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# A Scenario Analysis of TCFD Implementation—As an Example of H&M

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***Abstract:*** *It is ever increasingly imperative that organisations around the globe further their knowledge and understanding of their risk positioning in a rapidly changing climate. Global investment powerhouse BlackRock in its 2020 Sustainability Survey noted that 37% of its invested assets by 2025 would be required to illustrate a sustainable management approach [1]. The Financial Stability Board created the Task Force for Climate Disclosures (TCFD) in order to assist the development of recommendations surrounding type of information that organisations should voluntarily disclose. The TCFD in 2017 released its climate- related risks and opportunities framework which aimed to create a standardised framework that better disclosed information surrounding capital allocation [2]. This report is a Scenario Analysis prepared for H&M Group based on the above TCFD guiding principles. It is divided into seven sections; company introduction, analysis of climate-related risks, understanding the selected climate scenarios, evaluation of business impacts, potential responses, a brief discussion outlining potential improvements to the scenario risk analysis and the conclusion.*

***Keywords:*** *TCFD, H&M, Scenario Analysis*

## 1. Introduction

Founded in 1947, H&M Group is a multinational clothing company based in Sweden. As one of the biggest fast fashion giant companies, H&M has many fashion brands, including H&M, H&M Home, COS, Weekday, Other stories and so on. H&M Group insists on creating unique brands to meet the needs of customers about fashion, quality and sustainability. From a business point of view, H&M Group has achieved a huge success. Until 2021, H&M Group has expanded the business coverage areas to 75 geographical locations with over 155,000 employees all over the world [3]. Even under the pandemic in 2020, the sales performance of H&M Group still reached SEK 199 billion. Though Rashmila Maiti (2022) pointed that the fast fashion industry is always claimed as the main consumer of water and global carbon emissions, H&M has made great efforts to reduce pollution[4][5]. In 2021, the sustainability report of H&M Group has been combined with annual report, indicating that sustainability has been an integral part of their business. At the same time, H&M Group has actively engaged in global sustainability development. For example, H&M Group achieved the second highest score among all brands in the Fashion Transparency Index 2021[3].

## 2. The Analysis of Climate-related Risk

The climate-related risk can be divided into two main categories, including transition risks and physical risks.

### *2.1 Transition risks*

#### *2.1.1 Low carbon emission technology shifts*

Unsurprisingly, fashion makes up around 10% of greenhouse gas emissions from human activity [6], which indicates that it is necessary to find sustainable solutions to current pollution with the application of low carbon emission technology. H&M Group still relies on fossil fuels as the main source of energy. The cheap and constantly changing fashion generates the business model by using inexpensive materials to cut costs. The cheap synthetic fibers, large-scale used by fast fashion companies, mostly are extracted from fossil fuels, like oil and gas [7]. What's more, fibers are the largest source of emissions among all

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aspects of fashion, ranging from production to sales [8]. Therefore, it is essential to find sustainable raw materials as substitutes, or develop new technology to reduce the carbon emission in the process of production. H&M Group has made some achievements in the reduction of carbon emissions. For example, H&M Group has provided financial support for suppliers to replace coal and other fossil fuels as much as possible. Meanwhile, the subsidiary corporation Infinited Fiber Company is invested in research and development on regenerated textile fibers [3].

#### *2.1.2 Market preference shifts*

Consumers promoted the focus on sustainable development by increasing the preference on "green" products with less climate impact firstly. Greg Petro (2022) conducted the survey, showing that the primary driver for consumers to purchase sustainable products and brands is the willingness to protect the environment [9]. What's more, consumers from all generations, like baby boomers and Gen Z, would like to pay more on sustainable products, especially Gen Z attracting the sustainability topics.

To deal with the changing consumer preferences, there is no doubt that H&M should strengthen the process of building sustainable brands and products, and become more transparent on the environment issues to generate reputations among consumers. With the formulation of net-zero strategy in the supply chain, H&M Group made efforts to set up a circular business. At the same time, the sustainability strategy also favors building trust between consumers and brands, by offering products with lower effect on the environment [3].

