don’t exist at any counterpart of the supply chain, it is important to have a profound understanding on what the most necessary actions are to ensure sustainable development throughout the value chains while supporting all parties it concerns.

Based on the studied regulations and survey results, several recommendations were made for future improvements. Support that the suppliers of goods and services require, are clear specifications for sustainability demands and related calculation tools. Both clear specifications and calculation tools ensure coherent data and free up resources from background research to requirement fulfillment. Changes for internal ways to operate are also needed. Implementing sustainable design principles and reinforcing environmentally aware design of the products that are manufactured at suppliers, will have a direct impact on the upstream emissions.

Keywords: Upstream, sustainability, Scope 3, SCM

Contents

1 Introduction

Sustainability has been an integral part of processes at ABB and the target is to expand this sustainable approach throughout the value chains of ABB. The idea for this thesis came from the continuous efforts done by ABB to enable a low-carbon society, and specifically the Scope 3 targets set by ABB that have been approved by Science Based Targets initiative. To take the right actions and to reach the set targets, we need to have accurate information that we base our decisions on. Thesis was made for global supply chain management (SCM) team of ABB's Large Motors and Generators division.

Purpose of this thesis is to have more in depth knowledge about the factors affecting the upstream sustainability of purchased goods and services, including suppliers and regulations. Upstream sustainability includes emissions occurring as a consequence of a company's actions, but contrarily to emissions generated directly by the company itself, upstream emissions occur at an earlier stage in value chain, i.e. at suppliers. The research part of this thesis focuses specifically on purchased goods, as they constitute to a significant amount from the total Scope 3 upstream emissions formed by a company's activities. The quality of the available data from suppliers also varies significantly and informed decisions are required to take correct actions on improving the situation.

In the research part of this thesis, a survey was conducted for suppliers. The scope of the survey was defined based on interviews with internal stakeholders. Intention was, that through the questions it is possible to get an insight on how suppliers are seeing the current state in sustainability, sustainability related regulations and what the status is in their sustainability data availability. Suppliers' expectations and needs are also a relevant factor to be considered for successful implementation of sustainable development.

Results of this thesis are suggestions on the actions and process changes that ABB could implement. Suggestions are based on the analysis of sustainability

regulations and survey answers. By implementing these changes, ABB could improve the situation of the suppliers and increase the effectiveness of purchased goods related processes during this transition period guided by European Green Deal, ABB's sustainability initiatives and related regulations and guidance.

2 Sustainability

Sustainability might not be easily defined as it includes a wide variety of aspects and interpretations. One of the most fitting descriptions comes from 1987 from the report by World Commission on Environment and Development. In reports chapter 2: Towards Sustainable Development, sustainability is described as:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. [1.]

The topic of sustainability has been long in discussion and increasingly also a guiding factor for governments, companies and other organizations. Due to the scale of actions that are needed to control and execute sustainable development across the organizations and eventually across value chains, the change has its challenges. According to the United Nations Development Programme publication, to achieve set sustainability targets, the challenges are not only related to organizations' actions to using sustainable sources for filling their needs, but also poverty and inequalities, demography, environmental degradation and climate change, shocks and crises, development cooperation and financing for development, and technological innovation are topics that need to be addressed to reach the set goals. [2.] The change to have all participants integrated as part of the process for utilizing the resources of our planet in a more sustainable way requires time and effort.

2.1 ABB's sustainability agenda

ABB's Sustainability Agenda aims to enable a low-carbon society, preserve resources and promote social progress for a net-zero future. [3.] Sustainability

has been made into an integrated part of ABB's operations and there is a long history in sustainability at ABB. The first sustainability report, that included environmental and social performance was published already in 2000. [4.]

Targets seen in Table 1 that are set by ABB to reduce greenhouse gas (GHG) emissions were approved by the Science Based Targets initiative this year (2024). Scope 3 emission targets are to have a 25 % GHG reduction by year 2030 and a 90 % GHG reduction by 2050, both targets compared to year 2022 baseline. [5.]

Table 1. ABB's 2030 and 2050 science-based targets approved by the Science Based Targets initiative (SBTi).

Target Scope	**Year 2030 target**	**Year 2050 target**
Scope 1 and 2 (Operations)	80% reduction of GHG emissions (compared to 2019)	100% reduction of GHG emissions (compared to 2019)
Scope 3 (Upstream and downstream)	25% reduction of GHG emissions (compared to 2022)	90% reduction of GHG emissions (compared to 2022)

ABB targets to cover at least 80 % of its supply spending in focus countries by ABB's Sustainable Supply Base Management (SSBM) and to preserve resources with their circularity approach covering at least 80 % of its portfolio of products. SSBM includes environmental, social and governance performance assessments on regular basis [6].

2.2 Scope 3 upstream emissions

Emissions can be categorised to two different emission types, direct emissions and indirect emissions. Direct emissions are from sources managed directly by the company. Indirect emissions are from sources not managed by the company, but which emissions occur as a direct consequence of the company's activities. Scope 3 emissions are indirect emissions that occur due to the

actions of the company and are not directly managed by the company itself. Scope 3 is a significant source of emissions for most companies and therefore a significant opportunity to reduce emissions.

By the definition of GHG Protocol, emissions in Scope 3 are divided to upstream and downstream emissions as visualised in Figure 1. Scope 2 includes purchased energy and are emissions which are also indirect, but they differ from Scope 3 emissions in the sense, that Scope 2 emissions can be directly managed by the company at their own facilities. Scope 1 emissions are emissions that occur directly from company's own facilities and vehicles.

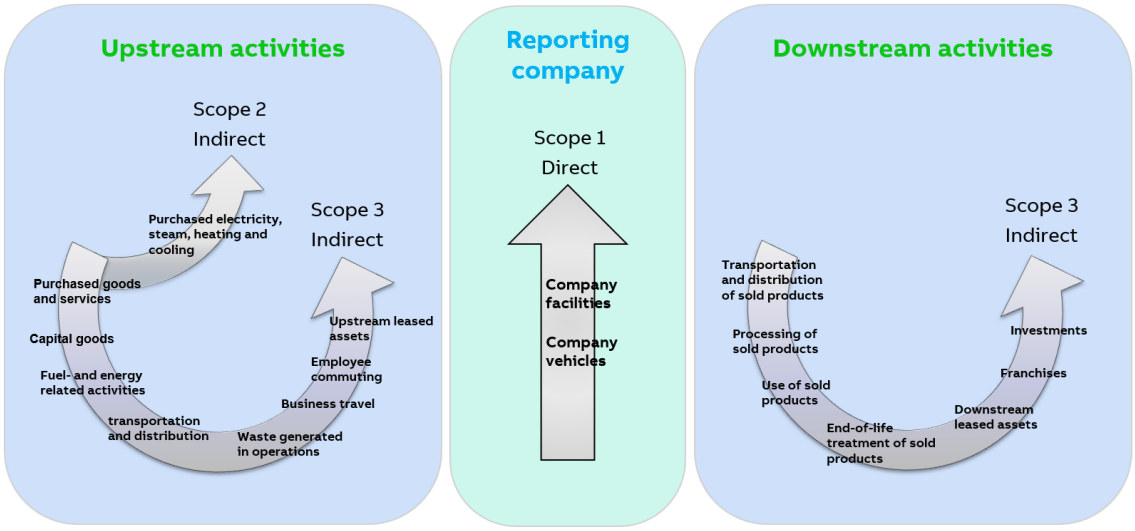

Figure 1. Illustration of greenhouse gas emissions by GHG Protocol scopes [7].

Scope 3 emissions are divided into 15 categories by GHG Protocol as seen in Table 2. Many companies refer directly to these classifications in reporting, and they can be used as guidelines for managing resources and setting targets in sustainability development [7]. Scope 3 Category 1 targets upstream emission from purchased goods and services, which in many companies play a substantial role in overall emissions. It can be useful for companies to differentiate Scope 3 Category 1 emissions between production related products like assembly materials or components and non-production related products like office furniture or IT support, as this distinction can align with procurement practices and help organize and collect data more efficiently. [8.]

Table 2. Scope 3 category classification by GHG Protocol [7].

Scope 3 Category	**Description of Category**
1 (upstream)	Purchased goods and services
2 (upstream)	Capital goods
3 (upstream)	Fuel- and energy related activities (not included in scope 1 or scope 2)
4 (upstream)	Upstream transportation and distribution
5 (upstream)	Waste generated in operations
6 (upstream)	Business travel
7 (upstream)	Employee commuting
8 (upstream)	Upstream leased assets
9 (downstream)	Transportation and distribution of sold products
10 (downstream)	Processing of sold products
11 (downstream)	Use of sold products
12 (downstream)	End-of-life treatment of sold products
13 (downstream)	Downstream leased assets
14 (downstream)	Franchises
15 (downstream)	Investments

To reduce Scope 3 Category 1 emissions, companies can replace raw materials with the ones that have lower emissions, implement purchasing policies and procurement guiding towards lower emissions and encourage suppliers to engage their suppliers to enable sustainable development throughout the supply chain [7]. Even if the different scopes and categories can be managed separately, and often separate management of the categories is required for efficiency, there is a direct relationship between the manufactured product and the different scopes of emissions as the product life cycle emissions consist of various emissions created throughout the value chain.

Product life cycle emission management is a complex process, as for accurate management, there needs to be a robust end-to-end data collection including various suppliers and customers. In Figure 2 there is a simplified illustration on how product life cycle emissions are related to different corporate emissions, but also inside these different scopes, there are multiple categories that effect the products total emissions. Besides these different scopes and categories, there can be different value chains for the same product due to the possibility of different combinations of variables, such as suppliers, manufacturing methods, intended use of the product, energy and available possibilities in waste management.

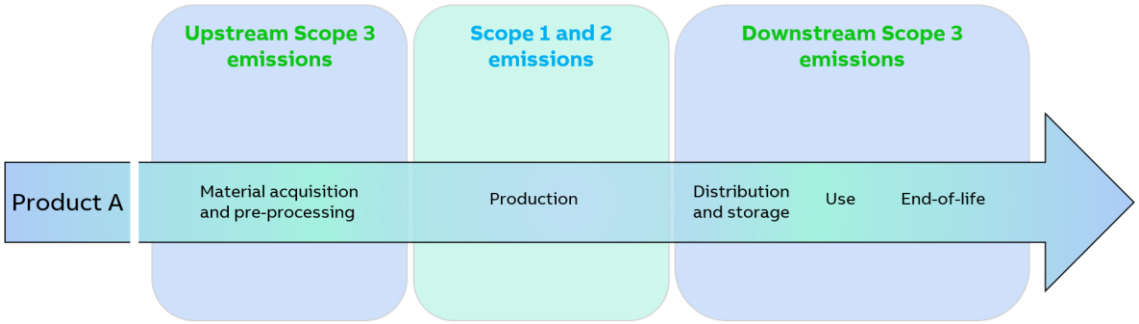

Figure 2. Relationships between corporate emissions and product life cycle emissions [7].

3 Regulations and guidance

Sustainability of business operations and products has been an increasingly important topic for both companies and governing bodies. With the ascending well-intentioned sustainability guidance comes higher diversity of required information and a need for increasing awareness and knowledge on how to fulfil both legislative regulations and contractual demands from customers or suppliers. Even though there has been widely adopted standards for corporate greenhouse gas accounting, like GHG Protocol started in the late 1990s, there still are uncertainties for companies in which way the more in-depth sustainability data should be calculated and what to include in which reporting [9].

3.1 GHG Protocol

The GHG Protocol is an organization that works with governments, industry associations, non-governmental organizations and businesses. It addresses private and public sector activities, value chains and mitigation actions as a standardized framework for measuring and managing greenhouse gas emissions by providing standards, guidance, tools and training. [10.] The Corporate Accounting and Reporting Standard published by the GHG Protocol is the world's most widely used greenhouse gas accounting standard. In the year 2016, at least 92 percent of the Fortune 500 companies reporting to CDP (Carbon Disclosure Project) used GHG Protocol directly or indirectly through a program. History behind GHG Protocol was in the late 1990's as WRI (World Resources Institute) and WBCSD (World Business Council for Sustainable Development) recognised the need for an international GHG accounting and reporting standard for corporates. [9.]

3.2 Carbon Border Adjustment Mechanism

Carbon Border Adjustment Mechanism (CBAM) is EU's emission pricing tool for carbon intensive goods with significant risk of carbon leakage to non-EU countries. It addresses the phenomena of carbon intensive production transferring outside of EU and being imported back. Goods that are subject to eventually fall under CBAM are cement, iron and steel, aluminium, fertilisers, electricity and hydrogen. CBAM's purpose is to ensure that the carbon emission price paid for imported goods is equivalent to the emission prices of domestic production and encourage cleaner industrial production in non-EU countries. It will also somewhat bridge the gap in costs between low-GHG manufacturing and high-GHG manufacturing to steer towards more sustainable alternatives. If the equivalent carbon emission price has already been paid for the imported goods during their production, the corresponding amount can be deducted. Target for CBAM is to be fully operational by 2026 with a transitional phase from 2023 to 2025. [11.]

