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Norsif Guide to ESG Integration in Fundamental Equity Valuation

Part I: ESG analysis for valuation purposes

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1 INTRODUCTION

The inspiration for this guide arose out of the authors' failure to find a valuation textbook that adequately addressed the challenge of ESG integration from a company-level perspective. The small, but growing academic finance literature on ESG has not yet filtered into practical guides for students attempting to learn valuation techniques. At the same time, we see an explosion in interest in learning how to integrate ESG into fundamental valuation models, driven both by exponential growth in assets under management in ESG-labelled funds, as well as the recent multiple expansion for companies with a "green" business model.

The purpose of this guide is to provide the analyst with practical tools for integrating ESG into equity valuation, with a focus on the Nordic market. In our view, the techniques are already available. What is missing are examples of how to apply those techniques to incorporate material ESG information systematically into valuation models. In other words, we hope to demonstrate that fundamental ESG integration involves new information sources and new types of risk, but the same valuation frameworks apply. We intend with this text to supplement, rather than replace, existing valuation resources.

As we are focusing only on ESG information that is relevant for valuation purposes, this guide emphasises the importance of determining which types of ESG information are likely to be material. This is therefore not a guide to maximizing sustainability impact or to values-based investing independent of financial considerations. Not everything that is important will be financially material. In addition, while we include suggested questions for analysts to use in gathering financially relevant ESG information, this is not a guide to engagement *per se*. Rather, we have the narrower aim of describing a process for ESG analysis in order to inform valuation models.

This guide is a collaboration between the Norsif working group on ESG integration in valuation and the Norwegian School of Economics (NHH).¹ In the first half, the Norsif authors, Bersagel, Storaker and Juillard Thompsen, describe a process for ESG analysis as a basis for valuation, drawing upon practical experience from buy-side ESG investing. In the second half, NHH researchers Albuquerque de Sousa, Bienz and Mjøs present methods for integrating ESG considerations into pro forma financial statements, before weighing the benefits and drawbacks of various valuation techniques for the type of ESG issue encountered.

Section 2 proposes a generic framework for conducting an ESG analysis, including suggested questions for companies and a discussion on the importance of materiality. **Section 3** provides examples of relevant ESG considerations in selected industries represented on the Nordic stock exchange. **Section 4** introduces various sources of ESG information for conducting the analysis.

2 A GENERIC FRAMEWORK FOR ESG ANALYSIS

The goal of this framework is to understand the sustainability-related risks the company faces by virtue of its industry as well as company-specific risk, and how these are integrated into company strategy. Importantly, sustainability-related risks include both upside and downside risk.

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2.1 CORPORATE GOVERNANCE

Corporate governance, or the “G” in “ESG”, tends to be material for all companies. In contrast to environmental and social factors, however, governance is rarely industry-specific. We have therefore chosen to include the corporate governance discussion as a standalone section, before delving into the materiality matrix as a gateway to the industry-specific sustainability analysis.

According to the OECD Principles of Corporate Governance, the purpose of corporate governance *is to help build an environment of trust, transparency and accountability necessary for fostering long-term investment, financial stability and business integrity, thereby supporting stronger growth and more inclusive societies* (OECD, 2015, p. 7). Governance describes the practices, controls and procedures in place to ensure that the company is managed in the interest of shareholders.

From a valuation perspective, the goal in analysing corporate governance is to determine whether board and management interests are aligned with those of the shareholders. This includes examining the various incentives at work within the company, the board’s effectiveness in setting a company strategy that is likely to lead to shareholder value creation, as well as monitoring management’s execution of that strategy.

In terms of the formal governance structures, there is no universal consensus on what constitutes best practices. Even across the Nordic countries, there is significant variation in local corporate governance code recommendations. For purposes of this guide, our approach is not to advocate for specific best practices, but to highlight various topics the analyst ought to consider in determining how the company’s governance structure may affect valuation. Below are some useful considerations to evaluate.

Board member skills and experience

It is important that the individual members have relevant experience to guide the company and challenge management. The board members should be able to serve as a sparring partner for management and contribute to the quality of the company strategy they set.

As a quick check, the analyst can look to the board member biographies (often found on the company website).

- Are there board members with industry experience, for example?
- Are there any specific competencies important to the company’s strategy that seem to be missing from the board?

The more difficult skills to assess from the outside concern the individual board members’ contribution to the collegium.

- For example, are the individual members likely to bring different perspectives to the board discussions?

The composition of the board needs to include diverse perspectives to make sure the board members can challenge each other and collectively reach better decisions (NBIM, 2018). Objective diversity indicators can be a proxy, even if imperfect, for diversity of thought.

Board member independence from management

For the board to effectively supervise and complement management, it needs to be sufficiently independent from management – not least because the board is responsible for hiring and firing the CEO. Under Norwegian corporate law, the CEO cannot be a member of the board. This is not the case for the other Nordic countries, however. In fact, CEO board members are relatively common in

Swedish-listed firms. For the analyst, gauging board independence from management can indicate the relative balance of power within the company.

- Does the board have a track record of efficiently monitoring and supervising management?

All things equal, we would expect the influence of the CEO to be greater when the CEO is a member of the board, and therefore, that CEO quality is likely to be relatively more important to the company's future performance than in companies in which the board provides a more robust check on management.

Board member share ownership

How the board is incentivised is likely to affect what decisions they make.

- Are there structures in place that might affect the board members' risk tolerance?

For example, board members who have meaningful shareholdings in the company are – all else equal – intuitively more likely to be focused on long-term shareholder value than those who do not. As board members have access to more information about the company than the market, share ownership suggests underlying confidence in the company's outlook. In addition, their position as insiders significantly limits their ability to trade shares in the company, thus requiring a more long-term perspective. This is part of the reason that board member share trades are so closely followed by the market. Significant share sales from insiders are generally a negative share price signal.

Shareholder composition/ownership structure

The presence of a dominant shareholder is relatively common in listed companies across the Nordics. Examples include a foundation, such as the Carlsberg Foundation, which owns a majority stake in Carlsberg A/S. Family ownership stakes are also common, e.g. through the Wallenberg family-controlled Investor AB, which is itself a listed firm and also a controlling shareholder in several of the largest Swedish listed firms. Dominating state ownership is also a common feature, as with Equinor ASA and Fortum Oyj.

The presence of an active controlling shareholder can hold the board's "feet to the fire", minimizing principal-agent conflicts. However, it can also pose a risk for minority shareholders. The board is mandated to work towards maximizing value for all shareholders. Different shareholders might have different views on how best to do this. It is the board's responsibility to weigh these interests and act in the interest of all shareholders by making decisions in the best interest of the long-term success of the company. Having a dispersed ownership can lead to collective action problems in that no individual shareholder has sufficient incentive to expend the resources necessary to effectively monitor management.

The point of this discussion is not to muse about which type of ownership structure is best, however. Rather, for the analyst, what is important to understand are the priorities and ownership activities of the dominant shareholder, as these are likely to shape the board's priorities.

- For example, does the dominant shareholder have a history of promoting value creation in portfolio companies?
- Has the dominant shareholder respected the interests of minority shareholders in the past?
- Does the dominant shareholder take an active role through representation on the board or management or delegate representatives on their behalf?

Management

The board elects and appoint the CEO, who has the responsibility to carry out the company strategy. The CEO needs to have the right experience and track record to effectively manage the company, and the ability to build culture within the company.

- Is the CEO able to efficiently carry out the board's strategy?
- Does the CEO incentive structure support the company's strategy for long-term shareholder value creation?

Share price reactions in response to CEO changes illustrate the importance of this role to long-term shareholder value creation. CEO remuneration should reward increased shareholder value and incentivise the CEO to execute the company's strategy. The company's long-term success largely depends on management's priorities and day-to-day decision-making. As a result, it is important that the CEO is incentivised to work for the long term success of the company (NBIM, 2017).

2.2 GOVERNANCE OF SUSTAINABILITY, INCLUDING STAKEHOLDER ASSESSMENT

Governance of sustainability highlights the board's and management's role and responsibility to identify the sources of long-term value creation, understand the link between long-term issues and the business case, develop long-term metrics, and transparently report these items publicly.

The Norwegian Code of Practice for Corporate Governance can be used as an example for what to expect of the board in terms of risk management, including sustainability risk. (Norsk utvalg for

Norwegian Code of Practice for Corporate Governance

Chapter 2: Business

- *The board of directors should define clear objectives, strategies and risk profiles for the company's business activities such that the company creates value for shareholders.*

The company should have guidelines for how it integrates considerations related to its stakeholders into its value creation.

The board of directors should evaluate these objectives, strategies and risk profiles at least yearly.

Chapter 10: Risk management and internal control

- *The board of directors must ensure that the company has sound internal control and systems for risk management that are appropriate in relation to the extent and nature of the company's activities. Internal control and the systems should also encompass the company's guidelines etc. for how it integrates considerations related to stakeholders into its creation of value.*

The board of directors should carry out an annual review of the company's most important areas of exposure to risk and its internal control arrangements.

eierstyring og selskapsledelse, 2018)

In determining the appropriate strategy to address sustainability-related risks (both positive and negative), the board needs to carry out a risk assessment that includes the expectations of the company's stakeholders. Stakeholders are defined as any group or individual that may affect, or be

affected by, the activities of a company. This can be separated into internal and external stakeholders. Internal stakeholders are those with a direct relationship with the company, like its employees or suppliers. External stakeholders are actors that affect, or are affected by the company's activities outside the organization, such as governments, local communities, etc. This analysis can help the company identify ESG-related issues likely to be important to its stakeholders and material to the company.

Benefits from good governance of sustainability issues can include:

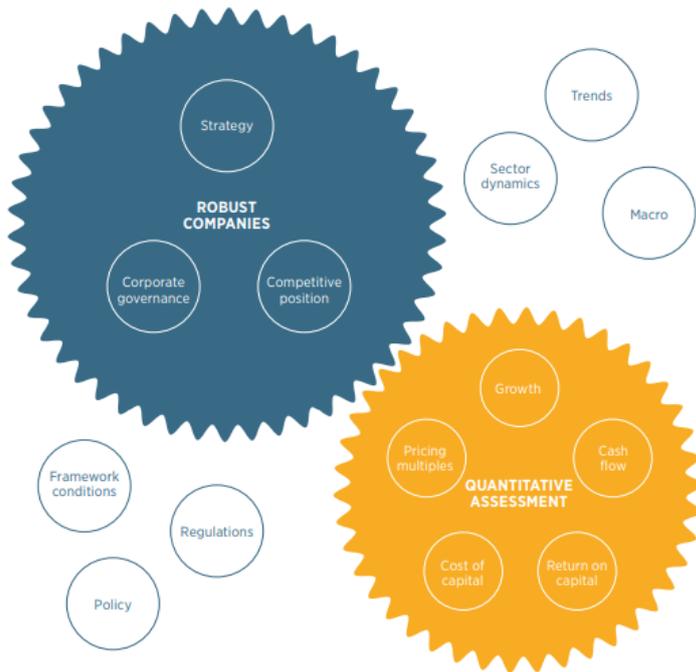
- Risk mitigation: the company may be less likely to be involved in controversies, which in the most severe cases can lead to penalties or legal actions against the company.
- Improved capital flow. The company may experience more confidence from banks and investors due to its risk management and public reporting. This may improve access to capital and reduce the cost of capital.
- Better decision making: if the company has good understanding of its stakeholders, risks and opportunities this will lead to better decisions, and all else equal, increased firm value.

2.3 STRATEGY AND RISK MANAGEMENT

The next step in conducting an ESG analysis is to understand the material risks the company faces (both positive and negative), and how the company's strategy for long-term value creation addresses these risks. These risks may be structural, such as increasing physical risk from climate change, or they may be idiosyncratic to a specific firm. **Section 2.5** describes the concept of materiality in more detail, with examples in **Section 3** of ESG issues likely to be material within particular industries.

Geographic exposure is likely to be a key factor in evaluating the company's ESG risk profile. Jurisdictions vary in the extent to which they regulate company activities that may have a negative impact on environmental or social issues, e.g. working conditions and benefits for employees. The impact of geography can be positive as well, e.g. for an industrial company with access to inexpensive renewable energy. Customer and stakeholder expectations may vary by geography. For example, Nordic companies found to be involved in severe environmental damage or worker rights abuse, whether through direct operations or in their value chain, can expect negative media coverage and the associated reputational damage as a result. By contrast, companies based in countries with more limited freedom of the press are unlikely to face the same level of scrutiny from stakeholders.

An analysis of ESG strategy and risk management does not necessarily differ from a traditional fundamental analysis. The specific issues and information sources may be new, but the methods are essentially the same. It is nevertheless important to think holistically about how the company interacts with, and is in turn, affected by environmental and social issues. The diagram below provides an example from Folketrygdfondet's investment process. ESG considerations may arise from several directions, such as new environmental regulations or policy goals, trends in consumer tastes towards more sustainable products, and technological innovations that change sector dynamics.



Source: Folketrygdfondet

A company’s competitive advantage (or disadvantage) when it comes to ESG can be its ability to quickly adapt to new legislation and proactively find solutions and utilize best practices, rather than lobbying against a long-term structural trend. Another advantage can be corporate culture, e.g. an innovative organization that looks for sustainability-related business opportunities and has the financial resources to develop and commercialize new products or services to meet emerging demand.

Case Study: Automobile Original Equipment Manufacturers (OEMs)

Development of electric vehicles and improved battery technology is moving fast, and as a result, sales of combustion engine vehicles will eventually be phased out. How car manufacturers meet this change that effects the entire industry varies. Some car manufacturers try to manufacture both electric and non-electric cars, some go all electric, and some are looking at alternative energy sources. How the company performs in the short to medium run will depend on multiple different factors, some external to the company and industry like political decisions on emission levels for cars and consumer preference, and some internal like the company’s ability to innovate, both financial and company culture.

2.4 EXAMPLE QUESTIONS FOR COMPANIES

The example questions below attempt to provide a generic framework for conducting dialogue with companies on their sustainability priorities in order to inform the analyst's analysis of company strategy. **Section 3** includes industry-specific examples for ESG topics likely to be material for the industry as a whole. The analyst should also tailor the questions to the company's business model, positioning within the value chain, and geographic exposure.

Governance

- What are the respective roles of the board and management in identifying and addressing ESG risk?

Strategy and risk management

- How does the company identify and address material ESG risks (both positive and negative)?
- To what extent is ESG integrated into the company's strategy?
- What does the company perceive as the most important long-term sustainability-related structural trends for the business?
- Where do you anticipate the company's sustainability work will be in 5-10 years? What are the main areas for improvement?
- How do the company's sustainability priorities affect its R&D strategy?
- How important is sustainability to the company's customers? Are they willing to pay a higher price and/or is sufficiently high performance a precondition for closing the deal (e.g. for a tendering process)?
- How does the company plan to comply with any coming environmental or social regulations, e.g. emissions requirements or increase in required employee benefits? Alternatively, is regulation necessary to drive new business initiatives forward, e.g. sufficient carbon price?

Metrics and targets

- Which key performance indicators and milestones/objectives should analysts look to in order to understand whether the company is successfully implementing its sustainability strategy?
- How does the company set its sustainability-related targets? How difficult are they to achieve?
- Which, if any, sustainability-related KPI's are integrated into management incentives? How?

2.5 MATERIALITY MATRIX

Whether ESG is a risk or opportunity, short or long term, macro or specific to a corporate, we aim to show how it may affect company valuation. Not all sustainability factors are relevant to all companies or will be relevant in a financial context. Indeed, companies will tend to address sector challenges and opportunities differently and will have distinct risk exposures based on their specific operational footprint. It is therefore necessary to look at companies on a standalone basis to identify specific risks and opportunities related to such factors in the long term. Analysts need to identify which ESG-related factors are likely to be financially material.

The International Accounting Standards Board provides the following definition of financial materiality:

Materiality is an entity-specific aspect of relevance based on the nature or magnitude, or both, of the items to which the information relates in the context of an individual entity's financial report. Consequently, the board cannot specify a uniform quantitative threshold for materiality or predetermine what could be material in a particular situation. (IASB QC11)

In the US, materiality is the criterion regulators apply for disclosure of investment-relevant information by companies. SEC Rule 405 defines materiality as “*those matters to which there is a substantial likelihood that a reasonable investor would attach importance in determining whether to purchase the security registered.*” (SEC, 1999)

Note that the above definitions are different from the concept of materiality used in many reporting frameworks, such as the Global Reporting Initiative:

Materiality

1.3 The report shall cover topics that:

1.3.1 reflect the reporting organization’s significant economic, environmental, and social impacts; or

1.3.2 substantively influence the assessments and decisions of stakeholders. (Global Reporting Initiative, 2016, p. 10)

This guide adopts the more narrow definition of financial materiality than GRI, focusing on shareholders as stakeholders, as the purpose is to provide advice on how to incorporate ESG information into a valuation. Materiality in this sense determines which long-term economic, governance, social or environmental factors are likely to have the most significant impact on a company’s growth, cost or risk, and ultimately, future financial performance.

The analysis of material factors should be done along different time horizons and probabilities of occurrence. The factors of greatest probable financial impacts will be highlighted in the materiality matrix and prioritized. It is important to note that an analysis of material ESG issues is therefore distinct from ESG scoring or assessments of a company’s sustainability performance as such. The goal is not to determine how sustainable a company is, but rather, how sustainability and governance-related factors might influence the company’s financial performance over the long term.

As the *PRI/CFA Institute Guide to ESG in Equity Analysis and Credit Analysis* explains:

ESG integration involves integrating only the material ESG issues that are considered highly likely to affect corporate performance and investment performance:

- *If ESG issues are considered material, an assessment of their impact is carried out.*
- *If ESG issues are analysed and found not to be material, an assessment is not carried out.* (PRI/CFA institute, 2018)

The Sustainable Accounting Standards Board (SASB) attempts to identify the material ESG issues at an industry level that are financially relevant for investors. (SASB, 2018) The framework identifies the sustainability-related risks and opportunities most likely to affect a company’s financial condition (i.e. its balance sheet), operating performance (i.e. its income statement), or risk profile (i.e. its market valuation and cost of capital) in the near, medium, or long term.

A materiality matrix provides a framework for relevant countries and sectors to help incorporate environmental, social and governance risks and opportunities in the investment process by using fundamental analysis and assessing the materiality of the issue at stake. Sector assessments identify key common sustainability challenges and opportunities relevant to a certain business activity. When of particular relevance, country and sector level analyses may be combined for certain business activities in certain geographic areas.

The PRI (PRI/CFA institute, 2018) as well as Lydenberg, Rogers & Wood (2010) in a report for the Initiative for Responsible Investment at the Hauser Center at Harvard University (Wood, 2010), define some of the risks and opportunities related to each of the ESG factors in a materiality matrix:

<i>Environmental</i>	<i>Social</i>	<i>Governance</i>
Climate Change Management Biodiversity Water Pollutants and Emissions Materials & Waste	Working conditions (incl. Child and forced Labour) Health and Safety Diversity in Workforce Stakeholder Engagement	Business Model Standards & Codes of Conduct Executive compensation Bribery and Corruption Board diversity & Structure

Product & Operational Efficiency Product Environmental Impact Product Quality and Innovation Energy Resource Depletion	Local communities Conflict Training and Development Sourcing & Supply Chain Data privacy Product safety	Tax Strategy Lobbying and Political Contributions
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Table: Lydenberg, Roger & Wood (2010), p. 19

A materiality matrix analysis at the company level should consider material ESG factors at an industry level and assess how the company addresses these factors on a forward-looking basis. The analysis should build upon the analyst’s knowledge of the company and the industry. For example, how does the company’s specific business model or placement in the value chain heighten or mitigate ESG risks common to its industry?

To be sure, the specific ESG issues likely to be material to a company or industry can evolve over time, a concept known as “dynamic materiality.” (Thomas Kuh, 2020) This can be due to, for example, changes in stakeholder expectations. The pace of change, driven by revised or new regulations, innovation and disruptive technologies will impact materiality matrices over time. This is an important consideration for investors as it implies financial impacts may materialise over a period much longer than what is considered for traditional financial reporting. As a result, a materiality analysis should take account of the relevant time horizon for investment, as well as the investor’s risk tolerance. Long-term investors or asset owners might have different preferences than investors with shorter term horizons. What long-term investors deem material might differ from investors focusing on a two to three-year horizon.

3 INDUSTRY-SPECIFIC ESG ANALYSIS: EXAMPLES

In our experience, a solid understanding of industry risk and profitability is critical in order to identify potential ESG threats and opportunities. These include exposure to positive or negative long-term sustainability-related trends. What the material company specific issues are may vary, but most of them will be common within an industry. We thus recommend that the analysis starts with an industry perspective.