### *2.2 Physical risks*

#### *2.2.1 Higher temperature*

H&M Group is heavily dependent on cotton as a raw material[3]. The extreme climate, especially higher temperatures, leads to significant effects on the production of cotton, via changing cotton's physiology, biochemistry and quality [9]. As a result, the less availability of cotton will directly affect the price of raw materials in the long term. At the same time, the heating wave also shifts to consumers' decisions on clothing they wear. Christopher Flavelle (2022) showed that clothing designed for high temperatures has become the mainstream clothing trend[10]. The length of summer promotions has been extended. The concerns on clothing design arise again. H&M Group has taken some actions to minimize the effect on raw materials. In the short term, with the help of global sourcing teams, H&M Group can also find the relatively cheap suppliers to meet the price function. In the long term, H&M Group also invested in new substitutes and recycling mechanisms. The seasonal products are designed on the basis of weather patterns, catering to climate change, which may influence the production and distribution in certain regions.

#### *2.2.2 Water shortage*

All over the world, the fashion industry is the second most water-intensive industry. The production of one average cotton t-shirt consumes 2,700 liters of water, equivalent to one person's consumption of drinking water for 900 days. Highly dependent on the usage of water, the fashion industry will be influenced by water shortage seriously. Meanwhile, the lack of fresh water will also affect producing areas. Extreme weather related to water shortage, like drought and flood, may also disrupt the process of production and distribution in many regions and countries. H&M Group has the ambition to reduce supplier's water consumption, and also care for those suppliers located in high-risk regions. The movement for low-risk regions is on the schedule to prepare for the extreme events.

The scenarios selected for this analysis incorporate recommendations presented by the Task Force on Climate-related Financial Disclosures (TCFD) found in the taskforce's The Use of Scenario Analysis in Disclosure of Climate Related Risks and Opportunities[2]. The TCFD presents an introduction to the Intergovernmental Panel on Climate Change (IPCC) and International Energy Agency's (IEA) two widely accepted climate pathways[11].

The IPCC was founded by the United Nations to represent all member states for the assessment of climate change related science. Its objective is to provide the governments of its member states with information pertaining to climate issues, to develop sound policy surrounding climate change (2022). On the other hand, the IEA is headed up by 31 member and 11 associate nations which account for approximately 75% of the world's energy production (2022).

The IEA's medium to long term transition scenarios are based upon the World Energy Outlook and Energy Technology Perspective, reliant on its Global Energy & Climate model. The model's assumptions

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capture global energy and non-energy sectors with respect to a given policy pathway (usually associated with a certain temperature limit).

Released in the IPCC's (2014) Fifth Assessment Report (AR5), as shown in Figure 1, the IPCC presented four different 21st century scenarios named Representative Concentration Pathways (RCPs)[12]. The RCPs detail scenarios based on four broadly different levels of radiative forcing between present day and the end of the century [13][14][9]. Radiative forcing is measured in Watts per meter squared and pertains to the delta of energy entering and exiting the earth's atmosphere. It is affected by greenhouse gas emissions, air pollutants, and change in land use [15]. Before the age of anthropogenic climate warming, radiative forcing generally was in equilibrium [13][14].

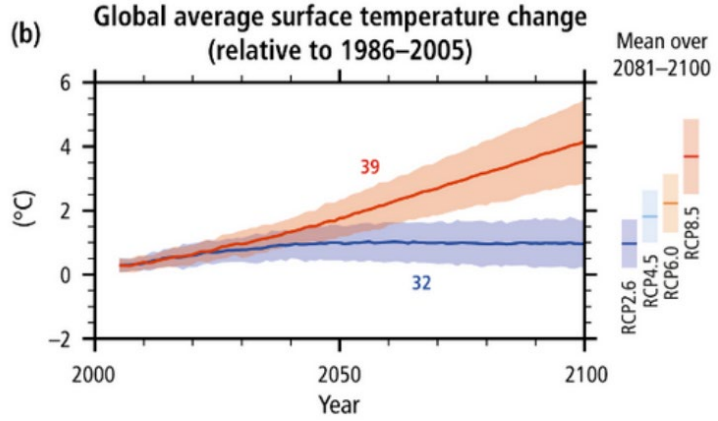


*Figure 1: AR5 - RCPs against Global average surface temperature change (IPCC 2014)*