3.3 Circular Economy Action Plan

European Commission adopted the new Circular Economy Action Plan in 2020 as one of the cornerstones of European Green Deal that is driving towards becoming climate neutral by 2050 [12]. Under the new Circular Economy Action Plan, regulatory framework is streamlined for sustainable future, opportunities for the transition are maximized and burdens on people and businesses minimized. Under the new plan, circularity in production processes is targeted to transform industry towards climate-neutrality as well as to improve long-term competitiveness. Promoting circularity in industry is planned to be achieved by the below actions. [13.]

- Reviewing Industrial Emissions Directive for circularity in industrial processes, including integration of circular practices to the Best Available Techniques reference documents.
- Developing industry-led reporting and certification system to facilitate industrial symbiosis.
- Implementing Bioeconomy Action Plan for circular and sustainable bio-based sector support.
- Tracking, tracing and mapping of resources by using digital technologies.
- Solid verification system to uptake green technologies through EU Environmental Technology Verification scheme as an EU certification mark.
- Foster circular industrial collaboration among small and medium enterprises under Enterprise Europe Network and knowledge transfer through European Resource Efficiency Knowledge Center.

3.3.1 Ecodesign for Sustainable Products Regulation

Replacing the old Ecodesign Directive, Ecodesign for Sustainable Products Regulation (ESPR) aims to improve the circularity, energy efficiency, recyclability and durability of products placed on the market in EU. Target is also to avoid diverging regulations throughout EU and create greater opportunities for remanufacturing, maintenance, recycling and repair. [14.] The importance of ecological design for product sustainability is crucial. More than

80 percent of the environmental impact of a product is determined in the design phase according to the European Commission's publication *Ecodesign your future* [15].

3.3.2 Digital Product Passport

Some of the measures that ESPR will bring are made to improve available information, with one of the most significant being the introduction of Digital Product Passport. The Digital Product Passport is a specific dataset that can be accessed electronically to get information on origin, composition, repair and disassembly information, including end of life management information for recycling and disposal. Target is also to introduce specifications that allow consumers to access comparable product data information, including sustainability data, to enable consumers to make informed sustainable choices. [16.]

3.3.3 European Platform on LCA

European Commission highlighted in its communication on the new Circular Economy Action Plan, that companies should be using Product and Organisation Environmental Footprint methods as a common way to verify their environmental claims [17]. Life Cycle Assessment (LCA) is the suggested method for quantifying Product Environmental Footprint (PEF) and Organisation Environmental Footprint (OEF). Target is that the environmental impacts could be reduced by considering supply chain activities throughout the life cycle from sourcing raw materials to waste management, including all the steps in between, like manufacturing and use. Detailed requirements for modelling the flows of materials and energy, including emissions and waste will guide these life cycle assessments associated with products or organisations. [18.]

3.4 Regulation on Deforestation-free Products

The target of Regulation on Deforestation-free Products (EUDR) is to ensure that the products consumed in EU do not cause deforestation or forest

degradation. Goods placed on the market in EU that constitute of or contain wood, cattle, cocoa, coffee, soy, palm oil and rubber are under the regulation. [19.] Deforestation is considered when forests are transformed to agricultural use. Conversing primary forests or naturally regenerating forests into planted forests, plantation forests or other wooded land is considered forest degradation. [20.] Objectives of the EUDR besides globally prohibiting deforestation and forest degradation are to reduce at least 32 million metric tons carbon emissions per year and that commodities in the scope are guided to be produced more sustainably in the future [19]. By no longer allowing commodities and products related to deforestation on the market, the European Union aims to stop the consumption in EU from driving deforestation and forest degradation around the world.

4 Upstream sustainability survey

As the scope 3 emissions are direct consequence of ABB's actions, but emissions mainly occur outside of ABB's direct management, there is a high need to understand suppliers better and provide support to help them align with ABB's sustainability targets. Through conducting interviews with internal stakeholders, the scope of the research was clarified. It was clear that there are challenges involved in managing upstream sustainability of purchased goods, as the available information from suppliers varies or is not directly available. Specifically, the targeted scope for the survey was delimited to Scope 3 Category 1 emissions for production related products, as classified by GHG Protocol [8]. Actions are needed to address challenges related to managing purchased goods emissions and related data for a wide variety of supplier, but based on the internal interviews the vision was not clear enough on what kind of measures would be suitable or effective. It was also unclear what is the current status or readiness of the suppliers to provide the needed information if ABB would introduce some new purchased goods emissions control methods. A survey was conducted to gain clearer sight of the overall status of the suppliers.

The research was conducted as a qualitative case study investigating the sustainability actions, sustainability data availability and future sustainability expectations of suppliers. The research survey targets to answer the following questions:

- What sustainability related data is available from the suppliers?
- What sustainable development are the suppliers planning that would affect upstream emissions of ABB?
- What sustainable development possibilities do the suppliers see as likely in their industry segment?

4.1 Survey implementation

To enable reaching suppliers globally, it was chosen to conduct the survey with Microsoft Forms survey method. The scope of the suppliers was defined by yearly spend being sufficient for the supplier to be considered as a regular supplier of purchased goods or services. From those suppliers the list was narrowed to 192 suppliers by selecting suppliers that exceed the specified spend limit in categories direct materials and raw materials, so the survey would focus on production related goods and services suppliers as agreed in the defining phase. From this list the final 90 suppliers that would be part of the survey were chosen by dividing the group into approximately half, by giving them random numbers in Microsoft Excel. The narrowing of the amount of suppliers to be contacted with the survey was done, because the sample size was considered to be sufficient with a smaller group and it was seen as beneficial to limit workload from an unnecessarily large number of suppliers.

4.2 Survey results

The respondents were categorised to six material classes and three supplier classes based on the materials they supply to ABB. Purpose of this was to see possible differences between different industry areas and to enable better utilisation of the results by internal stakeholders. Material classes are assembly parts, electrical components, insulation materials, machining, metal components

and metal raw materials. The three supplier classes are components, machining and raw materials. The relationships between supplier classes and material classes are presented in Table 3.

Table 3. Supplier and material classification of the survey suppliers.

Supplier class	Components	Machining	Raw materials
Material class included in supplier class	Assembly parts Electrical components Metal components	Machining	Insulation materials Metal raw materials

As presented in Table 3. Supplier class components included assembly parts, electrical components and metal components. Inside machining supplier class, the only material class is machining, as the nature of machining differentiates from other material classes. Raw materials supplier class included insulation materials and metal raw materials.

The survey was sent to 90 suppliers, from which 32 suppliers responded the questionnaire. The survey response rate was 35,6 %.

To the survey questions to which it was possible for a respondent to give multiple responses or question was voluntary, the total number of responses are marked in the figure label with (r = X, avg = Y), where X stands for number of responses and Y stands for the average number of responses per respondent.

Details of the respondents and individual answers are not published, as it was requested by the company this thesis was made for and it was informed to the respondents in the survey invitation letter (Appendix 1). The questions that are not published are marked in the attached survey (Appendix 2).

From the suppliers answering the survey, 63 % supplied to Europe, 30 % to Asia and 7 % also to other ABB regions as can be seen from Figure 3.

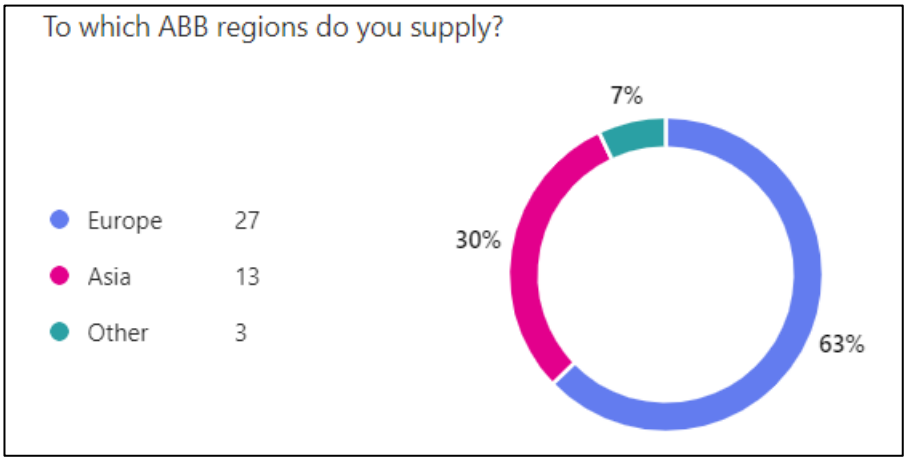

Figure 3. To which ABB regions do you supply?

The share of suppliers was divided in the survey by the company size to small with 28 %, medium 31 % and large 41 %. The classification to different sizes can be seen from Figure 4.

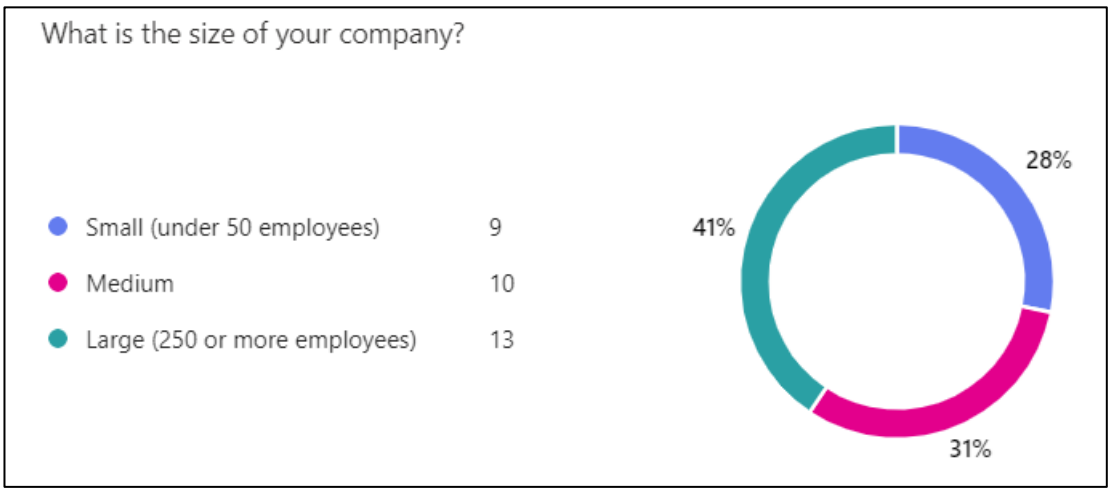

Figure 4. What is the size of your company?

From the responding suppliers 75 % had both organization and product related sustainability plans existing for the next two years, only organization related sustainability plans had 13 % of suppliers and only product related sustainability plans had also 13 % of the suppliers (Figure 5).

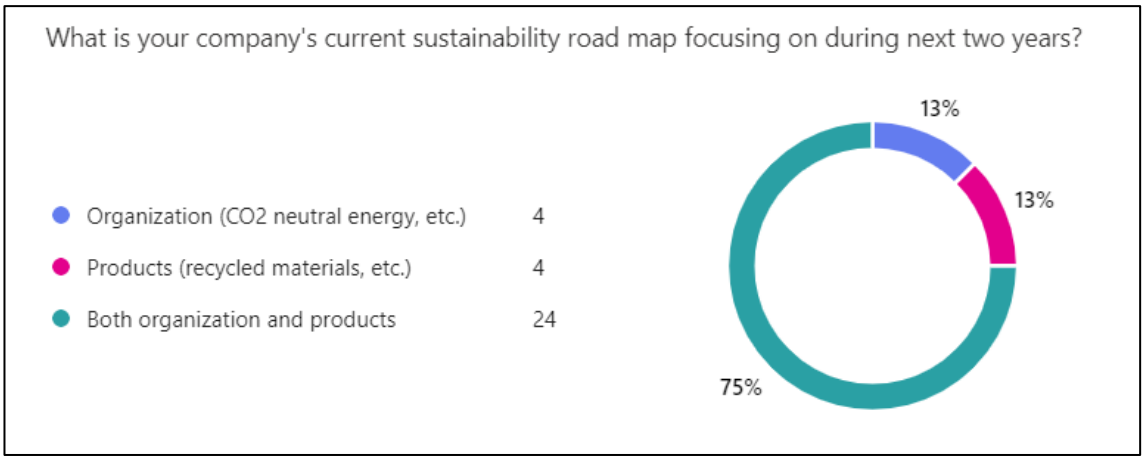

Figure 5. What is your company's current sustainability road map focusing on during next two years?

The organization related sustainability plans of the suppliers were divided to CO2 neutrality in operations 29 %, CO2 neutral energy 27 %, circularity 24 %, no plans 9 % and off sets or compensating emission 5 % (Figure 6). Other organization related sustainability plans had 5 %, and that included energy saving actions, emission reduction and life cycle perspective. Respondents that had no organization related sustainability plans were asked for the reason they don't have those plans. From the answers the reasons varied from being small or not having sufficient personnel, to being a part of a larger corporation and only following guidelines given to them.