The industries discussed in this section represent several of the largest on the Nordic stock exchanges. We have also included examples from sectors that are smaller in a pan-Nordic context, such as oil service/offshore, but that represent interesting cases for ESG integration. This is not an exhaustive list and there are certainly many good candidates for inclusion that were unfortunately left out due to time constraints.

In order to place ESG information into context, we highlight the main value drivers for each industry at an overarching level. Nevertheless, we focus on the ESG issues most likely to be material within each sector, with examples from Nordic companies. For sectors not covered in this guide, the SASB Engagement Guide for Asset Owners and Managers provides a list of suggested questions for all major sectors (SASB, 2019).

3.1 CONSUMER GOODS

3.1.1 Staples

Within the Nordic countries, the consumer staples sector comprises primarily companies that produce food and beverages or household personal products. These include fish farmers, such as Mowi and Salmar in Norway; alcoholic beverages producers like Carlsberg in Denmark; and consumer packed goods companies, such as Swedish Essity.

Companies in this sector face more stable demand trends than their counterparts in the discretionary sector. At a basic level, the key valuation drivers are margin and growth expectations. The example companies listed above vary in the extent to which they are able to command a price premium based on their brand, as opposed to more commodity-based pricing. On the cost side, the salmon farming sector stands out in terms of geographic-based supply restrictions. Barring technological innovations to scale up land-based production, salmon farming occurs only under specific coastal conditions, subject to government permits (Mowi, 2020). Salmon farming also entails a higher level of operational risk, as escapes or diseases can wipe out large swathes of production instantaneously. For consumer and packaged goods producers, there are generally fewer barriers to supply and more diversified operational risk. Salmon farmers also tend to control nearly the entire value chain, which is unusual for other consumer staples companies.

For salmon farming, the main ESG risk factors derive from **fish biology**. Stable production depends on keeping fish healthy and preventing escapes. This requires companies to take steps to prevent the spread of disease and salmon lice, as well as to treat infected fish. Harsh treatments can also impose physical stress on salmon, leading to reduced growth and potentially, mortality. These effects affect both revenues (total production) and costs (prevention and treatment measures). Fish escapes result in an obvious hit to top-line revenues, but may also include negative externalities for wild salmon populations. Mortality among cleaner fish used to remove lice represents another negative externality. Most of the ESG considerations named here have a direct impact on the bottom line. For those that do not, it is important to remember that salmon farmers depend on licenses issued by public authorities. Regulators can therefore address negative externalities through additional concession requirements and/or industry-specific taxation.

Potential questions for salmon farming companies:

Question	Implication
What are the causes the company has identified for any previous disease outbreaks? What measures have been taken to prevent future outbreaks?	Designed to gauge the probability of downside tail risk due to disease. The company should include information on past outbreaks in its reporting, as well as slaughter weight (a rough measure of fish health).
What is the company’s strategy for addressing the risk of salmon lice? Which treatments do you intend to use going forward?	Designed to gauge the probability of downside tail risk due to salmon lice. The company should include historic information on salmon lice per region in its reporting.
What measures has the company taken in response to any previous escapes?	Designed to gauge the probability of downside tail risk due to escapes. The company should include information on past escapes by region in its reporting.

Consumer staples firms tend to face the risk of **labour rights and animal rights abuses, as well as environmental violations in their supply chains**, which can lead to reputational damage and potentially supply bottlenecks as well (e.g. through worker strikes). The risk generally increases with supply chain complexity and exposure to jurisdictions with weaker social and environmental

protections. In the agricultural sector, labour and human rights challenges include poor worker conditions, land rights disputes, and child labour, among others. Environmental risks include deforestation, pollution and water usage in drought-prone regions. Examples include campaigns against the use of palm oil in Norwegian confectionary products and NGO criticism of the use of Brazilian soybeans in fish feed. Although it is difficult to eliminate, companies can mitigate the risk through supplier monitoring, training and audits, use of certification schemes, and industry-level initiatives to raise market standards. Product traceability is another measure to reduce the risk (as well as ensure product quality).

Potential questions for consumer staples companies:

Question	Implication
What is the company’s level of traceability from the individual supplier to the end product?	Designed to gauge the probability of downside tail risk due to supply chain incidents.
What are the company’s environmental and social standards for suppliers and how does it assess compliance?	Same as above
How does the company prioritize suppliers for ongoing assessment (e.g. by % spending) and how often does it conduct this assessment?	Same as above
How does the company address supplier non-compliance? Can you provide any examples?	Same as above

Climate transition risk is an ESG issue of growing importance for consumer staples companies. The effect can be positive or negative. For example, salmon farmers may face tailwinds from increased awareness of fish as low-carbon protein source relative to meat. Consumer packaged goods companies can develop products designed to meet consumer preferences for more sustainable products, which includes both the product itself and the climate impact from its packaging. This may be part of product branding.

Another way in which climate transition risk can affect consumer staples companies relates to their energy and water use. Stricter environmental regulations designed to address the causes and consequences of climate change could affect the company’s access to and cost of obtaining these inputs, as well as the economics of recycling the company’s products and/or packaging materials.

Potential questions for consumer staples companies:

Question	Implication
What does the company anticipate to be the long-term trend in its customers’ preference for “climate-friendly” products?	Should the analyst adjust future cash flows to reflect the company’s ability to meet shifts in long-term consumer preferences?
To what extent do climate considerations affect the company’s R&D strategy for product development? Could you provide some examples?	Should the analyst adjust forecasted capex needs?
What are the key sources of the company’s climate emissions footprint?	Will the company require additional opex to cover emissions-related costs (e.g. EU ETS) or capex to reduce emissions (e.g. convert factory to run on renewable energy)?

Consumer staples companies tend to face **physical climate risk** in their supply chain, e.g. crop failure due to drought or flooding, or in their direct operations. This can increase the price of raw materials, e.g. for feed or other inputs, thereby weakening gross margins. For salmon farming, higher ocean

temperatures improve growth up to a point. If the temperature is too high, however, the risk of disease outbreaks and algal blooms increases.

Potential questions for consumer staples companies:

Question	Implication
What has the company identified as its material physical climate risks in the supply chain and what is the strategy to address these?	Attempt to gauge vulnerability to assess the probability and potential impact from downside tail risk
(For salmon farmers): How has the company assessed physical risk in the company’s concession areas? What is the company’s strategy to address identified risks?	Should the analyst include provisions for additional investments in climate mitigation, assess tail risk for concessions concentrated in a specific region?

Lastly, **pollution from packaging** is an ESG concern in its own right, in addition to the climate footprint of different packaging materials. Recent regulatory measures such as the EU Single-Use Plastic Directive illustrate growing awareness of the problem of plastic pollution in particular. Consumer preferences for sustainable packaging have grown in tandem. Companies have responded through innovation to both reduce the amount of packaging used and ensure that it can be recycled. Beverage producers have also begun to support deposit return schemes, seeking to shape their design, rather than oppose their creation outright (Coca-Cola Australia, 2020).

Potential questions for consumer staples companies:

Question	Implication
What percentage of product packaging is currently recyclable? Does the company have any targets to increase this percentage?	Should forecasts include increased outlays for additional R&D or opex to meet packaging targets?
What are the technical, financial or regulatory barriers to doing so?	Same as above

Illustrative (not exhaustive) examples:

ESG-related financial impact matrix	Labour rights and environmental challenges in the supply chain	Increased customer preferences for sustainable products	Physical climate risk
Time horizon	Short term and long term	Short term and long term	Long term
P&L effects			
Revenue	Loss of sales through reputational damage	Increased (decreased) revenue depending on shift in customer preferences toward (away from) company’s product portfolio	Lower sales volume due to reduced access/higher prices for key input
Opex	Increased costs due to more limited access to inputs, to meet certification requirements, or to secure new suppliers with more rigorous	Higher unit costs for more sustainable materials, reduced costs from any energy efficiency/resource utilization improvements	Higher (lower) operating costs due to crop failures, increased (decreased) disease and growth conditions for a specific salmon farming concession

	social and environmental standards		
Capex	--	R&D to develop more sustainable products	Investments needed for climate resilience, e.g. de-icing of salmon farming facilities
Balance sheet effects			
Liabilities/provisions	Fines/litigation in worst cases	--	--

3.1.2 Discretionary

The Consumer Discretionary sector includes automotive, household durable goods, leisure equipment, textile and apparel, luxury goods, consumer retailing and services, and hotels and restaurants. In the Nordic context, the sector spans a wide range of companies including Hennes & Mauritz, Zalando, Pandora, Electrolux, Boozt, Fiskars, Bygghem, Clas Ohlson, Scandic Hotels and Radisson Hospitality.

The consumer discretionary sector is similar to consumer staples in terms of the main drivers of valuation. It is more cyclical, however, as it by definition includes products that are not necessities. As a result, the industry is more volatile in response to changes in consumer preferences. For example, the industry is typically more exposed to social media campaigns related to the real or perceived sustainability characteristics of the company's products. Also, in contrast to companies in the consumer staples industry, consumer discretionary firms tend to be more directly involved with their end customers, for example, by selling directly to consumers through own stores.

This section focuses on the retail segment as an example to illustrate how sustainability-related analysis can affect the analyst's forecasted cash flows. The industry has developed at a very fast pace over the past decade. The retail segment faces challenges as consumers expect fashion to be affordable, trendy and fast-paced. The shift from physical to online shopping has been a key disruption for traditional retailers.

Consumer are increasingly paying attention to the sustainability profile of retailers and of their respective product mix. The sustainability of the business model of retailers can be challenged when significant issues, for example labour issues, come to the public's attention. Major issues such as child labour in the supply chain or poor labour practices may impact the company's license to operate with significant brand impairment. (AccentureStrategy, 2018)

Online sales have grown, accounting for example for over 20% of total global sales in the luxury segment in recent years (Bain & Company, 2018). The uptake of direct retailing and e-commerce heightens risks associated with labour practices and increased employment costs. The significant increase in online shopping demands retailers be able to handle returns. Estimates for returns of online purchases range from 15% to over 30%, compared with estimated return rates of 3% to 10% for in-store purchases (Kier, 2020). Returns are costly due to shipping and handling costs, and value loss when products stay out of circulations. Return volumes therefore impact both sales volumes and inventories, and also increase the environmental footprint of online sales.

Based on how retailers tend to address sustainability challenges and opportunity at different stages of their value chain, the materiality of sustainability factors will differ.

Potential revenue impact

The potential revenue impact from sustainability-related concerns depends critically on the company's customer base. While interest in sustainability in global comparison ranks highly among Nordic, and

particularly young, customers, the relative importance of price or garment quality is likely to rank far higher in other regions.

Product environmental footprint

Sustainable consumption is increasingly becoming a relevant theme, particularly in the Nordic markets. Since about 2017, awareness about the harmful environmental effects of plastics on ocean life became a major theme that began to affect consumer preferences – at least in Europe and North America. The emergence of new regulations reflect this trend. This is a new challenge for retailers, including companies that sell garments made of synthetic materials.

It remains an open question whether sustainability trends are an existential threat to fast fashion business models in particular. Potential responses may include shifting focus to regions where sustainability concerns are less salient, testing rental clothing models, and increasing transparency about clothing origin to allow for sustainability labelling of specific items. The analyst will have to decide to what extent these measures are likely to materially affect revenue projections.

Supply chain management is critical in reducing risks to the company's reputation. The large product portfolio sold by retailers requires an extensive and complex supply chain. A solid sourcing strategy and audit of supply chains can help protect brand value and reduce the risk of revenue impairment. Examples of negative supply chain events on revenue include scandals involving labour conditions within supplier factories. For example, Boohoo faced negative publicity in 2020 following allegations of poor working conditions at a supplier factory in the UK, including wages below the legal minimum (Caroline Wheeler, 2020). Although the revenue effects were not immediately clear, the Boohoo share price dropped 16% within the first day following the news report (BBC, 2020).

Supply-chain related risks may also derive from the company's dependence on sourcing raw materials with high environmental impacts, such as cotton or leather. Sustainable sourcing policies that emphasize traceability and certifications schemes can help mitigate these risks.

Potential impact on OPEX

Supply chain management and resource efficiency

Sustainable sourcing and selection of items to stock can reduce the environmental footprint of retailers. The impact on operating costs depends on the measures taken. For example, while improved resource efficiency, all else equal, has an unequivocally positive impact on operating costs, switching to more sustainable materials may involve higher costs. The margin effect would then depend on the company's ability to demand a premium for more sustainable products.

The adoption of circular business models can be a key strategic move to respond to consumer expectations, enabling retailers to eliminate waste, drive positive impact across the value chain and improve competitiveness. Circular business models can take different forms that can impact both revenues and operational expenses. Here are a few examples:

- *Circular supplies*: This approach replaces scarce or polluting raw materials with renewable, recyclable or biodegradable ones. For example, H&M Group has committed to use recycled or other sustainably sourced materials in all its products by 2030. (H&M, 2019) However, this ambitious goal might be challenging when considering the speed required by fast fashion cycles.
- *Recycling*: Nike's Flyknit technology is an example of using new production processes to reduce waste and resource leakage (Nike, 2019), saving valuable material, components and energy. On average, waste is down by 60% compared with cut-and-sew shoe manufacturing. (Liu, 2016)

- *Product life extension*: The retailer aims to buy back clothing purchases customers no longer use. The retailer will give the consumer a coupon for future purchases for each bag of old clothes returned (Webb, 2020). The garments collected are resold, refashioned into new textile products, or recycled.

The analyst will have to determine the extent to which the above measures are likely to materially affect future operating costs.

The rise of online shopping has required significant investments in cyber security. An increasing amount of data is gathered on each customer’s habits and preference, which entail opportunities but also challenges in exploiting this data. Any data breach can affect customer loyalty and retailers will need increased IT spend to reinforce data security systems. Increasing privacy regulations globally have increased compliance costs. At the same time, increased compliance regulations tend to favour the largest incumbent players over smaller upstarts that lack the resources to navigate complex regulations.

Balance sheet:

Inventory management has to adapt to new emerging business models driven by increased focus on supply chain management. Inventory management is important due to the speed in the retail market. The company’s supply chain strategy is critical in meeting the market demands with adequate speed. Heavy reliance on production in a single geographic region located far from the end customer can make supply chain lead times significantly longer than those of competitors. For example, the recent pandemic highlighted the vulnerability inherent in relying on a concentrated Asian manufacturing hub (Russell, 2020).

The move towards a new circular economy may drive companies to rethink strategies that will impact their finished product inventories. For example, Ikea is experimenting with furniture leasing and will expand this to several markets. Under the program, customers rent their furniture for a set period before returning it for refurbishment, upcycling, resale or recycling. (IKEA, 2019) This type of product-as-a-service offering would, if rolled out in sufficient scale, impact current and future inventories on the company’s balance sheet.

Potential questions for retail companies:

Question	Implication
<p><u>Circular economy</u> Do you have a strategy to transition to a new circular economy? Are you transparent on the sustainability of your product offering? Do you measure the sustainability footprint of your product mix? Do you disclose KPIs and new long-term sustainability-related targets? How do you consider the health implications of your product mix? What is the company’s strategy to address the shift to online shopping?</p>	<p>This set of questions is designed to gauge the strategy to capitalize on the shift to a circular economy and new customer preferences.</p> <p>This is to assess how the company measures and targets sustainability KPIs in its operational processes and product mix</p>
<p><u>Supply chain management</u> How complex is your supply chain? How often do you audit supplier operations? What types of traceability procedures are in place?</p>	<p>This set of questions is to assess the vulnerability or strength of sourcing practices. Complex supply chains increase potential risks at different levels, and will require thorough procedures to manage these risks. This will help</p>

<p>What is the average length of commercial relationships with your suppliers? What is your process to approve new suppliers? Do you have a responsible sourcing policy?</p>	<p>assess tail risks associated with potential breach of human rights and labour rights in the supply chain, or potential disruptions to raw material supplies.</p>
<p><u>Resource efficiency</u> What are your environmental programs to improve resource efficiency and minimize environmental impacts? How do you source raw materials such as cotton or leather in a sustainable manner (e.g. use of certification schemes)? What is the energy efficiency of your operations? Do you have plans to reduce the carbon footprint of your operations, including transportation and freight?</p>	<p>This will help evaluate the potential implications for the company's long-term cost base through changes in the materials used and the company's resource efficiency.</p> <p>Traceability of product is becoming a customer requirement and a lack of focus on this issue can impact revenue growth.</p> <p>Transparency on consumer products' environmental footprint is increasing and new trends around local product consumptions are accelerating with implication for long-term growth opportunities.</p>
<p><u>IT investment and cyber security</u> What processes have you implemented to manage access to sensitive customer data? How much has been invested in cybersecurity technologies? Have you experienced a cyberattack? If so, what was the financial impact?</p>	<p>The move to online shopping entails new infrastructure requirements to protect against cyber-attacks or sensitive data leaks. This set of questions can help assess potential tail risks.</p>

Illustrative (not exhaustive) examples:

ESG-related financial impact matrix	Trend towards more sustainable consumption preferences	Supply chain labour issues	Circular economy
Time horizon	Short term and long term	Short term and long term	Long term
P&L effects			
Revenue	Sustainable product mix (esp. if offered at a premium)	Sales decline through reputational risk, both with end customers and third party platforms that sell the company's products	New revenue models with product leasing, reuse, etc.
Opex	Potentially higher wage or input costs to meet sustainability requirements	Costs associated with handling supply chain disruption, e.g. cost of immediate switch to new suppliers	Potentially higher input costs to ensure product quality is sufficient to permit reuse
Capex	R&D to improve sustainability characteristics of existing products	--	Investments needed to build new business model, e.g. platform for rental, logistics

	Innovation for new technology, online platform, digitization.		operations for product collection and reuse
Balance sheet effects			
Assets	Inventory management	Loss to intangible value of brand	Intangible value of brand, potential write-downs for obsolete inventory under new business model

3.2 ENERGY

3.2.1 Oil and gas exploration and production (E&P)

Companies in E&P sell a commodity product subject to high levels of price volatility. Return on equity for E&P companies is typically low across an entire cycle due to cost inflation when oil prices increase. Therefore, investors tend to emphasize dividend payments and share buybacks in pricing E&P company shares. Demand dynamics include overall GDP growth as well as growth in energy intensive industries, such as transportation and power production. On the supply side, geopolitical developments in key oil producing markets contribute to price swings (e.g. sanctions against Iran and Venezuela). The Organization of Petroleum-Exporting Countries (OPEC), a cartel of oil producers, also limits supply artificially through agreements to hold back production. Since the mid-2010's, new developments in hydraulic fracturing ("fracking") technology permitting horizontal drilling have been a key factor in vastly expanding global oil and gas supply. Moreover, fracking is a more flexible source of supply than, for example, offshore oil and drilling projects, which typically take a decade or more to develop. As a result, oil price peaks have been far less durable since 2014.

It is important to differentiate between the oil and gas market, as gas has traditionally been a regional, rather than a global market. That is changing due better transportation options with liquefied natural gas, but suffice to say the dynamics differ between the two markets.

On the cost side, E&P companies vary in their field positioning on the cost curve. Generally, oil that is more difficult to extract (e.g. due to location or product quality) will be more expensive and more carbon-intensive. Field location is a key source of both environmental and geopolitical risk.