The pathways consist of RCP 2.6 (stringent mitigation), RCPs 4.5 and 6.0 (middle of the road), and RCP 8.5 (high emissions based) [12]. Regarding the above graph from AR5, the IPCC projects that under the RCP 2.6 Watts/m2 scenario, global average surface temperatures should not exceed a 2˚C warming, which coincide with the Paris climate goals. Conversely, under the projected high emissions and unmitigated RCP 8.5 Watts/m2 outlook, global average surfaces would achieve a 4.3˚C increase by the end of the century. Until the most recent IPCC AR6 report (2022), the climate scenarios presented by the IEA were accepted as the most up to date which incorporated political and economic factors[13][14][16][2]. However, the release of AR6 by the IPCC (2022) presented a whole new range of pathways accompanying its previously published RCP framework, the Shared Socioeconomic Pathways (SSPs)[13][14]. As their name suggests, the SSPs relate to how socioeconomic factors influence how different RCP scenarios could be attained within the framework of a given world [17]. The following figure illustrates the five separate pathways against climate mitigation and adaptation challenges[2].


*Figure 2: The five SSPs and their respective socio-economic challenges of mitigation and adaptation (O'Neil 2014)*

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Figure 2 describes that the baseline scenario for H&M assumes the SSP 1 Sustainability, which incorporates the most aggressive climate change mitigation practices out of the five modelled pathways. The scenario, coined Taking the Green Road assumes a low carbon future whereby the global economy undergoes a rampant transformation in order to cap mean global surface temperature increase to 2˚C by 2100 [17]. In this pathway, radiative forcing is slated to peak around 2050 and then lower to 2.5 W/m2 by the end of the century, keeping in line with RCP 2.6 projections. Literature suggests that this scenario traditionally is seen as the highest cost in the short run, albeit lowest risk in strategic terms since global temperature rise, and subsequent effects of climate change are kept to a minimum [17].

According to the Figure 2, the second SSP and RCP (>3˚C increase) scenario selected for this risk analysis included SSP5. This pathway, named Fossil Fuelled Development, continues global dependency on high emissive fossil fuels for world energy supply. As shown in Figure 3, the IPCC (2019) projects that this pathway best illustrates how existing and developing carbon intensive economies will face monumental challenges regarding climate mitigation if global climate policy is kept business as usual. The corresponding RCP value chosen for this scenario is RCP 8.5, which the AR5 and AR6 reports suggest with high confidence that global mean surface warming will exceed 3˚C, potentially rising to 5˚C by the end of the century[12][13][14].