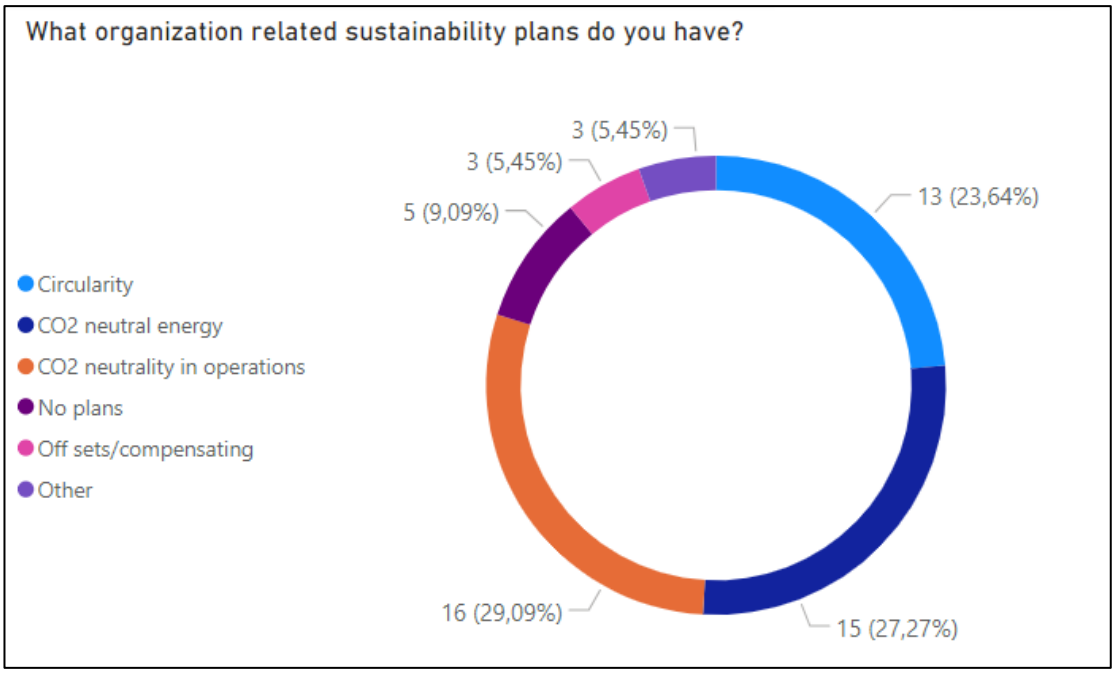

Figure 6. What organization related sustainability plans do you have? (r = 55, avg = 1,7).

To the question related to what product related sustainability plans the respondents have, recycled materials was responded by 37 %, low emission materials 31 %, renewable materials 15 %, no plans 12 % and other plans 6 % (Figure 7). The other plans with 6 % included RoHS (Restriction of Hazardous Substances Directive), REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals), conflict minerals and “Our customers' goals for product compliance”. The suppliers that had no product related sustainability plans either were subcontracting to ABB and were guided by product specification. One respondent felt they don’t have product related plans during the next two years, but the CO2 impact of their raw material will be close to zero by 2027 due to changes in raw material manufacturing methods.

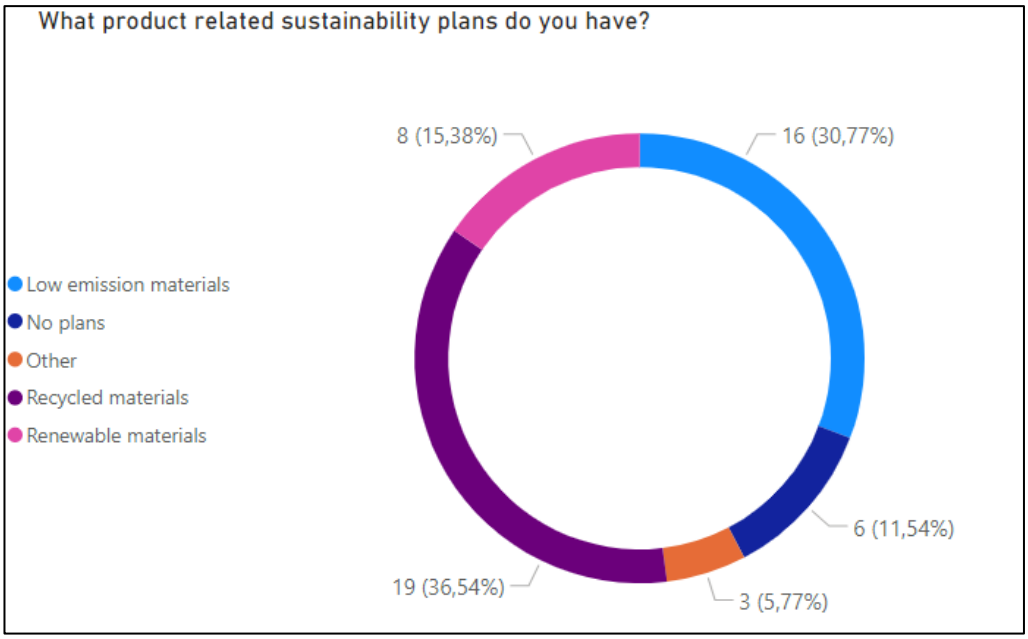

Figure 7. What product related sustainability plans do you have? (r = 52, avg = 1,6).

From the suppliers 32 % see technical advancements dependent on investments as likely in the future, 29 % see sustainable material availability likely, 20 % see technical advancements dependent on technology maturing likely and 18 % see renewable content likely (Figure 8). Green steel availability for smaller parts was seen as likely by 2 % in free text of other selection.

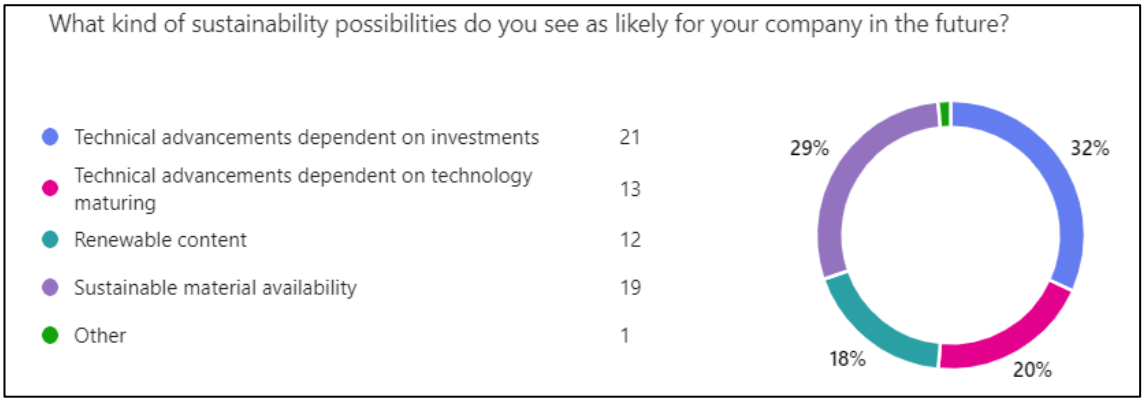

Figure 8. What kind of sustainability possibilities do you see as likely for your company in the future? (r = 66, avg = 2,1).

The suppliers think that their future technical sustainability possibilities are more dependent on the possibility to invest in the technology by 53 % of the

responses and by 38 % of the responses it is more likely dependent on the needed technology to mature into commercial phase (Figure 9). The remaining 9 % that answered “Other”, thought it is more dependent on the sustainable raw materials to become more common, or all aspects of sustainability to mature into the level that it can be implemented and it was also seen to depend on the cultural sustainability shift in the business i.e. whether customers start to offer higher prices for sustainable alternatives, or rather the majority of the suppliers shift to sustainable alternatives and therefore the higher prices become industry standard.

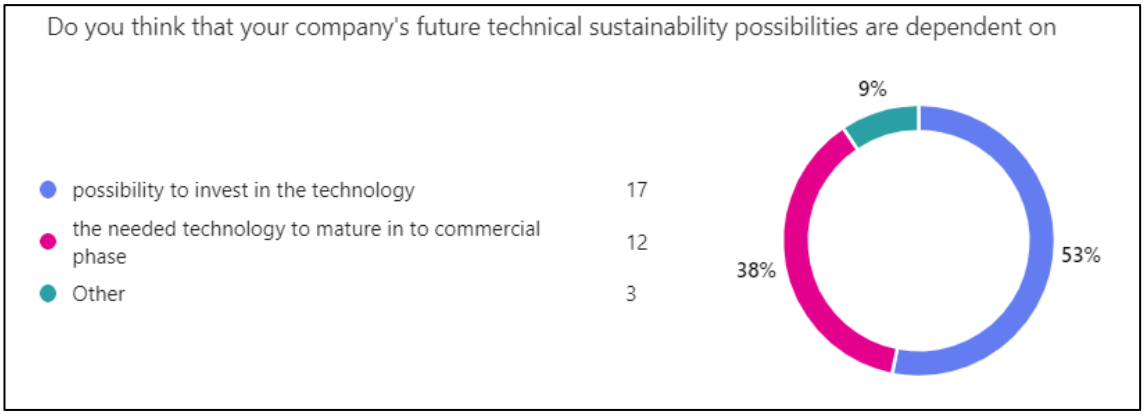

Figure 9. Do you think that your company's future technical sustainability possibilities are dependent on.

For the respondents the most likely factors affecting their company’s decision to make future sustainability advancements were economic situation of the company 34 %, lower manufacturing prices for sustainable alternatives 23 %, higher selling prices for sustainable alternatives 20 % and sustainability investment funding from governments etc. 17 % (Figure 10). The other 6 % of respondents stated that the affecting factors were interest from customers, customers willing to pay for sustainable options, regulation due to global warming and climate crisis and that there are no affecting factors as they have policy and commitment to full implementation of sustainability.

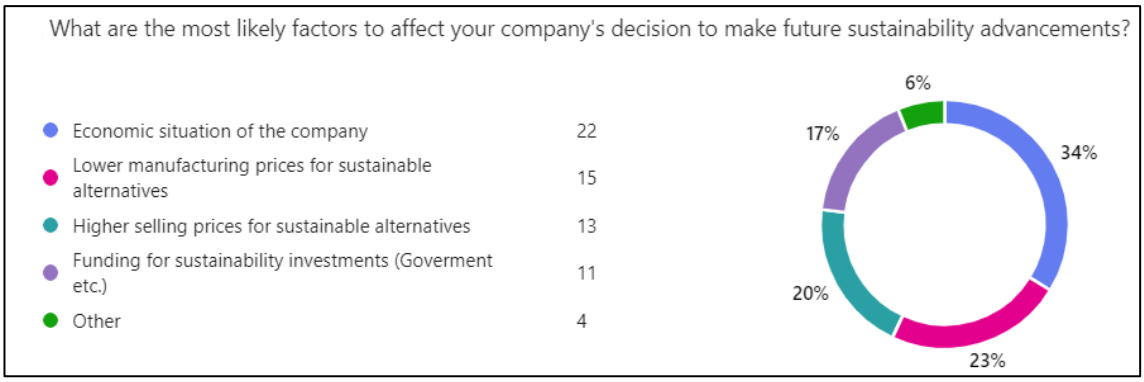

Figure 10. What are the most likely factors to affect your company's decision to make future sustainability advancements? (r = 65, avg = 2).

For open text question about the most potential future sustainability possibility related to the products' raw materials, answers were referring to sustainable raw materials with 46 %, recycled materials 22 %, renewable energy 11 %, designing sustainability to products (8 %) and other 8 % (Figure 11). Responses in "Other" included circularity, localized raw materials and that materials are specified by customer thus leading to having no opinion. Five percent of the respondents stated that they don't have an answer. On an average, suppliers brought up 1,2 subjects.

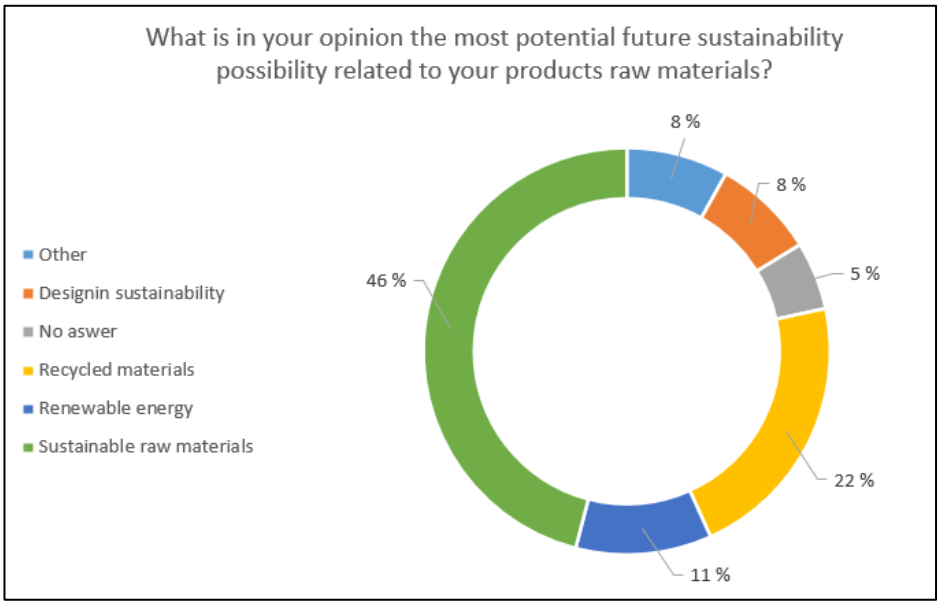

Figure 11. What is in your opinion the most potential future sustainability possibility related to your products raw materials?