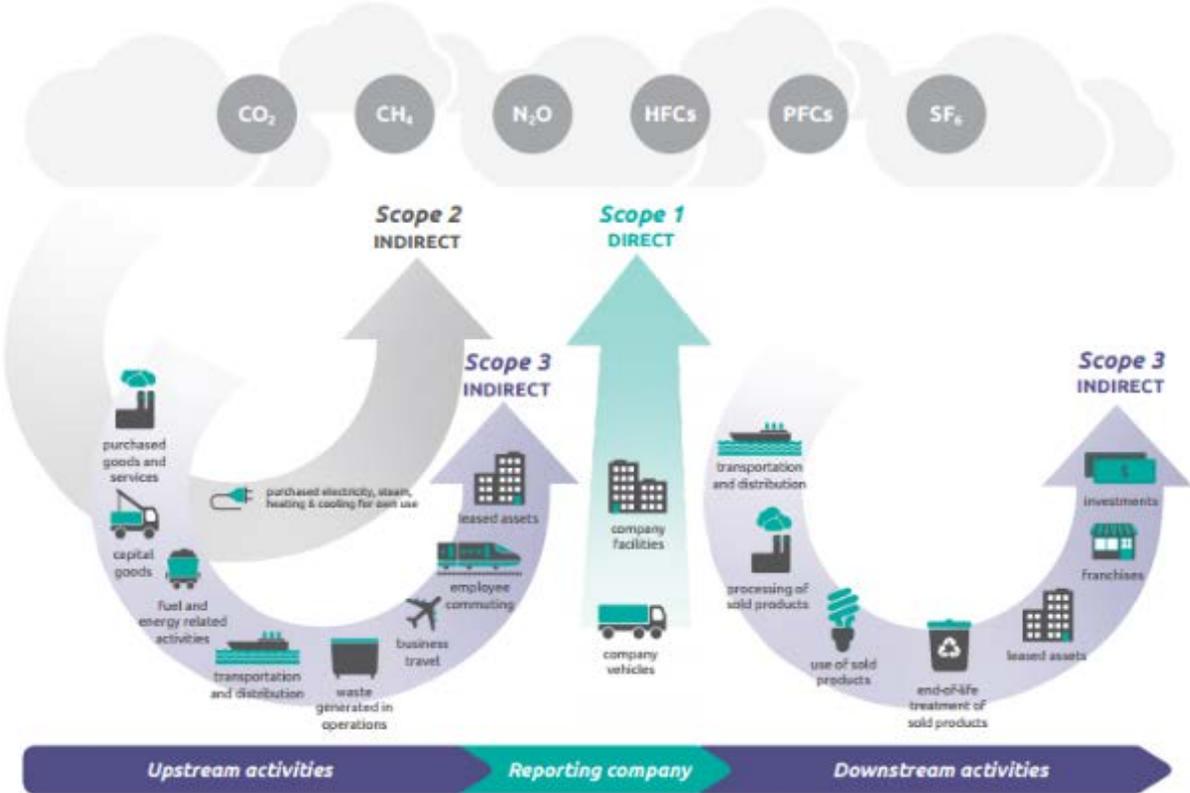
From the end of 2018 through early 2020, there was a dramatic multiple contraction for E&P companies. The corresponding multiple expansion for renewables firms suggests climate-related investor focus is at least a partial factor explaining this development. Anecdotally, although project-by-project discounted cash flow models are considered the gold standard for valuation, use of multiples techniques remains more widespread for the E&P sector. Historically, multiples tended to closely track dividend yields. This appears to have changed since 2018, consistent with the significant rating contraction for E&P companies.

Lastly, although **Part 2** of this guide includes a comprehensive discussion on use of adjusted discount rates to reflect ESG considerations, there are anecdotal examples of investors making beta adjustments to reflect expected investor preferences.

Environmental risks include water consumption, climate transition risk, and pollution through spills and leaks. Over the past decade, there have been major changes in companies' approach regarding climate change (e.g. proliferation of carbon emissions reduction pledges). NGO campaigns and climate-related shareholder proposals actively target E&P firms. The industry has become a flashpoint for divestment campaigns. The dominant environmental and macro theme affecting the long-term prospects of the industry is the global commitment to transition to a low carbon economy.

Looking to the emissions profile of an oil and gas company, direct emissions from the company’s activities and power purchases (Scope I and II, respectively) typically amount to roughly 10% of overall lifecycle emissions. The remaining 90% derive from customers’ burning of hydrocarbons (Mathis, 2020). Unless a company’s activities include refining or the operation of gas stations, it typically has few levers available to reduce scope III emissions, barring a shift in the company’s production mix from oil to lower carbon fuels such as natural gas.

Illustration of Scope I, II and III Emissions in Company Value Chains



Source: (Greenhouse Gas Protocol, 2016)

The role of gas in decarbonisation remains unclear. Nevertheless, switching from coal-fired to natural gas power generation (even in the absence of carbon capture and storage) could significantly reduce emissions prior to the large-scale rollout of emissions-free technologies. The IPCC therefore identified natural gas power generation as a “bridge technology”: preferable to coal in the short term, but not a long-term solution for decarbonizing power generation (The Intergovernmental Panel on Climate Change, 2014, p. 21). Naturally, changing the company’s production mix between two different commodities would affect expected cash flows.

Climate transition risk for E&P companies derives from technological innovation, carbon pricing and other regulatory measures, as well as the withdrawal of industry subsidies. These risks vary significantly depending on the individual company’s exposure to carbon pricing regulations, type of fossil fuel extracted, as well as field positioning on the cost curve.

One of the main climate-related concerns for E&P companies relates to the risk of **stranded assets**. Popularized in the 2014 report from NGO Carbon Tracker Initiative, *Unburnable Carbon*, this concept refers to the risk that achievement of the two-degree scenario would prevent E&P companies from extracting current reserves in the future (Carbon Tracker Initiative, 2014). The premise is relatively straightforward: the authors multiplied the proven reserves of listed coal, oil and gas companies,

multiplying each reserve type by an estimated emissions factor (Carbon Tracker Initiative, 2014, p. 6). The total estimated emissions potential of 745 GtCO₂ exceeds the 565 GtCO₂ estimated remaining global carbon budget per 2014 (for all activities – not fossil fuel extraction alone) under a two-degree scenario (Carbon Tracker Initiative, 2014, p. 8). Coal reserves alone account for over half of the 745 GtCO₂. Hence, listed companies will be unable to extract all proven reserves under a two-degree scenario; nor will they be able to add any new reserves.

Critically, the stranded assets valuation argument rests on the premise that energy companies are valued based on their reserves (accounting values), and that the risk of stranded assets is not already reflected in companies’ stock prices. These assumptions are not obvious. As evidence, Carbon Tracker points to the share price impact of Shell’s reserve restatement in January 2004 to indicate that “an oil major’s reserves contribute around 50% of the financial value attributed to the company by investors.” (Carbon Tracker Initiative, 2014, p. 19). Setting aside the wisdom of extrapolating the share price impact of a single company announcement to make a broader conclusion about the correlation between share prices and reserve values for an entire sector, calculating E&P equity prices from reserve values is far from a straightforward exercise. Not only are there challenges in using book values to estimate market values, but reserve values (measured as revenue per barrel of oil equivalent) measure only top-line impact, ignoring tremendous variation in the costs of extraction and therefore, reserve profitability. Rather, the biggest risk of stranded assets concerns undeveloped reserves.

For a traditional DCF valuation, the stranded assets argument about unburnable carbon is perhaps better understood as the risk to long-term volume and price forecasts given climate-related constraints. These include, for example, changes in demand due to technological development, as well as regulatory costs, such as long-term CO₂ tax assumptions. Admittedly, changes to companies’ long-term oil price assumptions would require reserve write-downs. Nevertheless, the sources of error in using reserves for valuation are so numerous that analysts should exercise caution in discarding a discounted cash flow in favour of a reserves-based valuation approach.

E&P companies differ in their strategies with respect to **renewables**. While some remain pure players focused on oil and gas, others have begun to diversify into renewables. There are examples of both in the Nordic universe. Regardless of the strategy chosen, it is important for the analyst to understand the implications of the chosen strategy for margins, dividend payments, and capital structure going forward.

In terms of **pollution**, the nature of the operating environment as well as the relevant regulatory framework affect the risk level. For example, the risk and impact of spills is greater in harsh environments that complicate clean-up efforts.

Environmental impact and water consumption are additional factors that might affect the project cost base, future liabilities and capex. Water is used in large quantities for drilling, hydraulic fracturing and oil sands operations. It is also consumed in downstream activities such as steam generation and cooling. Improving water consumption efficiency and recycling will affect the operational cost. Managing environmental risk appropriately can reduce the risk of financial penalties in the future. The analyst will need to assess the level of environmental provisions and their adequacy in light of the company’s risk exposure and operational practices.

Potential questions for oil and gas companies:

Question	Implication
What are your long-term carbon price assumptions?	As the carbon price assumptions rise, so too will the expected returns the company demands for new oil and gas projects. For E&P firms with a renewables portfolio, project economics are even more sensitive to carbon price assumptions

	than for oil and gas projects. A higher carbon assumption price could therefore accelerate a shift towards renewable energy production, while incentivizing more modest optimization among individual assets in the oil and gas portfolio.
How are world governments' long-term climate commitment integrated in your long-term strategic planning? What are the different scenarios you are running and what are their financial implications? What probability do you assign to each scenario?	How resistant is the company's current portfolio to changes in the speed and scale of government responses to climate change?
Particularly for firms involved in hydraulic fracturing: Do you quantify water-related costs? What percentage of water is recycled or reused in the company's operations?	Particularly for companies operating in water-stressed areas, increased water demand combined with future environmental regulations could require additional investments to reduce or recycle water usage, as well as adjusted expectation for water-related opex.
Are their scenarios in which the amount of environmental provisions on your balance sheet might increase?	Provision adjustment

Geographic constraints on E&P (hydrocarbons are where they are) pose a range of social and governance challenges for companies. The latent risk of **corruption** is high for operations in countries with weak governance structures, combined with an industry dependent on large-scale contracts with authorities. The Petrobras scandal, in which politicians and company officials received a combined total of several billion USD in bribes through supplier overbilling represents a high-water mark for corruption in E&P (The United States Department of Justice: Office of Public Affairs, 2018). The sophistication of the company's risk assessment and compliance program should be commensurate with the risk.

Relations with local communities and authorities are another key factor for E&P companies, particularly for operations in less developed countries. Poor relations (e.g. demonstrated through protests or disagreements about local content requirements) can result in delays, and even cancelled projects.

Worker health and safety, including both the company's employees and its contractors, is a factor that typically receives little attention until something goes wrong. The downside tail risk from work accidents can be enormous, as illustrated by the BP Deepwater Horizon blowout in 2010 (Busso, 2018). Anecdotally, the authors are unaware of any examples of the inclusion of health and safety factors *ex ante* in E&P valuations, due to the low probability of this type of tail risk in any given year. The dramatic impact on valuation *ex post* of an accident like Deepwater Horizon is, however, undisputed.

Potential questions for oil and gas companies:

Question	Implication
What percentage of employees received annual training on health and safety?	Indication of tail risk for work accidents
Percentage of sub-contracted workforce? How do the injury and near-miss statistics for contractors compare to those of employees?	Indication of tail risk for work accidents

How does the company engage with local communities? Do you have a formal program for local grievances?	Indication of tail risk from community grievances (e.g. exploration near traditional fishing communities), which could lead to project delays or cancellations
What is the company's exposure to anticorruption regulation such as the US Foreign Corrupt Practices Act or the UK Bribery Act? Has the company been sanctioned for corruption violations previously?	Suggests tail risk of substantial fines, particularly for companies with previous violations
To what extent does the company rely on sales agents versus own employees for entering contracts in high-risk jurisdictions?	Use of agents typically carries a higher risk as they are more difficult to monitor than employees

Illustrative (not exhaustive) examples:

ESG-related financial impact matrix	Extension of carbon pricing to new geographic regions	Corruption	Well blowout
Time horizon	Short term and long term	Short term and long term	Short term and long term
P&L effects			
Revenue	--	Potential loss of concessions	Project stop; reputational damage could negatively impact competitiveness for future bids
Opex	Increased opex for companies with new carbon price exposure (e.g. through extension of carbon pricing scheme to new region).	Bribes may be baked into reported opex; new compliance requirements require hiring of staff, greater administrative oversight	--
Capex	May require new capex to reduce carbon-intensity of existing infrastructure, avoidance of projects that no longer meet the company's return requirements under new carbon price expectations	--	Investments to replace damaged or destroyed assets
Balance sheet effects			
Liabilities/provisions	Write-downs of any fields that are no longer economic under new carbon price expectations (e.g. many oil sand fields from 2014-20)	Fines/litigations, particularly from US authorities	Cost of fines/litigation, compensation to workers'/contractors' families

3.2.2 Renewables

While “renewables” is not a sector as such, this section is meant to address both utilities with renewable energy production, such as Danish Ørsted or Norwegian Scatec Solar as well as non-utilities, such as Nel or Bonheur in Norway, that are direct suppliers to renewable energy producers. For valuation, key factors include assumptions for relative energy prices and volumes, as well as the type of production contract (e.g. market rates or fixed price), and technologically driven cost reductions. Maintenance of existing projects and farm-downs (sales of project equity to outside investors) may also form significant revenue components. Ideally, the analyst should value renewable producers project by project, but companies do not always provide enough granular information to make this feasible. Renewable energy projects typically require high upfront capex, but with a long project life and (compared to the oil and gas sector) relatively stable, but typically more modest cash flows.

From 2018-2020, these companies experienced a significant multiple expansion relative to their E&P counterparts. For utilities in particular, exposure to renewable energy has transformed the sector from a staid, bond proxy to a growth sector. Among the Nordic renewables firms, there are also significant differences in the extent to which valuations rest on exponential growth, as well as differences in current profitability.

Climate change dominates ESG considerations for renewables companies, given the forecasted explosion in demand for “green electrons.” The emissions goals of companies in many of the other sectors listed in this guide depend on greater electrification, along with renewable power sources. **Climate transition risk** for this industry is thus primarily positive. Technological innovation could nevertheless make certain renewables technologies obsolete. Moreover, increased competition and cost innovation can lead to commoditization of technologies currently considered cutting-edge. Analysts will need to determine whether the company is likely to maintain a lasting competitive advantage over time, as well as the extent to which size and scalability may grow in importance as the various sub-industries mature.

Regulation designed to incentivize the production of renewable energy, often through subsidies, purchasing power agreements or favourable tax agreements, form another example of climate transition risk for renewables. The form and timing of these regulatory measures are a key input needed to accurately estimate future cash flows. Unfortunately, companies seldom report this information in detail at the project level.

The material social risks differ significantly among firms within this category. For large-scale utilities, the “**Not In My Backyard**” (NIMBY) phenomenon can be a significant source of local community and regulatory pressure. This is particularly true for onshore wind and for hydropower production, although offshore wind (e.g. off the coast of Martha’s Vineyard in the United States) has also met community resistance, and even litigation. The risk is less salient (but not absent) for solar projects, given a smaller footprint. Concerns about **the impact of renewable projects on local wildlife** can be another source of community concerns. Examples include concerns about birds flying into windmills and solar projects destroying the habitats of desert tortoises (NRDC , 2012).

Risks related to governance, e.g. corruption, depend largely on project location. For projects in regions with weak governance and high corruption risk, the questions printed above for E&P companies may also be relevant.

Potential questions for renewables companies

Question	Implication
What are your long-term carbon price assumptions?	High inverse correlation between the long-term carbon price and the required rate of return for renewable energy projects.

To what extent do the company's projected targets depend on favourable environmental regulation or subsidies?	Should the analyst adjust forecasted revenues, costs or capex to reflect expectations of tailwinds from favourable regulation or subsidies?
How does the company engage with local communities? Do you have a formal program for local grievance?	Suggests tail risk of project delays and even cancellations, as well as litigation.
What are the main risks to wildlife from the company's activities? Has the company experienced any community or regulatory resistance on these issues? What is the company's strategy to address the risk?	Suggests tail risk of project delays, litigation.

Illustrative (not exhaustive) examples:

ESG-related financial impact matrix	Resistance to proposed renewable power production location	Technological changes that accelerate electrification (e.g. improved battery technology)	Removal of government subsidies as industry matures
Time horizon	Short term	Short term and long term	Short term and long term
P&L effects			
Revenue	Depends on the project outcome: cancellations eliminate future revenues outright. Delays or reductions in project size are also possible.	Increased revenues as renewable generation becomes more attractive relative to the use of fossil fuels	More volatile revenues as producers exposed to market price
Opex	Potentially increased opex to meet additional environmental or social requirements	--	--
Capex	Investment may be needed to meet additional siting requirements, or to find a new site altogether	Increased investment in new generation to meet demand, potentially lower cost of financing through access to green loans or bonds	Potentially reduced capex if greater uncertainty about long-term asset profitability
Balance sheet effects			
Liabilities/provisions	Potential compensation for affected communities, environmental fines	--	--

3.2.3 Service and offshore

The service and offshore sector includes companies involved in seismic surveying, engineering, subsea services, and supply operators to E&P customers. Increasingly, however, certain segments of the service and offshore sector have become significant suppliers to renewables projects as well, particularly within offshore wind.

The service and offshore sector is highly cyclical, traditionally driven by E&P capex budgets, which in turn depend on long-term oil price expectations. High oil prices have led to waves of above-average profits, followed by over-ordering (particularly in offshore supply segments) and subsequent downturns. Key factors affecting company resilience in a downturn include balance sheet strength as well as contract length. Companies in this sector differ in the standard length of contracts with customers. Seismic companies typically have the shortest contracts, lasting only a few months, whereas the subsea sector can have contracts of up to two to three years. In the engineering and subsea segments, companies typically have fixed price contracts, meaning that they assume project risk through completion of the service (e.g. subsea cable installation).

Climate transition risk is perhaps the key ESG challenge for the sector – that is, the transition to a low carbon economy. As noted above, the various segments of the service and offshore sector differ in their ability to attract customers outside of the oil and gas industry. For example, for seismic companies, low-carbon transition business opportunities remain limited. Within the subsea and engineering segments, however, experience from offshore oil and gas projects is transferrable to offshore wind. Although renewables margins for these companies initially paled in comparison to those of oil and gas contracts, the gap has narrowed considerably as E&P capex budgets shrink and offshore wind project volumes increase. Renewable projects are currently both higher growth and involve a lower cost of capital.

Similar to the E&P sector, **corruption** and **worker health and safety** are common ESG risks for service and offshore companies. Service and offshore companies mirror their customers’ exposure to jurisdictions with high corruption risk (e.g. Angola, Brazil). In addition, completion of complex projects – often in harsh marine environments – requires comprehensive security procedures to prevent work accidents. The Deepwater Horizon incident, referred to above, is an obvious example, as rig operator Transocean lost nine employees in the accident and ultimately paid total legal claims in the billions of dollars (Ingram, 2013).

Illustrative (not exhaustive) examples:

ESG-related financial impact matrix	Climate transition risk	Corruption	Well blowout
Time horizon	Short term and long term	Short term and long term	Short term and long term
P&L effects			
Revenue	Depends on supply and demand dynamics relative to E&P alternative contract	Potential loss of contracts	Project stop; reputational damage could negatively impact competitiveness for future bids
Opex	--	Bribes may be baked into reported opex, new compliance requirements require hiring of staff, greater administrative oversight	--
Capex	Potential increase in capex to meet specifications of new products (e.g. larger supply vessel to accommodate	--	Investments to replace damaged or destroyed assets

	increasing wind turbine blade size)		
Balance sheet effects			
Liabilities/provisions	Write-off of assets that are less valuable in a low carbon economy, e.g. seismic data from particularly carbon-intensive fields	Fines/litigations, particularly from US authorities	Cost of fines/litigation, compensation to workers' families

3.3 FINANCIALS

3.3.1 Banks

Within the banking sector, firms vary significantly in their business models and risk exposure, from the largest and systemically important banks such as Nordea and DNB, to more regional or national savings and loan institutions, to banks that specialize in consumer finance.

The most important income line for banks is **net interest income (NII)**: the difference between the interest the bank pays and interest charged to customers. The bank also derives revenue from **fees and commissions**, including fees from credit card usage, asset management fees, and market fees. On the cost side, banks vary significantly. For example, a bank that emphasizes mortgage lending will typically have lower costs than one that focuses on market activities, although the latter typically binds more capital. A third important factor for banks is **asset quality** – or, the credit risk profile of their loan portfolio. Lastly, perhaps more than any other sector, banking valuations depend heavily on **capital structure**. Banks are often valued based on their return on expected capital and dividend potential. The banking sector is heavily regulated. Requirements for capital ratios (e.g. the amount of capital the bank must hold based on its risk-weighted assets) and accounting rules for valuing loan books are among the most important valuation drivers.

From an environmental perspective, banks with a significant corporate lending portfolio face increased questioning over their exposure to **climate transition risk**. Since the oil price collapse in 2014/2015, value depreciation and increased refinancing risk in the offshore and supply industries have made these segments a source of significant uncertainty for corporate loan portfolios. At the time of writing, it is too early to tell whether scepticism about the longevity of fossil fuel-related industries might translate into higher funding costs for the banks holding these portfolios. Moreover, proposals for EU regulation to adjust capital requirements in response to the sustainability credentials of the underlying assets would, if implemented, have an immediate negative impact on the potential ROE for banks with greatest exposure to the fossil fuel industry. At present, the analyst has to make a subjective call about the probability and eventual scope of changes in funding costs and capital requirements, absent more concrete regulatory pronouncements.

Potential questions for banks:

Question	Implication
What requirements does the bank have in terms of their ESG status before accepting a new client? ² Has the company charged a higher/lower funding cost based on a corporate customer's sustainability profile? How many basis points is the difference?	Should the analyst adjust NII upward/downward to account for, e.g. sustainability-linked lending or for higher lending costs charged to more sustainability-challenged industries?

² Examples of lending-specific ESG standards include the Responsible Ship Recycling Standards and the Poseidon Principles, which involve climate-specific requirements.