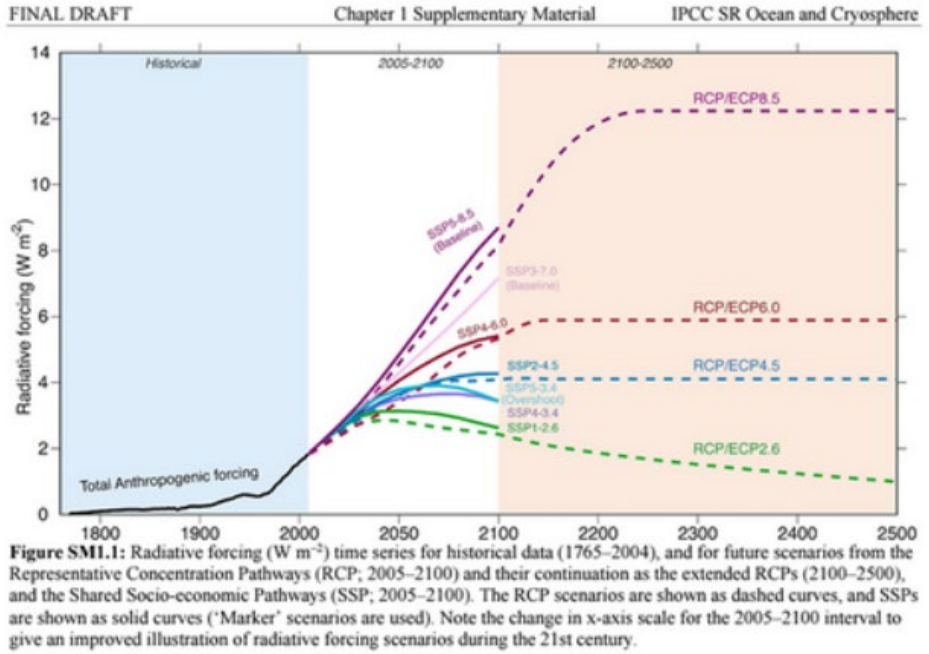

**Figure SM1.1:** Radiative forcing (W $m^{-2}$) time series for historical data (1765–2004), and for future scenarios from the Representative Concentration Pathways (RCP; 2005–2100) and their continuation as the extended RCPs (2100–2500), and the Shared Socio-economic Pathways (SSP; 2005–2100). The RCP scenarios are shown as dashed curves, and SSPs are shown as solid curves ('Marker' scenarios are used). Note the change in x-axis scale for the 2005–2100 interval to give an improved illustration of radiative forcing scenarios during the 21st century.

*Figure 3: Total Anthropogenic radiative forcing incorporating various mitigation and adaptation pathways of the five SSPs and potential RCP values by 2100(IPCC 2019)*

Literature notes, one of the key points regarding this scenario is a continued high birth rate in the developing world, based on Figure 3, little clean energy and climate investment in sustainable industry by existing developed nations [17]. Under this pathway, energy and carbon intensity in rapidly growing populations ramps up until at least the middle of the century, well past projected climate 'tipping points'. The following section of this report will illustrate the severity of risks under these scenarios to H&M.

## 3. Evaluation of Business Impacts

A thorough approach to environmental sustainability is a key component of H&M's business model as a prominent fast fashion store. The justification for this model is sound since the clothing sector has intricate supply and production chains with several environmental touch points, all of which run the danger of being significantly impacted by climate change.

Extremely important to the long-term financial success of clothing firms is how climate change is affecting the fashion industry: Under the SSP5 - RCP8.5 scenario, in 50 years, it is anticipated that glasshouse gas emissions would double and the earth's average surface temperature will rise, potentially hurting cotton production and textile manufacture. More than 70% of the freshwater used globally goes to agriculture, and cotton, a key component of many textiles, requires a water- intensive method to grow.

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3,000 gallons of water are used to produce one pair of jeans, this poses a high risk to H&M's supply network. However, worldwide water withdrawals have tripled over the past 50 years, and it is anticipated that the cost of water will rise as it becomes a more valuable resource. Compared with the SSP1 - RCP 2.6 pathway, water shortage looks to be a key risk for H&M. Long supply chains and labor requirements, including those for farming, shipping, garment production, and retail employees, create additional pressures on the environment and the climate.

Given that its average cost of products sold has continuously climbed over the past five years while gross margins have declined, H&M may already be feeling the effects of operating in a world influenced by climate change. There is even tangible evidence that in 2016: Swedish clothing retailer H&M said that hot weather, more markdowns, and a stronger dollar combined to reduce third-quarter profits by 9.2% to 6.3 billion kronor (£567 million), missing analysts' expectations. The firm claimed that the abnormally hot September weather in the UK and other European nations discouraged people from purchasing colder items and increased discounting, which made the start of the autumn trade season difficult. In an SSP5 - RCP 8.5 world, heatwaves are projected to increase considerably. Due to more competitive marketplaces, higher price competition, and a diminished structural boost currently from the expansion of online sales, the profits were impacted even more by the rising temperature. The supply and demand equation is disrupted by weather changes brought on by climate change.

Rapid weather changes brought on by climate change have an impact on consumers' consumption and purchase decisions, therefore the timing and volume of demand differ from what the provider had anticipated. When consumer demand varies from the anticipated timing and level, the business loses money, and discards unsold goods, which further releases glasshouse gasses into the atmosphere. This is an issue for H&M, since waste inherently adds to Scope 1 and 2 emissions. The greenhouse gas released hastens climate change and upsets the supply- demand equilibrium even further. By creating a predictive model to reduce GHG, wastewater, and wasted resources produced by overproduction owing to demand fluctuations created by climate change, it is crucial to make the product eco- friendly and low-carbon. We caution the H&M board regarding risks associated with cotton (and like) crop failures under the SSP 5 - RCP 8.5 scenario, as proceeding with synthetic fibers as a replacement can add to Scope 1, 2, and 3 emissions.