The question about the most potential future sustainability possibility related to respondents' company was an open text question (Figure 12). The responses to it were related to renewable energy (with 35 %), waste reduction (24 %), efficiency (11 %), sustainable manufacturing 8 %, no answer to give 6 % and not applicable 5 %. The responses in other (11 %) were related to biobased materials, taking actions through analysing emission causes, emission regulations guiding to more sustainable suppliers and focusing on Scope 3 emissions. On an average, suppliers brought up 1,2 subjects.

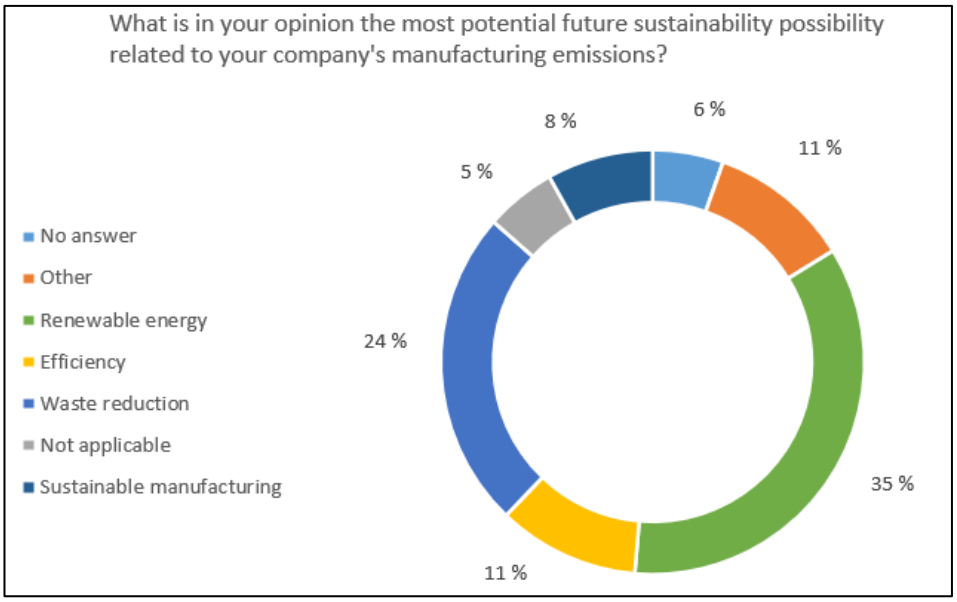

Figure 12. What is in your opinion the most potential future sustainability possibility related to your company's manufacturing emissions?

Organization specific sustainability data was medium granular for 66 %, low granular for 25 % and high granular for 9 % (Figure 13).

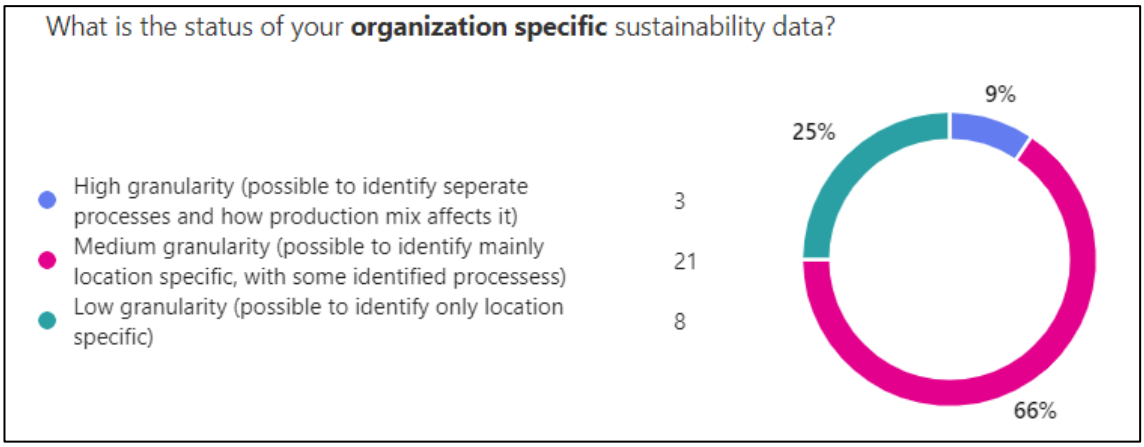

Figure 13. What is the status of your organization specific sustainability data?

The product specific sustainability data was medium granular for 47 %, low granular for 34 % and high granular for 19 % (Figure 14).

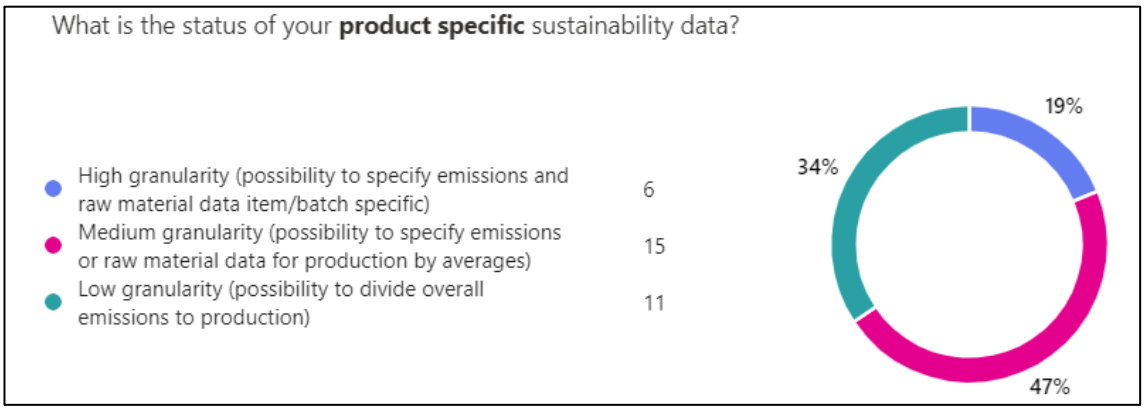

Figure 14. What is the status of your product specific sustainability data?

The most limiting factor for product sustainability data at the suppliers was resource limitations to gather information with 50 %, data missing from suppliers with 28 %, knowledge limitations with 13 % and other 9 % (Figure 15). The option “Other” included having only just started process for sustainability data, finding ways to transfer the needed data throughout the value chain and not owning the specification of the manufactured product.

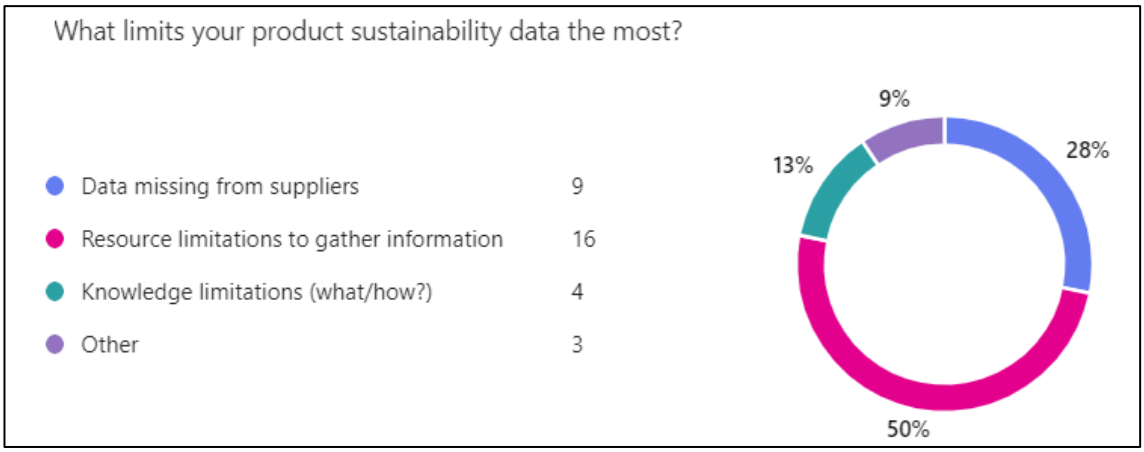

Figure 15. What limits your product sustainability data the most?

Sustainability related data that is specified unclearly and therefore affects companies' decisions on what to focus on, were according to responses granularity of information 33 %, what to include in calculations 27 %, what information customers need 17 % and how to calculate 15 % (Figure 16). The other 8 % included that sustainability data changes and expands all the time making the data hard to maintain, data missing from suppliers and for two respondents the management is not done locally.

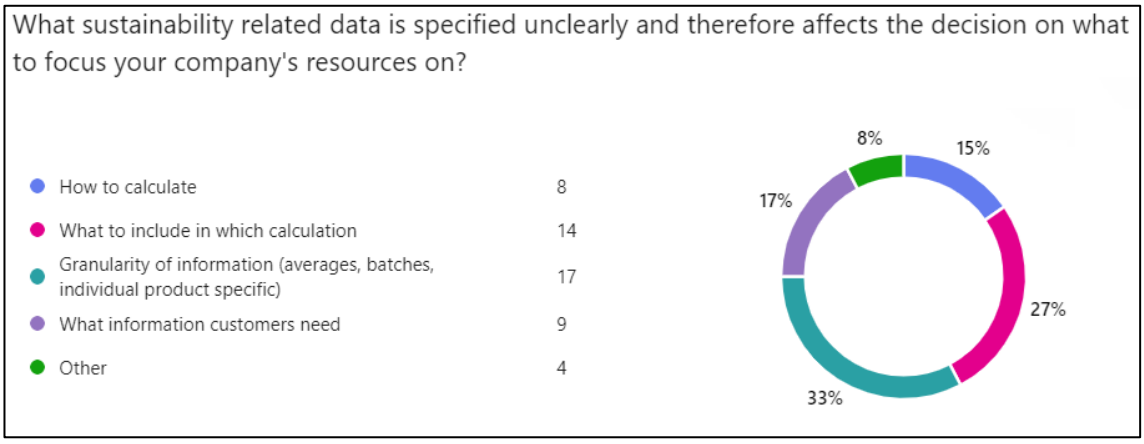

Figure 16. What sustainability related data is specified unclearly and therefore affects the decision on what to focus your company's resources on? (r = 52, avg = 1,6).

According to the responses, sustainability compliance related problems the companies face were complexity with 49 %, following changing regulations (32

%), awareness of new regulations (11 %) and responses to other (with 9 %) were high number of products with complex value chain, economic situation affecting compliance, progress being slow, and one respondent was not able to answer (Figure 17).

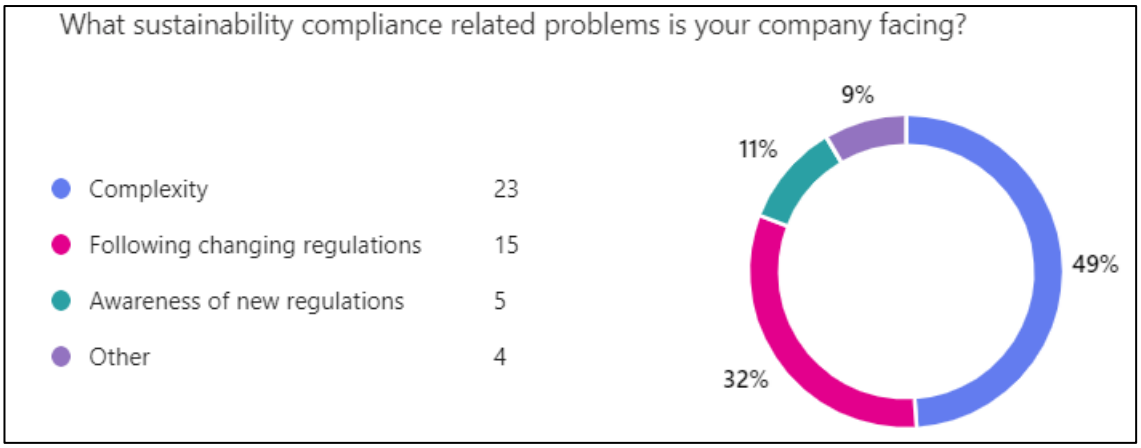

Figure 17. What sustainability compliance related problems is your company facing? (r = 47, avg = 1,5).

Answers to the question regarding resource limitations of the companies, 39 % responded implementing sustainability changes, 33 % responded staying up to date with requirements and 29 % responded sustainability reporting (Figure 18).