Another potentially material ESG issue concerns the bank’s **responsible lending** practices. Particularly for banks in the consumer finance market, as well as financial advisory services, negative publicity surrounding their treatment of customers can negatively affect the bank’s license to operate and spur regulatory action. This kind of regulatory pressure could result in lower growth, a more inefficient capital structure, and higher losses from stronger consumer protection. Even for mortgage lending, a relatively stable market segment, concerns about increasing household debt have led the regulator in Norway to impose additional lending limits meant to prevent individuals from taking on more debt than they can manage.

Potential questions for banks:

Question	Implication
What percentage of mortgage loans reach the maximum amount for the individual according to Financial Supervisory Authority regulations?	Is there for example a risk of regulators implementing additional capital buffers to guard against potentially unsustainable lending practices?
How many complaints were filed over the past year related to company lending practices? Did any complaints result in fines or other penalties for the company?	Should the analyst include expected fines/penalties in forecasted cash flows?

Perhaps more than any other ESG issue, a bank’s **compliance focus and capabilities** can have a significant, material impact on valuations. These include fines and penalties, which can be substantial for money laundering or sanctions violations – particularly for banks exposed to US regulators. Less commonly appreciated are the costs of implementing compliance improvements, both in terms of the resources and additional personnel required, as well as the demands on management and board time, potentially at the expense of addressing core business concerns. Money laundering cases involving Nordic banks from 2018-2020 also involved higher funding costs for these banks in the bond market. This was likely due to significant uncertainty about potential fines, but perhaps also reluctance from sustainability-focused funds to purchase securities issued by companies involved in serious controversies. Association with compliance scandals can negatively influence customer trust and the bank’s license to operate. During the recent scandals, there were examples of institutional customers that publicly refused to renew their framework agreements with their bank on this basis.

Potential questions for banks:

Question	Implication
Has the company received criticism from its regulator(s) related to compliance concerns? Has the bank corrected all deficiencies identified? If so, what was the approximate cost of doing so in terms of additional personnel, outside services, and other resources (e.g. IT platforms)?	Do compliance improvements suggest the bank will be better prepared to prevent compliance breaches in the future?
Is the bank the subject of any current investigations – and in which jurisdictions?	Should the analyst expect additional fines in the future? The level of fines varies significantly by jurisdiction and by whether the investigation involves money laundering or sanctions violations.
How often does the board address compliance issues? Approximately what percentage of a typical workweek does management devote to compliance matters? How does this compare to	Are management and the board devoting sufficient time to compliance – and conversely, do they have enough time to address business challenges as well? Jurisdictions such as the US

previous practice (e.g. prior to a compliance scandal)?	typically offer a fine reduction for exceptional compliance improvements. At the same time, should the analyst adjust expectations for the company's ability to deliver on stated targets if the leadership team and board are preoccupied with putting out fires?
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Illustrative (not exhaustive) examples:

ESG-related financial impact matrix	Money laundering and/or sanctions violations	Climate risk in loan portfolio	ESG integration in credit assessments
Time horizon	Short term and long term	Long term	Short and long term
P&L effects			
Revenue	Reputational effects can negatively impact customer demand	Depends on ability to assess credit risk due to climate-related factors, e.g. higher (lower) funding costs for borrowers with	Differentiated funding costs based on borrowers' sustainability performance

Case Study: Danske Bank money laundering scandal

In September 2018, the findings from independent investigation of Danske Bank and its branch in Estonia was published. The investigation analyzed 15,000 customers in Estonia, and total flow of payments of around EUR 200 billion, of which “it is expected that a large part of the payments were suspicious.” (Bruun & Hjejle, 2018, p. 7) It found that of the 15,000 customers analyzed, 6,200 hit the most risk indicators. Of these, the vast majority were found to be suspicious.

To put the flow of payments in perspective, the GDP of Estonia in 2017 was €29 billion and the figure in question is approaching two thirds of the GDP of Denmark itself at €324 billion. (Source: <https://newsoncompliance.com/danske-bank-the-story-of-europes-biggest-money-laundering-scandal/>)

In connection with the publication of the investigation, then-Chairman of the Board of Directors, Ole Andersen acknowledged:

The Bank has clearly failed to live up to its responsibility in this matter. This is disappointing and unacceptable and we offer our apologies to all of our stakeholders – not least our customers, investors, employees and society in general. We acknowledge that we have a task ahead of us in regaining their trust. (Danske Bank, 2018)

The bank will most likely be met with large penalties and Jyske analyst Anders Vollesen estimates that these penalties will drive up Danske's yearly operating expenses by almost 50% in 2020, to 42.4 billion kroner. Costs will probably return in 2021 to more normal levels of around 26 billion kroner. In addition to penalties from Denmark, Estonia and maybe the US, the bank is facing multiple shareholder lawsuit due to the loss for shareholders from the incident.

(source: <https://www.bloomberg.com/news/articles/2020-01-03/danske-faces-2-billion-in-fines-for-laundering-case-jyske-says>)

		higher (lower) climate risk	
Opex	Increased costs to support additional compliance personnel, added routines	Incremental increase in opex to integrate climate risk in credit assessment process	Incremental increase in opex to integrate ESG in credit assessment process
Capex	Investments in e.g. IT systems to improve compliance monitoring	--	--
Balance sheet effects			
Liabilities/provisions	Fines/litigation	Asset write-offs, potential regulatory requirements linking capital ratios to loan portfolio environmental parameters	To the extent ESG assessments better inform credit risk evaluations, fewer write-offs, and higher quality loan portfolio.

3.3.2 Insurance

At the risk of oversimplification, insurance valuations reflect the company's ability to generate greater income from premiums than it pays out in claims (**insurance results**), as well as the financial returns from investing premiums throughout the year (**investment results**). In the Nordic market, insurance companies typically have a **combined ratio** (equal to the sum of costs and claims, divided by income) of 80 to 90 percent. This compares favourably to other geographic markets, with combined ratios of close to 100%, meaning those companies generate earnings solely investment results. In other words, Nordic insurance firms typically have a positive underwriting result, generating income from both their insurance underwriting and asset management. Insurance results are higher quality earnings than investment results, as they are more resistant to economic cycles.

Turning to ESG considerations, **property insurance** companies face **physical climate risk** owing from the damage that more severe weather and flooding can wreak on insured assets. Importantly, however, the impact on insurance companies depends on the quality of their underwriting models in assessing climate risk. Whether the claims ratio (claims divided by income) increases depends on the company's ability to reprice insurance premiums. For example, there are recent examples of Nordic insurance companies justifying auto insurance premium increases by more extreme winter weather, as well as the higher cost of repairing electric vehicles (as opposed to those with internal combustion engines). The key question for insurance results is whether the company is able to collect sufficient premiums to offset the risk. In some cases that may entail declining to insure assets for which the company does not expect to be sufficiently compensated for the risk it would assume. An additional complicating factor involves whether and to what extent regulators might adjust insurers' capital requirements to account for climate risks. In sum, it is not clear *ex ante* whether physical climate risk is unambiguously negative for the insurance industry.

For **life insurance**, changing demographics put pressure on existing state-sponsored systems. There is a need for increased savings provisions. Holders of longevity risks, typically individuals, employers and government, can transfer this risk to the insurance industry. Life expectancy is here a key assumption that will impact future liabilities. Similarly, the ageing population has increased the need for healthcare and long-term care in old age. This represents an opportunity for the insurance sector to offer **health and/or long-term care insurance** to meet this demand.

Providers of pensions also face the risk more broadly of sustainability-related impacts on the results of their investment portfolios. Sustainability-related asset price changes could affect the insurer's ability to meet its obligations to current or future beneficiaries.

Potential questions for insurance companies:

Question	Implication
How does the company assess physical climate risk exposure in its portfolio of insured assets? Can you provide an example of how this assessment has informed the underwriting process?	Does the company’s answer provide confidence that they have assessed climate risk systematically and are thus, more likely to price the risk accurately? If not, the analyst might want to consider e.g. increasing the expected claims ratio or predicting greater claims volatility.
To what extent have environmental risk assessments affected premium rates? Can you provide an example?	Assess whether the company has the ability to raise premiums (top-line income) in response to increased risk.
How do you mitigate against longevity risks?	Should the analyst adjust life insurance company cost projections to account for unfavourable demographic trends?
What is your strategy for targeting the ageing population for your products?	Should the analyst adjust forecasts to include new/increased revenues from products designed to serve an ageing population?

In terms of social considerations, insurance companies face regulatory scrutiny owing to their **role in society in promoting financial stability**. As a result, insurance companies are subject to capital requirements to ensure institutional stability, but that limit the expected return on equity. In times of crisis, regulators may implement additional controls, such as Financial Supervisory Authority restrictions on dividend payments during the Covid-19 pandemic. The corollary of the insurance industry’s unique social role in society is a latent source of regulatory risk for insurance industry valuations.

Potential questions for insurance companies:

Question	Implication
Does the company anticipate any new solvency requirements? How does the company intend to respond?	The analyst should get a sense of any potential changes to the capital structure to meet new regulatory requirements.
Has the company faced any extraordinary restrictions on the payment of dividends? When do they anticipate these will be lifted?	Should the analyst forecast a lower (or no) payout in the short term? When should the analyst forecast (if at all) an increase in dividend payments?

Illustrative (not exhaustive) examples:

ESG-related financial impact matrix	Physical climate risk for property insurers	Demographic trend towards an ageing population
Time horizon	Primarily long term	Short term and long term
Revenue	May be able to charge higher premiums to compensate for additional risk	Increased/new revenues from the sale of health or long-term care insurance to meet increased demand
Opex	Incremental increase to integrate climate risk data into risk modelling, assess on ongoing basis	--
Capex	--	--

Liabilities/provisions	Increased liabilities from floods, extreme weather. Insurer's ability to assess climate risk influences whether liabilities will be more (less) than anticipated	Liability increase driven by greater longevity for life insurers, as well as health insurers serving customers with greater health care needs. Risk modelling abilities determine net effect.
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3.4 INDUSTRIALS

The industrials sector encompasses a wide variety of companies – from capital goods manufacturers like Swedish Atlas Copco to transportation companies like Danish DSV Panalpina and industrial commercial and professional services firms like the Norwegian recycling and sorting company Tomra or Finnish elevator and escalator manufacturer KONE. These companies typically compete in a global marketplace and have production facilities outside of their home markets.

Industrials vary in their exposure to market cycles, with those exposed to commodities or construction (e.g. manufacturers of mining equipment) highly sensitive to global economic conditions. For example, companies with significant service revenues (e.g. to maintain equipment throughout its useful life) are typically less cyclical than those that rely exclusively on manufacturing.³

From a valuation perspective, it is difficult to draw generalizations without mapping out the value chain for the specific company. For example, is the industry structure fragmented or concentrated? Is it characterized by large industrial conglomerates or specialized providers within a specific niche, such as door locks? Are there barriers to entry, such as access to unique technology that could justify super profits over time? How exposed is the company to the price of a particular raw material – either as an input in their production process or a driver of demand, e.g. for producers of mining equipment. Regulation can also be a significant value driver, e.g. countrywide deposit return schemes for Tomra or energy efficiency regulations for Swedish heat pump manufacturer NIBE Industrier.

Turning to the ESG-specific factors,⁴ **energy use and emissions** tend to be material for most companies within the sector. Energy use is likely to be a major cost for industrials, and access to stable energy sources is often critical for continuity in production processes. Key factors for the analyst to understand include the source and stability of the company's energy supply, as well as its exposure to carbon pricing regimes. In addition, industrial firms that manufacture technologies that reduce customers' emissions or consume resources more effectively may face significant tailwinds from the transition to a low carbon economy.

Potential questions for industrial companies:

Question	Implication
Does the company plan to invest in new energy capacity sources?	Should the analyst adjust capex expectations?
What is the company's exposure to national or regional carbon price regulation?	Should the analyst adjust forecasted costs given relevant market power and carbon price forecasts?

Health and safety statistics can also provide a useful indicator of operational excellence. Health and safety issues are material to sectors such as oil and gas and chemicals as well. Their relevance depends

³ The recent pandemic is the most obvious exception, as social distancing restrictions complicated efforts to carry out even routine maintenance.

⁴ Based on the SASB standard for industrial machinery and goods (2018, The SASB Foundation).

on the latent risk of the working environment (e.g. use of heavy equipment, handling of explosive materials, etc.) In contrast to many ESG data points, health and safety statistics, such as lost-time incident rate (LTIR), total recordable incident rate (TRIR), and near miss frequency rate (NMFR) follow a standardized format. The analyst should nevertheless check whether any deviations from peers derive from the population covered (e.g. whether contractors are included in the statistics). In our experience, examining outliers and trends over time can be helpful to gauge operational performance – particular if the company discloses disaggregated figures.

In order to assess tail risk going forward, it can also be helpful to ask the company how they distribute information on incidents and near misses across the company to prevent future accidents, as well as trends in reporting of undesirable events (RUE). Perhaps somewhat paradoxically, a very low RUE level might indicate the company culture discourages reporting, and therefore, is less likely to learn of its mistakes.

Potential questions for industrial companies:

Question	Implication
What is the trend in company reporting of undesirable events?	Indication of potential tail risk – important to gauge whether company encourages reporting and has process in place to learn from RUEs
What is the range of LTIF and RTIF values across production sites? How do these compare to site performance on operational metrics? Are the statistics different for contractors versus company employees?	Indication of potential tail risk as well as operational performance (e.g. ability to execute planned strategy)
What is the company’s policy for shutdowns regarding poor health and safety metrics? When did a shutdown last occur?	Indication of potential tail risk. Note that the company’s process for handling the risk may be more important than the existence of a recent shutdown itself.

Another potentially material ESG factor concerns the company’s **materials sourcing**. Depending on the production process, the company may depend on access to a specific mineral that is geographically concentrated in areas subject to significant political risk. One example is cobalt, a key mineral for lithium-ion batteries, found primarily in the Democratic Republic of Congo. From the analyst’s perspective, it is important to understand whether the company has policies and procedures in place to ensure continuous access to supply, as well as measures undertaken to mitigate the risk of association with labour rights violations, with the accompanying reputational effects.

Potential questions for industrial companies:

Question	Implication
What are the key materials on which the company depends and how does management identify and assess the risks associated with their use? ⁵	May suggest sources of cost volatility in acquiring key materials, as well as a potential risk of stalled production in the event they are not accessible.

⁵ The company’s dependence on key materials is often included in the long list of risk factors included in any prospectus.

Has the company faced supply disruptions in accessing these materials previously?	May suggest sources of cost volatility in acquiring key materials, as well as a potential risk of stalled production in the event they are not accessible.
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In general, the risk of **corruption** tends to be highest in industries involving large contracts with public entities, particularly for contracts with authorities in countries with weak governance. For subsectors within capital goods such as aerospace and defence, anticorruption is a key ESG-related risk.

Potential questions for industrial companies:

Question	Implication
What is the company's exposure to anticorruption regulation such as the US Foreign Corrupt Practices Act or the UK Bribery Act? Has the company been sanctioned for corruption violations previously?	Suggests tail risk of substantial fines, particularly for companies with previous violations.
To what extent does the company rely on sales agents versus own employees for entering contracts in high-risk jurisdictions?	Use of agents typically carries a higher risk as they are more difficult to monitor than employees.

Illustrative (not exhaustive) examples:

ESG-related financial impact matrix	Corruption	Safety-related incidents	Energy use and emissions
Time horizon	Short term and long term	Long term (tail risk)	Short and long term
P&L effects			
Revenue	Risk of disbarment from future contracts (e.g. with public entities)	Work stoppages, difficulty attracting qualified employees	--
Opex	Cost of implementing compliance measures, e.g. hiring staff	--	Lower (higher) energy costs based on price differential relative to more (less) carbon intensive fuel sources, cost of necessary emissions permits (e.g. EU ETS)
Capex	--	Investments to replace destroyed/damaged equipment	Investments in new technologies, equipment to reduce emissions e.g. to comply with emerging regulation
Balance sheet effects			
Liabilities/provisions	Fines/litigation	Employee-related claims, fines/litigation	--

3.5 METALS AND MINING

The metals and mining industries are in a unique position in relation to the transition to a low carbon economy as they are both emissions intensive and enablers of low-carbon technologies, such as battery electric vehicles. Nordic companies in these sectors include the Swedish mining firm Boliden, steel producers such as Swedish SSAB and Finnish Outokumpu, and Norwegian aluminium producer Norsk Hydro. Both metals and mining are highly cyclical, with demand driven primarily by GDP growth in key markets such as China. Minerals and metals are commodities subject to global prices. Individual company cost bases, in turn, depend largely on the unique features of each production site, e.g. access to raw materials.

Operational leverage is essential for the long-term sustainability of mining companies. Mines often operate at close to 100% capacity utilisation to minimize project payback time. Operational risks tend to be reflected in financial metrics. This is particularly relevant if the company has a concentrated asset base and more than 50% of operating assets are exposed to risky geographies or conflict areas or, or over 50% of revenues stem from one given commodity, mineral or metal.

Sensitivity to environmental labour, social and regulatory costs will impact operational leverage in the long run with a differing degree of materiality across the sector. Long term challenges stem from:

- Declining commodity spot prices and a large portion of un-hedged revenues
- Increased cash costs driven by inflationary pressures on operational costs, including labour and environmental costs (challenging physical lay-out of sites on remaining accessible deposits, increased labour costs and labour conflicts), positioning on the cost curve
- Declining ore grades resulting in operational complexity, including dealing with large waste volumes and low resource efficiency
- Natural capital and energy scarcity in a number of geographies, resulting in increased regulation to prevent resource depletion (e.g. water scarcity)
- Increased pressure from downstream industries requiring detailed reporting on raw material sourcing, e.g. Dodd Frank Act provisions on conflict minerals

The analyst should consider relevant mines, including mine design, operations and processing technologies, as well as mining regulations in the different jurisdictions. Mines should be prioritized by contribution to the company's Net Asset Value.

Potential material sustainability factors:

- Resource efficiency, such as water usage and energy consumption, will minimize costs and reduce the risk of operational disruption. For example, energy tends to account for 10-20% of the operating cost of mining companies. (SRK Consulting, 2016) The cost of using carbon intensive energy could increase if the cost of carbon increases.
- Physical risks of climate change: Extreme weather conditions, such as rainfall resulting in flooding can entail dramatic consequences for the mine site, including stop in operations, or at worst asset stranding.
- Environment: Good environmental management can reduce remediation costs and potential future liabilities.
- Water risk (Columbia University, 2017)
 - Water scarcity – leading to need for additional investments (e.g. desalination plant) or potential work stoppages, social conflict due to community water shortages
 - Excess water – tailings dams failure (e.g. Mariana, Brumadinho)
 - Water pollution – can be particularly challenging with cumulative pollution, with accompanying operational risk for the whole industry (Columbia University, 2017) (e.g.

Mariana dam collapse in region with 100+ years of mining activity). Baseline values may not be available, and companies look only to own discharge.

- Communities: Mining companies' license to operate relies on their relation to local communities. Health and safety issues, as well as labour practices, including through sub-contractors, will be essential in maintaining good relations with local communities.
- Alignment of management incentives: Mining projects tend to extend over 20 years, which exceeds the average CEO tenure. Focus on short-term project profitability could entail greater risk for higher liabilities at the end of the project if environmental management is neglected for short-term profitability.

The site or operations level research will be balanced against a consolidated analysis of the company's general policies and practices related to sector peers.

Other relevant factors to consider include: litigation provisions, closure provisions, decommissioning provisions, access to labour and labour conditions, - % of sub contracted versus own labour, and energy costs (grid access or not, fuel mix, and climate risk).