Many clothing suppliers are already seeing the impact on productivity and input costs, which are mainly focused on the employees' depleted motivation and concentration. The energy and concentration of the workforce are depleted as a result of these circumstances, which negatively impacts their productivity and efficiency. This could also have an impact on the performance of the ready-to- wear industry. Increased temperatures, droughts, a shortage of fresh water, and erratic rainfall patterns are all predicted to have an impact on cotton production across the world's existing cotton-growing regions (SSP5 - RCP 8.5 conditions). In terms of potential business interruption, given that 70% of the cotton grown globally is produced in China, India, and the United States, there would be significant supply problems, which will have a significant negative impact on commercial operations under the SSP5 - RCP 8.5 scenario. The textile sector in Europe, where H&M's headquarters are located, is heavily reliant on cotton fibers, which serve as the raw material for the entire production process.

But cotton is a plant that is susceptible to climatic change. More water is needed in response to rising temperatures, particularly during the growth of blooms and bolls, the fluffy white balls used to harvest cotton fibres. 73% of cotton is currently thought to be cultivated with full or partial irrigation. As a result, it is anticipated that the production of cotton will change in present cotton-growing locations around the world due to climate change, drought, a lack of fresh water, and unpredictable rain patterns. Global supply chains as well as local economies will be impacted by this. It implies that in order to create more sustainable agricultural practices such as seen in SSP1 - RCP 2.6 Taking the Green Road approach, the sector requires access to better forecasting techniques and better information about upcoming climatic changes. It is challenging to adjust plans in the midst of the season since the clothing business is particularly susceptible to climate fluctuations and the supply chain is dispersed and multi-layered globally. Long lead times and little flexibility cause issues with overstocking and understocking. In certain circumstances, lead times can be longer than during the sales season, and demand from customers can fluctuate quickly based on the trend, taste, season, and circumstance. Understock damages the brand's reputation by failing to meet consumer needs and results in the loss of possible sales opportunities because of a spike in demand while the product is not yet ready for sale.

Consequently, in advance of sales seasons and dates, the clothing industry needs reliable assessments of product supply. Overstock causes a number of concerns, from space management to out-of-style items to liquidity problems. Price reductions and marketing campaigns are required to increase a company's cash flows. If the supply chain is unable to react fast to inaccurate demand forecasting and unexpected

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shifts in demand, a cycle will continue in which elements related to climate change, such as resource waste, greenhouse gas emissions, and water pollution, will compound to cause more serious problems. In the worst, most unethical situations, fashion firms trash unsold merchandise to protect product value after an oversupply and avoid brand value loss.

## 4. Potential Responses

We have complied a list of recommendations that we believe H&M should consider as potential responses regarding the risks detailed in the previous section. Firstly, H&M should monitor its greenhouse gas emissions across its entire value chain and make this information available to the public in a timely manner. In order for H&M to achieve adequate environmental accounting information disclosure, it needs to have sufficient financial personnel with both environmental and accounting knowledge, and can disclose true, accurate and complete information to stakeholders in a timely manner. This ensures a high degree of transparency in H&M's responses to carbon emissions and its progress.

Furthermore, H&M could build a fund to invest in suppliers to help them improve energy efficiency and transition to renewable energy. For example, the transition to renewable electricity, accelerating next-generation materials, expanding sustainable materials and practices, eliminating coal in manufacturing, and improving energy efficiency.

In addition to this, H&M can reduce waste for its suppliers by adjusting data analytics to measure inventory levels on both the supply and demand sides in real time. This approach not only provides a more accurate estimate of the raw materials needed for production, such as a month's use to produce a Dallas Walmart TWMT shampoo, thereby reducing waste, but also reducing inventory and maintenance costs[17]. Artificial intelligence (AI) and machine learning will continue to enhance these predictive analytics so that H&M's suppliers can keep up with demand.

H&M can convert food crop waste, i.e. oilseed hemp waste, into natural fibres by upgrading new innovative materials. And added to the costume. In addition to reusing discarded food crops through high technology, H&M can also choose other sustainable materials. Some other sustainable raw materials include organic cotton knitwear, denim and poplin, as well as fresh organic linen. Obviously, in this process, H&M places higher demands on the raw materials of its suppliers. Because natural and sustainable raw materials are needed instead of industrial materials that can be mass-produced, cheap and low-cost.