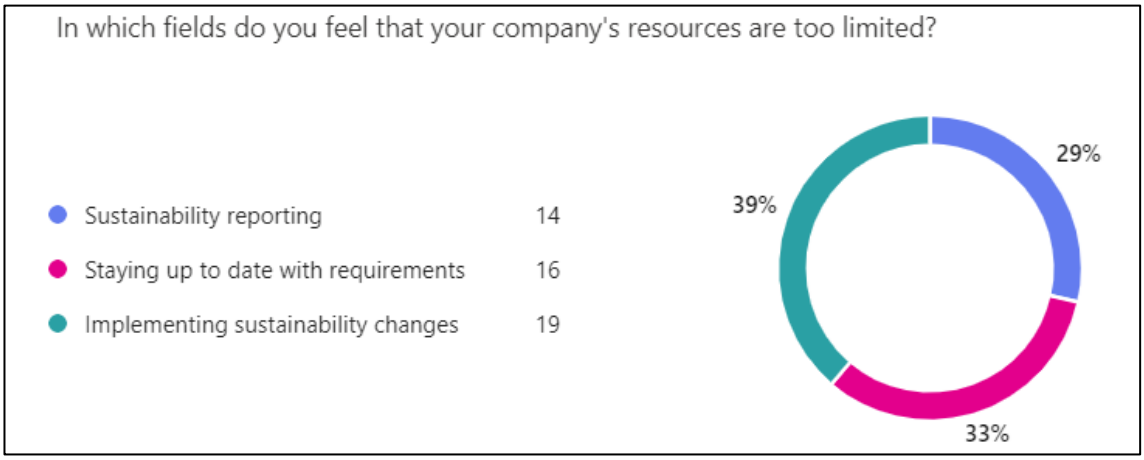

Figure 18. In which fields do you feel that your company's resources are too limited? (r = 49, avg = 1,5).

The tools that would help managing sustainability were according to the respondents clear specifications 43 %, calculation tools 30 %, availability of external consultants 13 % and Wiki-pages 9 % (Figure 19). Other with 4 % included clarity in reporting across full value chain and streamlined data available from suppliers and customers.

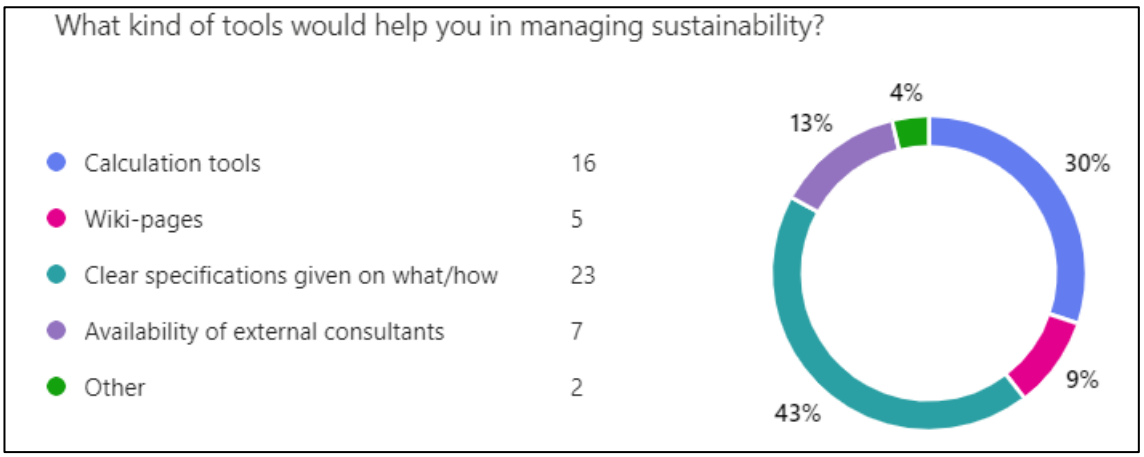

Figure 19. What kind of tools would help you in managing sustainability? (r = 53, avg = 1,7).

To the question, if there are some sustainability aspects that the respondents felt are not being considered or valued at the moment, the suppliers responded yes with 55 % and no with 45 % (Figure 20). The topics that according to respondents were not considered or valued at the moment were that focus is on large shifts and small improvements are forgotten, the resource limitations of companies are not taken in to account, the added work load of scattered reporting throughout supply chain as the entire supply chain is working on the same challenges, focusing on CO2 calculations when there is a wide variety of other sustainability topics like chemicals, waste management and ethical aspects, also Scope 3 was given as a topic that is not being considered or valued at the moment.

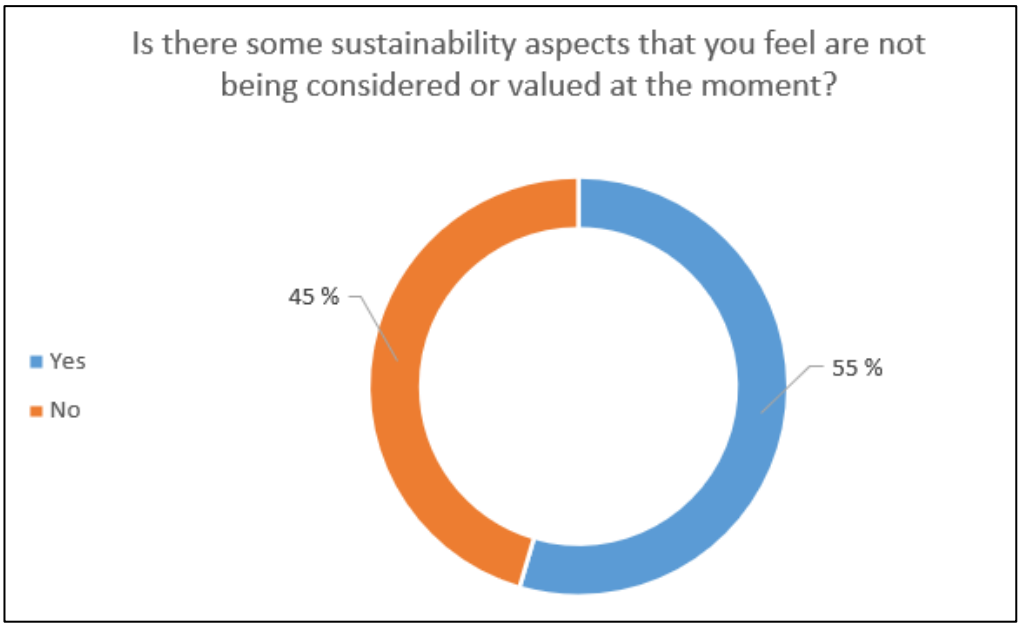

Figure 20. Is there some sustainability aspects that you feel are not being considered or valued at the moment? (r = 11, avg = 0,3).

4.3 Survey analysis

The survey was sent to 90 suppliers, from which 32 responded. When the survey was planned, the idea was to get answers evenly from suppliers by the size of the company and the region of supply so that they would represent realistic distribution of the actual supplier base to different ABB locations. Based on the results of the survey, the distribution of suppliers to the specified categories was satisfactory. As seen in Table 4, the survey responding companies divided equally to large, medium and small sizes, so different company sizes are covered by the survey, and it is possible to use company size as a variant in analysis of the results.

Table 4. Number of respondents by company size.

Size of company	**Number of respondents**
Large (250 or more employees)	13
Medium	10
Small (under 50 employees)	9
Total	**32**

In Table 5 about the regional distribution of the suppliers answering the survey, it can be seen, that the suppliers for the Large Motors and Generators division are mainly based in Europe and Asia. With many of them supplying to other ABB regions too. The regional distribution was satisfactory, as there were enough respondents for both major regions and the number of responses also represents the operational size of the region.

Table 5. Number of respondents by region of supply. In the last column are the respondents that only supply to that ABB region.

Region of supply	**Number of respondents**	**Number of single region respondents**
Europe	28	19
Asia	13	4
US	2	0
Total	**43**	**23**

For all the large companies there were organization and product related sustainability activities planned for the coming two years. As for the medium and small companies, that figure was 58 %. From the small and medium size companies, 21 % had just organization related sustainability activities and equally 21 % of those companies had just product related sustainability activities (Figure 21). There was no significant difference in the overall distribution by regional factors.

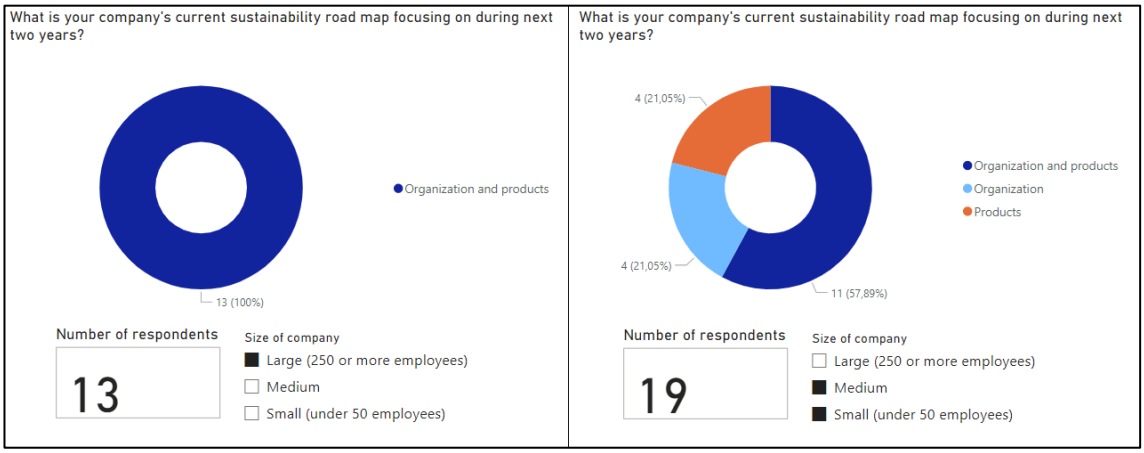

Figure 21. Sustainability road map by size of company.

Component suppliers have the largest amount of organization related sustainability plans. Component suppliers had 1,94 plans per supplier (31/16), raw material suppliers 1,25 plans per supplier (15/12) and machining suppliers 1 plan per supplier (4/4) (Figure 22).

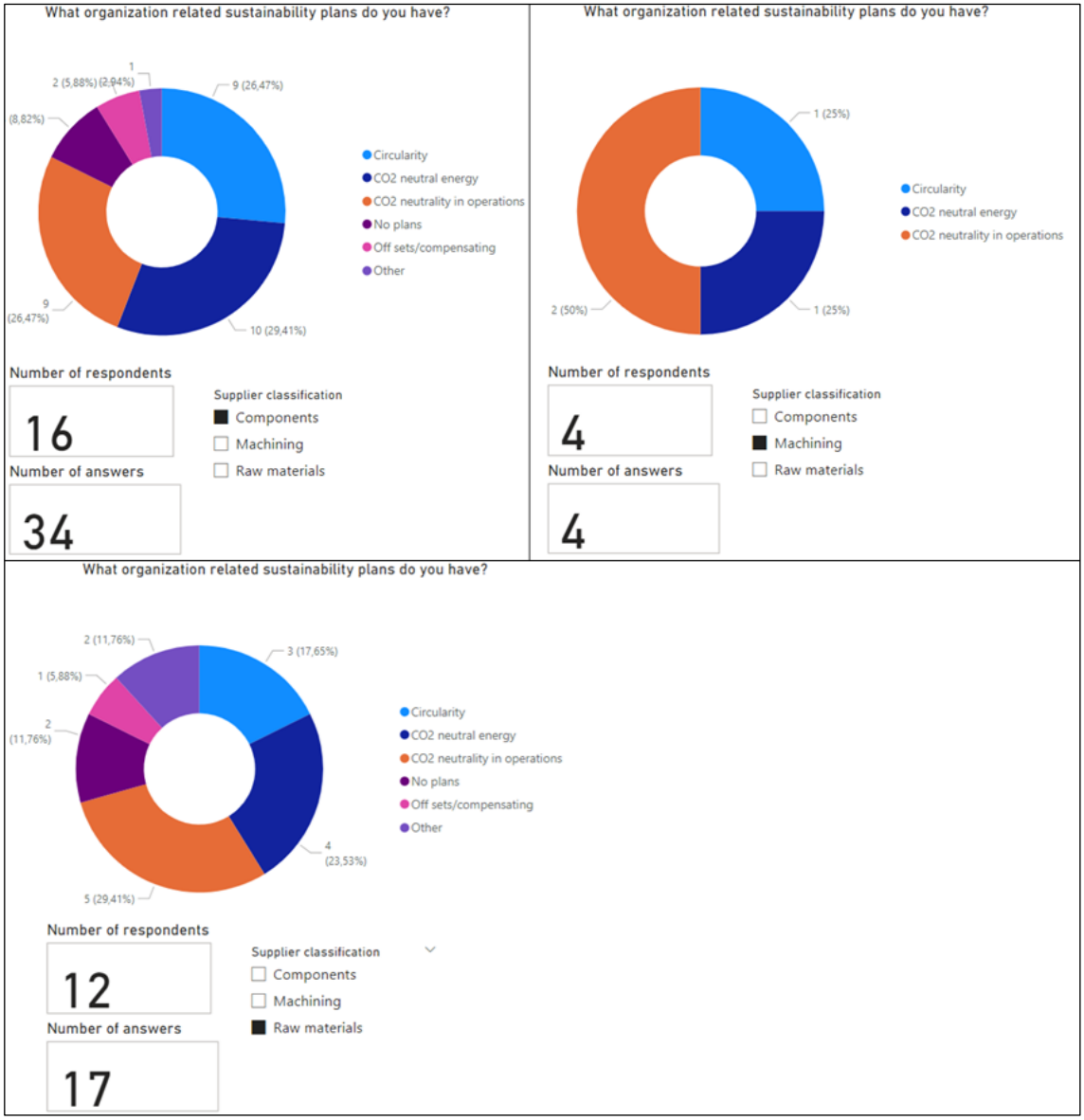

Figure 22. Comparison of organization related sustainability plans between component suppliers, machining suppliers and raw material suppliers.