Potential questions for metals and mining companies:

Question	Implication
How much do you spend on environmental matters, in terms of expenses and capital expenditures?	This is to evaluate the focus on environmental design of each project to minimize long term environmental impact and potentially avoid tail risks.
What percentage of your operations are certified according to an environmental management system? Do you have regular audits of your tailings dams?	Certified EMS ensure regular review of mine sites and objective assessments. This helps ensure processes consistency across sites, which should reduce risk of failure. Tailing dams need to be reviewed regularly to minimize probability of potential failure. This is particularly important if the project life has been extended and the capacity of tailing dams increased through limited retrofitting.
How does the company account for remediation costs?	Remediation costs should be accounted for properly but are often underestimated. Provisions should be compared to actual mine closure costs at comparable sites. This would help assess potential liabilities versus current insurance coverage
What percentage of water is recycled or reused? Do you quantify the cost of water in your operations?	Mining operations are water intensive. Water costs are particularly important in water scarce areas. Restrictive measures can be applied by local authorities, forcing companies to recycle water or find alternative water sources. This question is designed to gauge the potential impact on opex and capex.
What are your sources of energy (on or off grid), energy mix and your plans to improve energy efficiency?	This is to evaluate the impact of potential power outage on the operations, independence of energy supply and carbon intensity.
How do you consider risks and opportunities related to climate change? Is this discussed at the board level?	The energy intensity of mining operations as well as transportation of metals and minerals can generate a significant carbon footprint. This question will help gauge readiness to transition to a lower carbon economy as well as the impact of physical risks on different mine sites. This

	should help develop different scenarios, as well as assess potential tail risk (for example, related to extreme weather events).
Does your company have a local procurement plan?	License to operate will dependent on the ability to engage local stakeholders and contribute to local economies.
How do you invest in host community development? What percentage of workers are from local communities?	Community engagement is key to maintain the license to operate.
How do you ensure that economic development will be sustainable locally when the mine operations are terminated?	This is to evaluate risks related post closure and understand what has been included in the mine closure plans.
Do you report taxes and royalties paid on a project or country basis?	Royalties and taxes are a significant contribution to local economic development and should be transparent to avoid corruption. This is an important factor to understand for cash flow projections.
What percentage of employees receive training on health and safety?	Zero tolerance policy should be supported by continuous training on health and safety.
Do you verify that contractors work to the same standards required of your own employees? What actions are taken when there is a breach of the company's health and safety procedures?	Extensive use of sub-contracting without minimum standards can be source of social conflict and human rights issues. This will help gauge potential social tail risks such as strikes.

Illustrative (not exhaustive) examples of sustainability risks for mining companies:

ESG financial impact matrix	Water scarcity ref. NBIM research project): (Columbia University, 2017) Human rights, community Labour practices	Flooding	Climate change Environmental impact
Time Horizon	Short term and long term	Short term and long term	Long term
P&L Effects			
Revenue	Permitting delays and lost production	Production stoppage or curtailment	Fundamental commodity price/supply
Costs	Monitoring and social costs Taxes and Royalties	Monitoring pollution and remediation	Fundamental cost of water
Capex	Desalination, re-use Infrastructure for local communities	Clean-up and reconstitution	New technologies, substitution
Balance sheet effects			
Liabilities/provisions	--	Asset impairment (for example, tailings dams collapse)	Potential liabilities for reclamation if insufficient provisioning

3.6 HEALTH CARE

The Nordic health care sector includes pharmaceutical companies, such as the largest listed firm on the Danish stock exchange, Novo Nordisk, as well as medical equipment and supply industries, like Coloplast and Getinge.

From a valuation perspective, the two key factors for analysing pharmaceutical firms are 1) the **existing product portfolio**, and 2) the **product pipeline**. Pharmaceutical firms typically invest heavily in R&D to produce new products and receive patent protection for a limited time when a drug first comes to market. Companies earn super profits during the life of the patent as the regulator in effect grants the company a time-limited monopoly to incentivize drug development. Once the regulator allows generic development, the drug becomes a commodity. As a result, the critical questions for evaluating the existing portfolio are how long patent protection will last and how much sales will grow before that date. The second factor, the product pipeline, refers to the company's drugs under development. The analyst values the pipeline by assessing the probability that the various products will gain regulatory approval and the potential market size of each. For early stage firms with a single product under development, the entire valuation will depend on the pipeline.

The assessment is similar for medical equipment and supplies, depending on the level of innovation within each product category. For example, valuations for companies that produce relatively standard hospital equipment or supplies are likely to be driven by margins and volume, as patent protection and product pipelines are not typically relevant.

It is not difficult to find examples of ESG-related events that have had an immediate, significant negative impact on stock prices (e.g. from a major product recall). It is more challenging to identify the effect *ex ante*. In our experience, an analysis of the ESG risk factors can nevertheless help in identifying what might go wrong and thereby, suggesting the level of confidence the analyst should have in her valuation.

Turning to specific ESG issues, although **environmental** factors are not commonly material to the health sector, counterexamples exist. In 2013, Norwegian environmental authorities ordered then-listed Norwegian pharmaceutical firm Weifa to shut down one of its factories after failing to obtain a permit for discharging pharmaceutical waste into a nearby fjord (Nilsen, 2014). Another example of a potentially material environmental issue concerns new regulatory requirements for the materials used in medical equipment, e.g. the incremental cost of phasing out certain types of plastics. Nevertheless, social factors tend to predominate material ESG issues for the health sector.

Concerns around **access to medicine**, affecting both drug pricing and market access, are a major ESG issue for pharmaceutical companies. Regulators grant companies patent protection to encourage socially valuable drug development. Companies perceived to violate this implicit social contract risk inciting a regulatory response. Perhaps the most flagrant example involves lawsuits and public outrage in the US over a pharmaceutical firm that purchased the only FDA-approved drug for a rare but potentially deadly disease and increased the price 5.000% overnight (Kang, 2020). That is an extreme case, but price differentials across geographic markets, e.g. between Europe and the United States, can be substantial. Company-led affordability initiatives (e.g. pharmaceutical donations to individuals without insurance to cover the drug's cost) may be at least in part designed to offset latent regulatory risk by proactively contributing to society. Potential regulatory responses include requirements for public health systems to buy generic products or directly or indirectly regulating drug pricing (e.g. through public insurance coverage).

Potential questions for health care companies:

Question	Implication
What are the company's main geographic markets?	Indication of the company's regulatory exposure (and associated costs or necessary investments)

	to meet requirements), as well as exposure to market trends and stakeholder pressures (e.g. drug pricing debates in the United States)
Are there any regulatory proposals to limit pharmaceutical prices or market access in these regions? What is the company's strategy to address this?	Top-line implication for market access, as well as cost implications from strategy to address any pricing pressure. Tail-risk from compliance concerns may also be relevant (e.g. running afoul of lobbying restrictions).

Patient safety is a key issue for pharmaceutical companies – both during clinical trials, before a drug gains regulatory approval, and once the drug has entered the marketplace. Moreover, regulators (for example, the US Food and Drug Administration, or FDA) impose stringent requirements on **product safety**. The costs of poor safety include harm to human life and health, with the accompanying product recalls and litigation.

Potential questions for health care companies:

Question	Implication
Does the company currently face legal proceedings relating to patient safety? Are any of the company's products subject to recalls or FDA enforcement actions? To what extent is the company insured against product defects?	Immediate revenue implications for products withdrawn from the market, as well as costs of potential litigation and fines. Some of these costs may be covered by insurance, depending on the severity of the incident.
How have any legal actions affected company strategy going forward – if at all?	Risk of loss of market access, end consumer demand from withdrawn products, reputational effects

Another potentially material ESG issue for pharmaceutical companies involves **business ethics** – both anticorruption and ethical marketing. The companies often negotiate large contracts with public entities, a high-risk activity from a corruption perspective. There are several examples of pharmaceutical companies forced to pay substantial fines for bribing officials to grant market access. Ethical marketing is another potential concern. The opioid litigation in the United States is perhaps the clearest example of the potential negative impact from unethical marketing. The lawsuits in questions concern the pharmaceutical companies' role in withholding information about the addictive and dangerous nature of their product.

Potential questions for health care companies:

Question	Implication
Is the company subject to any corruption-related investigations?	Costs of litigation, management time and attention, as well as tail risk from adverse legal outcomes (e.g. 2020 Novartis settlement with the US Department of Justice)
Is the company subject to any complaints or litigation related to its marketing practices?	May indicate increased costs from litigation, including management time and attention, as well as tail risk from adverse legal outcomes

An emerging risk for the health sector is **data security and patient privacy**. As the suite of digitalized medical products increases, e.g. through IoT (internet of things) technology, the need for data security to protect sensitive patient health information becomes imperative. Failure to do so could risk a loss of customers and expose companies to lawsuits.

Potential questions for health care companies:

Question	Implication
Which of the company's products store sensitive user health information? What steps has the company taken to ensure this data remains secure?	May indicate tail risk for fines from e.g. EU General Data Protection Regulation (GDPR) violations
How does the company use patient data?	From a revenue perspective, innovative use of patient data may create better products and services, allowing the company to grow market share. However, the analyst will want to gauge whether the company appears to have the necessary routines and procedures in place to minimize the risk of fines and reputational damage from patient privacy violations.

Illustrative (not exhaustive) examples:

ESG-related financial impact matrix	Affordability initiatives	Drug pricing regulation	Product safety, data privacy, and business ethics/corruption	Environmental regulation
Time horizon	Short term and long term	Short-term and long-term	Short term and long term	Short term and long term
P&L effects				
Revenue	Market access, incremental revenue from uninsured customers	Pricing pressure	Risk of losing market access, reduced customer demand and reputational damage	--
Opex	Cost of program, potential tax deduction for charitable donations	--	--	Increased costs for e.g. more expensive inputs
Capex	---	--	--	Increased investments in e.g. wastewater treatment equipment
Balance sheet effects				
Liabilities/provisions	--	--	Fines/litigation related to non-compliance	Fines/litigation related to non-compliance

4 ESG INFORMATION SOURCES

Finding ESG information often entails reviewing a diverse range of potential and sometimes conflicting sources. Company-reported information is often a useful starting point, but the lack of standards creates wide variation in the relevance and quality of the information provided. Dialogue with companies can be helpful to fill in the gaps, particularly for companies with less advanced reporting. In addition, while we question the utility of relying on an ESG score for use in fundamental analysis, ESG data and analyst reports from third-party service providers can be helpful to streamline

data collection and pinpoint issues for further analysis. Information from news media often serves as an important check on company reporting, especially for identifying controversies and understanding stakeholders' perceptions of the company. It is also useful in identifying coming sustainability-related regulations or structural trends that may affect companies' ability to create value.

The sources listed in this section include examples that the authors find helpful in their daily work. Nevertheless, the volume, variety and quality of ESG information sources are constantly evolving and this should not be considered an exhaustive list.

4.1 COMPANY-REPORTED INFORMATION

The main types of company reporting include sustainability reports and annual reports that include sustainability-related information, such as integrated reports. These are not the only sources, however. For example, quarterly financial presentations may contain relevant information, such as progress on sustainability-related KPI's or the company's approach to complying with new regulatory requirements. Company prospectuses, both when raising new equity or debt, or for corporate transactions, can also contain sustainability-related information, often buried in the long list of risk factors that few bother to read. Annual reports and prospectuses are subject to stricter regulatory disclosure requirements than standalone sustainability reports. At a minimum, the company's auditor will have read any ESG information in the annual report.

Company-reported information tends to be one of the most useful sources for ESG data. It is not without its limitations, however. While the lack of universal standards for ESG reporting allows companies to report in a manner tailored to their specific circumstances, it also increases the risk for selective reporting. Comparing reports from peer companies can help the analyst to pinpoint ESG information left out that could suggest the company's prospects are not as rosy as they may seem.

4.1.1 Company reporting

Although the practice is far from universal, most Nordic-listed companies produce some type of standalone sustainability report or integrate sustainability-related information into their annual report. Even for those that do neither, the annual report usually contains some type of sustainability-related information, for example, in the management discussion.

Ideally, the company's sustainability reporting will include metrics demonstrating performance on KPIs linked to the company's strategy, as well as forward-looking targets. Either type of information (or their absence) are helpful to understand how the company's approach to ESG may affect its valuation. The following minimum recommendations for ESG reporting, from the Norwegian Society of Financial Analysts' Committee on Financial Information (Norwegian Society of Financial Analysts, Committee on Financial Information, 2019, p. 72), reprinted in the text box below, hint at some of the challenges in interpreting companies' sustainability reports.

ESG targets should be useful in forecasting, for example, required investments or net working capital requirements. Nevertheless, the analyst will need to do a sanity check based on the company’s expected ability to deliver on targets. Reported information on past performance is in this respect useful to assess whether the company is likely to meet its stated targets.

Comparing a company’s past performance and stated targets to those of peers is a potentially helpful, but not always straightforward exercise. In the absence of legally mandated ESG reporting

requirements and definitions, companies may use different metrics to communicate the same concept, e.g. carbon intensity of production. This can complicate the analyst’s efforts to compare the company to peers. Divergence may reflect differences of opinion as to the best way to measure performance along a specific dimension. There is also an inherent temptation for companies to use the metric that presents their performance in the best light. Given diverging metrics, the analyst will need to make a decision regarding which best reflects company performance and make the necessary adjustments across companies. Adjustments over time may also be necessary, for example, if the analyst extracts data from previous years' reports for historical comparison.

ESG reporting should be:

- *Easy to understand*
- *Comparable across companies*
- *Comparable over time – consistent KPIs*
- *Desirable in a tabular format*
- *Advantageous to follow established standards as these develop*

Recommendations from the Committee on Financial Information for the Norwegian Society of Financial Analysts

Key questions for sustainability information in company reports

Question	Implication
Does the company produce a standalone sustainability report?	If yes – typically a useful guide to company's priorities and performance over the past year. If not – check whether sustainability-related information is included in the annual report.
Is the report prepared according to a standardized framework?	If yes – the framework may dictate the choice of metrics and/or the intended audience.
Has the company assured some or all sustainability-related information?	Level of confidence in reported information. Relatively common to assure e.g. GHG emissions, but not rest of report.
Is the company transparent on sustainability targets and progress towards these targets?	Forward-looking ESG information is typically rare, but useful for the analyst in modelling the impact on future cash flows. Consistent reports on progress suggest greater confidence that the company will execute its strategy as planned.

4.1.2 ESG reporting frameworks – a few examples

Governance information is often reported separately from sustainability information. For governance information specifically, many Nordic companies include reports against the national corporate governance code within their annual report. This is a listing requirement for companies listed on the Oslo Stock Exchange, for example (Oslo Stock Exchange, n.d.). These codes follow a "comply or explain" format, meaning that companies can deviate from the code, but must report on their rationale for doing so. Company websites are usually the most up-to-date source for board member and

executive management biographic information. Companies in Norway, Sweden and Finland regularly publish lists of their largest shareholders on the company websites. Disclosure practices in Denmark, by contrast, are typically limited to controlling shareholders.

While an exhaustive discussion of **sustainability reporting frameworks** is beyond the scope of this guide, some of the most common include integrated reporting, the Global Reporting Initiative (GRI), the Sustainable Accounting Standards Board (SASB), the Task Force on Climate-related Financial Disclosures (TCFD) and the EU Taxonomy.

The **International Integrated Reporting Council (IIRC)** has developed a framework for integrating material ESG information into corporate annual reports. According to the IIRC: "The primary purpose of an integrated report is to explain to providers of financial capital how an organization creates value over time." (International Integrated Reporting Council, 2013, p. 4) Integrated reports should therefore be a useful starting point for analysts in identifying how ESG-related factors affect the company's value drivers.

The **Global Reporting Initiative** framework, which inspires the Euronext Guidelines to Issuers for ESG Reporting (Euronext, 2019), are designed for reporting to a broad range of stakeholders, not solely investors (Global Reporting Initiative, n.d.). The starting point for companies reporting according to GRI is to conduct an assessment of relevant stakeholders' perceptions of the most important issues the company should address. The company then maps stakeholder perceptions with the company's internal view. Here is an example from DNB's 2018 report (DNB, p. 2).

The figure below presents the results of the stakeholder dialogue and the Group's internal materiality analysis.



The company then reports most thoroughly on issues found in the upper right quadrant. For the analyst, this can be a helpful shortcut to identify the company's sustainability priorities and match these against the analyst's knowledge of the company and industry. Is the company prioritizing the critical issues? Another tip for the analyst reading a GRI report is to look for the GRI Index indicating on which page numbers the company has reported on key sustainability topics.

As discussed in the materiality section 2.5, the **Sustainable Accounting Standards Board (SASB)** is designed to provide financially material sustainability-related information to investors. The focus is therefore narrower than for GRI. In a joint op-ed, representatives from the GRI and SASB explained the differences between the two frameworks:

... GRI and SASB are intended to meet the unique needs of different audiences. The GRI standards are designed to provide information to a wide variety of stakeholders and consequently, include a very broad array of topics. SASB's are designed to provide information to investors and consequently, focus on the subset of sustainability issues that are financially material (Mohinoff & Rogers, 2017).

The advantages for the analyst in reading a report that follows the SASB standards are 1) the use of standardized reporting metrics for each industry (comparable data), and 2) a focus on financial materiality. SASB's advantage in comparability across firms within an industry is also its chief

weakness. In practice, we find the SASB framework works best for industries that are relatively homogeneous, such that a common set of material indicators is easier to identify. It is less helpful for industries with wide variation – e.g. the relevant metrics for a large US-based beef producer are likely to be a poor fit for Norwegian salmon farming companies. For the same reason, SASB tends to work less well for conglomerates, for which multiple industry indicators may be relevant. As an industry-based standard, the SASB indicators are also generally less helpful in assessing companies in which the main risks derive from the company's geographic exposure, rather than its industry. Nevertheless, it is often a useful starting point for identifying material issues.

Another reporting standard that has become increasingly common since its development in 2017 concerns the **recommendations of the Task Force on Climate-related Financial Disclosures (TCFD)** (Task Force on Climate-Related Financial Disclosures, 2017). As the name indicates, this reporting standard applies solely to climate-related risk. The TCFD is a principle-based framework, designed to guide companies in reporting on the potential financial impact of their approach to climate risk management. The diagram below lists the core elements of recommended disclosures.



Source: (Task Force on Climate-Related Financial Disclosures, 2017, p. v)

Companies have a wide degree of latitude to determine how they will report according to the TCFD framework. For example, existing climate reporting frameworks, such as the **CDP reporting framework**, have incorporated the TCFD format into their questionnaires. For the analyst, the benefit of TCFD reporting is that it adopts an explicitly financial lens, challenging the company to report its approach to identifying, assessing and managing the financial impact of climate risk.

From January 2022, companies based in the EU/EEA with 500 or more employees will be required to report non-financial disclosures according to the **EU Taxonomy for sustainable activities** (European Commission, 2020). Using the NACE code system, the taxonomy attempts to find a common definition of sustainable economic activities – that is, activities that contribute to six of the EU's environmental objectives:

- 1) Climate mitigation
- 2) Climate adaptation
- 3) Sustainable use and protection of water and marine resources
- 4) Transition to a circular economy
- 5) Pollution prevention control
- 6) Protection and restoration of biodiversity and ecosystems

As of mid-2020, criteria were available only for activities that contribute to climate mitigation and adaptation, and not all industries are included. A technical expert group published a detailed classification of eligible activities under the climate mitigation and adaptation objectives in March 2020 (EU Technical Expert Group on Sustainable Finance, 2020). At nearly 600 pages, the report contains criteria for determining whether an activity can be classified as sustainable. See the example below for the manufacture of aluminium, indicating the level of detail included.

Definition of Taxonomy Eligibility for the Manufacture of Aluminum

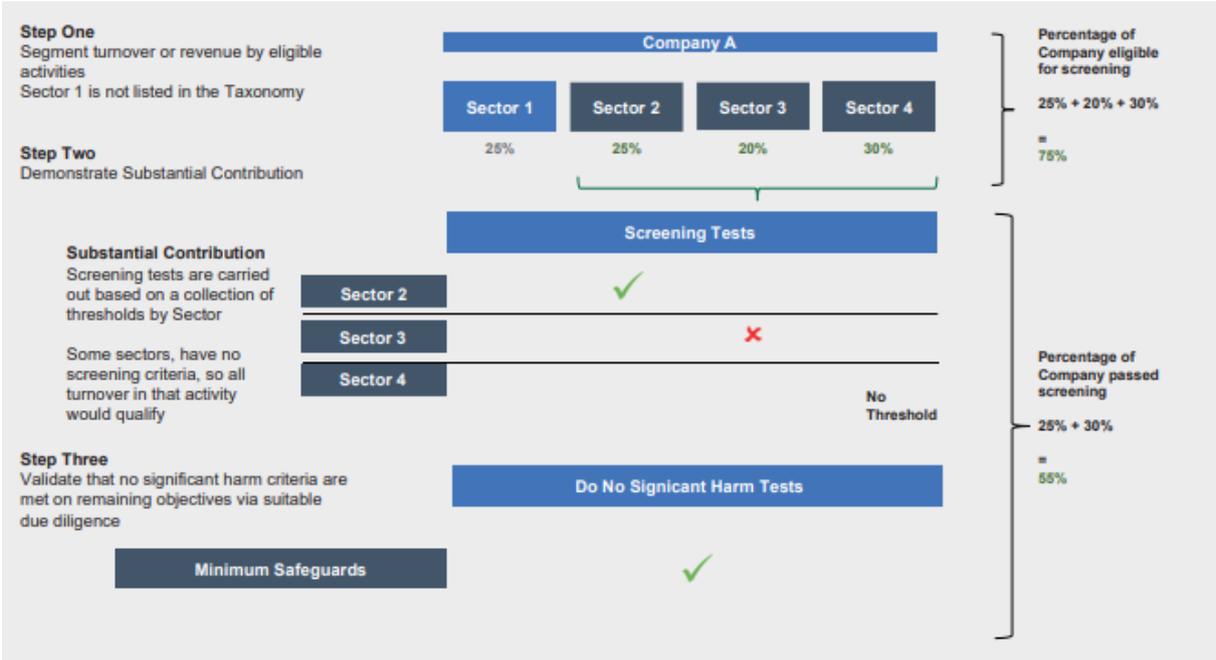
Manufacture of primary aluminium is eligible if Criteria 1 (see below) is met in combination with either criteria 2 or 3 (see below):

1. Criteria 1: Direct emission for primary aluminium production is at or below the value of the related EU-ETS benchmark. As of February 2020, the EU-ETS benchmarks values for aluminium manufacturing is 1.514 tCO₂e/t. Direct emissions are to be calculated according to the methodology used for EU-ETS benchmarks)
2. Criteria 2: Electricity consumption for electrolysis is at or below: 15.29 MWh/t (European average emission factor according to International Aluminium Institute, 2017, to be updated annually)
3. Criteria 3: Average carbon intensity of the electricity that is used for primary aluminium production (electrolysis) is at or below: 100 g CO₂e/kWh (Taxonomy threshold for electricity production, subject to periodical update).