These shifts can be costly, however shoppers are well aware. Many shoppers are now willing to pay more for sustainable goods. Bain & Co. According to the report, nearly 75% of shoppers will change their purchasing habits to improve the environment. Moreover (as exaggerated as it sounds), according to CDP, a non- profit organization, sustainable business opportunities are worth seven times more than investments – $2.1 trillion versus $311 billion. Thirdly, H&M should establish an internal carbon pricing mechanism to support H&M's team in minimizing carbon emissions when making decisions about materials, production processes and transportation. Choosing a product with higher emissions can have a negative impact on the product's profit margins. Thus, internal carbon prices will increase over time to encourage H&M to make more sustainable purchasing decisions.

If H&M intends to adopt a carbon budget, the first and most important decision is whether to allocate the budget to departments, individual employees or travel. The second option, giving employees individual carbon budgets, is often considered undesirable and impractical. Because every employee doesn't have to think about where they are in the department's financial budget. Another difficulty that may be encountered is that there are currently few travel technology providers at the point of sale to show individuals their carbon budgets [18].

Moreover, H&M could fund projects to reduce emissions across the value chain and remove carbon from the atmosphere. The return on green investment will be measured in terms of emission reductions, rather than economic gains. While environmental, social and governance (ESG) causes can be expensive, they are attracting more investors for legitimate financial reasons. Independent rating agencies found that companies with higher ESG ratings reported lower costs of capital – 1.1 percentage points lower [8]. In addition, there is evidence that this investment will pay off. Because of the short-term costs, H&M stores its long-term sustainability commitments in "tomorrow" machines that may face consequences before tomorrow.

Last but not least, H&M can experiment with several circular business models around acquisition, use and care, and product collection. The circular economy can reduce the number of raw resources

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H&M uses to produce products, and it can also reduce carbon emissions. While allowing the overall business model to remain the same, H&M has created an additional sustainability agenda, an ostensible effort [19]. If H&M relies on exploitation and unsustainable supply chain issues, a new eco-collection or two won't address the larger problems of waste and climate change. Therefore, instead of sticking to traditional models, H&M needs creative new sustainable business models. For example, a global service recycling station will be established to flow all recycled clothes, shoes, hats and other clothing around the world, so as to achieve the sustainable development of the circular economy.

## 5. Differentiation of Scenario Analysis

If this climate scenario analysis was to be delivered in H&M Group's annual report, we would intend that it be completely integrated. This would assist the sense that all financial and non-financial disclosures be accounted for, in order that H&M's shareholders are acutely aware of all potential risks and opportunities which the company is to face in the current operating sphere [20]. We would recommend to those preparing for an integrated report to continue with the recommendations provided by the TCFD as an external reporting framework. This will facilitate our current and future investors to successfully compare and contrast H&Ms risk disclosure against other potential investment opportunities, aiming to illustrate the opportunity cost of not investing in H&M Group. The integrated report (climate scenario analysis) would aim to include company wide scope, ensuring that all elements of H&M Group (H&M, COS, Weekday, Monki, H&M HOME, & Other Stories, ARKET and Afound), as well as partially or fully owned subsidiaries are captured in the report. Therefore, much more time would be spent collecting, collating, and disseminating the data gathered from H&M Group's operations. Moreover, we would recommend that all data is at least provided limited assurance through a limited assurance engagement, which will give H&M and stakeholders a high level of confidence in the accuracy and truthfulness of reporting. We intend that the provision of this assurance will assist H&M Group's decision makers, suppliers, investors and wider stakeholders clarity in understanding the complete standing of H&M Group's climate impact.

Furthermore, to assist readers with understanding the climate risks presented, we would suggest that a complex risk assessment rubric would be created, that allows the visualisation of a quantified risk rating of H&M Group's business activities against both the SSP1 – RCP 2.6 and SSP5 – RCP 8.5 scenarios presented.

We would further advise H&M group to update this risk assessment annually, ensuring that data is captured, analysed and compared on an annual basis in order to successfully benchmark the organisations improvements (or deterioration) regarding risk exposure to a changing climate.

## 6. Conclusion

The report is based on two scenarios, one that meets a less than a 2˚C mean surface temperature increase, and one that exceeds 3˚C. It finds that business functions and supply lines of the H&M Group are acutely at risk under a high-emissive and high warming global scenario, however multiple lucrative financial opportunities are present, using leverage created by circular business models through ethical and sustainable sourcing and waste minimisation.

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