For organization related sustainability plans, the share of companies that had plans including offsets or compensating, was the highest among medium and small companies from Asia region. In that scope, offsets and compensating plans were 20 % of all the answers (Figure 23), as for the whole survey the average was 5,5 %. Offsets and compensating can include actions that have a positive effect environmentally, but those cannot be seen as an emission reduction method as such, as they have no effect on the local emissions.

Offsets and compensation actions could be seen as environmental charity from the companies.

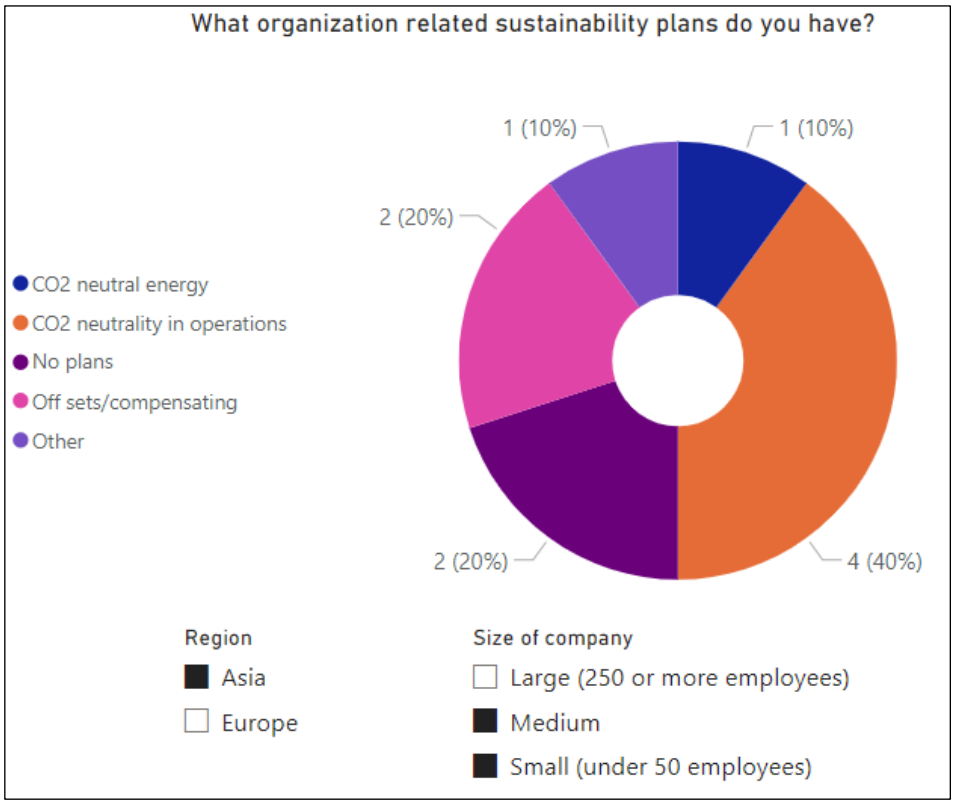

Figure 23. Distribution of answers to the question about what organization related sustainability plans respondents' company has for small and medium companies in region Asia.

For product related sustainability plans (see Figure 24), the distribution in the number of plans was almost the same between supplier classes as it was with organization plans. Component suppliers had most plans with 1,69 plans per supplier (27/16), raw material suppliers 1,33 plans per supplier (16/12) and machining suppliers 0,75 plans per supplier (3/4).

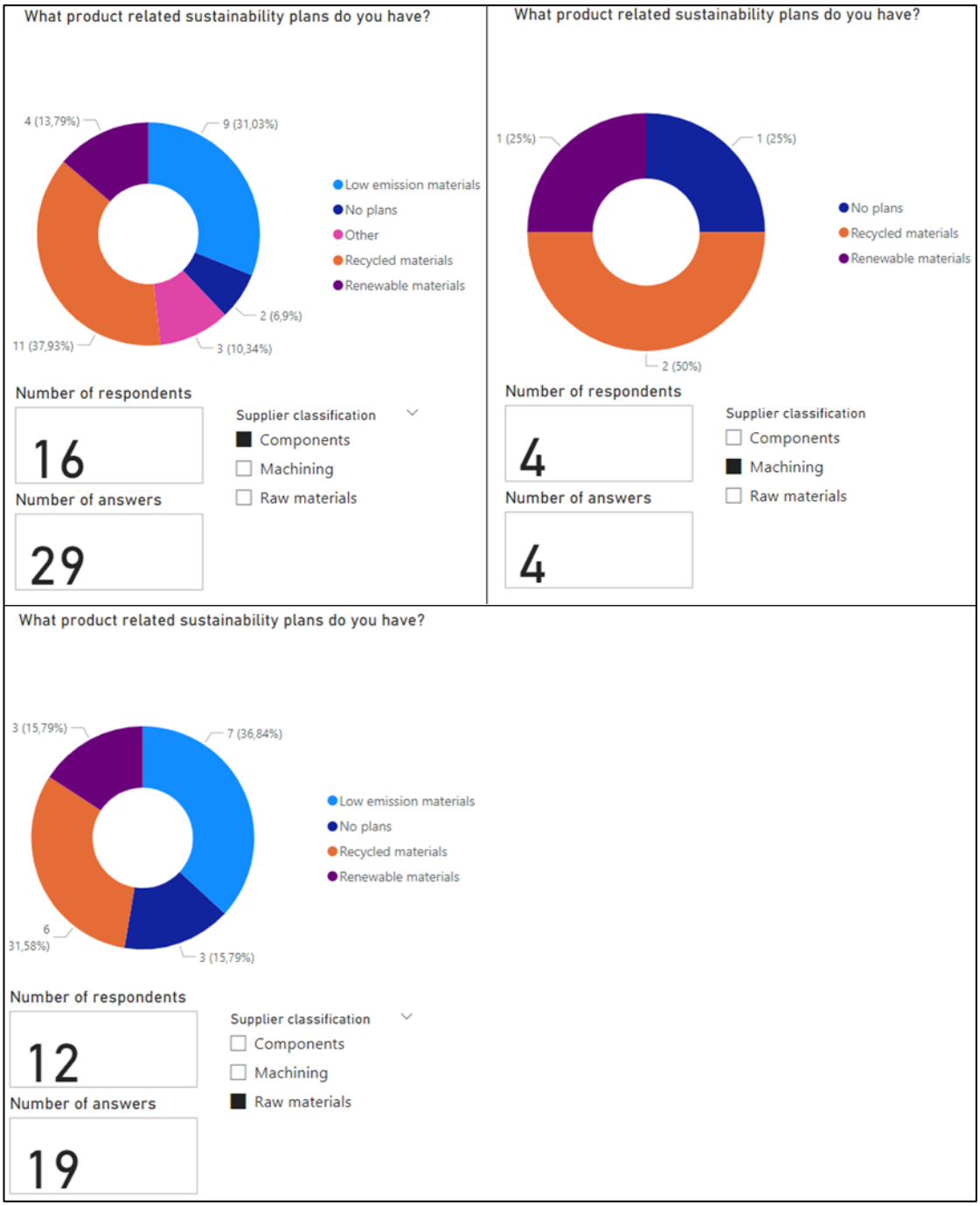

Figure 24. Comparison of product related sustainability plans by supplier classification.

Component suppliers had the highest granularity in organization data, with the amount of low granularity of only 18,8 % whereas the average amount of low granularity organization sustainability data of other supplier types was 31,3 % (Figure 25).

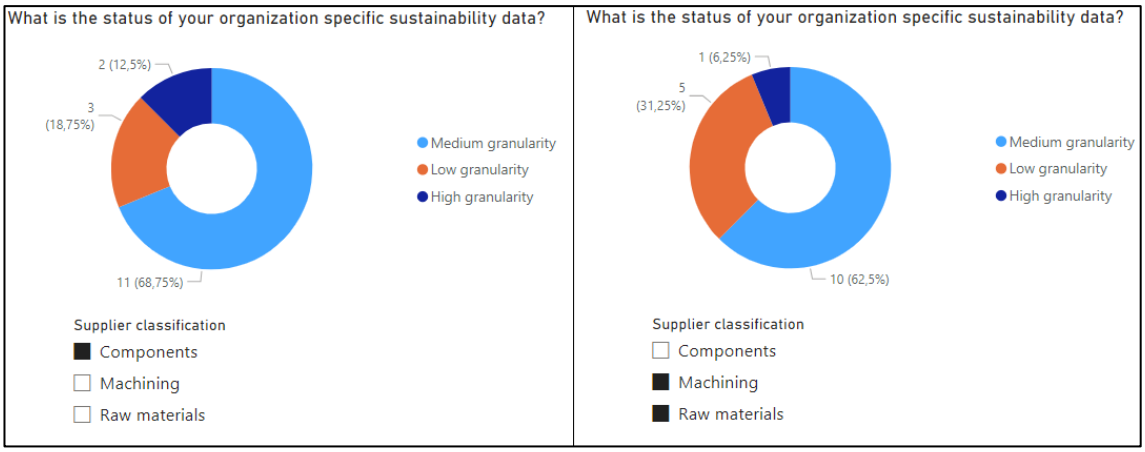

Figure 25. The left side diagram displays **organization specific** sustainability data granularity of component suppliers and the right side diagram organization specific data granularity of other suppliers.

Component suppliers also had the highest granularity in product sustainability data, with the number of suppliers possessing low granularity product data being only at 18,8 % of the suppliers. The average product data granularity for other supplier types was significantly lower, with 50 % of the other suppliers having low granularity in product sustainability data (Figure 26).

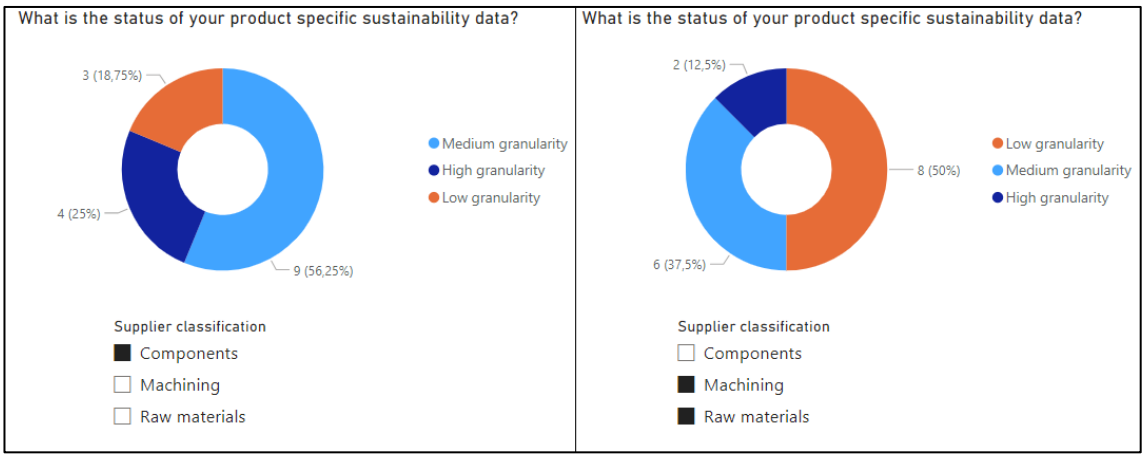

Figure 26. On the left side **product specific** sustainability data granularity of component suppliers, on the right side sustainability specific data granularity of other suppliers.

According to the results, component suppliers have a larger amount of organization and product related sustainability plans, compared to other supplier classes. They also have higher granularity in sustainability data for both

organization and products. It could be assumed, that because presumably component suppliers on average have more experience on administering granular data through their more complex product portfolios compared to raw material and machining suppliers, therefore it could be easier for component suppliers to adopt new data management related to sustainability. Their information systems also might adopt additional data strings related to sustainability more easily.

Component suppliers have the lowest expectation regarding sustainability possibilities dependent on technology maturing 15,6 % (Figure 27), as the average for machining and raw materials suppliers is 24,2%. On the other hand, component suppliers have the highest expectation on sustainable material availability 37,5 % (Figure 27), when the average for machining and raw material suppliers is 21,2 %.