Source: (EU Technical Expert Group on Sustainable Finance, 2020, p. 172)

Moreover, determining whether a specific activity is taxonomy eligible is insufficient. In addition to meeting the specific definition, the activity should “do no significant harm” to any of the other five EU environmental objectives, e.g. the aluminium company cannot discharge untreated waste from production into the local environment. Lastly, the activity should meet minimum social standards: compliance with the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights (European Commission, 2020, p. 8). The diagram below illustrates the process required.

Process for assessing a company’s taxonomy alignment



Source: (EU Technical Expert Group on Sustainable Finance, 2020, p. 49)

For the analyst, the upshot of the EU Taxonomy is that companies from 2022 will be required to report more granular information on revenues and/or capex (depending on applicability) for activities that specifically contribute to the six EU environmental objectives. As a result, companies will report information that might not otherwise have been available through existing segment reporting.

4.1.3 Dialogue with companies

The suggested questions presented throughout this guide are designed for use in meetings with companies. The level of depth should be adapted to the meeting participants, e.g. management versus board members versus dedicated resources on a specific topic, e.g. Head of Sustainability.

Meetings can be a useful venue for obtaining forward-looking information about the company's sustainability priorities, such as planned initiatives and improvements for the coming year or strategies to address coming regulations, as well as providing context for reported information. They may also be useful for getting a comprehensive overview of relevant and available documentation from internal and external sources.

4.2 THIRD-PARTY SERVICE PROVIDERS

This category includes both data providers, such as Bloomberg or Trucost, as well as providers of ESG analysis, such as MSCI and Sustainalytics. The distinction is not airtight, however.

Any discussion of third-party service providers risks becoming quickly outdated, as the industry has consolidated significantly over the past few years. Moreover, traditional "mainstream" financial data providers like Bloomberg and S&P continue to build their ESG offerings to simplify the information collection process. Perhaps unsurprisingly, these providers tend to be most useful for obtaining quantitative ESG data, although document search tools can be helpful for qualitative information if the analyst knows which query to use. Nevertheless, for smaller Nordic companies, and especially private firms, coverage can be patchy.

For providers of ESG ratings or scores, such as MSCI and Sustainalytics, the underlying analyst reports are likely to be more useful than the actual score. The correlation between ESG scores for the

same issuer from different providers is surprisingly low (Berg, Kölbel, & Rigobon, 17), suggesting there is no universal definition for what makes a company sustainable. Regardless, it is not clear how one would meaningfully use an ESG rating in a fundamental equity analysis. The best service provider reports, on the other hand, can be useful as a shortcut to identify material issues for the company. Again, however, smaller issuers may not be covered. As the analyst typically assesses the company against the house methodology based on reported information, companies with limited reporting typically fare worse, independent of performance.

The Bloomberg terminal also provides access to company-level ESG data and ESG-related news articles. The functions “ESG” (Environmental, Social & Governance Analysis) and “FAESG” (Financial Analysis: Environmental, Social & Governance Overview) display data scraped from company reporting, including absolute terms and ratios. BI ESG also provides industry primers. Other useful functions include DS (document search) to look for specific terms or phrases in company reporting, e.g. "TCFD". Lastly, the keyboard function “MGMT” (for “management”) provides an overview of company management and board membership, as well as cross-boarding, tenure and biographical information. In our experience, ESG data is not always up to date for smaller Nordic companies – particularly if they have just begun to publish a sustainability report. Therefore, we recommended cross-checking company reporting directly if ESG information is missing in Bloomberg for a specific firm. Trucost, in turn, provides environmental data, including environmental costs and estimated environmental parameters, such as emissions and water usage. Their datasets can be used in analyst models.

4.3 MEDIA

A 2017 Norsif study of Norwegian asset managers found that news media was the most widely used type of source for ESG information about Norwegian companies, followed closely by company-reported information (Norsif, 2017). Although news aggregators such as Bloomberg or TrueValue Labs increasingly tag and organize ESG information published in Nordic-language publications, we find that ESG service providers do not always pick up local debates, e.g. criticism from a Swedish NGO of a local company’s activities abroad or public debates between a company and locally based shareholders. As another example, for debates surrounding the state’s role as an owner, which naturally garner significant attention from the general public, local media typically remain the best source for understanding the dynamics at work.

4.4 INDUSTRY REPORTS, THEMATIC PUBLICATIONS AND SELL-SIDE ANALYSIS

Trade group sustainability-themed publications can be another source for relevant ESG information. These include both industry and trade group reports as well as sell-side analyses on specific themes. For example, the World Business Council for Sustainable Development (WBCSD) has published an industry overview and relevant performance indicators to assess industry-specific sustainable business practices for the cement industry (World Business Council on Sustainable Development, 2019), among others. For a list of relevant sustainability-related associations per industry, see the *Business Leadership in Society Database* (High Meadows Institute, 2020). Other useful sources include the World Resource Institute, CDP's sector reports on climate risk management, and 2i Initiative reports on scenario analysis.

Bloomberg New Energy Finance publishes research on energy and environmentally themed topics, as well as downloadable datasets. Research firms like IHS, Wood MacKenzie and Rystad Energy provide access to asset-specific datasets as part of their research offering. Sell-side analysts also publish an increasing volume of ESG-themed analyses, including for Nordic companies, although quality varies considerably. Their advantage compared to ESG service providers is their depth of industry-specific knowledge. The best reports place the sector's material ESG risks in context and identify how players

are positioned relative to one another, often based on risks that may play out over a longer time horizon than is typical of sell-side reports.

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HOW TO ADAPT THE VALUATION MODELS TO INTEGRATE THE ESG DIMENSIONS

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8 October 2020

1. HOW DOES INTEGRATION OF ESG REQUIRE AN ADJUSTED VALUATION PERSPECTIVE?

The core scope of financial valuation of a company or a contract is to estimate the value today to the owner of receiving the cash-flows produced, typically a shareholder in a limited liability company. A valuation aims to replicate what this asset would have been priced at if traded by willing, able and fully informed parties in an efficient market. As such, the estimate is a function of not only the estimated future cash-flows, but also the investor's alternative cost of capital over the same period, usually captured by the required return. In addition come any optionalities, subsidies, or other side-effects. All these elements require significant analysis to estimate reasonable input parameters. Whether one does a discounted cash-flow analysis, uses valuation multiples from comparable companies or some other related method, these are the fundamental valuation principles. These principles are equally relevant in a setting where we integrate ESG perspectives and specific information, as covered in the first section of this guide.

We start with the standard assumption underlying the Miller-Modigliani theorem of a world with perfectly efficient capital markets, no information asymmetries and no conflicts between investors and agents (agency conflicts). If we add the assumption that all assets are priced correctly, for example in an environmental context in the form of a CO_2 tax that includes all costs to society of CO_2 emissions ('externalities'), then the firm will take into account its full environmental impact, and no further adjustments to our standard valuation model are needed.

In order to understand this line of reasoning, let's look at what an externality is: the costs or benefits our actions impose on others. These can be positive, like volunteering or fundamental research, but can also be negative: e.g. smokers harm non-smokers. In the smoking example, one way to deal with such an obvious negative externality is through

taxes. Similarly, taxes on CO_2 emissions may change firm behaviour directly and indirectly .

One direct effect could be the substitution of CO_2 emitting fuel sources by replacing them with renewable energy sources. An indirect effect could be increased demand for renewable energy and the resulting price changes for renewable energy.¹

When these external effects are priced incorrectly, as CO_2 emissions currently are, then firms and consumers take sub-optimal decisions that affect long term firm value. This behavior also has a wider effect on nature and society which over time also will revert back and impact firms and consumers.

In what follows we will discuss how we can take these ESG issues into account. The starting point is a conventional valuation model based on standard assumptions, methods and input data. The next steps include:

- (1) Updating the input data and parameters to include expected effects from recognizing the ESG dimensions. I.e., those that now or later will change (owners' private) cash-flows or risk. These may change costs of investments, represent new opportunities, recognize additional sources of risk, or modify the cost-of-capital. One may also need to select different comparable companies for a relevant multiples valuation.
- (2) Additional analysis of significant case-specific ESG issues that a standard model may not capture sufficiently well, . E.g.:
 - Suboptimal incentive contracts that reward management for short term results at the expense of long term results.
 - Major possible future governmental policy decisions that may represent large costs or opportunities for the company.
 - Other possible significant shocks of environmental character, from customers, consumers, NGOs or nature.

¹Renewable energy prices could go up because of the increase in demand but could also fall if the increased demand finances R&D into increased efficiency and leads to utilization of large scale economies, say through falling prices for solar panels or offshore wind.

- (3) Additional analysis of any modified shareholder preferences for taking more additional responsibilities, typically by recognizing externalities inflicted on stakeholders (employees, customers, partners) or society at large in the analysis. This analysis needs to include and assessment of their impact on market valuation, in addition to fundamental values, as well as expected development and distribution of these preferences over time.

Each of these analyses require not only standard financial valuation capabilities, but also the ability to expand and complement the analyses to include the ESG dimensions. The latter analyses require understanding of the key issues surrounding ESG as well as a qualified assessment of both government policies, as well as preferences amongst shareholders and stakeholders, and how these may develop. Finally, in these times of transition into increased ESG awareness, one needs to consider to what extent any parameter based on market inputs may already reflect the market's updated assessment of the impact from ESG.

2. BACKGROUND LITERATURE

2.1. Standard valuation references. Traditional valuation models can be divided into four broad categories:

- (1) Income-based approaches - try to capture the value of the firm by estimating its ability to generate the desired cash-flows. Income (expressed by cash-flows, dividends and/or residual income) and cost of capital (return required by investors) are at the core of this type of approach.
- (2) Asset-based approaches - use the book value of a firm's existing assets as a starting point to estimate its total value.
- (3) Relative (multiple) valuation approaches - consider the pricing of assets with similar risk and return characteristics to determine firm value. This comparison can be based on several metrics, such as earnings, cash-flows, sales, or prices.

- (4) (Real) Option approaches - seek to estimate the value of managerial flexibility based on the potential variability of cash-flows generated by the firm.

An extensive review of the different valuation approaches can be found, among others, in Damodaran (2007) and Cobb and Charnes (2007).

Recent evidence (Pinto et al., 2019) suggests that most equity analysts use a combination of income-based approaches (most often the Discounted cash-flow (DCF) method using the Capital Asset Pricing Model (CAPM) to calculate the cost of capital) and multiple approaches (both Price/Earnings and enterprise value (EV) multiples).

Each approach presents advantages and challenges. Income-based approaches (in particular the DCF method) have the advantage of being based on solid economic reasoning and detailed inputs. Therefore, the valuation method presented in this guide is largely based on the DCF approach (Section 4). However, the preciseness of the valuation estimates produced by this method is still largely dependent on the subjectivity of the model's inputs, such as future cash-flows and cost of capital. Combining the DCF method and a relative (multiple) approach has the advantage of providing a more complete picture of the potential value of a firm by referring to relevant market pricing. Therefore, we recommend using the DCF approach as a departure point, and assess the soundness of the produced valuation estimate by complementing the analysis with a market multiple approach (Section 5).

Options-based approaches seem to be much less used by financial analysts (options-based approaches are used by 5% of the survey respondents in Pinto et al. 2019). We believe that in the context of valuation reflecting ESG dimensions, this approach has several advantages. Therefore, we dedicate a section of this guide to this type of approach (Section 5.4).

Asset-based approaches are generally based on the same principles as income-based approaches, but have the disadvantage of being less

”future oriented”. While income-based approaches focus on estimated future cash-flows at specific dates, asset-based approaches use the book value of the firms’ existing assets today as a departure point. Ignoring the value of future developments is a potential pitfall of this type of approach. Given the similarity of the principles of the two approaches, and the importance of properly valuing future assets in the ESG context, this guide focuses on the income-based approach.

An interesting intermediate approach can be the Residual Income Model (Olsen). The model estimates future cash-flow but uses accounting earnings rather than free cash-flow. However, it uses the book value of current assets as its departing point. The model’s focus on the current book value of assets forces the analyst to evaluate if these assets are currently valued properly.

2.2. Relevant literature on valuation reflecting ESG dimensions. Academic literature providing guidance on valuation reflecting ESG dimensions is currently scarce. However, the results of several academic papers provide important insights on how ESG dimensions impact the different components of traditional valuation methods.

In the DCF approach, ESG considerations can affect firm value through two main channels: the cash-flow channel and the cost of capital channel. These two channels correspond, respectively, to the numerator and the denominator of the DCF model.

In this context, when assessing the cost of capital, it is important to differentiate between systematic risk (related to the general market risk that all firms face, such as macroeconomic conditions like interest and inflation rates, commonly know as the firm’s β) and idiosyncratic risk (or firm-specific risk, related to the operations of a particular company). While the latter can typically be diversified away by investors, systematic risk can not. Therefore, in a traditional DCF model, systematic risk (β) will affect a firm’s cost of capital (the denominator of the model), whereas idiosyncratic risk will influence the firm’s cash-flows (numerator in the DCF model).

Investors often adjust a firm's cost of capital for different types of risk that can be diversified. Country risk, for example, can be diversified by investing in an international portfolio. Therefore, such an adjustment of systematic risk is unnecessary, as this type of risk should not be priced.

2.2.1. *The cash-flow channel.* The cash-flow channel can affect firm value both through changed profitability (cash-flows) and through a change in firm-specific downside risk (idiosyncratic risk). Empirical academic literature has long been trying to establish the link between ESG and firm profitability and risk. Several studies have established a positive correlation between ESG scores and firm value:

- Stakeholder welfare (in particular, employee welfare and environmental performance) is associated with higher firm valuation (Tobin's Q) (Jiao, 2010)
- High sustainability companies significantly outperform their counterparts over the long term (both in terms of stock market and accounting performance) (Eccles et al., 2014)
- Higher CSR performance is associated with better long-run growth prospects (Gregory et al., 2014)

However, establishing a causal relation between ESG scores² and firm value is not a trivial exercise. Profitability may induce firms to invest more in ESG (reverse causality), which may also justify the empirically observed correlation between ESG scores and firm value. In Section 4.1 of this guide, we provide an overview of ESG issues that may affect future cash-flows.

As discussed above, firm-specific risk may also affect future cash-flows. This type of risk can typically be diversified, which is why it should affect the numerator (and not the denominator) of the DCF model. Existing literature provides ample evidence of the relation between ESG and idiosyncratic risk:

²Note that the concepts 'ESG' and CSR (Corporate Social Responsibility) are highly correlated and thus not consistently applied in the literature.

- CSR is positively and strongly related to financial risk. (Oikonomou et al., 2012)
- Stock-specific volatility of stocks with worst ESG exposures is up to 10-15% higher (Dunn et al., 2018)
- CSR activities provide an "insurance-like" benefit to shareholders (Godfrey et al., 2009)
- Top management of U.S. firms in controversial industries is, in general, risk averse, and CSR engagement helps them reduce risk (Jo and Na, 2012)

Idiosyncratic risk will typically affect a firm's cash-flows in extreme events. Therefore, we argue that this type of risk can best be incorporated in valuation by using standard scenario analysis approaches (Section 5.3)

2.2.2. *The cost of capital channel.* Firm valuation is not only dependent on a firm's ability to generate future cash-flows. In any valuation model, generated cash-flows are discounted using the firm's cost of capital, the required return given an investor's level of exposure to (systematic) risk. Several academic papers have established a negative relation between ESG scores and cost of capital:

- Firms with better CSR scores exhibit a lower implied cost of capital (El Ghouli et al., 2011).
- Firms with better CSR performance enjoy a reduction in their cost of capital after initiating disclosure of CSR activities (Dhaliwal et al., 2011)
- Superior CSR performance leads to better access to finance and a lower cost of capital (Cheng et al., 2014)
- Firms with better environmental risk management have a lower cost of capital, shift from equity to debt financing, and have higher tax benefits due to the ability to add more debt (Sharfman and Fernando, 2008)

Empirically, the implied cost of capital is typically calculated as the discount rate that equates a valuation measure (often a stock-price based measure) with an observed income(earnings) measure. Therefore, the

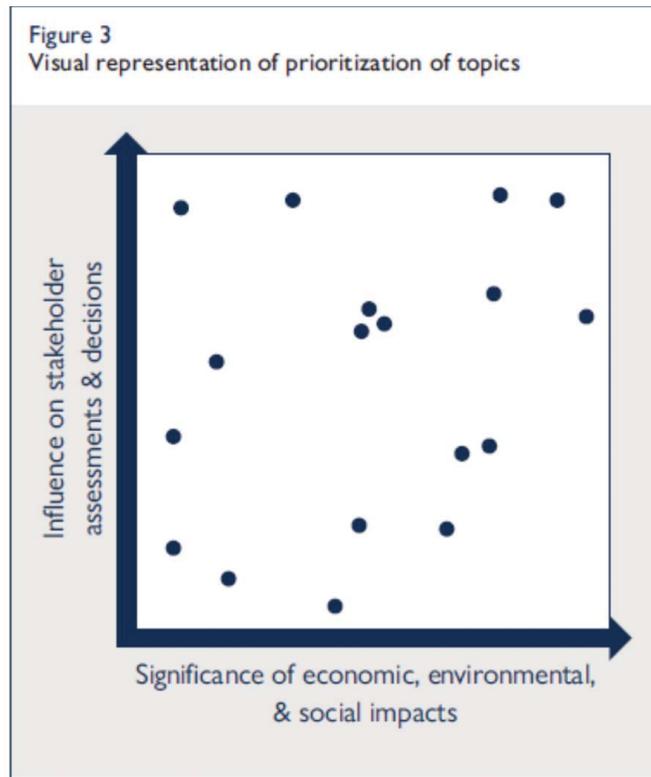
main challenge in this literature is that the cost of capital can only be measured *ex-post*, whereas for valuation purposes one would like to determine the appropriate cost of capital *ex-ante*. A lower measured *ex-post* cost of capital may be the consequence of a firm's valuation (stock price) being *ex-post* higher than the firm's projected (*ex-ante*) income (cash-flows) would justify. In Section 4.2 we present further empirical evidence on the impact of ESG factors on the cost of capital, and provide guidance on how to incorporate that evidence on the *ex-ante* calculation of a firm's cost of capital.

2.3. Surveys on how investors use ESG information in valuation. Recent surveys show that investors mostly use ESG information for "red-flagging" and to manage risk (Van Duuren et al., 2016). According to Amel-Zadeh and Serafeim (2018), financial analysts consider that ESG scores mainly provide information about firm risk. When it comes to valuation reflecting ESG dimensions, there is no one size fits all approach, as the materiality of different issues varies widely across sectors. Lack of comparability due to the lack of reporting standards is perceived as the main impediment to the use of ESG information. As a consequence, ESG information is mostly used for negative screening and risk assessment, and less for adding in any value from new opportunities.

3. HOW TO ASSESS MATERIAL ESG ISSUES FOR A GIVEN COMPANY/SECTOR?

The analyst should initially do a top-down assessment of how to clarify the material ESG issues for the company/project being analysed. Any analysis of ESG issues faces the risk of becoming fragmented, unfocused and too much bottom-up, also in situations where in reality only a selected few issues are significant for the final conclusions regarding values. The introduction to the 'materiality matrix', as done in section 2.5 in the first part of the guide and illustrated in Figure 1, is useful for getting this perspective right. The matrix helps to focus on issues that are important both to shareholders and stakeholders. This

FIGURE 1. An example materiality matrix



assessment also needs to include an expected time schedule for how the material issues will play out over the years to come, towards an expected long-term steady-state situation. This overall materiality assessment will then become a guide for the analytical focus of the actual quantitative analysis. If done appropriately, it also adds to an overall assessment of the viability of the company or project longer-term, as well whether there exists any binary risk of it collapsing. Note that an overall materiality matrix following the GRI-methodology implies that the stakeholder dialogue concludes with a consensus with regards to

the ranking of material issues. Similarly, but likely to be less controversial, shareholders need to agree on which are the main issues from an economic perspective.