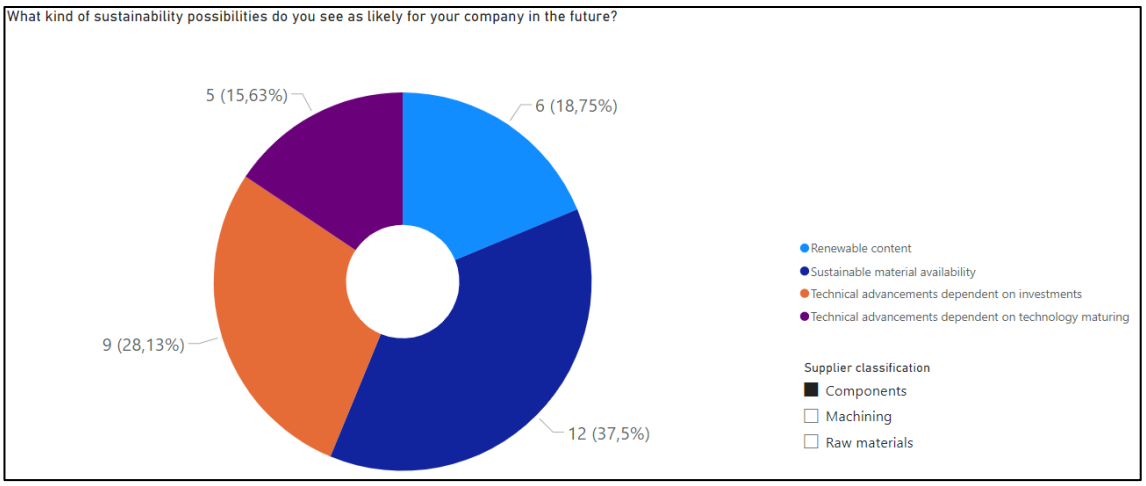

Figure 27. Sustainability possibilities seen as likely for component suppliers.

As visualized in Figure 28, machining suppliers were mostly relying in future sustainability possibilities in technical advancements dependent on investments with 66,7 % of the answers, as the average in other supplier classes was 28,8 %. Machining suppliers had 0 % for sustainable material availability, that was significantly below other supplier classes with an average of 32,2 % for sustainable material availability in those classes. The low number in sustainable

material availability from machining suppliers might reflect the nature of their work, where most of the components that are machined, come from customers.

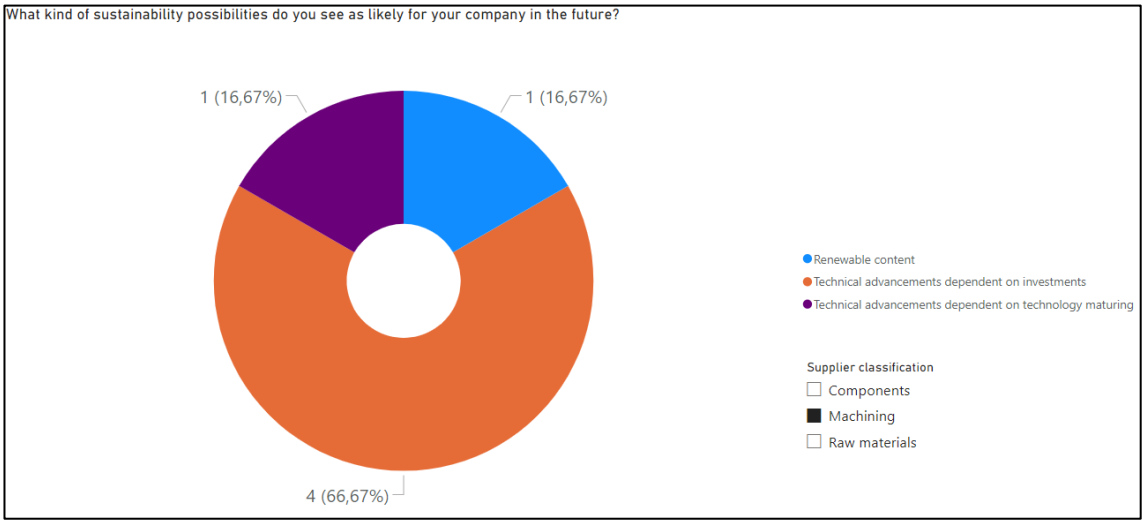

Figure 28. Sustainability possibilities seen as likely for machining suppliers.

Raw material suppliers have the highest expectation on technical advancements dependent on technology maturing with 25,9 % (Figure 29), whereas the average of others was 15,8 %.

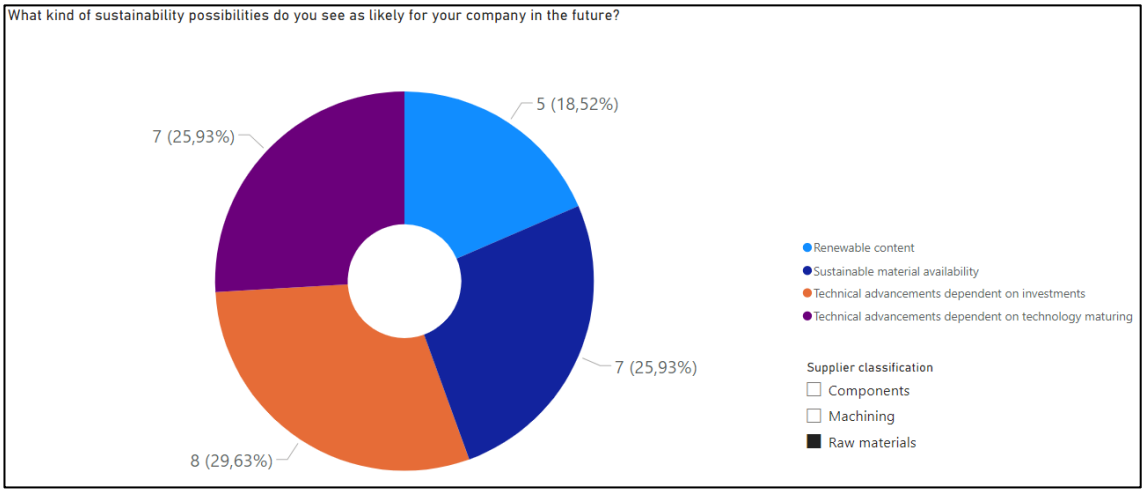

Figure 29. Sustainability possibilities seen as likely for raw materials suppliers.

In general, as the two most likely future sustainability possibilities were seen future possibilities dependent on investments with 32 % and sustainable

material availability with 29 % (Figure 8). For all the supplier classes, renewable content was seen equally as a future possibility, with shares of answers ranging from 16,7 % (Figure 28) to 18,8 % (Figure 27) with the average being 18 % (Figure 8).

As illustrated in Figure 30 it was seen that future technical sustainability possibilities are mostly dependent on the possibility to invest with 53,1 %, but the needed technology to mature into commercial phase was seen as relatively high too, being 37,5 % of the total answers.

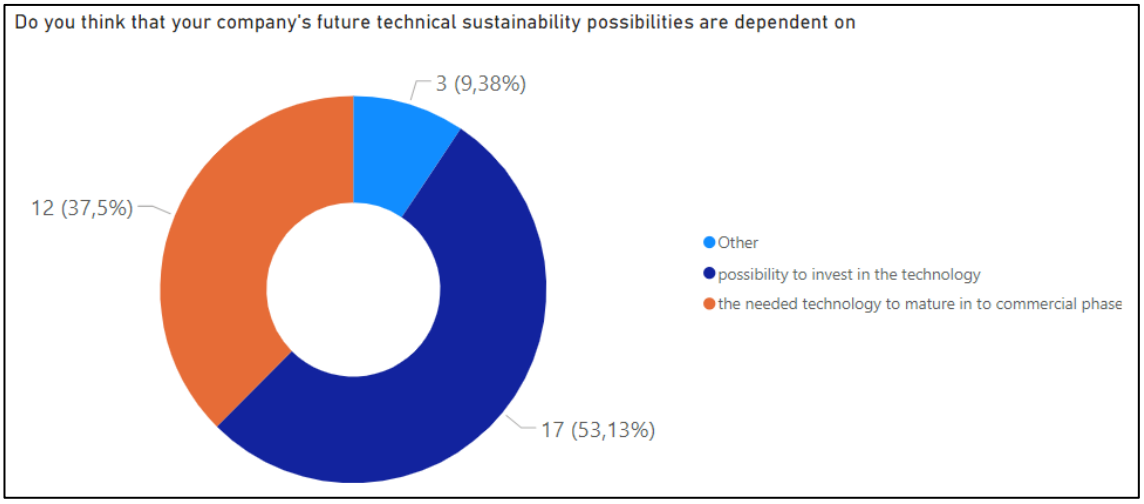

Figure 30. Distribution of answers to question about from what company's sustainability possibilities are dependent on.

Surprisingly higher number of component suppliers (43,8 %) saw that possibilities are dependent on technology maturing than raw material suppliers (41,7 %) did. The initial anticipated result was that technology maturing would have been significantly higher among raw material suppliers, than with other supplier classes, but the result was not far off from component suppliers. The high number from component manufacturers might be due to their higher grade in technicality in their products, which translates to higher number in development projects being active in different technical fields.

Clear specifications and calculation tools would be the preferable aids for the companies to manage their sustainability by covering 73,6 % of all the answers

(see Figure 31). This illustrates the fact that there is a lot of uncertainty in the industry about how the sustainability related activities should be handled in detail.

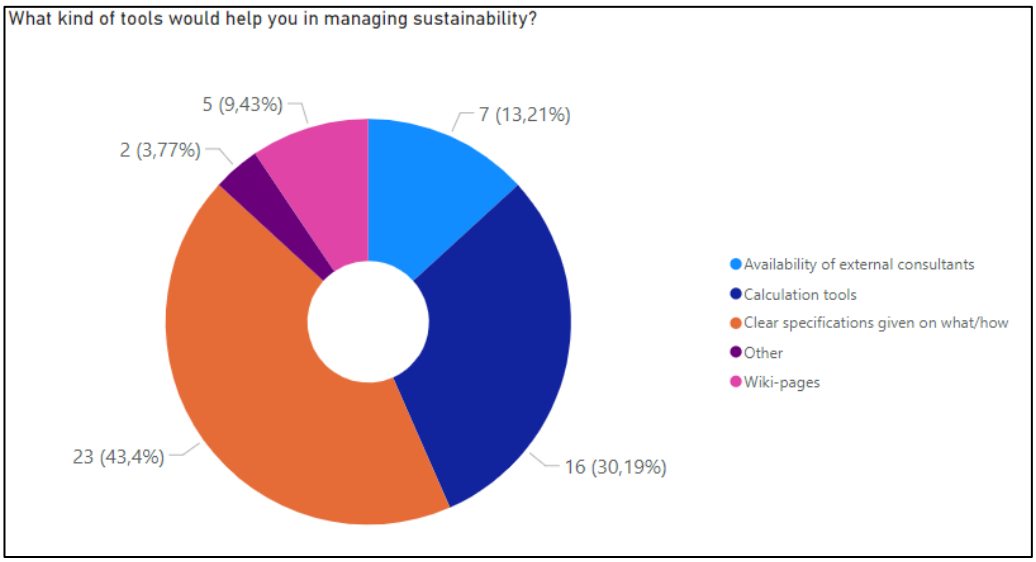

Figure 31. Distribution of the answers from all suppliers on what tools would help them managing sustainability.

5 Summary and recommendations

The Scope 3 emissions and the management of those emissions is a complex topic with a significant range over value chains of different participants. Even when focusing only on Scope 3 Category 1 emissions, it includes a wide range of aspects. Through the survey conducted in this thesis, it hopefully provides us with further insights on how to manage sustainability together with our suppliers and on which topics we need to focus on, to enable improved functionality in common processes.

To reduce scope 3 category 1 emissions, the most important step is to have comprehensive and comparable data available from all participants. Only with full knowledge available from the current status, we can make informed decisions for the most effective results. According to the survey results, for the suppliers the most wanted tools to help managing sustainability were clear

specifications and calculation tools, covering a total of 73 % of the answers. Supporting this statement, complexity of compliance was covering 49 % of the answers regarding what compliance related problems companies are facing. Providing clear specifications is vital for data quality, process optimisation and to ensure coherent data across the industry. Clear specification should not only be given on calculation methods and data contents, but also for emission reduction or balancing methods that are acceptable for ABB.

As ABB is working through a third-party tool to gather sustainability data from suppliers, and on that reporting platform they are currently working on introducing Scope 3 reporting, it might be most beneficial to participate in the development of the reporting platform to suit the future needs and to integrate sustainability reporting from suppliers to one platform for both organization and product related data. In the future, the best solution would be standardized emission data transfer protocols for goods and services. Initiatives like the Digital Product Passport will most likely over time lead to the introduction of such protocols, but it is not likely they will cover all products and services.