A financial materiality matrix, as also discussed in section 2.5 above, is a method to highlight the financial impact of the main stakeholder motivated issues. I.e. what are the expected effects on revenues, costs, capex and the balance sheet, from properly addressing the issues.

Figure 1 provides an illustrative example of how one may map specific ESG issues in an overall materiality matrix, following a process which involves both shareholders and key stakeholders (-groups).

4. DISCOUNTED CASH-FLOW VALUATION

As introduced in Section 2.1 above, discounted cash-flow models estimate the value of a company (or contract or project) from discounting expected future cash-flows from the company to the time of valuation. I.e. estimating the net available cash-flow at specific points in time and then using the risk-adjusted cost-of-capital over the time periods to estimate its value today:

FIGURE 2. Basic structure of company cash-flows

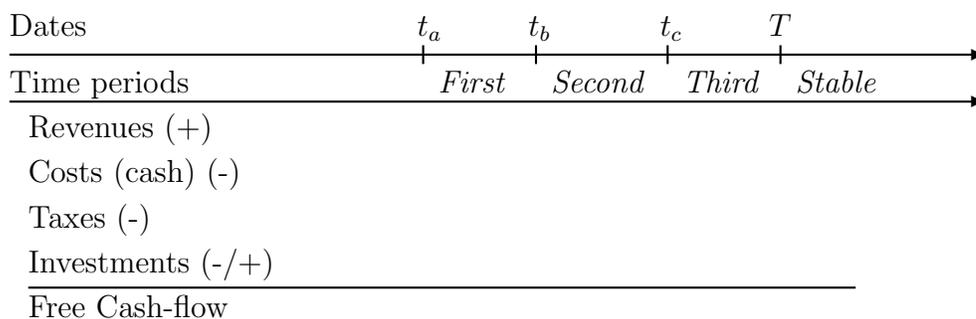


Figure 2 shows the basic structure of cash-flows for valuing a company, a matrix including the analyst's best estimates for each cash-flow

category displayed in the left column for each future date. The time-unit is typically set in *years*, and t_n denotes n years into the future. Estimated annual cash-flows are assumed to fall on these dates, as the benefits of specifying more frequent cash-flows usually are limited. The time *periods*, like from t_a until t_b are included as they are particularly important if one assumes significant staged changes over time, e.g. from an increasing ESG impact on the company. In general, it is only necessary to specify as the number of time periods for which one has relevant and significant information. For example, In a case where one has reliable information regarding the government's plans to gradually phase in costly regulations over time, e.g. emission taxes increased in three stages over 10 years, then each stage may represent a separate time period in the cash-flow structure. Even the best analyst cannot credibly forecast far into the future, and thus after time T one needs to specify the expected steady cash-flows for the continuation value.

Cash-flows may be defined differently, depending on the scope of the valuation. The standard approach is to assume *Free cash flow* to the whole firm, i.e. what the firm produces, and which value that afterwards may be split between lenders and shareholders. An alternative is to deduct interests and instalments to lenders from the cash-flow to get to *Equity cash flow*, i.e. what shareholders would receive after all other claimants have been serviced. How to estimate cash-flows reflecting ESG matters is covered below.

The actual valuation of these cash-flows is done by discounting them to today, effectively finding their value given their riskiness and how far out in time they are. Assuming r as the alternative cost-of-capital (see the discussion in Section 4.2), the discounting is done using Expression 1 for each cash-flow and adding the discounted (=present) values to get the total value:

$$(1) \quad PV(FCF_n) = \frac{FCF_n}{(1+r)^n}$$

The value of all cash-flows from time T on-wards, also called the continuation value, requires first valuing them at time T and then discounting this value to today. The future value at time T could either be valued using the 'Gordon's' formula, Expression 2 or a multiple of expected earnings, cash-flow or assets at that time:

$$(2) \quad PV_T(FCF_T) = \frac{FCF_{T+1}}{r - g}$$

where g represent perpetual growth rate in steady state.³

The value of these cash-flows today is then calculated as:

$$(3) \quad PV_0(PV_T(FCF_T)) = \frac{PV_T(FCF_T)}{(1 + r)^T}$$

Finally, assuming that one has valued the free cash-flow to the firm, one then needs to deduct any debt, and add any additional sources of value like tax subsidies or optionality.

We discuss all valuation elements and how to include the ESG dimensions below.

4.1. Cash-flow estimation. Each cash-flow element, as illustrated in Figure 2 , i.e. revenues, cash-costs, investments and taxes, are generally estimated from a company's own recent history, with reference to its peers, or based on specific information regarding verifiable business prospects. These estimations usually take a major share of an analyst's time, and it's beyond the scope of this guide to specify all possible techniques used.

In a valuation reflection ESG dimensions, one needs to also do an additional assessment of how the ESG issues that are *material* in the specific case are expected to impact any of these cash-flow items. This assessment should be focused on the overall materiality assessment discussed above. ESG issues commonly vary by industry, and the

³When there is increasing awareness that there are fundamental limits to growth based on availability of resources and total externalities on the globe, the need to set a moderate g is more relevant than ever.

industry-specific topics and related questions raised in the first part above are natural starting points for the analysis. Across any of these questions the same analytical approach applies:

- How is the future of the company going to be different from the past? Should the future be estimated over a longer horizon and/or are there valid reasons for predicting several distinct stages of development?
- How is the case different from its peers, and will it develop towards them or vice versa? What is a fair set of assumptions for the steady state cash-flows?
- Is there specific and reliable information regarding significant external changes in policies, regulations, public opinion, competitive pressure, best practices etc., that are applicable to the forecasts?
- For the material issues, what are relevant and reliably comparable metrics (ratios, scales, indicators etc.) that may be applied in the adjustment of cash-flow items. For each of these metrics, what are the current and expected levels?
- For each material issue: Does it represent changed costs, changed risk, changed capex and/or a different revenue development? Even if it is challenging, one needs to conclude on this to make the approach useful for a proper revision of the cash-flow estimates.

4.2. Cost of capital. As argued in Section 2.2, calculations of the cost of capital (the denominator in the DCF valuation approach) should only take systematic risk into consideration. For adjustments related to firm-specific risk, we refer to Section 5.3.

4.2.1. Standard inputs for estimating cost-of-capital. For valuation purposes, the cost of capital is most often calculated using the Weighted Average Cost of Capital (WACC) method, which takes into account the firm's leverage, its cost of debt, and its cost of equity according to

the formula

$$(4) \quad r_{WACC} = \frac{E}{E + D}r_E + \frac{D}{E + D}r_D(1 - \tau_c)$$

where E represents the firm's equity, D represents the firm's debt, both at market values, r_E and r_D the cost of equity and the cost of debt, and τ_c the corporate tax rate.

Alternatives to the WACC method are the the Adjusted Present Value (APV) method and the Free cash-flow to Equity (FCFE) method. Although the approaches differ in how leverage is taken into account when discounting cash-flows, all three methods require an estimation of the equity cost of capital to calculate firm value.

4.2.2. *Systematic risk adjustments - β* . The β -risk of a firm is usually estimated using observed equity β s of the firm, its peers and its industry, and then delevering these to get to asset *betas*. As these necessarily are estimated from historical data, the issue is whether the beta-risk may be different going forward due to ESG dimensions? In efficient markets, it is also necessary to assess whether market prices and implicit risk-assessments (β -risk) already have captured these dimensions in the most recent reference period.

As mentioned in Section 2.2, most analysts use the Capital Asset Pricing Model (CAPM) to estimate a firm's *ex-ante* cost of equity capital (Pinto et al., 2019). In the CAPM world, market-risk (systematic risk) is the only priced risk factor. The CAPM formula relates a firm's market risk (β) to the returns of an individual stock:

$$(5) \quad ER_i = R_f + \beta_i(ER_M - R_f)$$

where ER_i represents the expected return of stock i, R_f represents the risk-free rate, and $(ER_M - R_f)$ represents the market risk premium.

Importantly, assets will only be correctly priced if markets are efficient (Markowitz and Todd, 2000). The Arbitrage Pricing Theory (APT) (Ross, 1976) has less restrictive assumptions, and relates stock

returns to several "risk factors" (e.g. (Fama and French, 1993) , (Carhart, 1997)).

Determining whether a stock is *ex-post* correctly priced (i.e. whether the observed returns correspond to the systematic risk to which investors are exposed) is therefore largely dependent on which model is used. Several academic papers show that firms with higher ESG scores have higher returns than what traditional asset pricing models would predict:

- "A value-weighted portfolio of the "100 Best Companies to Work For in America" earned an annual four-factor alpha of 3.5% from 1984 to 2009, and 2.1% above industry benchmarks." (Edmans, 2011)
- Socially Responsible Investing (SRI) leads to superior performance that cannot be explained by differences in market sensitivity, investment style, or industry specific factors (Derwall et al., 2005), (Statman and Glushkov, 2009), (Kempf and Osthoff, 2007)

This evidence is in line with the findings described in Section 2.2.2, since a lower *ex-post* cost of capital is consistent with valuations being higher than *ex-ante* expected, given a certain level of risk. However, and in apparent contradiction, firms with lower ESG scores (stocks excluded by environmental screens and "sin stocks" are also shown to have higher returns than what traditional asset pricing models would predict ((Chava, 2010), (Hong and Kacperczyk, 2009)).

The fact that sorting stocks based on ESG scores leads to different returns than traditional asset pricing models would predict can be caused by two distinct channels:

- (1) Markets are inefficient, and investors do not base their decisions on the full set of information regarding ESG issues;
- (2) The models used to calculate expected returns are incorrect, possibly because they ignore the existence of an "ESG risk-factor" (systematic)

These two channels have distinct consequences for ESG-related cost of capital adjustments. If the reason for the mispricing is market inefficiency, one can argue that such inefficiency will decrease over time, as firms start reporting more on ESG issues, and investors start collecting more information about these issues. If that is the case, a cost of capital adjustment may not be warranted, particularly if investors have a long-term investment horizon. If, however, the reason for the mispricing is the existence of a systematic risk-factor distinct from CAPM's market risk (β), then investors should use an asset pricing model that takes a firm's exposure to that risk-factor into consideration. Importantly, the two channels may both play a role in the current observed mispricing.

The existing academic literature is far from conclusive with respect to the existence of an ESG risk factor. Below are two examples of papers that argue for and against this channel:

- ESG attributes may be relevant to firm value, but they are not efficiently incorporated into prices. No evidence that abnormal returns are compensation for risk (Mănescu, 2011).
- Existence of an ESG risk premium within global equity portfolios both geographically and longitudinally (Pollard et al., 2018).

A possible solution to this problem would be to gather information on ESG scores and returns of a firm's peers and industry, in order to determine the possible existence of a systematic risk factor, and track the development of this factor over time. In an actual valuation this is less relevant, as both markets are in transition and the research in this field is inconclusive. The pragmatic approach is to use a CAPM-based cost-of-capital.

4.3. Firm Value, Equity Value and Past Liabilities. One final issue is how to incorporate *known* past liabilities, such as underfunded

pensions plans or the decommissioning of power plants, into the valuation. For example, ENBW, the German energy producer, has (unfunded) pension provision of 7.65bn Euro and provisions for the dismantling of power plants of 5.86bn Euro in the balance sheet. ENBW reports the (estimated) present value of these obligations, so they should be treated similar to debt in the calculation of the equity value by deducting the book value of the assets from firm value.

We will discuss the valuation of unknown obligations in more detail in sections 5.3 and 5.4.

5. RELATIVE (MULTIPLE) VALUATION MODELS

Multiples, i.e. a ratio between a market value and an accounting item. These come in various forms, with Price/Earnings (P/E), Price/Book (P/B) and Enterprise Value/EBITDA, as the most commonly used. P/E and P/B relate the market value of equity to the earnings or book value belonging to the same capital, EV/EBITDA (Earnings before interests, taxes, depreciation and amortisation) relates the combined market value of equity and debt capital to the (broadly defined) operating profit to be split between the owners of these claims.⁴

Multiples primarily serve four different purposes:

- To value a company using the relevant multiples from comparable companies and multiplying with the related accounting item (denominator) for the company being valued.
- To test the plausibility of forecasted cash-flows by estimating the implied multiples from a DCF-valuation model and comparing these to those of comparable companies.
- To identify disparities between how the market views a company's performance and strategic position compared to its competitors.

Generally speaking, multiples valuation has the benefit of simplicity and immediate market calibration, compared to a DCF-valuation.

⁴A range of different valuations multiples are being used, often adapted to specific market, industry or state conditions.

The main challenge is that one needs to settle on only *one* accounting number for the denominator, thus leaving no opportunity to include expected future developments. In most cases it is also particularly challenging to find truly comparable companies.

5.1. Selection of peers. In a valuation analysis, e.g. of a private company, it is challenging to find a sufficiently broad and still relevant set of peer companies. For example, there are only around 200 listed companies on the Oslo Stock Exchange, and the industry mix is rather biased, thus making it particularly challenging to find peers in industries that are not well represented here. In addition to the need to find companies in the same industry, one also preferably should find companies of comparable size, scope (activities and geography), development stage and riskiness.

In a valuation reflecting ESG issues, these come in addition to the already challenging task of finding comparable companies. A starting point is to compare the current status of the companies when it comes to those main ESG issues that are deemed material in their industry. A related approach could be to adjust the profit or capital multiple denominator for known effects from recognizing ESG risks, costs or opportunities. In general, ESG status is more relevant for finding comparable companies and assessing development levels, than to be applied directly in a multiples valuation, unless the other main valuation items are sufficiently similar.

5.2. Combining and comparing DCF vs. multiples models. Figure 3 provides an example of how key parameters in a DCF-valuation relate to an enterprise value valuation multiple. These parameters of growth, cost of capital, tax and return on invested capital may either be assumptions behind the DCF-valuation, or estimated following a DCF-analysis.

In addition to analysing the consistency across different valuation models, this approach also allows for estimating implied parameters in cases where the value is reliably observed in a transaction or a market.

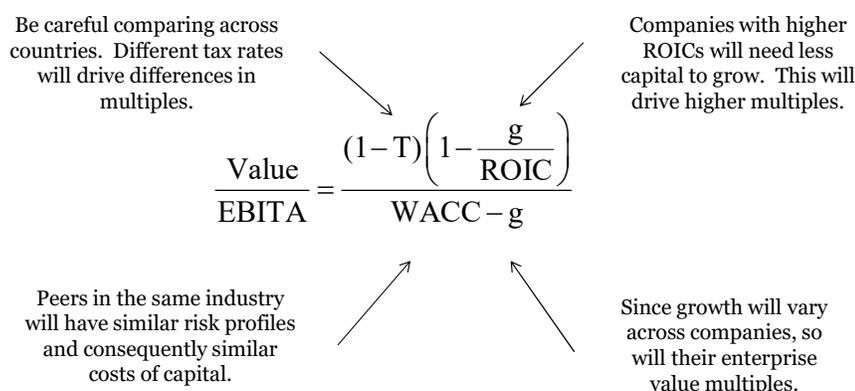
FIGURE 3. Comparing DCF parameters and multiples

Connecting DCF and multiples

NHH



- The enterprise-value-to-EBITA multiple is driven by growth, ROIC, the operating tax rate, and the company's cost of capital.



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5.3. Scenarios. Scenario analysis is a straightforward idea: instead of modelling the average expected cash-flow for the firm, we model several different outcomes. Often these reflect a good, medium and bad state of the world. However, one can also model specific material developments like high versus low CO_2 taxes to look at the impact of specific measures.

Take the example of an airline or cruise (shipping) company. As of 2020, when writing this guide, they both for example lack meaningful alternatives to CO_2 based technologies. Their value will then depend upon 1) the arrival of non- CO_2 based technologies, 2) taxation of CO_2 , and 3) changes in preferences among consumers. Additionally, and

along a different dimension, their value fundamentally depends on the development and distribution of an effective Covid-19 vaccine.

One approach to modelling will then be based on different assumptions when these technologies become available and/or changes to CO2 taxes: early technological arrival coupled say with relatively low taxes and a scenario with late technological arrival coupled with high taxes. Each scenario is then weighted by its probability to get an average cash-flow. On top of this comes likely scenarios regarding the impact of the Covid-19 developments.

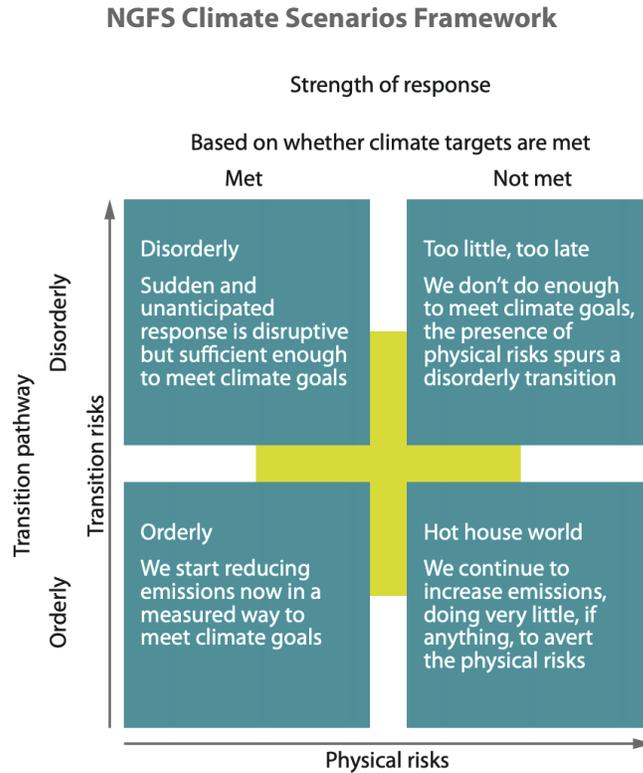
This approach also allows the analyst to take into account the probability for e.g. stranded assets as it can include a scenario where assets are stranded and one where they aren't. We cover stranded assets in more detail later in this guide.

Scenario analysis has two main components: the specific scenarios based of a consistent set of assumptions for a development, and the probabilities for each alternative scenario. There exists various generic sources for both, e.g. "the Network for Greening the Financial System's Climate Scenarios for central banks and supervisors"⁵. Their scenarios, sorted in a 2 x 2 matrix of physical risks and transition risks are shown in Figure 4. Such scenarios typically take a societal perspective and describe high-level scenarios well, but are less clear on probabilities. In a scenario-based company valuation, one needs to develop company-specific scenarios on the back of more generic ones, as well as the related probabilities. Note that scenario analysis like the climate scenarios developed by NGFS, is a methodology that may also be used to model any other possible ESG-related events with varying probabilities and conditional outcomes.

5.4. Optionality. Real options are a powerful yet underutilised tool for dealing with informational uncertainty much better than standard DCF methods. A standard introduction can be found in most corporate finance textbooks such as Berk and DeMarzo (2020).

⁵www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf

FIGURE 4. NGSF' Climate Scenarios



We will consider two types of options here. A standard type of real option is the option to expand production. We will focus on this case first. In our case we can easily see the use of such an option: Firms that produce environmentally friendly products can invest now and see if future demand rises to expand production.

How does one spot the option? Two conditions are necessary:

- Information will become available in the future
- This information affects our decision

How does one value the option? As in "normal" option pricing, two methods are available, namely binomial option pricing and an approach based on the Black Scholes formula. Both have advantages and disadvantages. In any case, two inputs need to be adapted. The "strike" (exercise) price for the option and the value of the stock. We note that the strike price of the real options is simply the investment amount whereas the stock price (or firm value) is simply the value of the project (excluding the investment amount):

- Strike Price = Investment Amount
- Stock Price = Project Value

Finally a measure of uncertainty is necessary. At its simplest, this can be a guesstimate of something like: we have a 50% chance of winning this lawsuit.

These probabilities should reflect the riskiness of the underlying asset. For more advanced methods of getting probabilities, the chapters in say Berk and DeMarzo (2020) are a good starting point.

Lawsuits or past liabilities can be valued as a real option too but we need to change our setup somewhat. Typically we assume being "long" in the option, meaning we get the benefit of the option. Losing a lawsuit means that we might receive a large negative shock to the firm. That means we have to think of being "short" in the option. Being short in a call option can potentially mean unlimited losses and provides a good framework for thinking such possibilities. This methodology captures situations where a requirement for compensation for past liabilities effectively causes bankruptcy and liquidation of the company, and thus normally wipes out the equity.