Internal changes that ABB could introduce to target scope 3 purchased goods and services emissions, could be introducing purchasing specifications, a continuous sustainable redesign process and sustainable design principles. Purchasing specifications could include ruling out high-GHG manufacturing methods and including sustainability figures as one of the fixed purchasing parameters as price, quality and delivery time are. Approved manufacturing method specifications could be implemented at ABB with a short transition period for the carbon intensive goods like iron and steel, in which the GHG emissions can vary significantly between different manufacturing methods and the emission levels of different methods are known. The implementation of a continuous sustainable redesign process would most likely require availability of additional data from how different manufacturing methods or materials impact the products sustainability. Regarding some components it could be started quickly. For these two internal changes to be possible, the first thing to do, would be the introduction of sustainable design principles. An instruction with

these sustainable design principles would act as a guideline for designers who are developing new products, as well as redesigning old products. Survey suppliers mentioned multiple times, that ABB owns the specification for many of the components they deliver. By designing sustainability into the products, the impact on Scope 3 Category 1 emission would be direct and according to *Ecodesign your future*, a publication by European Commission, more than 80 % of the environmental impact of a product is determined by the design phase.

A continuous sustainable redesign process would include going through existing designs based on development impulses, much like the existing R&D processes work. There have already been some pilot studies at different ABB divisions for adapting component design with the goal of reducing Scope 3 emissions. There is a fundamental potential for emission reduction as well as for cost savings and quality improvements through for example optimised materials. Product related sustainability plans were non-existent to some of the survey suppliers, as the specification for the product came from ABB. Especially those materials or components should be targeted, as suppliers themselves are bound to the given specification and development doesn't occur naturally inhouse at the supplier. ABB could also offer a development impulse portal for suppliers or introduce some other way of engaging suppliers in our sustainable design changes, as the suppliers have the best insights regarding the sustainability possibilities in their industry segment. Mutual benefit in this would be improved cooperation and improved possibility for both parties to reach their sustainability targets. Implemented improvements could also affect order volumes in some cases.

To reach the set Scope 3 targets, ABB should focus on getting green products to the market. There are already more sustainable options for many components coming to market, but being a forerunner has its costs. Limited availability and increased price are affecting the possibility to utilize these. Reducing emissions for the whole line of products can be seen as a permanent future target, but offering green versions to our customers, even for an increased price, should be made available in the short term.

It can also be estimated that all the new regulations are going to have a positive effect on reaching sustainability targets. If all the participants can get their systems up to the needed level and start working effectively for sustainable development, the regulations should guide them naturally towards the targets. CBAM could be helping with technical sustainability investments becoming more attractive and in general promote decarbonization in steel industry. It could to some extent bridge the price gap between low and high emission manufacturing methods for both imported and locally manufactured goods as importers need to purchase CBAM certificates that correspond with carbon emissions of manufacturing. Manufacturers from countries with existing carbon emission regulations and taxes should also see improvement in their competitiveness. Digital Product Passport introduced by Ecodesign for Sustainable Products Regulation will eventually lead to the need of uniform sustainability data from all the companies in the same industry segment. It will further lead to open data platforms providing the data in a standardized form. When standardized data is available, many of the time-consuming tasks of manual reporting and data gathering can be automated. In this way, the new regulations although needing a lot of work from all the companies at the moment, will result in a more controllable sustainable future.

References

1 Report of the World Commission on Environment and Development : note / by the Secretary-General. 1987. Online. UN Digital Library. <https://digitallibrary.un.org/record/139811?v=pdf>. Accessed 15.11.2024.

2 Dugarova, Esuna & Gülasan, Nergis. 2017. GLOBAL TRENDS Challenges and Opportunities in the Implementation of the Sustainable Development Goals. Online. United Nations Development Programme and United Nations Research Institute for Social Development. <https://www.undp.org/sites/g/files/zskgke326/files/publications/Global%20Trends_UNDP%20and%20UNRISD_FINAL.pdf>. Accessed 16.11.2024.

3 Sustainability. 2024. Online. ABB. <https://global.abb/group/en/sustainability>. Accessed 11.11.2024.

4 ABB's sustainability history. 2024. Online. ABB. <https://global.abb/group/en/sustainability/history>. Accessed 16.11.2024.

5 ABB’s 2030 and 2050 science-based targets approved by the Science Based Targets initiative (SBTi). 2024. Online. ABB. <https://new.abb.com/news/detail/116943/abbs-2030-and-2050-science-based-targets-approved-by-the-science-based-targets-initiative-sbti>. Accessed 10.8.2024.

6 Sustainability Report 2023. 2024. Online. ABB Ltd. <https://search.abb.com/library/Download.aspx?DocumentID=9AKK108469A1083&LanguageCode=en&DocumentPartId=&Action=Launch>. Accessed 8.9.2024.

7 Corporate Value Chain (Scope 3) Accounting and Reporting Standard. 2011. Online. World Resources Institute and World Business Council for Sustainable Development. <https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf>. Accessed 19.9.2024.

8 Technical Guidance for Calculating Scope 3 Emissions, Category 1: Purchased Goods and Services. 2022. Online. GREENHOUSE GAS PROTOCOL. <https://ghgprotocol.org/sites/default/files/2022-12/Chapter1.pdf>. Accessed 11.11.2024.

9 About Us. 2024. Online. GREENHOUSE GAS PROTOCOL. <https://ghgprotocol.org/about-us>. Accessed 11.11.2024

10 Tool guidance GHG Protocol. 2022. Online. European Climate Pact. <https://climate-pact.europa.eu/get-inspired/resources/ghg-protocol_en>. Accessed 7.9.2024

11 Carbon Border Adjustment Mechanism. 2024. Online. European Commission. Taxation and Customs Union. <https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en>. Accessed 30.8.2024.

12 The European Green Deal. 2024. Online. European Commission. Directorate-General for Communication. <https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en>. Accessed 21.11.2024.

13 COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A new Circular Economy Action Plan For a cleaner and more competitive Europe. 2020. Online. European Commission. Directorate-General for Environment. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:98:FIN>. Accessed 21.11.2024.

14 Ecodesign for Sustainable Products Regulation. 2024. Online. European Commission. Directorate-General for Communication. <https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/ecodesign-sustainable-products-regulation_en#:~:text=The%20Ecodesign%20for%20Sustainable%20Products%20Regulation%20%2829%2C%20which,can%20have%20a%20significant%20impact%20on%20the%20environment>. Accessed 18.11.2024.

15 Ecodesign your future. 2012. Online. European Commission. Directorate-General for Energy. Directorate-General for Enterprise and Industry. <https://op.europa.eu/publication-detail/-/publication/4d42d597-4f92-4498-8e1d-857cc157e6db>. Accessed 21.11.2024.

16 Adisorn, Thomas & Berg, Holger & Cembrero, David & Chowdhury, Tahmid & Götz, Thomas & Jansen, Maike & Markkanen, Sanna. 2022. Digital Product Passport: The ticket to achieving a climate neutral and circular European economy?. Online. University of Cambridge Institute for Sustainability Leadership. <https://circulareconomy.europa.eu/platform/sites/default/files/cisl_digital_products_passport_report_v6.pdf>. Accessed 3.9.2024.

17 Commission Recommendation (EU) 2021/2279 of 15 December 2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations. 2021. Online. Publications Office of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021H2279>. Accessed 23.11.2024.

18 Environmental Footprint. 2021. Online. European Commission. Directorate-General for Communication.

<https://eplca.jrc.ec.europa.eu/EnvironmentalFootprint.html>. Accessed 19.9.2024.

19 Regulation on Deforestation-free Products. 2024. Online. European Commission. Directorate-General for Environment. <https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products_en>. Accessed 7.9.2024.

20 Regulation on Deforestation-free Products - EUDR. 2024. Online. European Commission. Directorate-General for Environment. <https://green-business.ec.europa.eu/deforestation-regulation-implementation_en>. Accessed 7.9.2024.

Appendices

Survey invitation letter

Dear ABB Supplier,

In an effort to improve our **sustainability understanding and actions globally**, we would kindly ask you to fill out this short survey **by the 1st of November**.
By filling out this survey, you can help us to ensure that the information we base our decisions on is accurate.

Our target with this survey is to have a better understanding on how the industry is seeing current sustainability actions,
and how they foresee the **future sustainability related changes** in industry itself, and in the sustainability regulations.

The information given by your company will further help us in focusing on the needed actions and plan how we can support our suppliers the best. This is particularly important as **ABB has confirmed ambitious sustainability targets**,
see https://global.abb/group/en/sustainability, to help in decreasing emissions worldwide.
Information given to this survey is used to build **statistics for a study** and will not be used to assess your company as a supplier and no individual information will be published.

No sustainability data is required to fill the survey, and it shouldn't take more than **15 minutes** to complete it.
The questions in the survey are related to **how you view sustainability topics in general** and the survey can also be answered **anonymously**.

Link to the survey: https://forms.office.com/e/2SraNjB6SD

For questions, please contact Mr. Lauri Toivonen, who is conducting the study as a part of his Thesis "Upstream Sustainability".

Thank you for your cooperation!

Microsoft Forms survey

Sustainability survey

Information given to this survey will only be used to gather statistics from our suppliers view of the current state of sustainability. Those statistics will be used in a ABB Upstream Sustainability -study.

The individual answers will not be stored after the data has been summarized and no individual answers will be placed public or in to use for other instances.

* Required

What is the name of your company? (Results not published)

What products or materials do you mainly supply to ABB? (Results not published) *

To which ABB regions do you supply? *

- [ ] Europe
- [ ] Asia
- [ ] Other

What is the size of your company? *

- ◯ Small (under 50 employees)
- ◯ Medium
- ◯ Large (250 or more employees)

Appendix 2

What is your company's current sustainability road map focusing on during next two years? *

Choose one

- ◯ Organization (CO2 neutral energy, etc.)
- ◯ Products (recycled materials, etc.)
- ◯ Both organization and products

What organization related sustainability plans do you have? *

- ☐ CO2 neutrality in operations
- ☐ CO2 neutral energy
- ☐ Off sets/compensating
- ☐ Circularity
- ☐ Other

What is the reason your company doesn't have product related sustainability plans? *

What product related sustainability plans do you have *

- ☐ Renewable materials
- ☐ Recycled materials
- ☐ Low emission materials
- ☐ Other

Appendix 2

What is the reason your company doesn't have organization related sustainability plans? *

What organization related sustainability plans do you have? *

- [ ] CO2 neutrality in operations
- [ ] CO2 neutral energy
- [ ] Off sets/compensating
- [ ] Circularity
- [ ] Other

What product related sustainability plans do you have? *

- [ ] Renewable materials
- [ ] Recycled materials
- [ ] Low emission materials
- [ ] Other

What kind of sustainability possibilities do you see as likely for your company in the future? *

Sustainability possibilities that are not yet possible for your company

- [ ] Technical advancements dependent on investments
- [ ] Technical advancements dependent on technology maturing
- [ ] Renewable content
- [ ] Sustainable material availability
- [ ] Other

Appendix 2

Do you think that your company's future technical sustainability possibilities are dependent on *

- ◯ possibility to invest in the technology
- ◯ the needed technology to mature in to commercial phase
- ◯ Other

What are the most likely factors to affect your company's decision to make future sustainability advancements? *

- ☐ Economic situation of the company
- ☐ Lower manufacturing prices for sustainable alternatives
- ☐ Higher selling prices for sustainable alternatives
- ☐ Funding for sustainability investments (Goverment etc.)
- ☐ Other

What is in your opinion the most potential future sustainability possibility related to your products raw materials? *

What is in your opinion the most potential future sustainability possibility related to your company's manufacturing emissions? *

What is the status of your **organization specific** sustainability data? *

- ◯ High granularity (possible to identify seperate processes and how production mix affects it)
- ◯ Medium granularity (possible to identify mainly location specific, with some identified processess)
- ◯ Low granularity (possible to identify only location specific)

Appendix 2

What is the status of your **product specific** sustainability data? *

- ◯ High granularity (possibility to specify emissions and raw material data item/batch specific)
- ◯ Medium granularity (possibility to specify emissions or raw material data for production by averages)
- ◯ Low granularity (possibility to divide overall emissions to production)

What limits your product sustainability data the most? *

- ◯ Data missing from suppliers
- ◯ Resource limitations to gather information
- ◯ Knowledge limitations (what/how?)
- ◯ Other

What sustainability related data is specified unclearly and therefore affects the decision on what to focus your company's resources on? *

- ☐ How to calculate
- ☐ What to include in which calculation
- ☐ Granularity of information (averages, batches, individual product specific)
- ☐ What information customers need
- ☐ Other

What sustainability compliance related problems is your company facing? *

- ☐ Complexity
- ☐ Following changing regulations
- ☐ Awareness of new regulations
- ☐ Other

In which fields do you feel that your company's resources are too limited? *

- [ ] Sustainability reporting
- [ ] Staying up to date with requirements
- [ ] Implementing sustainability changes

What kind of tools would help you in managing sustainability? *

- [ ] Calculation tools
- [ ] Wiki-pages
- [ ] Clear specifications given on what/how
- [ ] Availability of external consultants
- [ ] Other

Is there some sustainability aspects that you feel are **not** being considered or valued at the moment?

If you feel like we could contact you for possible follow-up questions, please leave your e-mail address (Results not published)