5.5. Additional issues. Companies are dependent on authorities for licenses and approvals, and financial institutions for financing. In both cases, the counterparties are increasingly aware of the ESG dimensions. In a valuation model these thus both provide license to operate, as well as controlling of access to financing:

- Government policies include firm-specific support schemes to finance the transition towards more sustainable operations. These

are both general and industry-specific, grants and loans, and national and supranational, e.g. from the European Commission.

- Banks are including sustainability assessments and requirements in their credit assessments, and these criteria may limit access to funds, impact credit margins and/or result in new covenants. See the discussion in 3.3.1 in part one of this guide
- Insurance companies may deny PC coverage for companies with particularly high exposure on ESG issues that represent real risk to the insurers, e.g. flooding.
- The government itself, both when granting various licenses and when procuring various products, may enforce strong ESG criteria that forces the private companies to recognize these challenges to be allowed to contract with local or national governments.

6. LIABILITIES FOR PAST EXTERNALITIES - "SINS"

One of the more interesting questions is how to incorporate liabilities for past sins into a valuation. For example, consider the case of the tobacco industry. It faced long years of consumer lawsuits and was ultimately defeated in court and forced to pay victims of lung cancer compensation through the Tobacco Master Settlement Agreement.⁶

A recent example is how Bayer underestimated past liabilities in their purchase of Monsanto in 2016. Monsanto was facing multiple lawsuits regarding one of their main products, a pesticide called Roundup.

How can such situations be handled? Two steps are necessary: firstly discovery and/or recognition, and second an estimation of the expected impact on firm value. For a listed firm, one initially needs to understand the extent to which this is already priced into the firm's market valuation.

Firstly, an analyst should acknowledge that past liabilities may exist and actively search for currently unrecognized, or mis-estimated, liabilities during the due diligence process.

⁶Wikipedia has a good summary of this topic: https://en.wikipedia.org/wiki/Tobacco_Master_Settlement_Agreement

Often these liabilities are not unknown - asbestos, tobacco or pesticides were all well known to be contentious long before legislation created liabilities.

How can these potential liabilities be valued? As discussed in the section on real options, one can view past liabilities as a being short a call option. This view assumes that we have both sufficiently reliable estimates of the potential damages and an understanding of the probability of the respective outcomes.

Another question can be how to limit future liabilities, e.g. as seen from an acquirer's perspective. Once it is understood that a product may be harmful, what are the necessary steps to be undertaken? Recognizing an issue and not taking action can be much more costly than timely action.

An example of how to limit exposure is KSS' acquisition of Takeda's scandalous airbag business in 2018 (Inagaki, 2018) where the acquirer carefully excluded assets and intellectual property that was involved in the scandal that caused Takeda's downfall in the first place. One effect of this was that any claimants lost the opportunity for compensation via the overall assets of Takeda.

Even when risks have been recognized and firms have set apart funds for expected losses, the question is still how adequate these funds are.

Pensions have ESG implications too. Many firms still have legacy *defined benefit* pensions plans with large future pension liabilities. These plans tend to be underfunded given current interest rates, and an analyst should check the status of defined benefit pension plans as part of the due diligence.

7. MODIFIED OBJECTIVE FUNCTIONS - PURPOSE

Our guide has so far primarily dealt with how to adjust traditional valuation models to reflect ESG issues, keeping the maximization of shareholder wealth or contract values as the fundamental objective. Michael Jensen denotes this "Enlightened Shareholder Value", which recognizes and serves stakeholders' demands and externalities, but only as a condition for furthering shareholder value.

Hart and Zingales (2017) address situations in which owners (or decisionmakers in general) do not maximize financial value, but have a modified objective function. The classical example, which also is the basis for their model, is when a company could either use a costly and clean technology or a cheaper and dirty technology. In a case where shareholders have sufficient concern for the environment and how the company impacts it, they may choose to accept a lower return on their investment by choosing a clean technology that reduces emissions. This is a direct trade-off between shareholder wealth and shareholder utility.

In most situations it is challenging to implement a modified objective function. Firstly because the choices and trade-offs are difficult to measure and compare, secondly as an optimization of several objectives at the same time is impossible and may dilute responsibilities, and thirdly since shareholders may well have different views on what non-financial objectives they want to pursue through the company. Still, in cases where shareholders and stakeholders have a broad agreement on the material ESG issues, these may be recognized in an implementable way.

A related concept is the focus on company purpose, as in particular advocated by Alex Edmans in his recent book "Grow the Pie" (Edmans, 2020). The argument being that if shareholders, management and stakeholders together focus on maximizing value creation in a company, rather than a pure profit focus, then the overall value will grow, and even shareholders get a larger slice. This thinking obviously also relates to management style and focus. A "Grow the pie" perspective could be implemented as a scenario in a DCF analysis, but is in general difficult to enter into a model due to the implicit assumptions regarding how a stated and acknowledged purpose impacts both the operating model and corporate culture. This is particularly challenging if the focus on purpose is new and has not been present during the past financial development of the company.

8. ILLUSTRATIVE CASES

We add three cases covering corporate settings where ESG issues are highly relevant. These cases introduce and give background information on the settings of the companies and the issues in focus, as well as suggest topics for discussion and reflection. The purpose of the cases are as a basis for class- or group-discussions, not to promote one, definitive solution. At this stage, any inputs to improve the cases are welcome.

FIGURE 5. Overview of cases

Topic	Industry	Company
Cost of Capital	Energy	Aker – split
Scenario	Airline	KLM
Market Segmentation	Energy	Aker –split
Past Liabilities	Energy	ENBW

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Air France - KLM Case – Scenario Analysis

AFK is an airline company headquartered in France. Most of AFK's business (86% of revenues, according to the company's 2019 Universal Registration Document) consists of "Network" activities, which include offering air transportation to cargo and individual travelers. The airline sector is currently under high scrutiny, due to the impact of its activities on the global carbon emission load. Recent reports (e.g. Air Transport Action Group (ATAG)) suggest that aviation is responsible for 2 to 3% of greenhouse gas emissions. Given the expected future growth in air traffic, and in the absence of action, this proportion may even increase.

AFK is aware of the risks related to its impact on the environment and is committed to contributing to the achievement of a more sustainable business model in aviation. According to the company's Sustainability Report (2018):

"The Group is endlessly innovating so as to be a reference in sustainability. Its ground and flight operations have an impact on the environment, including climate change, noise, air pollution and waste. The Group strives to continuously improve all aspects of its activities to reduce its environmental footprint. In particular, it is contributing to the establishment of a sustainable biofuels industry for aviation."

From a Sustainable Finance perspective, one could make a broader analysis of factors affecting AFK's valuation (e.g. labor problems, as exposed in Schramade, 2019). Spillover effects could also influence several of those different factors simultaneously, creating complex trade-offs. In the following, for simplicity in the exposure, we focus exclusively on carbon emissions.

1. Uncertainties related to AFK's carbon emissions

Regarding its carbon emissions, AFK broadly faces two types of uncertainty, each relating to a different group of stakeholders: governments and consumers. On the one hand, legislative pressure is building up, both on a local and a global level. Governments are currently implementing carbon prices (either in the form of carbon taxes or emission trading) that could severely influence AFK's profit margins. Several countries plan to use these taxes to raise funds for investment in greener transportation infrastructure, such as rail transportation. Although this alternative does not impose a direct threat for ALK's transnational flights, it may certainly increase competition on a regional level. On the other hand, consumer pressure due to general climate change awareness could also affect AFK's ability to grow sales.

However, frictions pushing in the opposite direction accompany both of these threats. Governments are aware of the fact that air traffic is important for job creation and tax income, and consumers still want to be connected internationally and be able to travel around the globe.

Besides government and consumer pressures, climate change itself poses a threat to airline companies' business, as air operations depend on weather conditions and may be impacted by natural phenomena linked to climate change (earthquakes, volcano eruptions, hurricanes, floods, etc).

2. How the uncertainties could affect AFK's valuation

AFK's profit model is largely dependent on its ability to maximize its sales vis-à-vis its high fixed costs (planes and labour). To maximize sales, AFK has to maintain sufficiently high volumes (plane utilization rates) and attractive ticket prices.

Carbon emissions could impact AFK's cash flows through two main channels:

- Carbon pricing (carbon taxes, emission trading) and the ability to pass these on to passengers (through ticket pricing)
- Volumes (number of passengers, plane utilization rates)

Flight operations represent 99.7% of AFK's total direct emissions. Ground operations (testing bench, runway vehicles, etc.) represent 0.3%. In its Universal Registration Document (2019), AFK provides the following data regarding its carbon emissions:

		Air France - KLM Group			
		Unit	2018	2019	19/18
Greenhouse gas emissions (Scope 1 GHG protocol) ⁽³⁾	Aviation Fuel [√]	ktons CO ₂	27,571	28,228	+2.4%
	Ground Operations	ktons CO ₂	62.3	60.7	-2.6%
Greenhouse gas emissions (Scope 2 GHG protocol)	Electricity	ktons CO ₂	46.2	7.6	-83.5%
Greenhouse gas emissions (Scope 3 GHG protocol)	Upstream emissions from fuel production	ktons CO ₂	5,685	5,907	+3.9%
Total carbon Emissions		ktons CO ₂	33,365	34,203	+2.5%
Offsetting	Mandatory carbon offsets	ktons CO ₂ credits	3,106	3,253	+4.7%
	Voluntary carbon offsets	ktons CO ₂ credits	0	24	n.a.
	Customers' carbon offsets	ktons CO ₂ credits	0	98	n.a.

[√]Figures verified by KPMG for 2019 (reasonable level of assurance).

(1) Air France Group scope: all flights under AF and A5 code operated by Air France, Joon and HOPI, all flights under TO code operated by Transavia France.

(2) KLM Group scope: all flights operated by KLM, KLM Cityhopper, Martinair and Transavia.

(3) CO₂ emissions represent 98% for air transport (Carbon base at January 31, 2020: www.bilans-ges.adema.fr/).

n.a.: not available.

Below, AFK's CO₂ emissions are compared to a selected number of peers.

	CO ₂ emissions (mn t)		Revenues (bil €)		Net income (mil €)		Passengers (million)	
	2018	2019	2018	2019	2018	2019	2018	2019
AFK	33,4	34,2	26,5	27,2	420	290	101	104
Lufthansa	32,3	32,8	35,5	36,4	2196	1245	103	107
SAS	4,3	4,2	4,6	4,5	63	153	29	28
Norwegian	6,1	6,0	4,0	4,4	-145	-96	37	36
Ryan Air	11,7	13,1	7,2	7,7	1450	885	130	142

Source: own collection from financial reports

3. Current trends in the Aviation Industry

In 2009, the International Air Transport Association (IATA) set the target of carbon neutral growth from 2020 onwards, and a 50% reduction in net aviation CO₂ emissions by 2050 relative to 2005 levels. The European Union wants to cut greenhouse gas output by 55% in the next decade, rather than the previous 40%, from a 1990 baseline.

Legislation regarding carbon emissions has shown an upward trend. AFK has been subject to the European Union emission quota system (EU-ETS or European Union Emission Trading Scheme) since 2012. In 2019, AFK's CO₂ emissions totaled 28 million tons, of which 6 million are expected to fall under the EU-ETS requirement (AFK's Universal Registration Document, 2019). As of 2021, AFK will also be subject to the global carbon offsetting mechanism (CORSIA) adopted by the ICAO in October 2016.

Due to the Covid-19 pandemic, AFK reportedly granted 10.4 billion euros in state-backed loans from the governments of France and The Netherlands. However, these loans have strings attached. Both the French and the Dutch government have made the loans conditional on carbon emission reductions.

President Emmanuel Macron recently proposed an airline duty increase to 30 euros per short-haul economy passenger and 400 euros for long-haul business, from their current 1.50-18 euro range. From Jan. 1, the Netherlands is introducing passenger duties worth 220 million euros at pre-crisis traffic. (Reuters).

AFK therefore now faces higher pressures in both home markets as well as EU to reduce its carbon costs. These pressures come not only directly from governments, but also from civil society. A group of environmental organizations that includes Greenpeace has recently initiated a legal challenge to demand steeper emissions cuts in return for AFK's aid package.

The effect of the pandemic is not only felt through regulatory pressures. Due to travel restrictions, airlines in general have seen passenger numbers decline. The pandemic has also led to strong developments in alternative (digital) meeting services, which could affect consumers' willingness to fly in the long term.

4. AFK's measures to mitigate uncertainties

AFK summarized its climate action plan in its 2018 Sustainability Report:

OUR CLIMATE ACTION PLAN

- Pursuing fleet modernization and contributing to aeronautical research.
- Implementing operational measures, such as applying eco-design principles, weight reduction projects, and route optimization.
- Using and developing sustainable aviation fuels (SAF).
- Providing information for customers on their travel-related CO₂ emissions and the opportunity to offset these.
- Supporting implementation of the global sector-wide climate agreement (CORSIA).
- Supporting NGO-led environmental programs.

Air France KLM Sustainability Report 2018

Besides the points described above, other actions can be found in AFK's Sustainability Report and Universal Registration Document:

- Carbon risk hedging - at the financial level, AFK claims to have implemented a carbon credit risk hedging strategy in the form of forward purchases
- Reduce fuel consumption - At the operational level, AFK is "committed to exploring all avenues potentially reducing its fuel consumption and carbon emissions (...) The Group also uses an internal carbon price (price range) when taking a decision on whether to proceed with investments and projects, to factor the carbon risk into its decision – making scenarios." (Universal Registration Document 2019)
- Digitalization – limit use of paper and prioritize digital boarding cards
- Carbon offsetting – via offsetting programs offered during the ticket booking process or donations in favor of financing forestry plantation projects

- Ground operations – replace fossil-fired ramp equipment (baggage trailers, boarding walkways, etc) with electric equipment
- Lobbying

AFK is a member of the representative associations for the airline industry (IATA, ATAG, A4Em FNAM) which engage in lobbying activities directed at the relevant national, European and international authorities and bodies (ICAO, European Union, supervisory Ministries in France and The Netherlands) to promote effective solutions for the environment.

“Air France-KLM has always supported the implementation of a market-based mechanism for carbon emissions considering that, provided it is equitable, such a system is more effective from an environmental standpoint than a simple tax.” - Universal Registration Document 2019

AFK argues that increases in carbon taxes lead to additional costs for the Group and reduce its ability to invest in energy-efficient aircraft. In response to proposed increases to French passenger duties, Air France-KLM Chief Executive Ben Smith said new taxes "do not support emissions reductions (...) In fact it's counterproductive and would deprive us of finances that could otherwise be invested in environmental projects" (Reuters).

5. Possible scenarios and their probabilities

Based on the risks identified above, several scenarios for KLMs future cash flows can be constructed. The chosen scenarios and their probabilities largely depend on one’s views on the development of the trends described above:

- Regulation:
 - Will the trend of increasing regulation persist?
 - Will legislation be streamlined, to avoid doubling carbon prices on the airline industry?
 - Will the negative economic effects of the pandemic make governments more sensitive to the importance of job creation by the airline industry?
- Consumers
 - How will the development of greener transportation infrastructure (e.g. rail development) affect AFK’s competitive position?
 - How will climate change awareness and engagement by civil society develop?
 - How will passenger numbers be affected by the recent pandemic (in relation to new remote work possibilities) ?
- Effectiveness of AFK’s measures
 - Will AFK successfully implement measures such as using and developing sustainable aviation fuels (SAF)?
 - How will AFK finance such investments?
 - How will AFK’s lobbying activities and engagement with representative associations shape the legislative landscape?

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ENBW – A short case

ENBW is an electricity producer from southern Germany that operates a mix of nuclear power plants, coal fired plants and renewable energy installations. ENBW faces at least two major challenges as Germany is phasing out nuclear power and recently decided to do the same with coal fired power plants. These decisions impact ENBW in several ways.

At the *cash flow level*, ENBW must transition energy generation away from CO2 based sources to renewable sources. At ENBW renewable energies accounted for 32 % of the generation mix in 2019, with plans to increase this to 50% by 2025 (AR, 2019).

The impact of the decommissioning of all nuclear power plants is now fairly well understood and its impact on the firm can be seen on the *liability side of the balance sheet*.

Table 1: Liabilities of ENBW as of 31.12.2019

Equity and liabilities		7,445
Non-current liabilities	Provisions	14,333
	Deferred taxes	890
	Financial liabilities	7,361
	Other liabilities and subsidies	2,156
		24,740
Current liabilities		11,103
Total		43,288

in € million

Breakdown of provisions

Provisions	Pensions	7655.3
	Nuclear	5864.6
	Others	813.2

in € million

The impact of the decision to close coal-based plants on the other hand is not yet fully understood. The firm itself states in its annual report: *“Phase-out of coal power: early decommissioning of power plants: The version of the Coal Phase-out Act adopted by the German cabinet and its framework parameters (plans for operators regarding replacement power plants and decommissioning) are open to varying interpretations with respect to the phase-out path. In general, the later decommissioning of brown coal power plants will mean that hard coal power plants are shut down more quickly and thus even new hard coal power plants will be removed from the grid earlier. The German government does not plan to*

provide compensation for any power plants decommissioned after 2027. We currently identify an increased level of risk in this area.”¹

A worst-case scenario could be that ENBW faces considerable risks that a substantial part of the asset side of the balance sheet has to be written down. Currently, powerplants account for €4.6 bn in terms of value. How much of this value is at risk would need to be determined during due-diligence, as the annual report does not provide a break-down of the value attributable to each energy source. Hard coal accounts for 3,586 MW out of 13,849MW installed output.²

Looking at the ENBW example, several questions arise:

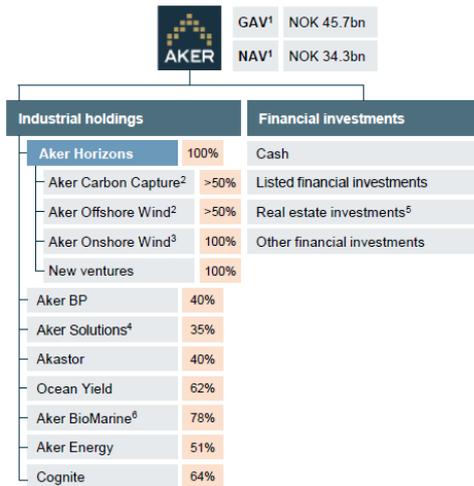
- 1) Will companies be able to fund the transition of their “brown” side to the green side successfully?
- 2) How can one understand the risk posed to firm’s balance sheets that arise from legacy assets and technologies?

¹ ENBW, Integrated Annual Report EnBW, page 108. Accessed 31.08.2020 at https://www.enbw.com/media/bericht/bericht_2019/downloads/integrated-annual-report-2019.pdf

² ENBW, Integrated Annual Report EnBW, page 88.

July 17, 2020 - Aker Solutions is launching a series of structural and strategic changes to transform the company and enhance shareholder value by spinning off the wind and carbon capture businesses to shareholders and merging Aker Solutions ASA ("Aker Solutions") with Kvaerner ASA ("Kvaerner") to create an optimized supplier company.

The Aker corporate sphere is a major Norwegian industrial structure related to engineering and production, primarily connected with the petroleum sector. Within this sphere, Aker Solutions is a Norway-based oil service company focused on manufacturing subsea equipment, engineering and maintenance/modification/ operation.



The announcement above has since been executed, including spinning off Aker Carbon Capture and Aker Offshore Wind, raising new capital to these companies and listing them on the informal Merkur, as well as merging Aker Solutions and Kvaerner.

Some key market data (1.10.20):

Company	MV(E), NOK, gross	Return from 26.8.20	Std.dev. (ann.)
Aker	29.4 mrd	-4%	7.2%
Aker Solution	2.4 mrd	-19%	21.0%
Aker Offshore Wind	3 mrd	41%	86.2%
Aker Carbon Capture	3.2 mrd	14%	50.0%

The business models of the newly spun off companies are, in short:

- Aker Offshore Wind: Pure-play deep-water wind independent power producer on water depths of more than 60m.
- Aker Carbon Capture: Technology, engineering, delivery and operation along the whole carbon capture, transport, storage and utilization value chain.

The market values Aker Solution, Aker Offshore Wind and Aker Carbon Capture are in the same range. Still, the companies represent three very different propositions from a sustainability perspective:

1. Which are the main scenarios that may be relevant for valuing the three companies?
 - a. Carbon emissions
 - b. Technological developments
 - c. National and supranational political developments and regulations
 - d. Demand
 - e. Other?
2. To what extent may governance, ownership and scope impact the valuation of the companies differently? Is it only about sustainability?
3. How may thinking around optionality, including real options, assist in valuing these companies?
4. Who are the main stakeholders and which are the material sustainability issues for the three companies?